The effectiveness of peer learning in a vocational education setting

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Acknowledgements

We would like to specially acknowledge and thank:

"**We become ourselves through others**"

- Lev S. Vygotsky –

Disclaimer: **Note the guidelines have been generalised to support peer learning, these guidelines have been compiled through work carried out within four specialised contexts with pre-trade students. These are (i) carpentry (ii) painting and decorating (iii) electrical and (iv) welding.**

Summary

This study investigates the effectiveness of peer learning in a vocational education setting. The objective of the project was to determine the effectiveness of peer learning in helping with students learn skills and knowledge.

The study involved classroom and workshop learning activity observations of four different trades (Carpentry, Painting and Decoration, Electrical and Welding). Pre-intervention data, in the form of video footage of practical/classroom learning activities was collected from selected pre-trade groups. Workshops were then conducted to help students improve peer learning strategies. Post-intervention data / video were then collected. The pre- and post- intervention data were compared to find out whether the peer learning workshops have were effective in improving students peer learning practice.

Examination of recordings from post-intervention group discussions indicated an increase in feedback quality. Data analysis of recordings illustrated improved richness of interactions in the post-intervention groups.

Examination of peer learning interactions indicate most groups (post-intervention) used effective peer feedback strategies, in turn, leading to an acceleration in students' skill acquisition. The recordings provide examples of a reconfiguration in motivational dialogue between students.

The study also found that not every student fits into a peer learning environment. This is because peer learning requires the application of basic communicative, conflict-management and attitudinal skills. The study found providing quality intervention workshops to recommend peer learning to students to be relevant and important.Therefore a recommended sequence to use as a guideline for helping trades tutors to implement peer learning with their students, is provided. The guidelines are a composite of the principles presented in the literature review and the findings from this project.

Contents

Introduction

This project is a follow-up from a study undertaken as part of another larger project to construct guidelines for the use of video and multimodal discourse analysis to study the learning of trade skills (Chan & Leijten, 2010). In the sub-project, peer learning strategies were found to have improved welding students' learning (Chan & Leijten, 2012). Thus, in the 2010 welding students study we observed the advantages of introducing peer learning into a learning environment that was previously dependent on individual learning.

As little is known about the mechanisms used by trade students in learning from each other, the project presented in this report seeks to illuminate aspects contributing towards what makes peer learning effective across several trades learning contexts. The findings of this study offer an understanding of what factors make effective peer learning, and contribute suggestions through the distillation of guidelines from the project's data analysis and synthesis from the literature, towards helping apprentice learners improve their learning journey.

In this project, we define peer learning as pre-trade students' informal sharing of knowledge, ideas and experiences, which are of <u>equal</u> standing due to their role as students, either older or younger with different cultural back grounds, social class and ethnicity. The study investigated the effectiveness of peer learning by students enrolled in four different trade disciplines' pre-trade training programmes at Christchurch Polytechnic Institute of Technology (CPIT). Pre-and post-data collection in the form of video-and voice recording footage was used to observe the efficacy of the intervention (i.e. a workshop on peer learning strategies).

The study was based on the belief that peer learning is a powerful way to enable students to systematically share skills and knowledge with each other (Boud, 2001). The project therefore concentrated on aspects contributing to effective peer learning in a vocational education setting. Aspects investigated included favourable conditions that support peer learning comprising:

- who is learning,
- what helps peers learn together,
- what learning results through the interaction,
- how we know what learning occurs in groups and
- what has been learned.

Project Aim and Objectives

In summary, the project's intents were to:

- create an awareness of peer learning amongst students and educators.

- recommend pre-requisites for peer learning.

- provide recommendations for favourable conditions in which peer learning can be effective.

- provide teaching and learning strategies for peer learning.

- improve teaching and learning in a classroom environment.

Overview of the literature

This study is framed by an appreciation of the following pedagogical approaches and builds on research undertaken in the compulsory school and higher education sectors. In this brief review, a definition of peer learning as it is applied in this project and a discussion on the advantages of peer learning when accompanied by adequate and effective feedback is provided.

