

GEOSCIENCE FOR LEAVING CERTIFICATE GEOGRAPHY

Continuing Professional Development Course 2022



FOLDING AND FAULTING LESSON PLAN

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Geoscience for Leaving Certificate Geography Teachers CPD programme

About the Geoscience for Leaving Certificate Geography Teachers CPD programme

Geoscience is vital for our sustainable future, and geography is the key gateway to geoscience for most students. The Geoscience for Leaving Certificate Geography Teachers CPD programme has been developed by iCrag (the Science Foundation Ireland Centre for Research in Applied Geosciences) and Geological Survey Ireland to create an opportunity for teachers and geoscience professionals to come together to increase the awareness of geoscience within the Leaving Certificate geography 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 2021, the resources produced have included lesson plans, module plans and field guides and the accompanying teacher notes and slides/field booklets for each resource.

The resources link the most recent advances in geoscience to the geography 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.

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This resource

This resource has been developed by Seantelle Quane, a geography teacher at St Peter's Community School and iCrag researcher Emma Tomlinson. The resource is a comprehensive overview of folding and folding. Included in this resource pack is a full lesson plan, worksheets and associated teacher notes, and a PowerPoint of slides. It is suitable for Leaving Certificate Students.

Sincerely,



Elspeth Sinclair, Fergus McAuliffe, Siobhán Power
Programme Managers – Geoscience for Leaving Certificate Geography 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, the Science Foundation Ireland (SFI) Research Centre in Applied Geosciences, are a team of researchers creating solutions for a sustainable society. They develop innovative science and technologies to better understand Earth's past, present, and future and how people are connected to it. iCRAG drives research into areas that are critical to society, including:

- The minerals and metals we need for decarbonisation and sustainable energy.
- Securing and protecting groundwater and marine resources.
- Protecting society from Earth's hazards, such as floods and landslides.

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

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Lesson plan: Folding and Faulting

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Lesson plan: Folding and Faulting

Links to curriculum

Core Unit 1.3 of the Leaving Certificate Syllabus

"The development of landforms is influenced by geological structures which have resulted from the operation of the tectonic cycle. Students should study the effects of the following on landform development:

- *volcanic and plutonic structures, lava flows, volcanoes, joints etc.*
- *sedimentary structures, bedding planes, joints etc.*
- *structures of deformation including folding, doming, and faulting (by both vertical and horizontal displacement)"*

Leaving Certificate Geography Syllabus Higher and Ordinary Levels, Government of Ireland, 2003.

The aim of the lesson is to revise over sedimentary rock formation and see the processes of folding and faulting and be able to identify them which is a popular question in the short question section of the leaving certificate examination.

Learning Outcomes

Students should be able to:

- Summarise the formation of limestone and sandstone
- Identify how rock layers are laid down
- Identify how tectonic forces create landforms
- Describe the folding and faulting processes and how they effect the local landscape
- Identify the various forms of faults

Resources required:

- Play- doh in three different colours
- Wooden compostable knives
- PowerPoint
- Worksheets
- Laptops/Tablets to access Geographical Society Ireland mapping website (www.gsi.ie)



Keywords and definitions

Keyword	Definition
Tectonic forces	Describes the energy or the movements that cause a change in the earth's crust
Tension	State of being stretched tight
Compression	Pressure being applied
Shearing	To break
Folding	Rocks bending
Faulting	Rocks breaking
Anticline	Type of fold that is an arch shape
Syncline	Type of fold that is a downward arc shape
Normal fault	Formed by tension when earth's crust pulls apart
Reverse fault	Formed when the earth's crust pushes together

Learning Activities

Students will create the different rock layers using play doh. They will manipulate the play doh then the mimic the tension and pressure that has caused folding and faulting. Students will use GSI geology maps to study the area of their school and make inferences about what has caused the landscape to look the way it does.

Detailed instructions

Students will work in groups for this activity and identify the variances in topography in the area around our school. This resource is of course adaptable to any location in Ireland.

Starter:

Students will, in pairs, list ways in which tectonic activity shapes the Irish landscape (link to thirty mark question from section two of the physical geography section of the exam)

Link to local:

Students will have a look at the area around our school using different maps (scoilnet maps and google street view) together students will identify the different features of landscape in our local area. Students will mark where there is a change in the landscape going from the school gate to the town of Passage West.

GSI-

Students will be shown the bedrock map of the area using GSI maps. Students will examine the different layers of rock that are in the area.

Students then will work in pairs to fill out a quick revision sheet (Worksheet One) where they will have to write down the key points of how limestone and sandstone are formed.

Play-doh

Using the GSI bedrock map as a reference students will use three different colours of play doh to create the layers of rock.

Students will then use their play doh models to create tension and compression to create anticline and synclines.

Using a compostable knives students will then cut and create the landscape from our school to expose the rock like what we can see from the GSI bedrock map.

Faulting

Students then will be shown the different types of faults and how it affects the landscape.

Referring to the GSI bedrock map students will research the symbols of faulting and record in Worksheet Two.

Using the map again students will see where the main fault line in our area is.

Homework Task:

In our area there are a lot of exposed rock areas shown. Students will explore their local area using GSI maps and find where the closed area of exposed rock is and take a picture. Students will also have to identify what type of rock it shown.

Extra Info/Files

- GSI Maps: <https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx>
- Sandbox idea link: <https://planet-geology.com/understanding-tectonics-with-sandbox-models/>

Linkage and Integration

Linkages

English- communication skills within group work and literacy skills.

Art- constructing a piece using play doh

S.P.H.E - working together cooperatively

Differentiation

- Groups could be predetermined to group students with additional educational needs with students who can help them
- Teacher will be observing and assessing as students are doing tasks to assist
- Worksheets could also be differentiated to include key words to help students form sentences in formation
- Students could also use immersive reader when typing their responses to aid with forming descriptions



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Teacher Notes

This lesson is very specific to our local area but is easily adaptable to your own area.

Instead of using Play doh students could also use sand box experiment where the different colours of sand are used to then the show the different layers of rock and then card is used to push the sand from both directions to mimic the pressure.

For those who wish to connect with the Home Economics department students could make three different layers of cake using food dye to bake them in different colours and use a knife to manipulate the “landscape” and show the different types of faults.

Methodologies

Teacher Based Instruction: Teacher will talk through the different types of folds and faults to the class

Student lead Inquiry- students will research the different types of fault lines and explore the different types of effects caused by tension of the earth.

Active learning- students will put the play doh pieces together and observe the changes and differences different actions create on the landscape

Collaborative learning- students will work together observing and making inferences based on their learning.

Assessment

Self-Assessment- students will compare their models with the ones shown on the PowerPoint

Teacher assessment- observing activities and the completion of worksheets

Practice state exam short questions e.g., SEC Higher Level Geography Exam short question section question two