Using Twitter to enhance reflective practice on work placements

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***Abstract**: Reflective practice is an essential engineering skill for life-long learning. However, most engineering students regard reflective practice as an onerous chore and do not find any value in doing it. Previous research for trainee teachers on practicum showed that microblogging (e.g Twitter) is a helpful tool for encouraging reflective practice. Tweets are kept short to 140 characters forcing students to be concise. Because large amounts of text are not required, it is easy for students to blog about their experiences and give and receive feedback. Twitter can be accessed by SMS from mobile phones as well as through the internet. A cohort of 12 volunteers were obtained from third to fourth year mechanical, materials process and biochemical engineering students. These students created private Twitter accounts using pseudonyms and were given training in using Twitter. Participants were instructed not to reveal information that was commercially sensitive. Students were encouraged to tweet once a day on the following: What are you doing? What are you learning? What would you like to learn? What equipment/software are you using? Are you having any difficulties? And what are you enjoying? Tweets were visible to all involved in the project and the researchers and participants were able to give feedback, support, and prompting questions. Tweets were analysed for common themes, how well students were supporting each other, and how much integration between placement and university knowledge appeared to be occurring. Participants were interviewed after their placements to ascertain their views on Twitter and reflective practice. Findings show that students used Twitter regularly. They shared information, gave each other support and commented on what they were doing from day to day. The work placement coordinators could see what the students were doing and give support and feedback.*

Introduction

Engineering students go on work placements each year during the summer vacation to gain work experience in the engineering profession prior to graduating. Work placements impart many soft skills that Universities cannot provide and provides students with contacts for obtaining full time work after graduation. The aims of the placements are for the student to learn about the industry and their profession, apply and develop some of the technical and theoretical skills and knowledge they learnt at university, as well as learn how to be a professional engineer.

The Cooperative Education Unit at the University of Waikato has facilitated work placements for over 25 years through the Bachelor of Science and Technology (BSc(Tech)) degree, which began in 1984, and the four year Bachelor of Engineering (BE) degree, which was first offered in 2001. The majority of work placement students are now engineering students who need two three-month work placements. Typically the first work placement involves practical work developing basic technical skills, while the second placement involves some form of research or design. Examples of

engineering placements include power generation companies and related industries, pulp and paper, milk processing and milk products, automation and fabrication, plastic extrusion, injection moulding and rotational moulding, food processing, and engineering consultancies. Work can range from routine testing, machining work in workshops, and maintenance, through to process and economic analysis, 3D computer aided drafting, and process design.

The students set learning objectives at the beginning of the placement as part of their assessment. They then try and achieve these objectives over the course of their placement. At the end of the placement they submit a report on their experiences and discuss what they gained from them. There is a reflection and review section where they discuss how they met their learning objectives, how they developed personally and professionally, what insights they gained about their profession, and how the placement impacted on their career. This section contributes approximately 10% to the student's overall placement grade.

While reflective practice is widely recognised as a valuable teaching and learning tool (Hancock, 1998; Richardson, & Maltby, 1995), previous studies and anecdotal evidence has shown that in general students have difficulty 'reflecting' on their work placement experiences. This is shown by a lack of detail, and failure to elaborate on skills obtained and personal development. Being able to reflect on personal experiences allows students to recognise areas where they do and do not have competency, why they might have succeeded or failed, and determine strategies by which they can overcome their limitations (Millonzi, & Reitano, 1977). In addition reflective practice provides students with greater self awareness, useful for when they are promoting themselves to prospective employers (Coll, Lay, & Zegwaard, 2001). Various models of reflective practice exist such as those proposed by Schön (1978, 1983), Kolb (1984), Gibbs (1988), Johns (1995) and Rolfe (Rolfe, Freshwater, & Jasper, 2001). Rolfe's model is simplest of the models and is basically composed of three questions, what?, so what? and what next?, i.e. what happened, why it happened, implications, etc., and what would be done next?

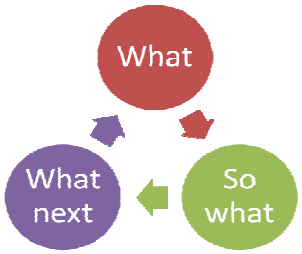

Figure 1: Rolfe's reflective model

Strategies such as learning portfolios have been implemented to try and improve student's reflective practice. However, it has been argued that students can find these burdensome and unengaging (Buckley et al, 2009). Another strategy is to use social media such as Facebook, Twitter, and microblogging (Brown, 2010). Advantages of using social media are students use it already; students remain connected with each other and can support each other; increased interaction between the educators and students while on placement (Brown, 2010); and improved learning (Junco, Heibergert & Loken, 2010).

A study at the University of Waikato of trainee teachers on practicum showed that microblogging was a helpful tool for encouraging reflective practice (Wright, 2010). Hence it was thought that microblogging might be beneficial for Waikato engineering students as well.

The aim of this study was to trial Twitter as a tool to improve reflective practice in engineering students while on work placement, study what students reported using Twitter, determine student perceptions of Twitter and reflective practice, and evaluate the effectiveness of Twitter in enhancing reflective practice.

