Learning project

Arduino and the Second World War

Cycle: 2nd cycle Secondary Education. **Year:** 4th year of Compulsory

Curricular areas: Geography and History and Technology

Timing: 1st term

Number of sessions: 12

Project description (A representative image is included at the end of the text.)

This learning project focuses on researching and exploring the following Geography and History topics:
"World War II (1939-1945). Causes and stages. Main scenarios and evolution of the conflict. Crimes against humanity. Consequences of the war. The creation of the UN."

To do this, they will use the Arduino board together with the following components from their kit: buzzer, RGB LEDs ring and LCD screen, as well as the serial port. These components will be studied individually in the first phase of the project.

Next, the students, with the help of computers and working in pairs, will carry out research and analysis of the information on the above-mentioned content. The result of this work will be 27 questions with their corresponding answers, which will be used in the programming part.

In the next step of this educational project, students will be given an Arduino sketch capable of conducting a 10-question quiz, chosen at random from 27 possible questions. This Arduino programme will be incomplete, lacking the 27 questions and answers, as well as the commands and instructions necessary to

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control the Arduino components they have studied previously.

Students will have to enter the questions and answers they obtained during the information search and research phase into the program. They will then complete the code with the missing commands and instructions that are essential for it to function correctly.

If they achieve their goal and the program works properly, when they load the sketch onto the Arduino board, the following will happen: (**it is very important that the serial port is open in order to carry out the questionnaire**):

- The program will randomly select 10 questions for the quiz from the 27 they obtained, without repetition.
- The questions will be asked and answered one at a time via the serial port.
- The LCD screen and serial port will display the number of the question being answered.
- If the answer is correct, the LED ring will glow green and the LCD screen will display "CORRECT ANSWER".
- If the answer is incorrect, the LED ring will light up red, the buzzer will sound, and the LCD screen will display "INCORRECT ANSWER".
- The LCD screen will also display the number of questions answered and the number of correct answers.

At the end of the test, the buzzer will sound and both the serial port and the LCD screen will display the number of questions answered correctly. Students will have the option to take a new quiz.

Álvaro Cortés Herreros
Animeife. Arduino and the Second World War
CC-BY-SA

The Arduino card, LCD screen, LED ring and a small protoboard will be integrated into a 3D-printed support or one made from another type of material. This support will be called "ERROR/CORRECT DETECTOR" and will also have to be designed and built by the students.

In the final phase, students will have to evaluate their classmates' work, based on the design, operation and assembly of the "ERROR/CORRECT DETECTOR" as well as on the quality and difficulty of the questions in the questionnaire.

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Objectives

With regard to the general objectives of the stage to be achieved, we can highlight the following:

b) To develop and consolidate habits of discipline, study and individual and team work as a necessary condition for the effective completion of learning tasks and as a means of personal development.

e) To develop basic skills in the use of information sources in order to acquire new knowledge in a critical manner. To develop basic technological skills and advance in ethical reflection on their functioning and use.

f) Conceive scientific knowledge as integrated knowledge, structured into different disciplines, as well as knowing and applying methods to identify problems in various fields of knowledge and experience.

g) Develop entrepreneurial spirit and self-confidence, participation, critical thinking, personal initiative and the ability to learn to learn, plan, make decisions and take responsibility.

In turn, with the implementation of this educational project, more specific objectives are also pursued:

1) To analyse the causes, development and consequences of the Second World War, identifying the main scenarios, actors and relevant events of the conflict.

2) Develop skills in searching for, selecting and critically analysing historical information, drawing up a set of questions and answers based on reliable sources.

3) Understand and apply the basic principles of programming with Arduino, incorporating and modifying code to control electronic components (RGB LED ring, LCD screen and serial port).

4) Design and build a prototype ("Error/Correct Detector"), integrating hardware, programming and 3D design elements or alternative materials.

5) Encourage problem solving by sharing responsibilities in research , code development and device construction.

6) Evaluate and reflect on your own learning and that of your classmates by completing and validating questionnaires created by other groups.

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Contents

Geography and History 4th ESO:

"World War II (1939-1945). Causes and stages. Main scenarios and evolution of the conflict. Crimes against humanity. Consequences of the war. The creation of the UN."

