

Training Model Based on The Anchoring Training

Yoshiaki Kunieda ^{a*}, Yuki Ito ^b, Koji Murai ^a, Hideyuki Kashima ^a

^a Tokyo University of Marine Science and Technology, 2-1-6, Etchujims, Koto-ku,
Tokyo, 135-8533, Japan

^b Japan Agency of Maritime Education and Training for Seafarers (JMETS),
5-57, Kitanakadori, Naka-ku, Yokohama, 231-0003, Japan

*Yoshiaki Kunieda, E-mail: ykunie0@kaiyodai.ac.jp

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ABSTRACT

This paper examines the effect of anchoring training given to trainees on the training ship at Tokyo University of Marine Science and Technology in 2017 and 2018. Two teachers, who were experienced as captains, evaluated the anchoring training using an evaluation rubric. High effectiveness evaluations were given to the skills associated with heaving up the anchor and the anchoring procedures; however, low effectiveness evaluations were given to situation-based skills associated with the give-way or stand-on ship handling and route voyage. For more effective overall anchoring training, a training model that combines ‘group work’, ‘actual ship training’ and ‘debriefing’ is proposed.

1. INTRODUCTION

Maritime knowledge and skills are achieved through both classroom education and actual shipboard training. The maritime classroom training generally involves lectures, exercise assignments and experiments, and the shipboard training involves active learning with authentic equipment. Compared with classroom training, it has been found that the practical shipboard training is more effective. However, simply practicing course content is not sufficient as students also need to be able to perform taught tasks and master active thinking, problem-solving and decision-making. Kashima et al. (2001) found that anchoring training on a training ship has a significant effect on the acquisition of ship handling skills [1], and Kunieda et al. (2018) found that that anchoring training could develop active thinking and problem-solving skills [2]. In this paper, the on-board anchoring training effect was examined, the results from which were used to inform the development of an effective training model.

2. ANCHORING TRAINING

Anchoring training, which is performed by student teams without instructor assistance, is a suitable exercise to improve ship handling skills through various manoeuvres. At first, the students heave up the anchor and sail on a planned route. Then, after passing planned waypoints, the students anchor at the planned anchorage. Anchoring training is generally performed in four-person teams, each of which has defined roles such as captain (Role of Captain-ROC),

first officer (Role of 1st Officer-RO1O), third officer (Role of 3rd Officer-RO3O) and quartermaster (Role of Quartermaster-ROQ); the training flow is as follows:

- (1) The ROC takes the lead and develops a navigation plan for the anchoring. This type of active student planning of ship handling is designed to develop leadership skills for the ROC and to create opportunities for peer learning. The ROC explains the navigation plan to his or her teammates and instructors, who then give them advice and feedback to correct the plan. After correcting the navigation plan, the ROC provides a briefing to the team members and instructors, who then check their notes and roles.
- (2) The ROC positions the leaving anchorage station and before heaving the anchor chains, directs the RO3O to prepare the main engine and then directs the heaving up of the anchor.
- (3) When the anchor is aweigh, the ROC sets off on a predetermined course using the main engine and rudder.
- (4) The ROC corrects the course appropriately to ensure that the planned route can be navigated. The ship then passes two scheduled waypoints and navigates a predetermined route.
- (5) The ROC slows the main engine, adjusts the course and stops the ship by applying the main engine to the sternway to ensure it is anchored correctly at the planned anchorage.
- (6) The ROC lets the anchor go at the planned anchorage, lets out the cables to a predetermined length, stops the main engine and finally dismisses the anchoring station.
- (7) Shortly after the end of training, the students complete a self-evaluation based on an evaluation rubric.
- (8) The anchoring training is then discussed within each group. Each team member presents their ship handling notes and the other students listen and engage in active thinking. The positive aspects and points for training performance improvements are then discussed within each team, after which it is presented to all teams, and the instructors give comments based on the evaluation rubric.

