

UNIVERSITY OF ABERDEEN
QUALITY ASSURANCE COMMITTEE

**INTERNAL TEACHING REVIEW OF PHYSICS AND MATHS,
SCHOOL OF NATURAL & COMPUTING SCIENCES**

FINAL REPORT

PANEL VISIT: TUESDAY 18 AND WEDNESDAY 19 NOVEMBER 2014

PANEL:

Convener: Dr Marie-Luise Ehrenschwendtner, Quality Assurance Committee and School of Divinity, History & Philosophy, College of Arts and Social Sciences

Internal Panel Members:

Dr Rick Knecht, School of Geosciences, College of Physical Sciences

Dr Debbi Marais, School of Medicine and Dentistry, College of Life Sciences and Medicine

Ms Alexandra Pavelekova, Student Representative School Convener for the Business School

External Subject Specialists:

Dr Will Hossack, School of Physics and Astronomy, University of Edinburgh

Dr Brendan Owens, School of Mathematics and Statistics, University of Glasgow

Observer: Dr Mhairi Beaton, School of Education, College of Arts and Social Sciences

Clerk: Ms Sarah James, Academic Services, Registry

SCHEDULE:

DAY 1: TUESDAY 18 NOVEMBER	
Time	Interviewees
11:30	Head of School: Professor Jan Skakle
12:00	Heads of Discipline, Discipline Directors of Teaching and Learning, Programme Co-ordinators, and staff representatives from the Programme Advisory Boards: Aaron Tikuisis, Alexey Sevastyanov, Assaf Libman, Jarek Kedra, Alessandro Moura, Geoff Dunn, Norval Strachan, Ekkehard Ullner
14:00	Representatives from the UG and PGT teaching teams, including lecturers, teaching fellows and new members of staff: David Quinn, Meadhbh Boyle, Ran Levi, Richard Hepworth, Zur Izhakian, Francesco Ginelli, Ross Macpherson, Murilo Baptisa, Geoff Dunn, Norval Strachan
14:30	PGR supervisors: Aaron Tikuisis, JB Gramain, Ran Levi, Richard Hepworth, Ekkehard Ullner, Charles Wang, Murilo Baptisa, Alessandro de Moura, Francesco Ginelli
15:00	PGR Students, including those who teach
15:30	Disability Co-ordinators, Placement Co-ordinators, Erasmus Co-ordinators, Personal Tutors: Jarek Kedra, JB Gramain, Mark Grant, Geoff Dunn, Charles Wang, Ross Macpherson, Paco-Francisco Perez-Reche

DAY 2: WEDNESDAY 19 NOVEMBER	
Time	Interviewees
10:00	School Administrative Officer: Sandra Edwards
10:30	Administrative Staff and Technical Support Staff: Sheryl Mackay; Anne Gall, Lynne Harrison, Irene Brand
11:00	UG students (Levels 1 and 2), including students who have come through the Summer School
11:45	UG students (Levels 3 and 4), including students who have taken the School's 6CC course
15:00	Feedback to Head of School

Additional comments on the Self-Evaluation Document were received from:

Convener of the Quality Assurance Committee.....	Dr Kathleen Shennan
Deputy Registrar, Registry.....	Ms Katja Christie
Head of Careers.....	Mr Peter Fantom
Head of Student Support.....	Dr Lucy Foley
Equal Opportunities Policy Officer, Policy, Planning & Governance.....	Ms Christina Cameron
College Relationship Manager, Information Technology.....	Mr Russell Moffat

OVERALL IMPRESSIONS

The Panel is grateful for the co-operation of staff and students throughout the Internal Teaching Review (ITR), with staff and students providing their opinions openly. The overriding impression of the Panel is that the departments of Physics and Maths, within the School of Natural & Computing Sciences, provide extremely supportive environments for students. The departments have an open-door policy and all staff interviewed spent a considerable amount of time with their students, providing help and feedback when requested. The students confirmed that staff are always available and willing to spend time with them on a one-to-one basis. The department of Maths is commended for having programmes with good continuity and progression through the syllabuses, and Physics for running an accredited programme with relevance to industry. Throughout the ITR process, however, it was clear that the departments could work much more closely together, and differences in approach – particularly in relation to assessment and examination – appeared to result in lack of adherence to University guidelines, as well as unnecessary duplication of effort. Many of the recommendations in this Report relate to this.