Defining peer learning

For the purposes of this project, the definition adopted to describe the process of peer learning is "the use of teaching and learning strategies in which students learn with and from each other without immediate intervention from the teacher" (Boud, Cohen & Sampson, 1999 p.413). The peer learning process utilised in this project, relied on two or more learners, forming peer learning groups. One of the challenges of using this form of learning is that peers may be unable to provide adequate assistance due to their unfamiliarity with the task or process (Tudge, 1992; O'Donnell & O'Kelly, 1994). Hence a more structured approach to introduce novices / learners / students to peer learning is necessary. This approach requires peer learners to utilise a structured peer feedback procedure (described later in this section – Page 8).

Taken that most of the literature on peer learning is school (Cristudason & Nelson, 2003), occupation (Roberts, 2008) or adult education centred (Boud, Cohen & Sampson, 2001), it is important to study peer learning in a pre-trade vocational educational learning setting.

Advantages of peer learning

Research into workplace learning has revealed the workplace as a challenging environment (Billett, 2001) for undertaking 'expansive learning' [1](Fuller & Unwin, 2003).

Numerous existing theories are offered on teaching and learning strategies for peer learning. One example is Boud's (2001) claim that students in peer learning situation will construct their own meaning and understanding of what they need to learn. Essentially, students will be involved in searching for, collecting, analysing, and evaluating, integrating and applying information to complete an assignment or solve a problem. Thus, students will engage themselves intellectually, emotionally and socially in "constructive conversation" and learn by talking and questioning each other's views and reaching consensus or dissent (Boud, 2001).

According to O'Donnell & King, (1999), peer-learning strategies are valuable tools. They argue that the outcomes of peer learning ultimately depend on learning design strategy, course outcomes or objectives, teachers' facilitating skills, and the commitment of students and teachers. Importantly, the teacher must consciously orchestrate the learning activity and choose the appropriate method for undertaking peer learning. Only then will students in fact engage in peer learning and reap the benefits.

Roberts (2008), states that peer learning can lead to development of self-directed learning skills; critical and creative thinking and problem-solving skills; communication, interpersonal and teamwork skills; learning through self, peer assessment and critical reflection; and increased understanding of concepts, skills and enhancing self-image.

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[1] The idea of expansive learning has been developed by Engeström (2001), who used it to achieve substantial changes at the organisational level. As he says: "The object of expansive learning activity is the entire activity system in which the learners are engaged. Expansive learning activity produces culturally new patterns of activity. Expansive learning at work produces new forms of work activity" (ibid, p139).

Therefore, peer learning techniques often result in improved classroom environment, including the development of skills related to collaboration and teamwork; increased responsibility for the learner to engage in reflection and exploration of new possibilities; encouragement for students to articulate their understanding; and improved 'learning to learn' strategies (Boud, Cohen & Sampson, 1999).

Feedback during peer learning

Due to the many individual approaches to peer learning that students may adopt, students undertaking peer learning activities need to be well-prepared for providing appropriate and relevant feedback. From the educational literature on formative assessment it is possible to identify some principles of good feedback practice. Good feedback practice is broadly defined here as contributions that might strengthen students' capacity to self-regulate their own performance. Additionally, effective feedback has to be organised in a structured manner so as to provide students with meaningful information for improving future performance. Hattie and Timperley (2007) recommend the deployment of three forms of feedback to contribute towards effective formative learning. The three types of feedback are:

- Feed-up – to check if the learning objectives are being met. Or that the learning activity is on track.
- Feed-back –on the performance level on learning. Is the standard expected being met?
- Feed-forward – recommends what the learner needs to do to improve learning or move to the next objective.

These three forms of feedback need to be used carefully to provide learners with information on task, process, self-regulation and self (image). In addition, this project also applies the research on formative assessment and feedback by Nicol and Macfarland-Dick, (2006) to further improve the effectiveness of the feedback processes by encouraging students take control of their own learning, i.e. become self-regulated learners. In summary, as recommended by Nicol and Macfarland-Dick (2006), good feedback supporting self-regulation should include elements of:

- helping to clarify what is good performance in the form of goals, criteria, expected standards;

- facilitating the development of learning self-assessment (reflection);

- delivering high quality information to students about their learning;

- encouraging teacher and peer dialogue around learning;

- encouraging positive motivational beliefs and self-esteem;

- providing opportunities to close the gap between current and desired performance;

- providing information to teachers that can be used to help shape teaching.

