

Biophysical Interactions

snoitcaretnI lacisyhpoiB

Trialling a flipped approach to teaching, learning and assessment in the Geography classroom.

Susan Caldis, GTA NSW President

As educators we frequently encounter requests to design teaching and learning programs that will incorporate an effective use of technology and enable the development of a range of 21st Century skills such as collaboration, communication, critical thinking, creative thinking and citizenship (often referred to as the 5C's). These requests come from a variety of sources such as policies, research, leaders, students and also as a result of personal reflection.

In recent years, literature emerging from the United States of America, initially from Bergmann and Sams (2012) in particular, has been encouraging teachers, internationally, to move towards a flipped approach in the development of their teaching and learning programs.

The purpose of this article is not to explore the arguments for and against flipped learning but to firstly express a basic outline of what a flipped learning approach is, and secondly to share my interpretation and adaptation of this in to my delivery of Biophysical Interactions.

Flipped Learning is probably best described as class time being utilised as 'a workshop of learning' (Boyer, 2013, p28). Typically, videos or information about the key theory, concepts or skills associated with a unit of work are investigated at home so that during class time the teacher is available to work with their students, provide advice, check progress and pick-up errors. The ability to increase time interacting with students was also something that significantly appealed to Gaughan (2014) as she explored arguments for and against moving towards a flipped approach to teaching and learning. Although Ng (2014) profiled flipped teaching and learning specifically in the Science classroom, there were many points raised that would be of equal merit in a Geography classroom such as self-directed learning, self-paced learning, increased contact time between teacher and student and the opportunity to develop better peer relationships through collaborative effort. Both Boyer (2013) and Ng (2014) suggested that 'flipping' leads to more effective use of digital

technologies by teachers and students as well as the opportunity to engage with more complex problem-solving activities. According to the literature, authors had used platforms such as BlackBoard, EdModo or Moodle and apps such as Camtasia to create the videos (or used already available clips from YouTube). The main idea put forward about flipped learning is that the learning environment becomes more interactive (student-student and student-teacher) and teachers become a facilitator of learning so students can apply key concepts in a thoughtful and creative way. However, as with any pedagogical approach, the skill of the teacher and their ability to design work that best caters for the needs of their students is crucial (DeSantis, Van Curen & Putsch, 2015).

As an advocate for a constructivist inquiry-based approach to teaching and learning in Geography, I embarked upon changing my teaching, learning and assessment program for Biophysical Interactions using a combination of key messages from the literature together with a new school direction in to the domain of BYOD, support from my colleagues, and clear requests from student surveys. A flipped classroom approach was in the making and even though I didn't video myself delivering a lecture, I endeavoured to encapsulate the concept of flipped learning. I also worked towards a specific 'flipped' stage rather than having all lessons being flipped. As always, there is plenty of room for refinement but everyone has to start somewhere...

Typically this unit of work culminates in the detailed, summative assessment event of the Half-Yearly exam and this year was to be no different. However, to lend purpose to flipping the classroom and facilitate student success in the assessment (whilst I and they grappled with trialling a flipped classroom approach) I framed the tasks around progressing towards an already available extended response question i.e. this question would appear in the Half-Yearly exam and students had to work both collaboratively and individually to construct the response.

Vital Statistics	
Online Platform	Edmodo
Unit	Biophysical Interactions
Case studies	Iceland (secondary research) Kurnell Peninsula (primary research via fieldwork)
Overarching question	Is the biophysical environment of Iceland significantly affected by its spatial and ecological dimensions compared to the biophysical environment of Kurnell peninsula?
Duration of unit	Term 1
Assessment	Formative: through items such as Edmodo comments; questions posed; engagement with task; number and quality of draft responses submitted Summative: half-yearly extended response question
Motivation/Incentive	A mixed ability class of 24 students ranging from students with additional learning needs requiring in-class support from the Learning Support Team through to gifted and talented. The school becoming Bring Your Own Device (BYOD) oriented and an opportunity to lead school-based professional learning in the use of technology to support the new BYOD policy. Results from student surveys expressing the desire to use their device frequently and meaningfully; to have more groupwork opportunities; to learn about somewhere 'really different' to Australia.

First stage (approx. 1 week):

Getting used to Edmodo!

After some explicit instruction about spatial and ecological dimensions and the 4 spheres (types, interactions, interdependencies) it was time for students to apply their knowledge and understanding. On Edmodo they were invited to:

Provide a short paragraph about the interactions and interdependencies between the 4 spheres with specific reference to both photographs (both of these photographs were previously unseen).