3. RESULTS OF ANCHORING TRAINING

In May and June, 2017 and 2018, anchoring training was conducted with third-year students from the undergraduate maritime systems engineering course at the Faculty of Marine Technology, Tokyo University of Marine Science and Technology and was evaluated using an evaluation rubric by two instructors experienced in captaining large training ships. The nine evaluation items were as follows: (1) Procedure for heaving up the anchor; (2) Lookout; (3) Course setting; (4) Give-way or stand-on ship handling; (5) Position fixing and anchoring position; (6) Anchoring procedures; (7) Gradual speed decrease; (8) Bridge Resource Management (BRM)/Bridge Team Management (BTM) and (9) Overall training. Course syllabus of all nine items (Extract) is shown in Table 1. The items were evaluated with a four-level indicator. The average marks given by the instructors for each evaluation item in 2017 and 2018 are shown in Fig. 1.

Table 1. Course syllabus of all nine items (Extract)

No.	Evaluation items	Performance goal	Evaluation criteria
1	Procedure for heaving up the anchor	The trainee can lift an anchor appropriately and can make it a predetermined speed.	1) An understanding and execution of the procedure which heaves up an anchor. 2) An understanding and execution of the procedure which raises the ship's speed.
2	Lookout	The trainee can do the lookout for a safe navigation.	1) The ability to discover a target at an early stage. 2) The ability to watch a target carefully continuously.
3	Course setting	The trainee can do a setup of the suitable course according to a situation.	1) Ability which can perform a proper course setup in raising the ship's speed. 2) Ability which can perform a proper course setup in consideration of the influence of external force, etc.
4	Give-way or stand-on ship handling	The trainee can do suitable ship handling for avoiding a collision according to law and a situation.	1) Ability which can do suitable Ship handling in accordance with the law 2) Capability which can do suitable Ship handling according to the situation at that time.
5	Position fixing and anchoring position	The trainee can do the grasp a ship's position in suitable time and high accuracy.	1) The ability to grasp the ship's position appropriately. 2) The ability to anchor in the planned anchorage.
6	Anchoring procedures	The trainee can do anchoring in a suitable procedure.	1) An understanding and execution of the procedure which anchor. 2) An understanding and execution of a relation of ship's speed and the anchoring procedure
7	Gradual speed decrease	The trainee can reduce speed appropriately.	1) Gradual decrease of the ship's speed in accordance with a standard. 2) Gradual decrease of the ship's speed according to the situation at that time.
8	Bridge Resource Management (BRM)/Bridge Team Management (BTM)	The trainee can utilize resources appropriately and can attain performance high as a bridge team.	1) Ability for using the resource in Navigational bridge. 2) Ability to tell team members the Ship handling intention
9	Overall training	The trainee can perform suitable Ship handling through the whole training.	1) Ability which can perform Ship handling with calm mind. 2) The whole impression.

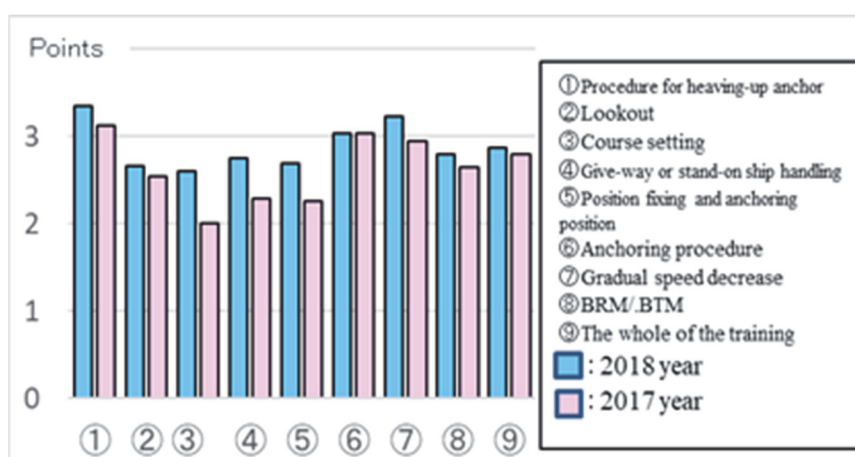


Fig.1 Instructors' average mark for each evaluation item

The average mark for all items was 2.62 in 2017 and 2.88 in 2018. Evaluation items (1), (6) and (7) had generally high scores, while items (2), (3), (4) and (5) had generally lower scores, which appeared to indicate that the items that required memorized procedures gained significantly higher scores than the items that required the students to make decisions based on the situation at hand, such as give-way ship handling and route navigation. At the same time, about (3), (4) and (5), it turns out simultaneously that the difference in 2017 and 2016 is large. This will be considered because in 2017, the experiment using various cards which are effective for navigating on the route and for determination of ship's position was conducted [3]. However, we think that the further investigation and examination will be required from now on.

