

Simulation in Maritime Education and Training

Shahrokh Khodayari

Master Mariner - MSc Nautical Sciences

Maritime Accident Investigator - Maritime Human Elements Analyst

Maritime Management Systems Lead Auditor

Maritime Lecturer (IMLA life-time member)

It is some time since the maritime training is involved in the use of simulation techniques for enhancing the effectiveness of training process. We might as well have a look at various pragmatic aspects of simulation.

► Why simulation is good?

There are a number benefits mentioned in the research studies about the simulation, namely:

- ✓ Involving learners and motivating them;
- ✓ Improving the capability to connect learning to real-life scenarios;
- ✓ Freedom to experiment with new behaviors in a risk-free environment;
- ✓ Opportunity for immediate feedback from actions taken and decisions made;
- ✓ There are no damages sustained and no expenses incurred due to making mistakes;
- ✓ Enhancing the ability to teach teamwork and leadership.

On the other hand, some experts who mention anecdotal evidence generally assert that trainees learn more effectively because they find simulations engaging. Students expend more effort when using simulations and more persistently pursue simulation goals because:

- Simulations are enjoyable to play, interesting, and build confidence; that is, they are fun and not boring like most of other lessons.
- Games involve repeatedly playing through analysis-decision-result cycles that provide instant and accurate assessment of performance throughout the exercise.

It is also interesting to quote the results of a research trying to analyze the connections between the learners' backgrounds and their ability to learn from a simulation, game, or case study:

- 1) Simulations and games are more effective at transferring learning rather than case studies;
- 2) Younger candidates who have used computer games since early childhood enjoy simulations and games more than case studies; they also learned more from simulations and games;

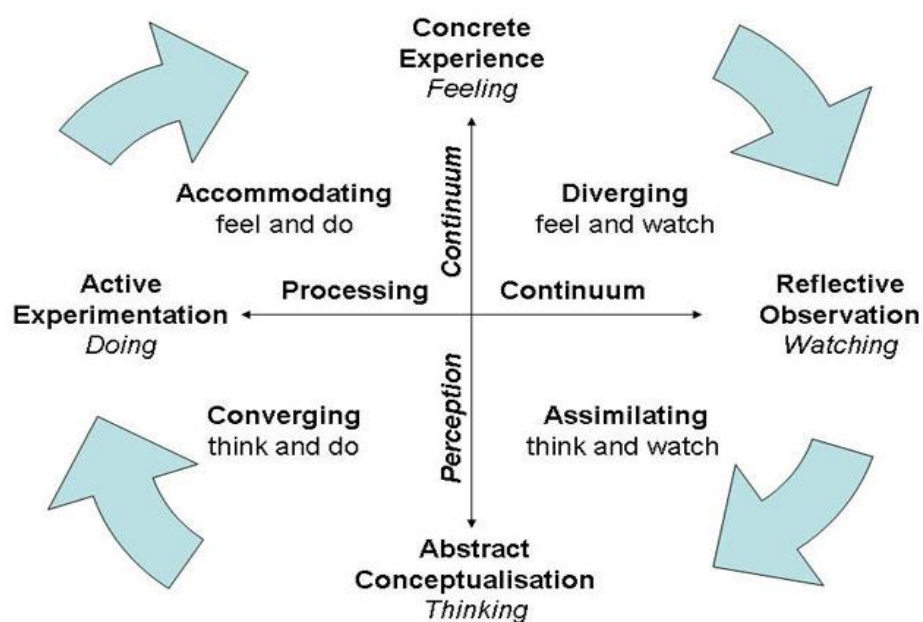
- 3) Senior learners over forty years old prefer simulations that use real industry data over games that used fabricated data which they consider unreal or overdone;
- 4) Learners with non-convergent learning styles enjoy simulations more than those with convergent learning styles.

The Convergent Learning Style:

- i. Is best at using abstract conceptualization and active experimentation.
- ii. Has the ability to find practical applications for ideas, concepts and theories.
- iii. Enjoys situations where there is a single or best answer to a problem.
- iv. May prefer to deal with technical issues rather than people issues.
- v. Needs to emphasize concrete experience and reflective observation.
- vi. Needs to place a higher value on gathering and understanding non-quantitative information by looking at situations from different perspectives.

In short; the converging learning style is a "Think and Do" and diverging or non-convergent learning style is a "Feel and Watch" system.

According to Professor David Kolb's model depicted below, there are other learning styles that can be referred to; but not discussed here.



Presentation of Kolb's two continuums

Other findings concerning simulation in learning indicate that:

- Simulations are effective at getting students to apply concepts that they have learned through lectures or reading course-books;
- Simulations can be used for testing because they can evaluate student comprehension of key concepts taught throughout a course;
- Students who played simulations during a course, performed significantly better than those who did not;
- Research into the training effectiveness of simulations and games has found that the material and instruction provided with a simulation influences its effectiveness as a training tool;
- Several studies have found that skilled instruction is critical to the success of a simulation especially during the early stages when teams are formed and during the debrief immediately following a simulation exercise to ensure that summary insights are acquired from the experience;
- Other studies have found that simulations need the support of ancillary material such as online help, student manuals, tooltips, and other activities for learning to be effective.

