

Best Practices – 1

Title of the Practice:

JAL (Joint Asian African Labs for Water Analysis) – A Collaborative Approach to Real-Time Water Quality Monitoring

Objectives of the Practice:

The primary objective of JAL is to enhance water quality monitoring through a collaborative effort involving India, Sri Lanka, and various African countries. The initiative aims to provide real-time water analysis using an advanced testing kit and the "Five Elements" smartphone application, developed by Sarang S. Dhote. JAL seeks to bridge the gap between laboratory experiments and real-life applications, empowering students and stakeholders with accurate data to make informed decisions about water quality.

The Context:

The need for efficient water quality monitoring arose due to the delays and potential inaccuracies in traditional methods, which required transporting water samples to laboratories. This process often resulted in degraded samples and delayed results, making timely decisions difficult. Furthermore, there was a demand for engaging students in practical applications of their laboratory knowledge, especially in regions where water quality is a pressing concern. To address these challenges, the JAL project was designed with international collaboration, involving stakeholders from India, Sri Lanka, and several African countries. This partnership not only expanded the project's scope but also fostered scientific exchange and innovation across borders.

The Practice:

JAL stands out for its unique approach to water quality monitoring in Indian higher education. The advanced water testing kit, developed by Sarang S. Dhote and Dr. Y. K. Mesharm, can analyze 15 parameters within 20 minutes, directly on-site, eliminating the need to transport samples to a laboratory. Parameters tested include color, odor, temperature, pH, TDS, EC, total hardness, calcium hardness, magnesium hardness, chlorides, and five types of alkalinity. This immediate analysis ensures accurate results, facilitating quicker responses to water quality issues. A distinguishing feature of JAL is its integration with the "Five Elements" smartphone application, which provides real-time analysis and publishes the results on a publicly accessible map. This map is open to all stakeholders, including educational institutions and environmental organizations, allowing them to utilize the data for research and decision-making purposes. Despite its success, JAL faced some challenges, primarily the high initial cost of developing and distributing the kits. Additionally, ensuring accurate calibration and providing adequate training for users were essential for the project's success. These challenges were overcome through a self-funded model and comprehensive training sessions.

Evidence of Success:

Since its launch in 2022, JAL has analyzed over 150 water samples from India, Sri Lanka, and African countries. The results, published on the real-time map, have significantly improved water quality monitoring. Feedback from educational institutions highlights enhanced student engagement and improved understanding of practical applications for

laboratory experiments. The project's success is evidenced by its adoption in multiple institutions and recognition in the broader scientific community.

Problems Encountered and Resources Required:

The main challenges encountered were the high initial costs of developing the kits, accurate calibration, and training. Logistical difficulties also arose when distributing the kits to international collaborators. Resources required included funding for the kits, training materials, and technological support for the smartphone application.

Resources required: Chemicals, Internet, Laptop, PC, & Apparatus

7. Contact Details:

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The Need for JAL

The world faces an unprecedented water crisis due to demographic pressures, environmental diversity, and climate change. Asia and Africa, in particular, are vulnerable to droughts, deforestation, and biodiversity threats. Recognizing this, JAL aims to monitor and analyze water quality by testing its physico-chemical parameters, making it essential for tackling water challenges.

JAL not only serves as a platform for testing water parameters but also promotes **cross-disciplinary collaboration** by creating an international network of **students, experts, and stakeholders** in water resources management. This platform allows for the creation and validation of water testing kits, integrating cutting-edge technologies and regulations to ensure effective water management.

Key Activities and Achievements (2023-2024)

1. International Collaboration

JAL unites 19 institutes, with 11 from Asia and 08 from Africa, in a joint effort to solve water-related issues. Its collaborative spirit has made it possible for both continents to exchange expertise and technologies to safeguard water resources.









OUR INTERNATIONAL COLLABORATORS



 <p>Md. Ruhul Amin Foisal Head- Chemistry European University of Bangladesh Bangladesh</p> 	 <p>Dr. Irene A. Tarimo Head- Environmental Studies The Open University of Tanzania Tanzania</p> 	 <p>Dr. Innocent Achave (PhD) Lecturer and HOD - Chemistry Gulu University, Uganda</p> 	 <p>Dr. AGBOGIDI, O. MARY Professor - Chemistry Delta State University, Abraka Nigeria</p> 
 <p>Dr. M.M. Farhath Head- Applied Chemistry South Eastern University of Sri Lanka</p> 	 <p>Dr. Bernard Juma Chairman- Pure and Applied Chemistry MMUST, Kenya</p> 	 <p>Dr. KESSY FIDEL KILULYA Head- Chemistry University Of Dar Es Salaam Tanzania</p> 	
 <p>Dr. Bongani Yalala Lecturer - Applied Chemistry NUST, Bulawayo, Zimbabwe</p> 	 <p>Dr. Edward Mubiru Lecture - Chemistry Makerere University, Uganda</p> 	 <p>Dr. Akwasi Acheampong Senior Lecturer- Chemistry KNUST, Kumasi, Ghana</p> 	