1. Range of Provision

1.1 Maths: MA Programmes:

- Mathematics (G102)
- Applied Mathematics (G122)
- Computing and Mathematics (GG41)
- Economics and Mathematics (LG11)
- French and Mathematics (RG11)
- German and Mathematics (RG21)
- Hispanic Studies and Mathematics (RG41)
- History and Mathematics (VG11)
- Management Studies and Mathematics (GN12)
- Mathematics and Philosophy (GV15)
- Mathematics and Physics (GF13)
- Mathematics and Sociology (GL13)
- Mathematics with Gaelic (G1Q8)
- Mathematics with Computing (G102)

1.2 Maths: BSc Programmes:

- Mathematics (G100)
- Applied Mathematics (G120)
- International Foundation Mathematics (G101)
- Computing Science and Mathematics (GGK1)
- Mathematics and Engineering Mathematics (G190)
- Mathematics and Physics (FG31)
- Mathematics with French (G1R1)
- Mathematics with Gaelic (G1Q5)
- Mathematics with German (G1R2)
- Mathematics with Spanish (G1R4)

- Chemistry with Mathematics (F1G1)

1.3 Maths: Postgraduate Programmes:

- MSc in Mathematical Sciences (G10PB)
- MPhil in Mathematical Sciences (G10PA)
- PhD in Mathematical Sciences (G10PJ, G10UJ)

1.4 Physics: Undergraduate Programmes

- Bachelor of Science in Physical Sciences
- Bachelor of Science in Physics

- Bachelor of Science in Physics with Chemistry
- Bachelor of Science in Physics with Geology
- Bachelor of Science in Physics with Modern Languages
- Bachelor of Science in Physics with Philosophy

- Bachelor of Science in Computing Science and Physics

- Bachelor of Science in Chemistry with Physics

- Bachelor of Science in Geology–Physics
- Bachelor of Science in Mathematics–Physics

2 Aims of Provision

2.1 Maths states that the overall aims of its taught provision are to increase students' knowledge and understanding of Mathematics, and to ensure the acquisition of various skills necessary for solving mathematical problems.

2.2 The programme aims to:

- provide the students with the working knowledge of modern mathematics;
- be stimulating, interesting and challenging;
- encourage students to exercise their own judgement by including elements of choice in their final year;
- present mathematics as a growing and developing discipline (both in theory and application) with well-structured foundations;
- develop independence of thought and study that will enable students to acquire new knowledge and skills both in the work place and in their personal lives;
- demonstrate that mathematics is a subject of great elegance, beauty and utility that can reward its practitioners with deep satisfaction.

2.3 Maths also provides teaching specifically for other departments, and where it does so those departments typically own the courses and are responsible for aims and objectives. Maths presently delivers four courses for Engineering students, the aims of which are to furnish the students with the basic mathematical tools and techniques that are commonly used by engineers.

2.4 Maths states that it undertook a reform of its provision last year with the aim of addressing problems that students have had in honours years which stem from the lack of good foundational knowledge and basic technical skills. The new programme started this academic year and will be gradually implemented over the next 3 years.

2.5 Physics states that its overall aims are to provide an excellent learning environment informed by research, to:

- provide knowledge and facilitate understanding of the basic principles and concepts of Physics and how these relate to the physical universe;
- enable development of transferable skills including communication and problem solving skills in the context of a career with physics content;
- show how Physics can be applied to other subjects.

At the end of a student's degree, Physics graduates will have an accredited or recognised degree with a suite of skills that will prepare them for work, research or higher education (eg PhD).

2.6 More specifically, for taught provision the department aims to:

- supply students with the key subject based skills that are essential for physicists;
- provide training in the appropriate mathematical techniques and problem-based learning;
- teach the basic use of information technology, computer programming techniques and statistical skills for analysis of data;
- demonstrate and provide experience of experimental methods and safety procedures;
- enhance transferable skills;
- oral and written communication skills (eg to present complex information in a transparent and concise manner);
- library skills for information retrieval;
- analytical skills (eg to use technical language appropriately, construct logical arguments and to understand and apply complex ideas);
- careers skills (eg how to prepare a CV, for an interview and identify the types of work/research that physicists carry out);
- personal skills (eg team working with colleagues, use initiative, meet deadlines, independent working and self learning);
- show the applications of Physics elsewhere;
- provide applications of physical principles elsewhere (eg medicine, mathematical modelling, the environment and biology).

2.7 Physics also aims to provide the basic principles of physics in a manner appropriate for students majoring in other subjects. This is taught in two ways:

- (i) for students who require some knowledge of physics for their chosen subject (eg maths, biology and geology); and
- (ii) for students who want to study physics at a general interest level (eg astronomy, meteorology and the physical nature of the world).

2.8 For undergraduate taught provision the department also aims to:

- (i) cater for the teaching of Physics in the local catchment area (Aberdeen is the only provider of undergraduate physics teaching in the North of Scotland and a significant proportion of our students come from the local catchment area); and
- (ii) provide opportunity for distance learning (through key learning courses). This latter point offers the opportunity of widening access.

2.9 The introduction of the Physical Sciences degree recognises a group of people who are interested in physics but who lack ability in maths. This degree has physics as its major component but there are no mandatory courses, instead allowing the student to build a suitable major/minor degree from the physical and geosciences and engineering.

