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Simulator-based learning, the Dunning-Kruger effect and the newly-‘qualified’ Officer of the Watch

Does simulator-based learning promote inappropriate confidence in the mind of a newly qualified Officer of the Watch?

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In recent years, an increasing body of anecdotal evidence has begun to suggest that the current batch of OOWs are somehow inferior to those of previous generations, having a higher level of confidence than their ability warrants. If true, this is not a new phenomenon. In 1999, David Dunning and Justin Kruger found that people are particularly poor at objectively evaluating their own competence. Although this can take many forms, this article focuses on the Dunning-Kruger (DK) effect, a bias in which people mistakenly assess their own ability to be significantly greater than it really is.

The DK effect has been succinctly summarised as the incompetent sometimes being blessed with an inappropriate confidence, buoyed by something that feels to them like knowledge. As a result, this often leads to the least proficient people dramatically overestimating their own ability. It is as if the skills they lack are the same skills required to recognise their own incompetence. The Dunning-Kruger effect can be found at work in the minds of everyone from bank robbers to presidents. With any given subject, ignorance can breed a higher level of confidence than the ability genuinely warrants. Some people hold up politicians as an excellent example of the Dunning-Kruger effect in full force. So, where does that leave the newly qualified OOW?

The role of simulation

Research into how learners benefit from simulation-based education has been taking place for decades. Despite the bulk of this research being conducted within the health care sector, the findings still have relevance for the maritime industry. Specifically, it has been found that simulation:

- Is an excellent strategy for competency building;
- Increases student satisfaction with the learning experience;

- Enhances student learning;
- Provides the opportunity for students to practise making appropriate use of their knowledge;
- Provides experience in priority setting, decision-making, teamwork;
- Provides a safe environment where errors can be made, learned from, and subsequently corrected without direct risk to participants, their ship, colleagues, or the environment;
- Increases student self-confidence;
- Enhances students’ belief in their ability to perform the necessary skills.

Whilst each of these points are important in their own right, it is the last two that hold a particular significance within the context of this article. Simulator training is an ideal environment to support an individual’s reflection on their own performance, particularly if errors have occurred. The opportunity to correct a misplaced sense of self-confidence is one good reason to employ simulator-based training as part of an OOW training programme. However, what if these reported benefits of simulation are simply evidence that the Dunning-Kruger effect is prevalent amongst those who have been trained on a simulator? Unfortunately, this would not be unprecedented. Once again, research conducted within the health care sector demonstrates that individuals are often unable to perform certain tasks at all even though they have confidence in their own performance. But is this also the case within the maritime industry?

Implications for learning

There are a number of reasons why we need to know if a genuine increase in skill performance occurs after an individual completes a course of simulator-based training. Firstly, in the maritime sector, students will go on to use their skills in real life settings as deck officers where there are real consequences associated with failure. Simulation is used to prepare an OOW prior to their first ‘real’ watchkeeping experience. The training is not simply technical. It is also a way to learn and practise decision-making skills, teamwork, and priority setting. A mismatch between confidence and ability in any of these areas could be disastrous. Secondly, educational institutions are increasingly investing significant amounts of money in the necessary equipment. In 2015, Liverpool John Moores University invested £2.4 million in a state

of the art 360° ship’s bridge simulator and supporting facilities.

However, just because an institution has an expensive simulator facility does not mean that it is the most effective way to educate and assess students. Simulator training is one of many recognised methods of achieving the necessary learning outcomes and is by no means the uncontested champion in this field. Research has been conducted in to whether simulation, as an experiential approach to learning, is more effective than other learning experiences. The results suggest that no significant difference exists between the learning outcomes delivered by a simulator, lecture, or videotape-based education. If this is indeed the case, the belief in the all-encompassing effectiveness of simulation is misplaced. It may simply be an expensive, time consuming, red herring. An ineffective educational approach that simply does not deliver the promised enhancement to students’ ability in the real world.

