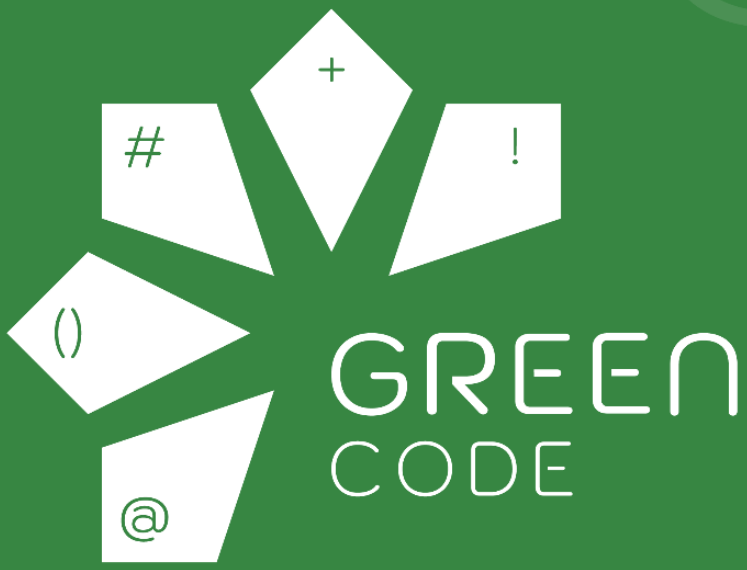

PREPARING FUTURE EDUCATORS

Lesson Plans

Supporting the Higher Education Course Curriculum on Robotics and Environmental Education

Funded by the European Union

Preparing Future Educators: Lesson Plans – Supporting the Higher Education Course Curriculum on Robotics and Environmental Education

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Introduction

Education plays a crucial role in the 21st century in shaping individuals who are not only technologically literate but also environmentally conscious. The project GREENCODE “Building an Eco-Friendly Future with Robots” embraces this challenge by integrating STEM/STEAM education with environmental awareness in Early Childhood Education (ECE). The project focuses on equipping future educators with innovative teaching strategies that combine robotics, coding, and sustainability, ensuring that young children develop both computational thinking and a respect for nature.

Project Overview and Objectives

The “Building an Eco-Friendly Future with Robots” project, also known as GREENCODE, integrates STEM/STEAM education in Early Childhood Education with a strong focus on sustainability and green practices. The project has three main priorities: (1) ensuring that early childhood teacher education organisations are equipped with effective STEM/STEAM teaching strategies, (2) connecting these strategies to environmental protection and green practices, and (3) using educational robotics to provide enjoyable, easy, and engaging learning experiences. By developing and updating the professional skills of preservice preschool teachers in both technology and eco-friendly practices, the project equips them with the skills to foster computational thinking and problem-solving skills in young children, ensuring they learn to live in peace, prosperity, and a clean environment from an early age. Using robotics as a tool for interactive learning, the project supports the creation of innovative teaching materials that prepare future teachers to address environmental challenges using engaging, technology-driven methods.

Project Information	
Title	Building an Eco-Friendly Future with Robots
Acronym	GREENCODE
Reference Number	2023-1-LV01-KA220-HED-000157623
Start date	01/09/2023
End date	31/08/2025
Duration	24 months

GREENCODE is funded by the ERASMUS+ programme of the European Union. It is a joint project, carried out by seven project partners from the European Union. The project coordinator is the University of Latvia. The project partners are:

- University of Mannheim, Germany;
- Instituto Politécnico de Viseu, Portugal;
- University of Rijeka, Croatia;
- Scuola di Robotica, Italy;
- Mellis, Turkey;
- Early Years, Ireland.

Finally, project GREENCODE aims to equip future educators with the tools and knowledge needed to create meaningful, engaging, and impactful learning experiences for young children. By integrating technology, sustainability, and innovative teaching methodologies, the project supports the development of a new generation of young learners who will grow up to be responsible stewards of the planet.

Lesson Plans for a Higher Education Course Curriculum

This document presents a structured collection of lesson plans designed to support educators in delivering GREENCODE Higher Education Course Curriculum. The lesson plans are organized into five key modules, each addressing a different aspect of sustainability, technology, and pedagogy in Early Childhood Education (ECE):

Module 1: Inquiry-Based Learning – Introducing educators to the IBL model, its benefits, and its application in environmental education.

Module 2: Supporting the Implementation of IBL in ECE – Providing strategies and best practices for integrating IBL into early childhood environments.

Module 3: The Importance of Outdoor and Indoor Activities for Environmental Education in ECE – Exploring how both outdoor and indoor environments can be used for teaching sustainability.

Module 4: Basic Hands-on Robotics and Coding Activities – Engaging educators in using educational robotics as a tool for interactive learning.

Module 5: The Role of Evaluation and Documentation in ECE in the IBL Approach – Highlighting the importance of assessing and documenting children's learning experiences.

Each module contains detailed lesson plans that include learning objectives, materials to be used, instructional strategies, hands-on activities, and assessment methods. These lesson plans are carefully designed to provide a balance between theory and practice, ensuring that future educators not only understand the principles of STEM, IBL, and environmental education but also gain the confidence to implement them effectively in their future practice.

Furthermore, the lessons incorporate interactive and experiential learning approaches, encouraging students as-future educators to adopt child-centred teaching methods. By using educational robotics, children can engage with technology in a way that enhances their understanding of environmental issues. Activities such as programming simple robots to mimic natural processes or designing sustainable cities with coding tools enable young learners to connect technology with real-world ecological challenges.

This document serves as a comprehensive guide for higher education educators who wish to implement these principles into their teaching practice. The activities included in the lesson plans encourage collaborative learning, supporting students in developing teamwork skills while exploring concepts related to environmental sustainability and educational robotics. The GREENCODE "Preparing Future Educators: Higher Education Course Curriculum on Robotics and Environmental Education" is designed to be flexible and adaptable, allowing educators to tailor the lesson plans to their individual skills, their students and the specific needs of the early childhood learning and teaching environment. University instructors can choose the most suitable assessment method – students may develop their own IBL lesson plans gradually after each lecture or only at the end of the programme.

The GREENCODE Lesson Plans make use of other outputs of the project, mentioned in the materials section:

- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Higher Education Course Curriculum on Robotics and Environmental Education, referred to as **GC Curriculum**;
- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Digital Handbook on Robotics and Environmental Education, referred to as **GC Handbook**;
- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Activity Book – Educational Robotics and Environmental Education in Early Childhood Education, referred to as **GC Activity Book**;
- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Video tutorials, referred to as **GC Video tutorials**;
- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Dream City: Set of Cards for Storytelling with Educational Robotics, referred to as **GC Dream City**.

Based on GC Curriculum, Module 1: Inquiry-Based Learning

LESSON 1

Getting to Know Inquiry-Based Learning

Ketlīna Tumase and Arta Rūdolfa, University of Latvia, Latvia

Elif Anda and Caner Anda, Mellis Eğitim Teknoloji Ticaret Limited Şirketi, Turkey

LEARNING OUTCOMES

- Know the potential of Inquiry-Based Learning (IBL) in Early Childhood Education (ECE).
- Understand the steps of the IBL model in ECE.
- Describe the importance of environmental education from preschool age.
- Recognise the importance of educational robotics in ECE and its pedagogical applications in the context of IBL and environmental education.

MATERIALS TO USE IN THE LESSON

- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Video tutorial – Implementation of the IBL approach and eco-friendly activities.
- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Higher Education Course Curriculum on Robotics and Environmental Education.

MATERIALS TO BE STUDIED INDEPENDENTLY

- Module 1 of Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Higher Education Course Curriculum on Robotics and Environmental Education (hereafter GC Curriculum).
- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Digital Handbook on Robotics and Environmental Education (hereafter GC Handbook).
- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Activity Book – Educational Robotics and Environmental Education in Early Childhood Education (hereafter GC Activity Book).