2.10 Physics states that the aims of the department's taught provision are in line with the University's mission. The outcomes are directed to the creation of autonomous, self-aware learners as described in the University's Model of the Learner. This is enabled by moving from 'teaching' to 'learning' as the degree progresses. Most courses have a balance of continuous assessment exercises and exam, though some are wholly continuously assessed. A range of assessments is included, and also include group work, often placed in context (eg Case Studies). By programme

year 4, self-directed learning is emphasised through courses such as Case Studies and the Honours Project.

3 Staffing

- 3.1 The Head of School reported the School is currently finalising a position of School Director of Teaching and Learning and the Panel **commends** the School for this initiative. In addition, the Head of School stated that whilst the staff–student ratios in both disciplines are good (averaging 12–15 students per member of staff), there is a need for the appointment of two permanent teaching fellows – one for Physics and one for Maths – to match the provision in Chemistry and Computing. Undergraduate student numbers are low with 20–25 and 30–35 graduating students each year in Physics and Maths, respectively. Physics has seen an increase in PhD numbers whereas Maths has seen a decrease. This decrease has lessened the supervisory workload but increased the teaching and tutoring workload. Each department within the School has its own workload model. Most of the academic staff interviewed agreed that their workloads were reasonable and that they were consulted.
- 3.2 The School Administrative Officer reported that it is difficult to retain secretarial staff because of competition from the energy sector. Frequent changes in secretarial staff obviously have an impact on the effectiveness of the team.
- 3.3 The Panel noted from the Self-Evaluation Documents (SEDs) that the numbers of female staff are very low as are the numbers of female postgraduate research (PGR) students. The College is working towards Athena SWAN awards and it is hoped that the initiatives relating to this will help to attract female members of staff. The Panel **commends** the College for taking on this initiative.

4 School Organisation

- 4.1 The Panel noted that the departments state that it is necessary for them to work in very different ways and that all four departments in the School work separately. In interviews, academic staff did not see that this led to duplication of effort and felt that it was necessary to have different approaches, with the needs of Maths and Physics having evolved separately over the years. Whilst the Panel understands the need for different approaches, it has some concern that this has led to practices within the School which vary from those of the University's Academic Quality Handbook (AQH); for example in the use of external examiners (see 8.1 and 12.1; cf. also 9.3). In addition to this, it is evident that it has led to duplication of posts and lack of cohesion within the School.
- 4.2 It was evident to the Panel that the School's administrative team work well together in the day-to-day running of administrative duties in what is a difficult environment given the different practices of the departments within the School. The team reported that their work would be made more effective if the departments had similar practices, especially in relation to assessment and examination and student attendance monitoring. The team also reported that they could contribute significantly in suggesting amended procedures to rationalise and improve the way things are done, and it was apparent that the team are keen to do so. The School Administrative Officer confirmed that the different practices added unnecessary difficulty for the team, with particular concerns regarding assessment and the use of external examiners. The Panel **commends** the administrative team for their commitment. The Panel understands that the School Administrative Officer attends the School Executive and **recommends** that the School Administrative Officer is included in the further discussion and consultation regarding School administrative procedures and how these might be harmonised.

- 4.3 In relation to 4.1 and 4.2 above, the Panel was pleased to hear that the Head of School is currently in the process of introducing changes that will bring about more cohesion within the School with the introduction of a School-level approach, with School-level committees and School-level roles to oversee and co-ordinate assessment and examination, programme and course development, and teaching and learning enhancement, to improve communication, guidance and practice. The Panel **commends** the Head of School for beginning this necessary change in structure and culture and looks forward to reports of the progress made.
- 4.4 The department of Physics shares one Laboratory Technician with the School of Engineering, Maths does not require a technician. There are several Laboratory Technicians for Chemistry as well as 1.5 Computing Officers for the whole School. As well as setting up and running teaching laboratories, the Physics Technician supports research laboratories and summer schools. The Panel heard that the Technician can have up to four laboratories running at the same time, which is very difficult to manage. In addition, there is no cover for annual leave and other absence. The Technician reports directly to the various Course Co-ordinators with no formal meetings or co-ordination with the other Technicians within the School or the College. The Panel **commends** the Technician for juggling a difficult workload and **recommends** that the Head of College reviews the current framework of Technicians within the College so that there is greater co-ordination of this provision, preferably with a team-based approach and appropriate cover for annual leave and other absence.

