

Factors influencing Pre-Service teachers' attitudes towards using a Moodle environment for teaching and learning.

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Abstract: Based on the success of the New Opportunities Fund (NOF) ICT training in Northern Ireland, the Department of Education have launched a new strategy, emPowering Schools, to encourage teachers to continue embedding ICT and elearning into their teaching pedagogies. This paper investigates the factors affecting the introduction of online learning into a one year PGCE course. Student teachers were required to complete a series of tasks, presented as an online course, which guided them towards the production of the content materials for their own online course. A face-to-face workshop provided the support and technical training needed to create a subject-specific Moodle course suitable for use with pupils aged in the range 11-18 years-old attending a secondary school. The evaluation revealed three factors which influenced student teachers' attitudes towards using an online course as e-learners and an additional three factors summarising their experiences of uploading resources to the Moodle environment. Significance tests by gender and subject area are reported and conclusions drawn for future work in this area.

Introduction

All teachers in UK schools have to successfully complete an Initial (or Pre-Service) Teacher Education course to be awarded Qualified Teacher Status (QTS) – a compulsory qualification which entitles teachers to teach. One of the qualifications offered to students who have already obtained an Honours degree in a specific subject (such as mathematics, English, Geography etc.) is the one year Post-Graduate Certificate in Education (PGCE) course. Typically students will be approximately 22 years old when they enrol on this course having already completed a three-year undergraduate programme of study in a related discipline however only a few of these students would have completed any education-related modules. The PGCE course therefore addresses key themes in teaching such as pedagogical practice and teaching methodologies, classroom management strategies and how to assess pupils, literacy, numeracy and ICT plus other professional issues associated with being a teacher.

Since 1997, existing teachers in the UK were trained in the use of ICT in the classroom using a series of courses funded by the New Opportunities Fund (Lottery money). Since 1997, initial teacher education courses in Northern Ireland have been required to ensure all students are able to demonstrate their competence in the use of ICT for personal, professional/teaching and administrative duties in the context of being a teacher. This is referred to as being qualified to 'NOF equivalent standards'. By the end of the course, the students will have a certificate qualification in ICT which is relevant to teaching in schools. Typical qualifications have included the European Computer Driving Licence (ECDL) plus a teaching portfolio showing how ICT was embedded in the students' teaching practices, the *Intel: Teach to the Future* portfolio and more recently, the *Moodle course* certificate. This research study focuses on the latter course and the impact of a compulsory ICT course (which was delivered online) on students' attitudes towards using ICT in the classroom and towards designing and creating an online course in the Moodle environment for use by pupils.

Moodle is open source software and therefore removed the need for a site licence to use the package with the 205 students who are enrolled on the PGCE course at Queen's University Belfast. All students created their own Moodle courses for a specified age group of pupils however only a small subset of these students had the opportunity to teach using their Moodle course. This paper therefore focuses on the experiences of all the students as they completed the modules leading to the creation of their Moodle course and the subsequent uploading of the course for use by pupils.

Context of the study

The UK Government document *Towards a Unified E-learning Strategy* (DfES, 2004) highlights the importance of preparing teachers for using 'blended learning' (Throne, 2003) to offer a more active and creative approach to teaching. In Northern Ireland a similar document exists entitled *EmPowering Schools* (DE, 2004) in which electronic and online multimedia will play a major role in the enhancement of teaching, learning and school leadership in the years leading to 2008. The overarching goal of the strategy is "that all young people should be learning with, through and about the use of digital and online technologies". So how does this impact on Pre-Service Teacher Education courses? Firstly there is a requirement that all teachers should be competent in integrating digital and online multimedia into their lessons, that they should be "e-confident teachers" and be comfortable with the idea of online collaborations across schools (both nationally and internationally) (DE, 2004).

In the context of a one year Post-Graduate Certificate in Education (PGCE) course, this initiative puts added pressure on the already limited time available to prepare students for school placements, to discuss effective teaching pedagogies and to reflect on wider educational issues. Therefore it was important to ensure these skills and experiences were embedded in the existing course structure.

