Implementation and preliminary evaluation of Project Based learning in a first year environmental chemistry module

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Introduction

- Motivation – Providing an inclusive curriculum using Project Based Learning
- Project and assessment
- Implementation
- Evaluation

Aspects of PjBL

Project is presented before all the knowledge is in place

So requires and develops

- Acquisition of new knowledge
- Independent learning.
- Co-creation of curriculum
- Team work
- Oral and written presentation skills
- Research skills / information retrieval

Module.	Create an accessible curriculum	Enable students to see themselves reflected in the curriculum	Equip students with the skills to positively contribute to and work in a global and diverse environment
In the concept	Global atmospheric pollution	Students from diverse ethnic backgrounds can explore countries of their choice	Awareness of global impact of atmospheric pollution
In the content (learning outcomes, reading lists)	Impact of atmospheric pollution across continents	Use project based learning to allow students to find and select their own content	Transboundary nature of pollution- global impact
In the delivery (learning and teaching strategy)	Start of lab class moved to 9:30. Schedule in new learning space with computer facilities/ provision of lap top loan from library	Use of names in class discussions Space for students to present their own opinions of pollution	Use of teamwork in project based learning. Identification of own team roles
In the assessment (assessment strategy)	Use of seen examination question on final examination paper. Practical reports completed in class using Learning science lab sheets - providing hints and resubmissions	Team choice in what material they present in reports	Oral presentations in formative assessment – written scientific report Peer assessment
In the feedback (feedback strategy)	Learning science lab sheets– providing instant feedback, second chances and automated marking	Peer assessment and feedback on formative oral presentations	Students asked to reflect on their teamwork experience
In the review/evaluation (MEP)	Review module attainment gap in Module Enhancement Plan	Course rep lead early module review	

Typical Project

You are a team of Atmospheric Chemistry research scientists who have access to a range of published data on $NO_{2,}$ $PM_{2.5}$ and PM_{10} concentrations and the occurrence of smog events in cities across the planet .

You are required to produce an evidence-based report on Smog pollution to an a government committee. The report has a word limit of 1500 words

Assessment

Formative assessment - Team report (1500 words)

Summative assessment – two short oral presentations on progress (2% each part of portfolio of in class assessments)

Summative assessment – Seen examination question

Project report

- Includes an introduction covering the causes and a scientific explanation of the issue.
- Presents data that evidences trends in relevant atmospheric gas concentrations and demonstrates conversion of units.
- Identifies reasons for these changes.
- Report the impact of these changes on humans, wildlife, ecosystems, etc.
- Suggests strategies to deal with these changes.
- Evaluates current success in tackling this environmental problem

Teaching structure

TW1-4	**Introductory lectures (4h).**
TW5	**Team roles –Formation of teams.**
TW7	**Allocation of Projects, Data searching and Team Planning.**
TW8	**Reporting progress and support with calculations.**
TW9	**Interim report: short group presentation-Peer assessment and feedback**
	Action plan for final report.
TW10	**Writing workshop.**
TW11	**Drawing conclusions and evaluating experience of team work.**
TW12	**Submit reports. Present strategies for reduction and evaluation of success so far**

TW5

- *Introduction to Team work*
  - Value of Team work
  - Introduction to team roles
  - Identifying top three team roles

Team Familiarisation

- Team formation – students allowed to form own teams
- Complete team role circle
- Ice breaking activity