5 Course and Programme Design, Accessibility and Approval

- 5.1 The Panel notes that Maths delivers courses in pure maths only and Physics delivers courses in physics and applied maths. Many students take courses from both disciplines or are on joint programmes.
- 5.2 Students registered on joint degrees say that there is a lot of repetition in the programmes and that the make-up of the joint degree does not seem to be thought through. Many of the compulsory courses in one discipline have very similar content to the compulsory courses in the other discipline. The Panel noted that the School reported that some of the repetition is necessary and suggests that the School might find ways to communicate this more clearly to students.
- 5.3 Physics students feel that the programme is too scattered with not enough continuity. Students who had taken 'A' levels report that the courses in level 1 repeat a lot of what is taught at 'A' Level. The Panel noted, of course, that the Scottish degree progresses from Scottish Highers and not from 'A' levels. The students also reported that they learn completely new material in the second half session of programme year 4, which is not the time to be doing this and that all learning should take place before they do their honours project. Many students say that they would like the whole of the half session to be dedicated to the honours project. Staff commented that the structure is partly dictated by the IOP and acknowledge that perhaps the links – which do exist – are not made explicit to the students.
- 5.4 Maths students on the whole are very happy with the Maths programmes and feel that there is good continuity and progression from one level to the next. The staff commented that the programmes had been reviewed specifically with these aspects in mind. The Panel **commends** the department for reviewing its programmes in this way.
- 5.4 Staff reported that more enhanced study Maths courses have been introduced so that students who want to do only Maths courses can do so. Many of the Maths staff and students at levels 3 and 4 reported that generally they do not agree with Enhanced Study, particularly Sixth Century courses

(6CC), the main problem being that students who study Maths do not want to study other disciplines. Other staff, however, said that the 6CC are very valuable courses and that most of them are excellent. It is felt that the level 3 6CC do need some further thought.

- 5.5 Students at levels 1 and 2 overwhelmingly enjoy the 6CC, with students who had taken 6CC run by other disciplines saying they very much enjoyed the courses – saying they were very cleverly designed and encouraged students to think about things from different points of view and gave the opportunity to mix with students from a different degree who had a different approach. Students said they particularly enjoyed the opportunity for debate, presentation and creativity, which they said complemented their Maths and Physics courses well. The students said that the 6CC and their collaborative nature helped to build skills in areas that will be useful in employment. Students commented that the courses required students to do a lot of work, but if you put in the hours and were committed then you could get good marks.
- 5.6 Students commented that some of the 6CC courses (especially one or two of the Level 3 courses) were seen to be ‘easy credits’. The Panel **recommends** that the University investigate this as the comments made by many of the students did indeed indicate that the courses were not sufficiently broad or challenging.
- 5.6 The School has ceased to run the MPhys programme and staff reported that this was because no applications were being received. The programme was not as flexible as the MChem and was therefore not attractive to students. The cessation of the programme appears not to have affected the number of applications overall, or the percentage of RUK applicants. The Panel questioned why Maths had no postgraduate taught programmes running. Staff reported that the applications were of a very poor quality from self-funding international students. The Aberdeen Maths programmes tend not to attract UK students as they are pure Maths. On being questioned why the department had not expanded its programmes beyond the niche pure maths programmes, staff responded to say that there is not the expertise to do so. The Panel **recommends** that the School look at the strategic development of its taught postgraduate provision, particularly in relation to how the current provision might be enhanced to attract a wider range and higher number of applicants.

6 Teaching, Learning and Assessment

- 6.1 Most of the Students interviewed are satisfied with the courses and teaching, though some students said that they would prefer the Maths courses, in particular, to have more variety in teaching and assessment style. Students reported that many of the Maths classes are taught problem solving and that there are one or two multiple choice tests each week.
- 6.2 Students commented that they would prefer to have all of their marks and feedback electronically rather than on a sheet, as some lecturers still deliver feedback and marks on a handwritten sheet. Students generally are happy with the amount and level of feedback they receive. All students said that they would prefer more similarity between courses in terms of how and what is put on MyAberdeen; saying that they would prefer all of their courses to be on MyAberdeen and that the uploaded material should include the lectures, the lecture slides and notes, and the assessments, grades and feedback, where appropriate.
- 6.3 Staff confirmed that approximately 50% of assessments for Maths are in-class multiple choice questionnaires, and said that it would be difficult to vary these. Staff expressed some reluctance to use MyAberdeen to deliver marks and feedback, saying it is not possible to do so. The Panel suggested that MyAberdeen might be used to enhance the assessments and the feedback – and that students had requested this – but staff reported that MyAberdeen cannot cope with

complex equations. The Panel **recommends** that staff discuss this issue with the E-learning Team in the Centre for Academic Development in order to find a solution that meets the students' needs.

