

Final Report of the Review Panel to the Teaching Council following a review of the proposed new 5-year programme in Mathematics and Science Education

**BSc in Mathematics and Science (Hons)
MSc in Mathematics and Science-Education submitted
by University College Dublin**

December 2012

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1.0 Background

The Teaching Council is the statutory body charged with setting the standards for entry to the teaching profession and ensuring that these standards are upheld.

In accordance with Section 38 of the Teaching Council Act, 2001, the Council shall:

- (a) review and accredit the programmes of teacher education and training provided by institutions of higher education and training in the State,
- (b) review the standards of education and training appropriate to a person entering a programme of teacher education and training, and
- (c) review the standards of knowledge, skill and competence required for the practice of teaching, and

and shall advise the Minister and, as it considers appropriate, the institutions concerned.

The Teaching Council's role in relation to the review and accreditation of programmes of Initial Teacher Education (ITE) is distinct from the academic accreditation which programmes also undergo. Academic accreditation is based on the suitability of a programme for the award of a degree/diploma, whereas professional accreditation for any profession is a judgement as to whether a programme prepares one for entry into that profession.

The review and accreditation of programmes of ITE by the Teaching Council provides an opportunity for Higher Education Institutions (HEIs) to demonstrate that they offer quality programmes of teacher education. It is expected that the graduates of such programmes will achieve programme aims and learning outcomes which are aligned with the values, professional dispositions, and the standards of teaching, knowledge, skill and competence that are central to the practice of teaching.

In order to guide its review of programmes, the Teaching Council has published *Initial Teacher Education: Strategy for the Review and Accreditation of Programmes* (hereinafter referred to as the Council's review strategy). This document sets out the process by which programmes are reviewed. The criteria against which reviews take place are set out in a second document: *Initial Teacher Education: Criteria and Guidelines for Programme Providers* (hereinafter referred to as the Council's criteria). This document, which will apply to existing and new programmes (from 2012 in the case of concurrent programmes and 2014 in the case of consecutive programmes), relates to a range of areas, including programme design, areas of study, the duration of programmes, the numbers and qualifications of staff, facilities and resources. Significantly, the criteria:

- prescribe those areas of study which will be mandatory in programmes, including numeracy and literacy, behaviour management, parents in education, ICT and inclusive education
- set out, for the first time, the expected learning outcomes for graduates of all ITE programmes
- propose raising the minimum requirements for persons entering programmes of ITE at primary level and a literacy and numeracy admissions test for mature entrants
- require a 15:1 student-staff ratio

- call for the development of a new and innovative school placement model, involving active collaboration between HEIs and schools, and an enhanced role for the teaching profession in the provision of structured support for student teachers
- require that student teachers should spend at least 25% of the programme on school placement, and that such placements should be in a minimum of two schools
- require increased emphasis on research, portfolio work and other strategic priorities.

Providers of existing programmes have been asked to reconceptualise their programmes in line with the revised criteria and to submit them for accreditation. All providers have made a declaration to the Teaching Council that the criteria will be fulfilled and guidelines followed in respect of all of their programmes.

In parallel with the drafting of the Council's review strategy and its criteria for ITE, the Council has also published its *Policy on the Continuum of Teacher Education*, which sets out its vision for teacher education at all stages of the continuum – ITE, Induction, and Continuing Professional Development.

In 2012, the Council published *Teaching Council Requirements for Entry onto a Programme of Initial Teacher Education*, which set out the Council's revised subject criteria in draft form. Although not yet finalised, the draft criteria represent the Council's latest thinking in this area and have guided providers of post-primary concurrent programmes in determining the subject content coverage which is appropriate.

2.0 The Review Process

The review of University College Dublin's (UCD's) submission for approval of a five-year concurrent programme consisting of a three-year BSc in Mathematics and Science-Education (Hons) followed by a two-year MSc in Mathematics and Science-Education, took place in September and October 2012. The process was formally initiated when the Review Panel (hereinafter referred to as 'the panel') was appointed by the Teaching Council's Director, with Professor Áine Hyland as Chairperson.¹ To assist and support the work of the panel, Fionnbarra Ó Tuama was appointed as Rapporteur. The panel was also supported in its deliberations by an external subject expert and by the Director and staff of the Teaching Council.

