

Bringing the Research Group Ethos into Taught Master's Learning



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Master's Learning

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What is an MSc
Physics for?

What do we want
MSc students to
become?

Conflicting
demands?

Providing the
environment

The research
group ethos

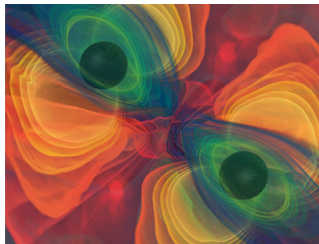
Building the
community

Action learning
sets

Outcomes and
feedback from
2015/16

Where next?

MSc Physics and MSc Astrophysics at Cardiff



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New MSc courses for 2015/16 (cohort size 12):

- ▶ Ground-up design: 2× **new** 20cr core modules each;
- ▶ 8× 10cr elective modules drawn from existing MPhys degree;
- ▶ Running alongside and implementing lessons drawn from MSc Biophotonics;
- ▶ A dedicated course coordinator per MSc, T&S career pathway.

What is an MSc Physics for?

Typical post-MSc career paths:

- ▶ **Academia:** PhD;
- ▶ **Industry:** R&D;
- ▶ **Other:** secondary education, scientific journalism, etc.

Why study an MSc Physics?

- ▶ **Development:** student holds a BSc Physics;
- ▶ **Conversion:** student holds a BSc in a related subject;
- ▶ **Other:** CPD, change of career, mature students, etc.

The “typical” MSc Physics student:

- ▶ Holds a BSc and wishes to do a PhD in physics or work in industry;
- ▶ **Has little or no experience outside of university.**

What do we want MSc students to become?

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Straw poll: “what would you like new PhD students to be able to do?”

- ▶ **Coding**, data manipulation and automation;
- ▶ Making, interpreting and presenting physical observations;
- ▶ Experimental design, ethics, risk assessments;
- ▶ Grant proposals;
- ▶ Project planning, “thinking ahead”;
- ▶ Effective communication orally and in writing.

Note that this list heavily emphasises **skills**.

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What must PhD students do in order to be successful?

- ▶ Successfully integrate into an existing research group;
- ▶ Adapt to local conventions and norms;
- ▶ Identify and develop a research niche;
- ▶ Personal, skills and network development;
- ▶ Plan, conduct and present research;
- ▶ Establish a solid support network for future career development.

Note that this list heavily emphasises **social interaction**.

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Where next?

Conflicting demands?

Practical and research skills

- ▶ What the student must **do**;
- ▶ An emphasis on the individual?

Engagement and community

- ▶ What the student must **be**;
- ▶ An emphasis on the group.

We have successfully merged development in both areas by ensuring the MSc cohorts have the following:

1. A dedicated MSc space – the **environment**;
2. A unifying sense of purpose – the **research group ethos**;
3. A consistent and reliable support infrastructure in the **core modules**.

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Where next?

Providing the environment



Conference room



Teaching laboratory

Dedicated MSc facilities are of central importance:

- ▶ No lecture theatres for core module contact time – **learning in the round**;
- ▶ IT and laboratory provision for entire cohort – **guaranteed facilities**;
- ▶ General-purpose space out of contact time – **student ownership of space**;
- ▶ Co-location with MSc coordinators' offices – **daily staff contact**.

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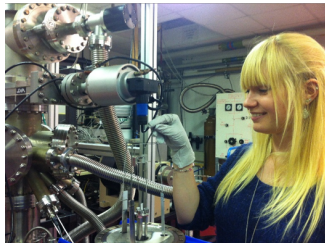
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The research group ethos



Research group ethos around which MSc community is built:

- ▶ **Proactivity:** flipped learning, delegation of responsibilities to the students;
- ▶ **Ownership and partnership:** semester-length overlapping micro projects;
- ▶ **Accountability:** weekly group meetings with updates and agreed targets.

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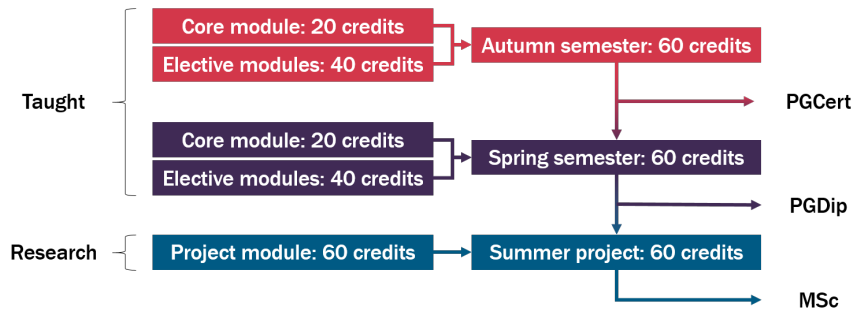
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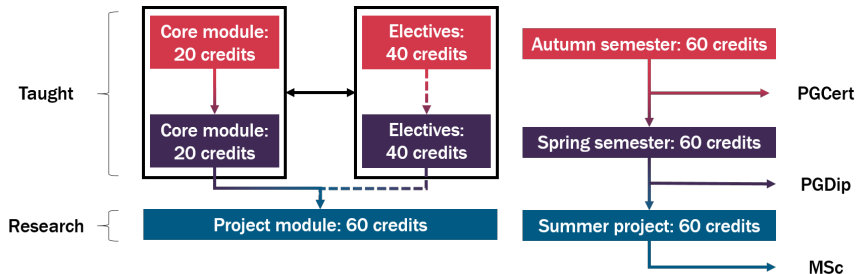
Building the community: core module top-level design



Standard MSc course structure:

- ▶ 120 credits taught, 60 credits research project;
- ▶ Logistical view, hard to distinguish from an “MPhys plus”.