- 6.4 Maths students commented that the Level 1 tutorials do not work well because of the very high numbers. Tutorials are run more like a lecture or a problem class rather than a tutorial, with it being common for there to be 50–100 students in a single tutorial. Less confident students said that they felt uncomfortable speaking in tutorials because of the large numbers, adding that the way that the tutorials are run (ie not split into smaller groups) means that not everyone has an opportunity to contribute. Some students said they feel they gain very little from the tutorials. The Panel **recommends** the School explores ways to deliver smaller-group teaching within the tutorials.
- 6.5 Some of the teaching of Physics tutorials is done by level 4 undergraduate students and the students reported that the quality of this varies considerably, with some tutors seeming not to know how to run a tutorial. On the whole, students said they would prefer to have tutorials delivered by lecturers or perhaps PhD students; at least overseen by a lecturer. Not all of the students who were interviewed who assisted with teaching had undertaken appropriate training. The Panel **recommends** that the School ensures that all PhD students (or level 4 students) who assist with or teach tutorials receive proper training from the Centre for Academic Development.
- 6.6 Students in Maths are supportive of the use of blackboards and chalk, though most would like this teaching method to be supplemented with other methods so that there is more variety. Students did not feel that the use of blackboards and chalk should be eliminated or significantly reduced but they did want additional methods to be used alongside the blackboards. Staff and students commented that many of the blackboards are too small, and that whilst they would like to be able to deliver classes with blackboards and chalk alongside another method, unfortunately the classrooms are not set up to allow this. The Panel **recommends** that the School discusses the issues regarding the requirement for larger blackboards that can be used alongside other technologies, with Estates.
- 6.7 In discussions regarding pedagogies more generally, staff had various opinions as to the usefulness of innovative methods. In general, Maths prefers a traditional approach and believes this works best for their students. Physics has many e-learning courses or elements of courses that are presented through Camtasia or through visualisations on MyAberdeen. Students commented that they find this very useful – especially those for whom English is not their first language – as it allows them to revise a lecture afterwards. Whilst the Panel recognises the requirement for a traditional approach, it nonetheless **recommends** that Maths, in particular, explore the use of more innovative pedagogies and technologies and how these may be combined with the traditional methods.

7 Course and Programme Monitoring and Review

- 7.1 The Panel heard that monitoring and review of courses and programmes is done at the discipline level. Maths has recently reviewed its provision and Physics review depends largely on the requirements of the accrediting body, the IOP. The Maths students were very happy with the structure and progression of their programmes and the Panel **commends** the School for reviewing its Maths provision.

8 Academic standards and the academic infrastructure

- 8.1 The departments follow different procedures for the use of External Examiners. Physics sends a selection of material to Examiners twice each academic year and asked Examiners to comment not

just on the assignments and the marks but also to provide more general comments on the degrees and their structure, for example. Staff in Physics commented that it was becoming increasingly difficult to find academics willing to undertake the role. Some of the Maths staff send their papers to the External Examiner to comment on the questions, and Maths holds an examination meeting in the summer when the examiners read through the students' examination papers. The Panel was concerned to hear that some of the staff in Maths do not support the External Examining system and have different understanding of what the University's procedures are. The Panel **recommends** that the Head of School considers harmonising these procedures – perhaps with the introduction of a School Examinations Officer – and that School procedures in relation to assessment and examination follow those detailed in the University's Academic Quality Handbook.

- 8.2 Staff in Physics saw and had an opportunity to respond to the External Examiner Annual Reports and include their recommendations. Staff in Maths said they did not see the Reports but were informed by the Head of Discipline if an Examiner had identified a problem. The Panel **recommends** that all staff in the School have access to all External Examiner Annual Reports.
- 8.3 Physics students in year 4 meet an External Examiner to discuss their final-year project. The Panel notes that this exercise has been working successfully for a number of years with examiners, staff and students benefitting from the exercise. The Panel **commends** this practice.

9 Training and supervision of research students

- 9.1 Physics has research links with the Complex Medical Systems Group, which has attracted a large number of the departments' PhD students. The Institute for Pure and Applied Maths at the moment is focussed on Physics staff research, though it is hoped to bring a more collaborative approach that would include Maths and attract Maths and Physics PhD students, and to be involved more in teaching. The Panel **commends** the School for its involvement in these two research groups and its plans to enhance its research-led teaching.
- 9.2 Physics staff reported that because the nature of their research is collaborative, PhD students may have more than the usual two supervisors, with some having three or perhaps four. Students reported that generally they met with their supervisor at least once per week on a one-to-one basis and saw their supervisors every day as part of their research projects.
- 9.3 In Maths, students generally have only one supervisor. The Panel questioned this given that the University's Code of Practice for Research Students (Academic Quality Handbook Section 5, Appendix 5.4) specifies that all PhD students should have a supervisory team, consisting of more than one supervisor, and that one supervisor from the team should act as lead supervisor. The staff interviewed were not aware of this requirement for more than one supervisor. The Panel **recommends** that the School ensure that all staff involved in supervising research students are familiar with the University's Code of Practice and regulations relating to research students and degrees, as specified in the Academic Quality Handbook and University Calendar. The Panel also **recommends** that the School ensures that all of its PhD students are assigned a supervisory team.
- 9.4 Staff had mixed views on the Postgraduate Research Monitoring Framework, some thinking that students focussed too much on producing their reports than on their research, whereas others considered that it kept students on track and provided a useful paper trail of progress. Most of the students interviewed liked the Framework saying that it forced them to consider what progress they had made, whether there were any gaps they needed to address, and helped them to plan.

