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Can the Use Of Online Learning and Reflective Journals Improve Students' Performance and Engage Them In Independent Learning for a Practically Taught "Timber Jointing Module

Jennifer Byrne
Technological University Dublin, jennifer.byrne@tudublin.ie

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Can The Use Of Online Learning And Reflective Journals Improve Students' Performance For A Practically Taught Timber Jointing Module?

Dublin Institute of Technology, Dublin School of Architecture. (IRELAND)

jennifer.byrne@dit.ie

Abstract

The Dublin Institute of Technology is one of the largest multi-level higher education providers in Ireland. The Institute's traditional mission has always been focused on teaching and learning in the field of advanced technical vocational education and training (TVET), and one of its agendas is to foster and encourage changes in teaching practice and methodology in order to enhance the student learning experience.

This research concerned the performance levels of first year students of the Timber Product Technology (TPT) programme. I wanted to investigate whether the use of independent online learning and reflective journals would encourage these students to continue their learning outside of the timetable class contact hours and improve their performance in the practical class.

The methods used were informed by a constructivist underpinning with students being encouraged to take more responsibility for their own learning. Independent learning was encouraged by using a purpose built website, where material relating to this module was provided using a variety of mediums.

Learner reflection and the use of reflective journals formed a substantial aspect of this research and students were encouraged to record the daily progress of their practical work and actively use estimated and actual time charts to plan practical work.

The findings of this research saw a more informed student than the previous year's cohort. This was evident in both the assessment stage of the research study and in the language used in the student's journal writing. The findings of this research also showed that the students did take charge of their own learning by coming to class well prepared with a plan of action.

Keywords: Action Research, Online Learning, Independent Learning, Timber Jointing Classes, Reflection & Reflective Journals.

1 INTRODUCTION

This research concerned the performance levels of first year students of the Timber Product Technology (TPT) programme. The background knowledge of these students is very mixed with many having little or no experience in working with wood or wood related tools. It investigates whether the use of independent online learning and reflective journals would encourage these students to continue their learning outside of the timetable class contact hours and improve their performance in the practical class. Having good background knowledge equips the student with firsthand information on what tools to use and how to better use them, in a given situation. The hope was that these students would use the resources to learn about the tools and wood related materials and prepare themselves better for the practical classes.

1.1 Background

The Timber Product Technology (TPT) programme that is the focus of this work was validated in June 2011 and took in its first cohort of students in September 2011. This programme meets the criteria for a level 7 Ordinary Degree specified by the National Qualifications Authority of Ireland (NQAI). The TPT programme caters for students that want to gain knowledge and skills for the furniture and joinery industry. It provides a high level of practical skills combined with the theoretical knowledge to start up a company.

The Jointing Techniques and Furniture 1 module (JT&F1) is taught to first year students in a practical workshop environment whereby the students learn the basic skills in wood jointing techniques and making furniture. The students learn using a combination of hand tool skills and the use of machines to fabricate wood into furniture.

1.2 Timber Product Technology cohort of 2013/14

The programme reserves sixteen places for mature students and sixteen for CAO students. It has a mixed range of students of both genders, aged from 17 to 60 and from different entry levels; leaving certificate, level 5 and 6 course graduates, past timber related apprentices and mature students with no timber background. There is a vast difference in their learning styles, especially between those students straight from secondary school to those having been away from education for quite some time.

It has been recognised that the outdated practices of telling students what they should learn, how they should learn it and assessing what they have learned leads to teachers teaching to the test and students rote learning (Peddiwell, 2004). As young and mature adults, these students should be taking responsibility for their own learning, but they also need help to show them how to learn and how to be self directed in their learning (Knowles, 1980). It is no longer acceptable to tell students to "go off and find out for yourself" and teachers have a role to promote and nurture this type of learning environment.

The cohort for this study consisted of 26 students, one of whom was female, ranging in age from seventeen to forty four. 20 students were under twenty three either direct from secondary school or else having up to one year's college experience and the remaining 6 were students over twenty three and from direct entry route.