Now that we have had a look at the points concerning how simulation can be beneficial; we must also have a glance at its limitations.

► Simulation and the associated shortcomings:

1. Problems with situational awareness:

This is described as the mental ability to perceive the very present situation and possibly what will happen next. It is quite doubtful that if simulation can really give us any additional strength about this ability. Studying the three levels through which one can attain a strong situational awareness, namely; perception, comprehension and projection; we can come to the conclusion that these can be built up through experience and as many scholars state a long term like 10 years of time. Well, that may be the time required to be an expert but anyway we must agree that situational awareness is dependent on time and simulation can hardly give us much of an expertise in that issue. The so called awareness has many levels or depths. The computer animated scenarios are helpful if you also possess an active and expanded imagination. Images on devices created by various soft-wares can be halted/alterd or even nullified, this is an added value and on the other hand interrupts imaginations, it can give us a

touch of the feeling we are going to have in real life but the bug of being only "simulation" will be a hindrance to our making proper sense of the things happening around.

2. Adding problems to automation:

Automation is already an arena for our weaknesses and simulation as very much dependent on automatically programmed responses can be an added problem. When there were no ARPA, we had the plotting done on sheets or on radar glasses, now we have officers who are radar-hangers and do trust in electronically reproduced images rather than an ordinary and compulsory visual look-out. One may suggest that part of this problem is due to simulation sessions and courses. The young cadets especially; learn and train to be equipment-dependent and gadget-players. This is what we have dragged them into and it surely is a flaw very much related to automation, therefore accentuating the already existent potential faults.

3. Decision making under stress:

Like above, this ability is also chiefly reliant on experience and time spent at sea. Simulation, no matter how realistic it is conducted; cannot make you strong in that aspect. Surely it helps but cannot replace a real sea-service. The various items discussed above harvest a game like approach to simulation and this is a holistic view amongst the candidates as well. When the real situation and accompanying stress is reached, our practices with simulators would not really be too much of an advantage.

4. Understanding and taking risks:

Within a human element concept; "understanding the risks" is primeval to "taking them". If this is not perpetually exercised, the results would be catastrophic. Training on simulation is usually based on probabilities - or as it may further be construed, on typical issues – considered. That is how the cases are devised and practices are formulated. But mind you; one must not confuse risk assessment with risk probability or with typicality.

This is unfortunately the situation most of the time. As per the human element studies, most people do not have a good understanding of probability and inherently mix it up with typicality as the probability laws usually work in large numbers and we do not mainly apprehend them.

As a result, we might be close to saying that the risk assessment capability of the learners in a simulation course cannot be expected to be elevated. Thus the trainees will mostly be able to comprehend and solve typical and pattern problems and their response in non-typical hazards quite possible to be encountered, cannot be evaluated or assessed.

5. Trainees and Trainers' cultural backgrounds:

This is another human element issue which affects the quality of simulation. Although the simulators should have had the standards and quality requirements fulfilled; how the users are going to utilize them is perhaps the most important point in this concept. In many societies the simulation is not taken very seriously. The sessions are treated like games-times, there is no or very little supervision over the activities, the scenarios are repeated oftentimes with nearly the same situation and candidates, the equipment are not used to the best efficiency, support and maintenance are very poor, therefore the outcome is usually not as expected. Researches had findings mentioning the difference between elder and younger candidates; we must add the older trainers' conception that is characteristically much more different than those of the young cadets. The app-boys and girls have an entirely different idea about the computer simulators, they rather see them as games to improve in or get marks rather than a learning tool. In some training centers, things like e-learning, computer-based-training and simulation are taken as very far from reality and luxury appliances that are cleaned and cared for very timidly but the actual software might be a decade old and virtually unusable.

6. The time to subside what is learnt:

We have already made schedules shorter. The learners spend lesser time in classes. Then how we can expect them to practice what they have theoretically learnt to be put into actual and near-real-life-scenarios in simulators. Mind you! They have not learnt much really, how could we ensure the simulation effectiveness? The radar courses for instance are now mainly conducted on simulators, the cadets have little or no idea about how the device works, nor they gain the ability to visualize the equipment limitations.

7. Simulation cannot replace or even shorten sea-service:

The whole idea is about time to practice. Simulation can be very good along with learning theories but it can in no way replace or even decrease the sea-time practice required. That is the real time to understand stress; perceive situational awareness and familiarity. This may be time-consuming or expensive but it is safe. Simulation is an aid to training but may not substitute the time that flesh and blood must feel, touch and run-through at sea.