- 9.5 The Panel heard that the departments run some events for their PhD students and **recommends** that the School consider introducing regular fora for PhD students where they can come together to present and discuss their research, for example, as is the case in other Schools. Some staff thought that the departments should focus more on training students in how to write their thesis and the Panel **recommends** that the School ensures that its PhD students are aware of the courses that are run by the Centre for Academic Development. Some of the students interviewed had taken the Centre's courses and found them to be extremely useful.
- 9.6 Of the PhD students interviewed who also teach, most commented that they would like to have training before they started teaching, commenting that the Centre for Academic Development's courses are run too late in the session to be helpful. The Panel **recommends** that the Centre review the timing of its courses so that they can be of real benefit. In addition to this, there appeared to be some inconsistency between the disciplines in their payment of PhD students in terms of what is included in the paid hours (eg some students were paid for preparation time, others were not). The Panel **recommends** that the School ensures that payment is consistent between disciplines.
- 9.7 Students said that funding and finance was a problem and all students interviewed said they had to work. For some students, teaching a minimum of 2-hours per week was a requirement in order to maintain the research funding. Students said that funding was available from the School for travel to conferences and one could obtain funding once per year. Some external sources of funding were available. Students commented that the procedure for obtaining internal funding was to apply to the Head of School. Some students were aware of other Schools where all PhD students were entitled to up to £300 per year for conferences and thought it would be better to have a similar system in Maths and Physics.

10 Personal development and employability

- 10.1 Students commented that in Maths, in particular, none of the courses at levels 1, 2 or 3 included aspects of oral presentation or developing debating skills. Just one course at level 4 included presentation. Students in Maths commented that they felt unprepared for the level 4 course and unprepared for employment and further study at masters or doctoral level. Many of the students interviewed were keenly aware that their peers in other disciplines had enhanced skills in these areas. In Physics there are several courses that include presentation and team work, and the project work in level 4 includes collaboration. The Panel **recommends** that the Schools look at the courses in Maths and ensure that students have opportunity to develop their oral communication, presentation and collaborative skills in courses at all levels of their programme.
- 10.2 The Panel heard from the Physics students that Physics incorporates team work and collaboration in many of its courses as well as at the Braemar weekend. The students very much enjoyed these aspects of the discipline. Students spoke very highly of the Braemar weekend and felt that they learnt a lot; the students added that they would like the weekend to be available in programme years 3 and 4. The Maths students said that they would like more opportunities for collaboration and team work, with only one of their courses requiring team work (modelling theory). Maths students would also appreciate something equivalent to the Braemar weekend. The Panel **commends** the School for running the Braemar weekend for the physics students and **recommends** that the School looks at how an equivalent to the Braemar weekend – incorporating collaboration and team building – might be provided for maths students.
- 10.3 Level 4 and PhD students who had had the opportunity to help with tutorials very much enjoyed the experience and the skills it enabled them to develop. One student had proactively taken a course in leading tutorials with the Centre for Academic Development and other students

commented that they would have taken this training as well had they known about it. The Panel **commends** the School for the initiative of using Level 4 students to assist with tutorials though **recommends** it monitors this carefully to ensure that students who deliver teaching are properly supported and trained. The Panel suggests that the School might consider widening this initiative across all the disciplines within the School.

11 Professional units/bodies

- 11.1 The Panel noted the documentation provided by Physics relating to professional units and bodies. This area was not explored during the review other than in relation to Section 5, above.

12 Staff Training and Educational Development

- 12.1 The Panel noted from interviews with new staff that because the departments are small, another member of staff was always available to answer any questions one might have. Two staff interviewed knew of the Teaching Fellow Network and had attended meetings. The Panel noted a lack of connection to University-wide practices and initiatives in Maths, however. This involved both lack of understanding of university practices (student monitoring and use of external examiners as examples), but also failure to take up useful opportunities such as the courses offered by the Centre for Academic Development.
- 12.2 Whilst many of the staff in Physics had attended courses run by the Centre for Academic development, staff in Maths said that the Centre did not understand the discipline and that the courses were of little use because the pedagogies did not apply to Maths. The staff, however, said that they have not fed this back to the Centre or provided suggestions as to how the courses might be made more relevant. The Panel nonetheless **recommends** that the Head of School ensures that the School's staff from all disciplines engage with the Centre and take up the courses on offer, working with the Centre to develop tailored courses if necessary.