Methodology

Ethics approval was obtained from the University of Waikato ethics committee for the project. A cohort of 12 volunteers were obtained from third and fourth year mechanical, materials process and biochemical engineering students who were starting their first or second work placement. A small number of participants seemed prudent because this was a qualitative study that involved document analysis and interviews. All students were briefed on the project, given a consent form which they signed to give their approval to participate in the project and their permission to use any data resulting from their participation.

Participants created private Twitter accounts using pseudonyms and were trained in using Twitter. Account settings were set so only participants in the study could see each other's tweets. Participants were instructed not to reveal information that was commercially sensitive. During the student work placements from November through to February, students were encouraged to tweet once a day on one or more of the following: What are you doing? What are you learning? What would you like to learn? What equipment/software are you using? Are you having any difficulties? And what are you enjoying? Tweets were visible to all involved in the project and the researchers and participants were able to give feedback, support, and prompting questions. Tweets were exported to Excel™, grouped according to one or more of the questions asked, and analysed for reoccurring themes, how well students supported each other, and whether or not integration between placement and university knowledge was occurring.

After placement, when the students were back on campus, a focus group of eight participants (four males, four females, all fourth year) who regularly used twitter during the project were interviewed as a group by the researchers to ascertain their views on Twitter and reflective practice. Students were also questioned on interesting themes that came through from the initial survey of data. The interview was conducted as a discussion group where comments were obtained from all participants and probed by the researchers. The interview was recorded and transcribed.

Results and Discussion

The students involved in this project worked for a range of companies from meat processing research, engineering consultancies, plastic and aluminium extrusion, and food processing. In total there were 287 tweets over the entire length of the project. Student tweeting ranged between one or two tweets a week to multiple tweets a day, but on average one tweet every two days. Several students had difficulties tweeting because the companies they worked for restricted internet access while others prevented access to social networking sites. Another student was mostly dependent on her cell phone because she was travelling most of the time and on site visits. Other students were doing routine work, which limited what they could say each day.

The tweets were allocated to the following themes: What are you doing, what are you learning, what would you like to learn, what equipment/software are you using, are you having any difficulties, what are you enjoying, unrelated tweets and prompts from the researchers. Individual tweets often had more than one theme. Results are shown in Table 1.

Table 1 Frequency of tweets according to theme/question

Question/Theme	Frequency
What are you doing?	217
What are you learning?	37
What would you like to learn?	1
What equipment/software are you using?	81
Are you having any difficulties?	55
What are you enjoying?	15
Unrelated tweets	14

The majority of tweets were about what students were doing:

Equipment –e.g. using computer, doing calibrations.
Researching – e.g. reading, studying methods, learning standards.
Practical – e.g. carrying out maintenance, cleaning, filing, design.
Measurements – e.g. data collection, sample collection, observations.
Spreadsheet – e.g. data analysis, calculations.
Software – e.g. databases, 3D Drawing, process design, creating process flow diagrams.
Writing – e.g. documentation, presentations, administration, quality control, meetings, presentations.
Other – e.g. taking lunch, holiday, settling in, or being sick.

In terms of what they were learning on placement, comments came through about how expensive some equipment was, technical and human error involved with using equipment, difficulties in calibrating equipment and getting reliable results. Comments came through about how students were getting an idea of how the industry works, making sense of data, using standards, the amount of work required to obtain good results, being informed about their project or work by reading literature. In terms of situated learning one student working in the fibreglass/plastic industry noted: "*On a more interesting note, fibreglass fumes are pretty intense at 34 degrees!*". Another who was working for an engineering consultancy said on the fallibility of supervisors: "*Learnt that supervisors aren't as smart as they may think. Mine burnt milk powder onto the rig.*" While another working for an aluminium extrusion and coating company noted the disparity between design and practicality: "*The apparently fairly new and expensive powdercoat filters were designed by idiots. accurately measuring the output will be a challenge.*" While another working in the design area of a company said that the way companies approached design was quite different to how university taught it: "*Things are not designed to safety factors. they are designed to standards that have been approved, kinda takes the freedom out of design.*" This last comment was interesting, and when the students were interviewed, several mentioned that a lot of design is done according to pre-existing engineering codes, so the majority of design is actually finding the appropriate code to use. At university, students are taught to design almost from scratch while doing all the necessary calculations.

While learning was obviously taking place, it was not obvious what they wanted to learn. There was only one tweet where a student working for a multinational engineering consultancy said they needed to learn to understand a project before proceeding with the next step.