This content is included in the first point, "Wars, crises and totalitarianism. The world between 1914 and 1945," in section A of the content: "History of the contemporary world: from the First World War to the collapse of the USSR."

Technology:

From section A of the contents, **"Problem-solving process,"**
the following will be developed:

– Strategies and techniques:

- Strategies and tools for collaborative project management and iterative problem-solving techniques.
- Ideation techniques. *Design Thinking*.
- Entrepreneurship, perseverance and creativity in problem solving from an interdisciplinary perspective of technological activity and satisfaction and interest in work and its quality.

– Manufacturing:

- Three-dimensional computer-aided design tools for the representation or manufacture of parts applied to projects.

In turn, section C, **"Computational thinking, automation and robotics,"** will cover the following content:

- Components of programmed control systems: controllers, sensors and actuators.
- The computer and other devices as elements of programming and control.
- Working with computer simulators to verify and test the operation of the designed systems.

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Methodology

In developing this project, various teaching methodologies have been selected with the aim of creating an educational environment that is both dynamic and effective. These have been chosen for their ability to actively engage students and promote meaningful learning.

The methodological approaches to be implemented are described below:

- **Learning by doing:** this methodology is based on constructionism, where students learn by creating digital artefacts. By actively engaging in the building projects, students develop practical skills and gain a better understanding of theoretical concepts.

- **Challenge-based learning (CBL):** In this methodology, challenges are posed to that students must solve to obtain a final product. This approach encourages critical thinking, creativity, and problem-solving skills, as students must apply their knowledge to overcome specific challenges.
- **Project-Based Learning (PBL):** Students work on long-term projects that may integrate multiple areas of knowledge. This approach allows students to explore topics in depth and develop research, planning, and execution skills.

Questions for classroom management

To manage my work on a daily basis, I ask myself the following questions:

- **I have a classroom with 30 students. How can I group my students in the technology workshop to carry out a project?** Ideally, if you have 30 students per class and 6 work tables, you should form groups of 5 with a heterogeneous profile so that peer learning situations ( ) can occur among them. Remember that each student has different learning abilities and skills. In addition to learning new ones from their classmates, they can contribute their strengths to the group, thus ensuring their commitment and motivation.
- **Should I distribute all the materials (devices, components, laptops, etc.) at the beginning of the class?** It is important to consider your teaching style and how you give instructions. For example, if theoretical explanations are necessary prior to the project, it may be preferable to wait to distribute the materials to ensure your students' attention. If you prefer to use an inductive method, you can present the task to your students in parts and give them the materials they need to test and design, investigating to

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find the solution to the challenge or prototype for the project. Then, you can approach the groups to gather their requests and feedback so that you can answer their questions, either by giving them clues to help them along or by giving them more complex tasks to carry out in phases throughout the project.

- **I have a group of students who find it difficult to motivate themselves and constantly ask for my help. How can I encourage them to work more independently?** If this is your situation, you might want to consider creating a virtual classroom with materials or video tutorials where you can guide them through the steps with very small challenges that are easy to solve. This will motivate your students more when they see that they are capable of completing the tasks on their own. You can then give them more complex tasks once they gain confidence in their learning, and you will help them become more independent.
- **How can I use the Educamadrid virtual classroom?** It is very interesting that, in addition to the workshop, the teaching-learning process is accompanied by a virtual space, in this case the Educamadrid virtual classroom. Here, you can provide information on the topic and the operational objectives to be achieved by the end of the project, so that students know from the outset what is required of them. You can also provide some kind of scaffolding to aid their learning, such as: instructions for using an Arduino board, examples of code from other simpler projects or similar programmes, essential tips or clues for configuring electronic components, an illustrative video if you are going to implement a class based on the "Flipped Classroom" model, a rubric or checklist for self-assessment, etc. You can also set up assignment submissions so that there is a record of the final work required as evidence of their work.
- **At my school, several teachers from the department share the workshop and we have to tidy everything away at the end of the class. How can I organise my students' projects so that we can continue in the next session?** This is a very important organisational point from the beginning of the course, as it will depend on the number of groups at the centre attending the workshop and other spaces available at the centre to carry out the development of your area or subject, such as the computer room or the regular classroom. One way to organise unfinished projects would be to store them in small cardboard boxes (such as those used for photocopying paper) or other materials and label them according to the groups in your class. At the same time, these boxes can be stored on high shelves so that there is no confusion when cleaning up discarded materials. These shelves could also be labelled by section for each of the courses. Students should be responsible for collecting all their materials and storing them in their boxes, preserving them as much as possible. Make sure you approve the collection before you and your students leave the workshop.
- **How can I distribute the kits?** This will depend on the equipment you have at your centre. Your centre may have already purchased materials and