Research method

An interpretative-qualitative research method was used to study feedback iterations with trade students within four different disciplines at CPIT. Permission was sought from each teaching section to allow students to work in pairs or groups. The reason for selecting four different disciplines in the pre-trade courses delivered at CPIT was to investigate whether peer learning would be effective across a range of disciplines. The study of two trades from the manufacturing sector and two from the infrastructure sector provided some scope for comparison due to the different industry demands and focuses of each trade sector. Therefore the project consisted of a comparative study to establish whether peer interactions were affected by the context and / or work type / environments.

Both pre and post intervention data was gathered by videoing or voice recording pre-trade students while they were working through learning activities. Students from carpentry, painting and decorating, electrical trades and welding participated in the project. A total of 46 students and 4 tutors participated in the project.

Initial pre-intervention data collection took place over a period of 2 to 3 weeks. Interactions of groups were videoed and / or voice recorded. Pre- intervention data was gathered from groups of students prior to students' participation in the peer learning workshops. The intervention was in the form of a work shop which covered the objectives of the peer learning process and strategies for appropriate/effective use of feedback during peer learning sessions. Both tutors and students participated in the workshops.

Using video and voice recorders, <u>post-intervention data</u> was collected from the same groups. A comparison of interactions amongst students from pre- and post-intervention data was analysed using multi-modal discourse analysis. Multi-modal discourse analysis includes a study of aural and non-aural interactions (body-language) as people communicate and inter-related. In the case of this study, an emphasis was placed on voice-based responses as the seven principles from Nicol and Macfarland-Dick (2006) – see above section (pages 8 to 9) - were used as a framework to categorise the interactions and ways in which feedback was relayed between students. However, some aspects of body language, including those indicating assent, consent or agreement/disagreement were also recorded to enhance the aural data.

The students' interactions were then studied and instances of feedback initially identified and tagged. These feedback sequences were then further analysed and each multimodal (aural and body language) phrase in students' conversations, usually consisting of several sentences or exchanges between students, were coded to each of the seven Nicol and Macfarland-Dick (2006) principles. The frequencies of each principle were collated in tables (see appendices 1 to 4) and summarised as bar graphs (see figures 1 and 2).

The research on formative assessment and feedback was reinterpreted to show how these processes can help students take control of their own learning, i.e. become self-regulated learners. A key argument was that students are already assessing their own work and generating their own feedback, and that learning should build on existing ability. The shift in focus, whereby students were seen as having a pro-active rather than a re-active role in generating and using feedback, had profound implications for the way in which teachers organize assessments and support learning (Nicol & Macfarlane-Dick, 2006).

Findings

Due to challenges and disruptions in 2011 (i.e. earthquakes, snow, strikes, non-synchronized time-tabling between participant student groups and researcher's teaching commitments) matching group data from all four disciplines was not collected. Therefore findings from non-matched cohorts, totalling 6 groups, were not included in data –analysis.

Significant (i.e. pre-and post-intervention of similar groups) data was gathered from the second intake of Painting and Decoration group as well as Electrical and Welding.

Ample time and encouraging co-operation by tutors and students was provided to collect base data, gather ethical forms, explain peer learning principles and answer any questions students and tutors might have.

Table 1 below shows the total pre-intervention and post-intervention recordings, the total recordings, number of visits, number of students, average recording times and matching of groups involved from each discipline.

Table: 1 – Summary of data collection

Disciplines	Pre-recordings	Post-recordings	Total recordings	No. of visits	No. of Students	Average recording times
Carpentry	2	4	6	4	9 (3groups)	10 min.
Painting and Decoration (1)	3	1	4	2	8 (3groups)	11 min.
Painting and Decoration (2)	3	7	10	5	11 (2groups)	13 min.
Electrical	5	7	12	7	12 (3groups)	12 min.
Welding	4	4	8	4	6 (3groups)	11 min.
Total	17	23	**40**	**22**	**46**	

Analysis of data from pre-intervention recordings

As a summary, the pre-intervention findings are now presented. Firstly, a brief description of the students and teaching/learning context in each discipline is provided to example the context in which the study was undertaken. Then the data analysis of the feedback interactions before students and tutors participated in the 'providing better feedback' workshops is presented in the form of a bar chart (figure 1).