Difficulties reported during the work placements included using particular equipment and getting it working properly, dealing with other staff, and work not being appreciated. One student working for a fibreglass/plastics company said "*work has decided that my costings are actually not that important. Now am doing more packaging documentation.*" The same student also mentioned, "*more and more pallet packing. nothing seems to please everyone so having a bit of trouble. monday will start documenting everything.*" The same student was also put in a difficult position which was described over three tweets: "*Has a dilema, could do with some advice! my boss wants me to identify inefficiencies in the company, places where money could be saved...but after observing, seems most of the inefficiencies are because of boss. whats the best way of explaining the solutions to these...inefficiencies without offending anyone? any ideas guys?*" Replies from other students were along the lines of being diplomatic by avoiding blaming particular people, these included: "*you could say it is not because of the boss as such, but because of the procedures or methods the boss has put in place*", "*ask your colleagues for their opinion also, so its not just coming from you*", "*Just don't name names, and try to generalise, ie this doesn't get done, this could be done better if this was done etc*". Another student who had been through a similar situation said "*i had to do the same thing and i just told them the truth no matter who it was effecting.*"

In terms of what students enjoyed during the work placements, the following was mentioned: the placement itself, setting up a rig for testing, experiments/lab procedures that are exciting, when things ran smoothly, getting good results and graphs, testing procedures that work well, observing a new product and new things, learning about things that are valuable for their career, and being busy.

There were several examples of knowledge integration between university and workplace taking place. One student working for a food processing company was asked "*any of the heat integration*

and heat exchange from 321 [a third year process design paper] *come in handy?*" and replied: "*Yea it is helpful especially the heat integration side havent done much on the heat exchange so much though. Its quite good to use it*" Another working for an engineering consultancy said: "*Finaly an engineering calculation, sizing up a drain pipe*" and "*Today I was given the mega book that is the Aus standards on pressure vessels to turn into a spreadsheet. Alot more advanced than at uni*". Another working for an aluminium extrusion company said: "*getting fill in projects. gas flow measurements brings back steam boiler memories*". This last statement was in reference to a steam boiler lab in second year where the students had to do a mass and energy balance on the steam boiler and utilities in the large scale lab.

Did Twitter help with reflective practice?

When asked during the interview if Twitter helped with reflective practice, students generally thought no. "*Twitter was useful for when we had problems or something more than a reflection thing.*"; "*I found at the end of the day you think about what you've done and it forces you to think about what you done that day, but I never went back and looked at them.*"

When asked why this might be, it was apparent there was a bad perception of Twitter: "*I think it has a bit of a bad rep in the news and stuff, all like the trashy people are all on Twitter you hear on the news*"; "*I think Twitter is more focused on if you're interested in what someone is doing, not really one to talk about, you just want to sort of stalk them [laughs] that's what it is more orientated towards I think.*"; "*It's more them just pumping themselves up kind of thing*".

Students found tweets to be too brief to be useful, some students insights ran over six-seven tweets. "*Being limited to 140 characters in tweets, if you learnt something or you did something new; it was hard to write about what you did in 140, it was a lot easier to say what you did at the day.*"

When the students were interviewed they said they found it was difficult to follow conversation threads on Twitter and the limited number of characters restricted conversation. They also mentioned that Facebook was better for following conversation threads and one could write as much as they wanted.

Another problem was students' general perception of reflective practice itself. During the interview students mentioned they found it hard, vague and waffly and they were unsure what the assessors wanted, so they generally left it until last or avoided it. This is a common problem for the reflection and review section of their work placement reports, because it was worth 10% of the placement grade. Students also struggled with the terminology, e.g. diary (more common with females or something done at primary school) versus log book, journal or lab book (less introspective, more concrete based on actual data).

Also some students found that reflective practice is a more personal activity which they did not want to share publically, or even to just the participants in the project: "*I'm kind of writing about how I feel and putting quite a lot of personal stuff into it and so [lecturer] said its actually really interesting to read but then I know that it's only her reading it, so I don't mind doing that. Where as if it was going to publicised, I would cut all of that out.*"

Conclusions

If Rolfe's reflective model is used, we found students were very good at stating "what" they had done, but there was very little "so what" or "what next". This suggested that they struggled with analysing what they had done and what results they got, reporting what it meant and why it happened, and deciding what to do next. This is also a common problem for students reporting on laboratory experiments, they are very good at saying what they have done but not good at interpreting what the results mean, drawing conclusions and deciding or proposing what to do next. The students appeared to lack the higher level analysis required to carry out the "so what" and "what next". This could be due to several reasons: they are unable to or do not want do it due to a negative perception of the nature of reflective practice, they are unsure about it so they avoid it, or they lack or do not allow time to put any thought into it. It could also be due to them being reluctant to reveal too much about themselves to their peers. In addition, as the students stated, the tweets were too brief to allow any

indepth discussion, and conversation threads were difficult to follow. Therefore it would be worthwhile exploring other social media tools such as Facebook to investigate whether or not they are beneficial to reflective practice.

The cooperative education unit typically visits the students while on work placement, but apart from the visit and occasional email, not much is known about what the students are doing until the visit and their placement report is submitted. A benefit of this trial was that it allowed greater monitoring of student activity on placement and greater interaction between the placement coordinators and the students. Any issues could be dealt with as they arose. In addition, students could seek support from each other for dealing with difficult situations, even though they might be in different parts of the country. Therefore while initial trials using Twitter were not overly promising in terms of enhancing reflective practice, the benefits of greater interaction with and between students while on placement would make the use of social media tools worth pursuing.

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