

E-Learning for Distance Students: A Case Study from a UK Masters Programme

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Abstract

The MSc Intelligent Systems (IS) and the MSc Intelligent Systems and Robotics (ISR) programmes at De Montfort University are Masters level courses that are delivered both on-site and by distance learning. The courses have been running successfully on-site for 11 years and are now in the 8th year with a distance learning mode. In this paper we discuss some of the techniques adopted to overcome the challenges of delivering a practical course to both distance and on-site students. Information collected from student case studies is used to enhance our observations about the delivery methods, the backgrounds of those that join the course and the value it can add to their employment opportunities. We present the course as a case study illustrating: possible approaches for distance and e-learning; the range of people (and their employment) to which it is relevant.

Keywords: Post-graduate, e-learning, distance learning

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Introduction

The MSc Intelligent Systems (IS) and the MSc Intelligent Systems and Robotics (ISR) programmes at De Montfort University are Masters level courses that are delivered both on-site and by distance learning (DL). The courses are delivered mainly by the members of the Centre for Computational Intelligence (CCI) at De Montfort University. Their development enabled us to capitalise on the research taking place within the CCI and therefore on the strengths of the staff delivering the modules.

Each MSc consists of 8 taught modules and an independent project which is equivalent to 4 modules. Each module is worth 15 credits (7.5 ECTS). The MSc ISR includes two mobile robots modules whilst MSc IS replaces one of these with a Data Mining module. Given their substantial overlap, from this point they will be referred to in the singular, for example, as 'the course'. A Research Methods module is delivered in semester 1 to ensure that students are equipped with the necessary skills to carry out literature searches, write project proposals and so on. An overview of the course content and delivery pattern for part-time distance students is shown in Figure 1. Full time students complete the course in one calendar year (all 4 semester 1 modules together, all 4 semester 2 modules together and the project over the summer period). In this paper we discuss the issues associated with delivering such a course at a distance and investigate the motivation of the students for embarking on it. Some short case studies were used to provide more detailed insights.

Pre-programme	Induction Unit
Semester 1 (Year 1)	Research Methods Fuzzy logic
Semester 2 (Year 1)	Artificial Neural Networks Computational Intelligence <u>Optimisation</u>
Semester 1 (Year 2)	Artificial Intelligence Programming Mobile Robots
Semester 2 (Year 2)	Applied Computational Intelligence Intelligent Mobile Robots (ISR) or Data Mining (IS)
Year 3 (typically or on successful completion of 4 of the above taught modules)	Master's thesis project.

Figure 1: The course structure

The remainder of the paper is structured as follows: Section 2 discusses approaches to e-learning on the MSc programmes and how this fits with recognised approaches from the associated literature; Section 3 presents and discusses the student case-study information. Section 4 draws conclusions from this work.

Approaches to E-Learning on the MSc Programme

E-learning offers methods and facilities for both learners and teachers to develop and enrich their learning and teaching experience through the learning environment. Although there are many definitions for e-learning in the literature, most of them focus on the same features that can be provided in e-learning environments, primarily that electronic media is used for the delivery of content in order to facilitate the learning process [7], [17], [18]. The use of technology has facilitated the learning process so that learners can learn anywhere at any time. The philosophy of e-learning is to provide learners with tools and facilities to allow them to learn anywhere at any time in which flexibility is gained in terms of knowledge acquisition. Other related approaches include Blended Learning [14] where there is a mix of face to face and on-line learning taking place.

A review of research into evidence based practices in on-line learning [13] found that "In recent experimental and quasi-experimental studies contrasting blends of online and face-to face instruction with conventional face-to-face classes, blended instruction has been more effective, providing a rationale for the effort required to design and implement blended approaches. When used by itself, online learning appears to be as effective as conventional classroom instruction, but not more so." This is interesting to us as it shows that pedagogic value is not lost with on-line delivery and that where it can be blended, such as with our on-site students, there is likely to be more learning taking place. Feedback from our on-site students supports this too and additionally many of the on-site students appreciate the opportunity to interact and work with the DL students; they are often working in interesting application areas, are distributed around the world and therefore bring their experience as added value.

The finding reported in [13], along with those from our study that seems to verify the efficacy of the content, suggests potential ways of the developing the course to make the experience more blended for our students. In particular the on-site students can be asked to do more independent work using the on-line materials and then use the face to face time to develop the work and apply the knowledge. This is also similar to the notion of Flipped Learning. [15].

On our course we have both distance and on-site students. The distance students are on-line learners for the majority of their work although face to face time is used via mediums such as Skype for individual discussions with tutors and for demonstrations, presentations and viva voce examinations. Finding ways to increase face to face engagement where possible with DL students would be more difficult but achievable at least with some of them and this is an aim for the future. All modules are assessed by 100% coursework. The on-site students can make use of the same on-line materials but also have face to face lectures, tutorials and lab sessions with their tutors.