1.3   The Module

The JT&F1 module is a first year module that extends across the full academic year. It has 10 ECTS (European Credit Transfer and Accumulation System) associated with it and class contact time is eight hours per week. It is taught in a workshop environment using hand tools and machinery and the students have to be supervised at all times. As a result the students spend the recommended eight hours per week per 5ECTS learning in a practical classroom. The independent learning that I wanted the TPT students to participate in would be in addition to their full timetabled hours and only the coursework journals would be assessed. There would not be any marks awarded for the pre-test and post-tests.

2   Aim of Research & Research Objectives

The aim of this action research study was to investigate as to whether the first year students would engage with online learning and reflective journals outside of their normal eight hours class contact per week for this practical module. It was also to determine if there would be any effect on their background knowledge and students performance in the practical class.

The research question:

Can the use of online learning and reflective journals improve students' performance and engage them in independent learning for a practically taught timber jointing module?

The reason for choosing to carry out this action research was to improve the teaching practice with this particular first year module, as it will establish the foundations for the following three years in related practical modules to come.

The research question can be broken down into a series of objectives as follows:

1   To establish students' prior background knowledge on starting this module and gauge any increase throughout the duration of the module. (By completing before and after testing.)

2   To explore the use of reflective journals to find out if they can encourage the student to become a reflective practitioner and self directed in their learning. (By comparing the difference in the marks achieved for each journal against the marking rubric.)

3   To determine if an increase in background knowledge can improve the students' abilities in practical skills. (This will be assessed by comparing grades achieved for practical coursework with last year's results and by lecturer observations in class.)

4   To determine how early promotion of independent learning influences learners attitudes to their learning. (This will be addressed by observing student performance during the practical classes and within the focus group and through student / staff interviews.)

3   METHODOLOGY

3.1   Action research

Schön's book "The Reflective Practitioner" is widely cited by many as seminal work. Norton (2009) states that Schön's concept of the reflective practitioner has widespread currency in higher education (p.21), a view that is also shared by Mc Niff (2002). Mc Niff (2002) suggests that action research is mainly about the lecturer becoming a reflective practitioner and always questioning whether their methods are working. I would concur with these authors and have always taken that approach to my teaching, so action research therefore seemed an obvious choice of methodology for this study.

Biggs and Tang (2007) advise that action research involves systematically changing your teaching practice using "on the ground" evidence that suggests that the changes you make are heading in the right direction and enhancing student learning. Mc Niff and Whitehead (2006, p.7), describe action research as "a form of enquiry that enables practitioners everywhere to investigate and evaluate their work". These authors argue that you must evaluate the research that you have carried out, reflect on it and act on your discoveries. Norton's (2001) five step process, better known by the acronym ITEDM, was used to carry out this research.

As stated earlier the independent learning that I wanted the TPT students to participate in, had the potential to increase their overall understanding and learning, however it was in addition to their timetabled hours and only the coursework journals would be assessed. Table 1 below shows how the research was carried out and how data was gathered during this study.

Stages	No of Cycles	Method	Student Participation	Data gathered and recorded
Stage 1 (a)	3 Cycles	Online learning & Pre-testing and Post testing	Voluntary	The results obtained have been recorded anonymously as Student 1, student 2 etc.
Stage 1 (b)	3 Cycles	Paper Surveys	Voluntary	Results compared in all 3 surveys recorded anonymously.
Stage 2	3 Cycles	Reflective Journals	Compulsory	Students names recorded in Grade Book and then results recorded for research anonymously.
Stage 3	3 Cycles	Practical Coursework	Compulsory	Students names recorded in Grade Book and then results recorded for research anonymously.
Stage 4	At end.	Focus Group & Interviews	Voluntary	Feedback recorded anonymously

Table 1: Shows how research projects were carried out and how data was recorded.

4   STAGE 1 (a) : METHOD FOR IMPLEMENTING ONLINE LEARNING

4.1   Establishing baseline IT skills

As this part of the study involved using computers and the internet, the IT (information technology) skills of these first year students had to be established. A short diagnostic test was carried out to check their basic IT skills and to confirm the correct email address for them.

All students completed this task successfully thus establishing their IT skills. They were then given access to the online learning environment and the action research project implementation began.

4.2   Online learning and testing

In week one, the level of knowledge these students had on four module related topics was established by giving them twenty short answer questions on these topics. I created a range of learning material which I uploaded into the module website. I obtained many of these emerging technology tools from Clarke (2011) who has correlated many forms of technology in his book. To cater for different learning styles, I provided written instructions, PowerPoint presentations, PDF files that can use the ADOBE audio tool for listening and embedded videos.