Documentation relating to the application was submitted to the Teaching Council by UCD in May 2012. The review panel met initially on 30 August 2012 in the Glenroyal Hotel in Maynooth. At that meeting, a general briefing was provided by Tomás Ó Ruairc, Director, and Carmel Kearns, Education Officer of the Teaching Council. The Teaching Council's terms of reference and general principles bearing on the review and accreditation of the reconceptualised programmes of ITE were outlined in detail. On foot of that briefing, the panel gave some preliminary consideration to the UCD submission.

Following this meeting, individual members of the panel focused on specific aspects of the submission and circulated their comments and questions to other members of the panel. Following further consideration of the documentation and a collation of the initial views of the members of the panel, the panel met on 24 September 2012 with a delegation from UCD consisting of:

- Prof. Ciarán Sugrue, Professor of Education;

¹ Details of the panel membership are included in Appendix 1.

- Dr. Judith Harford, Lecturer and Joint Director Professional Diploma in Education (PDE), School of Education;
- Dr. Gerry MacRuairc, Lecturer, Director MEd, School of Education;
- Prof. Joe Carthy, Principal of the College of Science and Dean of Science;
- Dr. Peter Duffy, Associate Dean of Science;
- Dr. Maria Meehan, Senior Lecturer, School of Mathematical Sciences;
- Dr. Pauline Mellon, Senior Lecturer, School of Mathematical Sciences;
- Dr Lennon O Náraigh, Lecturer, School of Mathematical Sciences.

After the meeting of 24 September 2012, the panel further considered the documentation submitted by UCD. A number of emails were exchanged between Professor Áine Hyland, on behalf of the review panel, and Professor Ciarán Sugrue, on behalf of the UCD team. Professor Sugrue responded readily and rapidly to the many queries raised by the panel and provided significant further information and clarification in relation to issues raised. The panel would like to place on record its appreciation of the courteous and helpful way in which the UCD team engaged at all times with the process.

Having taken account of the material set out in the initial submission, the clarifications provided at the meeting, and the further information and clarifications provided in writing and verbally after the meeting, this report sets out the outcome of the panel's deliberations.

3.0 Context of the Review

The award for which accreditation is sought by UCD is an MSc in Mathematics and Science-Education which will be awarded to students who successfully complete a five year programme. The first three years of the programme will lead to a BSc and the final two years to an MSc in Mathematics and Science-Education. Students who wish to register as post-primary teachers will have to complete the full five-year programme and will receive both awards – the Bachelor's degree and the Master's degree.

There will be five separate pathways from which students can choose:

- Applied Mathematics and Mathematics-Education
- Biology and Mathematics-Education (two pathways, referred to hereinafter as Biology Pathway A and Biology Pathway B)
- Chemistry and Mathematics-Education
- Physics and Mathematics-Education.

The undergraduate programme will be part of the newly restructured common entry Science undergraduate degree programme (initiated in September 2011). There are currently 22 pathways through this programme and, if the five additional pathways are accredited by the Teaching Council, there will be a total of 27 pathways from which a student can choose. Stage 1 (First Year) is designed to give students flexibility in choosing their area of specialisation. It provides them with the opportunity to specialise in one or two disciplines or to sample a variety of scientific disciplines if they wish to do so. At the end of Stage 1, students choose two or three pathways of study in Stage 2 (Second Year), committing to the study of one of these subjects in Stages 3 and 4. The MSc in Mathematics and Science-Education constitutes Stages 4 and 5 of the programme. During these stages, while students will take some Mathematics and Science modules, they will predominantly complete modules in Foundation Studies and Professional Studies at Level 9.

The proposed programme and qualification is novel and innovative and its relative complexity resulted in the panel seeking clarification from UCD in relation to a number of different issues. Some changes were made by UCD to the initial documentation in response to issues raised by the panel.

4.0 Documentation

The documentation submitted in May 2012 by UCD was in accordance with the template provided by the Teaching Council in the Pro Forma and Guidelines which accompany the Council's review strategy. Key areas of focus were:

- Conceptual Framework
- Programme Design
- Programme Aims and Learning Outcomes
- Areas of Study
- School Placement
- Teaching, Learning and Assessment Strategies
- Student Intake
- Staffing
- Facilities
- Student Support and Guidance System
- Financial Resources
- Communication and Decision-Making Structures.

