The Bureau of Meteorology

A JOURNEY IN CREATING A FLIP-TO-CLASSROOM COMPETENCY BASED SUBJECT

Tristan Oakley
Meteorology Trainer
Bureau of Meteorology Training Centre

OBJECTIVES OF THIS JOURNEY

1

Demonstrate a method to develop a flip-to-classroom subject.

2

Give ideas on how a flip-to-classroom can work, such as finding the balance between online content,tutorials and practicals.

3

A method used for assessing a flip-to-classroom competency subject.

WHY CHANGE?

1

Trail to see if it could be done

2

Course did not fully comply with WMO-No.1083 (2023) for BIP-M

3

Material was on a "rinse and repeat" cycle (was put together over 10 years ago)

- Some content was no longer correct

4

To pass the subject, students only needed to be marked as competent/not yet competent

ALL JOURNEY'S NEED A PLAN

WHAT IS THE CONTENT?

- How will it be delivered?
- What will be online learning?
- How many modules are needed?
- What will be face-to-face learning?

HOW ARE THE LEARNING OBJECTIVES ASSESSED?

- Are there tutorials?
- Are there practicals?
- Are there assignments?
- Are there exams?

Previous Module Breakdown

MARINE

- Wave basics (Lectures 1 and 2)
- Observations (Lecture 3)
- Marine NWP (Lecture 4)
- Marine Products (Lecture 5)
- 3 Tutorials (Nomograms, SpectralPlots, Developing Marine Forecast Policy)
- 1 Practical (GFE process or Non-Bureau work)
- 1 Online Exam
- 1 Practical Exam

OCEANOGRAPHY

- Intro to Oceanography and Physicalproperties (Lecture 1)
- Atmosphere and OceanInteractions (Lecture 2)
- Ekman Spiral (Lecture 3)
- Ocean Circulation (Lecture 4)
- Boundary Processes (Lecture 5)
- Regional Oceanography (Lecture 6)
- Tides and Sea Level (Lecture 7)
- Observations (Lecture 8)
- 3 Online exercises

New Module Breakdown

MARINE & OCEANOGRAHPY

- Sea, Swell and Wave Behaviour (2 hours online module)
- Observations (in situ and remote) (1 hour online module)
- Marine NWP and Forecast Verification (1 hour onlinemodule)
- Bathymetry (15 minute online module)
- Sea composition and Atmosphere and OceanInteraction (1 hour online module)
- Ocean Circulations and the Ekman Layer (1 hour onlinemodule)
- Eddies and Regional Oceanography (1 hour onlinemodule)
- Tides and Sea Level (1 hour)
- Marine and High Seas forecasting (Bureau Services) (1hour online module)
- Tsunami (1 hour online module)

NEW MODULE TUTORIALS AND PRACTICALS

- Tutorial: Nomograms (after Module 1)
- Tutorial: Spectra plots (after Module 3)
- Tutorial: Sea Surface temperature andcurrents (after Module 6)
- Tutorial: Sea Level (after Module 8)
- Tutorial: Marine Forecast Policy (after Module 9)
- Practical: High Seas Forecast (after Module 9)
- Practical: GFE process or Non-Bureau exercise (after Module 9)

Summary

- 10 modules
- 5 Tutorials
- 2 Practicals
- Extra time to help students who needed it

MODULE BREAKDOWN EXAMPLE

Module: Tides and Sea Level

Location: Online

Estimated time: ~45 minutes + 1 hour tutorial

Assessment: After module quiz

Topics:

1. Tides
- Tidal Theory
- Equilibrium Theory of Tides
- Lunar Orbit complications
- Tides with Lunar and Solar Forcing
- King Tides
- Tide Measurement
- Tide Types

2. Effects on Sea Level
- Storm Surge
- Meteotsunami
- Inverse Barometer Effect
- Coastally Trapped Waves

3. Sea level and Tidal Forecasting
- Tide Predictions
- Sea Level Forecasting
- Bureau services

Tutorial - Tides and Sea Level

WHAT COULD POSSIBLY GO WRONG?

