

The University of Edinburgh

**Internal Periodic Review**

**Data, Science, Technology and Innovation**

**Postgraduate Taught online provision**

22 and 23 March 2022

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## Executive summary

This report comprises the outcomes from the internal review of online postgraduate taught provision in Data, Science, Technology and Innovation. The Data, Science, Technology and Innovation (DSTI) programme is distinctive in that it draws on courses provided by 10 Schools across all three Colleges, therefore it does not directly own the courses that make up the programme. The programme also relies on its partner Schools to provide the bulk of the resources that support learning and teaching. The programme aligns with the University Strategy 2030 focus of the expectation to expand interdisciplinary and multidisciplinary, postgraduate and digital education.

The review team found that the programme has effective management of the quality of the student learning experience, academic standards and their enhancement and follows good and, often, best practice.

The report provides commendations on the programme's provision and recommendations for enhancement that the programme will be asked to report progress on to the Senate Quality Assurance Committee. The report also provides suggestions on how to support developments in the management and governance of the programme going forwards.

### Key Commendations

The review team commended the programme for its interdisciplinarity, flexibility, innovation and high student satisfaction. Staff are engaged and committed, and students are enthusiastic about their learning. The programme has succeeded in creating a high quality while flexible educational experience for students who are studying part-time, balancing study with employment and other commitments. Further commendations are included in the report.

### Key recommendations

The top three recommendations identified by the review team for the School to prioritise were:

- **Reviewing (and re-setting) the business model**
- **Curriculum: developing signposting and pathways**
- **Data: analysing available data and developing KPIs**

## Commendations, recommendations and suggestions

### Commendations

Key strengths and areas of positive practice for sharing more widely across the institution.

No	Commendation	Section in report
1	The review team <b>commends</b> the programme team for providing a high quality multi- and interdisciplinary, cross-School programme despite the challenges of University systems not being well set up to facilitate this. <b>(Curriculum)</b>	1
2	The review team <b>commends</b> the programme team for developing an innovative programme with high student satisfaction, which is well aligned to University strategy while successfully managing the complexity. <b>(Curriculum)</b>	1
3	The review team <b>commends</b> the engaged and committed programme team and their efforts in engaging across multiple Schools. <b>(Staff)</b>	1
4	The review team <b>commends</b> the Bayes Team's professional support in facilitating the success of the DSTI programme. <b>(Staff)</b>	1
5	There was appetite from the programme for a University level strategy in relation to lifelong learning. The programme team felt this would support getting buy-in from Schools to build capacity. The review team <b>commends</b> the programme for identifying this as a gap	1
6	The review team <b>commends</b> the programme's coverage of specialised areas in what is becoming a crowded data science space. <b>(Curriculum)</b>	2.1
7	The review team <b>commends</b> the flexibility that the DSTI programme offers and this flexibility is much valued by students. <b>(Curriculum)</b>	2.1
8	The review team <b>commends</b> the programme on its growth which is testament to the success of the programme and on achieving a high international student profile. <b>(EDI)</b>	2.3
9	The review team <b>commends</b> the programme team and Programme Oversight Committee's thinking on the appropriate response regarding cohort leads.	2.3
10	The review team <b>commends</b> the programme for its accessible entry routes. <b>(EDI)</b>	2.5
11	The review team <b>commends</b> the programme team for its initiative in thinking about future dissertation options and how supervision could be resourced.	2.6

### Recommendations

Areas for development and enhancement – progress to be reported.

