Systems approach to designing

Unit 2 · Energy, materials, systems and devices · matches the "Systems approach to designing" lesson slides (about 60 minutes)

Teacher notes for someone teaching this lesson without a Design and Technology background, including a cover or supply teacher standing in for the usual class teacher.

IF YOU ONLY DO ONE THING (RUSHED COVER LESSON)

If you only do one thing: make sure every pupil can say what "System" means in their own words before the lesson ends. A set of parts working together to do a job, shown as input, process and output. Ask two or three pupils to explain it back to you - do not just ask "does that make sense?".

Key facts in plain language

These are the facts this lesson depends on. They are written in plain English, not subject jargon, so you can say them in your own words while you teach.

System:
A set of parts working together to do a job, shown as input, process and output.

Input:
A sensor or switch that detects a change, such as light, heat or a button press.

Process:
The part that decides what to do, such as a microcontroller.

Output:
The part that does something, such as a buzzer, LED or motor.

Feedback:
Information from the output returned to the input to control the system.

Block diagram:
A diagram showing a system as connected input, process and output boxes.

Common misconceptions

Drawn from the wrong answers pupils pick in this lesson's own question bank, paired with the explanation that is already written for the right answer.

Pupils may think: "Process" is correct.
Why it is wrong: the correct answer is "Input". An LDR senses light, so it is an input.

Pupils may think: "Push switch" is correct.
Why it is wrong: the correct answer is "Buzzer". A buzzer produces sound, which is an output.

Pupils may think: "Returns information from the output to the input" is correct.
Why it is wrong: the correct answer is "Decides what happens and controls the output". The process (often a microcontroller) decides what the output should do.

Pupils may think: "An input with no process" is correct.
Why it is wrong: the correct answer is "Closed loop control with feedback". The room temperature is fed back to control the heater.

Pupils may think: "It removes the need to test the whole product" is correct.
Why it is wrong: the correct answer is "It breaks a problem into blocks that are easier to design". Blocks can be designed, tested and changed separately, which makes faults easier to find.

Talking points to follow the slide deck

The slide deck for this lesson follows the usual DT Classroom shape: a retrieval starter, then each key term below in turn, worked examples, exam-style practice, then an exit ticket. Use these lines as you reach each part - they are the same facts as above, just phrased as something you can say out loud.

When the deck reaches "System": say — A set of parts working together to do a job, shown as input, process and output. Ask: "can someone give me an example?"

When the deck reaches "Input": say — A sensor or switch that detects a change, such as light, heat or a button press. Ask: "can someone give me an example?"

When the deck reaches "Process": say — The part that decides what to do, such as a microcontroller. Ask: "can someone give me an example?"

When the deck reaches "Output": say — The part that does something, such as a buzzer, LED or motor. Ask: "can someone give me an example?"

When the deck reaches "Feedback": say — Information from the output returned to the input to control the system. Ask: "can someone give me an example?"

When the deck reaches "Block diagram": say — A diagram showing a system as connected input, process and output boxes. Ask: "can someone give me an example?"

Worked answers to this lesson's questions

The same question bank used for this lesson's knowledge organiser self-check and worksheet exam practice. Use this page as the answer key, or cover the right-hand explanation and hand out the questions as a silent task (see the cover lesson box below).

1. In a system, which part is a light-dependent resistor (LDR)?

a) Process, b) Output, c) Feedback, d) Input

Answer: d) Input. An LDR senses light, so it is an input.

2. Which is an output component?

a) Buzzer, b) Push switch, c) Microcontroller, d) Thermistor

Answer: a) Buzzer. A buzzer produces sound, which is an output.

3. What does the process block do?

a) Decides what happens and controls the output, b) Returns information from the output to the input, c) Turns electrical energy into movement, d) Senses changes in the surroundings

Answer: a) Decides what happens and controls the output. The process (often a microcontroller) decides what the output should do.

4. A heating system switches off when the room is warm enough. This is an example of…

a) An input with no process, b) Open loop control, c) Closed loop control with feedback, d) A timer-controlled output stage

Answer: c) Closed loop control with feedback. The room temperature is fed back to control the heater.

5. Why do designers use a systems approach?

a) It breaks a problem into blocks that are easier to design, b) It removes the need to test the whole product, c) It means only one component needs to be chosen at a time, d) It lets the designer avoid using any electronics

Answer: a) It breaks a problem into blocks that are easier to design. Blocks can be designed, tested and changed separately, which makes faults easier to find.

READY-TO-RUN COVER LESSON

Project the existing lesson slides as normal; read the key facts and talking points above before the lesson starts.

Low-prep silent task (needs no workshop tools or machinery): write or display the numbered questions above without the "Answer:" line, and have pupils answer them in silence on paper. Mark from the answers above at the end, or next lesson.

If the lesson plan calls for tools, machinery, heat or anything hands-on, do not run that part as a non-specialist cover teacher - set the silent task above instead and leave the practical for the subject teacher. See the general workshop safety guide in the Teachers hub.