I used the instructional design ADDIE model, I went through each stage -Analyse, Design, Develop, Implement and Evaluate - to develop my resource. I was informed by research on Website Design, Virtual Learning Environments (VLE) and Virtual Learning Communities (VLC). While I had no intentions of creating a VLC, I highlighted the observations made by the authors and noted the ones listed as good practice and applied them to setting up and maintaining my website. Lewis & Allen (2005) make a very valid observation when they state "Our experience of working with virtual learning communities has demonstrated that the facilitator input rather than the technical capability of the system is key to the success"(p. 51). I would concur with this statement as just because you put material onto the website does not mean that the students are going to learn from it. The facilitator has to guide and promote the students' learning.

In designing my website I followed Nielsen's (2006) F pattern design and kept my page tabs across the top of the page with instructions down the left-hand side of the page. In an eye tracking study Nielson carried out he discovered that people view a website page in an F pattern. Quickly scanning across the top section of the page then down a bit and across again and finally vertically down the left-hand side.

Constructivism is one of the main learning theories used in teaching practical modules. Projects of graduating difficulty are given to the students and they bring their newly acquired knowledge into their next stage of their learning and build on it. Students apply what they have learned each day to similar situations, thus increasing their knowledge. Earlier founders & proponents of the constructivist method of teaching were Dewey, Piaget, Bruner & Vygotsky (Lambert, Walker, Zimmerman, Cooper, Lambert, Gardner & Szabo, 2002). They all believed that learners should build on their knowledge and experience and apply it to new situations to create new knowledge. Learning is an active process whereby the students observe, copy, practice and repeat until they have achieved the required standards, in other words "learning by doing" (Gibbs, 1998).

The students were encouraged to take more responsibility for their own learning. Independent learning was encouraged by using a purpose built website, where material relating to this module was provided using a variety of mediums. Word documents, animated PowerPoint presentations and quizzes, links to other websites and videos were included. The constructivist pedagogy was implemented into the online learning, as material on the website could be related directly to practical work in the classroom. "Thus individuals assign meaning to experience and at the same time construct knowledge from experience" (Lambert, et. al 2002, p. 7) Students were asked probing questions and/or to comment on what they viewed online, "the emphasis is less on putting in information and more on drawing out new knowledge and understanding." (Carnell & Lodge. 2002 p. 13)

In week two, students were shown the website and given a brief demonstration on navigation and informed that material would be added on weekly basis. I sent them a link to the website and instructed them to save the link into a word document.

In week four, students were reassessed on the first four topics as a post test and prior knowledge was established on four new topics at the same time thus reducing the number of test sittings for the students.

These four topics that were new in week four were reassessed in week eight while again establishing prior knowledge on five new topics that were then reassessed in week twelve.

To ensure that students did not become familiar with the test questions, I altered or reworded the second set of post testing questions to assess the same topics.

4.3   Stage 1 (a) Results for online learning

Table 2 below shows the percentage difference between the first and second tests after the week four re-test on the first set of topics. It is important to note that I did not offer any feedback after the first test as I was concerned that giving feedback then would compromise the results of the re-test in week four.
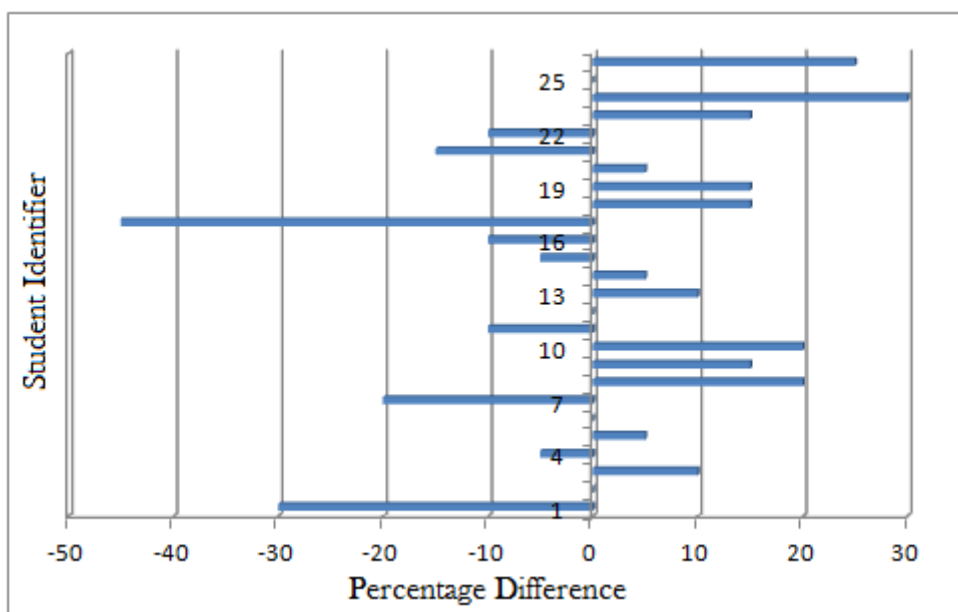