Priority	Recommendation	Section in report	Responsibility of
1	<p><b>Business model</b></p> <p>The review team <b>recommends</b> that the Bayes Executive Team look at ways resourcing can be related to capacity in considering appropriate business models. The Bayes Executive Team should consider how revenues can be related more clearly to costs and expenditure and capacity (academic and professional support staff).</p>	1	Bayes Executive Team
2	<p><b>Curriculum</b></p> <p>... the review team heard from the students it met with that they find it challenging to navigate the appropriate pathways (hence course selection) to achieve their goals. This is partly a function of only having one compulsory option and a large number of options in 10 schools to select from. The review team considered that DSTI needs to continually review its course offerings to meet the needs of a growing student population. The review team <b>recommends</b> that the programme team considers providing more guidance and signposting through the curriculum to address this. This could also involve creating distinctive pathways by selection from specified bundling of options.</p> <p>The review team <b>recommends</b> the programme undertakes an ELDeR (Edinburgh Learning Design Roadmap) workshop to help in reviewing the curriculum and considering pathways through the curriculum.</p> <p>The review team <b>recommends</b> that the programme team offer data science ethics education to all students.</p> <p>The review team <b>recommends</b> that the programme consider new options for advanced data science courses for data scientists who want to enhance their existing skills.</p>	<p>2.1</p> <p>2.1</p> <p>2.1</p> <p>2.6</p>	Programme Team
3	<p><b>Data and KPIs</b></p> <p>The review team <b>recommends</b> that the programme find ways to analyse existing student data, (some of which is currently hard to interrogate) and develop key performance indicators (KPIs).</p>	2.3	Programme Team/Bayes Centre

	The review team <b>recommends</b> that the programme team analyses available course data to help in understanding the student experience.	2.2	
	The review team <b>recommends</b> that the programme set KPIs on Equality Diversity and Inclusion and establish means to analyse data.	2.5	
4	<b>Student Support</b> The review team <b>recommends</b> that the programme considers developing the DSTI portal to be more integrated.	2.4	Programme Team
5	<b>Dissertation</b> The review team <b>recommends</b> that the programme team consider how more (dissertation) support can be provided. There may be potential for a series of pathways to help identify which courses are relevant to the dissertation.	2.6	Programme Team
6	<b>Lifelong learning</b> There was appetite from the programme for a University level strategy in relation to lifelong learning. The programme team felt this would support getting buy-in from Schools to build capacity. The review team commends the programme for identifying this as a gap and <b>recommends</b> the programme team and Bayes Centre advocate for this through the Data Driven Innovation hubs and the College of Science and Engineering.	1	Programme Team/Bayes Centre

### Suggestions

For noting – progress reporting is not required.

No	Suggestion	Section in report
1	The review team <b>suggests</b> that, should a non-dissertation pathway emerge, more structure, including more compulsory courses, may be beneficial.	2.6

## Section A – Introduction

### Scope of review

Range of provision considered by the review (see Appendix 1).

The Internal Periodic Review of Data, Science, Technology and Innovation in 2021/22 consisted of:

- The University's remit for internal review (see Appendix 2)
- The subject specific remit items for the review:
  - Where should DSTI position itself in relation to other University offerings?
  - How do we get to the position (and trajectory) identified in Remit Item 1
- The Reflective Report and additional material provided in advance of the review
- The meeting of the review team including consideration of further material (see Appendix 3)
- The final report produced by the review team
- Action by the School and others to whom recommendations were remitted following the review

### Review Team Members

Professor Rob Procter, University of Warwick – External

Dr Max Little, University of Birmingham – External

Dr Simon Shackley, School of GeoSciences – Convener

Dr Debbie Roberts, School of Philosophy, Psychology & Language Sciences – Internal

Dr Chibuke Okpara, EdMed MGPHS – Student

Susan Hunter, Academic Services – Review Team Administrator

### The School

The Data, Science, Technology and Innovation (DSTI) programme is situated within the College of Science and Engineering and is hosted by the Bayes Centre. It is not affiliated with a particular School. The programme is unique in that it is delivered by ten schools, deaneries and units across all three Colleges of the University.

### Physical location and summary of facilities

The programme is fully online and is hosted by the Bayes Centre, the University's innovation hub for data science and artificial intelligence.