The documentation was supplemented at the meeting of 24 September 2012 by the *UCD Science 2013* brochure which explains the current pathways within the BSc programme clearly and succinctly. In response to further emails from the panel, Professor Sugrue submitted a further detailed clarificatory document on 13 October 2012. In preparing this report, the panel drew on all of these documents and on supplementary information furnished in discussions and emails.

5.0 Overview of the Programme

5.1 Award Level and Duration of the Programme

As indicated above, the proposed programme is of five years' duration, leading to an MSc in Mathematics and Science-Education. If the current proposal is approved by the Council, those entering the teaching profession from this programme will hold an award at Master's level (level 9). This will mean that some newly qualified second-level teachers will hold a Master's degree while those from other programmes will hold a Bachelor's degree, and some others will hold a Bachelor's degree plus a PDE – some at level 8 and some at level 9.

The panel discussed this at some length with the delegation from UCD at the meeting on 24 September. UCD is aware of the implications for the university and for students (e.g., from the point of view of financing and student grants) of setting the qualification at Master's level. The model is in accordance with the Bologna guidelines, where a programme of three years' duration, allowed by a further two years of study is expected to lead to a Bachelor's award followed by a Master's award.

5.2. Student Intake and Admissions Criteria

As the programmes leading to an MSc in Mathematics and Science-Education are pathways within the UCD Science DN200 programme, the basic entry requirements are the same as for other Science programmes, i.e., a minimum of two C3s at Higher Level and four D3s at Ordinary Level in the Leaving Certificate examination. Leaving Certificate subjects must include Irish, English and Mathematics, one laboratory Science subject, and two other subjects. In addition,

- for entry to Applied Mathematics and Mathematics-Education, students must have a C3 or higher in Higher Level Leaving Certificate Mathematics;
- for entry to Biology and Mathematics-Education, students must have a C3 or higher in Higher Level Leaving Certificate Mathematics and Biology;
- for entry to Chemistry and Mathematics-Education, students must have a C3 or higher in Higher Level Mathematics and Chemistry;
- for entry to Physics and Mathematics-Education, students must have a C3 or higher in Higher Level Mathematics and Physics.

Subject to successful completion of 120 ECTS (European Credit Transfer System) credits over Stages 1 and 2, students who complete certain core modules in Mathematics, Education and either Applied Mathematics, Biology, Chemistry or Physics, and obtain Garda vetting clearance, are eligible to progress to Stage 3 of the programme. However, a cap of 42 places will be imposed on the programme at this stage, and places will be allocated on a competitive basis subject to the following quotas for each of the five pathways as follows:

Pathway	Number of Places
Applied Mathematics and Mathematics-Education	6
Biology and Mathematics-Education (2 pathways)	12
Chemistry and Mathematics-Education	12
Physics and Mathematics-Education	12

Admission onto the MSc in Mathematics and Science-Education programme will be based on the following criteria:

- A minimum GPA of 3.0 based on Stages 2 and 3
- A high level of reflection in and engagement with placements in Stage 3
- A high degree of understanding and insight between educational ideas and the student's own learning, demonstrated through assessment submissions.

In addition to the above, in certain cases acceptance on to the programme will be subject to interview.

Because of the flexibility inherent in the overall design of the undergraduate Science programme, students who fail to achieve the requirements for entry to the MSc Mathematics and Science-Education programme, or who decide that they do not wish to progress along this pathway, may

transfer to another pathway, provided they satisfy the requirements for that pathway. Exit routes are provided at the end of each of the first three stages.

As regards students from non-traditional backgrounds, the panel notes that UCD has a general overall policy of access for such students under the HEAR², DARE³ and FETAC⁴ entry schemes. The panel notes that while the proportion of non-traditional students accepted into the Science programme in 2011 was 11.24%, statistics from the Equal Access Survey carried out by the HEA show that 17% of the total intake into UCD in 2010/11 came from lower socio-economic backgrounds.

5.3. Conceptual Framework

In its submission, UCD states that it has designed an innovative programme which has the potential to become a model of best practice in ITE in 21st century Ireland. The programme design means that it is neither consecutive nor concurrent in the traditional sense, but that it incorporates what is best in both models. Since it extends over five years, students gradually develop an understanding of disciplinary and pedagogical knowledge, and have the time and the space to become reflective practitioners in the truest sense.