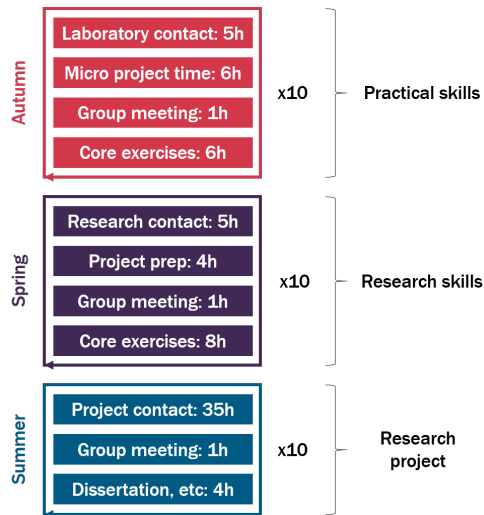
Building the community: core module top-level design



Separate teaching learning structure from logistics:

- ▶ Core modules are the heart of the MSc courses;
- ▶ Tight **coupling**, **scaffolding** and **consistency** of core and project modules.

Building the community: week-by-week



Coupling, scaffolding, consistency:

- ▶ Weekly group meetings with **action learning sets**;
- ▶ Core modules 50% independent projects, 50% set exercises;
- ▶ Core ILOs aligned to needs of project and beyond.

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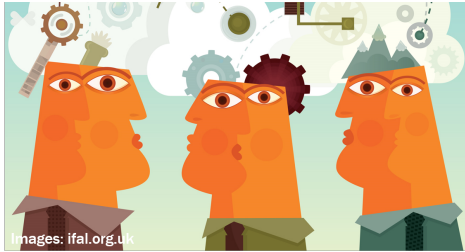
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Where next?

Action learning sets



Central component of the weekly group meetings:

- ▶ We implement the Marquardt model: $L = P + Q + R$;
- ▶ Each student brings an update and is in turn the focus of the session;
- ▶ Action plans decided on, students accountable to their peers;
- ▶ Builds community, facilitates original thinking and reflection.

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Where next?

Outcomes: students engage well and proactively

2015/16 MSc Physics student feedback (MQs / PTES):

- ▶ “Frequent CA has been good for ensuring I always do work”;
- ▶ “Read more papers than I have ever done before – good experience!”;
- ▶ “I found [the weekly contact and feedback] increased my confidence and crucially has instilled a self-sustaining motivation”.

2015/16 MSc Physics External Examiner feedback:

- ▶ “During our discussion with the students, it was apparent they tended to **work full working days (9 – 5) every weekday**”;
- ▶ “They spent most of this time on the work for the core modules, and some of it for the electives”;
- ▶ “They felt they could finish their work to their satisfaction within the given time frames [. . .] A sign of an excellent workload for MSc students.”

Outcomes: a strong sense of community

2015/16 MSc Physics student feedback (MQs / PTES):

- ▶ “Great community within the postgraduate areas”;
- ▶ “Having a designated MSc Physics area has immeasurably improved the quality of the experience”;
- ▶ “Really enjoyed how close the cohort has become – spending so much time around each other definitely creates a support network which is helpful”;

2015/16 MSc Physics External Examiner feedback:

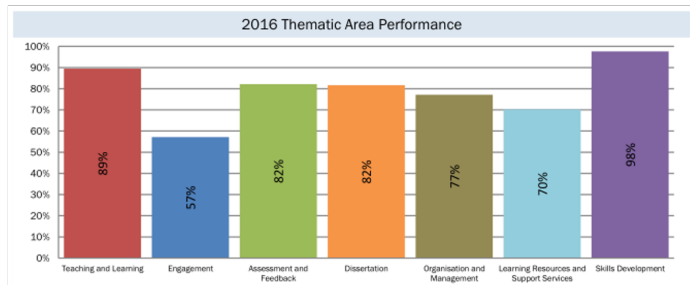
- ▶ “The students value the sense of community highly”;
- ▶ “[This] is aided by the very interactive style of teaching as well as the facilities offered to the students, such as having their own dedicated space to work in”;
- ▶ **“Clearly they work collaboratively and accelerate each other’s learning in this way.”**

Outcomes: module marks and PTES survey

Practical (autumn)	Average	STDEV
Quizzes	80.7	7.2
Exercises	73.7	9.2
Book-keeping	82.2	11.3
Reports	68.0	7.6
Presentations	69.0	10.8
Overall	73.4	7.3

Research (spring)	Average	STDEV
Lit reviews	53.2	16.2
Lit critiques	59.3	22.3
Grant proposals	64.0	11.9
Project proposal	71.6	14.0
Presentations	71.6	10.7
Overall	64.0	15.0

Core modules



PTES (3x MSc)

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Where next?

- Compare module scores with MPhys final year average of 65%.

Where next?

Lessons learned from 2015/16:

- ▶ Weekly interactions and ownership were very popular and positive;
- ▶ Skills and group working prepared students well for summer project;
- ▶ Switching “cold” from PGT group to live research group challenging;
- ▶ The solid community is a clear strength of the course.

Changes to be made for 2016/17:

- ▶ All-cohort group meetings to be extended into summer project period;
- ▶ Closer integration with PGR community: use of PG Lecture Series;
- ▶ Expected larger cohorts will require dedicated teaching support.

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