Northumbria Research Link

Supporting the attainment of professional attributes in a work based learning programme

Noel Perera (noel.perera@northumbria.ac.uk)

Roger Penlington (r.penlington@northumbria.ac.uk)

Northumbria University, UK

Abstract: *With the impending change in the higher education landscape within the UK there is a greater need for flexibility and innovation in the delivery of degree programmes. One flexible and innovative form of programme delivery is the work based learning platform. Additional academic guidance is imperative for students undertaking a work based learning programme due to the flexible nature of the programme. However in providing this academic guidance and support it places additional demands upon both tutor and student. Hence creative approaches which alleviate these demands are required to facilitate conversations between tutor and student as well as that from student to tutor. This paper will describe the current approaches used and how these demands are particularly important within the context of the personalised nature of work based learning. The contrasting characteristics with classroom based teaching will be highlighted. In particular this will include the authenticity and those factors which relate to the strong ownership of the context by the student within this mode of learning.*

Introduction

This paper is written in the context of delivering the work based learning (WBL) MSc Professional Engineering programme which was borne out of the Engineering Gateways Project in 2007. This project was created under the previous government's long term strategy of enabling the higher education (HE) sector to develop employer led provision which would deliver the skills that's required by the labour market (Kelly, 2006). Hence the conception of the Engineering Council DIUS (Department of Innovation, Universities and Skills) funded "Gateways to the Profession" Initiative which created the Engineering Gateways Project. The purpose of this initiative was to provide a flexible pathway to becoming a Professional Engineer. Another objective of this initiative was to create effective engagement between employers and the higher education institutions (HEIs) to plan and deliver a WBL learning programme that addressed the needs of the local and national economies.

The MSc Professional Engineering programme offered at Northumbria University is delivered entirely in WBL mode. It is a three year 180 credit programme which has a total of 12 compulsory and optional modules consisting of 10, 20 and 60 credits. In their 1st year of the programme the student will engage with a total of 4 compulsory 10 credit modules, in their 1st and 2nd semesters and then select either one 20 credit or two 10 credit optional modules for the 3rd semester. In their 2nd year of the program the student has the choice of selecting a total of 60 credits of optional modules to engage with over the three semesters. In the 3rd year the student will have to undertake one 60 credit compulsory module. In general for a 10 credit module the assessment is a 2000 word technical report, 20 credit module the assessment is a 4000 word technical report and 60 credit module the assessment is a 10-15000 word written dissertation. The programme and module learning outcomes of the MSc Professional Engineering programme are mapped to the UK-SPEC competence and commitment standard for Chartered Engineers (CEng) (Engineering Council. 2011). This was done to fulfil the purpose of creating an engineering postgraduate programme that assesses both the learning outcomes and work competencies in one evidence based piece of assessment. The intention is that an engineer who enrols onto the MSc Professional Engineering programme will upon graduating have fulfilled the further learning requirement and all the UK-SPEC CEng competencies.

Work based learning (WBL)

Marsick and Watkins (1990) have shown that the workplace environment provides good learning opportunities, which is informal in nature. The informal learning that occurs in the work place is due to the experiential and incidental learning which takes place through engagement with work activities. It has been reported that incidental learning produces tacit knowledge and practical intelligence which leads to professional success (Sternberg & Grigorenko, 2000; Sternberg, 2000). WBL is a culmination of both theory and practical which includes the acquisition of explicit and tacit knowledge in individual and collective situations. According to Raelin (1997) theory and practice modes of learning and explicit and tacit forms of knowledge are fundamental to the process of work based learning. WBL recognises that learning occurs during practice and can happen when engaging with an appropriate activity. Theory when coupled with action produces a good approach to learning. Schön (1983) describes practice as the method by which individuals attain and practice artistry. Work based learning is greatly dependant on the practice which relies on explicit information/ guidelines within the workplace and also the tacit methods employed daily in a particular situation. Explicit knowledge is articulated knowledge, expressed and recorded in formal language. Tacit knowledge however is not typically recorded since it is more action based within a specific context (Polanyi, 1966). Pleasants (1996) explains that this could mean that although individuals are knowledgeable in the practice they might not have the appropriate opportunity to elaborate on their practice.