From the start, the programme facilitates the gradual building of disciplinary and pedagogical knowledge and understanding. This knowledge is situated within a more broadly based contextualisation of the philosophy and history of Science and Mathematics. This is dovetailed with a similar engagement with the evolution of educational ideas, pedagogical capabilities, and didactic expertise. Constructivist principles underpin both the disposition of the programme and the mind-set it intends to engender amongst participants in a manner whereby they build a coherent and comprehensive expertise in an integrated manner.

The five-year programme is based on a number of key principles that integrate robust knowledge of the disciplines of Science and Mathematics with a high level of knowledge and understanding of the pedagogy of Science and Mathematics and a critical understanding of the contextual factors that shape/frame students, schools and education systems. The framework is derived from scholarship in the field of teacher education, the Teaching Council framework for programme accreditation, and lengthy discussions and reflections between colleagues in the School of Mathematical Science, the School of Education, and the College of Science in UCD.

5.4. Design, Programme Aims and Learning Outcomes

The design of the programme is innovative and novel. It is neither a fully concurrent nor a fully consecutive model, but strives to include the best of both approaches.

The focus during the Stages 1 to 3 of the programme is predominantly on the Mathematics and Science components. Education modules account for just 5 ECTS credits in Stage 1 and 10 ECTS credits in Stage 2 (from a total of 60 ECTS credits in each stage).

In Stage 3, 20 ECTS credits are allocated to Education and in Stages 4 and 5, 50 ECTS credits each year are allocated to Education.

² HEAR (Higher Education Access Route).

³ DARE (Disability Access Route to Education)

⁴ FETAC (Further Education and Training Awards Council)

School placement begins in Stage 3 and builds up gradually during Stages 4 and 5.

In addition to the Mathematics, Science and Education modules in Stages 1 and 2, students in Stage 1 may take up to 10 ECTS credits in another subject under the UCD Horizons programme, and in Stage 2 they may take 5 ECTS credits under this programme.

The panel notes that the overall design of the programme has been developed in line with the policy of the HEA that HEIs should offer generic first-year courses, and selection of more specialised courses should be undertaken at the end of first or subsequent years, when students have a greater awareness of the implications of their choice.

The panel is aware that the UCD team which planned the programme met with the executive of the Teaching Council when designing the programme during late Spring 2012. The panel is also aware that the *Teaching Council Requirements for Entry onto a Programme of Initial Teacher Education (post-primary)* were still at draft stage during the period when the programme was being designed, which made it difficult at times for UCD to ensure compliance with the criteria. The panel appreciates the willingness of the UCD team to make changes to the programme design and content when the initial choice of modules was found not to be in conformity with Teaching Council requirements. The panel commends the design team for its willingness to adjust and resubmit its submission at the request of the panel.

The panel is impressed by the overall principles and the aims of the programme and the congruence between those principles and aims, and the learning outcomes of individual modules. The clarity of the pathways is particularly impressive – a clear rationale is provided for the choice of modules under each pathway. The team is commended on the module learning outcomes, which are exemplary in the way they focus on higher-order thinking and on the application of theory to practice. The panel also commends the design team on the inclusion in each module of a section on integration and linkage which is designed to help students make the links between the particular module and other aspects of the programme. The clear and transparent way in which students are informed about the workload and assessment of each module is also commended, as is the information on the timing of assignments, which ensures that students can plan the work of the semester in a co-ordinated and integrated way.

5.5. Areas of Study

The panel recognises the challenge posed to the programme designers in devising pathways for this programme which would fit with the overall Science undergraduate programme while at the same time satisfying the Teaching Council criteria. The panel appreciates that UCD was willing to revisit some aspects of the programme to ensure conformity with the Teaching Council's criteria, notwithstanding the defensible rationale presented for the inclusion of some of the modules in the initial submission.

The panel notes that, following completion of the five years of the programme, and in line with the *Teaching Council Requirements for Entry onto a Programme of Initial Teacher Education (post-primary)* and *Initial Teacher Education: Criteria and Guidelines for Programme Providers*, a student wishing to graduate as a post-primary teacher of Mathematics and either Biology, Chemistry or Physics (including Junior Cycle Science) will have completed:

- 60 ECTS credits in Mathematics
- 60 ECTS credits in one of the Science subjects (Biology or Chemistry or Physics) plus a

- minimum of 10 ECTS credits in each of the other two
- 120 ECTS credits in Education including 60 ECTS credits in School Placement.

