DEPARTMENT OF MATHEMATICS AND STATISTICS

Pathways in Teaching

Retreat for Women in Mathematics
ICMS, Edinburgh
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Overview

- Background
- Teaching path
- Reflecting on the past three years
- Formative feedback: Different types of Quizzes
- Feedback practices
- Advice

Background

- MSc Mathematics with Teaching degree
- Y3 – Y5: Algebra
  (National Research Competition for UG students)
- Tutoring UG classes

Szeged, Bolyai Institute (Hungary)

- PhD in Mathematics (2001-2004)
- Tutoring UG classes (new culture)

St Andrews, School of Mathematics and Statistics

Background

2005 – 2009: Visiting Scholar at Heriot-Watt and Glasgow University

Joined the STEM Ambassador Network (outreach)

2010 - 2012: Visiting Scholar and Research Fellow at the Business School, University of Strathclyde

Lecturing one MSc class and additional tutoring

2013 - 2019: Teaching Associate in the Department of Mathematics and Statistics (fixed-term contracts until 2016, Teaching Fellow from 2020)

Module leader of several UG classes, supervising student projects, advising students, supporting accreditation processes, mentoring and supporting junior members of staff, serving on teaching related committees and Faculty Exam Boards, special needs students

2015: Fellow of the Higher Education Academy
2018: Senior Fellow of the Higher Education Academy

Career paths

Academic	Knowledge Exchange	Research	Teaching

Teaching path

Teaching: 40 - 50 credits of modules per year (3 - 4 different modules) + Project supervision (4)

Assessment: continuous components + final exam in Y1 and Y2, final exam in Y3 and Y4

Cohort-size: 130 - 220

Personal Development Adviser: around 20 - 25 students each year

Year 2 Adviser: 120 - 150 students

Pedagogical scholarship: Leadership in Teaching and Learning Networks,
Senior Fellows at Strathclyde
Advance HE
QAA for Higher Education
Psychology of Mathematics Education Network (Sheffield Hallam University)
Learning Mathematics with Lean (Loughborough, Imperial)
Talmo (Michael Grove, Rachel Hilliam, Kevin Houston)

Reflecting on the past three years

2020 - 21: Pivoting to online teaching was a huge challenge for everyone

To tackle some of these an Online Teaching Group was set up in our department

Weekly structure on VLE to help pace students' learning (flipped learning)

Weekly Zoom meetings (polls, GeoGebra Classroom, chat facility to engage students)

Online Quizzes (STACK, Moodle (latex package)),
online submission of written work - online marking