The instructor evaluation scores in 2018 for high- and low-scoring trainees are shown in Fig. 2. The high-scoring trainees had slightly lower scores for evaluation items (2), (3) and (5), and the low-scoring trainees had low scores even for evaluation items (6) and (7) for which the other students had comparatively higher scores. Because there were many overlapping tasks when approaching the final anchoring, it was surmised that the low-scoring trainees were unable to calmly approach overall ship handling.

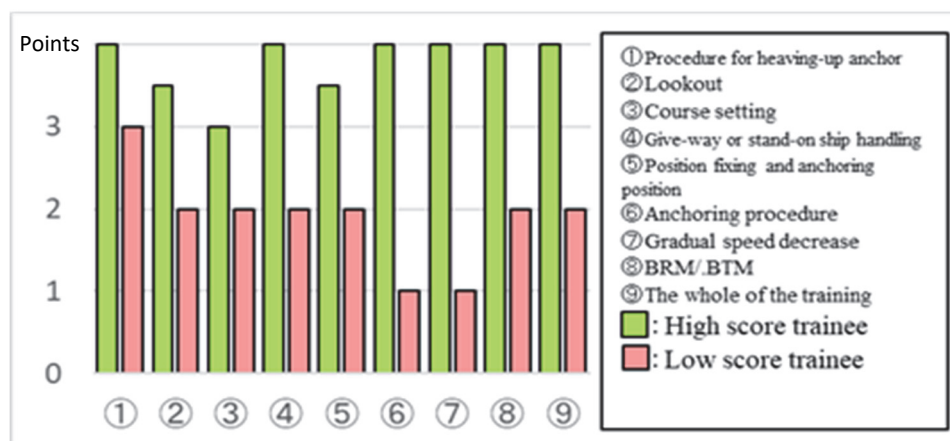


Fig.2 Instructors' average mark in each evaluation items of a high score trainee and a low score trainee.

The planned anchoring position and the anchoring position achieved by each trainee in 2018 are shown in Fig. 3, and the relation between the evaluation score and the distance of the actual anchoring position to the planned anchoring position is shown in Fig. 4. Fig. 3 indicates that the high-scoring trainees were able to anchor the ship close to the planned anchoring position, but the low-scoring trainees anchored much further away from the planned anchor position. The dotted line in Fig. 4 is an approximation straight line, and the correlation coefficient of -0.28 indicated that there was a weak negative correlation. While the high-scoring trainees mostly anchored close to the planned anchoring position, some anchored a fair distance from the planned anchoring position. While this is a key skill in this training, achieving the anchoring skill of exact positioning is only one of the nine evaluation items.

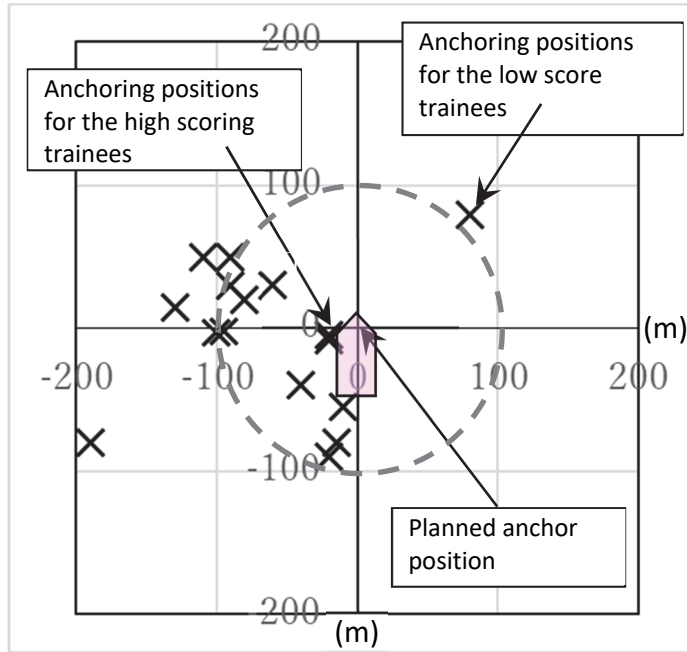


Fig.3 Relation between the planned anchoring position and the trainee anchoring positions

