

GEOSCIENCE FOR LEAVING CERTIFICATE TEACHERS

Continuing Professional Development Course 2024



LIVING IN YOUR LANDSCAPE MODULE PLAN

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Geoscience for Leaving Certificate Teachers CPD programme

About the Geoscience for Leaving Certificate Teachers CPD programme

Geoscience is vital for our sustainable future, and geography is the key gateway to geoscience for most students. Additionally, the new Climate Action and Sustainable Development (CASD) subject provides a brilliant opportunity to engage students with the geosciences through a new lens. The Geoscience for Teachers CPD programme has been developed by iCRAG and Geological Survey Ireland to create an opportunity for teachers of geography and CASD, and geoscience professionals to come together to increase the awareness of geoscience within the Leaving Certificate curriculum.

During the CPD course, teachers and geoscience professionals from both research and industry are paired together to co-create curriculum facing resources that are freely available for use. Over the course of six evening sessions, teachers learn more about the cutting-edge geoscience being undertaken by their partnered geoscientists, before working together to develop a curriculum-facing resource using their interests, teaching expertise and the knowledge of the geoscientist. In 2024, the resources produced have included lesson plans and module plans and the accompanying teacher notes and slides/activities for each resource.

The resources link the most recent advances in geoscience to the curriculum in a way that is both understandable and relevant. The resources are freely available to be used for classes anywhere in the world. We hope that you and your students enjoy using them.

This Resource

This resource has been developed by teacher Anne Browne alongside Benjamin Thebaudeau, the Geopark Geologist at the Joyce Country and Western Lakes Geopark Project. This resource is a comprehensive module guide to 'Living in your Landscape', focusing in on geohazards and resilience. It covers 12 lessons and is suitable for Leaving Certificate or TY students. Included in this resource pack is a full module plan and associated teacher notes, plus the PowerPoint slides.

Sincerely,



Elspeth Sinclair, Fergus McAuliffe, Siobhán Power
Programme Managers – Geoscience for Leaving Certificate Teachers

Geological Survey Ireland, a division of the Department of Environment, Climate and Communications, has been mapping Ireland since 1845. They continue to map the Irish land and marine territories, as well as mineral and groundwater resources. They have responsibility for actions in the current Climate Action Plan including monitoring coastal change, the Just Transition in the midland counties, and providing data for de-risking offshore renewable energy. Irish geoscience research, particularly as it contributes to the development of government policy, is an important part of their work and they fund and co-fund many research projects, including some of the iCrag research work. Their data and maps are freely available to all at www.gsi.ie.

iCrag is the Research Ireland Centre for Applied Geosciences hosted by University College Dublin. We are a team of researchers creating solutions for a sustainable society.

We develop innovative science and technologies to better understand the Earth's past, present, and future and how people are connected to it.

We drive research in areas that are critical to society and the economy, including:

- Sustainable discovery of energy resources and raw materials required for decarbonisation.
- Securing and protecting groundwater and marine resources.
- Protecting society from Earth's hazards such as flooding and landslides.

The iCrag Research Ireland Centre for Applied Geosciences hosted by UCD, comprises 150 researchers across ten universities and institutions. iCrag is funded by Research Ireland, Geological Survey Ireland and industry partners.

Further information is available at: www.icrag-centre.org

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Module plan: Living in your Landscape

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Module plan:

Learning Objectives

- Understanding the concept of geohazards and resilience
- Identifying the different possible geohazards in your landscape
- Learn about the geological features that may contribute to geohazards in your area
- Examine flood risks and management strategies in your area
- Using historic and present-day maps to predict any future risks
- Learn about community preparedness and response strategies for geo hazards
- Work together to develop a warning system for your community
- Explore how climate change might affect future geohazards.

Learning Outcomes

Students should be able to:

- Explain the concept of geohazards
- Describe the rock types in their region and how they may have an impact in their area
- Describe past and possible future flooding in the area
- Provide a community warning system
- Understand how climate change may impact their local area.

Links to Curriculum

i. Links with Geography

Core Units 1, 2 and 3

- Unit 1 – Patterns and processes in the Physical environment
 - Unit 2 – Regional Geography
 - Unit 3 – Geographical investigation and Skills
-
- 1.3 explain and illustrate how landforms develop from the interaction of the tectonic cycle, rock cycle, and surface forces
 - 1.6 illustrate how landforms represent a balance, through time, between endogenic (internal) and exogenic (external) forces
 - 1.7 assess, at different scales, the impact of human activity on the physical processes at work on the landscape
 - 2.1 explain and illustrate, at different scales, the concept of a region as identified by selected criteria
 - 2.2 show a detailed understanding of how physical, economic, and human processes interact in Irish and European regions and in one continental / sub continental region
 - 2.4 assess the complexity of this interaction, and the potential for change in the boundaries and extent of regions using specific examples

