

REFLECTIVE JOURNALS: GAINING INSIGHTS INTO THE EFFECTIVENESS OF MARITIME TRAINING

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Abstract

It has always been a challenge to evaluate the effectiveness of maritime education and training due to the difficulty in gaining access to the students once they have finished their training and returned to sea. The research team at Warsash Maritime Academy has elected to meet this challenge by developing a novel approach to evaluation, which it is hoped will enable not only the course team to gain an insight into the effectiveness of its crew resource management (CRM) training, but will also provide evidence to the customer of the effectiveness of the training, and enable students to assess for themselves their strengths and weaknesses. This novel approach is based upon the application of reflective practice. Accordingly this paper describes the reasoning behind the choice of approach and discusses preliminary findings from the research. The paper starts with an exploration of the levels of learning that are feasible in a five-day residential course wherein reference is made to contemporary thinking on teaching practice and student engagement. It then goes on to discuss the methodology being used to try and discriminate the levels of learning achieved by two cohorts of students who have attended the CRM course. This methodology is being used with the intention of evaluating effectiveness of such training and at the same time promoting reflection on practice by the students concerned. Finally the paper discusses whether reflection on professional practice during a training course, and afterwards in the operational environment, adds value to the student's learning experience and benefits their professional development.

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Introduction

Establishing the extent of the transfer of crew resource management (CRM) training from classroom or simulator to ship is difficult without elaborate experimental designs involving students matched for age and experience, control groups and multiple measures of performance. Even after having pursued such a strategy, it cannot be conclusively argued that changes in shipboard behaviour are wholly a product of maritime training and not due to some other unrelated influence on performance. Yet without evaluation of some kind, how are we to justify

- to shipping companies that what we, the maritime education and training specialists, are doing is benefiting their officers?
- to our own institutions that we are scholarly and professional in our teaching practice, and
- to ourselves that our teaching strategy is effective in producing the learning outcomes that we designed the course to achieve?

In addressing the first point, in the authors' institution, this question is satisfied predominantly, but not exclusively, by post course evaluation or student feedback questionnaires; both internally and externally generated. However, as Patrick (1992; p 513) argues,

"While trainee reactions are important and should be taken notice of, they are rarely the most relevant criterion for evaluation..."

The primary reason for this assertion is that a student's like or dislike of a course and its content may have little or no bearing on the amount that s/he has or has not learned.

In addressing the second point, our CRM courses are not mandatory and thus not subject to external evaluations or audits by regulatory authorities. However, maritime education establishments are often voluntary disciples of the quality assurance paradigm, and our own is no exception, and thus courses and their teams are subject to internal evaluations or external audits as part of their compliance with a quality management system.

Audits have their place; however they tend to be a backward look at what has been done and thus are in danger of being used as a stick for beating lacklustre teachers with rather than as a tool for understanding where and how improvements can be made. In the words of Ramsden (2003; p209):

..evaluation is best conceptualised not as something that is done to teachers by experts wielding questionnaires and spreadsheets, but as something that is done by teachers for the benefit of their professional competence and their students' understanding.

In addressing the third point, for the authors, the most relevant criteria for evaluating the CRM courses on which they teach are attitude, behaviour and cognitive change; in sum: *learning*. This is deemed by the authors to be the best measure of the effectiveness of teaching. Yet, as has been discussed elsewhere (cf. Pekcan *et al*, 2005), the extent of the change or learning expected by shipping companies versus what is achievable in a five-day residential course is open to debate.

Notwithstanding these issues, it is not sufficient for us to ignore the matter of investigating the effectiveness of maritime education and training by consigning it to the 'too difficult' box.

At Warsash, the research team is attempting to address this thorny issue, if not in whole, at least in part. In an effort to foster behaviour change beyond the usual 'honeymoon phase' of the training intervention, and to evaluate the effectiveness of that training, a reflective practitioner initiative has been developed and is being trialled. Preliminary results from the trial are presented below. First, the rationale for choosing the reflective practitioner model is presented, followed by a discussion of the level of learning expected on a five-day course.