The detail of the comments coming through was exceptional, especially from the students who were also studying Biology. Students received individualised written feedback from me (still on Edmodo) and gradually it became apparent that students were using my feedback to inform their responses. Students could post more than once if they were not satisfied with their original paragraph and they could also link to comments from each other. It was noticeable that they made a concerted effort not to repeat what had already been

said. This task enabled me to clearly gauge their depth of understanding and ability to apply knowledge and understanding – it was time to move on to the next component. Another benefit was all students now had a voice in the classroom – those who prefer not to or cannot verbally contribute to face-to-face class discussion were now the some of the first to post a comment in an 'online' learning environment.



Hells Gate, Rotorua, New Zealand



Lake Tabourie, near Ulladulla, NSW

Second stage (approx. 1 week): A practice 'flip'

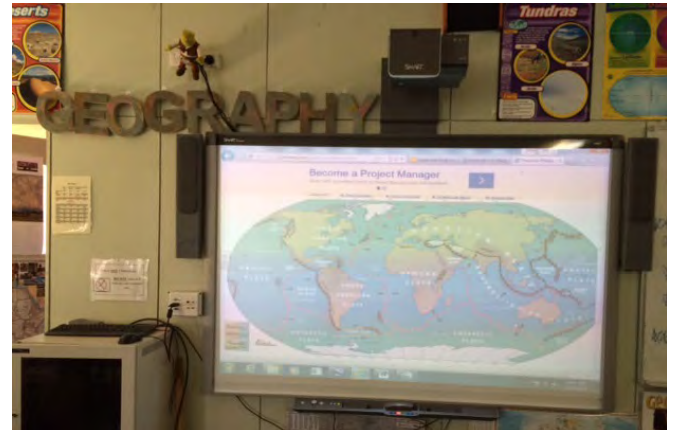
We moved on to a specific investigation of Iceland through a combination of explicit instruction and constructivist techniques. The next activity was for students to watch an instructional video at home and demonstrate their knowledge and understanding via providing a comment (on Edmodo) in response to a video clip:

How does the location of Iceland (its spatial dimension) affect the interaction of the spheres (ecological dimension) – think about the spheres you are seeing in each shot, what is happening and a possible reason why.

Again, I provided individualised feedback to the comments as they came through on Edmodo and these comments were used by students to further inform their own responses to the task. The chosen clip was <https://www.youtube.com/watch?v=24K4CHeS6b8&feature=youtu.be> (Iceland Presentation)

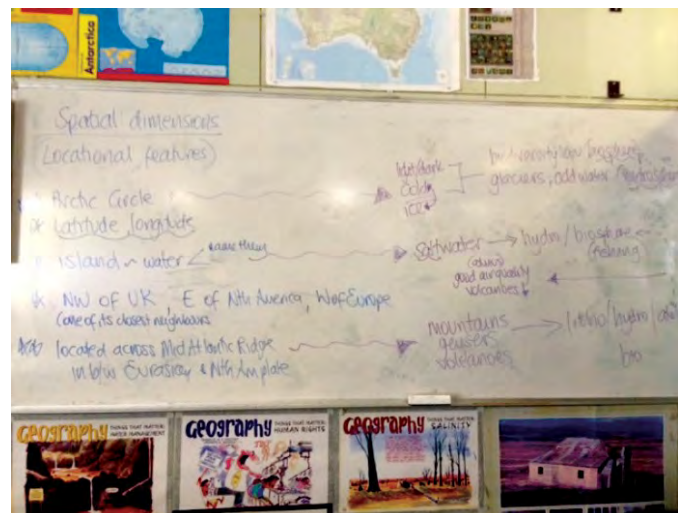


NASA satellite image of Iceland . Souce: Wikimedia Commons



Third stage (approx. 5 weeks): The real 'flip'

During the fortnightly double session lessons, students were working in groups to progress through learning about each sphere in the context of Iceland. The classroom was organised in to 5 groups – each sphere plus the spatial dimension and students rotated through two groups each fortnight. This work would enable students to apply and build their understanding of biophysical interactions in the context of Iceland which would enable students to develop an argument for the extended response during the single session lessons. Students were also provided with a scaffold for the extended response question and a range of resources connected to each sphere to start their investigation (see Scaffold 1). Additionally, they were encouraged to find additional resources to the ones provided. Students had to think critically and creatively about the information they were accessing in response to the question and then work collaboratively to build the response, sharing information they found and ideas they had about how they believed it contributed to answering the question. Part of effective collaboration was also the way in which they communicated in written and verbal form.