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added the new ones. In this case, you can distribute one kit to each group of five and they can keep it until the end of the project, if it lasts a month or more. If, on the other hand, you do not have enough materials because they have to be shared with other classes, then you can propose short projects lasting 1 to 2 weeks so that the kits can be freed up for use by other students at the centre. Remember that the kits must always be left in the workshop. When the kits are being used by other students who are not in your class, you can combine your classes with the computer room, for example, where you can propose tasks or activities involving code development, multimedia editing, etc., which not only complement the students' digital skills but also provide material that can be used as evidence for the design of the project for assessment.

- **What other resources can help me with classroom dynamics, besides the kits and laptops I use in the workshop?** You can integrate other elements that accompany you in the scaffolding of the teaching-learning process to help your students. For example, it is very useful to use a corkboard to organise other tools for each group when they are building the models, such as screwdrivers, pliers, etc., where it will be essential to keep them in order so that you can detect the absence of any of the items at a glance. The corkboard can also be used to leave them some basic design drawings for assembling fundamental pieces or gears, or examples of diagrams that serve as visual aids for all students to carry out their tasks.
- **If I work in groups and grade by project, how can I guarantee individual marks?** When I divide the class into groups, it is important to establish roles and assign specific tasks to each student, bearing in mind that these roles will rotate depending on the different projects carried out throughout the course. In this way, you can obtain a grade for the project as a whole, carried out by the group, and a more individualised grade for the specific task carried out by each member. In addition, you can give an objective test to verify the levels of achievement of each student. Don't forget that, as mentioned above, we will provide students with a rubric or checklist to help them visualise the stages of their learning, enabling them to carry out both self-assessment and co-assessment of the work carried out in the project.

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Resources

Personal	Digital	Digital
Teachers: teachers who guide and facilitate learning. **Students:** Classmates who collaborate and learn together.	**Technology:** computers, Arduino boards and components from their kit: RGB LED ring, expansion board and LCD screen. 3D printer (optional). Interactive Digital Panel/Digital Whiteboard/Projector **Office supplies:** scissors, glue, cardstock, cardboard.	**Educational platforms:** Educamadrid Virtual Classroom/Google Classroom. **Educational applications and software:** Arduino IDE, Internet browsers, Tinkercad. **Online resources:** tutorials.

Activities

Phase	1
Timing	4 sessions
Type of activity	Programming with Arduino. Group class and pair work.
Description	Presentation to students of the educational project to be developed in the coming sessions, based on content already covered in their Geography and History classes: "World War II (1939-1945). Causes and stages. Main scenarios and evolution of the conflict. Crimes against humanity. Consequences of the war. The creation of the UN." Next, the entire class will be given a joint explanation of Arduino IDE, how to connect the card to the computer, what a

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	library is and how to download it, how to save a program or sketch, what the expansion card is and how to install it, the characteristics of the protoboard they will be using in this project, and the void setup and void loop. Next, they will be shown the Arduino components they will be working with: RGB LED ring, LCD screen, expansion card, and serial port. In this phase, they will study the programming of these components one by one so that, in a future phase, they can connect and program them together. In this individual study of each component, there will be explanations to the whole class and work in pairs. Each pair will be assigned an Arduino board. - STUDY OF THE SERIAL PORT. FOR LOOPS, ARRAYS AND CONDITIONALS. Students will download the program from the Educamadrid virtual classroom or Google Classroom: "PROGRAM_SERIAL_PORT". The main commands of this Arduino tool will be explained and analysed: the pins it uses, how to open the serial port in the IDE, how to send information from the computer to the card while a program is running and vice versa, how to obtain information from the program running on the card. Once divided into pairs, with the program downloaded and open in the Arduino IDE, they will better understand the explanation of what an array, a for loop and a conditional statement are. After the explanations, they will load the program onto the board and see how the information sent by Arduino is printed on the serial port. In turn, they will be able to check how they send information from the computer to the board. Finally, you will be challenged to introduce variations into this program so that you can understand how the serial port works in a more proactive way. - STUDY OF THE PROGRAMMING OF THE RGB LED RING.