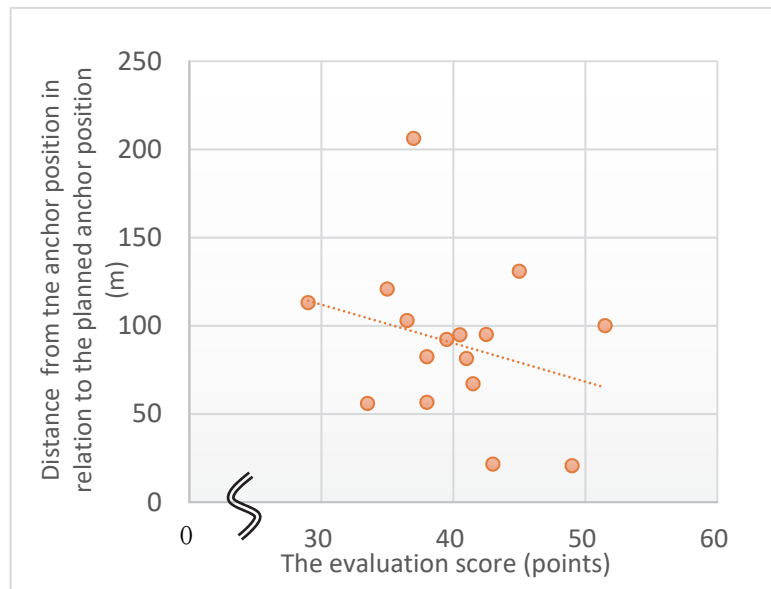


Fig.4 Relation between the evaluation score and the distance of the anchoring position from the planned anchoring position

To determine and classify the factors for each score, the training effect comments from the high-scoring trainees, the bridge teams and the instructors were examined, from which the following observations were made.

- (1) For ship handling planning, understanding was improved through group dialogues and peer learning, which improved the overall team performances.
- (2) Role plays and simulations for skills acquisition could be considered to understand and explore various assumptions before actual shipboard practice.
- (3) The presentation of the ship handling plan was effective in reinforcing the knowledge and skills.
- (4) Telling team members about the ship handling intentions was vital for information sharing, clearing up any misapprehensions and preparing for possible emergencies.
- (5) Discussing the effective points of training and the areas that needed improvement enhanced the trainees' knowledge and skills.
- (6) The debriefing presentation reinforced trainee knowledge and developed thinking and assessment skills.

4. EXAMINATION OF A TRAINING MODEL

The anchoring training evaluation results and instructor and trainee comments and observations were used to propose a more effective GTGP training model shown in Fig. 5. About group work, the effect is proved also in other fields [4][5][6]. We think that the training model which combines group work before and after actual ship training is very effective. Moreover, we think that the training effect goes up when students make a presentation as reflection. Moreover, we think that the training effect goes up when students make presentation as reflection as Uno et al. show [7].

In ship handling planning, an understanding of the procedure and the checking of notes can be performed through dialogue, discussion and peer learning through group work.

Prior to the ship handling exercise, planning sessions could be held to ensure trainees fully understand the procedures through dialogue, discussion, role plays, simulations, group peer learning and authentic briefing practice, with the emphasis being on group/team work learning (G).