Tynjälä (2008) explains that there are at least three modes of WBL which are: (a) incidental and informal learning which occurs as a result of work, (b) intentional learning but not formal learning such as intentional practicing of a certain task and (c) formal on the job and off the job training. Slotte et.al (2004) explain that formal education and planned learning situations can turn tacit knowledge into explicit knowledge by combining conceptual knowledge and practical experience which is the building blocks of expertise. Hence for work based learning to be successful it should also incorporate formal learning (Hatano & Oura, 2003). This should include structured learning support and guidance, explication of knowledge, conceptualisation and the use of project based approaches (Jäntti, 2003; Poelle et al,. 1998). Therefore for WBL to be successful it should have connectivity between informal and formal learning. Tynjälä (2005, 2007) suggest that this connectivity is achievable through the principle called integrative pedagogics. This principle states that theory, practice and self regulation should be incorporated in any learning situation. A pedagogic model of this principle is shown in Fig. 1.
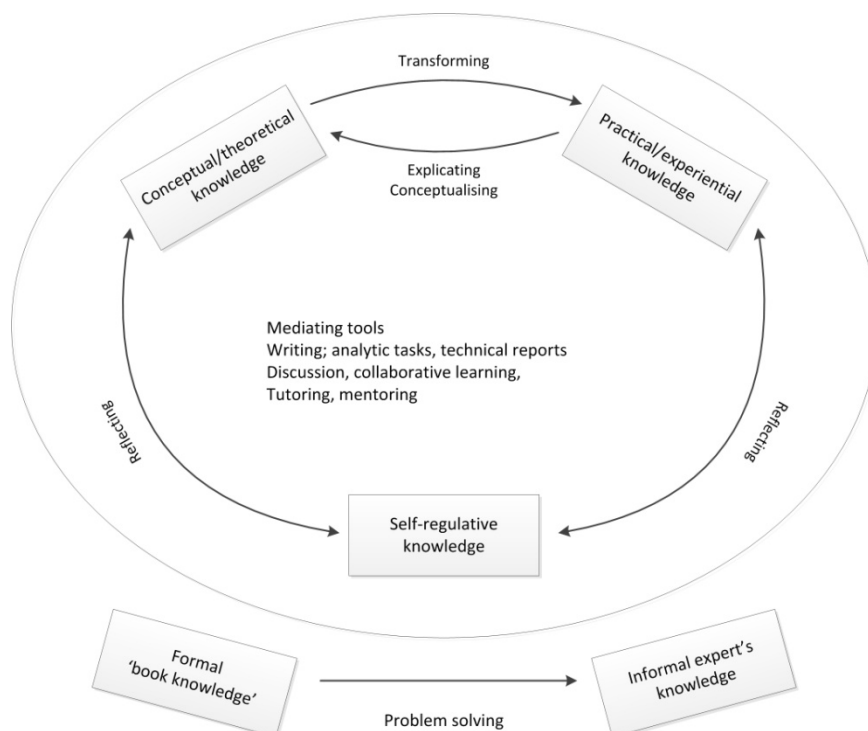

Figure 1: Modified version of the Integrative components of the development of vocational and professional expertise (Tynjälä et al., 2006)

Theoretical knowledge is universal and is elucidated in formal written materials and lectures whilst practical knowledge is instinctive and tacit in nature. The diagram above shows the importance of the reciprocal relationship between theoretical and practical knowledge. Researchers have highlighted that professional education should include the conversion of theoretical knowledge in the context of a practical situation and the conceptualisation of tacit knowledge from practical experience (Leinhardt et al, 1995). Mediating tools (activities) such as those shown in the above diagram enable the learners to combine theoretical and practical knowledge together. These mediating tools allow the learners to extend their self regulatory knowledge. Self regulatory knowledge including metacognitive and reflective skills is integral to this pedagogic model because it reaffirms the integration of theoretical and practical knowledge contributing to the development of professional expertise (Bereiter & Scardamalia, 1993; Bereiter, 2002; von Wright, 1992). Furthermore Bereiter & Scardamalia (1993) confirm that formal knowledge is converted into practical skills when it's used to resolve practical problems and into informal knowledge when it's used to solve problems of understanding. An important aspect of WBL is that learners should be supported by receiving guidance and their learning should be facilitated. The ideal situation should be that each learner will have an academic mentor, workplace mentor and the three parties would meet and speak at agreed intervals. It's also advisable that the aim of the WBL is related to the curriculum and to theoretical knowledge but planned in collaboration with the needs of the workplace. This would enable all three parties to create shared aims and objectives. Stenström & Laine (2006) explained that the tripartite principle is important from a learner's perspective in negotiating the learning aims and assessment of the entailed learning.