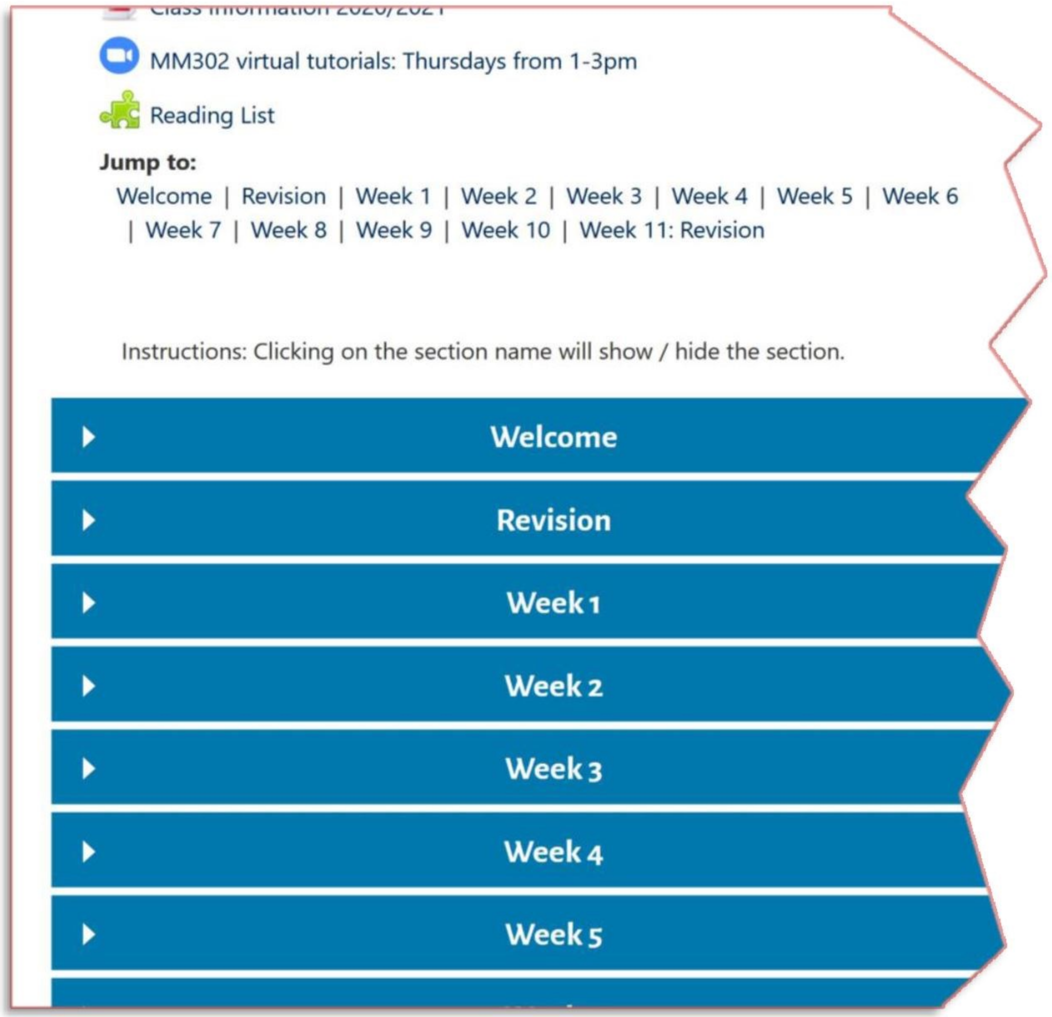
Online open-book assessments

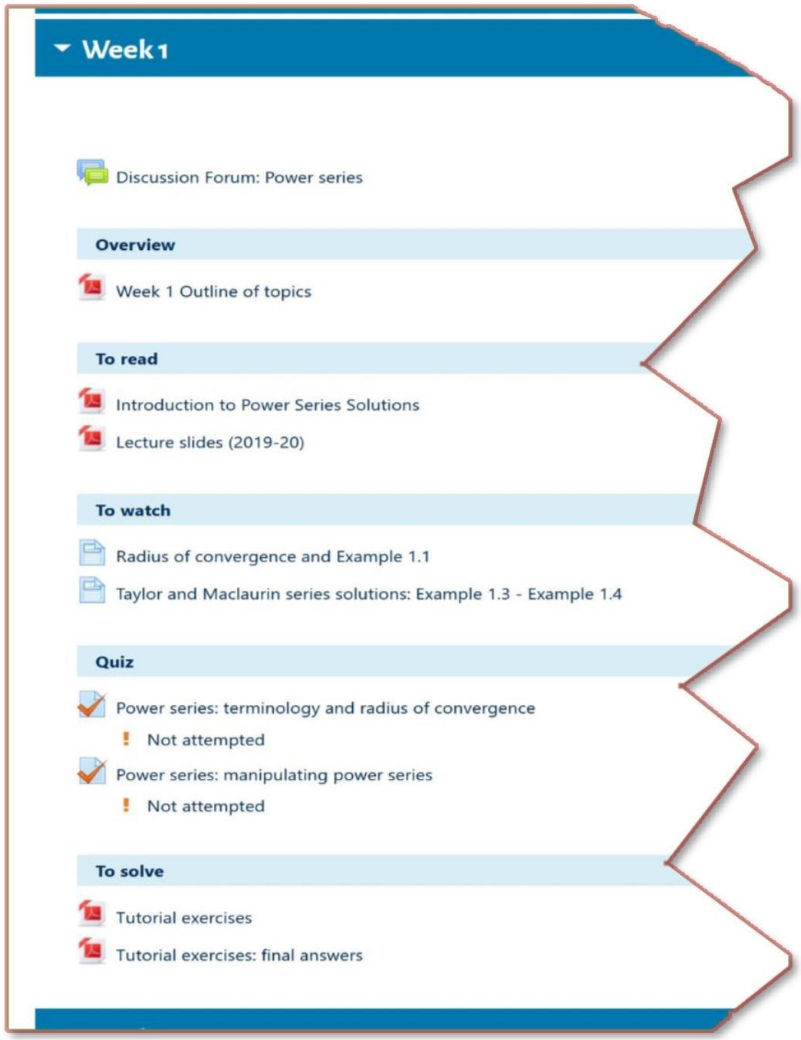
2021 – 22: Hybrid delivery, each student was offered to attend at least one on-campus session per week

Online open-book assessments

2022 - 23: "Return to normal"?

