

Portfolio

methods, tools and
materials for linguistic
and cultural sensitive
science teaching

for Science Teacher Education

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Need for the Changes within the Project ESTA in Science Teacher Education at our University

In Bosnia and Herzegovina, education has been used as an instrument for fostering nationalist tendencies after the fall of Yugoslavia and the Bosnian war. Although our country is small, with less than four million inhabitants, it has several educational systems that exist alongside each other. In these educational contexts, students are almost entirely separated according to the religious and cultural group they belong to. Bosniac Muslims, Serbian Orthodox Christians, and Croat Catholics living in the same country learn different interpretations of historical events, have different religious education and are taught in different languages, which they speak now as well. This is due to the strong influence of nationalistic parties and interest groups on the country's education curricula which perpetuates the existing socio-cultural divides. It leads to exclusive and discriminatory practices in B&H schools, in particular concerning ethnic minorities such as Roma children. Initial teacher training lacks the intersection of research and teaching practice thereby failing to provide future teachers with the skills to apply adequate teaching strategies and methods. Furthermore, educational practices and structures promoting social cohesion are needed, such as a teacher education that explicitly takes cultural diversity into account and that unites members of all religious and ethnic groups.

According to TIMSS 2007, in Bosnia and Herzegovina, 20 % of the students did not reach the lowest benchmark in the TIMSS 2007 study. The country's average score was 466 points, far below the scale average. Similarly, TIMSS 2019 also showed that the achievements of students from Bosnia and Herzegovina were below the average (452 for math, and 459 for science). These results show the urgent need to improve science education at the secondary school level in our country. One of the recommendations of the TIMSS 2019 Report for Bosnia and Herzegovina is: „Improve the quality of the teaching and the teachers“. In addition, PISA 2018 shows that B&H has a high percentage of students with results below the basic level of knowledge of reading and mathematics, as well as in science, and a low proportion of students who reach the highest levels of knowledge in at least one area.

One great challenge for science education in Bosnia and Herzegovina is the countries' plurality of languages and cultures. The education system underwent major changes after the fall of Yugoslavia. Science education in our country takes place amidst political and ethnic differences that translate into linguistic heterogeneity and cultural diversity.

Bosnia and Herzegovina has a decentralized system, with two entities, namely the Federation of Bosnia and Herzegovina (FBiH) and Republika Srpska (RS), as well as the Brčko District. Due to this structure, Bosnia and Herzegovina has a fragmented educational system in which ethnically isolated communities are clearly observed, where ministries, pedagogical institutes, and the academic community promote unity, peace, and coexistence, but it is not their shared mission. In this image, you can see the decentralized approach in organizing the jurisdictions of ministries and public universities in Bosnia and Herzegovina.