Rationale

Atherton (2005) argues that the "battery" model of professional training, wherein the student is loaded up with knowledge or skills that they are expected to discharge back in the work place is ineffective. Indeed, many writers in the field of education (e.g. Biggs, 2003; Ramsden, 2003; Knight, 2002) would agree: the knowledge transmission model of learning, as they call it, wherein the lecturer attempts to transmit their expertise to the student through lectures, results in students learning a rag bag of facts and terminology (Ramsden, 2003).

Where the development of professional practice for ships' officers is concerned, officers need to be active discoverers of such skills not passive recipients of broadcasts by lecturing staff (Pekcan, 2005). However, while active students are more likely to learn than passive students, being active *per se* is also insufficient for the learning of professional skills such as those taught on the CRM course. Certainly, where adult learners are concerned, Boud and Walker (1993) have argued that without reflection a professional is doing nothing more than living: in other words, the process of experiencing life at work without cogitation does not produce learning.

As with many constructs, the idea that reflection is important for learning is not new. As early as 1690 the philosopher John Locke wrote 'An Essay Concerning Human Understanding', in which he proposes, "*all ideas come from sensation or reflection*". He argues that our knowledge is derived and founded solely from our experience. He goes on to propose that it is our reflection upon our perceptions of both our external observations, and the internal operations of our minds, that give us our understanding. He posits that the further development of understanding that leads to new ideas can only come about through the process of reflection. He defines reflection as a process of synthesising new understanding by having an internal sense of how ones mind handles that which we perceive.

Reflective Practice

According to Schön (1983), the continuous reflection on practice, both 'in-action' and post-action is the defining characteristic of professional practice. He defines reflective practice as the criticism and restructuring of the understandings that have been implicit in one's actions in order to embody them in further actions. Moon (1999) takes this definition further by suggesting that reflection pulls together a broad range of previous thinking or knowledge, to make sense of it for another purpose that may transcend the previous bounds of personal knowledge.

Kolb (1984) includes reflection within his experiential learning cycle as shown below in Figure 1.

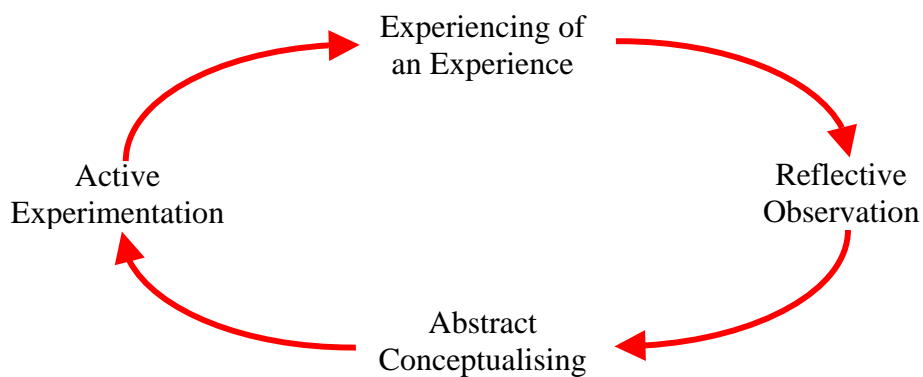


Figure 1. Experiential Learning Cycle (Kolb, 1984).

Kolb argues that the reflective practice within this learning cycle develops concepts from experience, and that the quality of reflection is crucial in ensuring that the learner progresses in their learning. This progression can be seen as the transformation of a learner's existing knowledge in the light of a learning experience.