For WBL to work successfully it's imperative that the learner receives feedback on their performance from both the academic and workplace mentors. The workplace mentor will provide the learner with feedback on their performance in the workplace with regards to their informal learning experience. The academic mentor will however provide the learner with feedback on their conceptual knowledge and its interaction with the practical knowledge. It is recognised that the mentors especially the workplace mentors have the important role of supporting the learners' learning at the workplace. However it should be noted that workplace mentors require pedagogical training to support these learners. Research (Stenström & Laine, 2006) has shown that workplace mentors with training experience have often expressed their feelings of inadequacies in providing appropriate guidance in learning and student assessment skills.

Work based learning within the MSc Professional Engineering context

In 1997 the requirement of the educational component of CEng registration was raised to masters level to ensure the continued international recognition of UK engineering qualifications yet the majority of graduates were leaving full time education with a BEng degree (Seddon and Lock 2010). This has created a body of students who fall between the educational requirements of IEng and those of CEng yet who are actively engaged within gainful engineering employment and therefore do not have to give-up their income to return to full-time study. This in combination with the support of the Engineering Council and the Professional Engineering Institutions established the context for the MSc Professional Engineering programmes initially piloted at 4 HEIs under the Engineering Gateways project. The engagement of employers, PEIs and HEIs provides the necessary components of a suitable learning situation for the student with support from both an academic and professional mentor completing the context.

Hope and Barrington (2012) have reported the experiences of another HEI in relation to the progression of students. The authors experiences differ in relation to the management of the demands of the programme as smaller numbers of students were accepted during the early stages of the programme. This has led to an interest in the effective use of feedback during the programme.

Feedback to support the WBL learner

Feedback has always been considered as an important influence on the learning experience. However the effects of feedback are quite complex and are depended on: (a) the feedback quality; (b) learners' goals and motives (Nolen, 1996) and (c) learning environment. It's also reported that feedback might have an impact on cognitive (attention, strategies), motivational and affective processes and long-term effect on the recipient's self concept (self esteem, control) (Vollmeyer &

Rheinberg, 2005). Research has shown that giving specific feedback has a direct positive effect on immediate and short term performance (IIgen et al., 1979; Luger & DeNisi, 1996). There is evidence which shows that specific feedback given to individuals measured against their performance criterion produces higher achievements than just superficial feedback on their performance (Kopelman, 1986).

As an auto-ethnographic study the authors of this paper have decided to focus predominantly on their personal experience of providing feedback as academic mentors to support the WBL learner. At the beginning of each module on the MSc Professional Engineering programme the learners are given access to the Virtual Learning Environment (VLE) to retrieve information regarding the module. Among the information provided to the learners is the assignment cover sheet. The assignment cover sheet is a document that outlines the learning outcomes, submission dateline, assessment guidelines and assignment instructions. The learners have 12 weeks (1 semester) to complete their assignment for a 2 x 10 and 1 x 20 credit module and 52 weeks (3 semesters) for a 60 credit module which is submitted at the end of the given period. Being a WBL programme the assignment will involve the work carried out on a selected work place project of the learners' choice. Typically a learner will contact the academic mentor who in this case will be the particular module tutor to discuss the suitability of the selected work place project for the assignment. After agreeing on the suitability of the work place project with the module tutor the learner then begins to work on the assignment. Depending on the complexity of the work place project and the deliverables required from the assignment a learner on average can have approximately 6 conversations with the module tutor via telephone and/ or email correspondences during a12 week duration. These conversations would typically be a progress update allowing for clarification of both student and tutor expectations. It is also used to provide formative feedback with a focus on the feed forwards into the final assignment submission. Usually the learner will contact the module tutor within the first 4 weeks of the semester to seek clarification on the deliverables of the module, hold discussions on the suitability of using a proposed work place project for the assignment and discuss about the module tutor's and student's expectations from the module. In the subsequent 4 weeks the learner will possibly contact the module tutor to discuss their progress, request for feedback on their submitted partial assignment and seek for advice if they have any issues with their work place project. In the final 4 weeks of the semester, the learner will possibly seek for feed forwards on their partially or fully completed assignment and advice if the assignment cannot be completed on time.