DURATION

4.5 h (1.5 h face-to-face + 3 h autonomous work).

Process

LESSON PARTS

Given that students are not yet familiar with the theoretical literature on IBL, a theoretical outline on the following topics is given:

1. Inquiry-Based Learning in ECE;
2. Environmental education in ECE;
3. Educational Robotics and IBL in ECE.

PART 1: INTRODUCTION (5 MIN)

The lesson starts with the question – *What is your dream city/village/place to live in?* (Answers can be written on sheets of paper, whiteboard or all uploaded to a tool such as *Padlet* or another.)

Once students have answered what they would like to see in their dream city, the next question follows – *what kind of world would you like children to see around them? How can we plan and design lessons to raise awareness of the environment around us?*

PART 2: INQUIRY-BASED LEARNING IN ECE (25 MIN)

The lecturer introduces students to the theoretical information provided in the GREENCODE project materials and from the latest studies in this field.

INQUIRY-BASED LEARNING APPROACH

The lecturer starts with a short video giving an overview of IBL: Inquiry-Based Learning (Explained in 4 Minutes).

Key takeaways to discuss with students (Use information from GC Curriculum, Module 1):

- IBL encourages curiosity, exploration, problem-solving and critical thinking in children.
- It focuses on children formulating hypotheses and exploring and building new knowledge.
- IBL encourages questioning, experimentation, analysis and reflection.
- It prepares children for lifelong learning and developing problem-solving skills.
- Robotics and natural sciences share common foundational skills, e.g., observing, describing, comparing, questioning, predicting, experimenting, reflecting, and collaborating.

- This may include collecting, processing and interpreting environmental data to enrich the learning experience.

Students can watch the GC Video tutorial – Implementation of the IBL approach and eco-friendly activities.

Once IBL has been introduced, the lecturer can then *ask the students what they think the IBL approach brings to ECE. Can they think of a topic where it would be useful?*

STRUCTURE OF THE IBL PROCESS

IBL can be structured in four stages (See pages 15-16 in GC Curriculum, Figure 1.1 and Figure 1.2):

1. Engage.
2. Investigate.
3. Create.
4. Reflect.

Once the students have been introduced to the IBL stages, *the lecturer ensures that everyone has understood the IBL cycle by asking them to draw the cycle in their notes and define the steps*.

Key takeaways to discuss with students (Use information from GC Curriculum, Module 1):

- What can initiate IBL in the introductory stage?
- What does the IBL emphasise?
- Which skills development are promoted through this model?
- What teacher support is needed?
- Can the IBL cycle be divided into stages?
- What part does reflection play at the end of a cycle?

RECOMMENDATIONS

The role of the teacher in the IBL model is very important (See page 16 in GC Curriculum, Figure 1.3):

- Figure 1.3 is studied with the students and the lecturer gives some theoretical information about the importance and role of the teacher (the role of the teacher and the methods to be used are explored in more detail in GC Curriculum, Module 2).
- Students work in groups to develop short guidelines for a teacher working in a preschool with IBL. Students can choose the form in which they represent the information – drawing, making a dashboard, writing bullet points. These guidelines will later serve as support material for students/teachers themselves.

PART 3: ENVIRONMENTAL EDUCATION (EE) IN ECE (25 MIN)

This approach shifts the focus from information-sharing to active problem-solving, enhancing critical thinking, creativity, and collaboration.

1. PRESENT A REAL-WORLD EE CHALLENGE (5 MIN)

Provide students with a practical Early Childhood Education scenario where environmental education can be applied. Example scenarios:

- A preschool with limited access to green spaces – how can teachers integrate nature-based learning?
- Children showing little interest in environmental topics – how can educators spark their curiosity?
- Or other student suggested challenges (based on information provided in GC Curriculum, Module 1, page 12).

2. GROUP BRAINSTORMING & SOLUTION DISCUSSION (10 MIN)

- Students in small groups discuss possible solutions to the scenario.
- Encourage them to draw from prior knowledge, research, and creativity to generate practical ideas.
- Each group identifies key actionable strategies without creating written proposals or visual models.

3. SHARING INSIGHTS & COLLECTIVE REFLECTION (10 MIN)

- Each group shares their key takeaways in a quick roundtable discussion.
- Wrap up by highlighting common themes, best practices, and key insights from the discussion.

PART 4: EDUCATIONAL ROBOTICS AND IBL IN ECE (30 MIN)

1. INTERACTIVE INTRODUCTION – INQUIRY-BASED QUESTIONING (10 MIN)

Begin the lesson by introducing a small programmable robot (e.g., Bee-Bot, Blue-Bot, or LEGO WeDo). Ask open-ended questions to model inquiry-based learning:

- "How do you think this robot moves?"
- "What would happen if we changed its commands?"
- "How can we use this robot to solve a problem in a preschool classroom?"

Encourage students to think critically and propose hypotheses before providing explanations (based on information provided in GC Curriculum, Module 1, pages 6-8).

2. HANDS-ON EXPLORATION – GUIDED DISCOVERY (10 MIN)

Provide students with simple robotics kits or simulation tools. Ask them to experiment by programming basic movements or interactions (If time permits, one of the activities from the GC Handbook can also be implemented). Guide students to observe, test, and refine their inputs, emphasizing the trial-and-error process in IBL.

3. PROBLEM-SOLVING DISCUSSION – APPLYING ROBOTICS IN ECE (10 MIN)

Split students into small groups and give them realistic preschool scenarios where robotics can enhance learning. Each group discusses possible activities but does not need to create materials – the focus remains on practical applications and adapting robotics to preschool learners.

Example scenarios:

- Teaching eco-friendly habits (e.g., a robot that sorts recycling).
- Encouraging storytelling through movement (e.g., programming a robot to act out a story).
- Exploring animal behaviours (e.g., making a robot move like a bird or fish).

Conclude by asking:

- "What challenges might preschool educators face in implementing robotics?"
- "How can we ensure young children remain engaged and curious while learning with robots?"

PART 5: REFLECTION AND DISCUSSION (5 MIN)

Depending on the flow of the lesson and the time constraints, the lecturer can choose just one of the questions for discussion. At the end of the theoretical overview, students are invited to discuss the importance of environmental protection in the ECE curriculum. Questions can also be raised to encourage thinking about what other ways educational robotics and environmental education can be incorporated into a lesson using an IBL approach?

At the end of the lesson, students can create a song with lyrics based on what they have learned. (By doing this, they will have the opportunity to reflect on the lesson, to create a song to perform for all their classmates and so recall the information they have learnt in a fun way. Another advantage is that the resource they have created can be used later in their work with children in ECE).

For example, in the AI tool Suno (available in several languages). *Example: a song created in the AI tool Suno* "Tiny Planet Heroes".

Evaluation

The evaluation takes place at the beginning of the next lesson (based on Individual work after Lesson 1).

Autonomous Work

- Students read a part of the material and prepare questions and answers (for other students) for the next class: GC Curriculum (page 6-20).
- Students find and read one research article on IBL and write down 3-5 key insights that could be useful for working with preschool learners.

Based on GC Curriculum, Module 1: Inquiry-Based Learning

LESSON 2

Applying Inquiry-Based Learning

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Ketlīna Tumase and Arta Rūdolfa, University of Latvia, Latvia

LEARNING OUTCOMES

- Know how to integrate the IBL steps into ECE.
- Understand the basic conditions for using educational robotics in ECE.
- Apply educational robotics in ECE in the context of environmental education.

