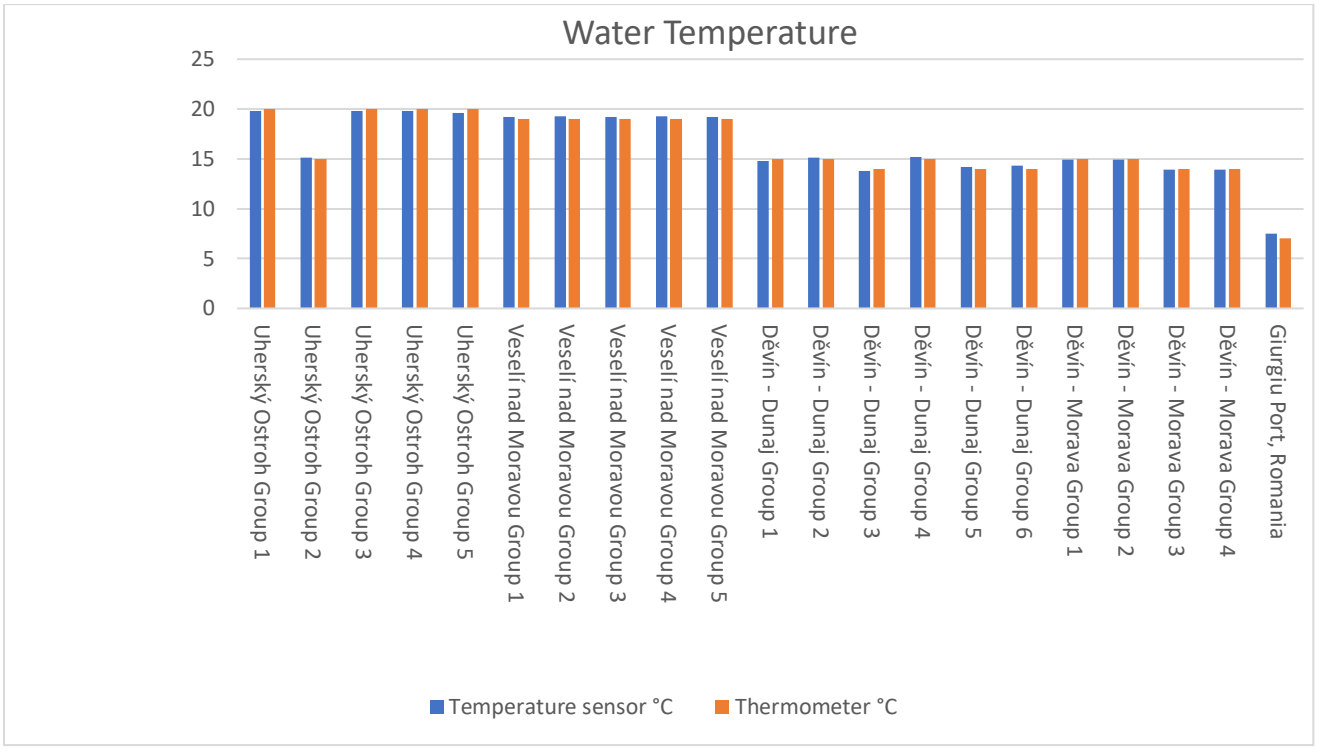
Evaluation of the ProBleu Project – Water Quality Monitoring

As part of the ProBleu project, students at our school had the opportunity to carry out practical water quality monitoring and to work with real data. The project focused primarily on the Morava River, but water samples were also collected at the confluence of the Morava and Danube rivers near Devín in Slovakia and in the port of Giurgiu in Romania. The project took place from May to October 2025 and involved students from grades 5 to 9. During the measurements in Slovakia, students from grade 7 of the Primary School of Prince Pribina in Nitra also participated.

During the project, students used Visocolor School water analysis kits, a Pasco temperature sensor, and a wireless weather sensor with GPS. These tools enabled them to measure water temperature, hardness, pH values, and the presence of nitrites, nitrates, phosphates, and ammonium ions. At each measurement, students recorded the collected data in prepared protocols and later processed the results electronically during information technology lessons.

Depending on the sampling location and time, water temperature ranged from 7 °C (October measurement in Romania) to 20 °C (May measurement in Uherský Ostroh). More accurate results were obtained using the Pasco temperature sensor.