Simulator-based courses run at WMA promote reflection throughout the five day's duration particularly during the simulator based aspects of the course where the officers observe their peers and then provide feedback in a structured debrief session. In this way, it is envisaged that the students question what they know and do, examine their assumptions and test the results of their trials, and incorporate the new learning so as to improve their practice. However, once out of the confines of the college, it is thought unlikely that this reflective process continues in all but a few students. The officers are transported back to their world of living and are not necessarily given the space or encouragement to reflect on their practice except, perhaps, in an appraisal situation. Unfortunately, it is likely therefore that the learning process stops because this reflection stops.

While this may be the case, not all writers on reflective practice necessarily agree that reflection on experiences at a point in time remote to the learning experience is good. For example, Eisner (1991) argues that the process of codification of an experience modifies the perception of that experience. Reflection made only at the end of a long-term experience, such as a project, may be primarily based upon the codified version of the experience. If our perception of the experience has been modified by this codification, the value of our reflection could be adversely affected. In the case of any long-term experience it may be beneficial therefore to undertake reflection throughout the experience. Again, while this is achievable in a college setting, the opportunities to foster continuing and on-going reflection in the work place are few particularly where shipping is concerned.

If, as Eisner (1991) proposes, we do not learn directly from an experience, but from our perceptions of an experience, the context in which our reflection takes place and the guidance given for our reflective practice, are of significant importance, as they can influence our perceptions. Usher (1985) also argues that emotional influences affect the process of reflection more strongly than any other influence. If reflection is not to be restricted it requires an environment in which the outcomes of a learner's reflective practice will not be emotionally challenged.

However, not all agree with Eisner. Moon (1999) proposes a positive benefit from the codification of an experience through reflection, in that it gives us the ability to codify the tacit knowledge of the experience. She argues that it is this tacit knowledge that guides our professional practice and provides the link between espoused theory and practice. Nevertheless, she does agree with Usher by suggesting that, "material produced through reflection that is for assessment by others may be influenced by the knowledge that it is to be assessed by others". She also suggests that the outcome of any reflective practice is therefore influenced by its purpose.

In order to address this issue, when students at WMA are asked to undertake reflective practice, they are advised that the evaluation of their reflections will remain anonymous. They are made aware that their reflections will only be evaluated by WMA and that their employer will only ever receive a sanitised summary of the results of the reflective practice study. In this way it is hoped that the students will understand that the purpose of their reflective practice is to evaluate the effectiveness of the training, and not in any way to assess their performance.

In summary, reflection possesses the following characteristics:

- It is an essential part of the progression of learning (Schön, Moon, and Kolb).
- The stage of an experience at which reflection takes place can affect how reflection modifies our perceptions of that experience (Eisner).
- It is affected by emotional influences (Usher).
- The outcome of reflective practice is influenced by its purpose (Moon).

Thus, reflection offers a credible technique for making us take stock of what we do and why, and in that way, it has the potential to lead to new thinking and new learning. It serves to justify the rationale for adopting a reflective practitioner model and supports the authors' fundamental belief that to get ships' officers on experiential courses to learn, they have to engage in reflection.

Learning Outcomes

Having set out the rationale for adopting the reflective practitioner model, the second issue to be addressed is the extent or depth of learning that can result from experience and reflection on a five-day residential course.

The expectation of the authors is that students should be able to do more than learn 'right answers' and unrelated facts. Certainly in simulator-based courses, we are often aiming for attitude and behaviour change as well as cognitive change. However, before one can begin to design courses and promote teaching practices that encourage students to do more than memorise, one has to understand the levels of learning that are possible.

Levels of Learning

Biggs proposes five levels of learning outcomes (as opposed to learning stages) for which he provides examples, and these have been paraphrased below:

1. *Prestructural*: students' responses to a question miss the point
2. *Unistructural*: students' responses deal with terminology but little more
3. *Multistructural*: students' responses are characterised by 'knowledge-telling' ; (Bereiter and Scardamalia, 1987) an unstructured 'brain dump' of facts
4. *Relational*: students' responses are characterised by explanation and relating of concepts, one to another
5. *Extended abstract*: students' responses go beyond what was presented in material to arrive at new conceptualisations of problems, issues or knowledge.