13 Student involvement in quality processes

- 13.1 The students interviewed had mixed opinions about the usefulness of the class representative system. Many students, particularly in years 1 and 2, did not know who their class rep was. The election system had not worked well last year or this year and there were cases where same person represented seven courses. Some nominees had been elected but then not been informed that they had been elected. Some students who tried to register as a nominee had not been able to. Most students felt that the system had been better when the representative was elected in class. Some of the students used social media to keep in touch as a class and found this to be very helpful.
- 13.2 The majority of students interviewed did not know about Staff–Student Liaison Committees (SSLC) and did not know whether or not a student representative sat on any of the School's committees; students had not seen minutes of School committees or of SSLCs. The research students who were interviewed said that they did not have student representatives so there was no representation of research students on the School's Committees. They did have staff co-ordinators but did not see minutes of committees or meetings. The Panel **recommends** that the School considers ways in which student representation can be improved, especially in terms of PGR students' voice.

13.3 Most students who were interviewed said that they completed the SCEF forms (though the School reports that returns are very low) and they liked them being on-line. Students commented, however, that the timing coinciding with examinations was not good. Engineering, it was said, did a mini-SCEF half way through the term and students liked this idea. The Panel **recommends** that the School considers introducing mini-SCEFs mid-term.

14 Public information/management information

14.1 *This was not explored during the review.*

15 Student support, retention and progression

15.1 Most students interviewed said that the staff in the departments are very approachable and friendly and always willing to spend a lot of time helping students who have problems or questions. Some of the less confident students, however, said that they would prefer there to be more formal opportunities (eg in tutorials) to ask questions. On the whole, all students feel that the departments provide a lot of support and one-to-one advice. Students in programme years 1 and 2 said they were committed and had a sense of belonging to a community; this was less the case in years 1 and 2. The Panel **commends** the departments for its open-door policy and for creating a supportive environment in which students feel committed and have a sense of belonging and **recommends** it considers ways to build this sense of community in years 1 and 2.

15.2 The Head of School reported that retention figures were poor. Very small numbers of student left (1–2 per year) but many of the Physics students who left did so in their third year, the reason appeared to be that students did not want to continue if they were on track for a third-class or lower-second-class degree and would rather find employment in the energy sector. The School reported that it seemed that students found it easier to find employment in the energy sector, for example, with no degree than with a lower class degree. Many Maths students who left did so in their first or second year, or left with a designated degree. Students who were struggling were offered options of changing to another degree in their third year, but most students did not take up these opportunities.

16 Recruitment, access and widening participation

16.1 The departments did have difficulty in recruiting female students, particularly at PGR level. The Head of School had been part of the International Women's Day – running a workshop and session for 13-year-old female secondary pupils – and was also part of the 'Let Toys be Toys'. The departments also have engagement with the Science Festival and Café Scientifique. In addition, physics staff went out to schools to talk to sixth form students. The Panel **commends** the School for this important engagement with schools and the wider community.

16.2 Some staff believe the University's English language requirements to be too high – especially for PhDs. Others did not agree commenting that students require good English skills particularly in order to communicate their research and to teach.

16.3 Both departments commented on the difficulty in attracting PhD students to Aberdeen. Physics students tend to be attracted to the Doctoral Training Centres (DTC) as they are funded and/or are salaried, and Physics at Aberdeen is too small to be part of a DTC and it is also physically distant, even from most of the Scottish universities, which makes collaboration more difficult. The

departments receive good applications from Scottish and RUK students every year but most cannot afford to take up the offer. Recruitment of PhD students can be coupled with research grants, but one has to obtain the funding first then look for the student. At the moment, there is no open PhD studentship scheme to which potential students can apply. All staff commented that it would therefore be helpful to have one or two funded studentships from the College each year, in addition to the University's Elphinstone Scholarships, adding that applying for Research Assistants is also a useful way to then get a funded PhD studentship.

17 QAA quality enhancement engagements

- 17.1 The Panel note that Maths states that it revised its curriculum in line with the University's Curriculum Reform Graduate Attributes (based on the QAA Enhancement Themes), focussing on those of Academic Excellence and Critical Thinking. Physics state that engagement with the QAA's Enhancement Themes is embedded within the curriculum, particularly in relation to graduate attributes, and developing and supporting the curriculum. Two of the department's staff have been nominated for the University's Excellence in Teaching award and one of the Teaching Fellows in Maths has won the award; the Panel **commends** this commitment to excellence in teaching.