The Geographical and Skills Unit

- use the skills listed above, where possible, to interpret how economic, human, and physical processes interact in a regional setting.
- understand, use and apply the skills listed to complete a geographical investigation
- work through the distinct stages of a geographical investigation

- use statistical analysis and information technology in the interpretation and analysis of results and conclusions
- analyse and evaluate their work, and make comparisons with other studies
- experience, where possible, working conditions similar to those likely to be encountered in the world of work.

ii. Links with Climate Action and Sustainable Development

- Strand 1 – Earth Systems, Life and Environment
- Strand 2 – People, Power and Place

Keywords and Definitions

| | |
|-----------------------------|--|
| Resilience | the capacity to recover quickly from difficulties |
| Geohazards | an adverse geologic and environmental condition capable of causing widespread damage or loss of property and life |
| Groundwater flooding | flooding caused when the natural underground drainage system cannot drain rainfall away quick enough, causing the water table to rise above the ground surface |
| Community risk | hazards, vulnerabilities, risks to the local community |
| Landscape/natural resources | materials or substances occurring in nature which can be exploited for economic gain |
| Weather warning | a weather warning generally refers to an alert issued by a meteorological agency to warn citizens of approaching dangerous weather |
| Synoptic maps | a map that shows weather patterns over a large area by putting together many weather reports from different locations all taken at the same moment in time |

Linkage and Integration

Linkage

- English – Oral discussion, debating, various styles of writing techniques to learn core facts.
- Agricultural science – Through agricultural science, an understanding of human use of the Earth’s natural resources and environment for the production of food and non-food materials is developed.
- Business – To enable students to use established commercial principles and knowledge, to critically evaluate commercial information, and to offer solutions to given commercial problem.
- History – Investigating aspects of human life, human institutions and cultural traditions, and engaged with measuring and explaining the manner in which all of these have undergone the experience of change.
- STEM – These subjects demonstrate how to explore nature using carefully planned methods and teach the basic methods and findings of scientific investigation.
- Climate Action and Sustainable development – develops students’ capacity for informed and meaningful action for a just and sustainable world as they engage with key sustainability challenges, including the climate crisis.

Differentiation

Teaching style: Identify what students already know from questioning. Observation of the student's interaction with information that is being relayed, (verbal and non-verbal). Use of visual aids and or hands on activities. Higher and lower order instructions.

Groups should be assigned to cater for different learning styles in each group, to create a positive and inclusive learning experience for all.

Teacher Notes

Lesson One

Natural Resources and landscape evolution; Why was your town/village built in this location?

Learning Activities

- Discuss aims of project – use slides (10 mins)
- Define key words – display on screen/ whiteboard (10 mins). Students to use internet for definitions.
- Examine how keywords and aim of project are linked (15 mins)
 - Discussion on local area - how ancient history, present day and future living combine
 - Obtain local knowledge from students who have a long history in the area and explore knowledge of area from those with a more recent history
- Demonstrate how to use google maps / GSI website and other maps – use slides (10mins)
- Examine Scoilnet maps for historic and present-day land use. Produce a map showing changes over time. Each group could take a different location in the target area

Assessment:

- Teacher question students understanding of topic and local links
- Teacher Observation of digital competency for project

Resources:

- Projector to display PowerPoint, Maps, videos etc
- Whiteboard and markers
- Computers for each student
- Internet access
- Flood assessment Ballinrobe – County Development Plan

<https://www.heritagemaps.ie/>

<https://www.gsi.ie/en-ie/programmes-and-projects/geohazards/Pages/default.aspx>

<https://gwlevel.ie/>

<https://gsi.ie/en-ie/data-and-maps/Pages/default.aspx>

<https://www.teagasc.ie/media/website/environment/soil/Peatlands-of-Ireland-Map.pdf>

<https://joycecountrygeoparkproject.ie/en/landscape-of-joyce-country-and-western-lakes-region/>

<https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/understanding-irish-karst/karst-in-ireland/Pages/default.aspx>

Lesson Two

Natural Resources and landscape evolution; Why was the town/village built in this location?

Learning Activities

- Recap on the aims and objectives of the project (slide)
- Show RTE – 10 Things to Know About – Flooding
<https://www.rte.ie/tv/programmes/919906-10-things-to-know-about/>
- Instructions to be higher and lower order to enable all students understand the brief.
- Display slide with relevant resources
- Examine the local rock types and landscape
- Geohazard identification (E.g. landslides, floods, earthquakes, and particularly Karst Geohazards)
- Discussion on what geohazards may impact the chosen area
- Karst Geohazards
- https://www.gsi.ie/en-ie/programmes-agroups/brief_e.g._Historic_v_present_daynd-projects/groundwater/activities/understanding-irish-karst/Pages/Karst-geohazards.aspx

Students should contact a member of the Community response team to arrange a for a speaker to come in to school and explain action plan for Lesson 10

Assessment

- Teacher continually monitoring progress through the collaboration space and discussion with each group
- Class discussion on geohazards

Resources:

- Resources to be displayed on Whiteboard (PowerPoint slides)

Lesson Three

Natural Resources and landscape evolution; Why was the town/village built in this location?