It should be noted that the above ECTS credit weightings are minimum thresholds which have been prescribed by the Teaching Council and, in the case of some areas of study, these minimum thresholds will be exceeded by the proposed programme. The following is a diagrammatical representation of the programme for Chemistry and Mathematics-Education as resubmitted by UCD on 13 October 2012 in response to requests for clarification of certain issues and for assurance that all elements of the programme comply with the Teaching Council criteria. This table replaces the table set out on page 11 of the original UCD submission and can be read as the template for the other pathways:

	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Total ECTS credits
Mathematics	15	20	15	5	5	60
Chemistry	10	20	20	5	5	60
Science Options	20					20
Electives	5	10	5			20
SCI10010	5					5
School Placement			10	20	30	60
Education Modules	5	10	10	30	20	75
Total ECTS credits	60	60	60	60	60	300

Table 1: Breakdown of 300 ECTS credits over 5 stages of the programme for Mathematics- and Chemistry-Education

In the light of the revisions made to its original submission, the panel is satisfied that the balance and the content of the modules proposed for all five pathways of the programme satisfy the Teaching Council's subject criteria.⁵

The panel is aware that UCD has well-developed systems and practices of advisory sessions for students, programme booklets, an online curriculum management system (CMS) and degree compliance procedures, to ensure that students choose the correct combination of modules in order to achieve their desired qualification. In this context, students need to be advised that they will be required to choose very specific module options in order to meet the Teaching Council's requirements in respect of Science, Mathematics and Applied Mathematics. This is particularly true in the case of Biology.

5.6. Linking Theory and Practice

In any professional programme, the link between theory and practice should be made explicit at every opportunity. If teachers are to develop as reflective practitioners, they need to understand the theory which informs best practice in their profession. It is important that all aspects of ITE programmes are informed by up-to-date research and that this link between research and teaching

⁵ As set out in *Teaching Council Requirements for Entry onto a Programme of Initial Teacher Education (post-primary)*, Teaching Council, Nov. 2011.

and learning is explicit and understood by students. As indicated in section 5.4 above, the panel is impressed by the way in which the documentation provided in the UCD submission is explicit in the way it links theory and practice.

5.7. Suggested / Required Reading

The panel compliments the UCD team on the indicative reading lists provided for each module. The lists are concise, relevant and up-to-date and are exemplars of the type of reading lists which should be provided for students on ITE programmes. The panel suggests that the reading lists for the Science Education modules should be reviewed to ensure that they include reading material on investigative and enquiry-based approaches to teaching Science.

5.8. School Placement

The panel notes that the overarching principles governing school placement map onto those of the Teaching Council's continuum of education and in particular to the criteria and guidelines for ITE. Thus, students will be expected to have experience of a range of supported placement situations and these will be maximised to allow for a broad experience of the school setting, with a focus on the wider school context and not just on actual classroom teaching. Placements will be underpinned by the concept of reflective practice with student teachers being supported in honing their reflective skills.

The panel commends UCD on the partnership approach to school placement, at the heart of which will be a close partnership with school leaders and co-operating teachers. These teachers will play a highly significant role in the formation of the student teachers. The model pursued is one in which the role of the co-operating teacher is at the core, and the university, through the placement tutor, will work closely with the co-operating teacher in scaffolding the learning of the student teacher. Placement will be assessed by two or more placement tutors. The panel notes that each student will be visited a total of six times in each of years 4 and 5 and that some of these visits will be by a subject expert.

The panel thanks the UCD team for responding to its request to provide grade descriptors for school placements and notes that the language in each category is currently under review to render it more consistent with university-wide criteria regarding standards and grades. The panel suggests that the criteria for assessing school placement, while sound, ought to be reviewed and revised to ensure that they identify behaviours which distinguish one grade from another. For example, rather than just recognising "excellent integration with school staff" it is suggested that (i) there should be some indication that the student contributed to the knowledge or understanding or development of the school staff in some concrete manner and (ii) at the "very good" and "excellent" levels there should be some ability shown to differentiate the responses of the pupils to teaching ("very good") and of adjusting one's teaching in light of such insights ("excellent"). The panel also notes that "good" is described as "above average"; and suggests that "good" should be regarded as "average" and "satisfactory" as "emergent".