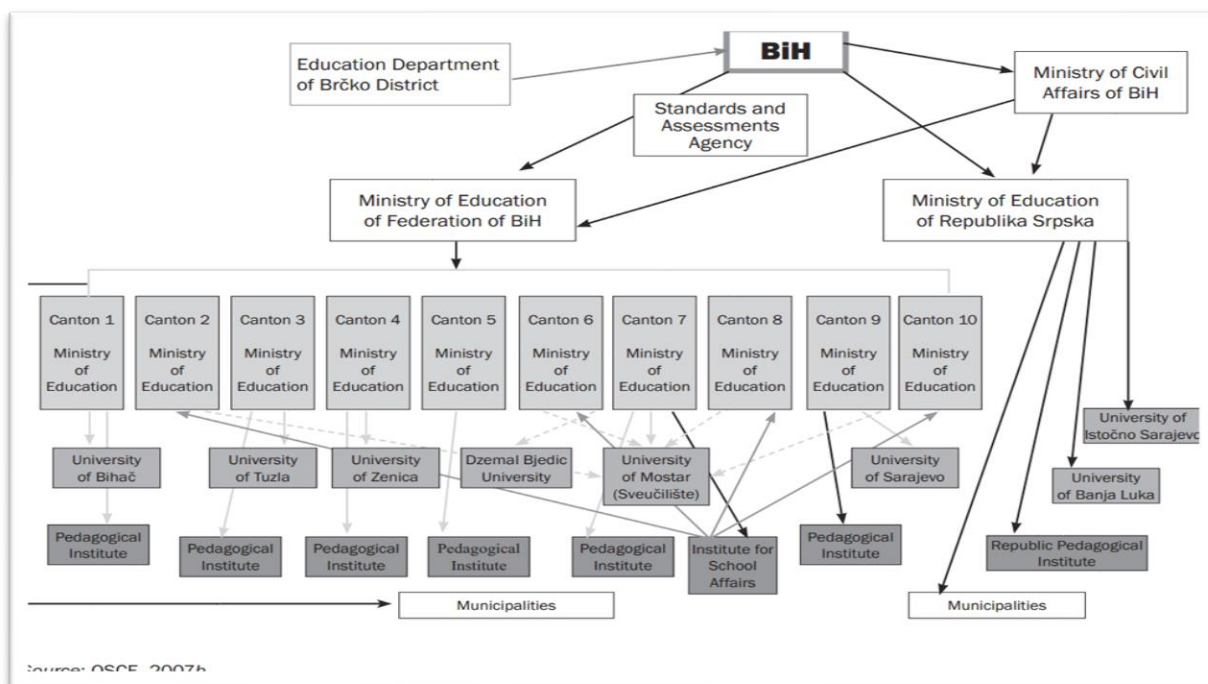


Figure 1: Decentralized education system in Bosnia and Herzegovina (OSCE, 2007)

Linguistic heterogeneity

The disintegration of the common Serbo-Croatian or Croato-Serbian language in the 1990s has not been sensational or unexpected for many linguists. The preconditions for this existed long before since two variants have always functioned in that language (Eastern/Belgrade, and Western/Zagreb), as well as two expressions (Bosnian and Montenegrin linguistic expression), which had their special linguistic upgrades conditioned by different linguistic heritage, cultural, and traditional peculiarities. The disintegration of the common state Yugoslavia had only accelerated the process of creating independent national languages.

Among some linguists, the idea of one standard for all speakers of our languages lives on - so the *Declaration on the common language* has attracted attention recently. However, the idea has not had a stronger impact on linguistic developments in our region. Today, three standard languages function in official use in B&H: Bosnian, Croatian, and Serbian and both alphabets (Latin and Cyrillic); problems are numerous in official communication as well, but the situation created at the end of the last century has not changed nor have solutions been found for this trilingual official communication.

Cultural diversity

Bosnia and Herzegovina is a country of a long history, reflected in its cities, monuments, symbols, artifacts, and rare books. For this long and rich history of BiH, we can thank the people who live and have lived here. BiH is the home to three constituent nations and 17 national minorities who represent the cultural diversity and invaluable values of BiH society. The development of national identity is based on the understanding of nationality in BiH, most often caused by the narratives of certain ethnic groups and the decentralization of the education system. The creators of the textbooks show the reproduction of the basic stratification of society and social inequality, and the contents of the national group of subjects encourage

segregation, the creation of antagonism, and the separation of students by ethnicity. Therefore, it is important and necessary through education to encourage intercultural dialogue between the nations and national minorities of BiH and to develop sensitivity to diversity to build peace and coexistence, as well as to raise awareness of the multicultural wealth of society in which we live in, on the path to integration into modern European trends.

In addition to the above, there are also differences, more or less common for every country. They are presented in this scheme:

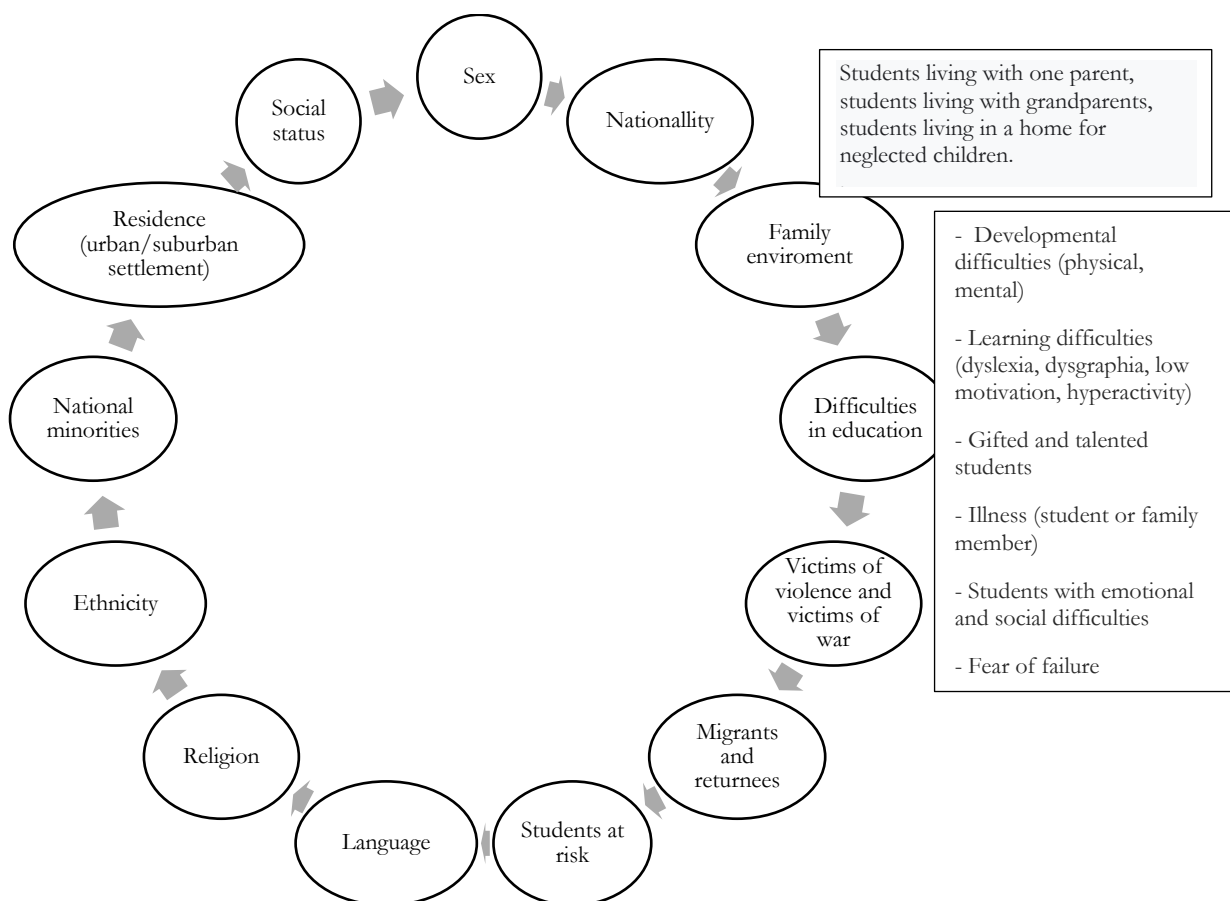


Figure 2: Wheel of Diversity

For future teachers, it is of great importance to understand the school culture, which implies its character, its spirit, or its identity. The identity of the school is determined by its students, teachers, and also students' parents. The culture of the school is the system of customs, traditions, beliefs, as well as the nature and quality relations among its members, which are the result of the historical awareness of the values of knowledge in a particular school situation. It is important to emphasize that the school as an educational institution enables “cultural transmission” and “cultural reproduction”.

The right to education implies access to educational institutions, quality educational experiences, the opportunity to choose education according to one's own desires and needs, as well as the right to a safe and supportive educational environment where the rights of children, teachers, parents, and all other participants are respected. Education is considered a human right in itself but also as a necessary means to realize other human rights.

The majority of future science teachers in Bosnia and Herzegovina stem from the University of Sarajevo and the University of Mostar, both severely touched during the war in the 1990s. After they finish their studies, student-teachers move back to their home cities or spread through the country, where they encounter linguistic heterogeneity and cultural diversity, as well as with other types of diversity inside their classrooms. Thus, both preservice teachers and science teacher educators need to be prepared to teach in such culturally diverse groups.

Possible adaptation to the local context

Questions and phenomena of interest for research in the current B&H language reality:

- What happens with communication when students, enrolling in a new school (primary, secondary) or faculty, choose a school/faculty whose teaching takes place in the language of another national community, or when they find themselves in a language environment where another language standard generally functions?
- Are language differences so large and pronounced that they threaten communication, ie whether students achieve poorer results because they did not understand the task if he is familiar with only one lexeme from the existing triplet?
- Will her/his achievements be (significantly) lower just because of the differences in linguistic expression?
- How to ensure that students coming from school settings with different language habits feel comfortable and feel accepted in the new (language) environment?
- How to nurture their linguistic expression in the new language environment (how to ensure their constitutionally guaranteed right to their language)?
- How much ignorance or poor knowledge of another alphabet (Latin and Cyrillic) can affect student achievement?
- How to train teachers (in this case science teachers) to be familiar with all the features of language standards in B&H (especially if they also had their education in nationally homogeneous environments and did not have the opportunity to get acquainted with the language features of other standards).
- How do students coming from school settings with different language habits communicate with other students?
- Survey proposal: At the beginning of the school / academic year administering the survey to students who come from schools working on national curricula (simple questions in the field of chemistry and other natural sciences, using lexemes from other languages that we assume that are not known in the environment they come from or questions whether they understand what a certain word means).
- Workshop proposal: To organize a workshop in which, in addition to chemistry content, language learning will be represented: terms (lexemes) in the field of chemistry used in three different standards (Bosnian, Croatian, and Serbian), and at the end of the workshop to check the knowledge of these new, adopted concepts (in workshops with pupils/students to use the methods offered in the ESTA Academic Staff Tour).

Fundamental principles in understanding the educational goal of the ESTA project

The Universal Declaration of Human Rights, adopted by the United Nations General Assembly in 1948, emphasized that:

- Education must be directed towards the full development of the human person and the strengthening of respect for human rights and fundamental freedoms.
- Education promotes understanding, tolerance, and friendship among all nations, racial or religious groups, and supports United Nations activities in maintaining peace.

