the simulator-based method, the alarms can be re-set by pressing only a button, and they will become readily available. On the other hand, in the hands-on method, the subjects must go to the machine and calibrate some control mechanisms before it becomes operational and ready. There is the possibility that the sheer size of the actual machine will add to the challenge of the subjects.

The result of task number 7 subjects' performance interpretation shows that it favors the simulator-based method with an interpretation rating of very satisfactory, a mean of 3.45 and 3.19, respectively. This difference suggests that the subjects are more inclined to use the simulator in areas and activities involving risk or if there is a real presence of danger. Furthermore, it is because the younger generation is more comfortable with computers. Thus, even though they have already familiarized themselves with the actual equipment. They still favor doing the task in the simulator machine to allow repetition in case of error.

Like task number 7, task 8 indicates a performance interpretation favoring the simulator-based method. This finding may be because students realized that simulator activities or tasks in a simulator are easy to manipulate without the danger of having an accident. They can also repeat the task without much physical exertion. Thus the subjects' performance in refrigeration activities becomes more satisfactory through a simulator than the actual or real refrigeration equipment. The overall performance interpretation under competence favors the simulator-based method.

A previous study by Kim, Te., Sharma, A., Bustgaard, M. *et al.,* (2021) supports this finding. The study states that the trend for the simulator-based MET have been towards increasing the fidelity of the simulators. Whereas also focuses on matching the simulator's appropriate scale and suitability to the seafarer's ever-changing role. The classical definition of the term "fidelity" can be described as the ability of the simulator to closely replicate the natural environment, which is central to any discussions regarding simulators (Hays, 1980; Kinkade & Wheaton, 1972). Prior research has synthesized the relevant studies and found that the fidelity term has four dimensions which include physical, functional, behavioral, and perceptual (psychological) fidelity (Hays, 1980). Depending on the ability of simulators to accurately replicate the technical characteristics, tasks, and social factors for the targeted operations. The term physical fidelity pertains to the physical properties of the simulator and the degree to which the simulator could replicate the physical appearance of the actual system (Allen *et al.,* 1986; Kinkade & Wheaton, 1972; Liu *et al.,* 2008). Functional fidelity, on the other hand, refers to the functional similarity and the degree to which the simulator could replicate the functions and experience of the operational setting in question (Hays, 1980).

At present, the full-mission simulators are considered to be the most versatile in use and best support the MET facilities in meeting the regulatory requirements and training objectives. Their replicability of operational experience and the ability to train technical and non-technical skills for the trainees in a highly controlled and quasi-real environment is unmatched at the moment (Kim, T. *et al.,* 2021).

C. Subjects Performance in Simulator-Based Method and Structured Hands-On Method under Competence 2

This section presents the subjects' performance in the simulator-based training and the structured hands-on training scenarios. Table III summarizes the subjects' performance operating the jacket water cooling pump and associated control equipment.

TABLE III PERFORMANCES OF THE SUBJECTS IN SIMULATOR BASED METHOD AND STRUCTURED HANDS-ON METHOD IN TERMS OF OPERATING PUMPING SYSTEMS AND ASSOCIATED CONTROL SYSTEMS

Sl. No.	COMPETENCE: Operate jacket water cooling pump and associated control equipment	Simulator Based Performance		Structured Hands-on Performance	
		Mean	Interpretation	Mean	Interpretation
1	Open all suction valves of the cooling pump.	3.50	Very Satisfactory	3.32	Very Satisfactory
2	Open all discharge valves of the cooling pump.	3.38	Very Satisfactory	3.24	Satisfactory
3	Check that the cooling medium is available.	3.41	Very Satisfactory	3.31	Very Satisfactory
4	Engage pump supply breaker and contactor breaker.	3.41	Very Satisfactory	3.26	Very Satisfactory
5	Press the run button switch to run the cooling pump.	3.46	Very Satisfactory	3.28	Very Satisfactory
6	Check the suction side to ensure the pump is taking in water.	3.45	Very Satisfactory	3.28	Very Satisfactory
7	Stop the pump and inject/prime water into the suction side if water is absent.	3.41	Very Satisfactory	3.24	Satisfactory
8	Check discharge side pressure to ensure the pump is delivering water.	3.53	Very Satisfactory	3.18	Satisfactory
9	Check for abnormal motor bearing temperatures and system leaks.	3.47	Very Satisfactory	3.22	Satisfactory
	Overall Mean	3.44	Very Satisfactory	3.26	Very Satisfactory

Table III shows that the conventional interpretation of the subjects' task performance under competence operating jacket water cooling pump and associated control equipment is more or less equal except for tasks two, seven, eight, and nine. Task 1 of table III shows that although the subjects got a different mean of 3.50 and 3.32, respectively, the subjects still have the same interpretation, which is very satisfactory.