Table 2: Percentage difference after re-testing in week 4 for 1st Cycle of short answer questions to probe student knowledge.

Note: Students 12 and 17 did not sit the retest, there was no difference in student no 24 results.

Students' results shown in table 2 are very varied with many showing negative results, meaning that they got a lower mark in the post test. My objective then was to find out why. I carried out a short anonymous survey to get feedback on how the students preferred to connect to the internet and on which device. I also inquired on the level of computer skills they felt they had and on how useful and user friendly they found the website. (See graphs under "Survey" section.)

My findings were positive in general which then led me to the conclusion that the issue was that students were not familiar with answering these types of short answer questions. Black & William (2001) found that knowing how you are going to be assessed can influence your test result by up to 20%. The TPT students had never seen an example of these test questions prior to this study and it may have been the case that "time-constrained, unseen, written examinations only manage to measure a shadow of students' actual learning, as filtered through their pen-and-paper communication in exam rooms" (Race & Pickford, 2007, p. 113).

At this stage, I gave them general feedback on the first cycle and how questions should be answered. Students were not given individual feedback. I am a firm believer in giving formative feedback and I was uncomfortable in testing this way without using feedback for re-testing, but as I stated earlier I was concerned that feedback would unfairly prepare the students for the re-test. I would not know for sure if the students were engaging in independent learning or using my feedback to enable them to sit the re-tests.

During the 2nd cycle of testing, two things became apparent;

1   Students were engaging with the website more, as I could track online activity and noticed a huge increase compared to previous four weeks. (See table 3)
2   Students were asking questions in the practical classes about material that they had viewed online.
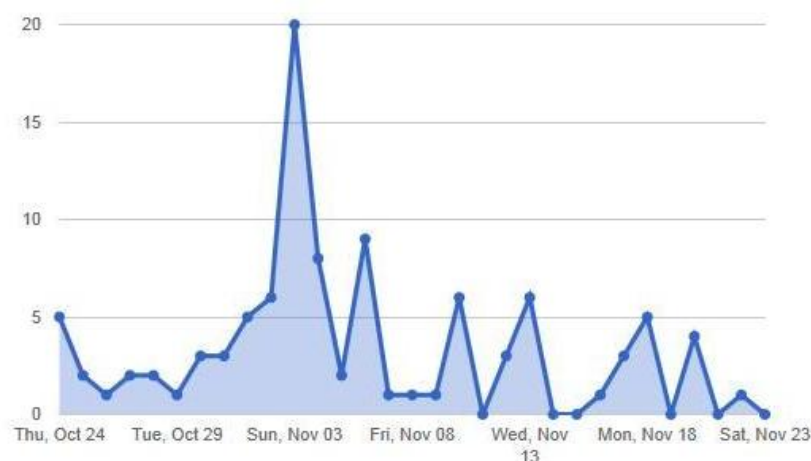
Visits	Visitors	Unique visitors change	Pageviews
101	21	-1.0%	239
in the last 30 days	in the last 30 days	in the last 30 days	in the last 30 days