The panel is aware that the grade descriptors are generic descriptors and are not specific to Science/Mathematics student teachers. It is suggested that in the case of student teachers on this programme, the grade descriptors might include a reference to the demonstration of skills that link practice to theory, especially skills associated with facilitating an investigative approach to Science. They might also include a reference to competence in carrying out laboratory work, since the Junior and Senior Cycle syllabi in Science subjects include a large number of laboratory experiments and

investigations.

5.9. Staffing, Facilities and Financial Resources

Details of the academic qualifications of members of the core group for this programme were made available to the panel, together with details of their teaching and research experience. The panel notes with satisfaction that all members of the core group hold a PhD in a relevant area of expertise and have impressive research records. It also notes that many of the staff in the School of Education have teaching experience at primary or post-primary level. While there are no names associated with individual modules at this stage, the panel notes the intention to make two further academic appointments – one in Mathematics Education (Pedagogy) and one in Science Education (Pedagogy), as well as an administrator and a placement officer.

As regards facilities, the panel notes that a new Science Centre costing €65 million is currently being constructed on the UCD campus and that this is due to open at the beginning of the next academic year. This Centre will provide a first-class, modern, cutting-edge science facility for the students of this programme.

As regards the funding of the programme and the student-staff ratio, the data available in the submission was insufficient for the panel to come to a definitive conclusion about these matters. The panel is aware that in a large Education Department such as the School of Education in UCD, it is difficult to separate the resources available for the MSc Mathematics and Science-Education from the resources available for the PDE. It recommends that UCD be required to furnish further details to the Council in relation to these matters and that when the reconceptualised PDE is being reviewed by the Teaching Council, the resourcing and staffing issue be examined more fully.

The panel is aware of the challenges being faced by Education Departments and Schools of Education in dealing with the current economic constraints, particularly in the context of extending the length of consecutive ITE programmes. The panel recommends that the resourcing situation of the UCD School of Education be carefully monitored in the years ahead to ensure that adequate resources (staffing, funding and space) will continue to be available for the effective delivery of all ITE programmes.

6.0 Overall Findings

The panel notes that all five pathways of this programme satisfy the Teaching Council's requirements and recommends to the Teaching Council that all pathways be accredited.

The Panel proposes that such accreditation would have a lifespan of six years and would be subject to any changes which may be made to the subject criteria in the intervening period. It further recommends that any subsequent review should take account of the views and experiences of graduates of the various pathways of the programme and of employers of those graduates. It should also take account of relevant findings arising out of the review of the university's consecutive programme (PDE).

The commendations below relate to areas of particular strength which the Panel has identified.

With regard to the recommendations below, the Panel recommends that the Teaching Council should require UCD to set out, in advance of the review of its extended PDE programme, its proposals for implementing the recommendations. It further recommends that the Council should prioritise those areas for particular attention when the programme falls due for re-accreditation.

The following commendations are made:

1. The panel commends Professor Ciarán Sugrue and the members of the UCD Science and Mathematics-Education team for their commitment to the provision of a high quality initial teacher education programme, for their courtesy throughout the process, and for the helpful and efficient way in which they engaged with same.
2. The panel commends UCD for devising an innovative programme which has the potential to become a model of best practice in ITE. The panel notes that the programme accords with the Bologna model of a three-year undergraduate programme leading to a Bachelor's degree, followed by a two-year programme leading to a Master's degree.
3. The panel notes that the programme is in line with Ministerial policy on generic (non-denominated) entry to higher education where specialisation is delayed until second or subsequent years.
4. The panel is pleased to note that exit routes are provided at the end of each of the first three stages of the programme for those who do not wish to pursue teacher education.
5. The panel is impressed by the overall principles and aims of the programme and the congruence between the learning outcomes of individual modules and their delivery and assessment with the overall aims of the programme.
6. The team is commended on the module learning outcomes, which are exemplary in their conciseness and in their focus on higher-order thinking and on the application of theory to practice.
7. The panel commends the team on the inclusion in each module descriptor of a section on "Integration and Linkage" which is designed to help students to make links between each module and other aspects of the programme.
8. The clear and transparent way in which students are informed about the workload associated with each module is commended.
9. The availability of information on the timing of assignments is commended.
10. The panel notes that the overarching principles governing school placement map onto those of the Teaching Council's continuum of teacher education and, in particular, the ITE criteria and guidelines. It commends UCD on the partnership approach which it has adopted, at the heart of which will be a close partnership with school leaders and co-operating teachers.
11. The panel welcomes the intention of UCD to make further academic appointments – one in Mathematics Education (Pedagogy) and one in Science Education (Pedagogy). It also welcomes the plans to appoint an administrator and a placement officer.