Lecturer interviews

In 2015, a series of interviews was conducted with individuals involved in the assessment of OOW candidates in a simulated ship’s bridge environment. The purpose of these interviews was to provide an indication of the prevalence of the Dunning-Kruger effect among newly qualified OOWs. Unfortunately, whilst these interviews provided a great amount of anecdotal evidence of interest there was little in the form of hard evidence. Data needed to be collected.

Student questionnaires

Over the course of the following four years (2015-2019), 124 OOW students were involved in a research project. All of these students were surveyed at their commencement of a five-week long, practical and theory based, operational level, Navigation Aids, Equipment and Simulation Training (NAEST-O) course. This usually marks the end of OOW training, and is conducted after trainees have accumulated over 12 months sea time. Only those who successfully completed the training had their information included in the final data set.

To provide the necessary information these students filled in a subjective, self-report, questionnaire composed of a single question. This was ‘On a scale of 1 to 5 (1 being very low, 3 being moderate, 5 being very high) rate your ability as an Officer of the Watch (OOW)’. The results were revealing.

Results

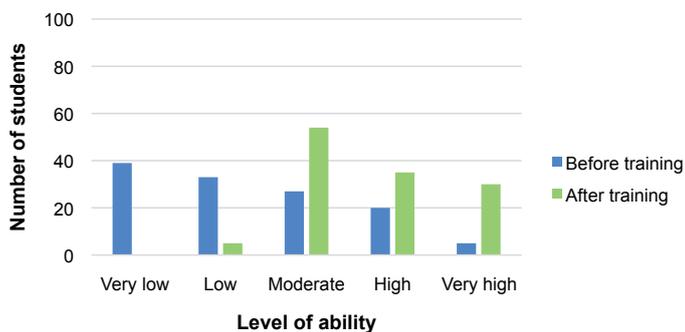


Fig 1: The students’ rating of their own ability before and after training

The data showed that students feel that they have greater ability after receiving simulator training (Fig 1). This supports the findings of the earlier work conducted in the field of medicine.

However, if people are especially poor at objectively evaluating their own competence, are the students’ ratings accurate? Or, have they mistakenly assessed their ability to be greater than it really is due to the DK effect? Fortunately, this question can be assessed by comparing the data collected from students with another set of data that was collected, using the same approach, from the assessors of these students (Fig 2).

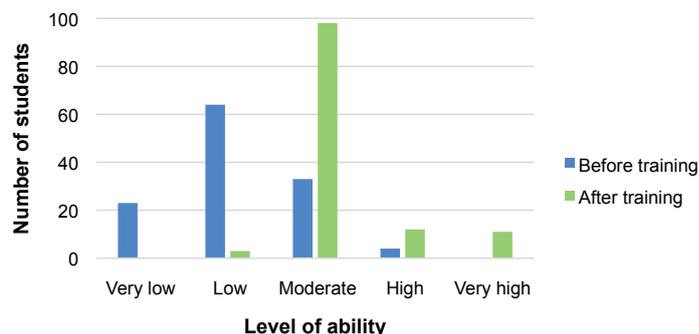


Fig 2: The assessors’ rating of students’ ability before and after training

There is a noticeable difference between the students’ assessment of their own ability before and after training and the assessors’ assessment. When compared, it can be seen that although students tend to report an improvement in their ability after training (Fig 1) the degree of improvement does not match with the assessors’ assessment. Assessors tend to rate the students ability (both before and after training) as lower than the students themselves do (Fig 2). Both parties report an improvement in ability after training. However, whereas the majority of students (65 out of 124 individuals) report their abilities as high or very high, the assessor rates the majority of students (98 out of 124 individuals) as moderate.

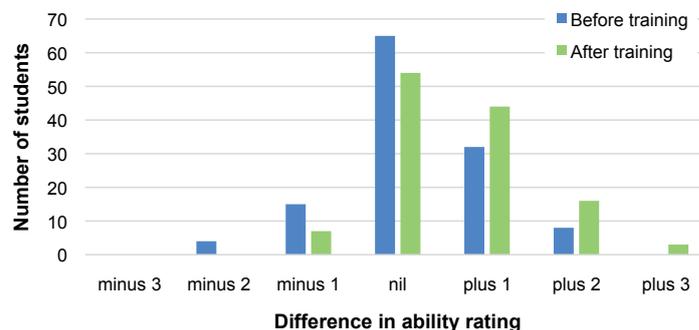


Fig 3: The difference in ability rating between the student and the assessor

To test these results for significance, both the students’ and assessors’ ‘before training’ and ‘after training’ values were compared. Students’ rating of themselves was compared against the assessors’ rating. The results were presented as a difference score where a ‘plus’ value denotes a degree of over-confidence on the part of the student.