OUR NATIONAL COLLABORATORS

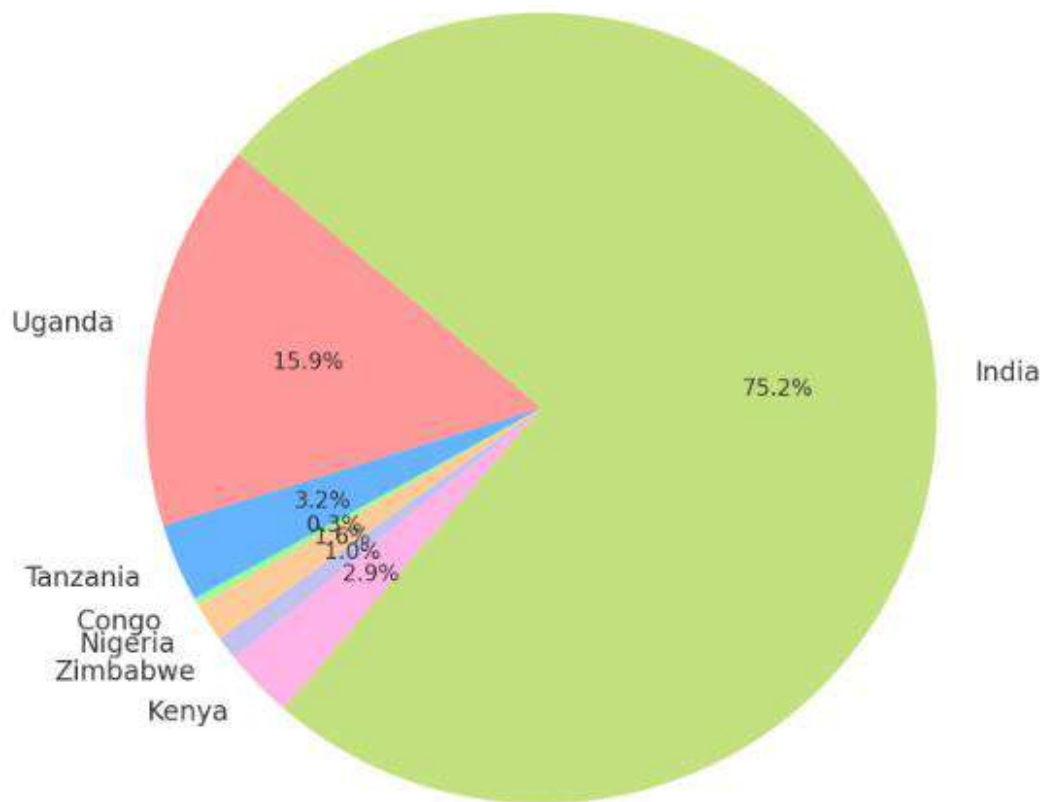


 <p>Mr. Zamir S. Shekh Asst. Prof. - Chemistry Sri Shivaji College, Akole India</p> 	 <p>Dr. Suahil B Kapoor Asst. Prof. - Chemistry Dr. Khatni Mahavidyalaya Tukum Chandrapur India</p> 	 <p>Dr. Nilesh V. Gandhare Asst. Professor - Chemistry Nalwa Mahavidyalaya Katal India</p> 	 <p>Mr. Rahul G. Sawarkar Asst. Prof. - Chemistry J.P.S.M., Daryapur India</p> 
 <p>Dr. Yogesh P. Thawari Head - Chemistry N. H. College, Bramhapuri India</p> 	 <p>Dr. Avinash Ingele Asst. Prof. - Chemistry Anandabai Deshmukh Mahavidyalaya Bharsing, India</p> 	 <p>Dr. Vijay S. Nigpurkar Head - Chemistry SCET, Nagpur India</p> 	
 <p>Dr. Nitin Vilayatkar Asst. Professor- Chemistry S.S. Jaiswal College, Ajum Morgson, Gordia India</p> 	 <p>Dr. Amit H. Kalbandhe Asst. Prof. - Chemistry SSGM College, Hingna India</p> 		

2. World Water Day Celebrations & International Quiz (2023)

To mark World Water Day, JAL organized an **International Quiz Competition**, which attracted over 300 participants from regions like Sri Lanka and Africa. This event emphasized the importance of water preservation and sustainability, fostering awareness among young minds across the globe.