MATERIALS TO USE IN THE LESSON

- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Activity Book – Educational Robotics and Environmental Education in Early Childhood Education
- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Video tutorials (hereafter GC Video tutorials).
- Simple educational robots (e.g., Bee-Bot, Photon, and Code & Go Robot Mouse).
- A robot mat or area on the floor, taped with identical rows.
- City structures made from cardboard or paper such as buildings, roads, schools, hospitals, parks, or Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Dream City: Set of Cards for Storytelling with Educational Robotics (hereafter GC Dream City).
- Scissors, glue, markers, coloured pencils.
- Coding cards (arrows: forward, backwards, left, right).

MATERIALS TO BE STUDIED INDEPENDENTLY

- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Activity Book – Educational Robotics and Environmental Education in Early Childhood Education (hereafter GC Activity Book).
- Examples of good practice in your own country.
- Project "Algolittle" Interactive Presentations: Algorithmic Thinking.
- Project "EARLYCODE" Handbook for Early Coding.

DURATION

4.5 h (1.5 h face-to-face + 3 h autonomous work).

Process

LESSON PARTS

1. Introducing the practical part – GC Activity Book.
2. Educational Robot Challenge.

PART 1: INTRODUCTION (20 MIN)

The lesson starts with the homework from the previous lesson, which serves as an assessment of what students have learned in the previous lesson.

- Students exchange their prepared questions (preferably sent to the lecturer for checking before the lecture), and each student answers them (reference materials may be used).
- Once students have completed the task, they return the answers to the author of the questions for checking.
- Each question-answer sheet has the names of both students involved (author, answerer) and is submitted to the lecturer for formative assessment (the lecturer prepares feedback for the next lecture or can send it by email).

Next, students are asked to share with peers their prepared thesis on one of the articles they have read related to IBL (homework).

Use large pages, a whiteboard or an online tool such as https://miro.com/brainstorming

PART 2: INTRODUCING THE GREENCODE ACTIVITY BOOK (30 MIN)

PRACTICAL USE OF THE ACTIVITY BOOK WITH ECE LEARNERS

Students review GC Activity Book's structure and goals.

Students select an activity from the book, such as *Planet-Earth, A City, Animals Around Us, Gardens, My Habits*, or *Let's Recycle* and explicitly identify the IBL phases by aligning them with the contexts of the activities to create meaningful connections.

Students discuss how to use the activities in the GC Activity Book practically, ensuring the effective and beneficial use of the IBL phases.

INQUIRY-BASED LEARNING IMPLEMENTATION IN ECE

Students work in groups and brainstorm the IBL implementation challenges and solutions in ECE settings.

Students design a mini-lesson in groups using IBL phases (Engage, Investigate, Create, Reflect) for a simple environmental concept (e.g., "How do plants grow?"). Worksheet 1 – Module 1 – Lesson 2.

ADAPTING INQUIRY-BASED LEARNING TO THE NEEDS OF ECE

Students work in groups and discuss how IBL can be adapted to the needs of ECE by considering the results of their brainstorming session.

Groups exchange their mini-lessons, review and make suggestions if there are sections to be adapted to the needs and developmental features of ECE learners.

The lecturer can support groups to critique the mini-lessons efficiently by posing guiding questions such as:

- Are the tasks age-appropriate?
- Does the language and content match the cognitive abilities of preschoolers?
- Are there activities designed for exploration and play?
- Which parts encourage children to create their own questions and seek out their answers?

PART 3: EDUCATIONAL ROBOT CHALLENGE (25 MIN)

Refer to the Algorithmic Thinking interactive presentations developed for Algolittle, the GC Video Tutorial on Algorithmic Thinking Skills, and the Handbook for EARLYCODE. Ask students to look at the materials before the lesson.

Describe the educational robotics used in ECE and focus on the possibilities of activating "children's minds" when using these robots. Consider the children's curiosity that awakens when exploring these robots, their investigations when trying to comprehend the coding units on/linked to them, the thinking processes conducted when planning how they should move to reach the target destinations or fulfil other coding tasks (such as; beeping, turning on and off lights, measuring humidity, etc.), doing experiments (programming) and evaluating if they work (debugging). Highlight how those cognitive processes resemble IBL implementation processes in a lesson.

Emphasise the algorithmic thinking processes when planning and implementing the programming of educational robotics. Together, plan a Robotic Coding Activity including sequential and if/then algorithms.

Engage

a) Discuss with students which activities could be engaging for children when introducing the concept of the "Dream City" before they involve the Reco robot in collaborating with children to build it.
b) Students brainstorm how to introduce children to the GC Dream City cards at this stage.

Investigate

Students work in groups to determine how sequential and if/then algorithm activities can be created in the Dream City building process, using the Reco robot on the coding mat. After placing some city structures with sequential algorithms, children will need to use if/then algorithms because the city structures on the mat will prevent them from moving easily. (If there is a city structure on your path, then create a different path.)

Examples of inspiration:

- For children who are just learning early coding, use arrows and write the code yourself. (To let them explore the code and follow the arrows to take the Reco robot to the final destination.)
- Use two copies of the GC Dream City cards. Place one card showing the same city structure on the robot and the other placed on the coding mat by the children.
- To start, prepare (with children) city structures using cardboard and coloured paper sheets. Code the city structures with different colours (e.g., parks and woods are green, buildings with solar energy panels are blue, etc.). Children place colour cards on the coding grids.

Experiment (Create)

Code the Reco Robot and let it move to the final destination to build the dream city.

Reflect

a) Evaluate if the codes work. Correct the errors.
b) Evaluate your dream city design in terms of its aesthetic and functional structure.

Printables: GC Dream City cards.

PART 4: REFLECTION AND DISCUSSION (15 MIN)

Each student shares his/her reflections on the hands-on lesson and writes down how he/she feels after the lesson. For example, a tool can be used to do this:
https://www.mentimeter.com/work/brainstorming.

Evaluation

Task: Individually or in pairs, research good practices in your country, get inspired and design a lesson plan that includes environmental education, and educational robotics, where the topics are built based on the IBL approach. Make sure to frame it in your national preschool curriculum/guidelines. (Use the template to consider all the steps.)

Notes:

- This lesson plan will be continued and expanded upon in all future lessons, submitted and summatively assessed after the final lesson. In this lesson, it is formatively assessed.
- University lecturers can choose the most suitable assessment method – students may develop their own IBL lesson plans incrementally after each lecture or solely at the end of the GC Curriculum programme.
- This lesson plan will be summatively assessed after the final lesson.

Template: Activity Plan Evaluations for students.

Autonomous Work

Students read the GC Activity Book, study the Algorithmic Thinking interactive presentations (Algolittle Project) and the GC Video Tutorial about Algorithmic Thinking Skills, and evaluate the lesson.

LESSON 3

The Role of the Educator in the IBL Process

Jasminka Mezak and Sanja Vranić, University of Rijeka, Croatia

Jan Delcker, University of Mannheim, Germany

LEARNING OUTCOMES

- Describe learning and teaching strategies in the IBL process with children.
- Analyse learning and teaching strategies in the IBL process with children in selected examples.
- Describe the role of the educator in the IBL process with children.

MATERIALS

- Module 2 of Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Higher Education Course Curriculum on Robotics and Environmental Education (hereafter GC Curriculum).
- Chapter 1 ("Example of good practice", page 7) of Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Digital Handbook on Robotics and Environmental Education (hereafter GC Handbook).
- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Activity Book – Educational Robotics and Environmental Education in Early Childhood Education (hereafter GC Activity Book).
- Form about personal IBL experience.
- Form for analysing example activities.

DURATION

4.5 h (1.5 h face-to-face + 3 h autonomous work).

Process

This lesson is organised as a flipped classroom. Before coming to live classes, students will:

- Read and study GC Curriculum, Module 2.
- Fill out the Form about personal IBL experience.
- Study the example of good practice in GC Handbook, Chapter 1 (page 7).

The estimated time for autonomous work before the live class is 3 hours.

Students bring the completed form to the live class regarding their personal experience of IBL learning. The form includes a brief description of a research process in which they have personally participated. This can be IBL learning in a previous education experience, or an independent inquiry interest not necessarily included in the class (implicit learning).