Biggs argues that it is only when students reach levels 4 and 5 that we can be sure they are truly understanding, and thus have learnt more than what Ramsden refers to as an 'imitation of their discipline'.

Expecting students to engage in the kinds of problem-solving and theorising expected in many simulator-based courses (the *extended abstract* end of the development continuum), when they are only unable to grasp simple concepts (the *unistructural* level) – is likely to result in limited learning at best, and the 'wrong' learning at worst. Borodzicz and van Haperen (2002) argue that simulation is a training methodology that should be used 'when people are ready for [it]' (p 16). They support their assertion by referring to the work of Lagadec. Lagadec (1997) found that students who undertake simulations involving crises too early in their development become anxious and defensive. Lagadec also found that 'undertaking [crisis simulations] too late might merely set in-house attitudes in concrete' (p 331), suggesting that there is a time window for learning using simulations.

We take the view that simulation is less linked to chronology and more to the learning outcomes in relation to the level of the students. In accordance with theories of learning presented in texts on higher education (cf. Pekcan, 2005 for an overview), the CRM course begins with teacher led instruction and increasingly exposes the students to experiential learning in the simulator as the week progresses. The intention is to develop the students' independence and increase the level of learning outcome they can achieve by the last days of the course. In designing the CRM course this way, the students are expected to achieve learning outcomes at the *relational* level (Biggs's level 4 above) i.e. they are expected to be able to relate, through reflection, what they have learned in the classroom and simulator debrief sessions to their professional practice and to modify it accordingly. It was not felt appropriate to expect the students to achieve level 5 in the time scales available.

Accordingly, the study sought to establish the extent to which the students were achieving level 4, and the methodology is described below.

Methodology

Taking on onboard the messages from educationalists and writers on reflective practice, the research team decided to adopt the reflective practitioner model to develop a process that was thought would achieve two aims:

- Promote the act of reflection post the conclusion of the CRM course for the benefit of the officers
- Enable an assessment of the depth of those reflections to determine whether learning from experience was continuing and to what extent learning had taken place.

Before the start of the course proper, course attendees were encouraged to reflect on past experiences (*concrete experience* in the words of Kolb), to ascertain where their behaviour has been effective and where it has been ineffective. At the end of the course, the students were asked to return to their original reflection to think about what they have learned and how they might re-interpret the outcome described in their earlier reflection. In effect, this was a rather rudimentary attempt to teach them the meta-cognitive skill of reflection.

Three month's after they attended the course, the students were followed up to establish what they remembered (*multistructural* learning), what they had applied (*relational* learning) and what they believe to be the enablers and constraints to applying what they had learned (*extended abstract* learning) on board ship. This latter aspect of the reflective practitioner exercise was also used to enable the research team to establish whether the culture in which the students were attempting to apply their newly learned non-technical skills, is receptive or hostile. In other words, it was hoped the research would help us to understand the extent to which company culture influences accident likelihood and inhibits safe behaviour.

The students were sent a questionnaire that contained eighteen questions, sixteen of which covered the subject matter of the course and two of which asked the students to reflect on their professional practice post the course. The first sixteen questions varied in style and were designed to assess the levels of learning from *unistructural* to *relational*. An example of each is presented in Table I.

Question Type	Example question
Unistructural	List three ways in which we communicate
Multistructural	Describe what is meant by the term Amber
Relational	Give an example of BLIND communication and explain the problems associated with communicating in this way