Participants Overview



3. Innovative Water Testing Kit Development

JAL developed and distributed **advanced water testing kits** for rapid field analysis of water parameters. These kits were provided to multiple institutions affiliated with **RTM Nagpur University, SGB Amravati University, and Gondwana University**, with the technology shared with international collaborators. These efforts have revolutionized water testing by making it more accessible and efficient.



Figure 1- Advanced Water Testing Kit

4. Revolutionizing Water Analysis with the Five Elements App

The Water Testing Kit is now integrated with the "Five Elements" Android application for rapid analysis of water parameters. Dr. Sarang Dhote develops this app. Within a short time, students can calculate up to 15 parameters, and the results are sent to the JAL server. After data verification, results are populated on Google Maps, and tagged to the geolocation of the water sample. This app has been installed on over 200 devices, not only in India but also in Africa and Sri Lanka, enabling widespread and efficient water analysis.



Figure 2- Screenshot of Five Elements app on Google Play Store

5. Virtual International Symposium on Water (2024)

Held to commemorate World Water Day, the **4-Day Self-Paced Virtual International Symposium on Water** brought together participants from across Africa and Asia. The symposium focused on various water management and sustainability topics, featuring notable speakers and international experts:

- **Dr. Sarang Dhote:** An overview of JAL and its mission.
- **Dr. Bongani Ndhlovu Yalala:** Addressing cholera as a water-borne disease.
- **Dr. Vijay D. Raut:** The role of zooplankton in water quality.
- **Dr. Vijay S. Nagpurkar:** Primary and secondary water treatment techniques.
- **Dr. K. Saminathan:** Spectroscopy and water analysis methods.

The symposium attracted over 168 students and professionals and garnered significant interest on **YouTube**, with each session viewed by hundreds. Active engagement was encouraged through MCQ-based assessments, with certifications awarded to participants.



6. Hands-On Water Testing Workshops

A **guest lecture and hands-on training on water testing kits** were organized on March 25, 2023, attended by students from various colleges affiliated with RTM Nagpur University and Gondwana University. The kits were demonstrated, highlighting their use in detecting pollutants and ensuring water quality.



Figure 3- Guest Lecture By Dr. V. S. Nagpurkar on Water Analysis



Figure 4- Distribution of Water Testing Kit

7. Demonstration and Expert Talk By Dr. Dhote in Institutes

As part of JAL's consultancy services, water testing kits were distributed to colleges and a demonstration of this kit is given by Dr. Dhote as an expert talk. The initiative ensures that institutions can independently monitor water quality, empowering students with practical knowledge in water analysis.



Figure 5- Demonstration of Advanced On Field Water Testing Kit by Dr. Sarang Dhote @ J. D. Patil Sangludkar Mahavidyalaya, Darpur Dist. Amravati, [M.S.], India on 13/11/2022.