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	As they did with the study of the serial port, students will download the program that will serve as a basis for understanding the programming of the RGB LED ring from the Educamadrid virtual classroom or Google Classroom. The programme will be called: "PROGRAM_LED_RING". With the program open in the IDE, the whole class will be taught what an RGB LED is, how the LED ring is connected to the Arduino board, what library is needed to program it, the commands to configure and initialise it, as well as the main commands for this device so that the LEDs change colour, light up one by one thanks to a for loop, or change colour randomly. They will be challenged to introduce variations into this program so that they can modify the speed of colour change, vary the order of colours, practise with new random colours and change the direction of the LEDs when they light up one by one. - PROGRAMMING THE LCD SCREEN. The last device to be addressed in this phase is the LCD screen. As the students did with the two previous components, they will download the program from the Educamadrid virtual classroom or Google Classroom: "PROGRAM_LCD_SCREEN". They will be taught about the I2C protocol, the function of the SDA and SCL pins on the screen, how it connects to the Arduino board using analogue pins A4 and A5, the library that needs to be imported in order to work with it, its configuration and initialisation commands, as well as the main commands for displaying text on it, deleting it, moving the cursor, and making it visible or invisible. They will be challenged to introduce variations into this program so that they can change the messages, write on the two rows of the display, delete them and move the cursor along the columns of the LCD display.

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Resources

SERIAL_PORT_PROGRAM (Download)

LED_RING_PROGRAM (Download)

LCD_SCREEN_PROGRAM (Download)

SERIAL PORT.

Components:

Arduino R4 WIFI board.

Connection diagram:

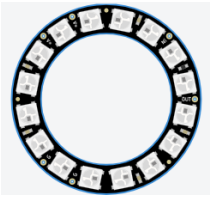
You only need to connect the Arduino card to the computer.

RGB LED RING

Components:

Arduino R4 WIFI board.

RGB LED ring



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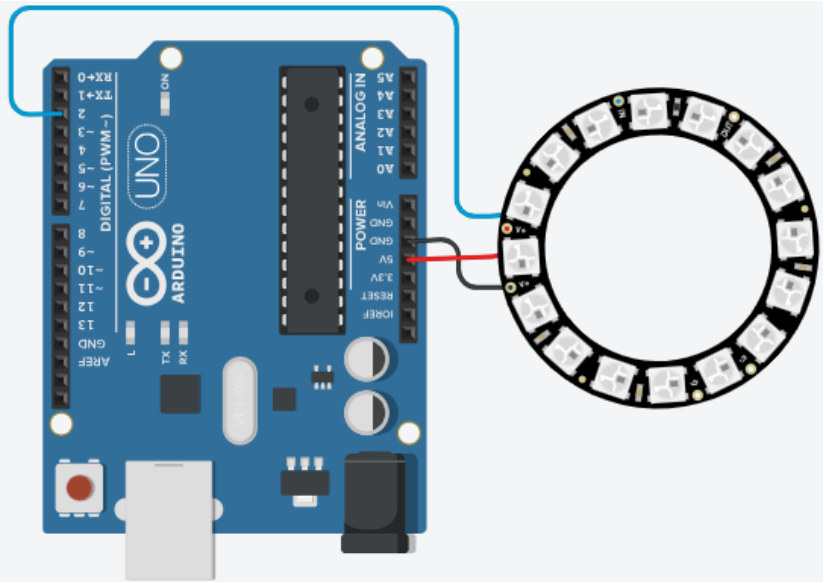
Connection diagram:



GND pin on the LEDs ring	**Black cable**	**Connects to the Arduino GND PIN.**
+Vcc pin on the LED ring	**Red cable.**	**Connects to the Arduino's 5V pin.**
DI pin of the LED ring	**Blue cable**	**Connects to Arduino PIN 2**

LCD SCREEN

Components:

Arduino R4 WIFI card.