The right to education implies access to educational institutions, quality educational experiences, the opportunity to choose education according to one's own desires and needs, as well as the right to a safe and supportive educational environment where the rights of children, teachers, parents, and all other participants are respected. Education is considered a human right in itself but also as a necessary means to realize other human rights. To equip ourselves for applying a human rights-based approach, we need to have a better understanding of human and children's rights, as well as their implications for thinking, planning, and evaluating in the educational process. The school is recognized as an institution that takes social care of the future and life perspectives of students, thus elevating its social reputation. It has always been a place where values were promoted and taught (sometimes explicitly, sometimes implicitly). The transmission of values is a shared responsibility that requires the involvement of all those concerned in identifying, understanding, and living these values.

Our intention was to offer participants quality teaching ideas, to encourage them to support students and enable their development in line with their potential, and to raise teachers' awareness about the values of the teaching profession. Education and upbringing in heterogeneous communities do not imply that teachers should treat students equally or in the same way, but rather based on the principle of fairness and in accordance with students' rights, characteristics, needs, and interests.

Program for in-service teacher education

Target group:

- In-service chemistry teachers in 8th and 9th grade of primary school (students age 12-14);
- High school chemistry teachers (students age 15-18);
- Students – future chemistry teachers; students – future elementary school teachers; students – future pedagogues.

First step: For enrolling in the program, participants were asked to fill out the questionnaire containing the following types of questions:

- General data (name, surname, date, place of birth, current employment status...)
- Data regarding their education: highest degree earned, university and faculty they attended.
- Data regarding their work experience: school(s) they work in, school subjects they teach, the average number of teaching hours.
- Linguistic heterogeneity: their mother tongue, their students' mother tongue, the language of the literature they use to prepare for teaching.

- Other types of heterogeneity of their students: ethnic minority groups, students without parents, students with learning difficulties...
- Characteristics of their teaching process: frequency of selected methods and tools they use in their teaching.

Timeframe of implemented project activities:

Below, we present specific activities within the project and support them with photographs.

- Workshops for primary school teachers in November and December 2021.
- Workshops for high school teachers in May and June 2022.



Figure 3: Workshops for primary school teachers and for high school teachers

- High school students from KŠC „Petar Barbarić“ from Travnik and high school students from Maarif School Sarajevo visited the Faculty of Sciences in Sarajevo to participate in laboratory exercises prepared within the ESTA project, 2022.
- Students with hearing difficulties had the opportunity to perform certain lab exercises using computer equipment.



Figure 4: Laboratory exercises with high school students

- Disseminating ESTA project at 4th International Congress of Chemists and Chemical Engineers of Bosnia and Herzegovina, Jul 2022.
- Academic Staff Tour in Ludwisburg, October 2022.
- ESTA Consortium Meeting, January 2023.
- Training program for pre-service students - future chemistry teachers and students – future elementary school teachers, March 2023.



Figure 5: Laboratory exercises with students

- The ESTA project was presented during the 12th Open Days of Chemistry, March 2023.



Figure 6: Poster for 12th Open Days of Chemistry

- Visit to elementary school students, April and May 2023.
- Participation in the Third International Conference "A Window into the World of Education, Science, and the Youth" held at the Faculty of Education, University of Sarajevo, May 2023.



Figure 7: ESTA team, University of Sarajevo

- Presentation of ESTA project to pre-service primary school teachers of University of Sarajevo – Faculty of Educational Sciences, October 2023.
- A round table about heterogeneity and cultural diversity was held at the University of Sarajevo – Faculty of Philosophy, October 2023.
- Participation in the Final conference of the project ESTA, Decembar 2023.

Collection of Methods, Tools, and Instruments

Chemistry in education

Workshop for Primary and Secondary School Chemistry Teachers

The workshop was strategically designed to place teachers in a dual role for enhanced learning. In their primary capacity as educators, the workshops aimed to offer professional development opportunities. Simultaneously, it positioned them in a student's role, enabling them to experience situations akin to those encountered by their students. This approach sought to sensitize teachers to effectively work in diverse and heterogeneous classrooms.

Within the framework of the ESTA project, the concept of CLIL (Content and Language Integrated Learning) served as a valuable foundation for selecting workshop implementation methods. Implementing CLIL in the classroom offers numerous advantages. It not only enriches language acquisition by familiarizing students with subject-specific vocabulary and language structures but also concurrently enhances their understanding of the content being studied. Learning content through a different language tends to be more engaging and motivating for students. It provides a practical application of language skills, thereby rendering the learning process more meaningful and applicable.