LESSON PARTS

During the live class of 1.5 hours, three activities will be carried out in which:

- students consider the skills to be developed by children in order to improve their investigative nature;
- students discuss teaching and learning strategies in the IBL process in ECE;
- students discuss the role and awareness of educators in encouraging flexibility in work and the environment for implementing IBL activities with children.

PART 1: ACTIVATING PRIOR KNOWLEDGE (25 MIN)

Students are presented with a table (see below) that helps them to activate their prior knowledge about IBL and the materials they worked on by themselves. The table can be printed on a sheet or copied into an online quiz. The lecturers leave some of the cells in either the IBL or the traditional row blank and students have to fill them out.

The students agree on a collective solution through a group discussion. The students are presented with a sample solution after the exercise. The lecturer can then repeat some of the key aspects of IBL, connecting to the material of Module 1 as well as the proposed answers of the students.

Aspect	Inquiry-Based Learning	Traditional/Teacher-Centred Learning
Role of Teacher	Facilitator and guide	Authority and primary knowledge source
Role of Children	Active participants and investigators	Passive recipients of knowledge
Learning Process	Driven by questions and exploration	Structured delivery of predetermined content
Curriculum Flexibility	Adaptable to children's interests	Fixed and predetermined
Assessment	Focuses on process and understanding	Focuses on outcomes and correctness
Skills Emphasized	Critical thinking, creativity	Memorization, basic skill mastery

PART 2: RECOGNIZING LEARNING STRATEGIES IN THE IBL PROCESS USING PERSONAL EXAMPLES (20 MIN)

In pairs, students exchange personal experiences they have recorded (see Process) and recognise the learning strategies used in each step of the IBL process. They will also share what skills they developed during their IBL experiences/research process (as described under Process).

A Mentimeter tool with three questions can be used to obtain feedback. The results will be shared in the classroom:

- What strategies did you use in your IBL learning?
- What skills did you develop in your IBL learning?
- In which parts of the process did you experience the field of tension between exploring on your own and guidance from a lecturer?

PART 3: RECOGNIZING THE ROLE OF THE EDUCATOR IN THE IBL PROCESS ON THE CHOSEN EXAMPLE (25 MIN)

Based on the example from the GC Handbook (Chapter 1, page 7), students will recognise and name the teaching strategies used, and analyse and describe the role of educators in each step of the IBL process. (Form for analysing example activities.)

After naming the strategies, students create a personal top 5 list of strategies they prefer in relation to their own experience and set of competences. Students have to argue why they prefer/dislike their top 1 and top 5 positions. For both positions, they have to find good examples on why to use them and

counterexamples for situations where those teaching strategies will most likely not work. In addition, students have to find an alternative strategy, not listed in their top 5 to solve both situations.

PART 4: REFLECTION AND DISCUSSION (20 MIN)

Problems and difficulties in implementing activities in preschools and kindergartens will be discussed. Changes to individual strategies will be suggested to better adapt the activity to each step of the IBL process.

Evaluation

The evaluation of the learning outcomes is carried out by analysing the completed forms and through discussion.

Task: Review your lesson plan taking into consideration what you have learned in these lessons. Look into each step and refine the proposal. Particularly, look into the strategies and activities that support each step.

Based on GC Curriculum, Module 2: Supporting the Implementation of IBL in ECE

LESSON 4

Applying Strategies and Activities Supporting the IBL Steps

Jasminka Mezak and Sanja Vranić, University of Rijeka, Croatia

Jan Delcker, University of Mannheim, Germany

LEARNING OUTCOMES

- Apply learning and teaching strategies in the IBL process with children.
- Create a project about IBL activities with children.
- Analyse examples of presented projects.

MATERIALS

- Instructions for the creation of the project.
- Peer assessment questionnaire.

DURATION

4.5 h (1.5 h face-to-face + 3 h autonomous work).

Process

The lesson is organised as a flipped classroom.

Before coming to the live class, students will create a project activity following the instructions, which will be presented later and analysed in the live class. This task is to be done in project groups. Students can choose one of the following projects:

1. Students design a workstation that can be used as a basis for IBL activities. This project includes the following steps:
    - organise a special area/room in an ECE organisation;

- create a list of relevant material;
- develop or choose some basic IBL activities for the workstation (explain the activity with bullet points);
- design a basic plan to evaluate and document children's processes at the workstation.

2. Students develop a presentation for parents in ECE organisations to inform them about planned IBL activities. This project includes answering the following questions:

   - What is IBL in your own words and how can you explain it to parents?
   - Why do you want to use it (benefits of IBL)? Develop or choose some basic IBL activities as examples for parents and underline how their children can benefit from the IBL process.
   - How can parents support IBL (at home)? In what ways can parents integrate IBL activities outside of the classroom? What are possible synergistic effects?
   - What would be a good way to evaluate the quality of your evaluation?

The estimated time for autonomously working before the live class is 3 hours. The GC Activity Book can be used to get insights into examples for IBL activities (how they can be structured, documented and constructed etc.). The GC Activity Book can be an inspiration for both a workstation or a presentation for the parents.

LESSON PARTS

The first part of this lesson includes creating a project activity (see Process). The following parts involve presenting, discussing and analysing the projects during a live class. The estimated time for the live class is 1.5 hours.

PART 1: PRESENTATION OF PRODUCED EXAMPLES OF ACTIVITIES (60 MIN)

During the live class, students will present their projects in front of other students and facilitate a discussion after the presentation.

PART 2: PEER EVALUATION OF PRESENTED PROJECTS (30 MIN)

During each presentation, the other students will make reflections on the presented projects according to the specified criteria. If possible, there will be a discussion after each presentation with suggestions for improving the content of a project. In the absence of enough time, students will submit their

observations through the forum on the e-learning platform. Leading questions for the analysis of the project should focus on:

- the clarity of goals;
- the overall fit between planned activities and the implementation of IBL;
- balance between teaching strategies and the activity goals;
- the effectiveness of the evaluation plan.

PART 3: REFLECTION AND DISCUSSION

After each presentation, there will be a discussion based on the completed questionnaires and the reflections of the presenters themselves. To guarantee critical reflections, each student has to find at least one thing that they feel requires improvement.

Evaluation

The evaluation of the learning outcomes is carried out by analysing the completed forms and through discussion.

Task: Review your lesson plan taking into consideration what you have learned in these lessons. Look into each step and refine the proposal. Particularly, look into the strategies and activities that support each step.

Based on GC Curriculum, Module 3: The Importance of Outdoor and Indoor Activities for EE in ECE

LESSON 5

Going Outside and Learning with Robots

Maria Figueiredo, Sandra Ferreira and Valter Alves, Instituto Politécnico de Viseu, Portugal

LEARNING OUTCOMES

- Understand the benefits of outdoor experiences for children.
- Identify ways of articulating indoor and outdoor educational experiences in Early Childhood Education.
- Establish meaningful connections between environmental education and educational robotics.

MATERIALS

- Module 3 of Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Higher Education Course Curriculum on Robotics and Environmental Education (hereafter GC Curriculum).
- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Activity Book – Educational Robotics and Environmental Education in Early Childhood Education (hereafter GC Activity Book).
- Large sheets of paper, pens, post-its, washi tape, etc for posters, or computers for digital creations.
- Video: Why children need to play in nature.
- Video: How does playing in nature help your child's development?

DURATION

4.5 h (1.5 h face-to-face + 3 h autonomous work).

Process

The lesson can take place outside, in the school garden or in a nearby natural park or forest.

LESSON PARTS

The lesson is organised as a Jigsaw Active Learning Strategy (Centre for Higher Education Research, Policy and Practice, 2019). Students will work in Jigsaw groups and Expert groups. In Expert groups, all members have the same topic and access to the same material. The focus is on collaborating to learn the material and prepare to share their knowledge. The Jigsaw groups include students with different expertise from their Expert groups. The focus is on teaching each other what they have learned before.