CARPENTRY
The carpentry groups consisted of young males with an average age around 20. They were engaged in practical exercises in the workshop (hanging doors and attaching door handles). It was noisy and there was little student interaction. Most of the interaction in the work shop involved the tutor giving instructions.

PAINTING AND DECORATION

The Painting and Decoration groups were from 2 different intakes. Only the data from intake 2 was used, so this group's context is provided.

The group was in the early weeks of training. They were engaged in practical painting and brush exercises. This group was joyful, chatty and engaged with lots of interaction. As the practical workshop sessions progressed, the tutor provided short mini theory sessions.

ELECTRICAL

The Electrical groups consisted of males with an average age of 22, engaged in practical and theory exercises in workshop situations. Students were involved in group activities set out by the tutor in a tidy workshop and there were many instances of interaction amongst students.

WELDING

Traditionally, welding has been a 'solitary' activity due to safety factors and the use of welding booths in the welding workshops. Students practice welding skills individually in booths. Therefore, in comparison with the other three investigated disciplines, welding students do not have opportunities to observe other students learning welding. The welding groups consisted of young males with an average age of 18, in their fifth week of training. Due to technical difficulties posed by high light levels when welding torches were used, the both pre-and post-recordings consisted of voice recordings only.

A summary of the collated analysis of the various videos and voice recordings before students participated in the workshops on providing peer feedback is provided in figure 1. Examinations of recordings from pre-intervention group discussions indicated a low level of interaction. These low level interactions were grouped around:

- helping performance
- delivering information
- encouraging dialogue

Furthermore the pre-intervention data showed limited evidence of the following feedback principles:

- Facilitating development
- Encouraging motivation

- Closing the gap
- Helping to shape teaching

The red bars in both the charts in figure 1 and 2, account for the accumulated variety of feedback or responses (as outlined by Nicol and Macfarlane-Dick (2006)) for all groups involved. The bar graphs are visual tools to show the differences in students' deployment of feedback type.
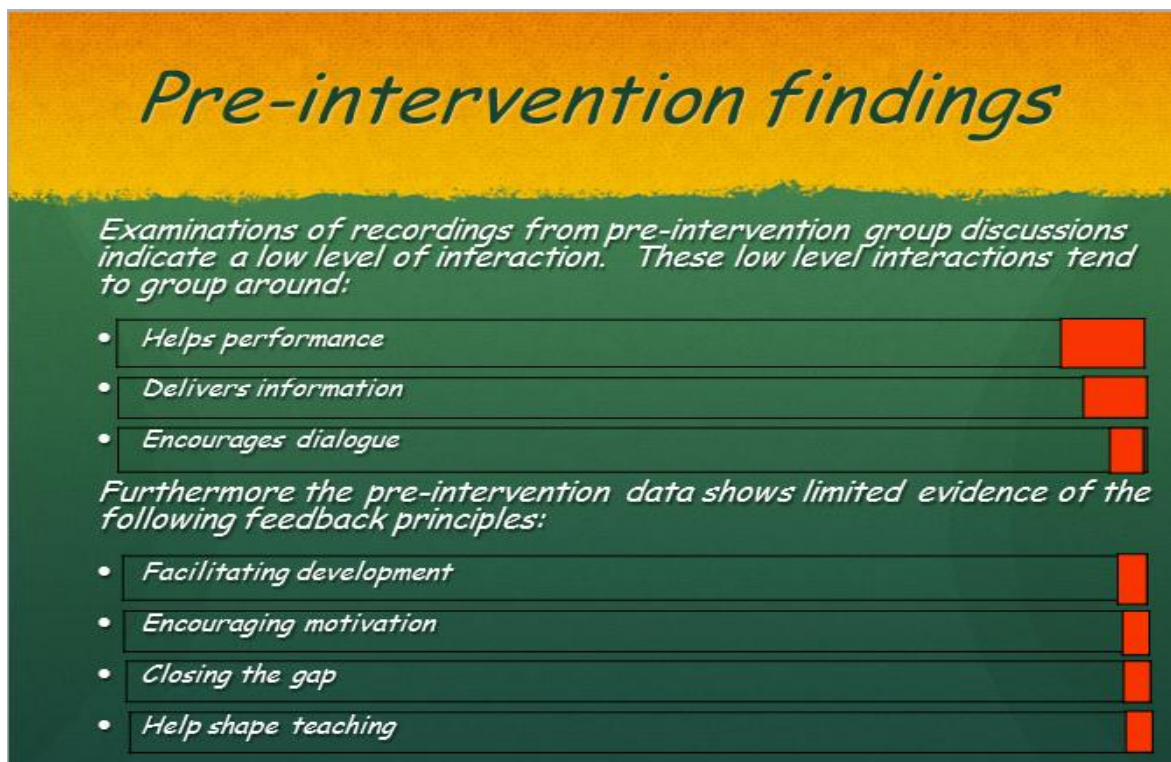
Figure 1: Pre-intervention findings based on themes proposed by Nicol and Macfarlane-Dick (2006)