Table I. Examples of Questions by Type

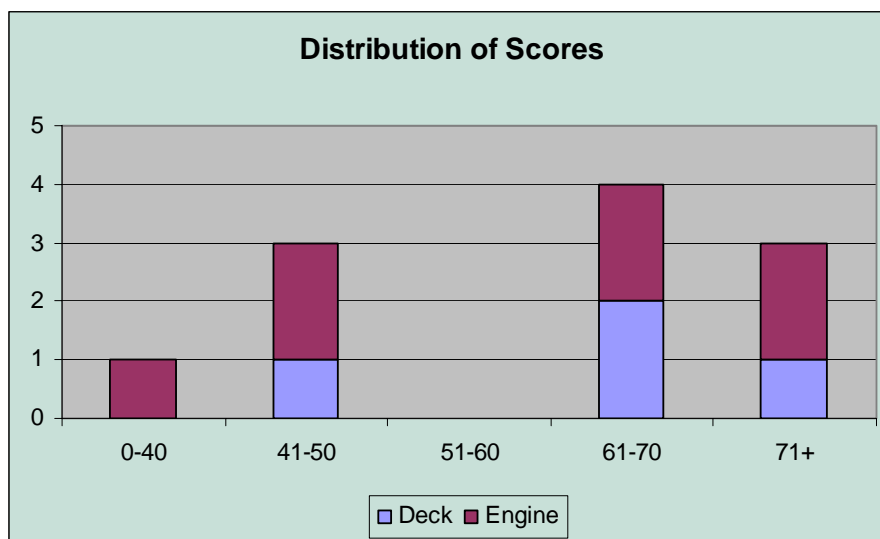
The last two *reflective* questions were designed to see whether the students were able to stretch their learning to the *extended abstract* end of the learning continuum. An example of an *extended abstract* question is presented below.

Please describe a situation / event that you have encountered since attending the CRM course at Warsash in which you were unable to apply the lessons learnt on the CRM course. Please describe the situation, what you did / said, and explain why you were unable to use what you had learnt on the course.

Questions 1 to 16 were scored on the basis of completeness and accuracy and provided 80 percent of the marks. Questions 17 and 18 were scored on the basis of the extent of critical self-analysis and contributed 20 percent of the marks. Accordingly, the students could score anywhere between 0 and 100.

Results & Discussion

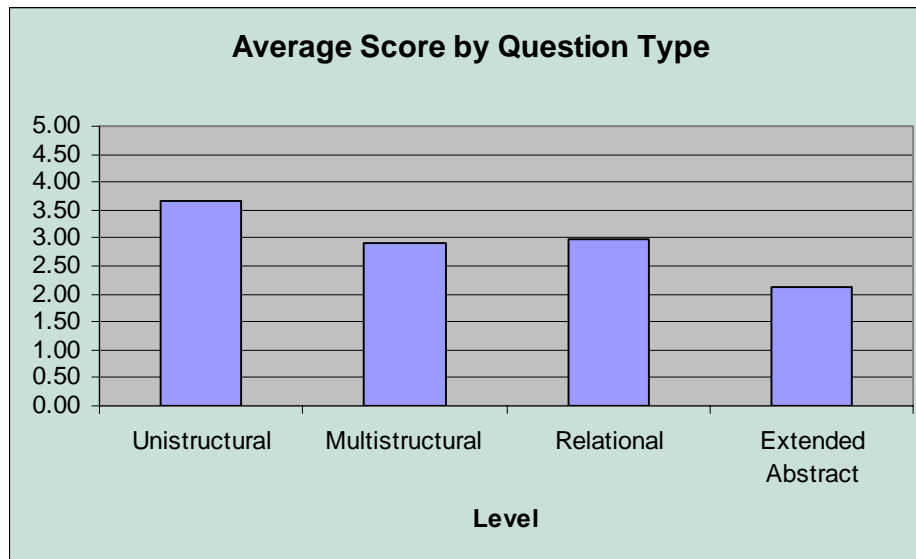
Eleven responses were received out of a possible 12. The overall average score was 59 percent indicating satisfactory retention levels of knowledge. Figure 2 displays the distribution of the scores. From the graph it can be seen that more than half of the officers (64 percent) had retained the majority of the learning from the course. Ninety percent of the officers, if this were a test of their knowledge, would have passed (i.e. they obtained more than 40 percent). This result indicates that learning had taken place in all bar one officer and the extent of that learning varied.



