

MODEL 2

Action timer



Time is always frustrating!



KEY QUESTIONS:

- What function must a timer fulfill? (*Communication*)
- Which steps must be taken into account when controlling time loops? (*Critical thinking and collaboration*)
- How could the timer be optimized in terms of material savings and effectiveness? (*Creativity*)

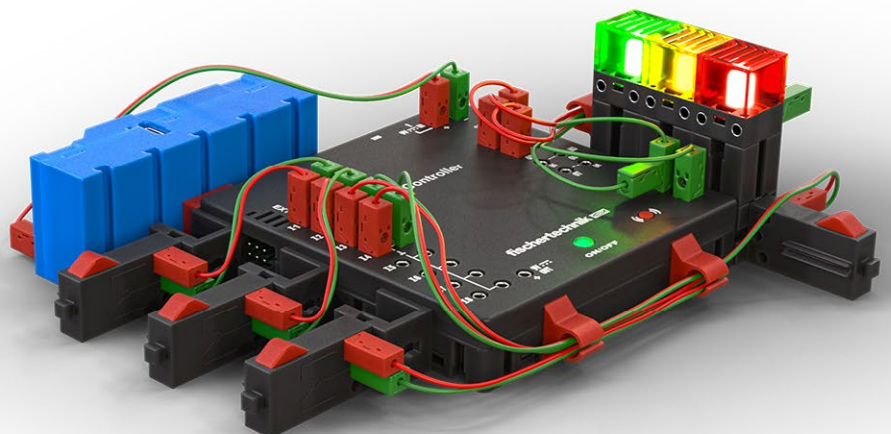
THE TEACHING CONCEPT AT A GLANCE

Grade level:	5–7
Time required:	1 double lesson
Degree of difficulty:	Model  Programming 
Model type:	Desktop device as a timer for time games or measurements

MODEL DESCRIPTION / TASK

Students plan and implement a timer for all types of games where time is of the essence. Three different countdown times can be set using three buttons. The selected time is confirmed when an LED lights up briefly. The countdown then starts via a different button. The remaining running time is indicated by the flashing of the respective LED. Shortly before the time expires, all three LEDs flash quickly and then go out.

The action timer can now be restarted for the next game round.



○ EVERYDAY RELEVANCE

Variable time loops (hard, medium, and soft for egg timers, or sound sequences for a distance warning device, or running times and acoustic output for sonar devices ...) as well as simple options for outputting recorded processes have a strong everyday relevance for the students.

The topic could be integrated into preprofessional orientation with regard to IT-related occupational fields. Time loops and the synchronization of times are required in almost all apps or types of software.

○ SUBJECT REFERENCE

- **Information technology:** Programming basics, time loops
- **Physics:** Recording and displaying times
- **Sports:** Measurement of reaction times
- **Technology:** develop constructive solutions for technical problems, manufacture and optimize an object

○ LESSON PLAN

Introductory phase



Classroom discussion

- Inquire about scenarios in which a timer is used.
- Collect different timers from the students' everyday lives (optionally as realia or on text cards).
- Presentation of the task.
- Discussion about possible/useful time intervals depending on the area of application. Reference to useful times: e.g., egg timer 5/7/10 minutes, chess 1/2/5 minutes, activity 20/30/40 seconds.



Support, if necessary

- Show sensors and actuators from the assembly kit or timers from everyday life (egg timer, stopwatch); use presentation media if necessary.

Planning Phase



Classroom discussion

- The teacher specifies the procedure using the work steps in the app.



Partner or individual work

- The students familiarize themselves with the app and download the corresponding task.
- Students complete the first task in the app.



Optional:
Partner or group work

- The students sketch a possible system.
- The students discuss the results and agree on a design.

Construction Phase



Partner or individual work

- Students use the app to build the action timer. The app guides them through the program in short steps.

Programming Phase



Partner or group work

- Students write the program for the action timer. The app guides them through the program in short steps.
- The app offers assistance.
- The program is transferred to the RX controller.

Experimentation and Test Phase



Partner or group work

- The action timer is put into operation and tested.
- Possible malfunctions in the functional sequence must be found and eliminated. The app offers assistance.
- Any optimizations can be made to button positioning, the wiring, or the programming.

Final Phase



Discussion in plenary

- Project debriefing in class.
- The strengths and weaknesses of the solutions are discussed.
- Theoretical optimization options for various application scenarios in everyday life are discussed.



Optional:
Presentation and allocation of differentiations

- The app offers a differentiation option for fast learners.



Competition

- The use of the individual timers in a practical application, e.g., in an action game, can take the form of a small competition.

METHODOLOGICAL AND INSTRUCTIVE TIPS

Differentiation options

Depending on the desired application, the three usable **running times** for the Action Timer can be adapted to individual requirements, e.g., use as an egg timer (hard, medium, soft) or adapted playing times (e.g., for timed games, brain teasers, and guessing games). The running times can be reprogrammed for this purpose.

Motivational Aspects

Students are familiar with the problem of timing and possible resulting disputes in the course of a board game, as well as other possible uses of time measurements and their functions in everyday life. As a rule, the students know that clear rules for time schedules have a positive effect on social interaction.



PROGRAMMING SKILLS

- Program start
- Continuous loop
- Integration of sensors
- Integration of actuators
- Loop **if – then**
- Loop **wait**
- Loop **repeat – x times** (variable-dependent)
- Integration of variables
- Change of variables

ADDITIONAL MATERIALS

- If necessary, use a realia in the form of an egg timer or a stopwatch to introduce the topic.
- Optional drawing media (paper, whiteboard, or projection screen).

Optional download:

- Circuit diagram
- Building instructions

FUNCTIONS OF THE MODEL AND THEIR TECHNICAL SOLUTIONS

Function of the timer	Technical solution
Select the desired running time (1, 2, or 3)	Press one of the three buttons for the respective time loop
Confirmation of the selection made	Flashing of one of the three associated LEDs
Starting a timing process	Pressing the start button
Output of the countdown function	Flashing of the associated LED (every second)
shortly before the set time expires	Rapid flashing of all three LEDs (every half second)
Expiry of the entered time	All three LEDs go out
Differentiation: Adaptation of the time loops to specific areas of application (e.g., egg timer)	Changing the time loop

MATERIAL LIST

Sensors	Function
4 buttons	Input

Actuators	Function
3 LEDs, yellow, green, red	Display
1 motor	Alarm transmitter