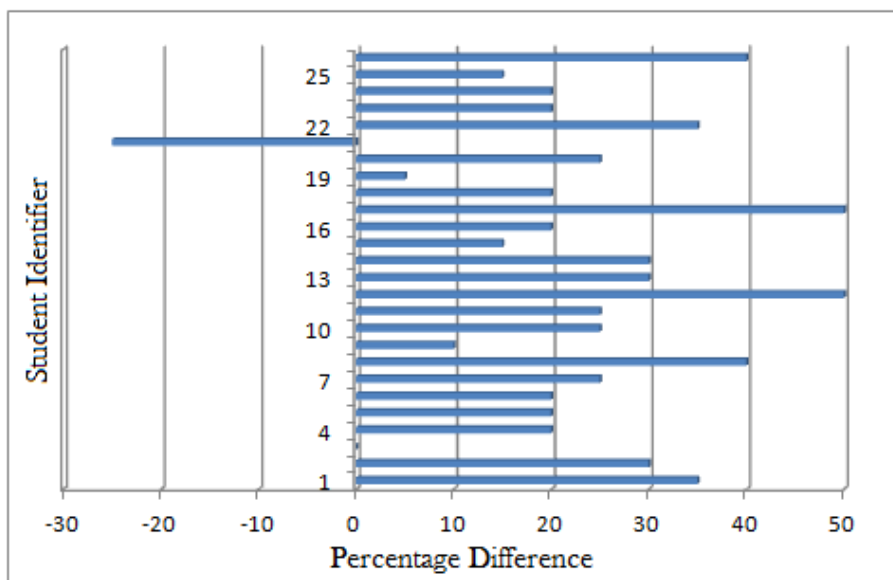*Table 3: Site Traffic for October - November 2013.*

Table 4: Percentage difference after re-testing in week 8 for 2nd Cycle of short answer questions to probe student knowledge.

Note: Student 21 left the programme at week 6 ,there was no difference in results of student no 3.

The results shown in table 4 clearly show a positive outcome between the initial cycle 2 test and the cycle 2 post-test and students were observed to have answered the questions more clearly and accurately. As they had not received any feedback in-between the tests, my conclusion would have to be that they engaged with the online learning.

The final cycle of this part of the project occurred between weeks 8 and 12 and as the students did not receive any marks towards this module for taking part in this study, coursework for the programme's other modules became a priority for them. However apart from one student, everyone managed a positive percentage difference (as shown in table 5) although on average not as high as the 2nd cycle of testing.
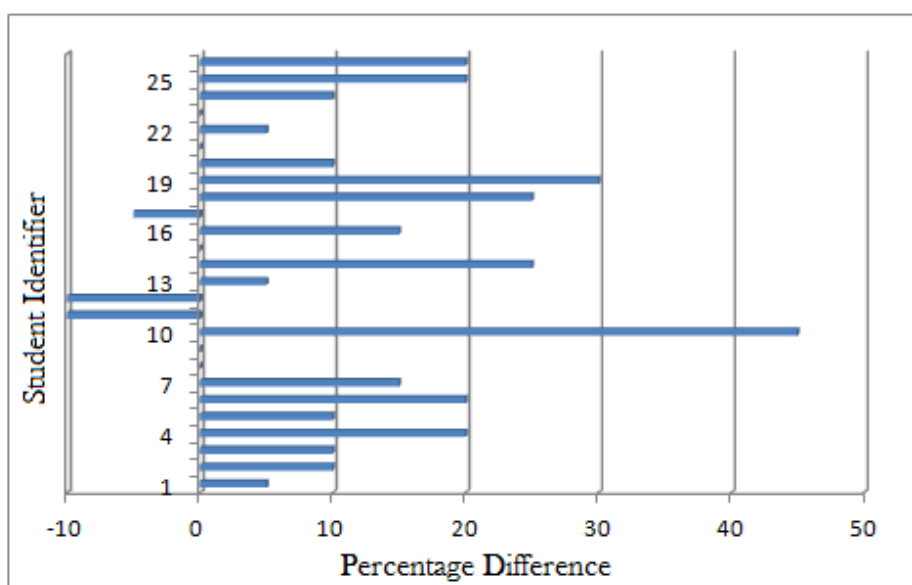

Table 5: Percentage difference after re-testing in week 12 for 3rd Cycle of short answer questions to probe student knowledge.

Note: Students 11 & 12 did not sit the re-test, there was no difference in remaining student results.