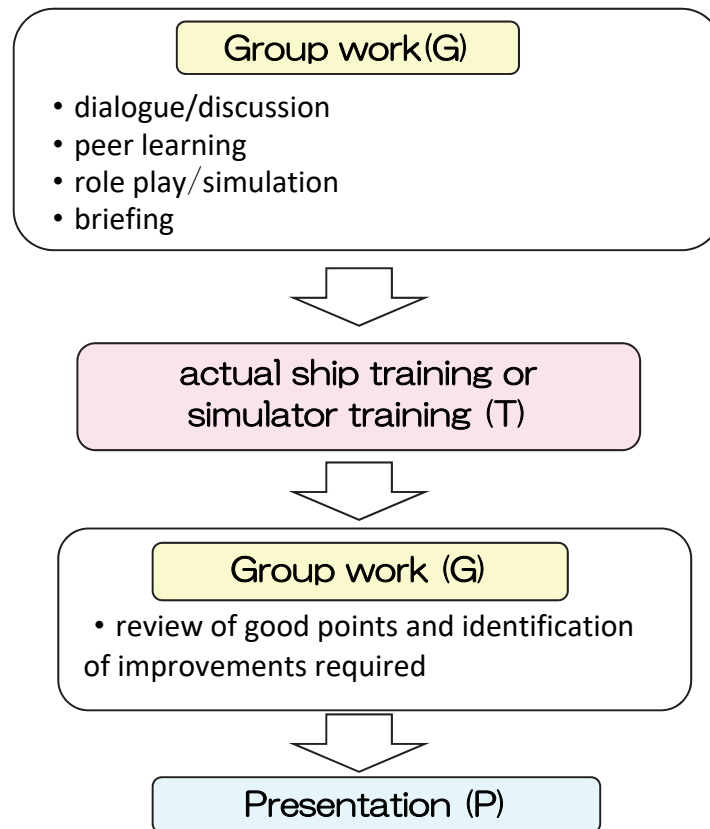


Fig. 5 Effective training model for anchoring training

Next, during actual ship training, the trainees practice memorized procedures and demonstrate their ship handling skills based on the given situation using the knowledge and technologies discussed in the first session. It is proposed that actual training at sea on an actual ship is the most effective (T) as trainees must apply the learned ship handling knowledge to an actual team situation.

After the ship training, each group then identifies the good points from the training exercise and identifies those areas in which improvements are required, all of which requires the trainees to reflect on both their individual and team knowledge and skills, which raises awareness and stimulates decision thinking (G).

Finally, based on the group discussions, each group/team assesses their own performances, presents these findings to the other groups and come to understand the results from the other groups, thereby further deepening both individual and team understanding, all of which improves trainee knowledge and skills (P).

Although this training model is specifically based on anchoring training and considered it, it could easily be used for other types of practical maritime-based training, such as lifeboat lowering, on-board work procedures, emergency procedures and accident investigations among several other areas. The key aspect of this type of peer learning or jigsaw method is that the trainees have the opportunity to reflect on their experiences and to learn from the experiences of others. This training model involves the trainees in reviewing their training and understanding their role in the groups/team and, therefore, expands their critical thinking and decision skills, both of which are vital for effective on- and off-board maritime operations.

5. CONCLUSION

The paper examined anchoring training evaluations from training conducted at the Faculty of Marine Technology, Tokyo University of Marine Science and Technology in 2017 and 2018. Nine specific procedures were evaluated by experienced instructors from which it was found that procedures (1) Procedure for heaving up anchor, (6) anchoring procedure and (7), all of which were memorized procedures, had generally high evaluation scores, but procedures (2) Lookout, (3) Course setting, (4) Give-way or stand-on ship handling and (5) Position fixing and anchoring, all of which required on-board decision-making based on the situation, had much lower evaluation scores.

As the high-scoring trainees demonstrated that it was possible to correctly perform the ship handling procedures, to better assist the trainees in thinking for themselves, they need to be better prepared to respond to unknown situations. From the results of the anchor training effect evaluations, a revised training model was proposed that had four main stages:

- group work that includes peer learning, discussion, dialogues, role plays and simulations;
- actual ship training to improve problem identification, problem-solving and decision-making capabilities;
- group reflection on the training and the identification of the strong and weak aspects;
- presentations and overall class discussions on the results.

The aim of each of the identified training stages is to develop trainee abilities to think for themselves and respond confidently in all situations. We would like to apply the built training model to various training, and would like to verify the training effect from now on.

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