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Assessment Framework

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REFERENCED DOCUMENTS

ID	Reference		Title
1	**2021-1-FR01-KA220-SCH-000031617**		SCRAPY Proposal
2			

APPLICABLE DOCUMENTS

ID	Reference		Title
1			
2			

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Introduction to SCRAPY

The SCRAPY Kit

The SCRAPY Kit aims to promote hands-on educational learning via distance teaching as well as in a classroom setting.

Due to the COVID-19 pandemic, educational systems across the globe were forced into remote learning which meant the digitalization of subjects that also have practical parts that require offline activities. After more than a year in distance learning, students have mostly lost this practical side of STEM-related lessons and as such, the SCRAPY Kit aims to combine the best of online and offline worlds through hands-on learning from the safety of the students' home.

This Kit includes all the necessary hardware (microcontroller, electronics, sensors, peripherals, etc.) that can be used on the one hand by teachers to teach STEM subjects incorporating physical computing and programming concepts which are considered more engaging and educational, and on the other hand by students to perform experiments, build DIY constructions, create their own programs and control the hardware offering a stimulating, offline and hands-on learning experience.

The SCRAPY Guide

The SCRAPY Guide includes educational content for using the SCRAPY Kit for teaching STEM-related concepts, basic programming and physical computing.
The content will explain in detail how each component can be used for hands-on experiments and simulation paradigms through the interactions of electronic components and peripherals with Pico's GPIO. Links to the curriculum will help teachers decide which experiments can apply to which subjects.
- Lesson plans that describe the use of sensors and electronics to conduct experiments in STEM subjects either in a
classroom setting or through distance learning.
- Assessment framework for assessing the knowledge of students after completing a series of exercises.
- Online environment which will host the educational resources taking advantage of motivational mechanisms (skills and
achievements framework) and gamification workflows (completing assignments). The online environment will also host the
online programming interface.

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The SCRAPY Guide has the following goals:

1. Be a guide for the educators, with clear and detailed instructions on how to use the SCRAPY Kit, its components and the SCRAPY Coder, complemented by lesson plans which utilize the SCRAPY Kit sensors, components and peripherals into interactive, hands-on exercises. These lesson plans involve the construction of several DIY kits, using the material and resources already provided, which will be used either remotely or in a classroom setting to transform STEM lessons into responsive, and stimulating experiments and prototypes.

2. Deliver the SCRAPY digital resources and coding platform under a learning motivation environment (LME) that engages users (teachers/pupils) in the learning process, offering an enhanced experience through motivational workflows and gamification mechanisms.

- Purpose: being part of something bigger
- Autonomy: freedom of choice
- Mastery: feel and sense your progress

Assessment

Assessment plays an important role in the process of learning and motivation. The types of assessment tasks that we ask our students to do determine how students will approach the learning task and what study behaviours they will use. In the words of higher education scholar John Biggs, “What and how students learn depends to a major extent on how they think they will be assessed.” (1999, p. 141).

Good assessments allow you to answer the question, *“What was it that my students learned in my course?”*

Assessment then becomes a lens for understanding student learning, identifying invisible barriers, and helping us to improve our teaching approaches.

There are different options for the assessment process:

- Asynchronous assessment: learners seek out the assessment when it is convenient for them instead of being required to take an exam at a pre-determined time.
- Stealth assessment: assessment and awarding badges can happen automatically and provide immediate feedback.
- Portfolio assessment: work samples, projects, and other artefacts the learner has produced can be used as evidence for claiming a badge.

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Since we are working with content that can be addressed in lessons given online or physically, applying multiple choice or true or false questions seems to be the best assessment option.

This way, students can easily show and apply what they learned and teachers can understand where the students have doubts and quickly plan their lesson in order to help the students overcome this difficulties.

Electricity is briefly defined as the flow of electric charge

Assessment of the lesson plans

1.What is Electricity?

1 – Electricity can be defined as…

a) … something that happens suddenly
b) **… the flow of electric charge**

2 – An atom is…

a) **one of the basic building blocks of life and matter**
b) a gather of different materials
c) a wire to conduct electricity

3 – According to the electrostatic force (or Coulomb's law) what happens to two charges of the same type?

a) **Repel**
b) Attract

4 – According to the electrostatic force (or Coulomb's law) what happens to two charges of opposite type?

a) Repel
b) **Attract**

5 – What do we call an element with high conductivity?

a) Insulator
b) **Conductor**
c) Essential

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2.What is a Circuit?

1 – To have a circuit we need to connect the positive side of a voltage source, through something that does some work such as a Light Emitting Diode (LED), and back to the negative side of the voltage source.

a) False
b) **True**

2 – A circuit starts and stops in different places

a) **False**
b) True

3 – If we have an open circuit, the electricity doesn't go through.

a) **True**
b) False

4 – When a circuit isn't working, what should you check first?

a) The wires
b) **If the circuit is not open**
c) If the battery is working

5 – A multimeter can measure volts in different parts of the circuit to ensure the circuit is powered.

a) **True**
b) False

3. Voltage, Current, Resistance and Ohm's Law

1 – What unit do we use to measure the electrical potential produced by a battery?

a) Joule
b) Watt
c) **Volt**

2 – What is **Voltage**?

a) **the difference in charge between two points**
b) the rate at which the charge is flowing.
c) a material's tendency to resist the flow of charge (current).