12. The panel welcomes the fact that a new Science Centre costing €65 million is currently being constructed on the UCD campus and is due to open at the beginning of the next academic year. This Centre will provide a first-class, modern, cutting-edge science facility for the students of this programme.

The following recommendations are made:

1. Given the wide choice of pathways within DN 200, students should be advised that they will be required to choose very specific module options in order to be eligible for registration as teachers for the various Science, Mathematics and Applied Mathematics subjects at post-primary level. This is particularly true in the case of Biology.
2. In the context of the current review of grade descriptors for the assessment of school placement, the panel recommends that revised descriptors identify behaviours of student teachers to distinguish one grade from another.
3. While noting the reference to literacy and numeracy in the UCD submission, the panel recommends that students be made aware of, and become familiar with, the national strategy *Literacy and Numeracy for Learning and Life* (2011) as well as reports of national and international assessments of literacy and numeracy, especially those relating to pupils at post-primary level.
4. In the case of student teachers of laboratory science subjects, the panel recommends that the grade descriptors should include a reference to the demonstration of skills that link practice to theory, especially skills associated with facilitating an investigative approach to Science. They should also include a reference to competence in carrying out laboratory work, since the junior and senior cycle syllabi in Science subjects include a large number of laboratory experiments and investigations.
5. The panel suggests that the reading lists for the Science Education modules should be reviewed to ensure that they include reading material on investigative and enquiry-based approaches to teaching Science.
6. The panel recommends that the funding and staffing of UCD School of Education be carefully monitored in the years ahead to ensure that adequate resources (staffing, funding and space) will continue to be available for the effective delivery of ITE programmes. It recommends that when the reconceptualised PDE is being reviewed by the Teaching Council, the resourcing and staffing issues be examined more fully.

Appendix 1 – Review Panel Membership

Independent Review Panel Chair

Professor Áine Hyland is Emeritus Professor of Education and former Vice-President of University College Cork. She was a member of a review team organised by the Irish Universities Quality Board which carried out an institutional review of NUI Galway in 2010 and is a member of the European Universities Association Institutional Evaluation team. She has been involved in reviews of universities in Italy, Turkey, North Cyprus, Bosnia-Herzegovina, Slovakia, Portugal and Romania. She is author of *A Review of the Structure of Teacher Education Provision in Ireland*, a Background Paper published in June 2012, and *Transition from Second to Third Level*, published in September 2011.

Teacher Education Expert

Professor John Anderson is Managing Inspector for teacher education in the Education and Training Inspectorate in Northern Ireland and an Honorary Professor of Education at Queen's University, Belfast. He was formerly a lecturer in Education at the University of Ulster and an adjunct Associate Professor in the School of Education at Duquesne University, Pittsburgh, USA. He has also worked for British Educational and Communication Technology Agency (Becta) where he was responsible for the formulation of national UK teacher education in IT policies. He is a former Academic Secretary for the Committee on Early Professional Development for Teachers of the Northern Ireland Teacher Education Committee.

Teaching Council Member

Christy Maginn is a member of the Teaching Council and serves on the Disciplinary and Finance Committees and the Primary Applications Panel. He is a full-time teacher of Mathematics, Applied Mathematics and Physics. He has prior experience of the Teaching Council's review and accreditation function, having previously been appointed as a member of a review panel.

Inspector from the Department of Education and Skills

Carmel Donoghue is senior Post-Primary Science Inspector at the Department of Education and Skills. She has a variety of experience in research, curriculum, teaching and inspection. Her work involves a range of evaluation models of teaching and learning, as well as whole-school evaluations, including management and leadership.

Rapporteur

Fionnbarra Ó Tuama was, until recently, a member of the Inspectorate in the Department of Education and Skills. Initially he worked as a District Inspector and later at Divisional level. He contributed to policy formulation and implementation in a variety of settings throughout the education system during a period of over thirty years. Prior to that he taught at primary, secondary and third level.