Analysis of data from post-intervention recordings

The summary of the analysis of the post-intervention recordings is reported in this section.

CARPENTRY

The analysed data is obtained from the last two theory sessions. Due to mentioned unforeseen circumstances and disruptions, the researcher was unable to compare recordings with the same groups. Consequently comparing both pre-and post-footage with similar group(s) could not be completed thus affecting the data analysis and outcome for

this discipline. The two post- intervention recorded sessions however show valuable peer interaction providing worthwhile data to support the analysis.

PAINTING AND DECORATING

Appropriate data to compare pre-and post-recordings from intake 2 was collected for suitable analysis. Allocated data collection and timetabling was a challenge, resulting in the matching of pre-and post-footage from groups out of intake 2.

ELECTRICAL

Collected data from these groups was suitable for analysis, consequently giving weight to findings reported.

WELDING

Collected data from post-recordings was suitable for analysis. Pre-and post-recordings from the same groups with different skill levels could be compared.

As depicted in figure 2, coding from the recordings from post-intervention group discussions pointed to a higher level of interaction and an increase or improved richness of interactions. The intervention helped increase the following feedback principles:

- delivering high quality information to students about their learning
- encouraging student peer dialogue around learning
- encouraging positive motivational belief

And to a lesser degree:

- Clarification of what good performance is (goals, criteria, expected standards)
- Facilitating the development of self-assessment (reflection) in learning
- Providing opportunities to close the gap between current and desired performance
- Providing information to teachers – students that can be used to help shape teaching - learning.

The red bars figure 2, account for the accumulated variety of feedback or responses (as outlined by Nicol and Macfarlane-Dick (2006)) for all groups involved.
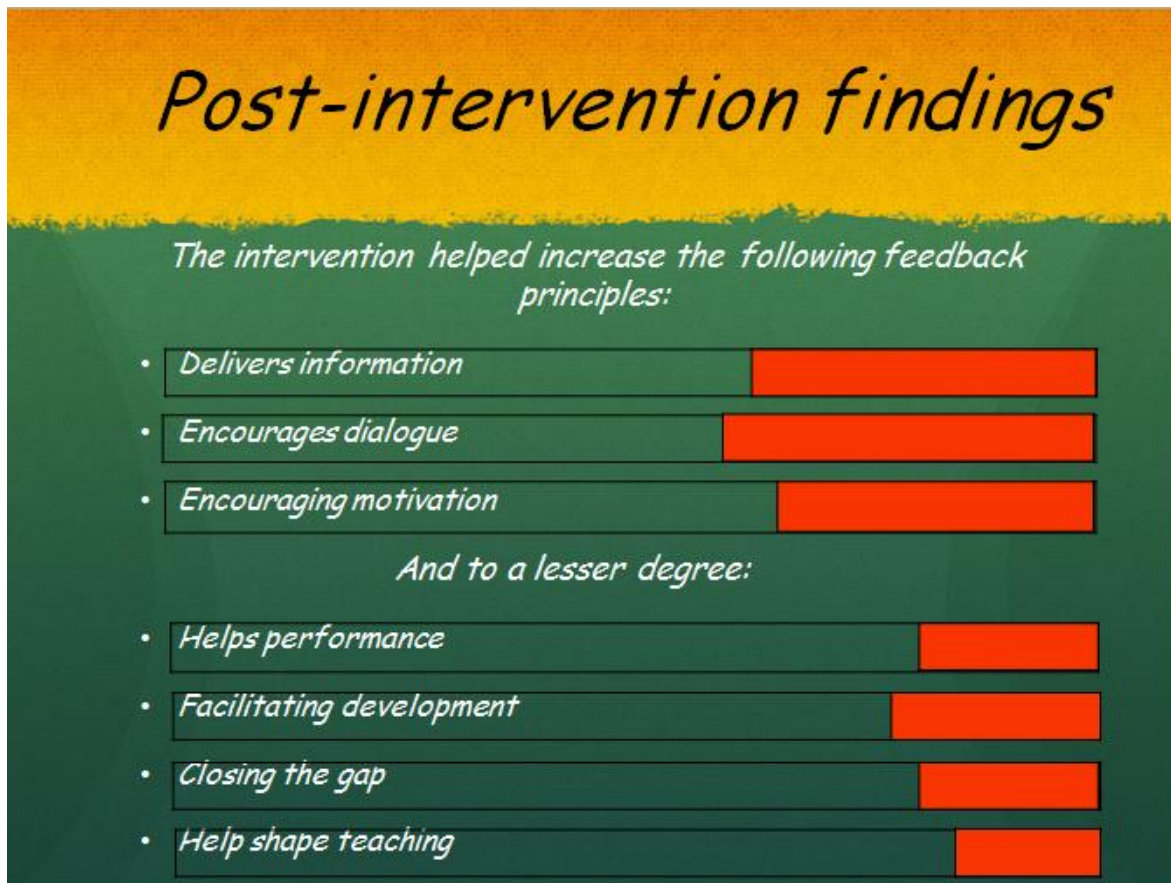
Figure 2: Post-intervention findings based on themes proposed by Nicol and Macfarlane-Dick (2006)