LCD screen

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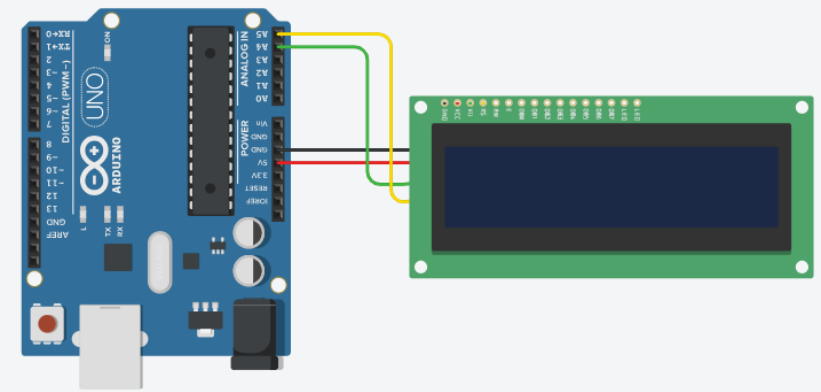
Connection diagram:



GND pin on the LCD screen	**Black cable**	**Connects to the Arduino GND pin.**
Vcc pin on the LCD screen	**Red cable.**	**Connects to the Arduino's 5V pin.**
SDA pin on the LCD screen	**Green cable**	**Connects to Arduino PIN A4**
SCL pin on the LCD screen	**Yellow cable**	**Connects to Arduino PIN A5**

Phase	**2**
Timing	2 sessions
Type of activity	Information search and analysis. Work in pairs
Description	Students will conduct a search for verified information, based on reliable sources, on the aforementioned history topics, allowing them to explore them in greater depth and expand their knowledge. This information search will result in 27 questions and their corresponding answers, formulated correctly, concisely and clearly, which will be introduced into the final project

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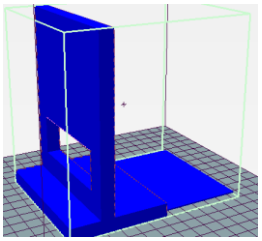
	program in subsequent phases.
Resources	**Notebook**

Phase	**3**
Timeline	3 sessions
Type of activity	Design, construction, and connection. Work in pairs.
Description	Using 3D design and, if the centre has this type of printer, the online program Tinkercad, or, if 3D printing is not used, cardboard and card, the students will design and correctly construct the support called "Error/success detector": • Space for the LCD screen. • Space at the front to place the RGB LED ring. • At the rear, sufficient space for the mini protoboard and the Arduino card. The various components of the project (LCD screen, RGB LED ring, mini protoboard and Arduino board with its expansion board) will be mounted on the support. You will also make the connections between the components and the expansion board mounted on the Arduino. An STL format model is attached for analysis and reference.
Resources	**STL model of the "Error/Correct Detector" support. (Download)** **Example of the support in STL format:** 

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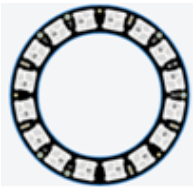
Components:

Arduino R4 WIFI card.