One of the significant strengths of CLIL lies in its adaptability to various educational settings and student levels. This flexibility allows its implementation to be tailored to meet the diverse needs of learners. Drawing from the benefits of CLIL, specific elements—such as visualization, group work, and ICT—have been deliberately chosen and integrated into the development of workshop materials.

Incorporating group work, visualization techniques, and ICT resources in a CLIL-based classroom setting significantly enriches the learning experience. It not only fosters language development but also deepens content comprehension and cultivates essential 21st-century skills among students.

Benefits of using ICT in the classroom: To enhance the efficiency and meaningful integration of ICT (Information and Communication Technology) within educational settings, it's crucial to examine educators' viewpoints and practices. International providers, like Phywe, Vernier, and Pasco, offer reasonably priced devices specifically designed for educational use. These devices require a mobile phone or tablet with an installed free measurement application. Additionally, teachers can access a wealth of experiment collections freely available on the Internet, serving as valuable resources. It is worth mentioning that students' familiarity with digital devices has transformed education, leading to the integration of ICT in learning environments. This integration significantly impacts student motivation, engagement, and the overall learning journey. ICT has revolutionized teaching methods by providing dynamic, interactive platforms that captivate students' interest and accommodate diverse learning styles. Interactive apps, multimedia presentations, online resources, and collaborative tools foster active participation and critical thinking, reshaping traditional learning approaches.

For the realization of the laboratory exercises, Phywe digital sensors were chosen.



Figure 8: Equipment and materials for the exercise Energie from Food (Phywe CobraSmart Thermocouple sensor was used to measure temperature changes)

The participants of the workshop did not have the opportunity to work with this kind of equipment before, which enabled them to find themselves in a new situation. They were exposed to learning about new equipment, new types of exercises, and new words and it was monitored by the ESTA Team how they managed in a new situation. Many teachers in numerous countries often display hesitancy towards adopting changes and incorporating new methodologies into their teaching practices. The decision to introduce digital devices during the workshop was made not only to elevate the quality of teaching but also to respectfully address this resistance among teachers.

Benefits of using group work in the classroom: Engaging in group work facilitates students in communicating, collaborating, and discussing content in the target language, consequently aiding in the improvement of their language abilities. Collaborative group tasks enable students to exchange ideas, share diverse perspectives, and explore different cultural backgrounds, fostering a richer understanding of varied viewpoints. These collaborative activities create a more interactive and stimulating learning environment, resulting in increased motivation and participation among students.

For each exercise, each group used material in a different language or alphabet typical for BiH. It was observed that the participants communicated with each other more intensively when they received material in a language or alphabet that they knew less or used less often. In each group, one of the participants who was more familiar with the exercise material spontaneously became the group leader and explained the exercise task in more detail. This situation allowed the participants faced with a novel situation and encountering unfamiliar elements, to subsequently ease into a more comfortable state. As a result, they were able to actively engage in the exercise segment that aligned better with their familiarity and experience.



Figure 9: Participants of one group solve the exercise tasks together



Figure 10: Participants of the second group also use the break to solve tasks together

Benefits of using visualization in the classroom: Utilizing visualizations, such as pictures, in chemistry exercises under a CLIL framework significantly enriches students' learning experiences. These visuals not only bolster comprehension but also aid in language development, engagement, and critical thinking skills. When paired with specific terminology, visual aids reinforce subject-specific vocabulary in the target language, facilitating improved language acquisition. Additionally, employing software and visual tools prompts students to actively engage in discussing, describing, and explaining chemical concepts, thereby enhancing their language fluency and accuracy in the subject matter.

Each group received visual material - without text - for a specific exercise as an procedure. After viewing the material, the participants began to discuss and define the procedure, making notes. This was a clear indication that each participant would acquire some new knowledge, i.e. expand their “chemish” vocabulary. Another visual tool that has been used is *MeasureApp* application which allowed the participants to observe certain changes during the exercise by observing the tablet screen (movement of the curve on the graph, numerical values, etc.). All observations were used for discussion and solving tasks in the worksheet. They also served to create and express a critical opinion on the topic that the exercise concerned.

Vježba: Energija iz hrane

(A)