PART 1: INTRODUCTION (10 MIN)

For the introduction, start with the question – What is your most beautiful childhood memory?

Ask for quick verbal answers from the participants and group them/establish connection between them in terms of referring to emotions, physical activity, natural spaces, etc. Explore the sensations and details of the ones about nature and/or outdoor experiences to follow on to the next part.

PART 2: PREPARATION (20 MIN)

Explain the overall process by using the terms Jigsaw group and Expert group. Clarify that each student will work in two different groups. Highlight the idea that we will need everyone to be able to learn all the material.

Module 3 of the GC Curriculum is divided into three subtopics which will be assigned:

- Topic 1: Benefits of outdoor experiences for children (pages 32-38 of the GC Curriculum).
- Topic 2: Connecting outdoor and indoor experiences in ECE (pages 38-40 of the GC Curriculum).
- Topic 3: Promoting computational thinking and educational robotics in nature (pages 40-41 of the GC Curriculum).

CREATE THE JIGSAW GROUPS

Divide the students into Jigsaw groups of at least 3 learners and let them choose who wants to be student 1, 2 and 3. It is advisable to make the groups as diverse as possible with mixed interests and levels of ability.

Assign a topic to each student based on the numbers chosen in each of the Jigsaw groups. With an odd number of students, the groups must be arranged to ensure each group has at least one “researcher” for each of the topics (1 to 3).

In each group, students list their own ideas about the three topics as a loose list or word cloud – either on paper or on a tablet. This is kept for lesson 6.

DISTRIBUTE THE TASKS TO THE EXPERT GROUPS

Provide the students with the learning material for individual topics (one video and the pages from Module 3 corresponding to each topic). Explain that they will now move to the Expert groups by joining colleagues from other Jigsaw groups with the same numbers (1, 2 and 3). State a period of time for researching in collaboration as an Expert group (a group of researchers with the same topic).

PART 3: RESEARCHING AND LEARNING (45 MIN)

The Expert groups read the material together and discuss their understanding of the topic and prepare material/information to present to their own Jigsaw group. Each Expert group researches, discusses and creates an individual poster or other visual (identical content on all posters/visuals) based on the information of the topic.

PART 4: REFLECTION AND DISCUSSION (15 MIN)

When the time is over, let students sit where they want (in Jigsaw or in Expert groups) and inquire about students' overall satisfaction with the process so far and expectations for the next lesson. Possible questions/prompts are "Identify three key points you learned in today's lesson", "Identify two specific areas from today's lesson that you're still unclear about or feel unsure of".

Inform them about the autonomous work to be completed before the next lesson:

- Read the GC Activity Book.
- Identify and list uses of the outdoor space in the activities.
- Identify and list uses of educational robotics in the activities.

Evaluation

The evaluation will be carried out after lesson 6.

Task: Review your lesson plan taking into consideration what you have learned in these lessons. Look into each step and refine the proposal. Particularly, look into the use of the outdoors and nature spaces in your proposal.

LESSON 6

Activities for Learning Outside with Robots

Maria Figueiredo, Sandra Ferreira and Valter Alves, Instituto Politécnico de Viseu, Portugal

LEARNING OUTCOMES

- Evaluate activities that connect educational robotics with the outdoors.
- Establish meaningful connections between environmental education and educational robotics.

MATERIALS

- Module 3 of Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Higher Education Course Curriculum on Robotics and Environmental Education (hereafter GC Curriculum).
- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Activity Book – Educational Robotics and Environmental Education in Early Childhood Education (hereafter GC Activity Book).
- Videos.
- Large sheets of paper, pens, post-its, washi tape, etc. for posters, or computers for digital creations.

DURATION

4.5 h (1.5 h face-to-face + 3 h autonomous work).

Process

The lesson can take place outside, in the school garden or in a nearby natural park or forest.

LESSON PARTS

The second lesson starts with a return to the Jigsaw groups to share the materials researched and learned as Experts in their group on a specific topic.

PART 1: INTRODUCTION (10 MIN)

Quickly recap on lesson 5 and the makeup of the Expert groups and the Jigsaw groups. Discuss briefly the students' impressions from the analysis of the GC Activity Book.

PART 2: SHARING THE LEARNING (40 MIN)

Students go back to their original Jigsaw groups, and each researcher takes turns presenting what they've learned in the Expert groups. Students can display their posters on a wall space or show their screen. Each topic is given ten minutes. If there are two researchers of the same topic in a group, the presentation must be shared.

PART 3: MOBILIZING THE LEARNING (20 MIN)

After a quick round checking if everything is ok, the Jigsaw groups are directed to the GC Activity Book analysis (homework) and asked to highlight instances in which each topic was well developed/applied:

- Topic 1: Benefits of outdoor experiences for children.
- Topic 2: Connecting outdoor and indoor experiences in ECE.
- Topic 3: Promoting computational thinking and educational robotics in nature.

Each group should list these either on paper or by digital means.

PART 4: REFLECTION AND DISCUSSION (20 MIN)

Ask groups to share best examples for each topic. Ask who feels they have identified a good example in the GC Activity Book and ask which of the topics is connected to that example. Take two or three examples.

Explain the autonomous work: invite students to choose one of the three subtopics presented during the lesson and, based on the materials provided (the videos of each subtopic and the GC Curriculum and GC Activity Book), make a short video about it (3 to 5 minutes).

Evaluation

The formative evaluation of the learning outcomes from lessons 5 and 6 will be carried out by evaluating the video created by each student (50%), as well as the poster from each Expert group (35%) and the list from the Jigsaw group (15%).

Task: Review your lesson plan taking into consideration what you have learned in these lessons. Look into each step and refine the proposal. Particularly, look into the use of the outdoors and nature spaces in your proposal.

LESSON 7

Unplugged Coding and Sustainable Behaviours

Gianluca Pedemonte, Nicolò Monasterio and Alice Franciscono, Scuola di Robotica, Italy

LEARNING OUTCOMES

- Understand the pedagogical role of robotics and coding in Early Childhood Education (ECE).
- Recognize the importance of sustainability and environmental education through robotics.
- Explore hands-on, unplugged coding activities for Early Childhood Education (ECE) children.
- Develop strategies to integrate robotics into early learning programmes.
- Reflect on the role of educators in promoting computational thinking and problem solving for children.

MATERIALS

- Module 4 of Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Higher Education Course Curriculum on Robotics and Environmental Education (hereafter GC Curriculum).
- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Digital Handbook on Robotics and Environmental Education (hereafter GC Handbook).
- Physical materials: Coloured tape, cards with directional arrows, small robots (Bee-Bot, Blue-Bot or similar), markers and paper.
- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Video tutorials.

DURATION

4.5 h (1.5 h face-to-face + 3 h autonomous work).

Process

PART 1: INTRODUCTION TO ROBOTICS AND SUSTAINABILITY IN EARLY CHILDHOOD EDUCATION (15 MIN)

INTERACTIVE DISCUSSION AND BRAINSTORMING

To start the lesson, the lecturer asks participants a key question, “How can children learn about sustainability through robotics?” This question stimulates reflection and helps connect the concepts of technology and environmental education.

Next, students share their previous experiences with educational robotics and environmental education in early childhood. This exchange of ideas serves to introduce the benefits of integrating robotics in preschool, highlighting the active involvement of children, the development of their problem-solving skills, and the role of experiential learning.

PART 2: ROBOTICS AND CODING ACTIVITIES (35 MIN)

EXPERIENTIAL LEARNING AND GUIDED EXPLORATION

The concept of coding unplugged, or programming activities without the use of digital devices, is introduced. Students explore how coding can be taught through movement and play.