From experience most of the module tutor-learner conversations that take place are usually with regards to clarifying the module tutor's expectations, agreeing on a suitable work place project, feedback on the partially completed assignment and assignment completion issues. Depending on the learners' situation and the individual's conscientiousness majority of the conversations normally take place in the first 4 weeks and final 4 weeks of a 12 week period. Irrespective of the learners' situation tutor-learner conversations nearly always takes place in the final 4 weeks of the given assignment duration. This could be attributed to the nature of WBL which acknowledges the tacit knowledge of the learner by giving them the responsibility of critically reflecting on their practice and turning it into explicit knowledge. The tutor-learner conversations in the final 4 weeks are usually based around the guidance of focusing the learner's attention to creating a cohesive technical report which contextualises the learner's tacit knowledge into explicit knowledge which addresses the learning outcomes of the module and its respective UK-SPEC CEng competencies.

This is where a WBL programme is very different from the traditional classroom based programme because the learner assumes full responsibility for the contextualisation of their acquired knowledge and the customisation of their learning pathway. A WBL programme provides a culturally and historically different learning environment to the traditional learning delivered in a classroom. Classroom based delivery is seen to emphasise planned activities where abstract, general and formal knowledge in systematically delivered and individually reflected. WBL in contrast is more social in nature, personalised, reflective, tangible and action oriented (Tynjälä et al., 2003; Eraut, 2004). WBL is very much based on the concept of communities of practice as espouse by Wenger (1998). Wenger explains that communities of practice are informal communities formed by people to work on joint enterprises at work and during their leisure time. This is crucial to the learning process in the work place because it allows the learner to interact and benefit from working under the guidance of a more experienced worker and to participate in the community of practice. By participating in these communities of practice learners share their knowledge, convey their meanings, develop their identities and advance their work practices. Hence one of the responsibilities of a module tutor is to provide guidance to the WBL learner to harness and package the learning experience gained at the work place into a technical report that meets all the module learning outcomes and respective UK-SPEC CEng competencies.

Due to the flexible structure of a WBL module the tutor-learner conversations are crucial to ensure that the learner may fully benefit from the opportunities of the personalised learning which includes comprehension of the tutor's expectations and their use of reflection to meet the expected deliverables of the module in terms of evidencing both the academic and professional experiences. These conversations are greatly appreciated by the learners as they provide the link between their workplace attainment and academic attainment which are not easy to distinguish early in their programme. Some quotes from the students showing the importance of the tutor-learner conversations are *"thanks for the information as this now makes more sense and I'm more confident on successfully completing the assignment"*, *"your feedback has greatly helped in pointing me in the right direction"* and *"your explanation has assisted me in selecting the appropriate work based project for this module"*. The tutor-learner conversations are specific to the learner and their particular work based project. Depending on the situation and ability of the learner these conversations may be quite short in duration and frequent, or longer in duration and less frequent but they often develop from the tutor stimulating reflection. It is suggested that there is a particular opportunity for stimulating reflection obtained from the tutor not having the same experiences as the learner, for example as the technical content for a module is derived from work place experience then many conventions of professional practice will apply, for example design codes will be applied. This enables the learner to be prompted to reflect on and question the suitability, assumptions, derivation or historical limitations of such design codes in a learning rich and fully authentic manner.