The purpose of this research study was to investigate the factors which enabled or inhibited the creation of a short subject-specific Moodle course by 205 PGCE students from a variety of subject disciplines and differing levels of ICT experience. The tutor-defined requirements of the course were:

- to adopt a 'teacher controlled, specified learning activities' paradigm in the VLE course (Coomey & Stephenson, 2001);
- to integrate 'multiple approaches to the material being presented...along with various types of activities' (Palloff & Pratt, 2003);
- to embed the use of subject-specific software and 'good practice' as an integral part of the VLE course.

The structure of the online course

The guidance materials and instructions regarding the construction of the Moodle course were offered as a series of 10 Units with up to four activities per unit. All Units were available on Queen's Online (QOL), the University's MLE/VLE, which could be accessed from home, university or placement school. This format of course was adopted as it offered the student teachers an opportunity to experience an online course and be 'e-learners' before assuming the role of an 'e-tutor' as they progressed through the stages of their course creation. In addition, the course content also meet the requirements of the *ET Strategy for ICT in NI* which requires that all newly qualified teachers leaving the PGCE course were ICT competent to the equivalent of NOF standards for experienced teachers.

Content and purpose of the Units

Each Unit focused on a particular aspect of the student teachers' ICT development. Overall, some Units addressed the student teachers' personal competence in the use of a variety of software applications in MS Office, others encouraged them to reflect on the role of ICT in their subject and their pedagogical practice when embedding ICT into the teaching and learning process, while the final group of Units considered the role of ICT in supporting a more effective and efficient administration process when recording and monitoring pupils' progress. A number of transferable skills were also evident in the activities. The students were required to produce high quality worksheets, to identify and evaluate the suitability of a number of websites relating to their chosen topic, to comment on the usefulness of the internet to support teaching, to investigate the use of online assessment and to reflect on the advantages and disadvantages of the 24/7 access resulting from online courses of this nature. Even as standalone activities, these tasks were relevant to the students' personal development as a teacher and the outcomes could be used directly in the classroom as teaching resources, outside the context of the VLE course creation.

Course delivery

All Units were completed during self-directed study time and there was minimal input from the course tutors. Within each Unit, there was at least one activity that required the students to engage in an online discussion about a key aspect of the use of ICT in teaching. All discussions were subject-specific with each subject group having a

separate, closed area for these debates. Short summaries of these discussions were included in the students' final portfolio of evidence. Over the course of the year, these discussion areas also become the hub of the peer support mechanism where advice, encouragement and ideas were exchanged within the group both relating to ICT activities and also on the broader issues of classroom management and professional development whilst on placement in schools.

Due to the varying degrees of ICT competence within the subject groups, the student teachers were allocated the full 36 week academic year to complete this aspect of the PGCE qualification. All work was submitted and assessed in the final week of the PGCE course which allowed the students to work at their own pace and plan around the other pressures on their time. At the mid-point of the year (February), the students received a two hour face-to-face tutorial workshop which demonstrated how to store and upload electronic resources into their individual Moodle courses. Students were informed in advance that they should have completed all the activities up to Unit 4 by this time and to bring their pupil worksheets and any additional support materials or electronic resources to this workshop.

Research methodology

The two main areas under investigation were the student teachers' perceptions of the process of completing the online Units which guided the creation of the Moodle course and secondly, their perceptions of the experience of working within the Moodle environment, uploading and presenting their resources as an online course.

The evaluation of this study used both quantitative and qualitative methods using a mixture of questionnaires and focus group interviews to gather the data. The questionnaires were distributed electronically via e-mail to all students during the final week of the PGCE and after the deadline for submitting their portfolio of evidence. Focus group interviews were held on the afternoon of the submission deadline while the students' experiences and thoughts were still fresh in their memory.

Findings

All questionnaires were distributed electronically to the PGCE cohort during the final week of the course and after the submission date for their Moodle portfolio. There was a 55% response rate (n=112) and all subject areas were represented. The breakdown of respondents by gender was 18.8% male and 81.2% female which reflects the male/female course enrolment pattern of 22.5% male and 77.5% female.