UNPLUGGED ACTIVITIES: SUSTAINABLE AND UNSUSTAINABLE ACTIONS

Introduction to the concept of sustainability and explanation of how to make it understandable to preschoolers through the example of the operational activity found in GC Curriculum.

- Creation of action cards representing sustainable and non-sustainable behaviours.
- Using directional arrows to guide a “human robot” through a path of movement in space that distinguishes between positive and negative actions for the environment.

After the activity, we discuss how unplugged coding can support computational thinking and the development of logic skills in children.

PART 3: PRACTICAL ROBOTICS IN ECE (30 MIN)

DEMONSTRATION AND PRACTICE IN SMALL GROUPS

Students experiment with the use of an educational robot, such as the Bee-Bot, and reflect on its use in educational activities aimed at sustainability and the environment.

Proposed activities:

- Programme the robot to follow a path that represents an ecological cycle (e.g., from recycling to remanufacturing a product).
- Use of basic coding concepts such as sequences, loops, and debugging in a preschool learning context.

PART 4: CONCLUDING REFLECTION (10 MIN)

COLLABORATIVE DISCUSSION AND LESSON PLANNING

This section focuses on the role of educators in guiding children through robotics activities. Students discuss how to adapt these activities to different preschool learning environments.

Evaluation

The evaluation of the learning outcomes is carried out by analysing the completed forms and through discussion:

- Presentation of independent study results at the beginning of the next session.
- Group discussion on strategies to improve sustainability education through robotics.

Task: Review your lesson plan taking into consideration what you have learned in these lessons. Look into each step and refine the proposal. Particularly, look into the strategies and activities that support each step.

Autonomous Work

- Reading (1 h): Study of the GC Curriculum.
- Activity planning (1.5 h): Planning a small-group "ecological challenge" in which the robot is programmed to perform sustainability actions (e.g., waste separation or energy conservation).
- Reflection and research (30 min): Students reflect on possible difficulties children may face in using robotics and provide strategies to help them, identifying 3-5 key elements.

LESSON 8

Coding with Electronic Devices and Block Programming

Gianluca Pedemonte, Nicolò Monasterio and Alice Franciscono, Scuola di Robotica, Italy

LEARNING OUTCOMES

- Understand the role of educational robotics and coding in Early Childhood Education (ECE) and its applications.
- Apply teaching strategies based on hands-on and playful approaches.
- Recognise the importance of integrating sustainability and environmental education topics with robotics and coding and hands-on tinkering activities.
- Develop tinkering, storytelling and coding skills including using ScratchJr.
- Exploring the potential of natural and recycled materials for creative learning experiences based on tinkering.

MATERIALS

- Module 4 of Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Higher Education Course Curriculum on Robotics and Environmental Education (hereafter GC Curriculum).
- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Digital Handbook on Robotics and Environmental Education (hereafter GC Handbook).
- Devices with ScratchJr installed and camera.
- Natural materials (leaves, branches, pinecones, stones, flowers, acorns) and recycled materials (cardboard, paper rolls, plastic caps, fabric scraps) for hands-on activities.

DURATION

4.5 h (1.5 h face-to-face + 3 h autonomous work).

Process

PART 1: INTRODUCTION (5 MIN)

To start the lesson, each student is invited to reflect on his or her experience with technology in teaching.

The opening question, "What is your experience with technology in teaching?" stimulates an initial discussion of students' perceptions and expectations (Answers can be written on sheets of paper, whiteboard or all uploaded to a tool such as Padlet or another.)

PART 2: INTRODUCTION TO EDUCATIONAL ROBOTICS IN EARLY CHILDHOOD (25 MIN)

Presentation of the results of the independent study from the previous section with overview of unplugged coding and its applications with children. (Brainstorming using Miro, Padlet or similar tools).

The benefits of integrating coding and robotics into educational pathways are explored:

- Development of critical thinking and problem-solving skills.
- Enhancement of creativity and collaboration.
- Early introduction to STEM skills in an engaging and accessible way.

The most effective teaching methodologies for teaching robotics in Early Childhood Education are then explored, highlighting the difference between unplugged coding (without digital devices) and coding with technology, the possibilities of which will be introduced.

Introduction of the ScratchJr app and its use.

Introduction of how robotics can be used to raise children's awareness of environmental issues, such as through activities that promote respect for nature. Concrete examples of educational activities will be explored during the lesson.

PART 3: STRUCTURE OF EDUCATIONAL ROBOTICS ACTIVITIES (25 MIN)

Educational robotics activities can be organised following a four-step structured model:

- Engage – Introducing the topic in an engaging way, stimulating children's curiosity.
- Investigate – Direct exploration and experimentation with robots to understand how they work.
- Create – Development of hands-on activities, such as route planning or problem solving.
- Reflect – Sharing the experience and discussing the results obtained.

To understand this model more clearly, students are asked to come up with concrete examples of activities with tools such as Bee-Bot, Blue-Bot and ScratchJr.

PART 4: PRACTICAL ACTIVITY EXPERIMENTATION – "NATURE MASCOTS FOR ENVIRONMENTAL PROTECTION" (30 MIN)

1. Introduction and brainstorming (10 min):
   - Students are encouraged to think about how robotics can be used to raise children's awareness of environmental sustainability.
   - The lesson's main activity is introduced: creating an ecological mascot using natural and recycled materials, then programming its interactive story with ScratchJr.
2. Activity development (10 min):
   - Step 1: Students gather materials and assemble mascots, customizing them with creative details.
   - Step 2: Using ScratchJr, each group digitises its mascot and creates a short-animated story to convey an ecological message.
3. Final discussion (10 min):
   - Each group presents their work, explaining the educational message they intended to convey.
   - The educational potential of the activity and possible modifications to adapt it to different age groups are discussed.

PART 5: REFLECTION AND DISCUSSION (5 MIN)

To conclude the lesson, a collective reflection is proposed on how to integrate educational robotics into daily teaching. Students are invited to discuss:

1. Possible practical difficulties and possible solutions or adaptations of the activity for different developmental levels and educational needs.
2. Summary of the main skills developed through educational robotics.
3. Importance of integrating technology and sustainability.

Evaluation

The evaluation of the learning outcomes is carried out by analysing the completed forms and through discussion.

Task: Review your lesson plan taking into consideration what you have learned in these lessons. Look into each step and refine the proposal. Particularly, look into the strategies and activities that support each step.

Autonomous Work

Activity 1: Designing a New Activity (1.5 h)

Students, divided into small groups, design an educational robotics activity taking their cue from the examples provided in class.

The design must include:

- Learning objectives.
- Materials or tools needed.
- Detailed description of the activity.
- Links to environmental or social issues.

Activity 2: Simulation and Sharing (1.5 h)

Each group creates a presentation of their designed activity. The ideas are compiled into a collective document for future classroom applications.

LESSON 9

Understanding Evaluation and Documentation in IBL for ECE

Mary O'Reilly and Noletta Smyth, Early Years – the organisation for young children ROI, Ireland

LEARNING OUTCOMES

- Understand the importance of documentation, assessment and evaluation in Early Childhood Education.
- Explore methods and tools for assessing learning outcomes in Early Childhood Education.
- Understand how to adapt evaluation/assessment techniques for children's learning and development.

MATERIALS

- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Digital Handbook on Robotics and Environmental Education.
- The Monkey Business Illusion by Daniel Simons.
- YouTube interview Carla Rinaldi on Documentation (03:30).
- The 100 Languages of Children (Reggio Emilia) Loris Malaguzzi International Centre YouTube (06:00).
- Individual Reflection and Implementation Plans.
- Learning Journals.

MATERIALS TO BE STUDIED INDEPENDENTLY

- Module 5 of Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Higher Education Course Curriculum on Robotics and Environmental Education (hereafter GC Curriculum).

- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Digital Handbook on Robotics and Environmental Education (hereafter GC Handbook).