### Date of previous review

The programme was last reviewed as part of a wider review of College of Medicine and Veterinary Medicine provision in 2016/17

### Reflective Report

Prepared by: Dr Adam Carter – Programme Director and Fraser Pullar – Education Programmes Manager

In consultation with:

Professor Iain Gordon – Chair of Programme Oversight Committee (POC), Dr Miguel O. Bernabeu – Deputy Director, Bayes Centre, Neil McGillivray – Chief Operating Officer, Bayes Centre, Teresa Ironside – Director of Data Science Education, Bayes Centre, Kirsten Phimister – Head of Education Programmes, Cat Andrade-Robertsen – Education Programme Coordinator and Staff Student Liaison Committee members. Professor Michael Rovatsos – Director, Bayes Centre signed off the final report.

## Section B – Main report

### 1 Strategic overview

The Data, Science, Technology and Innovation (DSTI) programme provides postgraduate taught teaching and learning delivered digitally. The programme offers much flexibility for students who can choose from a range of courses across the University. Rather than owning the courses that form the programme, the programme draws on online course delivered by 10 Schools across the University's three Colleges (with one compulsory course taught by the Programme Director). Therefore DSTI has a strong interdisciplinary focus and provides a multi- and interdisciplinary experience for students. The review team **commends** the programme team for providing a high quality multi- and interdisciplinary, cross-School programme despite the challenges of University systems not being well set up to facilitate this. The majority of students are part time learners, with a high proportion of mature students who may also be working, and have other commitments such as family ones, while studying. The programme enables intermittent study to facilitate a flexible approach for these types of students.

Programme oversight is provided by the Programme Oversight Committee (POC) which also acts as the Board of Studies. The programme relies on its partner Schools to provide resources for student support in personal tutoring and dissertation supervision. Currently, there is high reliance on a single member of staff for key roles such as Programme Director, Senior Tutor, Director of Teaching and Director of Quality. The POC recognises that there is a risk, particularly with planned growth, in overburdening limited personnel resources and have recently agreed the appointment of a Co-Director (as proposed by the Programme Director following discussions with the Bayes Education Team) who will share some of these responsibilities. Co-delivery agreements are being developed to formalise and clarify arrangements with the programme's partner Schools. A key feature is that the programme does not have its own budget but is resourced through partnership with other Schools and business units. In terms of University reporting and communication structures, it is linked to the College of Science and Engineering through the Bayes Centre.

The nature of the DSTI programme aligns closely with the University's Strategy 2030 focus of the expectation to expand interdisciplinary and multidisciplinary, postgraduate and digital education. The review team **commends** the programme team for successfully developing an innovative programme with high student satisfaction, which is well aligned to University strategy while managing the inevitable complexity. The review team **commends** the engaged and committed programme team and their efforts in engaging across multiple Schools. The review team **commends** the Bayes Team's professional support in facilitating the success of the DSTI programme.

The current business model was established six years ago. However, with growth in student numbers the business model may need to be reassessed. The review team considered that a lot of pressure is being put upon the co-delivery agreements to provide solutions to resourcing issues. Other models were discussed during the review visit that could be considered. The programme team recognise that Schools are experiencing pressure on their own resources and care will need to be taken when considering redistribution of roles and commensurate compensation for capacity provided. The programme has access to professional services and management experience within the Bayes Team which could be used more. The

review team **recommends** that the Bayes Executive Team look at ways resourcing can be related to capacity in considering appropriate business models. The Bayes Executive Team should consider how revenues can be related more clearly to costs and expenditure and capacity (academic and professional services staff).

There was appetite from the programme for a University level strategy in relation to lifelong learning. The programme team felt this would support getting buy-in from Schools to build capacity. The review team **commends** the programme for identifying this as a gap and **recommends** the programme team and Bayes Centre advocate for this through the Data Driven Innovation hubs and the College of Science and Engineering.