PROBLEM 1:

Online content being dry or boring

PROBLEM 2:

Content not being understood or absorbed

MODULE BREAKDOWN EXAMPLE

Module: Tides and Sea Level

Location: Online

Estimated time: ~45 minutes + 1 hour tutorial

Assessment: After module quiz

Topics:

1. Tides
   - Tidal Theory
   - Equilibrium Theory of Tides
   - Lunar Orbit complications
   - Tides with Lunar and SolarForcing
   - King Tides
   - Tide Measurement
   - Tide Types
1. Effects on Sea Level
   - Storm Surge
   - Meteotsunami
   - Inverse Barometer Effect
   - Coastally Trapped Waves
1. Sea level and Tidal Forecasting
   - Tide Predictions
   - Sea Level Forecasting
   - Bureau services

Tutorial - Tides and Sea Level

Where possible module uses video interview with Subject Matter Experts (SME's) to explain theory, applications and services

Where possible, animations used to explain concepts (some animations from COMET)

Avoided large chunks of text, broken up with images or interactive activates to see the information and retain what has been seen

Knowledge checks used throughout module to reinforce theory

SME's checked content to make sure correct

PROBLEM 3: HOW DO WE ASSESS LEARNING OBJECTIVES ARE BEING MET?

DECIDING ON THE ASSESSMENT

End of subject exam

End of Module Quizzes

Assignments

There were several options for the assessment/s

Assessed Practicals

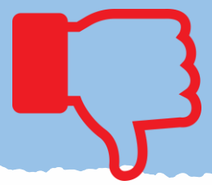
Assessed Tutorials

PROBLEM 3: HOW DO WE ASSESS LEARNING OBJECTIVES ARE BEING MET?

DECIDING ON THE ASSESSMENT

End of Module Quizzes

End of subject exam



Assignments

There were several options for the assessment/s

Assessed Practicals

Assessed Tutorials

PROBLEM 4: HOW TO RETAIN INFORMATION THROUGHOUT THE SUBJECT, NOT JUST FOR THE ONE MODULE OR TUTORIAL?

INFORMATION RETENTION

End of Module 1 Quiz

- 100% of questions related to Module 1

End of Module 2 Quiz

- 90% of questions related Module 2, 10% Module

End of Module 3 Quiz

- 90% questions related to Module 3, 10% Modules 1 and 2

End of Module 10 Quiz

- 70% questions related to Module 10, 30% Modules 1 to 9

Note: Each quiz remained around 20-25 minutes to complete

Another Note: The best answered questions were those from other modules

FULL ASSESSMENT BREAKDOWN

1

Actively participate in all tutorials and practicals and complete all online modules to a satisfactory standard.

2

Complete each tutorial session

3

Obtain a minimum mark of 80% overall made up of various assessments
- End of Module Quizzes (100% total, about 10% each, some quizzes will be worth more than others)

PROBLEM 5: HOW TO STOP STUDENTS FROM DOING THE ENTIRE SUBJECT IN 1 WEEK OR LESS?

SOLUTION

MODULE 1	TUTORIAL	QUIZ
MODULE 2		QUIZ
MODULE 3	TUTORIAL	QUIZ
MODULE 4		QUIZ
MODULE 5		QUIZ
MODULE 6	TUTORIAL	QUIZ
MODULE 7		QUIZ
MODULE 8	TUTORIAL	QUIZ
MODULE 9	TUTORIAL	QUIZ
MODULE 10		QUIZ

- PRACTICAL 1
- PRACTICAL 2

FEEDBACK

Overall mark for the subject was 90%

RESPONSE TO THE COURSE

- 75% of respondents were satisfied with the subject
- 75% either agreed or strongly agreed with the delivery method helped to achieve the learning outcomes
- Written feedback suggested the tutorials and practical were good, as they reinforced the theoretical content

SUGGESTED IMPROVEMENTS

- Delivery of the tutorials (currently online exercises)
- Module 1 not being so long

JOURNEY'S END

LESSONS LEARNT

Have clear learning objectives, and how you want to accomplish them

✓Have a plan and know what the end goal is!

Not having to repeat a lecture every year is great, but not at the expense of students experience (and sanity)

Make any online material not just reading, make it engaging and fun (if possible)

✓If you have fun making the subject it will come through the learning

✓Look how to improve content all the time

Use tutorials and practicals for the face-to-face engagement

✓Reinforce theory learnt with hands on experience

Take on all feedback

✓My quizzes probably need to be a little harder

Use SME's/other trainers if you can for feedback

The Bureau of Meteorology

THANK YOU AND CAN YOU RECALL EVERYTHING THAT WAS SAID?

Questions?

tristan.oakley@bom.gov.au