While planning the delivery of the course it has been useful to consider approaches to learning and teaching in higher education more generally. Most of the modules include both theoretical and practical work and the assessments are usually open

enough to allow the students to investigate appropriate topics in their own way thus there is an attempt to facilitate experiential learning as defined by [1]. We believe it to be very important for our students to draw on non-course experiences as many of them have work experience: for example, DL students are often in full time employment, there is a wide variety of first degree subjects amongst them and some have already studied for higher degrees.

The Quality Assurance Agency (QAA) for Higher Education in the UK provides codes of practice for all types of learning. There is a section of the documentation that is aimed specifically at flexible and distributed learning and within this they include e-learning and formative feedback [2]. The QAA documentation defines what the students should be able to expect from their institution, their learning materials, their tutors and so on when engaged in flexible, distance or e-learning. The QAA suggest that excessive amounts of summative assessment should be avoided. They state that “it is good practice to provide students with sufficient, constructive and timely feedback on their work”[2, p20].

De Montfort University uses Blackboard as a platform for providing e-learning materials for all students and this was therefore an obvious choice as the main platform for the MSc. Decisions about the best way to use Blackboard and which other resources to employ alongside it were necessary and as both on-site and distance students study the modules concurrently, the experiences need to be as similar as possible. We provide software if necessary for all modules, though some modules use free downloadable software. Lectures and software demonstration can be viewed as streamed video through Blackboard. Other methods include sound over Powerpoint slides using tools such as Articulate Presenter and more recently Microsoft Expression Encoder.

Assignments are made available to students on Blackboard and they are asked to submit them for assessment twice, once to TurnitinUK for plagiarism detection and once to a Blackboard assignment submission link. The assignment submission link enables multiple files and multiple file types to be uploaded which is important for computer courses. This work is then marked using electronic methods, and the annotated scripts with provisional marks are posted in a feedback space on Blackboard that is generated when the students submit their work. This means that the students get feedback as soon as the work is marked and the university requires marking to be completed within a maximum of 4 weeks. The kinds of annotations added to the scripts vary depending on the tutor. Most work with PDF files and these can be annotated easily with the use of pen-tablets (for hand-written notes), or with typed ‘post-it’ notes, voice clips and so on. The timing of students receiving their feedback has been an issue on our courses but since adopting this approach it is no longer the case. The approach summarised in this paragraph is more fully described fully in [6].

As well as the requirement for timeliness, the feedback needs to be of an appropriate quality so that the students are able to learn from it and make use of it in subsequent work. This is identified by the Joint Information Systems Committee (JISC) [5] which states that “feedback must:

- Be helpful, detailed and appropriate to learners' current understanding
- Provide more detail with each failed attempt
- Identify a means of rectifying errors
- Invite an active response." [5, p1]

Both [5] and [7] identify that feedback that is explanatory is necessary; in particular, [7] shows that explanatory feedback results in improved learning compared with the effects of corrective feedback (simply marked right or wrong); they also state that such explanations should be succinct and positioned so that they are close physically to where the error in the students' work took place. This is why the commented work (regardless of the mechanism used for making the comments) is considered to be valuable for our students.

All tutors have adopted one of the electronic methods made available to them and described previously. The good take-up by staff has been aided by the variety of methods possible. In [6], two modules from the course used electronic methods for assessment and feedback as a pilot study and students' opinions of the change in approach to marking and feedback were gathered by means of a short survey. The results showed that all students, both on-site and DL, preferred this method.

We encourage interaction between students and tutors; students and peers; by having an assessed discussion board on our Virtual Learning Environment (VLE). It is assessed based on the number of contributions over the semester rather than the quality of the content. We have found this to be very successful [11] and it is clear that it helps to create a virtual learning community amongst our students.

Student Case Studies

In order to find out more about the students' perspective on the course, a study was carried out [16] to find out the opinions of the students about the different materials with which they are presented and additionally to find out why they chose to do the course and what they hope to achieve in terms of their employability as a result of completing it.

The results were interesting and therefore prompted a further study presented in this paper. For this, a smaller number of students (volunteers) were asked for more detailed information enabling us to gain a better depth of understanding about their reasons for doing the course and the way in which they have been able to use what they have learned. The aim of the research is to have a better insight into:

1. The typical backgrounds of those who study the course
2. The way they use the knowledge gained from their course (if at all) either in current or future employment
3. What they see as the gains from studying the course.

The questions were sent to students who had finished or who were about to finish. Only a small number of volunteers were needed as the emphasis here was on depth of information rather than breadth. A previous study [13] already collected data

from a larger number of students. The students were therefore only asked once (as a group) and those that responded have been used.

The short case studies that resulted included 6 DL and 5 on-site students. The focus of this paper is on the distance students but some discussion about responses from the on-site students is also given.