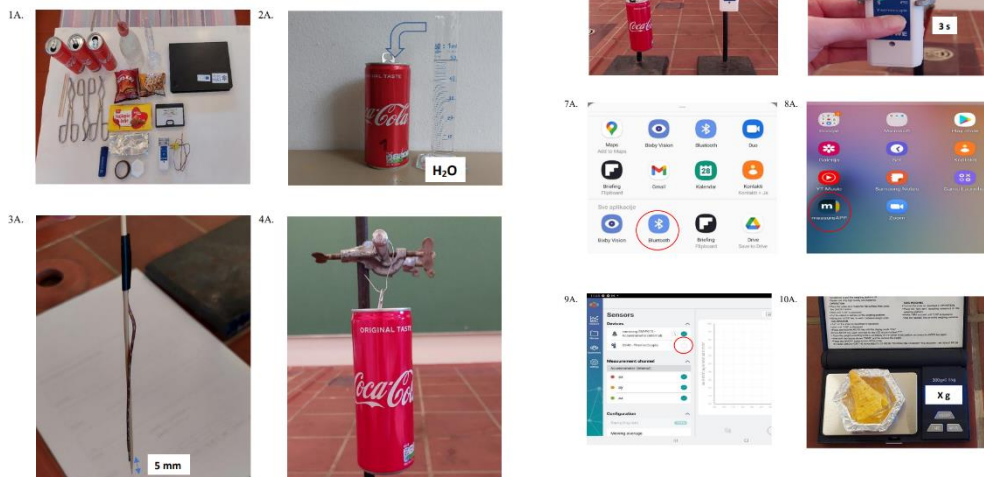
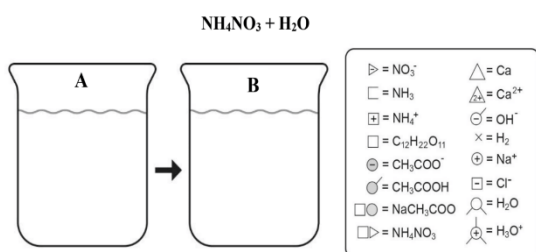


Figure 11: Parts of the pictorial material for the Energy from Food exercise

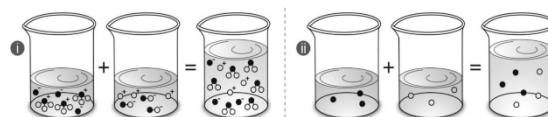
As one of the most important segments of learning chemistry, the submicroscopic part, i.e. the level of particles, was represented in the exercises. In the context of "chemish" vocabulary, through this type of task, the names of compounds, types of particles are learned and the behavior of particles is defined.

Čistični crtež:



Objašnjenje:

5. Na osnovu prikazanih čestičnih crteža odgovoriti na pitanja a) i b).



a) Koji čestični crtež odgovara reakciji između supstance A i supstance B? Objasnite bazirajući na podacima prikupljenim uz pomoć mjerne senzora.

b) Koji čestični crtež odgovara reakciji između supstance C i supstance D? Objasnite bazirajući na podacima prikupljenim prethodno izvedenim mjerjenjima.

Figure 12: Examples of tasks related to the representation of the particle level:

In terms of sensitization, during the workshop teachers were offered examples of how to design an exercise that will include several segments essential for working in heterogeneous and diverse classrooms.

Science on Stage: In the workshops for primary school chemistry teachers and students of the Faculty of Educational Sciences, materials taken from the Science on Stage platform were used. These materials offer different experiments with materials

available in everyday life. The exercises are based on activities that include conversation and discussion and are an excellent resource for acquiring knowledge about basic scientific concepts related to natural sciences.

Workshop for Students of the Faculty of Educational Sciences

In addition to the exercises from the Science on Stage resource, the students of the Faculty of Education were also offered simple exercises that covered the topics found in the curriculum of the subject My Environment, which is studied in the 4th grade of elementary school (age 9-10). Students had the opportunity to see some of the ideas of how concepts such as chemical changes, rusting, energetic value of food, sugars, and weighing, can be presented to students of lower grades. The exercises were also designed based on the STEM approach. Tasks included working on text and doing calculations using pictures with data.