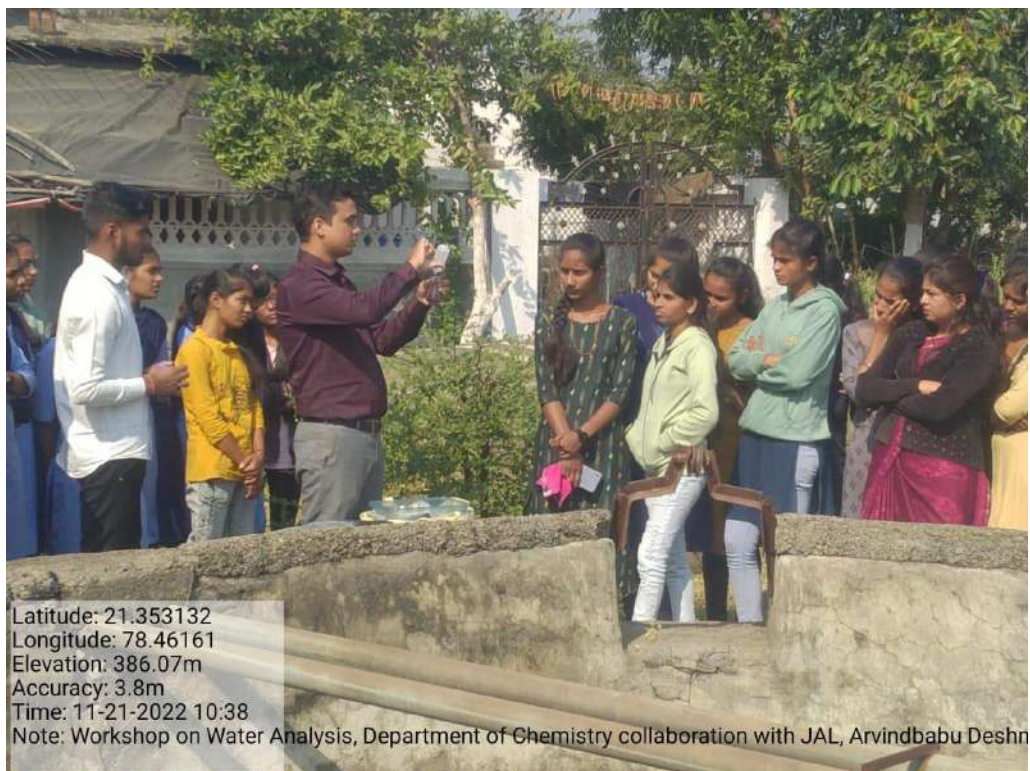


Figure 6- Demonstration of Advanced On Field Water Testing Kit by Dr. Sarang Dhote @ Arvindbabu Deshmukh College, Bharsingi Dist. Nagpur, [M.S.], India on 21/11/2022.



Figure 7- Demonstration of Advanced On Field Water Testing Kit by Dr. Sarang Dhote @ Nabira Mahavidyalaya, Katol Dist. Nagpur, [M.S.], India on 13/11/2022.



Figure 8- Demonstration of Advanced On Field Water Testing Kit by Dr. Sarang Dhote @ Suryodaya College of Engineering & Technology Dist. Nagpur, [M.S.], India on 7/12/2022.



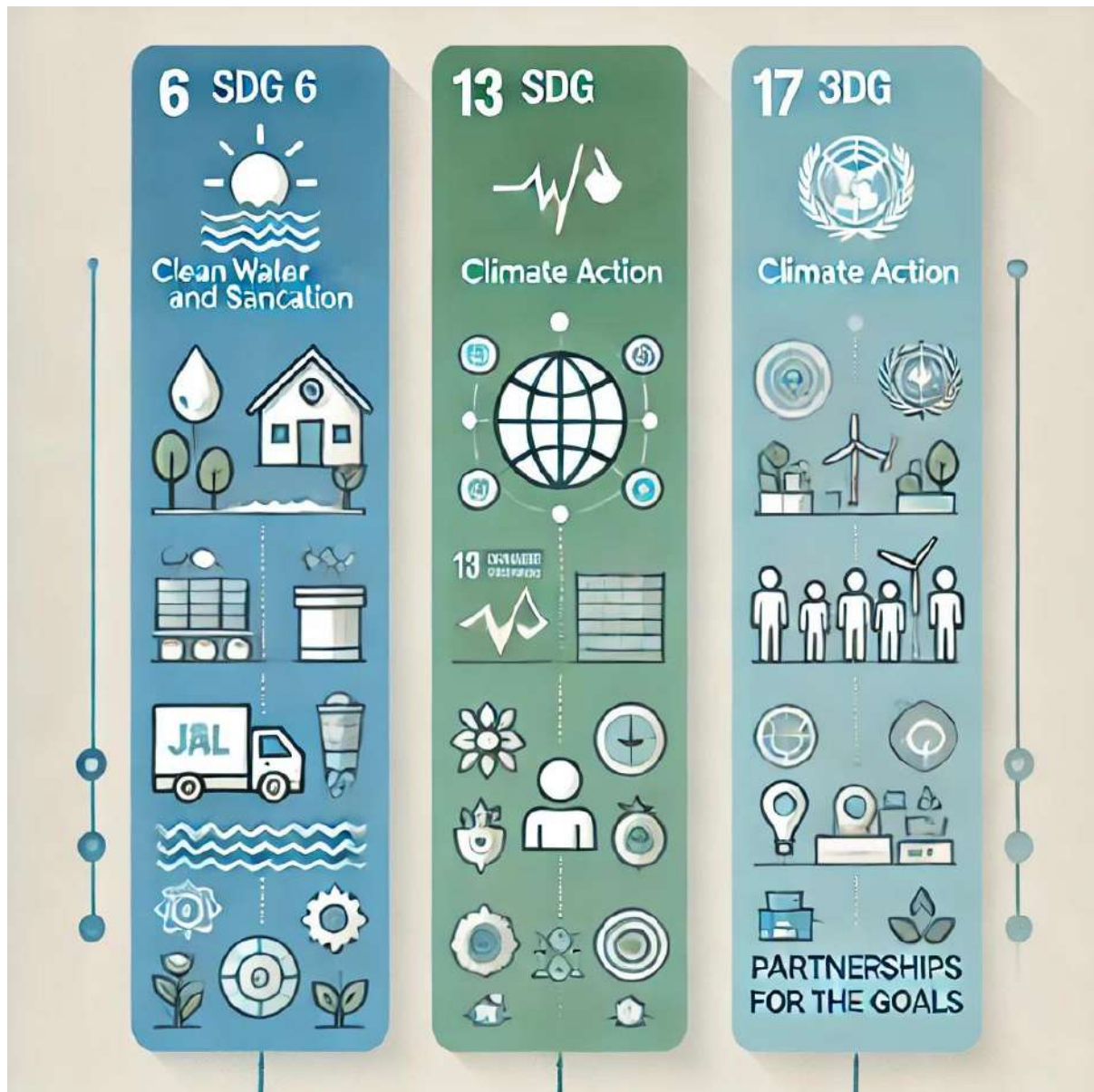
Figure 9- Hand Over Advanced Water Testing Kit to Dr. N. Patankar Chairman of Envinzoa, Nagpur.