## 2 Enhancing the student experience

### 2.1 The approach to enhancing Learning and Teaching

As part of this review, DSTI had asked the review team to consider where the programme should position itself in relation to other University offerings, and how to get to the position (and trajectory) identified. As discussed above, the programme is designed to draw on courses provided by a range of partner Schools across the University. There are strong links between DSTI and the Edinburgh Futures Institute and discussions are ongoing on more formal connections between the two education areas. There is also potential for consolidating overlaps in offering, particularly with the School of Informatics where some courses appear in both the DSTI and Informatics Masters programmes (especially MSc Data Science). However, it is expected that the market for Informatics and DSTI will be different with fewer working professionals seeking to enrol on the Informatics programme. The review team **commends** the programme's coverage of specialised areas in what is becoming a crowded data science space.

The review team **commends** the flexibility that the DSTI programme offers and this flexibility is much valued by students. However, the review team heard from the students it met with that they find it challenging to navigate the appropriate pathways (hence course selection) to achieve their goals. This is partly a function of only having one compulsory option and a large number of options in 10 schools to select from. The review team considered that DSTI needs to continually review its course offerings to meet the needs of a growing student population. The review team **recommends** that the programme team considers providing more guidance and signposting through the curriculum to address this. This could also involve creating distinctive pathways by selection from specified bundling of options. There may be opportunities for the programme to proactively engage with the Curriculum Transformation Project to both learn from and potentially influence University strategy. Considering existing frameworks, for example British Computing Society (BCS), EDISON Data Science Framework (EDSF) and Association for Computing Machinery (ACM), could also be helpful and may inform compulsory courses and potential clusters of course options for different pathways. The review team **recommends** the programme undertakes an ELDeR (Edinburgh Learning Design Roadmap) workshop to help in reviewing the curriculum and considering pathways through the curriculum. The review team **recommends** that the programme team offer data science ethics education to all students. There is growing sector recognition that ethics is an important element for data science and there are emerging standards in the field of ethics in the applications of data science. The programme team should consider whether this type of course could be compulsory for particular pathways. The review team encourages continued dialogue with other

on-campus teaching areas to explore opportunities for online course provision to enhance the DSTI programme.

## 2.2 Assessment and Feedback

The review team heard from the students it met with that they thought assessments were fair and, although feedback could take some time to receive, generally communication on this, and quality of feedback, was good. As course assessment and feedback is owned by the partner Schools who provide them, these would be covered in other Internal Periodic Reviews.

The review team **recommends** that the programme team analyses available course data to help in understanding the student experience. This may also support setting key performance indicators and reveal outcomes for DSTI students compared with those of other students on other programmes who may be taking the same courses. The review team understands that there is resource available within the Bayes Centre to undertake further data analysis.

## 2.3 Supporting students in their learning

The review team **commends** the programme on its growth which is testament to the success of the programme and on achieving a high international student profile.

The review team **recommends** that the programme find ways to analyse existing student data (some of which is currently hard to interrogate) and develop key performance indicators (KPIs). Analysis should be used to further inform decision-making. It could also provide evidence of the value of the multi- and interdisciplinarity the programme offers and how much these features are borne out by student choices. There is also scope for checking unintended outcomes and reviewing non-completion or 'drop-out' rates. Better indicators could be developed to measure student numbers, for example a way of measuring the 'actual students being taught' would be to create an indicator of number of students enrolled in each course per year multiplied by the number of credits taken in that year, while acknowledging head count, given that both constitute staff workload albeit it in different ways.

DSTI will be piloting the new student support model being introduced across the University. This is being rolled out across the College of Science and Engineering for new students initially. The review team **commends** the programme team and POC's thinking on the appropriate response regarding cohort leads.

## 2.4. Listening and responding to the Student Voice

The review team heard from the students it met with that, although most were aware of feedback surveys, there was mixed appetite to complete them. This was mainly because students were unaware of actions taken in response to course feedback. They noted some anecdotal feedback on actions but nothing formal and systematic that they were aware of. Students commented that this information would be particularly useful when considering which courses to take. The programme has a Teams channel for students but the students the review team met with seemed to be unaware of this. The review team **recommends** that the programme considers developing the DSTI portal to be more integrated. There is potential to explore Learn Ultra functionality to provide a single point for a given student in relation to existing course and programme information and linking to existing Teams channels, discussion boards and online provision from University support services. This could

also be useful for closing the feedback loop to students. The review team noted that feedback may be approached differently by different Schools and while it may not be in its power to change, the programme could nevertheless explore what is possible.