DURATION

4.5 h (1.5 h face-to-face + 3 h autonomous work).

Process

LESSON PARTS

Part 1: Introduction.

Part 2: The Importance of Documentation, Assessment and Evaluation.

Part 3: Methods and Tools for Assessing Learning Outcomes In ECE.

Part 4: Adapt Evaluation/Assessment Techniques for Children's Learning and Development.

Part 5: Reflection and Discussion.

PART 1: INTRODUCTION (15 MIN)

Introduce lesson by showing the YouTube video The Monkey Business Illusion (01:41).

"Observing" is not the same thing as "seeing". Seeing is passive. For example, you see everything around you as you go to work, but you rarely look for anything specific or note down information to use later.

When you're observant, you use your senses to examine something that you're curious about, and you evaluate what you experience. Observation is a process of paying attention, intently and actively, so that you can gather specific information to assess.

Let's look at the video clip – count how many times the people in the white t-shirt pass the ball to one another.

Take feedback from preservice teachers – are we seeing or are we observing?

Review The Monkey Business Illusion video clip again and discuss.

Begin with a brief overview of IBL and the importance of documentation, observation, assessment, and evaluation in Early Childhood Education using material from Module 1 and Module 5 of GC Curriculum.

PART 2: THE IMPORTANCE OF DOCUMENTATION, ASSESSMENT AND EVALUATION (25 MIN)

Begin with a short review of inquiry-based learning model (GC Curriculum, Module 1). Ask why we need to observe the children as they go through the IBL steps?

To refresh on previous knowledge of observations, in small groups discuss what we mean by observations and present feedback. Word storm on FC paper. Refer to GC Curriculum, Module 5 and the Appendix to this lesson.

Ask Preservice teachers "**How can we document children's learning?**" and elicit feedback:

- Use content from GC Curriculum, Module 5 on High quality documentation and assessment and Rich assessment emphasising the important learning for us regarding documentation from the Reggio Emilia Approach and the importance of observing social interactions throughout each step of the IBL approach.
- Watch the interview with Carla Rinaldi from Reggio Emilia on documentation Carla Rinaldi on Documentation, YouTube (03:30). Students in pairs reflect and list 3 significant points to share with the class.

Introduce the next video to be watched: *Remember that there is not only one way to assess and evaluate learning. Children have multiple ways of learning, and the teacher needs to observe children carefully to get to know their different learning styles and intelligences. The similarities and connections between the Hundred Languages of Children conceived by Loris Malaguzzi, Reggio Children and Howard Gardner's theory of multiple intelligences must influence the way we view and respect children's learning processes within our preschools. The hundred languages are the endless number of children's potentials, their ability to wonder and to inquire. The hundred languages remind us that there are multiple ways of seeing and multiple ways of being.*

Watch the 100 Languages of Children – Loris Malaguzzi International Centre – YouTube (06:00). Students in pairs reflect and list 3 significant points to share with the class.

PART 3: ASSESSING LEARNING OUTCOMES IN ECE: METHODS AND TOOLS (20 MIN)

Lecturer to present on the Observation, Assessment and Planning cycle from GC Curriculum, Module 5.

Observations are the most used methods and tools used in ECE for assessing learning outcomes in preschool.

Lecturer to elicit some of the different types of observation methods students may have heard of that will help the needs of early childhood development – Examples:

- Anecdotal notes.
- Webbing Formats.
- Running records.
- Time samples.
- Jottings.
- Work samples.
- Photographs and videos.
- Learning Stories.
- Authentic assessments – HighScope and lots more.

Electronic documentation programs can also be used, such as: Teaching Strategies, HiMama, Seesaw, Class Dojo, and Google Classroom.

Ask preservice teachers to share their initial thoughts and experiences with these practices.

In small groups – from your experience – answer the following questions and feedback on answers:

1. What methods are currently used to document children's progress in learning?
2. How effectively do you think they document the process of learning?
3. How effectively do current records communicate children's experiences and learning processes to parents?
4. Do children and parents contribute to the documentation process?

PART 4: ADAPTING EVALUATION/ASSESSMENT TECHNIQUES FOR YOUNG LEARNERS (20 MIN)

Let's review!

Ask Preservice teachers, in pairs, to discuss what evaluation and assessment provide evidence of and feedback. Refer to the ideas listed in GC Curriculum, Module 5.

As stated, assessment of preschool children should be carried out in a holistic manner to cover all development areas and include skills such as language, motor, self-regulation, and social interactions for individual children as well as groups of children. This will also help to identify any individual needs. The IBL cycle of learning encourages children to be critical and analytical thinkers, to build on their natural curiosity by asking questions, investigating, solving problems, testing out theories alone and with their peers, challenging others and becoming effective decision makers. Effective assessment needs to capture and build on all of this.

Small group discussion: consider the 2 questions. Have each question on a flip chart page and ask preservice teachers to carousel and add ideas to each page. Discuss the results.

1. **What are some of the challenges in assessing preschool children?**

   (busy routines, short attention spans, distractions, different responses to different people, digital assessment, using particular methods, etc.)

2. **What are some of the important things to remember when assessing preschool children?**

   (being flexible, children's learning styles, intentional teaching outcomes, being objective and factual, assessing social interactions, engaging in real conversations with children, listening to the voice of the child, using open-ended questions, don't overdo it, etc.)

The best way to assess and evaluate young children's learning and thinking is through documentation.

Refer to the ideas on adapting assessment techniques from Sally Featherstone listed in GC Curriculum, Module 5.

To conclude, a quote from the final paragraph in GC Curriculum, Module 5: "By using what we know about the child through written records, photographs, and films we can interpret what the child is doing. This important process involves us thinking about what we have seen and striving to make sense of it, helping us to figure out and gain insight into how and what a child is learning. Our interpretations are likely to be subjective, based on our own personal knowledge of child development, cultural background, relevant curriculum, and our understanding of what we observe. Having regular opportunities to discuss our observations with colleagues will help us to think more deeply about our unconscious biases (Louis, 2022)".

PART 5: REFLECTION AND DISCUSSION (10 MIN)

Activity: Have Preservice teachers reflect on how they can integrate the learning from this lesson into their future teaching practice.

- Reflection and Implementation Plan: Ask them to write about what they learned during the lesson and how they plan to apply it.
- Discussion: Facilitate a closing discussion where Preservice teachers share their reflections and ask any remaining questions.

Evaluation

The evaluation of the learning outcomes is carried out by analysing the completed forms and through discussion.

Task: Review your lesson plan taking into consideration what you have learned in these lessons. Look into each step and refine the proposal. Particularly, look into the strategies and activities that support each step.

Autonomous Work

Lecturers can allocate videos to be reviewed from Module 5 by dividing class into 3 groups. Each student can watch the 3 videos.

1. Sir Ken Robinson's TED Talk – Do schools kill creativity?
2. Dr Christina Egan Marnell's blog for how she uses Notice-Recognise-Respond framework (Carr, 2001) to structure her learning stories – Pedagogical documentation: telling a story about learning
3. Podcast Inquiry Based Learning with Dr Claire Warden

Homework: students write their views into their Learning Journals on the videos they have watched and make a list of their key takeaways to share with the groups in Lesson 10.

Appendix – Optional Prompts for Lecturers to Use Verbally or on Slides

Module 5, Lesson 9

Share – Observation is about much more than describing what a child does. It means really watching and listening, being aware of the child's actual development, recognising what interests, motivates and engages them, and then reflecting on what these observations tell us about the child's learning. Observation means registering these details as significant and important and knowing how to use them to extend learning.

Observations allow teachers to gain a better insight into the children's needs, experiences, interests, thinking, strengths and areas for development. This information is essential when deciding how to support and enhance the children's learning, both individually and collectively.

Whilst observing children you will watch their actions, behaviours, interactions and expressions. Sometimes you will just listen and other times you will join in and talk to them. Observation forms a vital part of the assessment and planning cycle.