Figure 10- Demonstration of Advanced On Field Water Testing Kit by Dr. Sarang Dhotе @ Jawaharlal Nehru Arts, Commerce & Science College, [M.S.], India on 11/12/2023.

JAL's Alignment with UNESCO's Sustainable Development Goals (SDGs)

JAL is in alignment with several **UNESCO SDGs** focused on ensuring environmental sustainability and responsible water use:



- **SDG 6: Clean Water and Sanitation**

JAL directly addresses this goal by providing innovative water testing solutions and empowering communities to monitor and improve water quality.

- **SDG 13: Climate Action**

By mitigating water scarcity and developing sustainable practices, JAL plays a crucial

role in climate change adaptation, particularly in regions most affected by water-related issues.

- **SDG 17: Partnerships for the Goals**

JAL fosters international collaboration by bringing together 25 institutions from Asia and Africa, promoting global partnerships to tackle water challenges.

Conclusion

JAL is a groundbreaking initiative, striving to ensure **water sustainability** and improve water quality through **innovation, collaboration, and education**. Its work is not only solving immediate water issues but also preparing the next generation of scientists, students, and experts to continue this vital mission. As we look to the future, JAL stands as a testament to the power of **international cooperation** in solving the world's most pressing environmental challenges.

Outcome

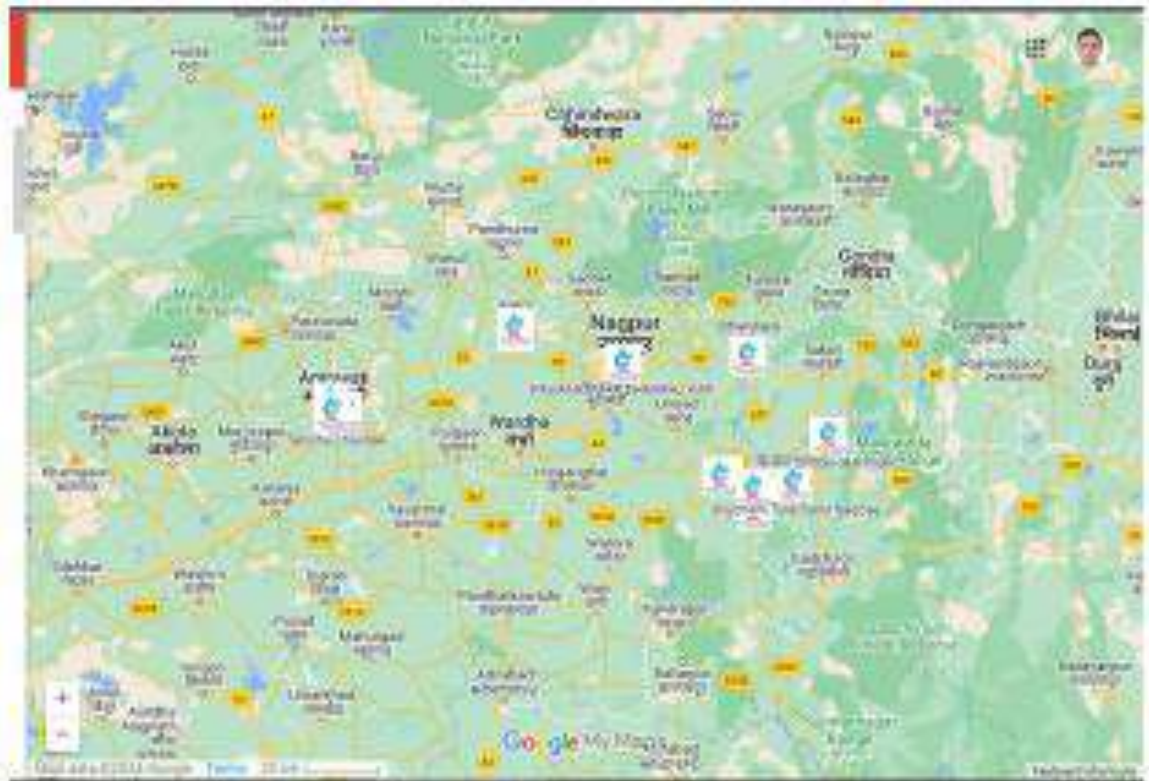
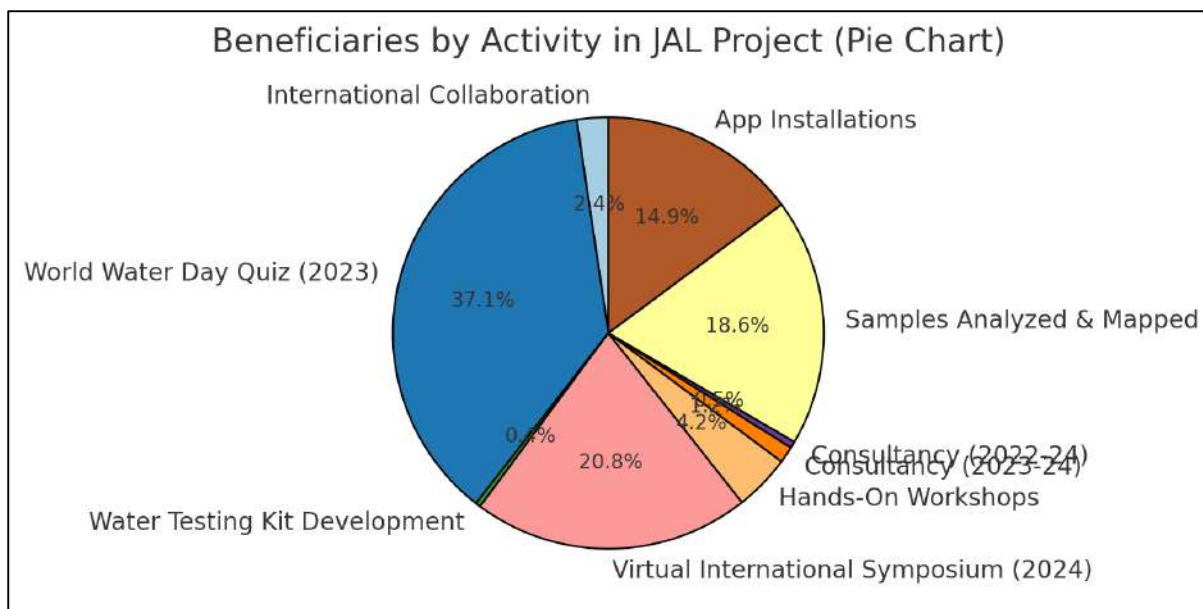


Figure 11- Mapping of Results



Sr. No.	Name of Activity	No. of Beneficiaries	Link