Scaffold 1 for the extended response:

Biophysical Interactions: Investigating the 4 spheres in the context of Iceland and Kurnell Peninsula

Overarching question: Is the biophysical environment of Iceland significantly affected by its spatial and ecological dimensions compared to the biophysical environment of the Kurnell peninsula?

Justified hypothesis:

Research methodologies: A combination of primary and secondary research methodologies will be used to investigate the overarching question and gather research findings in order to reach a conclusion.

Kurnell peninsula will be investigated via primary research methodologies (1 April) such as:

Iceland will be investigated via secondary research methodologies such:

In order to respond to the overarching question you will need to investigate spatial dimensions (location) and the ecological dimensions (interactions) occurring within and between the 4 spheres.

Maps, diagrams, images, representation of data and information, excerpts from newspaper articles etc., should be evident in your geographical research.

Presentation of research findings should be developed around the use of sub headings, dot points, paragraphs etc.

Spatial dimensions:

1. Use the Atlas, Google Earth, apps such as The World Factbook, World Atlas etc., to provide an appropriate overview of Iceland's spatial dimensions (remember location can reveal a lot about interactions likely to occur)

Ecological dimensions:

2. Investigation of each sphere will need to occur in order to explain the biophysical environments (including species) that are occurring in Iceland
 - Atmosphere (hint: climate, air quality)
 - Hydrosphere (hint: water cycle, role of water)
 - Lithosphere (hint: soil and rock type, erosion, weathering, mass movement)
 - Biosphere (hint: flora and fauna)



Resources for the extended response (Iceland section):

Below are some secondary research methods you could use to inform your response to the overarching question. Some resources overlap between spheres i.e. they could be referred to more than once and may cover off on more than one sphere. Some resources may provide 'theory' that you could apply to the context of Iceland.

There may be other resources you would like to use as well, such as the textbook, responses from Edmodo etc.

Spatial dimensions

- Atlas
- Apps such as The World Factbook, The World Atlas
- <http://www.worldatlas.com/webimage/countrys/europe/iceland/island.htm>
- http://www.edhelper.com/geography/Iceland_map.htm
- <http://travel.nationalgeographic.com/travel/countries/iceland-facts/>
- <http://www.roebuckclasses.com/105/physical/geomorph/plateboundaries.htm>

Ecological dimensions:

- <https://www.extremeiceland.is/en/multimedia/videos>
- http://inspired.visiticeland.com/?utm_source=InspiredbyIceland&utm_medium=web&utm_term=InspiredbyIceland&utm_content=InspiredByIceland_URL&utm_campaign=InspiredByIceland

Atmosphere

- http://www.ted.com/talks/james_balog_time_lapse_proof_of_extreme_ice_loss
- <http://blog.ted.com/2012/11/26/on-our-must-see-list-james-balogs-chasing-ice/>

Hydrosphere

- <http://www.livefromiceland.is/>
- <http://www.sln.org.uk/geography/SLNgeography@Iceland6.htm>
- http://video.nationalgeographic.com/video/iceland_bluelagoon
- <https://www.youtube.com/watch?v=sa-DdSPya2E>
- http://need.is/jardvefur/index.php?option=com_content&view=category&layout=blog&id=8&Itemid=10&lang=is

Lithosphere

- <http://www.sln.org.uk/geography/SLNgeography@Iceland3.htm>
- <https://www.youtube.com/watch?v=bIDXgde1Tpg>
- Earth and Environmental Science Excel Guide
- http://www.nytimes.com/2006/06/18/travel/18ring.html?pagewanted=all&_r=0
- <http://splash.abc.net.au/media/-/m/1534586/tectonic-plates-move-slowly-with-massive-results>
- <http://www.geography.org.uk/resources/volcano/#top>
- <https://www.tes.co.uk/teaching-resource/Icelandic-Volcano-6382871>
- <https://www.youtube.com/watch?v=2j1UzJulWBk>
- <http://geogteaching.blogspot.com.au/2011/06/iceland-volcano-video-lesson.html>
- <http://travel.nationalgeographic.com/travel/countries/iceland-traveler/>