The questionnaire was presented in three main sections: background and prior experience of VLEs, using QOL, and the creation of the Moodle course. The first section revealed that the majority of students are graduates from Queen's University or the University of Ulster and therefore should have had some limited experience of using either QOL or WebCT as part of their undergraduate course. However, it was interesting to note that 85.7% of the respondents declared they had no prior experience of using a VLE as part of their undergraduate degree course. Half of the respondents (50.9%) had used QOL for accessing resources prior to the PGCE course while only 8% of students had participated in online discussions in QOL. This outcome highlighted the fact that 92% of the students had no prior experience of the environment in which a key element of each Unit was to be completed. When asked if the Moodle environment was available in their first teaching post, would they consider using it, 71.4% of respondents agreed however many added conditions such as "the Moodle/VLE course would have to be already created since this was a time-consuming element of the process", or that its use would only be for "a specific topic or aspect of the course specification" or only if "it was relevant" and "to complement my teaching, not replace it".

The QOL experience

The second section of the questionnaire related to the students' experiences of completing the QOL Units of work during their directed study time. A 4-point Likert scale (ranging from 1=Strongly disagree to 4=Strongly agree) was used to obtain the students' attitudes to 26 items. Exploratory factor analysis revealed a three factor model summarising 38.99% of variance.

The first factor, *Enjoyable and valuable ICT experience*, accounted for 22.61% of variance, and was composed of 10 items such as:

- I enjoyed completing the tasks in QOL
- I enjoyed reading the background materials in the modules/units
- I enjoyed thinking about ways to use ICT in my subject
- I feel using QOL like this was an important experience for me
- The QOL discussions were beneficial in exchanging ideas

The reliability of this factor was calculated as $\alpha=0.7887$ using Cronbach's alpha.

Factor 2, *Students' managing their own learning*, accounted for 8.51% of variance, and comprised 7 items such as:

- I feel I paced myself well when completing the QOL work
- I didn't have enough materials ready for the February workshop (recoded due to negative wording)
- I should have spent more time earlier in the PGCE course working on the modules
- Ten modules was too many to complete in the year
- There was too much expected of us in the modules/units.

The reliability of factor 2 was measured using Cronbach's alpha $\alpha=0.7627$.

The third factor, *Confidence in using QOL*, accounted for 7.86% of variance, and was composed of 9 items such as:

- QOL is easy to use.
- It was hard to work with the QOL interface. (recoded due to negative wording)
- I feel confident in using QOL now.
- I was totally confused when trying to complete the QOL work. (recoded due to negative bias)

The reliability of factor 3 was measured using Cronbach's alpha $\alpha=0.7377$.

Profile analysis by population subgroups

The mean scores for each factor (with standard deviations in parentheses) are included in Table I. Overall the males appear to be more positively disposed to this mode of completing the Units, with their scores above 2.5 in each factor, compared to the females. In both cases, the students' confidence in using QOL ranked highest and their ability to manage their own learning ranked lowest. In light of the students' earlier claims of a lack of familiarity with QOL and VLEs in general, it is important to recognise the progress that has been made in reaching this level of confidence and positive disposition towards the environment. As future teachers, it is also interesting to note their lack of confidence in managing their own learning. Perhaps this lower mean score reflects the extent to which modular examinations at schools and university reduce the students' need to plan and prepare over a complete academic year.

Gender	Enjoyable and valuable ICT experience (mean, sd)	Students' managing their own learning (mean, sd)	Confidence in using QOL (mean, sd)
Male	2.58 (0.47)	2.54 (0.51)	3.08 (0.48)
Female	2.51 (0.45)	2.41 (0.53)	3.01 (0.39)

Table I Mean scores for each 'QOL experience' factor by gender.

Profile analysis revealed no significant differences between the genders ($F(108,1)=1.20, p=0.275$).

Table II reports the mean scores for each factor by subject area. It should be noted however that some subgroups are very small (less than 5 respondents) which equates to less than half of that subject group responding. Results from these groups should therefore be treated with caution.

