AUTOMATA DANCERS
CAT# 80-50-W054

The Automata Dancer is a wonderful STEM project that promotes creativity, understanding of mechanical principles, and historical context. This is a simple design that could be used to discuss structures and simple machines at any level and will help develop STEM creativity. Having students build this simple user-friendly design will give them the confidence to try to do more, and experiment with different designs. The use of the cam became a function that powered the medieval industrial revolution allowing millers to pound grain at the great water mill of Barbegal. This is an extension of the simple machine axle, but it creates a whole series of interesting possibilities for students to study the timing of the cam to move trip hammers, saws, or the dancing men.

PRIMARY DIVISION: GRADES 1-3

Overall Expectation: STEM, Structures and Mechanisms Focus
Explore structures and mechanisms, including the roles of materials in supporting structures and making devices work.

Specific Expectation
Identify and describe the purpose of simple machines such as levers and pulleys.

Activity
Students use the Automata Dancer to learn about cams and how they can convert rotational motion into linear motion. They observe how the cam's shape affects the dancer's movement and discuss the role of simple machines in making work easier.

JUNIOR DIVISION: GRADES 4-6

Overall Expectation: STEM, Structures and Mechanisms Focus
Investigate the principles of forces, energy, and control in simple machines and structures.

Specific Expectation
Explore the relationships between the components of simple machines and the forces acting on them.

Activities
Students investigate how the cam in the Automata Dancer converts rotational energy into the vertical motion of the dancer. They can then experiment with different cam shapes and sizes to see how these variables affect the dancer's movement and explore the concept of mechanical advantage.

INTERMEDIATE DIVISION: GRADES 7-8

Overall Expectation: STEM, Structures and Mechanisms Focus
Investigate how technological problem-solving meets human needs and leads to innovation.

Specific Expectation
Analyze the impact of friction and lubrication on the efficiency of mechanisms.

Activities
Using the Automata Dancer, students explore how friction impacts the efficiency of the dancer's movement. They should then begin to experiment with different materials for the cam and axles to reduce friction and increase efficiency. They also discuss the historical context of cams, such as their use in the medieval Industrial Revolution for operating machinery like water mills.

SECONDARY DIVISION: GRADES 9-12

Overall Expectation: Physics Focus
Apply principles of physics to understand the operation and efficiency of mechanical systems.

Specific Expectation
Analyze mechanical advantage and efficiency in simple and compound machines.

Activity
Students delve into the physics behind the Automata Dancer by calculating the mechanical advantage provided by the cam and axle system. They explore the efficiency of the energy transfer from the rotating cam to the vertical motion of the dancer and discuss real-world applications of cams in engineering and technology.

CROSS-CURRICULAR CONNECTIONS

Mathematics
Students can calculate the mechanical advantage and efficiency of the cam system using mathematical formulas.

History
Students can research the development of the post-Roman influenced European middle age through the use of the great water mill of Barbegal.

Technology
They explore modern applications of cam mechanisms in machinery and robotics.

Language Arts
Students can write reports or presentations on the history and development of cam technology, its role in the Industrial Revolution, and its applications in modern engineering.

Summary
By integrating the Automata Dancer project into the curriculum, students gain hands-on experience with mechanical principles and historical innovations, fostering a deeper understanding of STEM concepts. This project not only meets curriculum expectations but also encourages critical thinking and creativity in STEM disciplines.