3 – What is **Current**?

a) the difference in charge between two points

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b) **the rate at which the charge is flowing**
c) a material's tendency to resist the flow of charge (current).

4 – What is **Resistance**?

a) the difference in charge between two points
b) the rate at which the charge is flowing
c) **a material's tendency to resist the flow of charge (current).**

5 – What is the Ohm's Law formula?

a) V = I + R
b) I = V x R
c) V = I x R

4. Electric Power

1 – Mechanical, electrical, chemical, electromagnetic, thermal, are forms of what?

a) Force
b) **Energy**
c) Movement

2 – What is the unit we use to measure **Energy**?

a) **Joules**
b) Watt
c) Seconds

3 – What is the unit we use to measure **Power**?

a) Joules
b) **Watt**
c) Seconds

4 – Power is a measure of energy over a set amount of time.

a) False
b) **True**

5 – We can use the formula **P = V x I** to calculate the power.

a) False
b) **True**

5. Alternating Current (AC) vs Direct Current (DC)

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1 – What does **AC** stand for?

a) **Alternating Current**
b) Alternating Circuit

2 – What does **DC** stand for?

a) Direct Circuit
b) **Direct Current**

3 – We can produce AC using an alternator

a) True
b) False

4 – AC oscillates back and forth as DC provides a constant voltage or current.

a) **True**
b) False

5 – What does **HVDC** stand for?

a) **High-Voltage Direct Current**
b) Huge Volt Different Circuit
c) High Value Direct Current

6. Series and Parallel Circuits

1 – What is a node?

a) A bridge between two electric components
b) **A representation of an electrical junction between two or more components.**
c) A type of wire used in circuits

2 – If components share two common nodes, they are in parallel.

a) **True**
b) False

3 – Two components are in series if they share a common node and if the same current flows through them

a) False
b) **True**

4 – Is it possible to combine parallel and series circuits?

a) No

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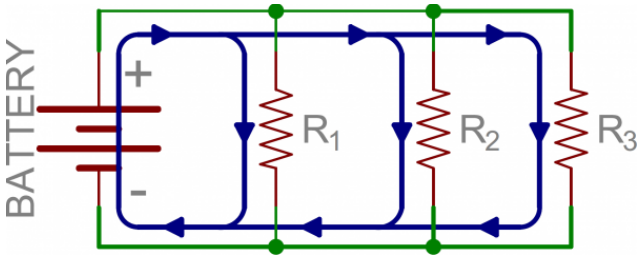
b) **Yes**

5 – What type of circuit do you find in the image bellow?



a) Series circuit
b) **Parallel circuit**

7. Introduction to Sensors – The PIR Motion Detector Sensor HC-SR501

1 - What is the function of a PIR motion sensor? (choose all the questions that apply)

d) Detect distance of an object
e) **Receive data PRESENT or ABSENT**
f) **Detect motion whether the human has move or not**
g) Detect temperature of an object

2 – Could this sensor be used as a Security Alarm System?

c) **Yes**
d) No

3 – What is the type of PIR Motion Sensor?

c) **Digital sensor**
d) Analog sensor

4 – Where can we use this sensor?

a) Smart phone
b) **Human detection robot**

5 – PIR stands for

a) Pulsating infrared
b) Pulsating ratio
c) **Passive infrared**
d) Pulse in radiation

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8. Analog vs Digital – The push button

1 – Can we connect more than one push button?

a) No
b) **Yes**

2 – What is a momentary push button?

a) **A button that only works while it's being pressed**
b) A button that works until it is pressed again
c) A button that works when he wants to

3 – What is the use of a push button?

a) It looks nice
b) **Controls the electrical circuit**
c) Powers a circuit

4 – Which one is **not** a use of a push button?

a) Gaming consoles
b) Electronic devices
c) **Light intensity control**

5 – What is a non-momentary push button?

a) A button that only works while it's being pressed
b) **A button that works until it is pressed again**
c) A button that works when he wants to

9. Binary – The OLED I2C ICC

1 - The OLED I2C ICC display can display information it collects from a sensor

a) **True**
b) False

2 – I can program a text to be shown in the OLED I2C ICC

a) **True**
b) False

3 – What does OLED stand for?

a) Only light emitting device
b) **Organic Light-Emitting diode**
c) Occasional Light-Emitting diode

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4 – Since the OLED I2C ICC doesn't have a backlight…

a) … it's easy to read the information in a bright environment
b) … it's easy to read the information in a dark environment
c) **Both the above options are correct**

5 – You can change the font in an OLED I2C ICC.