Subject	Number of respondents (n)	Enjoyable and valuable ICT experience (mean, sd)	Students' managing their own learning (mean, sd)	Confidence in using QOL (mean, sd)
Mathematics	20	2.60 (0.46)	2.54 (0.57)	3.03 (0.35)
English	15	2.38 (0.60)	2.43 (0.63)	2.93 (0.40)
Science	30	2.42 (0.32)	2.47 (0.39)	3.03 (0.39)
Modern Languages	24	2.44 (0.41)	2.17 (0.54)	3.00 (0.43)
ICT/Computing	7	3.13 (0.35)	3.00 (0.40)	3.31 (0.38)
Religious Education	3	2.29 (0.29)	2.19 (0.33)	2.86 (0.00)
Social Sciences	10	2.75 (0.40)	2.43 (0.44)	2.99 (0.52)
Overall	110	2.52 (0.45)	2.44 (0.53)	3.02 (0.40)

Table II Mean scores for each 'QOL experience' factor by subject area.

Overall the students had a positive attitude towards the use of QOL and were confident when using it to complete the activities for each Unit. Across all subjects the mean score for this third factor was 3.02 indicating a high level of agreement with the items in this factor and a high level of student confidence as 'e-learners'. Although the overall mean score for factor 1 was 2.52 – indicating an overall positive attitude to the course being an enjoyable and valuable experience, four of the seven main subject areas had mean scores of less than 2.5. Only the maths, ICT and social science groups truly enjoyed completing the QOL units and developing the resources needed to create an online course in the Moodle environment. Some of the students commented that using QOL “gave me the chance to develop my ICT skills and allowed me to discuss ideas online” and it has “long-term benefits to me as a teacher”. Another student declared “The most beneficial part of the QOL work was being able to access the materials at any point because this allowed you to pace the workload and have independence in completing the work.”

Finally, the overall mean score of 2.44 in factor 2 indicates the students found it difficult to manage their own learning in QOL. Across the main subject groups, only the ICT and Maths students had a positive attitude towards being independent learners and organising their own time over the academic year. The Modern Languages and RE groups appeared to struggle most with this approach.

From the table it is clear that the ICT/Computing group had a noticeably more positive attitude in all the factors compared to their peers in the other subject areas. It may be assumed that this type of learning is more suited to the typical teaching approaches used in ICT/Computing classes and therefore these students saw the relevance of the QOL and Moodle work in terms of their future role as teachers. It may also be the case that they saw evidence of experienced teachers using innovative techniques in the classroom and embedding internet activity into their teaching repertoire on a regular basis. With this in mind, it is clear why the ICT/Computing group viewed these activities in a more positive light than those students who had been exposed to traditional pedagogical approaches during their school placements.

A profile analysis of the mean scores by subject revealed a significant difference ($F(10, 98) = 2.59, p = 0.008$) across the subject when split into their component parts, that is, when the Science group was split into Biology, Physics and Chemistry, the Modern Linguists were split into Irish and French/Spanish, and the Social Scientists were divided into Sociology and Politics for comparison. However it should be noted that some of these subgroups were very small (less than 5 students) and therefore these results should be treated with caution. When the subjects were grouped into larger categories of 'Sciences' composed of Maths and Science, 'Languages' comprising English and Modern Languages, and Other – namely Social Sciences and RE (with ICT omitted from all the groups due to being a special case), a non-significant result was obtained ($F(2,99) = 1.51, p = 0.227$).

The Moodle experience

The third section of the questionnaire related to the students' experiences of creating the Moodle course – the technical aspects of uploading resources to make them available online. A 4point Likert scale (ranging from

1=Strongly disagree to 4=Strongly agree) was used to obtain the students' attitudes to 26 items relating to this aspect of the work. Exploratory factor analysis revealed a three factor model summarising 49.81% of variance.

The first factor, *Positive experience of personal development as a teacher*, accounted for 30.32% of variance, and was composed of 12 items such as:

- The Moodle course will be useful as a teaching resource in the future.
- I am motivated to create another Moodle/VLE course in the future.
- I value the Moodle work in terms of preparation for my future experience as a teacher.
- I enjoyed thinking about teaching differently using the Moodle.
- I experienced a feeling of success when I had created my Moodle course.