1	International Collaboration	19 Institutes (11 from Asia, 8 from Africa)	View
2	World Water Day Celebrations & International Quiz (2023)	300+ participants from Sri Lanka, Africa, and others	View
3	Innovative Water Testing Kit Development	Multiple institutions in RTM Nagpur University, SGBU Amravati, Gondwana University	View
4	Virtual International Symposium on Water (2024)	168 students and professionals	View
5	Hands-On Water Testing Workshops	34 students from various colleges	View
6	Water Testing Kit Consultancy & Distribution in Year 2022-23	10 Institutes	View
7	Water Testing Kit Consultancy & Distribution in Year 2023-24	6 Institutes	View
8	Water Sample Analysed and successfully mapped	150	View
9	No. of Five Elements App Installed In Devices	120	View



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Title of the Practice

Empowering Learning Through Student-Created Educational Games: A Multidisciplinary Approach

Objectives of the Practice

The primary objective of this practice is to enhance the learning experience of students by integrating educational games into the academic curriculum across multiple disciplines, including Botany, Zoology, Chemistry, Geology, Physics, Mathematics, Microbiology, and Biotechnology. These games are developed by students for the benefit of their peers, under the guidance of the Shivaji Science Innovation and Incubation Centre (SIIC). The initiative aims to promote interactive learning, foster student creativity, and provide a unique platform for hands-on education in the sciences. It also serves to strengthen student engagement, improve retention of complex concepts, and encourage teamwork and collaboration in educational game development.