## 2.5 Accessibility, Inclusivity and Widening Participation

There are different entry paths to the DSTI programme, for example, through MOOCs (massive open online courses). The programme team believe they are doing better than other programmes within the University in terms of access routes and are open to having more structure around this. The review team **commends** the programme for its accessible entry routes.

As noted above, the programme has a high percentage of international students. This includes a small number of Mastercard Foundation scholars. The review team noted a decline in the proportion of female students over the past couple of years. The programme team were aware of this and aspire to carry out further analysis of available data to inform admissions processes.

The review team **recommends** that the programme set KPIs on Equality Diversity and Inclusion and establish means to analyse data. Such analysis will help with consideration of admission processes and explore potential options to add weighting for offer decisions. The admissions team maybe able to offer some advice on this.

## 2.6 Development of Employability and Graduate Attributes

The programme attracts many students who are professionals looking to enhance their data science skills and are often working while studying part time. Students may pursue workplace projects as part of their dissertations.

The review team heard from students it met that some would like to have access to more advanced data science courses, such as some of those available to students on the Informatics Masters programmes (for example MSc Data Science). The review team **recommends** that the programme consider new options for advanced data science courses for data scientists who want to enhance their existing skills. As noted above, continued dialogue by the programme team with partners on options for online course provision is encouraged.

The programme team had asked the review team to focus on the dissertation as part of this review. This topic was explored in meetings with both academic staff and DSTI students. The review team heard from the students it met with that in terms of the dissertation, students were uncertain on how to acquire the right skills and knowledge for their chosen project. The review team **commends** the programme team for its initiative in thinking about future dissertation options and how supervision could be resourced. The review team **recommends** that the programme team consider how more support can be provided. There may be potential for a series of pathways to help identify which courses are relevant to the dissertation. Consideration could also be given to a pathway without a dissertation, for example a capstone project instead. A non-dissertation pathway could help in the short term with managing pressure on resources for dissertation supervision. Thinking about the programme's objectives and considering learning outcomes will be important in this respect. The University Curriculum Transformation Programme is exploring postgraduate taught dissertations and it may be useful for the programme team to connect with these discussions.

The review team **suggests** that, should a non-dissertation pathway emerge, more structure, including more compulsory courses, may be beneficial.

## 2.7 Supporting and developing staff

Due to the nature of the programme structure and resourcing, staff development is supported by partner Schools and business units. The review team met with professional services staff from the Bayes Centre. Both new appointments and longer term colleagues were represented and they reported that they felt well supported in their roles.

Similarly, academic, early career staff and postgraduate tutors are supported in their development by partner Schools, so were not a feature of this review.

## 2.8 Learning environment (physical and virtual)

As the DSTI programme is delivery wholly online, it does not have a physical environment.

Courses are delivered through the Learn platform and students reported that this worked well. They felt that the system was well set up for online provision although they did comment that further investment may be needed to bring the platform up to date.

The students the review team met with had viewed introductory videos at the start of their programme and had found the opportunity to speak with someone who had taken a course before particularly useful.

## 3 Assurance and enhancement of provision

The programme has appropriate mechanisms in place for setting and maintaining academic standards. The programme has a single External Examiner and mechanisms are in place for reporting and responding to External Examiner comments. As discussed above, there are opportunities for the programme team to harness the professional services support available in the Bayes Centre to help with quality processes such as annual monitoring, review and reporting. The programme is not currently accredited by a professional body, however, the programme team is considering the benefits and relevance of accreditation. The programme team recognises the benefits of structure and clarity for students and employers that accreditation can bring but also the risk of the programme becoming less distinguishable from other offerings as well as the risk of constraints on the curriculum that would detract from the current flexibility

## Appendices

### Appendix 1: Range of provision considered by the review

Data Science, Technology and Innovation (Medical Informatics) (Online Learning) (ICL) (MSc)

Data Science, Technology and Innovation (Online Learning) (ICL) (MSc) - 6 Years

Data Science, Technology and Innovation (Online Learning) (ICL) (PgCert)

Data Science, Technology and Innovation (Online Learning) (ICL) (PgDip)

Data Science, Technology and Innovation (Online Learning) (ICL) (PG ProfDev)

Programmes

### Appendix 2 – University remit

The University remit provides consistent coverage of key elements across all of the University's internal reviews (undergraduate and postgraduate).