Weekly structure





Different types of Quizzes

Consider the power series $\sum_{n=0}^{\infty} a_n(x-x_0)^n$. The series will always converge at $x = x_0$. What interests us most, is whether there are other points for which the series converges. Fill in the blank spaces below that describes the possible convergence behaviour of a power series:

1. The power series ______ at $x = x_0$ and ______ for all $x \neq x_0$.

2. The power series ______ for all $x \in \mathbb{R}$.

3. There exists a positive real number $R > 0$ such that the power series ______ for all x such that $x_0 - R < x < x_0 + R$ and ______ when $x < x_0 - R$ or $x_0 + R < x$. At $x = x_0 - R$ and at $x = x_0 + R$, the series may converge or ______

We call R, the ______ Formally, we set $R = 0$ in the first case and $R = \infty$ in the second case. We can use the ______ test to determine R.

Different types of Quizzes

In this exercise, you will need to determine the first few terms of the **sequence of partial sums** of a given power series at a given point. Based on your findings, observe whether the power series convergences or diverges at that point.

Consider the power series $\sum_{n=0}^{\infty} 2^n x^n = 1 + 2x + 4x^2 + 8x^3 + \ldots$ centered at $x_0 = 0$ and consider the sequence of partial sums $S_m = \sum_{n=0}^{m} 2^n x^n = 1 + 2x + 4x^2 + 8x^3 + \ldots + 2^m x^m$.

Exercise 1 Determine S_0, S_1, S_2 and S_3, when $x = 0$ and write your answer in the boxes below.

$S_0 =$ ☐, $S_1 =$ ☐, $S_2 =$ ☐, $S_3 =$ ☐.

Observe that the limit of the sequence of partial sums exist, the power series is ☐ at $x = 0$. In fact, every power series is ☐ about its centre.

Exercise 2 Determine S_0, S_1, S_2 and S_3, when $x = 1$, write your answer in the boxes below.

$S_0 =$ ☐, $S_1 =$ ☐, $S_2 =$ ☐, $S_3 =$ ☐.

We observe that in this case the limit of the sequence of partial sums does not exist, the power series is ☐ at $x = 1$. (Note ,that when $x = 1$, we obtain the geometric series $\sum_{n=0}^{\infty} r^n$, where $r = 2$. It is well known that the geometric series is divergent if $r > 1$.)

Exercise 3 At $x = \frac{1}{2}$, the power series becomes the geometric series $\sum_{n=0}^{\infty} \left(\frac{1}{2}\right)^n$. It is well known that the geometric series is ☐ when $|r| < 1$.

Different types of Quizzes

By shifting the index of summation, the power series $\sum_{n=0}^{\infty} n(n-1)a_n x^{n+2}$ was rewritten, so that the generic term involves x^n. What is the resulting form of the power series?

Select one:

- a. $\sum_{p=2}(p-2)(p-1)a_p x^p$.
- b. $\sum_{p=-2}(p-2)(p-1)a_{p-2} x^p$.
- c. $\sum_{p=0}(p-2)(p-3)a_{p-2} x^p$.
- d. $\sum_{p=2}(p-2)(p-3)a_{p-2} x^p$.
- e. $\sum_{p=0} p(p-1)a_p x^p$.

Different types of Quizzes

Consider the function $f(x) = \ln(a - x) + \sqrt{b + x}$, where a and b are constants. Find the values of a and b, if the natural domain of f is $\mathrm{dom} f = [-3, 5)$. (Your answers should be integers.)

$a =$

$b =$

Different types of Quizzes

Tidy STACK question tool | Question is missing tests or variants.

Differentiate $\cos(2\cdot x)+\frac{1}{x^2}$ with respect to x:

Different types of Quizzes

No variants of this question have been deployed yet.

```
aa: 2+rand(4);
bb:1+rand(3);
exp: cos(aa*x)+x^(-bb);
ta: diff(exp,x);
```

Differentiate \({@exp@}\) with respect to \(x\):

[[input:ans1]] [[validation:ans1]]

1

[[feedback:prt1]]

Feedback: some well-received practices

Make it clear to students at the beginning of a semester how often and what type of feedback they will receive (e.g. verbal feedback during tutorials, written feedback on homework, immediate feedback on Quizzes, facilitate self-assessment)

Prompt turn-around time on written work (1-2 weeks)

Written only feedback is better than giving marks – always look at the good points, never say “This is wrong!”

Offer the opportunity to discuss any feedback comments on written work

Prepare a document discussing common mistakes on summative assessments

Advice

Join the STEM Ambassador Network https://www.stem.org.uk/stem-ambassadors

Apply for Advance HE (Associate) Fellowship https://www.advance-he.ac.uk/fellowship/your-routes-fellowship

Join Advance HE Connect https://www.advance-he.ac.uk/advance-he-connect

Sign up to TALMO http://talmo.uk/

Have a mentor

Look out for staff networks at your Institution