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W02 - 2-Stage Water Rocket Workshop: A Model for Promoting Active Learning and Developing Student Competencies through Integrated STEM Education

Monday, 23 November 2026 14:00 (1 hour)

The 2-Stage Water Rocket Workshop is a hands-on learning activity that helps schools promote Active Learning by giving students the opportunity to learn through direct experience. The workshop makes difficult physics concepts easier to understand by allowing students to build, test, and launch a two-stage water rocket with a stage separation mechanism. Through this process, students gain a clear understanding of the concept of multi-stage rockets and the basic principles of physics in a practical way. The activity also inspires interest in science, engineering, and space technology while connecting classroom knowledge with real-world applications.

During the workshop, students follow the Engineering Design Process, including identifying a problem, planning, recognizing design constraints, building a prototype, testing, and improving their design. The activity also integrates the four areas of STEM Education into a single learning experience: Science (motion, force, and air pressure), Technology (tools and mechanisms), Engineering (designing, building, and improving the rocket), and Mathematics (measurement, calculation, and ratios).

This learning approach also helps schools develop important student competencies, including critical thinking, problem-solving, teamwork, and communication. Because the workshop involves challenging engineering tasks, students also learn resilience by understanding that failure is a natural part of the learning process. They are encouraged to analyze mistakes, improve their designs, and try again. As a result, the workshop provides a challenging, enjoyable, and motivating learning experience that supports the development of well-rounded learners and offers an effective STEM learning model that can be applied in schools.

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