It covers all credit bearing provision within the scope of the review, including:

- Provision delivered in collaboration with others
- Transnational education
- Work-based provision and placements
- Online and distance learning
- Continuing Professional Development (CPD)
- Postgraduate Professional Development (PPD)
- Provision which provides only small volumes of credit
- Joint/Dual Degrees
- Massive Open Online Courses MOOCs (even if non-credit bearing)

#### 1. Strategic overview

The strategic approach to:

- The management and resourcing of learning and teaching experience,
- The forward direction and the structures in place to support this.
- Developing business cases for new programmes and courses,
- Managing and reviewing its portfolio,
- Closing courses and programmes.

#### 2. Enhancing the Student Experience

The approach to and effectiveness of:

- Supporting students in their learning
- Listening to and responding to the Student Voice
- Learning and Teaching
- Assessment and Feedback
- Accessibility, Inclusivity and Widening Participation
- Learning environment (physical and virtual)
- Development of Employability and Graduate Attributes
- Supporting and developing staff

#### 3. Assurance and Enhancement of provision

The approach to and effectiveness of maintaining and enhancing academic standards and quality of provision in alignment with the University Quality Framework:

- Admissions and Recruitment
- Assessment, Progression and Achievement
- Programme and Course approval
- Annual Monitoring, Review and Reporting
- Operation of Boards of Studies, Exam Boards, Special Circumstances
- External Examining, themes and actions taken
- Alignment with SCQF (Scottish Credit and Qualifications Framework) level, relevant benchmark statements, UK Quality Code
- Accreditation and Collaborative activity and relationship with Professional/Accrediting bodies (if applicable)

### Appendix 3 Additional information considered by review team

#### Prior to the review visit:

- Reflective Report
- School Quality Assurance Reports:
  - 2020-2021
  - 2019-2020
  - 2018-2019
- External Examiners Summary reports:
  - 2019-2020 Comments as report not available
  - 2018-2019
  - 2017-2018
- External Examiner Report form
- Programme Organisation Committee membership
- Programme Handbook
- Programme specification information:
  - DSTI (Online learning) (ICL) MSc
  - DSTI (Online learning) (ICL) PG Dip
  - DSTI (Online learning) (ICL) PG Cert
- Stats reports
  - Course enrolments
  - Programme registrations (Excel)
  - Total student numbers and graduations
  - Widening Participation Entrant Numbers
  - Widening Participation Percentages
- Postgraduate Taught Experience Survey (PTES) results 2020-21
- Student Staff Liaison Committee meeting minutes

- SSLC Feedback Summary
- MSc DSTI Medical Informatics feedback 2019
- Student feedback for DSTI April 2021
- Student feedback for DSTI - course feedback
- SSLC meeting notes February 2018
- Student feedback 2016-17

#### During the review visit

- Email feedback from student
- Curriculum Transformation Programme briefing
- Senate Academic Policy and Regulations Committee minutes January 2022
- New student support model web page

#### Appendix 4 Number of students

Data Science Technology & Innovation

Total student numbers

	MSc **	PG Diploma	PG Certificate	PPD	TOTAL
2016/17	13	0	14*	15*	42*
2017/18	63	3	10	27	103
2018/19	100	4	7	20	132
2019/20	137	2	10	21	170
2020/21	180	8	17	16	221
2021/22	192	9	12	17	230

\*This number includes students from 2015/16 onwards. PG Certificate and PPD were available.

\*\* Includes MSc with Specialism in Medical Informatics. This number includes students recruited to.