This result is because opening all the suction valves of the cooling pump is an essential requirement by which the students have to perform to continue working with the pumping system in either the simulator-based or hands-on methods.

Task 2 performance results demonstrated the inclination of the subjects to work with computer-generated learning equipment. It is indicated by the 3.38 weighted mean in favor of the simulator-based method – which is interpreted as very satisfactory as against the subjects' weighted mean using the hands-on method, which is only 3.24 of which the interpretation is satisfactory only.

According to Crichton (2017), as we know them in the present-day industrial context, simulators have been used for many years in safety= critical industries. Such as aviation, process, health care, nuclear, maritime, and rail, to prepare the personnel in these domains for their job roles and to ensure that they perform optimally as a team in instances of highly stressful situations (Kim, Te., Sharma, A., Bustgaard, M. *et al.,* 2021). One of the main advantages is that it provides a non-threatening environment in which trainees are allowed to exercise their skills with the freedom to fail. Moreover, to practice their job roles, in the presence of instructors and peers, without any possibility of their errors translating to economic costs, environmental pollution, or in worse cases, fatalities (Sharma *et al.,* 2019; Håvold *et al.,* 2015).

The performance results of task three indicate that the subjects are generally comfortable understanding the two methods as indicated by the respective mean, which does not have a considerable margin and thus was interpreted as very satisfactory. Technological advancement has steadily increased the effectiveness of simulators and brought many advantages to prospective seafarers.

Like task number 3, task 4 performance results shows that the subjects have almost the same mean. Thus, it also has the same interpretation, which is very satisfactory. This output may be because both methods can efficiently perform the task.

Task 5 is an activity intended to allow the students to practice how to press the run button switch to run the cooling pump. The results show that both methods got the same very satisfactory interpretation. However, the simulator-based method has a slightly higher mean because the activity is easier to manipulate, thus, the difference in the mean.

Like task 5, task number 6 performance results indicate a similar interpretation which is very satisfactory. This interpretation means that both methods are beneficial in providing the needed tool for developing the subjects.

Performance results of task number 7 favor the simulator-based method as it generated a higher mean interpreted as very satisfactory. The reason is purely due to the capability of the simulator to allow the students to repeatedly perform the activity without safety problems and time constraints in preparation.

Task number 8 requires the subjects to check discharge side pressure to ensure the pump delivers water. The performance result of the subjects indicates a very satisfactory interpretation of the simulator-based method because the simulator will allow the students to perform the activity without the risk of damage to the pump in case of malfunction or loss of pressure. As a result of this advantage, students find it easier to keep on repeating the process compared to the hands-on method.

According to the study by Szczepanek M. (2015), using the simulator as a tool for training staff connected is a key issue due to the practical application of acquired skills. Practice on the most corresponding to reality object with the possibility of supplying scenarios based on use at work procedures, tools, and potential emergencies allows the trainees to perform technological operations safely and learn from their mistakes without any influence on reality.

Software simulators make the training process for E.R. crews easier and faster due to learning from one's mistakes without the cost of damaging or destruction of an actual device. That plays a vital role in acquiring proper maintenance skills for a future E.R. operator.

The performance results of task 9 show that the simulator-based method in checking for abnormal motor bearing temperature and system leaks got a very satisfactory interpretation compared to the hands-on method. This interpretation could be because the students are more comfortable using the simulator as the basis for practice since the possibility of repeating the process without further preparation is higher than the hands-on. Furthermore, the simulator offers a safer environment when dealing with this activity.

The overall performance results of the tasks under competence number two show that the simulator-based method got a higher mean than the hands-on method. Although the interpretation of both means is very satisfactory, the difference suggests that the subjects are more comfortable using the simulator to ensure the application of theoretical knowledge in a practical setting.