Discussion

In this discussion, we focus on the aspects introduced at the beginning of this report. These are the five aspects to explore in establishing the effectiveness of peer-learning:

- who is learning,
- what helps peers learn together,
- what learning results through the interaction,
- how we know what learning occurs in groups and
- what has been learned.

Who is learning?

Examination of both pre- and post- intervention data indicates students' interaction occurs during learning activities. These learning activities were recorded in both workshop (electrical, painting and decorating and welding) and classroom (carpentry, electrical) vocational learning environments. However, a comparison of the data (as summarised in

figures 1 and 2) indicates a difference between the frequency / number of interaction before and after intervention, with post-intervention data revealing a greater number of student interactions.

What helps peers learn together

The ways in which students provided feedback also varied. In the post-intervention chart (figure 2), students were able to help increase the learning of information and the motivation to learn, however, the important advantages afforded by 'feed–forward'-(i.e. identified as - helps performance, facilitate performance, close the gap) were less used. This result signals the need for more coaching on feedback strategies or for better techniques to be used to encourage students to engage with feedback as a learning method. As peer learning was occurring between two students, both of whom are novices, a lack of experience with specialised trade skills may be the reason students found it difficult to provide adequate feed-forward.

What learning results through the interaction

In this project, intervention through the introduction of peer learning workshops, helped students increase the following peer learning strategies:

- delivering high quality information to students about their learning
- encouraging student peer dialogue around learning
- encouraging positive motivational belief.

For the above, some examples of the dialogue between students is provided.

In the process of *delivering high quality information to students about their learning*, two painting and decorating students are evaluating one of the student's wall-papering task.

(Note: Excerpts from transcriptions are reported between two students, the *second student's responses are presented as italics* and descriptions of <u>non-verbal actions are underlined</u>)

> What you see here is two patterns.
> *Yup.*
> And I ran out of this pattern,
> *Yup.*
> So I had to find another patter.
> *Oh. OK.*
> That had the same measurements to go round the corner.
> *Yeah. I have to say it, but it is kind of stepped*
> <u>(i.e. uneven).Student indicates by pointing and touching.</u>

Yes, I noticed but it is the only wall-paper I could find.

Here is one student, *encouraging student peer dialogue around learning*. The example is from two carpentry students working on calculations to draw a plan.