The questions were as follows:

- Why did you apply for the MSc IS/ISR?
- What did you do before? (previous degree? training? jobs? Where did you live?)
- What were the best things about the course for you, what did you get out of it?
- What do you plan to do next (or what are you doing if you've already finished)?
- Would you recommend the course to future applicants?
- What advice would you give them before they start?

Tables 1 and 2 summarise the responses for DL and on-site students respectively.

Question	Response summary
Why did you apply for the MSc IS/ISR?	To learn about data-driven modelling techniques - increasingly important to programming the finance industry where employed. Structure, content, study mode Add to skills for current & future employment Up to date useful content Interested in robotics Interested in AI
What did you do before?	Web & desktop software development, UK – x3 – London, Cheshire, Italy E-learning creator, UK SW development, business analysis, DBA, USA Finance (MD of asset management company, Germany)
What were the best things, what did you get out of it?	Learning a variety of AI tools. Interesting & useful topics Practical work Robot localization & navigation Convenience of distance learning New algorithms Keeping up to date

	<p>Relevance & variety of topics</p> <p>Practical component</p> <p>Distance Learning mode (DL)</p>
What next?	<p>One person going on to a PhD</p> <p>Others are using the MSc to enhance current employment in the following ways:</p> <p>Move into research & development</p> <p>Commercialization of ideas</p> <p>Application to finance</p> <p>Application to portfolio construction in asset management</p>
Would you recommend it?	All said yes
Advice to future applicants..	Advice was mainly about preparation (pre-reading), how to keep on top of the work load and how to plan for the final project.

Table 1 : Summary of responses for distance students

Question	Response summary
Why did you apply for the MSc IS/ISR?	Content, part time mode Interest in subject Robotics Met tutors before and enthusiasm & accessibility added to the content made it the first choice. Higher level study for better job prospects
What did you do before?	BSc Computer Science, ran own e-commerce business, wants to expand knowledge into wider areas. Worked in multimedia development for training, then BSc from DMU BSc from DMU followed by year out. BSc from DMU
What were the best things, what did you get out of it?	Confidence, understanding, meeting like-minded people. Good foundation both technically and in research skills Small numbers on-site. Good relationships with peers and staff. Robotics
What next?	Full time PhD. Full time PhD – now completed and modelling customer behavior at Experian. PhD in grey systems. Full time job in Telecoms Full time mother (to 2, soon to be 3)
Would you recommend it?	Yes
Advice to future applicants..	All said pre-reading again Chance to engage with tutors because of smaller group – make the most of that Ask questions. Engage with induction material (programming & maths classes etc.)

Table 2: Summary of responses for on-site students

All of the students, both DL and on-site, said that they would recommend the course and most suggested pre-reading and engagement with the induction programme beforehand. More of the on-site students came straight from a first degree although some had worked before doing that degree. All of the distance students were in full

time employment and chose to study for the MSc on order to enhance their employment, either in terms of prospects for the future or to provide alternative problem solving techniques within their current roles. Two of the distance students specifically wanted to apply their new skills within the finance industry.

The open nature of the assignments for most of our modules enables students to try applying the techniques they learn to their areas of interest and we see this frequently in module assessments and in the final projects. To illustrate this point, some previous project titles are given: “The success of a Genetic Algorithm for portfolio and risk management within a momentum trading strategy”; “ Indoor Search & Rescue Simulation using Lego”; “Question Generation on Software Requirement Specification to Support Rich Requirement Tracing”; “Intelligent Radio: An Evolutionary Approach to General Coverage Radio Receiver Control”; “ Development of a Quadcopter with Fuzzy Stability Controller”; “ A Neural Network Model for Exoplanet Detection”. A number of students publish papers in both conferences and journals as a result of either their assignment or project work.

All of the students said they would recommend the course to future applicants. This is a pleasing outcome especially as many of our students are very experienced in their fields of work and are therefore especially discerning about what they want to study and what they hope to achieve from their work.

Conclusion

In this paper we have described the MSc in Intelligent Systems and MSc Intelligent Systems and Robotics. As courses that runs both on-site and by distance learning, they are often used as an example in our own institution.

Delivering courses at a distance is a topical area. With the many available mechanisms for interacting with learners electronically, there are a number of choices to be made regarding the approach to take. In this paper we have summarised some of the approaches to the course delivery and the assessment and feedback strategies. We have also discussed information gathered from students about their backgrounds and reasons for studying the course. This showed an apparent difference between the typical backgrounds of distance learners and on-site students. It also helps to validate the content of the course and the way that it has evolved as technology changes.

The course is successful and sustainable with a total of around 60 students currently enrolled (5 on site, the rest as DL). We continue to gather feedback regularly, using the responses to inform future developments. We hope to continue in this way ensuring that our students benefit from a carefully crafted course that makes appropriate use of current e-learning research and associated technology.

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