The reliability of this factor was calculated as $\alpha=0.9221$ using Cronbach's alpha.

Factor 2, *Ease of working in the Moodle environment*, accounted for 12.69% of variance, and comprised 8 items such as:

- There was too much covered in the Moodle workshop in February. (recoded due to negative wording)
- I found the training workshop in Moodle helpful.
- It was hard to work with the Moodle interface. (recoded due to negative wording)
- It was easy to add content material to the Moodle course (uploading resources)
- There was too much effort involved in creating the Moodle course.

The reliability of factor 2 was measured using Cronbach's alpha $\alpha=0.7572$.

The third factor, *Value of the Moodle workshop*, accounted for 6.80% of variance, and was composed of 5 items such as:

- The workshop for the Moodle should be optional. (recoded due to negative wording)
- I didn't need the Moodle workshop to train me in using the features of the Moodle environment. (recoded due to negative wording)
- There should be more Moodle workshops throughout the year.
- I had to spend a long time creating the content of my Moodle course.
- I should have spent more time planning my Moodle course.

The reliability of factor 3 was measured using Cronbach's alpha $\alpha=0.7590$.

Profile analysis by population subgroups

The mean scores for each factor (with standard deviations in parentheses) are included in Table III. Overall the males appear to be more positively disposed to working in this type of virtual learning environment, with their scores above 2.7 in each factor, compared to the females. However it is interesting to note the difference in mean scores for the third factor where the female students clearly put a greater emphasis on the 'Value of the Moodle workshop' as a means of supporting them in completing this element of their coursework. Perhaps this mean score reflects the male trait of being happy to muddle along and discover a way of uploading resources using trial and error or commonsense whereas the females prefer to be taught a logically structured and fail-safe technique. In light of the emphasis being placed in e-learning, particularly in NI, it is worrying to note that the first factor scored lowest for both the male and female student teachers. In terms of their personal and professional development as teachers embedding ICT into their pedagogical practice, it would appear this factor is of least importance in terms of their attitude towards the experience of creating a subject-specific online course.

Gender	Positive experience of personal development as a teacher (mean, sd)	Ease of working in the Moodle environment (mean, sd)	Value of the Moodle workshop (mean, sd)
Male	2.71 (0.53)	2.77 (0.30)	2.76 (0.67)
Female	2.52 (0.56)	2.63 (0.23)	3.02 (0.60)

Table III Mean scores for each ‘Using the Moodle’ factor by gender.

Profile analysis revealed no significant differences between the genders ($F(106,1)=0.12$, $p=0.727$).

Table IV reports the mean scores for each factor by subject area. It should be noted however that some subgroups are very small (less than 5 respondents) which equates to less than half of that subject group responding. Results from these groups should therefore be treated with caution.

Overall the students had a very positive attitude towards the Moodle environment, finding it easy to work in and also valuing the workshop support. For one student, the Moodle offered her a true sense of achievement:

“I really enjoyed putting my Moodle together and uploading it – I felt quite proud of myself for being able to do it. I can really appreciate the benefit it would be to teachers and pupils alike.... I think the Moodle really helped my ICT skills as I had to figure out things and use aspects of ICT that I had never used before. I feel more confident about using the computer than I used to - this is the first time I’ve attached something to an e-mail and I figured out how to do it using the skills I acquired from uploading my Moodle.”

It is particularly noticeable in factor 3 that the students on language (English or Modern Languages) and Social Science (Sociology and Politics) courses had high levels of agreement with the statements in the third factor as illustrated by mean scores over 3.0. Across all subjects the mean score for this third factor was almost 3 (2.97) indicating overall agreement that the workshop was of value in supporting student teachers’ needs in terms of creating and uploading their course. Some students even declared they should “have a session every couple of months.” Others requested additional workshops nearer the submission date or longer workshops at a slower pace.

Although the overall mean score for factor 1 was 2.55 – indicating an overall positive attitude to the personal and professional development being offered to them, only the ICT group (with a mean score of 3.24) appeared to appreciate the true value of this course in terms of their future role as teachers. This result may be explained by the fact that this was the only group of students who actually used their course in a classroom with pupils.