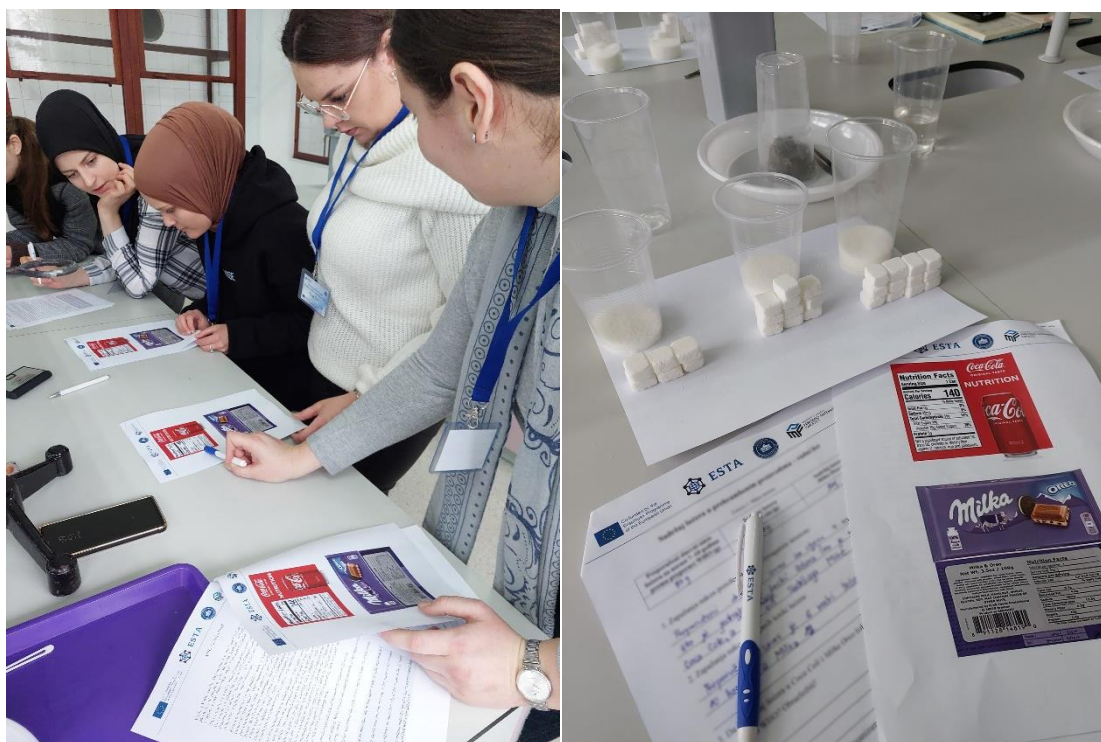



Figure 13: Discussion and realization of the exercise for acquiring information about sugar


Studying linguistic diversity


Considering that in Bosnia and Herzegovina three language standards (Bosnian, Croatian, and Serbian) are officially used, it implies that education in these languages should be ensured within the school and educational system. However, this issue has never been resolved within the state entities and cantons, leaving teachers once again to find solutions on their own. Speakers of these three languages understand and communicate with each other in everyday communication without major difficulties. Yet, due to the lack of a systemic solution, teachers face a significant challenge - how to ensure that every student feels comfortable in a linguistically heterogeneous community, such as the environment in Bosnia and Herzegovina. It remains a question of how to enable each student to attend classes in their native language and how to anticipate all the language difficulties that students may encounter, hindering their acquisition of educational content. These are the goals that were set as fundamental in planning language workshops for teachers from Bosnia and Herzegovina.


From the initial questionnaires filled out by primary and secondary school teachers when applying for training, we obtained necessary information regarding the teacher's native language, their knowledge of other official languages in Bosnia and Herzegovina, both official scripts (Latin and Cyrillic), as well as their proficiency in foreign languages. Based on this data, we designed texts for laboratory exercises in different official languages, different scripts, or a foreign language. Groups were formed so that participants received texts in a language that was not their native one, a script they were less familiar with (or not at all), or a foreign language they didn't know. We observed how teachers reacted to these materials (some understood the task texts without difficulty, others had minor issues and felt uncomfortable in the group, while a third group entirely refused to participate due to not understanding the essence of the tasks because of unfamiliar scripts or languages). This put them in the position of students who might encounter similar difficulties in classrooms where teachers teach.



Co-funded by the
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 **ESTA**





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6. Одредити масу узорка који је сагорно, $\Delta m = m_1 - m_2$.

7. Израчунати количину ослобођене топлоте у килокалоријама по граму узорка (kcal/g).

Figure 14: The official scripts - Cyrillic

Many teachers only became aware of such situations that probably happen in their classrooms or could occur then. The training participants then had the opportunity to become acquainted with the differences among language standards – for many, this was the first time in their education that they heard about these differences, how common they are in teaching natural sciences, and the specificities of each language standard. They became familiar with phonological differences encountered in the language of chemistry (*bemija / kemija, blor / klor, brom / krom...*), morphological (*natrij / natrijum, kalij / kalijum, metod / metoda, laboratorij / laboratorija...*) or lexical differences (*kisik / kiseonik / oksigen, ugljik / ugljenik / karbon, dušik / azot / nitrogen, hidrogen / vodik / vodonik...*).

An integral part of every training session was a discussion about whether teachers, in their previous work, had the opportunity to teach students from different language backgrounds or students who were not familiar with any of the official languages of Bosnia and Herzegovina. In this way, we shared positive experiences and highlighted the best solutions for these and similar issues.

In the training aimed at students, the focus was also on familiarizing them with linguistic diversity in Bosnia and Herzegovina. As the participants were students preparing for work in classrooms, they were particularly introduced to all the challenges awaiting them in heterogeneous environments. The students showed great interest in this form of training, as well as readiness to apply the methods and materials they were introduced to.