That angle there, See.
Hmm.
And then you go to that angle.
<u>Other student places ruler in place.</u>
So that angle 175, you got to take it from here.
<u>Other student marks the place</u>
Then that is? <u>Prompting the other student to answer</u>.
180?
Yes. So we take 30 off that and we ---

The example below is an example of one electrical student *encouraging positive motivational belief* with another student. Two students are working on assembling an electrical supply component, a box to contain a motor.

So, if you want, I will cut some pieces.
Yup, yup.
If you want, you can try to make it even.
Yes. I just need two boards.

Although there was an increase in feedback exchanges overall, the following types of peer feedback still require further intervention.

- giving clarification of what good performance is, including goals, criteria and expected standards.
- facilitating the development of self-assessment or reflection in learning
- providing opportunities to close the gap between current and desired performance
- providing information to teachers – students that can be used to help shape teaching/learning.

How we know what learning occurs in groups

Examination of peer learning interactions indicate some groups to be interacting before intervention and most groups (post-intervention) to be using effective peer feedback strategies. The post-intervention recordings illustrate an increase in motivational dialogue around how students are performing. Hence, the coding derived from recordings of the post-intervention group discussions indicated an increase in the quality of feedback. As depicted in figure 2, using the seven principles of feedback (Nicol & Macfarlane-Dick,

2006) as data interpretation markers, there was improved richness of interactions in the post-intervention group.

What has been learned

From the observations undertaken and the analysis of the video and voice recorded data, it was noted that not every particular student seems fit for a peer learning environment. This is because deploying feedback requires basic communicative, conflict-management and attitudinal skills (Boud, 2001). These basic skills were presented and discussed during the intervention workshops but students only had a short time to practice these across the life of the project.

As Tannen, (1990, 1994) claims, teachers must set aside training sessions to talk about gender communication issues and need to recognize that male students in particular may be competing for attention, status and power. For peer learning to be effective, students must build mutual respect for and trust and confidence in one another, so that they "feel free to express opinions, test ideas, and ask for, or offer help when it is needed" (Smith, 1983, p 39). Hence the guidelines derived below, try to improve the use of peer feedback through strategies that need to be actioned by students and tutors/teachers.

In following the guidelines below, students may, as suggested by Boud (2001):

- Extend learning far beyond the written word and given task
- Take alternating roles in learning and teaching
- Acquire conflict-managing skills
- Discuss and clarify concepts
- Engage intellectually, emotionally and socially in "constructive conversation"
- Learn by talking and questioning each other's views and reaching consensus or dissent
- Unravel the complexities of human relationships within a given context
- Increase motivation by using group rewards.

Guidelines

The guidelines recommended in this section are based on analysis of the data revealing that the post- intervention findings in Figure 2, shows an uneven spread of responses used in peer learning after the workshop intervention. These guidelines aim to provide direction for how peer learning can be improved. It is therefore important to focus on guidelines to lift those weaker bars as shown in Figure 2, for example: - helps performance, - facilitating development, - closing the gap and help shape teaching. As a result the guidelines are a composite of the principles presented in the literature review and the findings from this project, to try to investigate and clarify how peer learning takes place and ways to improve in workshop based learning environments.

From the study presented in this report, providing quality intervention workshops to recommend peer learning to students are therefore relevant and important.Below is detailed a sequence to help trades tutors implement peer learning with their students,

To improve successful peer learning, teachers may choose from many teaching/learning activities. Examples of teaching and learning strategies recommended by Cristudason and Nelson (2003) include buzz groups, affinity groups, solution and critic groups and using the 'teach-write-discuss' structure to guide group interaction. Kaufman, Felder and Fuller (1999) state as students communicate with one another, they inevitably assume leadership roles, acquire conflict-managing skills, discuss and clarify concepts, and unravel the complexities of human relationships within a given context, and inevitably enhance their completion of learning outcomes. Thus, students' learning extends far beyond the written word and even the given task. One strategy recommended by King (1999) is the concept of reciprocal peer tutoring, where students work together to teach one another, and they alternate between the roles of student and teacher. This technique combines elements of both motivational and cognitive approaches to collaboration.

Therefore, the guidelines below provides a list of structured strategies for teachers to introduce peer learning activities into workshop based practical learning activities and class-room based theory learning activities.