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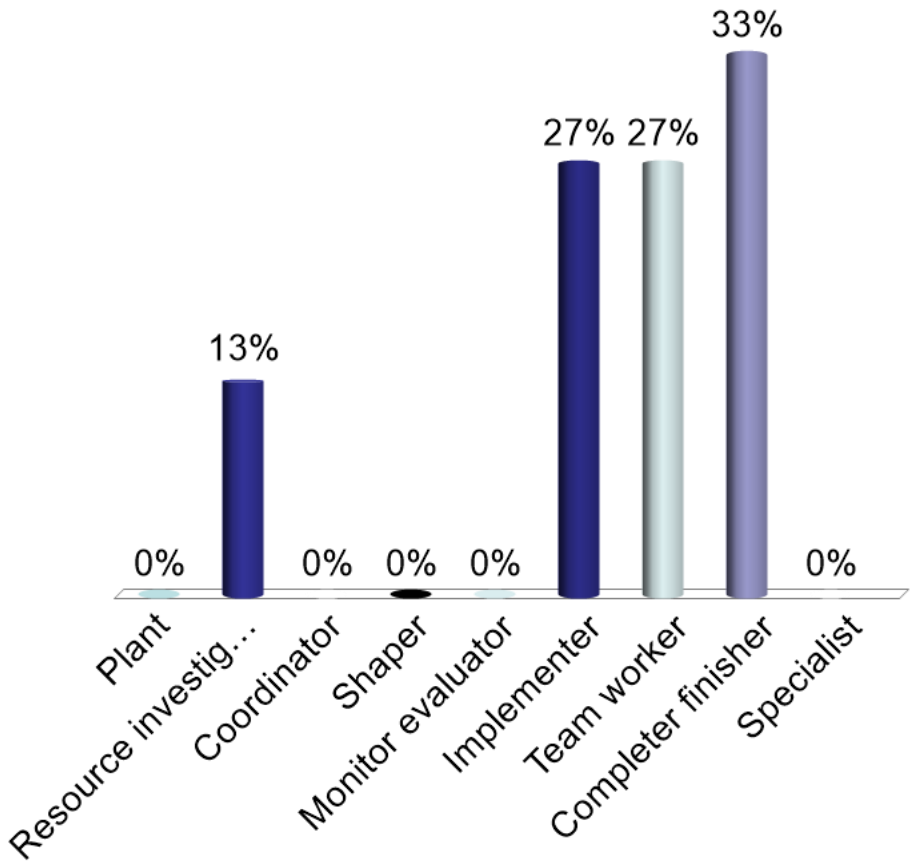
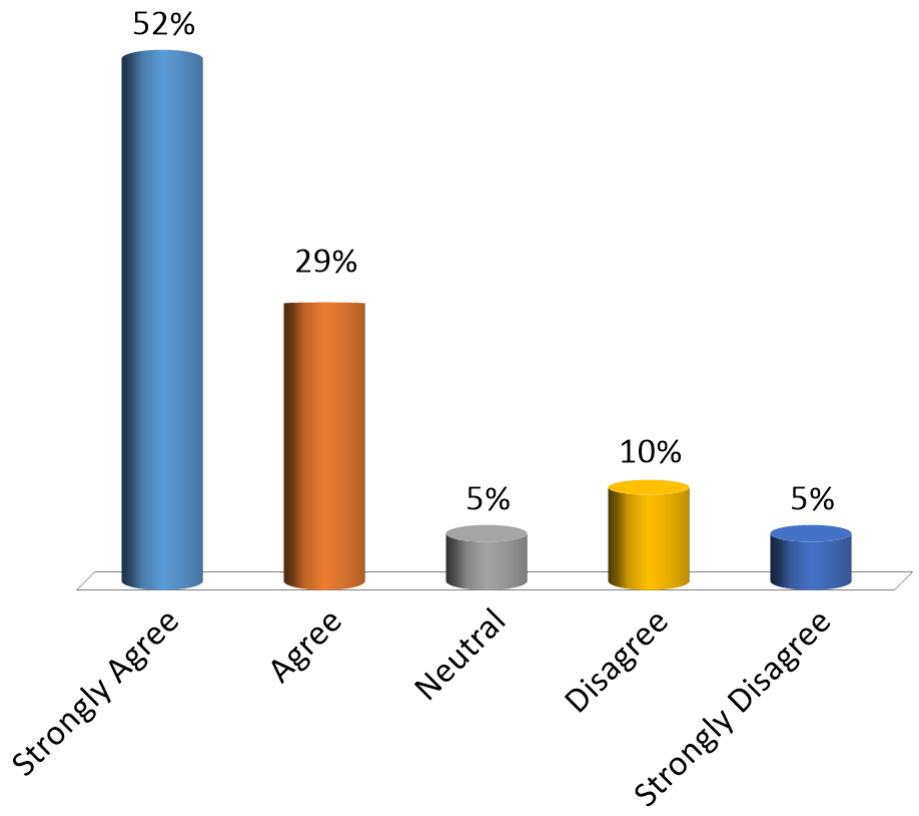
Which role do you most identify with?

A. Plant
B. Resource investigator
C. Coordinator
D. Shaper
E. Monitor evaluator
F. Implementer
G. Team worker
H. Completer finisher
I. Specialist



I am looking forward to working as part of a team in this module?

A. Strongly Agree
B. Agree
C. Neutral
D. Disagree
E. Strongly Disagree



TW7

- Discuss timetable and Assessment of project
- Description of the PjBL scenario and report requirement
- Introduction to information searching.
- Brainstorming session to identify what information they need to progress further.
- Allocation of tasks to Individual members.