Psychologists believe that training should weaken the DK effect, but this is not the case here. When displayed in graphical form (Fig 3) a noticeable shift to the right – that is, towards increased confidence – can be seen. After training, the number of students who rate themselves ‘plus 1’ or ‘plus 2’ levels higher than the assessor has increased. Notably, it is only after training that some students consider themselves ‘plus 3’ levels higher than the assessor rates them. The data collected clearly depicts that the DK effect has been strengthened by simulator training.

In this data set, 63 newly qualified OOWs have a confidence level that is higher than their ability would warrant after having completed the NAEST-O training. That is 51% of all of those whose data was used. When this is extrapolated to take in to account the number of ships estimated to be in the world merchant fleet – approximately 53,000 – the implications are that over a half of these vessels may have at least one junior officer on board whose belief in their ability is misplaced. That is over 27,000 merchant ships, out there on the ocean, right now.

Overconfidence at sea

So, in response to the question posed by this piece, does simulator-based learning create over confident but under skilled OOWs? The answer appears to be yes. A significant number of junior OOWs are poor at objectively evaluating their own competence, mistakenly assessing their ability to be greater than it actually is. Their increased sense of confidence most definitely does not equate to a matching level of increased competence. However, concerning whether there is a specific casual relationship between the NAEST-O course itself and the prevalence of the DK effect in the minds of newly qualified OOWs, the answer is less clear.

The situation is clearly not straightforward. Just as in the rest of the population, newly qualified OOWs will possess a broad spectrum of mental biases. The Dunning-Kruger effect sits at one end of this spectrum and the Imposter Syndrome at the other. More research is needed to evaluate the mechanics of the relationship between the level of confidence possessed by a newly qualified OOW and their actual level of competence. Developing a methodology for identifying specific individuals that are experiencing the DK effect is a challenging task – and one that is certainly beyond the ability of a simple questionnaire to directly measure. However, it is also a very difficult task for neuroscientists equipped with state-of-the-art equipment as it is poorly understood how self-bias is generated.

Implications for the future

It is a worrying suggestion that over 20,000 vessels may have junior officers aboard who possess an inaccurate assessment of their own ability. Not to mention the implications if they carry this form of mental bias with them as they progress into more senior ranks.

The role of an OOW requires an individual to make decisions of the highest quality and then take action to implement these decisions in good time. Shipboard navigators must avoid all collisions 100% of the time, often making critical manoeuvres alone without the support of other officers to check their decisions. To achieve this requires them to possess up-to-date information and technical competency as well as an appropriate level of confidence in their ability. Therefore, the key ingredients for an effective OOW are a sound understanding of theory, a good level of practical competence, a moderate level of confidence, and ongoing training to improve upon their initial level of competence.

The last of these, ongoing training, is critical to maintaining and improving upon their initial competence. The newly qualified OOW must continue practising their skills. Rather than focusing on exam results and initial threshold competency assessment, the maritime industry needs to support its most junior members by spending more time measuring the ongoing maintenance of their learning. Key to this should be addressing the major issue of how to provide an individual with the ability to develop, as a trainee, a realistic perception of their own ability. Attention should also be paid as they become an experienced officer and move into more senior ranks. At this point, it becomes pivotal that the individual possesses an accurate perception of their own ability.

True perception of their own abilities will lead to them possessing a deepening level of competence and a deserved sense of self-confidence. The role of Continuing Professional Development (CPD), specifically the opportunities provided by professional organisations within the maritime industry, such as The Nautical Institute, will surely have a role to play in delivering the ongoing maintenance of learning that is necessary to produce junior officers that possess both competence and an appropriate level of confidence. 🌐

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