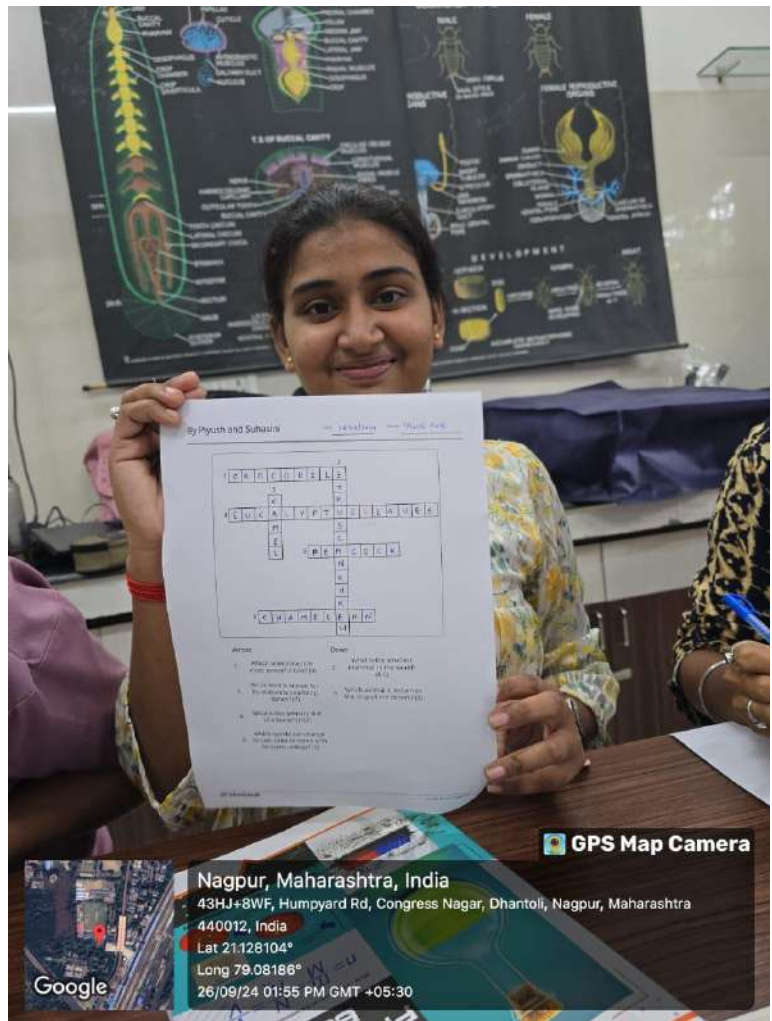
2. The Context

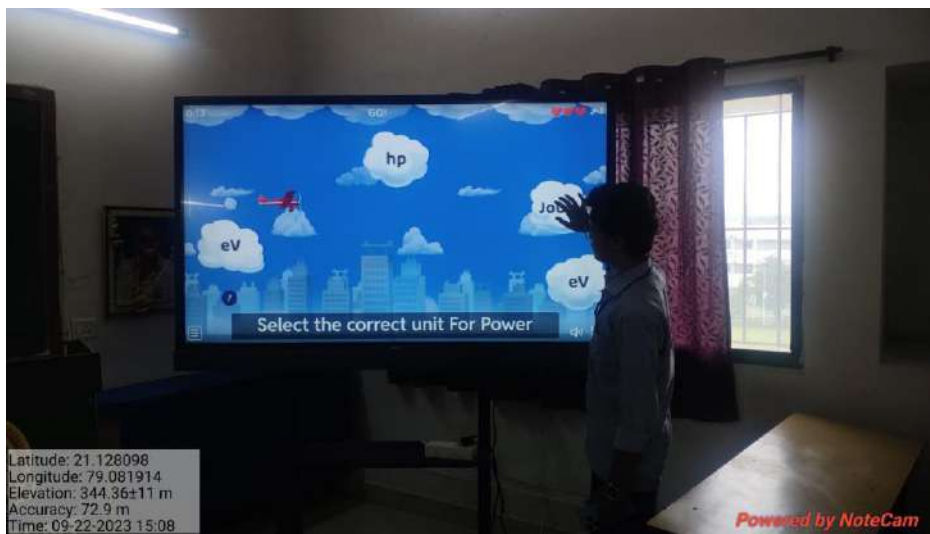
In the digital age, where students are more accustomed to engaging with technology, traditional methods of teaching are often less effective. Recognizing this, SSES's Science College in collaboration with the SIIC, launched a multidisciplinary educational gaming initiative in 2023. The aim was to create an innovative, student-centered approach to learning by integrating smartphone-based games into the academic curriculum. This practice not only helps in simplifying complex topics but also encourages students to learn by doing. The gaming activity is unique as it blends modern technology with traditional academic disciplines, thereby addressing the challenge of making learning enjoyable and interactive for the new generation.