The value of simulator training can be observed innately and practically. Generally, as one of the training methods, simulations allow the trainees to make decisions resulting in outcomes that mirror what would occur if the trainee were on the job as simulators replicate the environment used for actual tasks (Al Shahin, R. 2017). The decisions' impact in an artificial, risk-free environment teaches skills inclusive of production, process, management, and interpersonal aptitudes (Noe, Hollenbeck, Gerhart & Wright, 287; Noe, 270).

Stan (4522) cited that the "artificial experience" enhances professional judgment and offers the trainee manifold ways of tackling problems, particularly those which require the management of risk and crisis.

Simulation training does not just contribute to the trainees' efficiency and experience as confidence in the job situation is also promoted (Stan, 4522).

D. Difference between the Performance of simulator-based Method and the Structured Hands-On Method

This section presents the difference in the performance of the subjects in the simulator-based method and the structured hands-on methods. Table IV summarizes the subjects' overall performance in operating main and the auxiliary and associated control systems operating jacket water cooling pump and associated control equipment.

TABLE IV DIFFERENCE BETWEEN THE PERFORMANCES OF THE SUBJECTS IN SIMULATOR BASED METHOD AND STRUCTURED HANDS-ON METHOD

Variables		Mean	Description	p-value	Alpha	Decision on Ho	Interpretation
COMPETENCE: Operate main and auxiliary and associated control system	Simulator Based	3.38	Very Satisfactory	0.00	0.05	Reject Ho	Significantly Different
	Hands-on Training	3.21	Satisfactory				
COMPETENCE: Operate jacket water cooling pump and associated control equipment	Simulator Based	3.44	Very Satisfactory	0.00	0.05	Reject Ho	Significantly Different

Table IV reveals the difference in the subject's performance in the two pre-selected competencies. Incompetence one, the simulator-based method got a statistical description of very satisfactory if translated to numerical grades. Most of the subjects were able to attain satisfactory to above satisfactory ratings. Incompetence number two, the simulator-based method still got the advantage over the hands-on method with an overall mean rating of 3.44, which has a statistical interpretation of very satisfactory even though most of the tasks under this competence are more or less having the same results. On the other hand, the performance results for the hands-on methods suggest that the younger generation of students no longer consider doing any actual tasks that a simulator can duplicate.

The study's findings clearly show the effectiveness of simulator-based training as an alternative method for conducting teaching and learning within the laboratory. Simulator-based training had become considerably more realistic concerning the operations and processes on board ships. Simulation is a realistic imitation, in real-time, of any ship- handling, radar and navigation, propulsion, cargo/ballast, or other ship system incorporating an interface suitable for interactive use by the trainee or candidate either within or outside the operating environment and complying with the performance standards prescribed in the relevant parts of the STCW Code.

Simulator training allows a student to build a mental model of a real-world scenario and test the solution safely without fear of injury and damage to the equipment. Simulator programs can be developed or upgraded using software to suit any training environment. This method allows students to exercise variable operating conditions of any engine room machinery or system that could be completely inadmissible in realism (Moorhead, K. & Pinisetty, D. 2020).

V. CONCLUSION

The study's results suggest that simulation-based methods in teaching and learning the PASGT course have strong educational effects, with particular consideration to the psychomotor domain of the students as the medium provides learning in a manner that is very suitable to the current practices of the younger generation. The findings of this study satisfy the theory espoused by Malcolm Knowles. According to the andragogy theory, effective instruction includes the student in addressing real-world problems since adult learners are good problem solvers and learn best when the material is immediately applicable. Thus, educators should set a cooperative climate for learning, assess the learner's specific needs and interests, and develop training objectives based on the learners' needs, interests, and skill levels. Additionally, educators should choose techniques, tools, and resources for instruction together with the student, analyze the effectiveness of the learning experience, and make necessary improvements while determining the need for additional learning.

VI. RECOMMENDATIONS

The researchers firmly recommend the following actions based on the findings and conclusion of the study.

1. The researchers hope that future researchers undertake similar to obtain more researched-based ideas regarding the enhancement of the student's learning through modern technology to address issues like.

a. risks and safety when conducting the actual operation of pumps, valves, and gauges.
b. short circuit, electric shock, or electrocution when performing electrical tasks and other control systems; and
c. proximity and time constraints when doing an actual reading and monitoring of the processes of the auxiliary power engines.

2. To adopt the appropriate action plan intended for continual development of the marine engineering program.

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