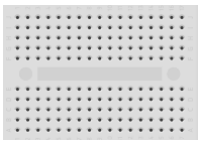
RGB LED ring



HW-723 expansion board

LCD screen

170-point mini



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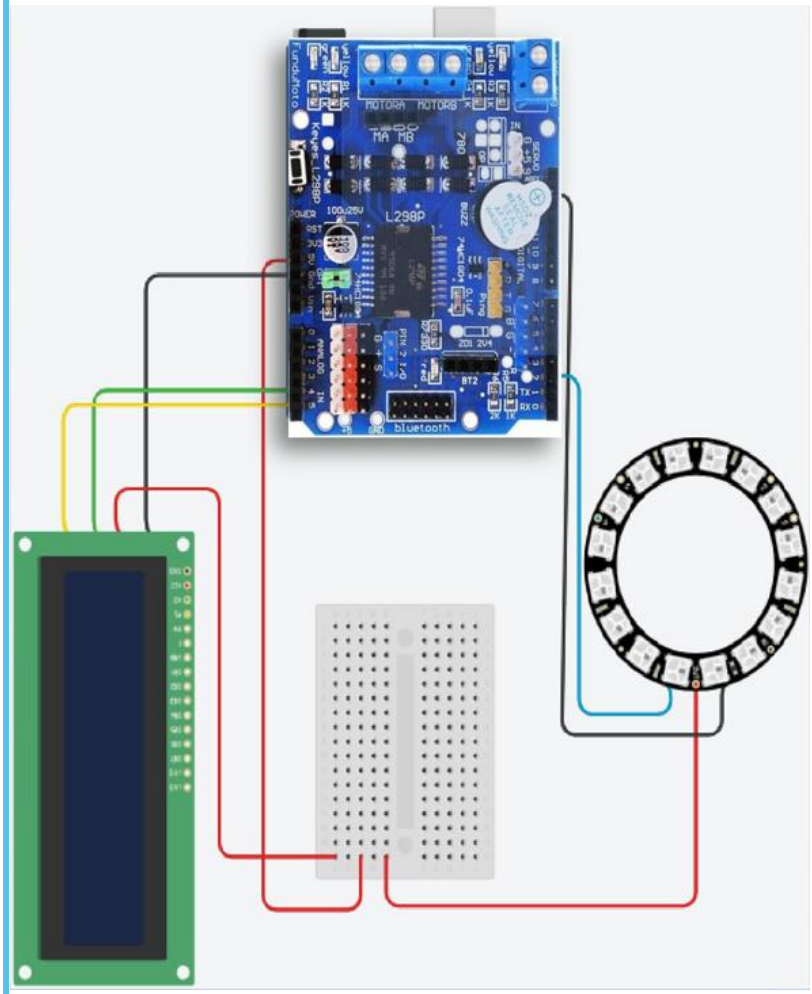
Connection diagram:



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EXPANSION BOARD CONNECTIONS:

- FROM THE 5-VOLT PIN ON THE EXPANSION CARD TO A COLUMN ON THE MINI PROTOBOARD

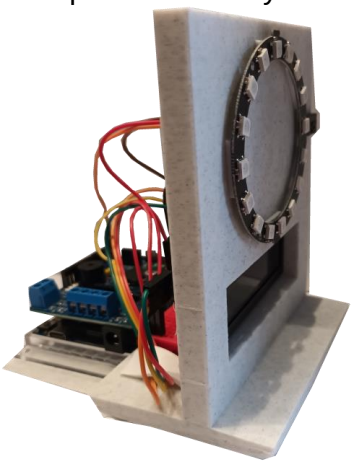
RGB LEDs RING CONNECTIONS:

- GND PIN (BLACK CABLE) TO THE GND PIN OF THE EXPANSION CARD.
- VCC PIN (RED CABLE) TO THE COLUMN OF THE MINIPROTOBOARD, WHERE THE 5V FROM THE EXPANSION CARD HAS BEEN CONNECTED.
- DI PIN (BLUE CABLE) TO PIN 2 OF THE EXPANSION CARD.

LCD SCREEN CONNECTIONS:

- GND PIN (BLACK CABLE) TO THE GND PIN ON THE EXPANSION CARD.
- VCC PIN (RED WIRE) TO THE COLUMN OF THE MINI PROTOBOARD, WHERE THE 5V FROM THE EXPANSION CARD IS CONNECTED.
- SDA PIN (GREEN CABLE) TO THE A4 PIN OF THE EXPANSION CARD.
- SCL PIN (YELLOW CABLE) TO PIN A5 ON THE EXPANSION CARD.