Biosphere

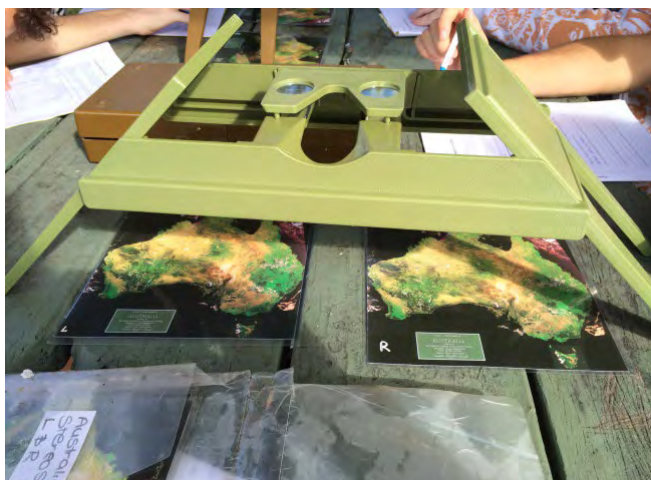
- <http://www.iceland.is/the-big-picture/nature-environment/geography/>
- <http://video.nationalgeographic.com/video/news/iceland-timelapse-video?source=relatedvideo>
- <http://www.english-online.at/geography/iceland/geography-of-iceland.htm>
- <https://www.youtube.com/watch?v=boghpsPR6FI>
- <http://www.newsoficeiland.com>

Fourth stage: Fieldwork

The fieldtrip to Kurnell Peninsula was organised to occur at the end of Term 1. In order to prepare students for their visit to this place and to start thinking about the differences between this environment and what they were learning about in Iceland, students were invited to complete the following task on EdModo:

- explore Google Earth. Provide a description about its spatial dimension (where is it) and about how at least 2 spheres would be expected to interact (this description is like a prediction of what you would be expecting to see there on the fieldtrip based on what you can see from Google Earth).
- explore <http://hscgeography.hsieteachers.com/towra-point.html> and complete the virtual fieldtrip. Provide a comment about the different ecosystems you can see in this area and the spheres to which they are mostly connected.

And then...The fieldtrip!





Along the way:

Explicit instruction about extended response writing through the use of the ALARM© matrix also occurred and an additional scaffold (see Scaffold 2) was provided to students to help them develop their response. This scaffold was completed as part of the collaborative work outlined in the third stage and then refined as part of individual work as they completed their draft responses ahead of the half-yearly exam. Resources that we used to inform instruction about extended

response writing were developed by Max Woods from NBSC Freshwater Campus – links to a selection of these resources are included below:
<https://www.youtube.com/watch?v=gnZ2TiBh-QY>
(An introduction to ALARM©)
<https://www.youtube.com/watch?v=JBVOmX-Et6Q>
(The concept of a question)
[http://www.castlehill-h.schools.nsw.edu.au/news/ alarm-a-learning-and-responding-matrix](http://www.castlehill-h.schools.nsw.edu.au/news/alarm-a-learning-and-responding-matrix)

Scaffold 2 for the extended response – the ALARM© matrix:

Unit name	Biophysical Interactions
Question	Is the biophysical environment of Iceland significantly affected by its spatial and ecological dimensions compared to the biophysical environment of Kurnell peninsula?
Summary	In a couple of sentences, outline what is this unit is about?
Criteria	What criteria should be used to decide how important or effective something is? What value judgements might be made? (positive, negative, effective ineffective, valid, invalid, harmful, beneficial)



Biophysical Interactions – snoitcaretnl lacisyhpoiB



Panoramic view of Bjarnarflag Geothermal Station, Iceland. Source: Wikimedia Commons

Name and define	Describe	Explain	Analyse	Critically analyse	Evaluate
<i>What is it?</i>	<i>What are its features/properties?</i>	<i>What is its function/purpose/effect?</i>	<i>How does it work?</i>	<i>What are its pro's and con's and why</i>	<i>How important is it and why</i>
Provide a name and definition of each factor/criteria/component	What are the features of each factor/criteria/component	What does each factor/criteria/component address or what is their impact or effect?	How and why does each factor/criteria/component work or operate	What are the arguments for and against each factor/criteria/component and why	To what extent is each factor/criteria/component contributing to the overall process? Does it achieve purpose? Why

Key references:

- Boyer, A. (2013). The flipped classroom. *Teacher Learning Network* p28–29
- DeSantis, J., Van Curen, R. & Putsch, J. (2015). Do students learn more from a flip? An exploration of the efficacy of flipped and traditional lessons. *Journal of Interactive Learning Research*, 26(1), 39–63
- Gaughan, J.E. (2014). The flipped classroom in World History. *The History Teacher*, 47(2), 221–246
- Ng, W (2014). Flipping the science classroom: exploring the merits, issues and pedagogy. *Teaching Science*, 60(3), 16–27
- Pearson and the Flipped Learning Network (2013) http://flippedlearning.org/cms/lib07/VA01923112/Centricity/Domain/46/FLIP_handout_FNL_Web.pdf



Aerial view of Kurnell. Source: Wikimedia Commons