Subject	Number of respondents (n)	Positive experience of personal development as a teacher (mean, sd)	Ease of working in the Moodle environment (mean, sd)	Value of the Moodle workshop (mean, sd)
Mathematics	20	2.48 (0.57)	2.62 (0.21)	2.88 (0.65)
English	16	2.54 (0.63)	2.60 (0.22)	3.15 (0.41)
Science	28	2.51 (0.49)	2.68 (0.27)	2.68 (0.57)
Modern Languages	24	2.43 (0.54)	2.60 (0.24)	3.14 (0.60)
ICT/Computing	7	3.24 (0.40)	2.80 (0.19)	2.81 (0.72)
Religious Education	3	2.31 (0.35)	2.96 (0.51)	2.56 (0.38)
Social Sciences	9	2.74 (0.62)	2.61 (0.23)	3.36 (0.47)
Overall	108	2.55 (0.56)	2.65 (0.25)	2.97 (0.62)

Table IV Mean scores for each ‘Using the Moodle’ factor by subject area.

A profile analysis of the mean scores by subject revealed a non-significant difference ($F(10, 96) = 1.88$, $p = 0.057$) across the subjects when split into their component parts, that is, when the Science group was split into Biology, Physics and Chemistry, the Modern Linguists were split into Irish and French/Spanish, and the Social Scientists were divided into Sociology and Politics for comparison. However it should be noted that some of these subgroups were very small (less than 5 students) and therefore these results should be treated with caution. When the subjects

were grouped into larger categories of 'Sciences' composed of Maths and Science, 'Languages' comprising English and Modern Languages, and Other – namely Social Sciences and RE (with ICT omitted from all the groups), a significant result was obtained ($F(2,97) = 3.87, p = 0.024$).

Conclusions

All 205 students successfully completed and submitted their Moodle portfolio within the allocated timeframe. It was interesting to note the change in access statistics on the Moodle as the deadline approached. For the weeks leading up to the submission date, access rates were relatively steady at 300 accesses spread over the school day. For the final two days before the deadline, access rates to the Moodle environment soared to approximately 4000 per day with some students working until 5am. These statistics further reinforce the students' self-declared problem of managing their own time.

Overall the students reported a positive experience when using QOL and in particular, they revealed that the online course had boosted their confidence as e-learners. Although the student teachers did not appear to find the course as enjoyable as would have been anticipated this may have been as a result of their difficulties in managing their own time as revealed in the analysis of the questionnaire data. The face-to-face workshop was highly valuable to the students in terms of support and clarification at the midpoint of the PGCE course and also for confidence building which led students finding the Moodle environment was easy to use contrary to their expectations. Although there were no significant gender differences across the factor structures, the mean scores for the females were lower than those for the males on all factors apart from the 'Value of the Moodle workshop'. Clearly the males were comfortable working in the VLE environment of QOL and coped well with the need to work independently and manage their own learning. The female students however appeared to be dependent on the workshop for guidance and clear instructions on the technical aspects of uploading resources into the Moodle environment and on the wider VLE issues. The subject differences were not unexpected as past experiences of ICT workshops with Languages and Sciences students have revealed noticeable differences in level of ICT competence and confidence. Perhaps the biggest surprise came from the small Social Science group who were very positively disposed to all aspects of the course and saw its relevance for their future development as teachers.

In terms of future developments to the course, the content and structure (including the mode of delivery) will remain the same however students will be offered more guidance on how to participate more effectively in online discussions since this is an area where they have little experience. In addition, time limits will be added to the discussions at Unit level which will also create regular deadlines throughout the year for those aspects of the course and may assist the students in structuring and managing their own time better during the year. Finally, exemplars of completed Moodle course in each subject will be viewed and discussed at the beginning of the PGCE course so that the students have a clear understanding of their goal for the year.

Future research in this area will include an investigation into the use of other VLEs such *LearningNI* which are already accessible in schools and to follow up student teachers to determine if, and when, they embed a VLE course into their teaching during full-time employment. In addition, it would be important to identify the factors which facilitate or hinder such innovative ICT usage in the classroom environment.

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