MODEL 9

Claw machine

I'm going to get you!

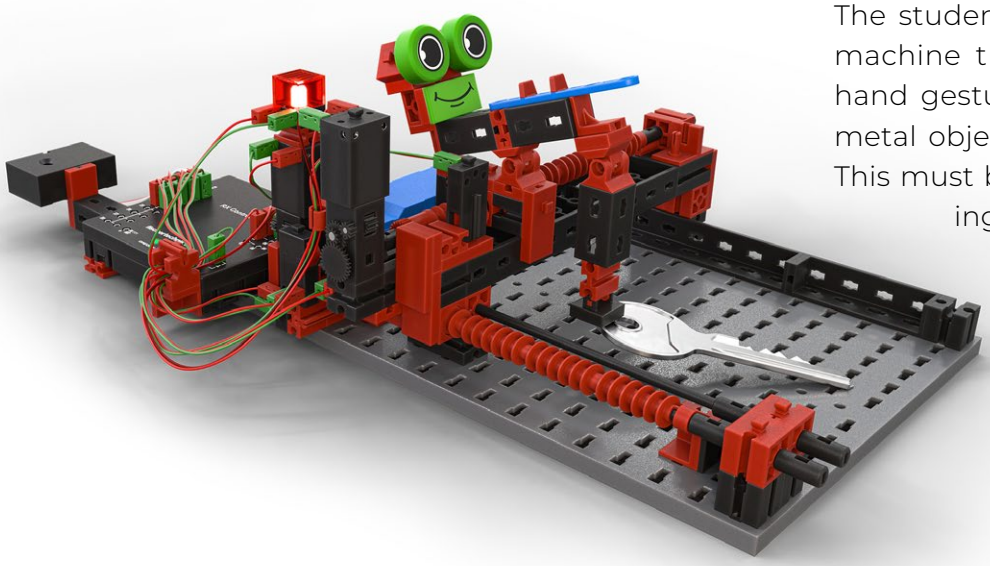
KEY QUESTIONS:

- **Where can a claw machine be used in everyday life?** ***(Communication)***
- **What functions does the system need to fulfill?** ***(Collaboration)***
- **Under what conditions should the system enable gaming?** ***(Critical thinking)***
- **What needs to be considered so that the system can be used at different locations and be as robust as possible?** ***(Creativity)***

THE TEACHING CONCEPT AT A GLANCE

Grade level:	7–10
Time required:	3 double lessons
Degree of difficulty:	Model
	Programming
Model type:	Mobile device, can be positioned individually and used flexibly

MODEL DESCRIPTION / TASK



The students plan and realize a claw machine that moves two axes via a hand gesture control and picks up a metal object with an affixed magnet. This must be transported to the starting position after the playing time has expired.

The playing time can be changed as a differentiation.

EVERYDAY RELEVANCE

The automatic triggering of a process has a strong motivational effect on students. Recording the physical quantity "movement" is quick and easy for everyone to understand.

The topic could be integrated into preprofessional orientation with regard to IT-related occupational fields. Automated switching by recording physical variables is used here in many fields. The detection of movements in particular is becoming increasingly important in many areas of information technology (e.g. gesture control).

SUBJECT REFERENCE

- **Information technology:** Programming basics, time loops
- **Physics:** Strength, movement
- **Technology:** stable construction, construction technology, component arrangement

LESSON PLAN

Introductory phase

Classroom discussion	• Announcing the topic. • Inquire about scenarios in which automatic claw machines are used (fairgrounds, retail stores, waiting areas, etc.) and which objects can be grabbed. • Basic functional options, e.g., switching on when a coin is inserted, game time limit … Objects: e.g., candy, plush toys, surprise eggs
Support, if necessary	• Show sensors, actuators and components from the assembly kit, use presentation media if necessary.

Planning Phase

Classroom discussion	• The procedure for building the model and the target function are developed jointly. • Follow-up steps of the app are announced or discussed.

Partner or group work	• The students familiarize themselves with the app and download the corresponding task. • Students sort these into useful and less useful functions of a claw machine. • The students prepare the list of requirements for the system to be built.
Optional: Partner or group work	• The students sketch the possible system. • The students discuss the results in the group and choose a design.
Construction Phase	
Partner or individual work	• The students use the app to build the claw machine. The app guides them through the program in short steps.
Programming Phase	
Partner or group work	• The students write the program for the gesture control of the motors. The app guides them through the program step by step. • Individual intermediate steps are transmitted to the RX controller and tested. • The app offers assistance. • The complete program is transmitted to the RX controller.
Experimentation and Test Phase	
Partner or group work	• The claw machine is put into operation and tested. It is only allowed to react to the gestures in front of the sensor. • Possible malfunctions in the functional sequence must be found and eliminated. • Suggestions in the app can be used for troubleshooting.
Final Phase	
Optional: Presentation and allocation of differentia-tions	• Quick students are offered the possibility of differentiation. The teacher approaches eligible students. • The additional procedure is realized via the app.
Discussion in plenary	• Project debriefing in class. • Clarification of future application possibilities in everyday life (transfer of the topic to everyday life), recourse to the discussion in the introductory phase – e.g., locations such as fairgrounds and waiting areas as well as objects to be grabbed such as candy and plush toys.

METHODOLOGICAL AND INSTRUCTIVE TIPS

Differentiation options
Quicker pupils can be given the task ofextending or shortening the playing time.

Motivational Aspects
Students are familiar with claw machines from everyday life at various locations. Perhaps they have once used a claw machine. Being on the "production side" instead of the "operator side" may now fill them with pride.

PROGRAMMING SKILLS

- Program start
- Continuous loop
- Integration of sensors
- Integration of actuators
- Loop **if – then**
- Loop **repeat until**
- Loop **wait**
- Loop **repeat – x times** (variable-dependent)
- Integration of variables
- Change of variables
- Working with subprograms
- Subprograms with transfer variables
- Dealing with time functions

Optional download:
- Circuit diagram
- Building instructions

ADDITIONAL MATERIALS

- If available, pictures of claw machines can be presented in the introductory phase of the topic.
- If applicable. Drawing media (paper, whiteboard, or projection screen).

FUNCTIONS OF THE MODEL AND THEIR TECHNICAL SOLUTIONS

Function of the sensors/actuators	Technical solution
Capturing gestures	Evaluating the signals on the gesture sensor
Light output	The red LED lights up

MATERIAL LIST

Sensors	Function
1 RGB gesture sensor	Gesture recognition right/left and forward/backward
2 buttons	End switches x- and y-axes
2 pulse buttons	Rotation counter per axis (x/y) in 90° steps

Actuators	Function
1 motor x-axis	Forward/reverse travel
1 motor y-axis	Forward/reverse travel
1 LED	End of playing time display