• Figure 2. Distribution of Scores by Officer Type

Depth of Learning

While Figure 2 portrays the overall achievement of the students, it does not indicate the level of learning the students had achieved. Although it would be hard to score more than 50 percent without answering a range of questions accurately, the research team were interested to see whether, on average, the officers scored better on the easier questions: i.e. those requiring no more than recognition of the terms, and worse on the harder questions: i.e. those questions requiring the officers to have processed the information from the course and understood it.

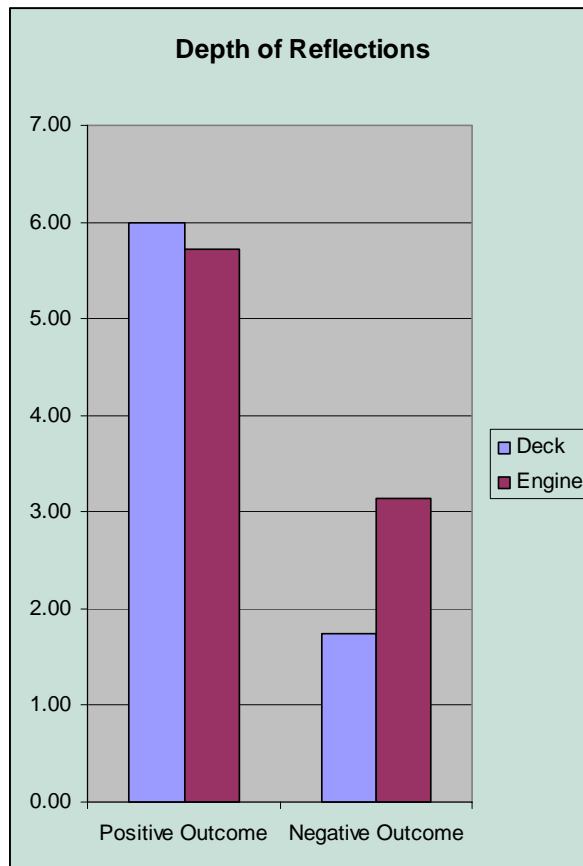


• Figure 3. Level of Learning

As can be seen from Figure 3, the officers performed best on the questions requiring them to have recognised or remembered the terms and concepts from the course. On average for each question that required such a *unistructural* response, the officers scored 3.65 out of a possible 5 points. The officers' average scores on the questions requiring greater depth of processing were 2.92 for *multi-structural*, and 2.98 for *relational* questions, respectively. The officers, as one might expect, obviously found these questions harder. Nevertheless, this result indicates that learning at the *relational* level had occurred.

Examining the responses on a question by question basis was also informative. Although not reported here, those questions where the average score was less than two indicated that the students' collectively struggled to understand that particular concept. As argued in the foregoing, using the reflective practice model enables the course team to evaluate their own teaching practice. Those questions where performance is poor indicate that further explanation or a different approach is required to achieve the *relational* level of understanding of that particular concept.

Finally, as expected, the officers scored least well on the *extended abstract* questions: the two reflective questions in which they were asked to interpret new experiences on board ship post the course and evaluate, or hypothesise about what happened and why. As Figure 4 shows, they were happier reflecting on positive experiences in which they had managed to apply the lessons from the course and less happy about discussing situations in which they had not been able to apply the lessons learnt from the course.



• Figure 4. Average Scores for Depth of Reflections by Officer and Reflection Type (max 10 Points per item)

Several of the officers simply did not respond to the question asking for reflections on difficult experiences. In some instances, the officers responded by saying that they had not had any negative experiences. The following officer’s response is typical:

“There was not a situation where I wasn’t able to use lessons learnt at course.”