Learning Activities

- Teacher display aim and objectives of project on whiteboard.
- Teacher to divide the class into groups of 3 or 4 with specific aims:
 - water resources (rivers, lakes and aquifers) and navigation
 - soil and drainage (farmland quality)
 - other natural resources (mining, fishing, etc...)
 - woodland
 - energy potential (wind, solar, geothermal or even peatland)
- Teacher will set up groups in collaboration spaces where they will complete all the relevant tasks.
- Students produce maps on their given topic e.g. natural resources etc. soil etc. in their chosen area. See Appendix 1.

Assessment

- Teacher observes if students have organised into roles within groups
- Teacher checks that each person understand their roll and can access relevant material
- Observation within the collaboration space
- Move between groups, questioning on understanding of the topics

Resources:

- Resources to be displayed on Whiteboard (PowerPoint slides)

Lesson Four

Natural Resources and landscape evolution; Why was the town/village built in this location?

Learning Activities

- Display aims and objectives on whiteboard (Slide)
- One student from each group to present their findings on the chosen area
- Why was the town/village built there....?
- What resources are there and potential resources....?
- Class discussion at end of presentation on what worked well and what didn't

Assessment

- Observation of presentation given by each group – delivery, depth or research and understanding of topic

Resources

- Internet access
- Student computers
- Access to whiteboard for student presentation

Lesson Five

Community Risks: groundwater flooding, pollution of water and soil and climate change

Objective

Learn about risk to communities based on past experiences

Learning Activities

- Students to research past experiences by reading articles in local newspapers online, videos and other relevant media. (slides of resources)
- Students to divide up tasks within the groups
- Assess the risks to local communities, biodiversity, building and infrastructure
- Write up a report on findings

Assessment

- Check students can access required materials
- Monitor the collaboration between all students in groups
- Monitor reports through collaboration space

Resources

- Display slide with resources.
- Appendix 2 (below): Instruction for creating a Community Geo Hazard Events Form

Lesson Six

Community Risks: groundwater flooding, pollution of water and soil and climate change

Learning Activities

- Display aims and objectives on whiteboard (slide)
- Students to prepare a questionnaire for the local communities and businesses on past experiences with flooding (houses or roads), wind damage, boil water notices, river pollution from runoff and any other risks
- Questionnaire to be created in a digital form so results can be input. See Appendix 2.
- Plan what business and communities will be surveyed
- What students will conduct survey in each area
- Some students may be able to survey family members
- Students not out on survey can work on a map of the town highlighting historical flood events or other damages and vulnerable areas

Assessment

- Discussion on questionnaire. Whether all questions are necessary and suitable etc.
- Check that form is presented in a clear and comprehensive format

Resources

- Internet access
- Student computers
- Printer for survey
- Appendix 1: Building a map (below)
- Appendix 2: Instruction for creating a Community Geo Hazard Events Form (below)

Lesson Seven

Community Risks: groundwater flooding, pollution of water and soil and climate change

Learning Activities

- Display aims and objectives (slide)
- Students to go out to survey local businesses
- Remaining students to work on mapping vulnerable areas, infrastructure etc. to geohazards and climate change

Assessment

- Check students can access required materials
- Monitor the collaboration between all students in groups
- Monitor mapping through collaboration space

Resources

- As Before
- Display slides with resources
- Appendix 1: Building a map (below)

Lesson Eight

Community Risks: groundwater flooding, pollution of water and soil and climate change

Learning Activities

Students to input survey results

- Student to map local area vulnerabilities based on survey
- Further research into impact climate change might have on vulnerable areas
- Research historical rainfall amounts and temperature from closest station to area
- Write brief report on possible impacts
- Students to give brief on findings from survey

Assessment

- Teacher to observe groups working collaboratively
- Check the students can access material
- Ensure all above work completed this session

Resources: as before and

- Computers
- Survey forms
- Appendix 1: Building a map (below)
- <https://www.met.ie/climate/available-data/monthly-data>

Lesson Nine

Build a community action plan.

Learning Activities

- Research Weather Warning systems in Ireland, EU and worldwide
- Make comparisons between systems
- Create content on warning systems in collaborative space that can be used in the community action plan
- Prepare questions for the guest speaker next lesson

Questions may include:

- Who is the Local contact in case of an emergency
- Are the responder contacts displayed locally
- Is there an area specific plan or is it a general county plan
- How often is the plan updated
- Etc.....