5   STAGE 1 (b) : SURVEYS

As mentioned previously a short anonymous paper survey was carried out after the first test to inquire about the level of computer skills these students felt they had, where they preferred to connect to the internet and on which device. Despite Prensky's (2001) explanation on the concept of students as "digital natives," I find that this is not always the case. Individual students are different, they are at different stages of their learning and may have different levels of experiences with digital technology.

Results showed that 95% of the students preferred to connect to the internet at home, with 50% using their laptop, 40% their smart phone and the remaining 10% their computer.

These findings were quite similar to a survey that I carried out in the previous year and as a result of that survey I had ensured that the text and images on my presentations were easily viewed as a whole page on the typical large screen Smart phone or 7" tablet.

A paper survey was conducted after each stage of testing to see if there were any changes needed or issues with the students using the website.

Vital information was gained on how useful these students found the site and the durations spent using it from the survey. All students said that the site was either useful or very useful Only two of the students found some difficulty in navigating the site. I asked the two anonymous students to contact me for help and both did and I gave them a demonstration on navigating the site.

Table 6 shows a bar chart representing the results after 3 cycles for question 3 on the survey: On average how much time did you spend each time looking at the material on the website in each session?
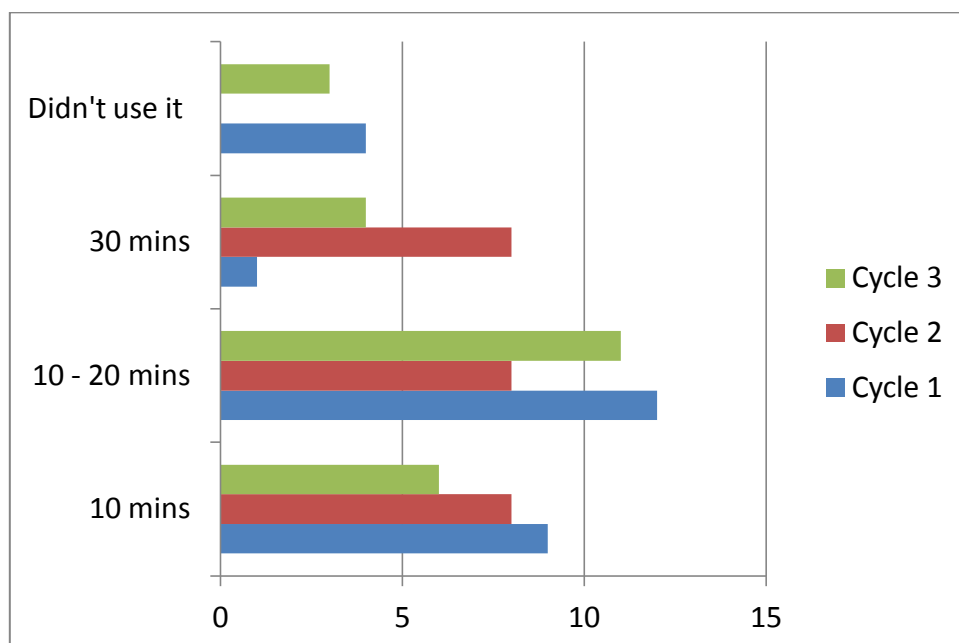

Table 6: Bar chart showing survey results over 3 Cycles for question 3.

In cycle 1, four students claimed not to have used the website, while all students used the website in the 2nd cycle. Three students did not use it in the last cycle. As the survey was anonymous, I cannot tell if they were the same students. This was the voluntary section of this module so whether the students wanted to engage with the online learning was entirely up to them. Some students readily engaged with it while others saw it as extra unaccredited work. Mac Donald (2006, p. 75) made similar observations "Despite the best laid plans, some students are more likely to participate actively than others, for a variety of reasons".

This aspect of my research was over in week 12 (early December 2013) and I left the website active for the students to use, as many of the topics I had covered were also covered at a later stage in another TPT module "Materials". The students had an exam in this module in January and I tracked access to my website during this time. In the weeks prior to the Materials exam, it had been accessed sixty three times by sixteen viewers. This confirms that overall it does have the potential to be a useful resource in teaching.