- Example of how the "Error/Correct Detector" would look with the components already assembled and connected:



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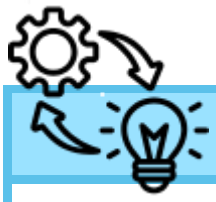
Learning project

Phase	**4**
Timing	3 sessions
Type of activity	Complete final programme. Co-evaluation. Work in pairs and class groups.
Description	Students will download the program "INCOMPLETE_STUDENT_QUESTIONNAIRE" from the Educamadrid virtual classroom or Google Classroom. This program is incomplete and must be implemented with the missing commands, entering the questions and answers obtained in phase 2, so that the application, from the 27 questions entered, creates a questionnaire by randomly selecting 10 of these 27 questions. The questions will be asked one at a time via the serial port and the "Error/Correct Detector" will indicate whether the answer given is correct or incorrect. At the end of the questionnaire, the "Error/Correct Detector" will show the total number of correct answers and the serial port will offer the student the possibility of taking another test. In the last session, students will have to evaluate their classmates' work, based on the design, operation and assembly of the "ERROR/CORRECT DETECTOR" as well as the quality and difficulty of the questions in the quiz.
Resources	**"INCOMPLETE_QUESTIONNAIRE_STUDENT" program (Download)** **"COMPLETE_QUESTIONNAIRE_TEACHER" program (Download)** **Document for co-evaluation. (Download)**



Did you know?

- We are working on a project about the Second World War. We explain some of the famines it caused among the civilian population: in Greece between 1941 and 1944, there was a famine that caused the deaths of

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more than 300,000 people; in the siege of Leningrad, now St. Petersburg, more than a million civilians died of hunger and cold during almost 900 days of German siege.

- We are studying and analysing the Holocaust. We explain the difference between concentration camps and extermination camps, where not only were more than six million Jews murdered, but also gypsies and homosexuals.
- We are delving deeper into the creation of the UN. We explain that the idea of creating an international organisation to maintain peace arose befor , before the end of the Second World War.
- We are working with the Arduino serial port. We explain how serial communication between devices works and how we can use the serial port to debug programs. A small example is given.
- We are working with the LCD screen. We explain how we can use sensors and variables to display the temperature and distance to an object on the screen, and we create a program with the ultrasonic sensor that shows the distance to objects in centimetres on the LCD screen.
- We are working with an RGB LED ring. We explain that each RGB LED has three tiny diodes: red, green and blue. By combining the light from these three colours at different intensities, more than 16 million colours can be generated.

Assessment

In order to properly evaluate this educational project, procedures, assessment activities and tools have been established that accurately reflect the objectives and competencies set out. Assessment not only measures student progress and achievement, but also provides valuable information for adjusting and improving the teaching process. These aspects are detailed below.

Procedures	Assessment Activities	Tools
Direct observation. Oral exchanges. Student work. Peer assessment.	Daily participation Digital files of the programming of the different components to be used in the activity. Proper functioning of the program that carries out the questionnaire.	Rubrics. Programs created with the Arduino IDE for the different components individually. Functioning of the final program with all components. Verification that the

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	Daily work. Questions and answers found in the search and research phase ( ).	questions and answers on the contents of History, related to the contents being worked on, are correct and show a high level of research and investigation.

Assessment criteria

- Conduct a search for information, based on different sources, to clearly and correctly formulate the 27 questions that will be included in the questionnaire.
- Check that the answers to the 27 questions are correct and verify them using different reliable sources.
- Understand the essential commands of the serial port and be able to make changes to the example program that was given and explained to you.
- Know the essential commands for the RGB LEDs ring and LCD screen, and be able to make changes to the example programs that were given and explained to them.
- Correctly connect the components to the Arduino board.
- Correctly completes the final program, in which the questionnaire is carried out, integrating all the components.
- Correctly designs and builds the support called "Error/Correct Detector", mounting the different components on it and making the connections.
- Checks that the program is working correctly, synchronised with the "Error/Correct Detector".

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Assessment rubric for the teacher (Download)

	Excellent	Satisfactory	Needs improvement	Insufficient
Conducts a search for information, based on different sources, in order to clearly and correctly formulate the 27 questions that will be included in the questionnaire.	You do this independently, using different sources and cross-checking the information. (1.25)	They do this but need help in formulating the questions correctly and clearly. (0.75)	Does this, but has needed continuous guidance to search different sources of information and write the questions. (0.5)	They have not been able to formulate the 27 questions clearly and correctly. (0.25)
Checks that the answers to the 27 questions are correct and verifies them using different reliable sources.	Checks that the answers are correct and verified in different sources. (1.25)	Checks them, but has up to 5 incorrect answers because the information has not been verified. (0.75)	They check it, but have up to 10 incorrect answers because they did not verify the information, using only one source of information. (0.5)	Checks it, but more than 10 answers are incorrect because they use a single unreliable source of information and do not verify the information. (0.25)