TW8

- Groups Report back what they have found.
- Teams have found some atmospheric concentration data relevant to their topic
- Units conversion workshop to support handling concentration data

TW9 -

- Teams give short oral presentation showing progress

  3 PowerPoint slides

- Peer assessment and feedback using given marking criteria

- Portfolio component 2% of module mark

TW9 – TW 10

TW10	Writing workshop.
TW11	Drawing conclusions and evaluating experience of team work.
TW12	Submit reports. Oral presentation on current success in tackling this environmental problem and conclusion
	Reflection exercise

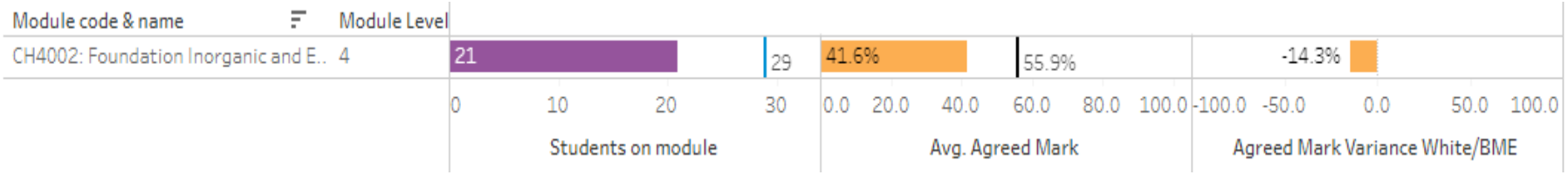
Feedback

- “Having the chance to do the project–based learning and the presentations helped to develop my presentation skills and working in a team to produce a final product. “

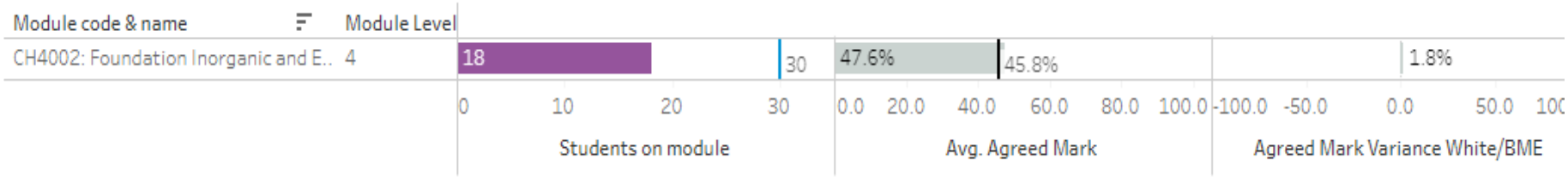
- “I do not question that Environmental Chemistry might be the future and really important, but at the same time I think it should be an optional subject” !

Impact on attainment gap

2017/8



2018/9

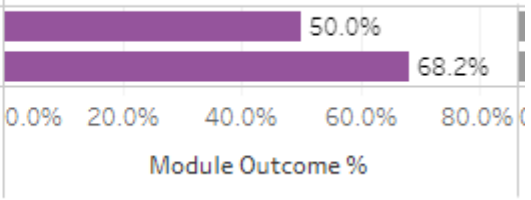


BME Attainment change from -14.3% to + 1.8%

Impact on pass rate at first attempt

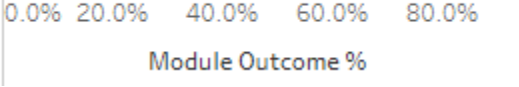
2017/8

Module code & name	Module Level	Select Characteristics	2017
CH4002: Foundation Inorganic and Environmental Chemistry	4	Clearing	50.0%
		Main Scheme	68.2%

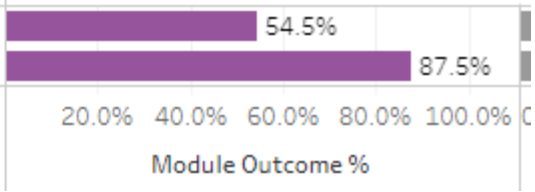


2018/9

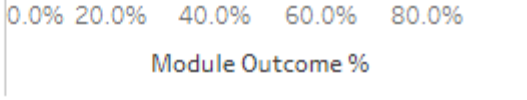
Module code & name	Module Level	Select Characteristics	201
CH4002: Foundation Inorganic and Environmental Chemistry	4	Clearing	72.7%
		Main Scheme	73.9%



Module code & name	Module Level	Select Characteristics	2017
CH4002: Foundation Inorganic and Environmental Chemistry	4	BME	54.5%
		White	87.5%



Module code & name	Module Level	Select Characteristics	201
CH4002: Foundation Inorganic and Environmental Chemistry	4	BME	72.2%
		White	76.9%