While this is gratifying to hear, the interpretation of this result is harder to come by. It was hoped that this question would give the team an insight into the constraints to the transfer of training. It was thought that the officers’ stories would reveal the barriers to the application of CRM principles in their working environment, as well as give an indication of the officer’s developmental needs. Nevertheless, and although not in the way the team had intended, perhaps this lack of response is revealing something about the company or shipboard culture or the officer’s culture. There are four possible explanations for the lack of response:

- The officers genuinely did not have any experiences where they were unable to apply the lessons
- The officers were being respectful to the course team and did not feel comfortable recounting stories which might indicate they had not learned from the course
- The officers did not trust that their reflections would remain anonymous and worried that the information might be used in a way that would negatively impact on their career
- The lack of coaching in reflection has hindered the officers’ ability to reflect

Whereas the majority of officers were able to reflect on positive past experiences, it is difficult to ascertain from this snap shot in time whether the officers are reflecting as part of their practice in an ongoing manner. It would appear, from one engineer officer's responses at least, that the completion of the questionnaire was beneficial in prompting them to reflect:

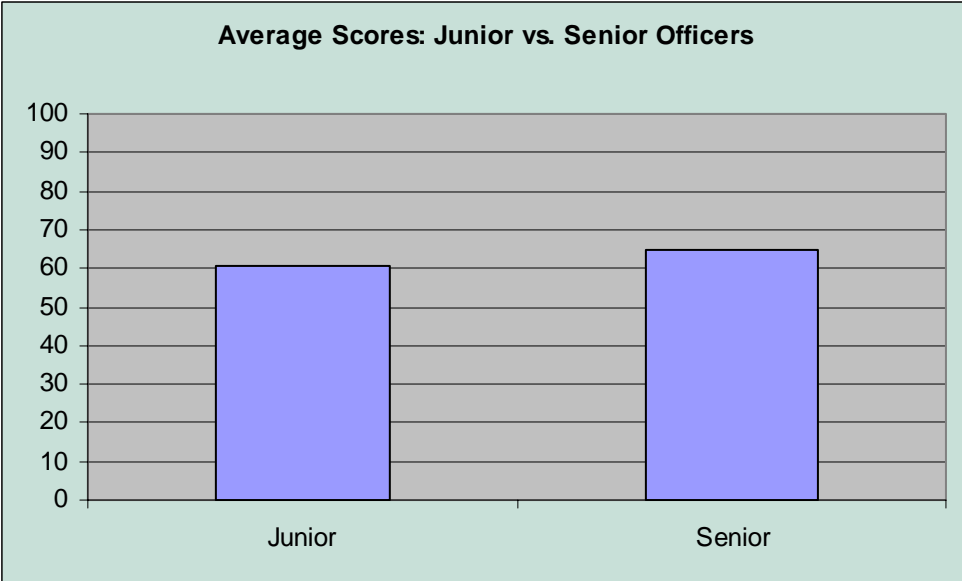
"I have found this post course evaluation very useful as I am nearing the end of my first trip since the course. I have had to review the notes and it's all come flooding back. It's also easier to see from where to use different tools."

How much of this type of reflection will continue without further prompting or facilitation is difficult to gauge. It is incumbent on the company to give the officers opportunity for reflection and it is the responsibility of the officers themselves to take charge of their learning through reflection.

Timing of CRM Courses

Lastly, the results from the junior officers were compared with those from the senior officers. The assertion by Lagadec (1997), reported above, that the timing of an experiential course should be neither too early nor too late in a person's career progression, was investigated.

If the CRM course were given too early for the junior officers, then we should expect them to perform worse on the evaluation than the senior officers. If, on the other hand the course was given too late for the senior officers, then the senior officers should perform worse than the junior officers. As can be seen from Figure 5, there was minimal difference in the scores for the two groups, with the senior officers marginally outperforming the junior officers. The junior officers scored 61 percent and the senior officers scored on average 65 percent.