From a module tutor's perspective the personalised nature of these conversations are manageable only when dealing with a small number of learners per module during the early life of the programme. However as the programme matures then the number of tutor-learner conversations can be reduced by using the VLE, for example by posting a list of frequently asked questions (FAQs), video clips of the tutor providing an in depth insight to the module, making available a sample of "good" and "poor" examples of anonymously completed assignments and a road map showing a successful route to completing the module. It's also possible to create utilise a discussion forum within the VLE for the learners to interact with one another although the students must be fully aware that the technical content of their work is often commercially sensitive in nature and that such sharing must be restricted to reflection on learning. This enables the learners to engage and exchange ideas among themselves with a focus on the learning rather than technical context which further enriches their learning experience. The nature of material made available to the learner must also accommodate the level of digital literacy and accessibility available to the student (Strachan et. al. 2011), for example workplace network infrastructure my hinder access to some content and in these cases alternative delivery mechanisms are employed which attempt to replicate the delivery component of the VLE. Another method that can be used to further clarify the module tutor's expectations is by posting on the VLE a table showing the Level 7 descriptors for a WBL learner. This table is as shown below.

Description	Ability
Problem solving	Level 7: To independently solve complex problems which have incomplete or ambiguous information by applying advanced methods and tools
	Level 6: Complex problems are solved through the critical application of appropriate methods in stages to reach original solutions
Self evaluation	Level 7: To apply critical self reflection to plan own learning needs for personal and professional accountability
	Level 6: To apply self reflection in identifying actions required to overcome weaknesses and compliment strengths
Use of information and resources	Level 7: To undertake broad research activities in a timely manner with minimal guidance for both directed and independent study
	Level 6: To select and source own learning and research materials with limited guidance
Learner skills	Level 7: To independently undertake complex tasks as a self learner and to demonstrate an understanding and aptitude for working with others including constructive negotiation and conflict

	resolution.
	Level 6: To work effectively in a range of situations through self-review and able to undertake a range of roles within a group under a range of constraints

Table 1: Level 6 and 7 descriptors for a WBL learner

The information contained within Table 1 clearly outlines the minimum threshold ability that should be demonstrated by a WBL learner engaging with a Level 7 programme. This information can be used as a guide by the learner to enhance their attainment of the required ability to show achievement of the highlighted professional attributes.

Having started this conversation with the WBL mechanical engineering students it is then necessary to develop the conversation from a focus on the technical substance of their submissions for assessment onto a self evaluation of their learning, in general not an ability which receives significant development on undergraduate programmes. It has been observed that the student will not immediately relate their learning on a particular module the reason for their studying that module identified within their initial learning contract. Reflection is and self-evaluation are key components of identifying goals, organising ideas a planning future learning (Lester and Costley 2010).

Conclusion

Learning at work takes place when the learner participates in various working practices, collaborates with work colleagues and clients in engaging new challenges. This learning is cultivated by engaging with problem solving with the intention of utilising theoretical understanding in a practical problem solving situation. WBL encourages learners to adapt to change and uncertainty and to be courageous in the workplace by taking on challenges to explore their creativeness. These are traits that are highly valued by current employers who are seeking for employees that are good communicators with the ability to work independently and are highly motivated, determined and adaptable.

Although formal learning in the classroom and WBL are opposites in nature but both are imperative for the advancement of practical and professional expertise. Researches (Eraut, 2004a; Guile & Griffiths, 2001) have stressed the importance of integration and interaction between formal and informal learning or explicit and implicit knowledge which is pertinent to advancing WBL and the development of professional expertise. This is where the tutor-learner conversations and feedback and/ or feed forwards is important in bridging the gap between explicit an implicit knowledge. In general the learners valued tutor-learner conversations and used the feedback and/or feed forwards to improve their learning experience. This confirms the findings summarised by Rowe & Wood (2007) where it has been identified that feedback is valued and that students want helpful comments from their tutors." It should however be noted that due to the possible exhaustive demands these conversations can place on the tutor the learner numbers should be kept small to allow it to be manageable and workable. In light of this new innovative ways should be investigated to allow the tutors to effect the learning experience of a greater number of learners with minimal demands placed on both the tutor and learner.

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