6   STAGE 2 : METHOD FOR IMPLEMENTING REFLECTIVE JOURNALS

In the academic year 2012/13, my colleague and I introduced using Reflective Journals to our then cohort of first year students on the TPT programme. We wrote a paper on our experience (Byrne & Ryan 2013) on using reflective journals which we presented at the [International Conference on Engaging Pedagogy (ICEP) at the IT Sligo in December 2013.](#)

Having carried out this initial research, I was more prepared to take it on again. Having had the benefit of hindsight in our trial run the previous year I was more aware of what was involved for the student to commit to writing a Reflective Journal. In 2012/13 we (the lectures involved) had allocated 2% and 5% towards these two journals and discovered that the amount of time that students spent on typing them alone was worth more than 2% or 5% so I increased the value of the mark allocated to the journals.

As I am module coordinator I designed the coursework projects and my colleague agreed to carry out the extra assessment marking of the Journals, as he was already convinced of their value to the students learning. Table7 below shows the coursework and allocation of marks for each aspect of the projects.

Coursework	Item	Practical	Journal
1	A frame (six joints)	15%	5%
2	Trinket box with veneered lid	30%	10%
3	Table with turned legs & drawer	30%	10%

Table 7: Coursework projects for the JT&F1 module.

I believed this layout to be fairer to the student because as the size and work associated with each piece of coursework increased, the students were required to reflect more with each project. The journals were graded according to marking criteria set down for them.

I followed the same procedure as the previous year for instructing the students on reflection and the perceived benefits of using the reflective journals. Students were given a one hour session outside of normal class time. During this hour the students were shown a PowerPoint presentation explaining what reflection is, the benefits of maintaining a reflective journal and the different models of reflection. This presentation was uploaded into Slide Share™ and embedded into the website so that the students could re-visit at a later stage.

The Power Point Presentation covered the following:

What is reflection?

How can reflection help me in practical class?

What is a reflective journal?

Students were told that a journal is keeping a written record of events and that a reflective journal is about reading about those events and writing about new events sometimes in relation to past events. Students were shown that keeping a reflective journal can be a very effective tool in developing learning because it can deepen the learning experience. The students were shown the many models used for reflection (Schön, 1983: Kolb, 1984: Gibbs, 1998: Finlay, 2008: Visser, 2010)

Students were informed that in their practical class many of them were already using Schön's reflective model reflection-in-action (1983) as they were thinking while carrying out the task. The students were reflecting if the task in hand was going well or if they needed to stop and re-evaluate what they were doing.

> In "reflection-in-action", "doing and thinking are complementary. Doing extends thinking in the tests, moves, and probes of experimental action, and reflection feeds on doing and its results. Each feeds the other and each sets boundaries for the other" (Schön, 1983 p. 280)

Students were shown an example of Kolb's Experiential learning (1984) and his reflective cycle which allows them to plan ahead. Finally the students were shown Gibbs reflective cycle (1988) which encourages the students to reflect at all times. Surprisingly this model was the most effective with this year's cohort with many students taking photographs of their work along the way and writing short notes during the class.

6.1 Stage 3 : Using Reflective Journals in the coursework projects.

Scaffolding was used to instruct the students on the use of the journals in relation to their practical work. The students need to be shown what to do, actively engage in what they have been shown, receive constructive feedback and then reflect on all three aspects before attempting a similar task. Students were instructed to approach each timber joint in a planned sequenced way; this ensured that they developed their "cognitive skills" of reason, remember & relate. Students were given a handout with a list showing the "sequence of events" for the first two timber joints, and asked to reflect on how they carried out their work. Students noted mistakes and areas that worked really well for them. For the third exercise students were not given any handouts and they were required to carry out their own sequence of events and record their reflections. Most students carried out this task very well, some needed further instructions. This work was done in preparation for the first coursework project, the frame.

Students were also instructed on the importance of creating estimated timescales and actual time scales and the planning of their work on a daily basis.

As the year progressed students had to complete three coursework projects and were asked for a reflective journal for each project. The students were given instruction on how the journals were to be presented i.e., typed, in book format with contents page, sequence of events and reflections and the marking rubric. Coursework briefs were also uploaded onto the website for easy access. Samples of student's journals from the previous year were displayed on the website. As each stage of the coursework finished I also asked permission to display some of the journals from this research project onto the first year website. All students asked were happy to have their work displayed.

I believe that sharing their work in this way has given these students more confidence and that they seem to engage more in peer learning in the classroom environment, by offering opinions and advice to each other. Students from the previous year did not show these traits with only small select groups of students engaging with each other.