a) **True**
b) False

10. Digital Logic – The Joystick module

1- Joysticks are often used for

a) **Playing games**
b) Turning on a device
c) Starting an engine

2 – Which is an advantage of a joystick?

a) Limited direction
b) Hard to use
c) **Easy to use and learn**

3 – Joystick does _____ of directional data

a) Output
b) **Input**

4 – A joystick control can replace a laptop cursor

a) **True**
b) False

5 – What's another use for a joystick control?

a) Remote Control for a Tv
b) **Electric wheelchair driving**
c) Driving a car

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11. Metric Prefixes and SI Units

1 – If voltage is 5V and resistance is 1.5Ω, find the current(I).
Answer: I = V / R = 5/1.5 = 3.33 A

2 – If current is 8A and resistance is 2.75Ω, find the voltage(V).
Answer: V = I x R = 8 x 2.75 = 22 V

3 – If current is 4.4A and voltage is 2.5V, find the power(P).
Answer: P = I x V = 4.4 x 2.5 = 11 W

4 – If voltage is 12.5V and current is 5.3A, find the resistance(R).
Answer: R = V / I = 12.5 /5.3 = 2.36 Ω

5 – If current is 4A, voltage is 5V and time is 3.5 seconds, find the energy(J)
Answer: E = I x V x t = 4 x 5 x 3.5 = 70 J

6 – If current is 3.3A and time is 2.6 seconds, find the electric charge (C)
Answer: Q = I x t = 3.5 x 2.6 = 9.1 C

12. Polarity

1 – Polarity indicates whether a circuit component is symmetric or not.
a) **True**
b) False

2 – A non-polarized component - a part without polarity - can be connected in any direction and still function the way it's supposed to function.
a) **True**
b) False

3 – A symmetric component has more than four terminals, and every terminal on the component is equivalent.
a) True
b) **False**

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4 – LED stands for light-emitting diode, which means that much like their diode cousins, they're polarized.

a) **True**
b) False

5 – It's not important having a polarity straight with ICs.

a) True
b) **False**

13. Diodes

1 –Multiple diodes can be connected in series to increase the voltage rating of the overall circuit.

a) **True**
b) False

2 –A diode has a high resistance when the current is flowing in the reverse direction.

a) **True**
b) False

3 – A diode conducts electricity equally well in both directions.

a) True
b) **False**

4 –The voltage drop across a diode remains constant regardless of the current flowing through it.

a) True
b) **False**

5 – We can test the diode in a multimeter.

a) **True**
b) False

14. Light

1 –A photoresistor changes its resistance in response to changes in light intensity.

a) **True**
b) False

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2 – A photoresistor can be used as a light sensor.

a) **True**
b) False

3 – The resistance of a photoresistor can be adjusted by applying an external voltage

a) True
b) **False**

4 – A photoresistor can detect:

a) Sound
b) **Light**
c) Colour

5 –We can have a live update from the photosensor at any time

a) **True**
b) False

15. Capacitors

1 – We need to use "coding" to light up an LED light in a breadboard using a capacitor.
True
False

2 – How can we charge a capacitor?

a) Battery
b) Power supply
c) Generator
d) All the above

3 – A capacitor can store electrical energy

a) **True**
b) False

4 – If we add more capacitors in parallel, we will not have a voltage multiplier.

a) True
b) **False**

5 – Which capacitor can store more energy?

a) 10µF

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b) 100µF
c) 1000µF

16. Resistors

1 – Resistors are electronic components which have a specific, always-changing electrical resistance.
a) True
b) **False**

2 – The electrical resistance of a resistor is measured in ohms.
a) **True**
b) False

3 – Resistors can be constructed out of a variety of materials.
a) **True**
b) False

4 – Resistors are made in two shapes and sizes.
a) True
b) **False**

5 – Resistors could have a color-coding system or could have their own value-marking system.
a) **True**
b) False

17. Transistors

1 – Transistors can be used to create simple electronic switches, digital logic, and signal amplifying circuits.
a) **True**
b) False

2 – Transistors are fundamentally five-terminal devices.
a) True

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b) **False**

3 – Transistors are built by stacking five different layers of semiconductor material together.

a) True
b) **False**

4 – Transistors are linear devices that enforce a linear relationship between voltage and current.

a) True
b) **False**

5 – Saturation is the on mode of a transistor.

a) **True**
b) False

18. Integrated Circuits

1 – An IC is a collection of electronic components -- resistors, transistors, capacitors, etc.

a) **True**
b) False

2 – ICs are not polarized.

a) True
b) **False**

3 – Most ICs will use either a **notch** or a **dot** to indicate which pin is the first pin.

a) **True**
b) False

4 – All packages fall into one of two mounting types: **through-hole** (PTH) or surface-mount (SMD or SMT).

a) **True**
b) False

5 – Modern digital sensors, like temperature sensors, accelerometers, and gyroscopes all come packed into an integrated circuit.

a) **True**
b) False

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