• Figure 5. Comparison of Senior and Junior Officers' Scores

As contended in the foregoing and discussed extensively in Pekcan (2005) and Pekcan *et al* (2005), the course team have given considerable thought to the pedagogical principles underlying the teaching practice employed on the CRM course. The belief of the authors is that all officers can benefit from training in non-technical skills, as long as the balance and staging of instructional and experiential elements is well thought through. Granted, not all of the officers will take away all of the messages. And, perhaps, the level of learning achieved is more to do with an individual's stage of personal development than their career progression.

Conclusions

There is now a general acceptance of the core concepts for the non-technical or resource management skills required for competence in shipboard operations. There is also an acceptance that the behaviours associated with these skills are context specific. Helmreich *et al.* (1998) suggest that the optimal implementation of resource management skills is dependent upon the cultural context in which they are applied.

The maritime training community often finds that the application of CRM style training is limited to a retro-active 'dose' of post incident remedial training. A collision or a grounding is likely to result in bridge teams being prescribed a course of 'treatment' in passage planning; an engine room fire or catastrophic failure is likely to result in engineering officers being prescribed a course of treatment in engine room management.

Quite rightly, the management of shipping companies feel that these potentially life-threatening incidents need to be addressed. The human errors arising from poor judgement, poor situation awareness and procedural violations are unpacked to see what lessons can be learnt. Officers are sent on the courses in the hope that their erroneous behaviour can be un-learnt and replaced with more appropriate behaviour. In effect, training colleges are asked to 'fix' problem employees. The training colleges oblige with a week's course for the problem employees but it is unlikely that the course members will ever sail together as a team.

In our rush to fix the problem employee, we are all in danger of missing the point: different ships, different teams, different individuals, but the same sort of incidents keep occurring. Something more fundamental, more deep rooted than operator error is at fault. In the same way that having a documented safety management system does not make a company safe, having employees attend CRM courses does not make a ship safe. Most company managers fail to ask why this is the case. Training is often seen as an end in itself and little effort is made to follow up the training by seeing how effective it has been on board the vessel itself. Little or no research is done to analyse whether solutions other than training are more appropriate and the training community unwittingly colludes in this self-deception by supplying yet more customised courses (Barnett *et al* 2003).

Crew Resource Management training needs to be one step in the process of managing the human element. It needs to be part of an holistic approach to managing human resources in which an individual's needs are identified and the appropriate training solution provided. Once this training has been provided, a company or ship-board culture needs to be fostered that supports the transfer of that learning to professional practice. The maritime colleges' responsibilities are to ensure that the pedagogical principles on which their courses rest are sound and are evaluated to ensure relevance and value added. An individual's responsibility is to take ownership of their learning and reflect on their professional practice to ensure a continuous appraisal of their strengths and their development needs.

The study reported herein is an attempt to ensure that the educational principles and professional practice of teaching employed on the CRM course are sound, relevant and provide value in the form of learning. Through the application of a reflective practitioner model, the team at WMA has established that a five day course can achieve behavioural as well as cognitive change, and to the level desired. By encouraging the officers involved in the study to reflect on their practice, it was hoped that learning could be extended beyond the post course 'honeymoon' and into the shipboard environment. Indeed it was found that the majority of the officers were able to reflect on positive experiences, but few were able or willing to reflect on the challenging experiences. What is less clear is whether the environment onboard ship supports continuing reflection and whether the officers themselves have learnt the value of continuous reflection both in action and post action.

Thus the question remains: have we, the maritime educationalists, reached the perimeter of our influence on professional practice? The other side of this boundary is where employer

and employee take over: the former by providing the environment for continuous learning through, for example, personal development plans, appraisal and 360 degree feedback; the latter by taking the time to reflect on their practice and by taking responsibility for seeking out opportunities for learning. Whatever the answer is, it is incumbent on all stakeholders in maritime safety to continue the dialogue regarding professional practice and to develop an holistic approach to the management of ship's officers' learning.

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