Assessment

- Teacher to observe groups working collaboratively
- Check the students can access material

Resources

<https://www.met.ie/met-eireann-warning-system-explained>

<https://www.meteoalarm.org/en/live/>

[https://wmo.int/topics/early-warning-](https://wmo.int/topics/early-warning-system#:~:text=Early%20warning%20systems%20are%20put,assets%20of%20people%20at%20risk.)

[system#:~:text=Early%20warning%20systems%20are%20put,assets%20of%20people%20at%20risk.](https://wmo.int/topics/early-warning-system#:~:text=Early%20warning%20systems%20are%20put,assets%20of%20people%20at%20risk.)

<https://www.mayo.ie/en-ie/news/mayo-county-council-activate-preparedness-plans-in>

Lesson Ten

Build a community action plan.

Learning Activities

- Student introduces Guest Speaker
- Guest Speaker (30 – 40 mins)
- Question and answer session

Resources

- Computer
- Internet
- Projector
- Speaker's own resources

Lesson Eleven

Build a community action plan

Learning Activities

- Brief discussion of guest speaker's contributions
- Students to develop a Community Action Plan using information from lesson nine
- The full class participate in a brainstorming exercise:
 - Potential issues – flooding/fallen trees/power outages/ landslides/ wind blown debris
 - What is required for the warning system
 - What does each warning mean
 - What does each warning require us to do
- Each group now designs their poster for the warning system
- The Action Plan will be the same in each project, but designs will be different
- At the end of the class display each poster and pick best or combine parts to complete one poster
- Students complete their presentation ready to deliver at next class

Assessment

- Listening to students understanding of issues from guest speaker
- Clarity of information
- Design initiative
- Presentation of poster

Resources

- White board markers
- Whiteboard
- Student's computer
- Projector

Lesson Twelve

Build a community action plan.

Learning Activities

- Students present each of the group's projects

Assessment

- Teacher can use matrix on slides to award grades

Resources

- Student's computer
- Projector
- Whiteboard

Appendix 1: Building a Map

Objectives

Students will learn to create a simple layered map using historic maps, present day maps, future maps and assessments of flood and landslide risks.

Learning Activities

- In lesson 2 students have identified areas of flood and landslide risk, they will now compile this information onto a layers map
- In their groups students will produce a layers map on their specific research topic
 - water resources (rivers, lakes and aquifers) and navigation
 - soil and drainage (farmland quality)
 - other natural resources (mining, fishing, etc...)
 - woodland
 - energy potential (wind, solar, geothermal or even peatland)
 - past present and future maps
- Each group includes:
 - A base layer of present day
 - An over layer of their specific topic
- Encourage use of colours, hatch, symbols etc to clearly represent the theme of their map
- Provide assistance where needed

Resources

- Access to software or tools for creating layered maps (e.g. Google Earth, ArcGis online, or similar software)
- Paper and coloured markers for initial sketches
- Printer to print maps if necessary
- Tracing paper to create physical overlays if necessary
- Computers/tablets to access their collaborative space and map creation

Assessment

- Participation: contribution to group discussion and activities
- Layered Map Project: creativity accuracy and clarity in final presentation

Appendix 2: Instructions for creating a Community Geo Hazard Events Form

Title: Community Geo-Hazard Events Inquiry

- Teacher to demonstrate to students how to create form
 - Access software that can create forms such as Microsoft forms or Google forms
 - Enable features to allow easy data collection and analysis
 - Demonstrate different types of questions – open, closed, date etc.
- When teacher has completed demonstration: students to brainstorm question needed for the survey.
- One or two students writes the questions on the whiteboard while one group orders the questions e.g.1-10
- Select one group to create the form while others are brainstorming the questions
- Create the form to be shared with students.

Types of questions

Section 1

- Name of business / person (Text field)
- Name of neighbourhood (Text field)
- Date of survey (Date field)

Section 2: Geohazard event

- Have you experienced or witnesses any geo-hazard events in your area
- If yes, please specify the type of geohazard
- Please provide the dates of the geohazards
- Please describe the location of the event

Section 3: Event impact and response

- What was the magnitude of the event(s). This could be multiple choice question - (Tick)
 - minor,
 - severe,
 - major
- Did the event result in any of the following (tick all that apply)
 - Damage to property
 - Evacuation
 - Road closures
 - Loss of power
 - Injuries or fatalities
 - Other (text field)
- How did your community respond to events (tick all that apply)
 - Community meetings
 - Emergency services involvement
 - Local government response
 - Volunteer assistance
 - Other (Text field)
- What improvements do you think could be made (text field)
- Additional comments (Text field)

Print survey/form or use digital form for students to conduct survey.

Appendix 3: Extra Material

Students may like to play some of the online Climate Action games

<https://climatesmart.ie/game>

<https://subjecttoclimate.org/external-resources/water-cycle-game>

<https://teachingthefuture.eu/climate-simulations-and-games/>