Tutors' role in introducing peer learning

1) During the first 3 weeks set aside training sessions to discuss and participate in learning activities to support the following principles:

   Basic communicative-, conflict-management- and attitudinal skills
   Keep disagreements civil and unheated and protect minority opinion.
   Build mutual respect for and trust and confidence in one another

2) Follow the above by providing students with a session to introduce the feedback cycle:

   Explain and practice the process of feed-back, feed forward and feed-up.

   The above learning session supports the student's ability to be aware of and use/apply feedback in future workshop and classroom learning activities.

3) Then:

   Incorporate peer learning as an integral component of a curriculum, by:

   Creating a conducive learning environment
   Making sure the entire group experiences 'positive interdependence'
   Encouraging face-to-face interaction and group processing of learning
   Explaining and supporting the importance of individual and group accountability

Conclusion

As reported by Nuthall (2007) and also by Tudge (1992), collaborative learning activities undertaken by students, may lead to unintended learning outcomes. Hence, peer learning activities should be initially teacher guided and structured. One method for providing guidance is to assist students with the process of providing feedback to peers. In this project, students were provided with a suggested framework for providing peer feedback. In so doing, the project has met the original objectives by creating an awareness of peer learning amongst students and educators. Recommendations, in the forms of the provision of guidelines to support student learning in the above section, provide pre-requisites,

favourable conditions, teaching/learning strategies, so as to improve teaching/learning in a workshop/classroom within vocational learning contexts.

Peer learning is optimised when it is integrated into normal structure of lessons, paying special attention to creating a conducive learning environment (O'Donnell & O'Kelly, 1994). Peer learning can be further enhanced if the "environment of mutual help…continues over time and beyond the classroom". Thus, students are individually and collectively accountable for optimising their own learning and achievements (Boud, 2001, p 87).

This project provided some insight in the dynamics of peer learning; the impact and effect of prior instructions for peer learning situations; the design strategy and teachers' facilitating skills, and the commitment of students and teachers. The guidelines provide a recommended process for introducing and encouraging peer learning within vocational education workshops and classrooms.

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Appendices

CARPENTRY

Appendix 1

7 principles of feedback			pre-recordings			intervention		clip 1	clip 2	Clip 3	post-recordings Clip 4			
	clip 1	clip 2						clip 1	clip 2	Clip 3	Clip 4			
helps performance		2						2		1	2			
facilitates development								2		1	2			
delivers information	1							4	3	3	4			
encourages dialogue								3	3	4	3			
encourages motivation									3	5	5			
closing the gap									1	1	2			
help shape teaching										2	1			

Appendix 2

7 principles of feedback			pre-recordings			intervention					post-recordings			
	clip 1	clip 2	clip 3				clip 1	clip 2	clip 3	clip 4	clip 5	clip 6	Clip 7
helps performance	2	2	2				2	2	1	1	1	1	2
facilitates development								1	2	2	1	1	1
delivers information	2	2	2				2	3	2	3	1	2	3
encourages dialogue	1	1	1				3	1	4	5	1	5	3
encourages motivation							2	2	3	3	3	1	2
closing the gap								1			1		1
help shape teaching									1	1			

Appendix 3

7 principles of feedback			pre-recordings				intervention		clip 1	clip 2	clip 3	post-recordings			clip 7	
	clip 1	clip 2	clip 3	clip 4	clip 5			clip 1	clip 2	clip 3	clip 3	clip 4	clip 5	clip 6	clip 7	
helps performance	1				1				1	2	1	2	2	2		
facilitates development	1				1			1	2	1	1	1	1	2		
delivers information	1		1					2	2	4	1	4	5	4		
encourages dialogue	1	3	1					1	2	3	4	4	5	4		
encourages motivation								2	3	4	2	2	4	5		
closing the gap	1								1	2	2	1	1	1		
help shape teaching				1				1					2		2	

Appendix 4

7 principles of feedback			pre-recordings				intervention				post-recordings				
	clip 1	clip 2	clip 3	clip 4				clip 1	clip 2	clip 3	clip 4				
helps performance	1	1	1	1				1	2	1	1				
facilitates development								1	2	1	1				
delivers information	2	1	1	1				3	4	4	3				
encourages dialogue								3	2	2	2				
encourages motivation								5	3	2	4				
closing the gap								1		1					
help shape teaching									1						