Figure 15: Some of the spelling editions of the three official languages in Bosnia and Herzegovina

Intercultural education

Intercultural education has two key tasks: respect for diversity and respect for human rights, which means that intercultural education respects and supports diversity in all forms of human life, promotes equality, human rights and values on which justice and solidarity are built, and opposes discrimination, segregation, and disrespect. At the same time, intercultural education contributes to openness to other cultures, encourages learning about and understanding of other cultures and respect thereof, at the same time encouraging the development of intercultural sensitivity.

UNESCO has created guidelines for intercultural education consisting of three principles:

- Principle I: Intercultural education respects students' cultural identity by providing culturally appropriate, open, and quality education for all.
- Principle II: Intercultural education provides all students with cultural knowledge, skills, and attitudes necessary for them to be active and responsible citizens in society.
- Principle III: Intercultural education equips all students with cultural knowledge, skills, and attitudes enabling them to contribute to respect, understanding, and solidarity among individuals, ethnic, social, cultural groups, and nations.



Figure 16: Intercultural education

The fundamental aim of intercultural education is to enable quality education for all students, considering that diversity forms the basis of the authenticity and purposefulness of the educational process.

For a teacher to work in heterogeneous environments, they should:

- Understand the characteristics of students and adapt content to their learning styles.
- Have a detailed and flexible understanding of the subject they teach.
- Effectively manage the classroom, foster collaboration among students, develop responsible behavior, and manage cultural behavioral patterns.
- Have a developed awareness of ethical issues related to the profession and question practice.

Intercultural education promotes values, empathy, openness, coexistence, assertiveness, curiosity, readiness for change, respect for and preservation of cultural heritage. By promoting these values, the process of upbringing and education enables the learners to notice, accept, and respect different cultural identities and their coexistence in a particular community.

Recognizing the values of intercultural education, the ESTA team created lectures and workshops in the field of intercultural education, providing opportunities for teachers and students to develop knowledge, skills, and attitudes that will prepare them for working in heterogeneous communities.

Within the framework of intercultural education, teachers and students studied the topic "Fundamental Principles of Intercultural Education". This lecture content allowed participants to reflect on culture, multiculturalism and interculturalism directions, as well as intercultural education. They also learned about equality and fairness in education, as well as anti-prejudice behavior. *Empathic strategy* involves introducing activities that will help students see a topic from a different perspective, especially when it involves a group that is not popular with some or all students, when the topic involves prejudice or discrimination against a group, or when the topic is far from student life.

The theme "Learning and Teaching in Heterogeneous Communities" allowed participants to discuss school diversities, ethics, empathy, and advocate for quality education.

Within the topic "Learning about Diversity and Nonviolent Communication", we explored the philosophy of non-violence and peace, familiarized ourselves with violent and non-violent speech skills, and practiced non-violent communication. Associations for violent speech and hate speech involve snake speech, while the association for non-violent speech involves giraffe speech.



Figure 17: Symbols for violent and non-violent speech

Of particular significance is the workshop titled "Brown Eyes and Blue Eyes Racism Experiment"¹. This was an opportunity for participants to watch a film made in the last century addressing discrimination based on skin color. The content of the film highlights the importance of the teacher's role in developing values and perspectives in students, as well as the teacher's responsibility in creating a supportive and encouraging relationship with students.



Figure 18: Image from the movie "Brown Eyes and Blue Eyes Racism Experiment"

Culturally sensitive teachers demonstrate understanding towards intercultural differences and engage with issues of intercultural sensitivity. Their prior experiences, if devoid of biases, influence their interest and motivation to continue learning and improving in this area.

An interculturally competent teacher can "see" and understand relationships between different cultures, comprehend the beliefs and behaviors of members of various cultures, and actively work to address issues arising among cultures within the societal community.

Interculturally competent teacher is ready to use knowledge of practical customs of a multicultural area in the process of upbringing and education, such as the choice of teaching materials, forms and methods of learning, and is ready to understand the inner world of the learners and build responsible, supportive and encouraging relationships with them. In process of upbringing and education, an intercultural science teacher enables the learners to learn to accept diversity, to communicate with others, to feel as equal members of the community, to retain adopted cultural values, and so on.

¹ Link: https://www.youtube.com/watch?v=1mcCLm_LwpE

Conclusions

A crucial challenge in the modern educational process must face is the interactions between different people, ethnic and religious groups and minorities and movements that make up the diverse mosaic of their societies. The multinational and multicultural societies in which students will work in the future, and in which more extensive migrations and contacts with different cultures are to be expected, will demand a highly developed intercultural competence for successful work in the field of teaching and pedagogy. In a modern classroom environment, interculturality or education of acceptance is a crucial principle.

Based on these theses, and with sincere gratitude for the opportunity to participate in the project, we have strengthened our own competencies and enabled chemistry teachers and students - future teachers, to develop intercultural competencies and intercultural sensitivity.