18 Recent developments

- 18.1 The majority of students at all levels said they did not like the Personal Tutor system and did not think it was useful. Students did not understand why a Personal Tutor was necessary because all of the issues they were supposed to discuss could be covered by the University's Student Support Services. Personal Tutors could not cover academic issues because they might be in a different discipline and one had to go to the course co-ordinator or head of the department to discuss those issues. Personal Tutors seemed to be just 'middle-men' who would direct students on to professional support elsewhere in the University or to someone in the School. Only one student had a Personal Tutor who had discussed graduate attributes, employment and volunteering, but the student thought that the Careers Service would probably do the same thing. The dissatisfaction with the Personal Tutor scheme was very strong and this was the case for students as tutees and for staff as tutors. The Panel **recommends** that the University – in its review of how the Personal Tutor system has worked – consider whether the role of the Personal Tutor is distinct enough from that of the Professional Services staff, and whether Personal Tutors should be in the same discipline as their tutees.
- 18.2 Students and staff reported that Registration had not worked well because MyCurriculum did not work and students had been told that it would right up until the last minute. It was only when students arrived at Aberdeen that they found out that it did not work. Students reported that it was very stressful having to go to a timed session when they had thought they would be able to do it in a less rushed way. Staff (academic and administrative) reported that they were called at very late notice to register students – right until the week before registration they had been led to believe they would just assist students and guide them through the system. Staff and students described this as unacceptable. The Panel **recommends** that the University undertake a review of the way in which registration was handled and the impact that late communication had on both staff and students.

19 Quality enhancement and good practice

- 19.1 The Panel notes that in the documentation provided by Maths the department stated that it was unable to identify good practice and staff who were interviewed explaining that innovation was not

applicable to Maths. On further investigation, some of the staff within Maths were indeed including innovative practice and pedagogies within their teaching – this was not necessarily related to technology but nonetheless was quality enhancement and the Panel **commends** this.

- 19.2 Physics states that it aims to excel at research-led teaching and that many of the Physics students go on to higher degrees, continuing to work with their undergraduate project supervisors. Overall, an exceptionally large proportion of Physics students continue on to higher degrees.
- 19.3 The Physics Electricity and Magnetism course works very well and, as the problems of teaching electricity and magnetism at this level are well known in many universities, the department believes could be disseminated to physics departments in other universities.
- 19.4 All Physics students are offered membership of the professional body, the Institute of Physics (IOP) and the department believes this to be important in offering students access to information, advertising, career services, plus an excellent magazine with topical articles that will students to feel a part of a community of scientists who are thinking about exciting ideas. The Panel **commends** this.
- 19.5 The department of Physics runs a weekend in Braemar which remains an important part of the department's teaching and attempt to develop personal skills, group working, planning and creative thinking. The students spoke well of the event and students from Maths commented that they would like to have a similar event featuring team-working tasks.

20 Impediments to quality enhancement

- 20.1 The main impediments to quality enhancement identified by the Panel relate to some lack of engagement with innovative pedagogies and with the Centre for Academic Development in Maths; lack of common practices in the School with some divergence from the University's regulations, policies and procedures as detailed in the Academic Quality Handbook and Calendar, particularly in relation to assessment and use of external examiners; and a lack of a School-level Teaching and Learning Committee and related roles to bring the School together as a cohesive unit and to provide fora for the sharing of good practice. These are commented on in other sections of this Report.

21 Issues for discussion with external subject specialists

- 21.1 The issues raised by Maths (relating to tutorials and examinations, in particular) are covered by other sections of this Report.
- 21.2 The issues raised by Physics (how the challenges of personal tutoring and retention are addressed by other universities) were not discussed in detail as part of the Review, though it was noted during discussions that at Glasgow the Personal Tutor comes from the same discipline as the tutee.

22 Other issues

- 22.1 No other issues were raised.

23 Production and approval of self-evaluation document

23.1 The Panel noted that two Self-Evaluation Documents (SED) had been produced – one by each department. The Physics document had been produced and reviewed by several members of staff and by student representatives, before being seen by the Head of School. Maths provided no information on how its SED had been produced and it was not clear whether or not the documents had been reviewed by staff before submission. The students who were interviewed said they had not been involved in its production or review.

CONCLUSIONS

The Panel **recommends revalidation on the condition** that the recommendations in this Report are acted upon by the School. The Quality Assurance Committee (QAC) asks the Head of School to note that subsequent Internal Teaching Reviews will not cover the separate disciplines within the School but will cover the School as a whole, as is now the case for all other Schools across the University. Therefore, where the this Report makes recommendations, the QAC requests that the Head of School provides a One-Year Follow-Up Report to cover not only Maths and Physics, but also Computing, to report on what progress has been made – particularly in relation to the bringing together of the departments within the School and the harmonising of their procedures. Where the recommendations of the Panel have not been followed, the Report should outline the School's arguments leading to and justifying this decision.

The Panel thanks the Head of School and all staff involved for the work put in to organising the Internal Teaching Review documentation and visit.