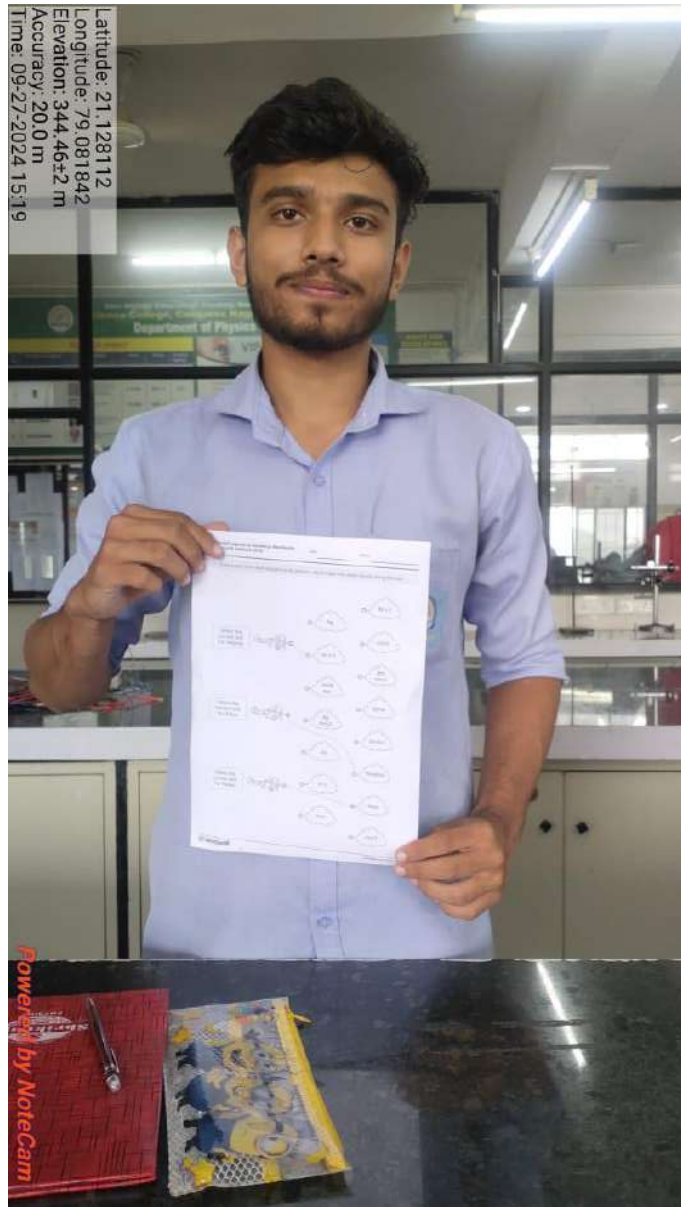
3. The Practice

The initiative began in 2023, with the goal of creating educational games that cater to various academic disciplines such as Botany, Zoology, Chemistry, and others. Until now, 24 games have been developed under the guidance of the Innovation and Incubation Centre. Each year, small workshops are organized for newly admitted first-year students across different departments, where they are trained to play and create educational games. These workshops not only focus on developing games but also teach students how to play these games without smartphones, encouraging hands-on learning even in offline settings. Some of the popular games include "Plant Play" for Botany, "Zoo Warrior" for Zoology, "ChemGame" for Chemistry, and "Earth Explorer" for Geology.

















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4. Evidence of Success

The success of this educational initiative can be seen in several ways. First, over **200 students** have actively engaged with these games, which have become an integral part of the learning process at the college. Furthermore, in 2023, one student emerged as the winner at the **R.T.M. Nagpur University Level Avishkar 2023-24 competition**, further validating the success of this practice. The initiative has also fostered a collaborative environment where students, guided by faculty, work together to create meaningful educational tools. This approach has not only enhanced student learning outcomes but also cultivated skills in game development, teamwork, and creative thinking.

Project Name: **Interactive Game for Chemistry Subject**

Category: **Arts and Humanities**



Figure 1- R.T.M. Nagpur University Level Avishkar 2023-24 competition Winner



5. Problems Encountered and Resources Required

One of the key challenges encountered was ensuring that all students had access to smartphones and the necessary technological resources. Although the workshops also teach students how to play these games offline, the digital divide was a hurdle that had to be addressed. Additionally, game development requires a certain level of technical expertise. Another challenge was maintaining student interest in game development over time, requiring continuous mentorship and innovation in the gaming content. Resources like computers, gaming software, and faculty guidance were critical in overcoming these challenges.

6. Resources required: Internet, Computers or Laptop

7. Contact Details:

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