Temperature sensor °C	19,8	15,1	19,8	19,8	19,6	19,2	19,3	19,2	19,3	19,2	14,8	15,1	13,8	15,2	14,2	14,3	14,9	14,9	13,9	13,9	7,5
Thermometer °C	20	15	20	20	20	19	19	19	19	19	15	15	14	15	14	14	15	15	14	14	7

Another monitored parameter was the concentration of ammonium ions. These enter water mainly through the decomposition of organic matter or from wastewater and agricultural activities. The measured values ranged from 0 to 0.2 mg/l, which corresponds to common levels in clean or only slightly affected watercourses. Low concentrations indicate sufficient oxygen levels and low pollution. Higher concentrations, however, can be dangerous, as ammonium ions may convert into toxic ammonia at higher temperatures and higher pH levels, posing a risk to fish and other aquatic organisms.

Nitrate concentrations in most samples were around 1 mg/l, indicating good water quality and no risk to aquatic life. Environmental problems usually occur at concentrations of approximately 10–25 mg/l, when excessive growth of algae and cyanobacteria may reduce oxygen levels in the water.

Nitrites, which are toxic to aquatic organisms even at low concentrations, could not be reliably detected in most cases. This is a common outcome, as nitrites are unstable and quickly oxidize to nitrates in well-oxygenated water. In addition, their concentrations may have been too low to be detected by school testing kits.

Phosphates were another parameter monitored during the project. These substances mainly enter water through household wastewater and can cause eutrophication, leading to excessive growth of aquatic plants and algae. The measured phosphate values ranged from 0 to 0.5 mg/l. Values exceeding 0.3 mg/l, which may indicate pollution, were recorded in seven out of a total of 21 measurements.

Water hardness values ranged from 8 to 21 °dH, corresponding to moderately hard to hard water. Water hardness itself is not considered pollution; it reflects the concentration of calcium and magnesium ions originating from rocks in the river basin. During the measurements, students were required to follow precise procedures, carefully count reagent drops, and thoroughly mix the samples.

Sampling site	Water hardness °dH
Uherský Ostroh Group 1	10
Uherský Ostroh Group 2	21
Uherský Ostroh Group 3	10
Uherský Ostroh Group 4	16
Uherský Ostroh Group 5	11
Veselí nad Moravou Group 1	13
Veselí nad Moravou Group 2	10
Veselí nad Moravou Group 3	8
Veselí nad Moravou Group 4	10
Veselí nad Moravou Group 5	10
Děvín - Dunaj Group 1	19
Děvín - Dunaj Group 2	15
Děvín - Dunaj Group 3	13
Děvín - Dunaj Group 4	8
Děvín - Dunaj Group 5	16
Děvín - Dunaj Group 6	14
Děvín - Morava Group 1	17
Děvín - Morava Group 2	19
Děvín - Morava Group 3	16
Děvín - Morava Group 4	16
Giurgiu Port, Romania	15

The final parameter measured was water pH, which students determined using pH indicator strips and chemical reagents. The recorded pH values ranged from 4 to 9. However, most results were close to neutral pH 7. The wider variation in some measurements may have been caused by inaccurate color interpretation or insufficient mixing of samples. The optimal pH range for most aquatic organisms is between 6.5 and 8.5.

Sampling site	pH - reagent	pH test strip
Uherský Ostroh Group 1	7,5	6,5
Uherský Ostroh Group 2	7	7
Uherský Ostroh Group 3	6,5	6,5
Uherský Ostroh Group 4	6,5	6,5
Uherský Ostroh Group 5	8	6,5
Veselí nad Moravou Group 1	7	7
Veselí nad Moravou Group 2	7	7
Veselí nad Moravou Group 3	7	7
Veselí nad Moravou Group 4	7	5
Veselí nad Moravou Group 5	-	6
Děvín - Dunaj Group 1	8	6
Děvín - Dunaj Group 2	7,5	6
Děvín - Dunaj Group 3	-	7
Děvín - Dunaj Group 4	8	8
Děvín - Dunaj Group 5	8	7
Děvín - Dunaj Group 6	6	5
Děvín - Morava Group 1	8	7
Děvín - Morava Group 2	4	7
Děvín - Morava Group 3	7,5	5
Děvín - Morava Group 4	7	9
Giurgiu Port, Romania	7,8	7

Measurements using the Visocolor kits required students to work carefully, follow written instructions, and apply accurate procedures. Students practiced teamwork, task distribution, and responsibility for collected data. Sampling and measuring all monitored parameters took approximately two teaching hours for each group.

The project also included complementary educational activities. Students participated in the educational program “Life in the Morava River,” where they learned about natural features of the river basin such as meanders, oxbow lakes, and floodplain forests, as well as the causes of floods and flood prevention measures. Another activity was an excursion to the Dlouhé Stráně pumped-storage power plant, where students learned how water can be used to generate electrical energy.

The ProBleu project contributed to the development of students’ scientific, digital, and inquiry-based skills and helped them better understand the importance of protecting aquatic ecosystems.