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Understands the essential commands of the serial port and is able to make changes to the example program that was given and explained to them.	Understands the commands and is able to independently make changes to the example program that was given. (1.25)	Understands the essential commands of the serial port, but needs help to make changes to the example program they were given. (0.75)	Understands some of the essential commands of the serial port and is unable to make changes to the example program. (0.5)	Does not understand most of the essential commands of the serial port. (0.25)
Knows the essential commands for the RGB LEDs ring and the LCD screen, and is able to make changes to the example programs provided and explained.	Knows the commands for both components and is able to independently make changes to the example program provided. (1.25)	Knows most essential commands of the serial port, but needs help to make changes to the example program they were given. (0.75)	Knows some of the essential commands of the serial port and is unable to make changes to the example program. (0.5)	Does not know most of the essential commands of the serial port. (0.25)
Correctly connects the components to the Arduino board.	Connects the LCD screen and RGB LEDs ring without assistance. (1.25)	Connects the components but makes mistakes in some of the connections for the power supply. (0.75)	Connects the components but needs continuous guidance (0.5)	Does not know how to connect the components, mainly the LCD screen and the power supply connections (0.25)

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Correctly completes the final program, in which the questionnaire is carried out, integrating all the components.	Completes all missing commands: initial configuration of components, initialisation and operating commands. (1.25)	Does not complete some initial configuration commands for some components, but correctly fills in the initialisation and operational commands. (0.75)	There are errors in the initial configuration and initialisation commands for the devices, but the operational commands are completed correctly. (0.5)	It presents errors or does not complete device configuration and initialisation commands, and the same occurs with operational commands. (0.25)
Correctly designs and builds the support called "Error/Correct Detector", assembling the different components on it and making the connections.	Is able to design and build it independently , assembling the components and making the connections correctly. (1.25)	Is able to design and build it, although has difficulties in connecting and assembling the components. (0.75)	Manages to design and build it. Also manages to assemble and connect the components, but with constant guidance. (0.5)	Despite continuous guidance, they are unable to design it and therefore cannot assemble and connect the components on their own. (0.25)
Checks that the program is working correctly, synchronised with the " “Error/Correct	The program, together with the "Error/Correct Detector " device ,	The program, together with the “Error/Correct Detector” device, has	The test can be performed, but there are errors in the programming that prevent	The test cannot be performed. When the serial port is opened, no

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Detector ".	works correctly. The test can be performed without any problems, the messages on the LCD screen and the serial port are correct, and the LEDs ring lighting is appropriate. (1.25)	some errors. The test can be performed without any problems, but some messages on the LCD screen and the serial port are contradictory or do not respond to certain answers. (0.75)	the "Error/Correct Detector " from working, with no messages appearing on the LCD screen and the LEDs ring not lighting up when it should. In addition, some messages are missing from the serial port. (0.5)	text appears. (0.25)

Attention to student differences

As a teacher committed to the inclusion and success of all students, it is essential to adapt tasks and activities to cater for diversity in the classroom. Following the principles of **Universal Design for Learning (UDL),** flexible and personalised strategies can be implemented to respond to the individual needs of each student.

This learning situation applies the concepts of UDL from its very design, as it is an interdisciplinary project that works with content from the subjects of Geography, History and Technology, allowing different skills to be worked on and enabling each student to develop their potential in different activities and align themselves with their interests.

Furthermore, due to the very nature of the activities, which involve modifying given programs, these modifications can be graded for both students with special educational needs and those with high abilities.

The following are the guidelines and measures that will be applied to promote an

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inclusive and effective learning environment:

- **Location or grouping of students in the classroom:** students who need more support sit close to the teacher to receive additional instruction. Students who work better in groups are grouped together at collaborative tables to encourage cooperation.

- **Reconsideration of the level of demand for basic knowledge:** to facilitate learning, expectations are adjusted according to individual abilities. For example, a student with special educational needs may focus on explaining only the main parts of the water cycle, while other students may delve into additional details.

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