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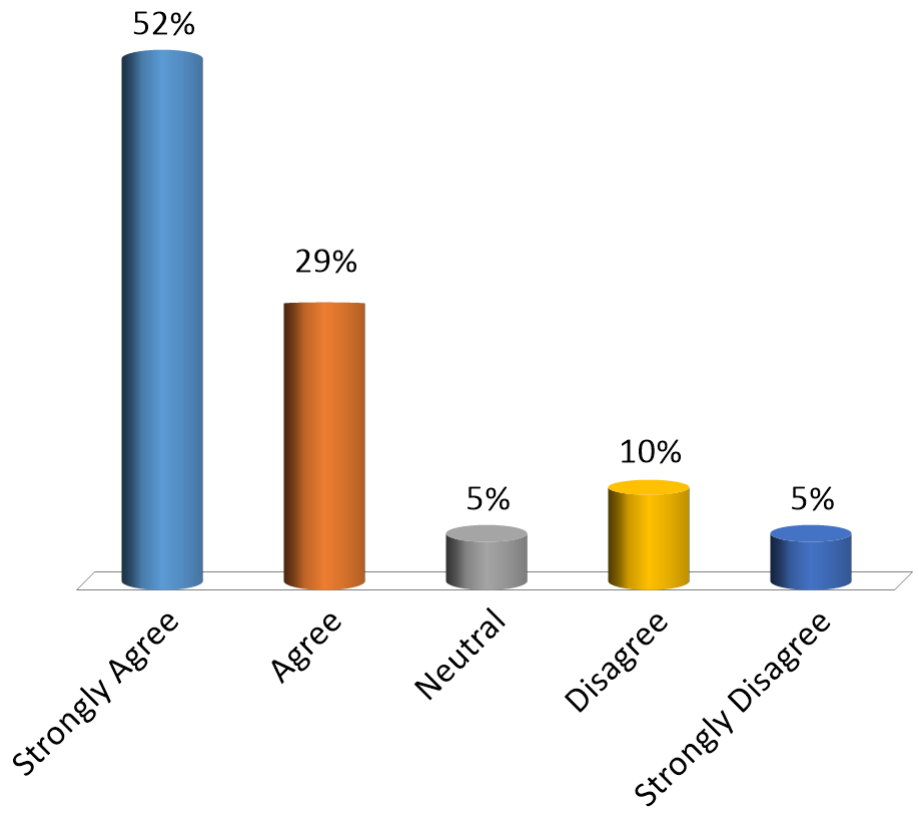

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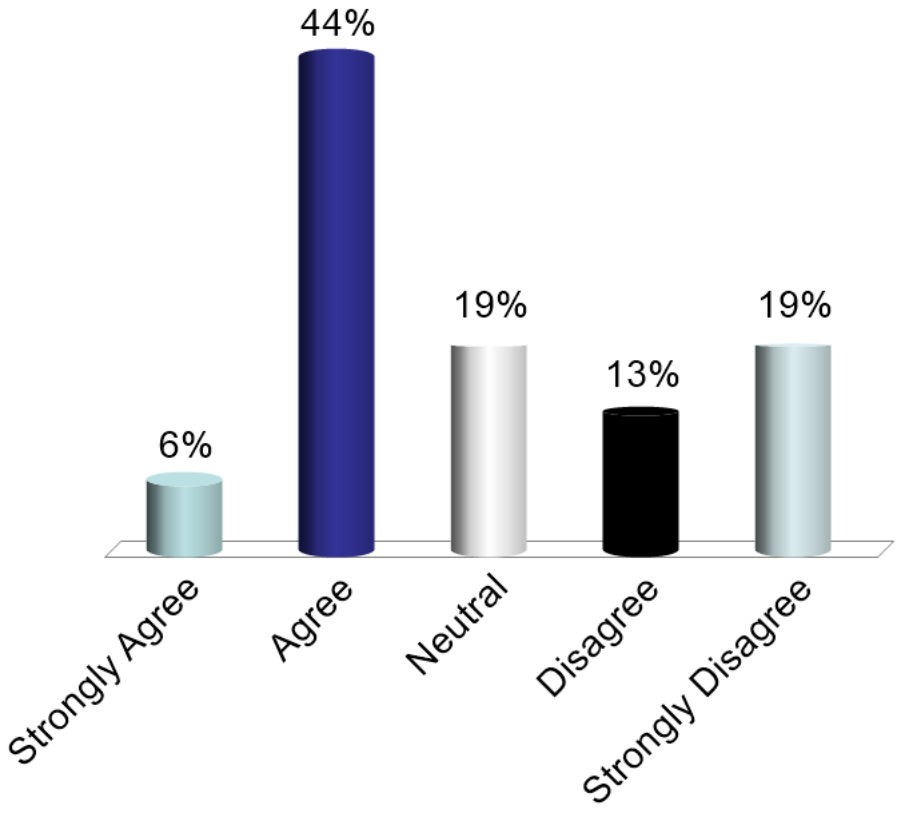
I have enjoyed working as part of a team in this module?

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