Observations can help us to:

- discover what interests a child and where they enjoy playing and exploring --see how children interact with other children and adults;
- see how children manage their feelings;
- start to understand the learning styles of individual children – i.e., schemas;
- start to see their stage of development;
- enable us to follow the sequence of development;
- see if children are developing the characteristics of effective learning;
- understand and monitor specific issues i.e., behaviour, learning delay.

Observation is also a long-term process: consistent monitoring and reviewing documented observations provides evidence to make sure children are at the expected stage of development. If there is an issue, observation quickly identifies the area or areas the child is struggling with, so you can address these issues and ensure the child is getting suitable support.

Before observing a child there must be a main reason for doing so. The purpose of the observation is to (with intention):

- plan the curriculum (observe child participating and engaging within the environment);

- for a child to achieve a goal (observe child during a particular experience and watch for child to achieve goal);
- to describe a child's skills and abilities (observe child practising their skill at different times throughout the day);
- to inform parents about their child's learning (observe an aspect of child's learning that parents told you about).

When we intentionally plan observations for specific purposes, we can plan how, when and where we will observe.

LESSON 10

Documenting Children's Learning in IBL Activities

Mary O'Reilly and Noletta Smyth, Early Years – the organisation for young children ROI, Ireland

LEARNING OUTCOMES

- Consider observation methods and tools to document children's learning during an inquiry-based learning activity.
- Describe the strengths and limitations of various observation methods and tools.
- Reflect and evaluate the effectiveness of the documentation process.

MATERIALS

- Module 5 of Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Higher Education Course Curriculum on Robotics and Environmental Education.
- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Digital Handbook on Robotics and Environmental Education.
- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Activity Book – Educational Robotics and Environmental Education in Early Childhood Education.
- Flipchart paper and markers for groups.
- Individual Reflection and Implementation plans.
- Learning Journals.

MATERIALS TO BE STUDIED INDEPENDENTLY

- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Higher Education Course Curriculum on Robotics and Environmental Education (hereafter GC Curriculum).

- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Preparing Future Educators: Digital Handbook on Robotics and Environmental Education (hereafter GC Handbook).
- Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" Activity Book – Educational Robotics and Environmental Education in Early Childhood Education (hereafter GC Activity Book).

DURATION

4.5 h (1.5 h face-to-face + 3 h autonomous work).

Process

LESSON PARTS

Part 1: Review.

Part 2: Documentation of an Inquiry-Based Learning Activity.

Part 3: Discussion.

Part 4: Reflection.

PART 1: REVIEW (10 MIN)

Begin by reviewing the homework from the previous lesson. Students are allocated to one of the 3 groups (1 group for each of the videos from Lesson 9) where they discuss their individual findings and then each group presents their key takeaways to the class.

Explain that today's focus is on considering a variety of methods and tools to observe and document children's learning journey during an inquiry-based learning activity.

Recap on the concept of inquiry-based learning with the preservice teachers.

Remember that the IBL approach encourages children to ask questions, experiment, explore ideas, find answers to their questions on their own and construct knowledge through hands-on learning.

Today, we will consider the observation methods and tools to document children's learning during an inquiry-based activity, describe the strengths and limitations of various observation methods and tools and reflect and evaluate the effectiveness of the documentation process.

PART 2: INQUIRY-BASED LEARNING ACTIVITY (45 MIN)

Lecturer to ask "what is the teacher's role in documenting children's learning?" and record on flipchart.

Lecturer notes for reference:

- Recall the various observation and documentation techniques, such as anecdotal records, learning stories, paintings, drawings and photographs introduced in the GC Curriculum, Module 5, Lesson 9.
- As children engage with the activity, the teacher observes and records key moments, such as questions, problem-solving, collaboration, or discoveries.
- Teachers document children's thought processes, actions, and questions using anecdotal notes, learning stories and photographs.
- Teachers should focus on documenting the children's engagement during the activity.
- Are children engaged in problem-solving or collaboration? Did they demonstrate creativity and critical thinking?
- Noting any questions children ask during the activity that reveal their curiosity and emerging thinking.
- Document instances where children work out how to solve problems or approach challenges.
- Record moments when children work together, share ideas, or explain their thinking to others.
- Capture specific actions, such as how children manipulate materials or respond to changes in their environment.

Divide the students into 6 groups and each group to choose one activity from the GC Activity Book and:

1. Decide the best methods/tools to use to document/assess children's learning throughout each step of the chosen IBL activity and why.
2. Provide examples of each method/tool chosen by the group.
3. Discuss the strengths and limitations of each technique.

Each group presents their findings to the class.

Throughout the activity, the lecturer observes how students document and assess children's engagement and learning. Are students asking effective open-ended questions? Are they capturing meaningful moments in their notes?

Review the examples of documented observations ensuring the depth and clarity of the documentation so that it provides insight into children's inquiry processes and learning outcomes.

PART 3: DISCUSSION (30 MIN)

After the activity, the lecturer brings students together for a group discussion.

Reflection and Sharing:

- Discuss the importance of documenting not only skills but also emotional and social development, interests, and strengths.

Ask questions such as:

- How does documenting these observations help support a child's learning journey?
- How did you decide which moments to write down?
- What did the anecdotal observations and learning stories or other methods reveal about the child's interests?
- How can documentation help us adjust our teaching?

PART 4: REFLECTION (5 MIN)

Reflecting on the effectiveness of the documentation process, students *complete their individual reflection and implementation plan.*

- Did the documentation accurately capture the children's learning and curiosity?
- How can documentation be used to guide future teaching strategies and activities to track progress, recognise strengths, and identify areas for support?
- What adjustments could be made to improve the observation and documentation process in future inquiry-based lessons?

Evaluation

Task: Individually or in pairs, research good practices in your country, get inspired and design a lesson plan that includes environmental education, and educational robotics, where the topics are built based on the IBL approach. Make sure to frame it in your national preschool curriculum/guidelines.

Autonomous Work

Task: Review your **lesson plan** taking into consideration what you have learned in these 2 lessons.

Look into each step and refine the proposal. Particularly, look into the documentation throughout the process and the reflection step.

Points for students to consider:

- Did the observations and learning stories provide a deeper understanding of each child's progress?
- Did the activity encourage inquiry and exploration?
- Were children able to work through challenges, ask meaningful questions, and demonstrate learning?
- What did the documentation reveal about the children's interests and learning styles?
- How can this documentation be used to support teaching strategies?

- What improvements can be made to the observation process to better support children's individual learning needs?
- The use of these tools regularly to inform lesson plans.
- How documented observations can enable teachers to better understand each child's needs and adapt their teaching strategies necessary
- Review the steps of observing, assessing, documenting, and evaluating inquiry-based learning.
- Consider the importance of observing children's curiosity, using questions to guide the learning process, and documenting their growth.
- How can students incorporate more inquiry-based learning into their curriculum and use observations to inform future teaching strategies.
- Consider how students can share documentation such as learning stories or anecdotal notes with parents to keep them informed about their child's curiosity and progress.
- Explore strategies for improving observation techniques, supporting inquiry in different learning contexts, and adjusting future activities based on assessments.

References

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GREENCODE Kit

The Erasmus+ GREENCODE "Building an Eco-Friendly Future with Robots" project developed a set of complementary resources:

- Preparing Future Educators: Higher Education Course **Curriculum** on Robotics and Environmental Education.
- Preparing Future Educators: **Lesson Plans** – Supporting the Higher Education Course Curriculum on Robotics and Environmental Education.
- Preparing Future Educators: Digital **Handbook** on Robotics and Environmental Education.
- **Activity Book** – Educational Robotics and Environmental Education in Early Childhood Education.
- **Video tutorials**.
- Dream City: **Set of Cards** for Storytelling with Educational Robotics.

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