6.2   Results from using Reflective Journals in the coursework projects.

The class average results from the current year and the previous year can be viewed in table 8 below. I found that these first year students had a better grasp on using the correct terminology in their journals than the previous year's students. Journals were used to give formative feedback; as a result errors were corrected in subsequent journals which resulted in students receiving higher marks at the next stage. Table 8 shows an increase of 22% on the class average for the previous year.

Cohort of 12/13 26 students	Class Average	Possible	Out of 100%
Reflective Journal	11%	20%	54%
Practical Work	49%	80%	61%
Cohort of 13/14 22 students	Class Average	Possible	Out of 100%
Reflective Journal	19%	25%	76%
Practical Work	49%	75%	65%

Table 8: Final class average results from both years 12/13 and current year 13/14.

In each calculation, I only included students that had completed the module. While there is an increase of only 4% for the practical work this does not reflect the students' performance in practical classes. Lectures noted that students became aware of time spent on each task and tried to reduce time spent on other similar tasks. Students also took more care with their practical work. Some representative extracts from student journals are provided below:

"I was reasonably happy with the plan I set and followed mostly throughout the project. And in planning ahead I think on the next project that I have a better understanding of how long things are going to take me and I will be able to plan ahead more efficiently" Student D

"While making my frame I encountered several problems. . . . If I was giving the opportunity to change anything about my frame would be preparation time and work ethic." Student K

Students also became aware of mistakes much quicker than previous cohorts and tried to rectify or prevent similar mistakes.

"I can admit that through making mistakes I made, I learned a lot throughout this project. I now know that marking pieces out cannot be rushed and must be done with, thought, care and efficiency." Student G

Reading the journals also helped lecturers to identify problem areas that some students wrote about. We were able to revisit these areas and give further instruction as needed.

7   FOCUS GROUPS

A small focus group study was carried out to gather feedback on these out of class activities. I carried out a number of short interviews with staff and students and finally an anonymous online survey was carried out to triangulate my findings.

In general, most students realised the benefits of using the reflective journals in comparison to the time spent writing them, as they said that they became more focused on their work during class time. I have found that as the students are reflecting before they carry out the work, while they are carrying out the work and after the work has been done, that they are constantly thinking of ways to improve their standard and performance.

They said that having access to the website allowed them to revisit material from time to time to ensure that they were using the correct terminology for writing in their journals. They like the idea of being able to see examples of other students work. They also like having their work displayed online.

One lecturer stated that he found that the students were very motivated and seemed to have a plan of action for each day as they were not gathered around machines waiting for them to become free, instead they were going ahead to another aspect of their project to work on.

8   CONCLUSION

Over all I am very pleased with this research and how the students engaged with it. Going forward I aim to continue using the website with next year's first years and hope that next year's cohort engage with it also. Evidence would suggest that the online learning greatly benefited the students in their journal writing ensuring the correct use of terminology and encouraged them to become more independent.

I also believe that sharing their journals with their peers online allowed learners to interact more freely with each other and build up their confidence. The use of online facilities for sharing appears to be second nature to some students (Veira, Leacock & Warrican, 2014. p. 230). This will equip them better for second year when peer sharing and oral presentations are part of the teaching and learning strategies used for some modules.

Lecturers have noticed a huge improvement on the motivation of this year's students. The peer learning started much earlier in the year. This has resulted in the class gelling together quicker as they ask each other for advice. Some students even refer to peer learning in their sequence of events

> "Review design of the legs, think and talk it through identifying any potential problems with tutor and peers" (Example taken from student's journal).

I believe that incorporating the estimated timescales and actual timescales into the Reflective Journals has made this practice invaluable to the students learning in their practical classes. Students are so surprised when they run over their estimated time that they straight away ask why? They write down in their reflections what happened and more importantly how they will improve their timescale.

I would like to see Reflective Journals being used as part of the teaching methods for all practical modules across the programme and have put this proposal forward as part of our programme review and school review. I would also like to encourage the students to use blogs and post any research notes and share resources (O'Donnell, 2006) that they use to promote learning outside of the walls of the classroom.

I believe that the application of online learning and reflective journals could also be implemented in any discipline involving the development of practical skills.

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