

# Study on Education of Seamanship in the Anchoring Training

(1) Yoshiaki KUNIEDA

Faculty of Marine Technology  
Tokyo University of Marine Science and Technology  
Tokyo, Japan  
E-mail: ykunie0@kaiyodai.ac.jp

(2) Koji MURAI

Faculty of Marine Technology  
Tokyo University of Marine Science and Technology  
Tokyo, Japan  
E-mail: kmurai0@kaiyodai.ac.jp

(3) Hideyuki KASHIMA

Faculty of Marine Technology  
Tokyo University of Marine Science and Technology  
Tokyo, Japan  
E-mail: hkashi0@kaiyodai.ac.jp

**Abstract**—Seamanship, as an educational object, is classified into four components: (1) seamanship literacy, (2) technical theory, (3) management theory, and (4) functional theory beyond management. We consider active thinking to be an element of seamanship literacy as well as technical skill acquisition. We use anchoring training in a small training ship as an opportunity to practice active thinking. In this anchoring training, the required self-evaluation and improvement in the evaluation rubric are both undertaken with typical active thinking. Here, 92% of students respond that self-evaluation “is very effective” or “is effective”.

Future improvement can be expected from students when they have improved the evaluation indicator themselves. When students have education and training, including opportunities for active thinking, we believe that they are acquiring seamanship skills.

**Keywords**— *Seamanship, Anchoring training, Self-evaluation, Evaluation rubric, Active thinking*

## I. INTRODUCTION

There is no clear definition of seamanship in Japan, where seamanship is a broad term with various meanings from ship-operating skill to mental knowledge. Seamanship is not even defined in the seamanship study group of the Japan Institute of Navigation. As the former chairman of the seamanship study group has said, ‘100 captains define 100 kinds of seamanship’ [1]. With our focus on maritime education and training, we support the following understanding of seamanship as an educational object [2].

(1) Seamanship literacy

(2) Seamanship as a technical theory

(3) Seamanship as a management theory

(4) Functional theory beyond management (e.g. functions related to a crisis, safety, and un-experiencing)

Seamanship literacy is fundamental to seamanship and covers the contents of seamanship broadly. We consider seamanship literacy to include thinking actively in relation to a vessel. In the context of maritime education and training in an appropriate ship, knowledge and skill about vessel operation

acquired via active learning can have profound impacts. In this study of an anchoring training using a small training ship, we implemented a training that engages opportunities for active thinking as an element of seamanship literacy as well as of technical skill acquisition. Active thinking exercises included both a self-evaluation and an evaluation rubric improvement exercise. Although the outcomes we reported were largely anecdotal rather than quantitative, we perceive great student value in the students’ debrief feedback, both ‘good points’ and ‘points for improvement’.

## II. ANCHORING TRAINING

Anchoring training is a suitable exercise for student improvement in ship handling based on ship manoeuvring. Furthermore, it is training suitable for acquisition of various elemental ship handling skills, including information exchange and management [3].

In anchoring training, student teams perform without an instructor’s help. At first, the student heaves up an anchor and sails a planned route. Then, after passing the planned way point, the student anchors to the planned anchorage. Anchoring training is performed in four-person teams. Each team consists of a student in the role of a captain (ROC), a student in the role of a 1st officer (RO1O), a student in the role of a 3rd officer (RO3O), and a student in the role of a quartermaster (ROQ). Since anchoring training is carried out in four-person teams, the effect can be expected as that of a group work, as well as peer learning or the peer instruction [4,5,6]. The procedure of this training is essentially captured in the numbered sequence below.

(1) ROC takes the lead and forms the navigation plan for anchoring. Active student planning of ship handling means a leadership improvement opportunity for ROC. Meanwhile, as ROC explains the navigation plan to teammates and instructors, and corrects the plan according to advice and feedback, opportunities for peer learning arise. After correcting the navigation plan, ROC provides a briefing to team members and instructors. The team members check in with their roles, their

notes, etc. Fig. 1 shows the students planning the ship handling for anchoring.

(2) ROC stations the leaving anchorage. ROC calls an RO30 to start the GS pump when heaving up anchor chains, directs preparation of the main engine, and directs heaving up the anchor.



Figure 1 Students planning the ship handling for anchoring



Figure 2 Students in anchoring training



Figure 3 Student in anchoring training

(3) When an anchor is aweigh, ROC heads off on a predetermined course using the main engine and a rudder. Then, ROC corrects the course appropriately so that the planned route can be navigated. The ship passes two scheduled way points and navigates a predetermined route. Figs. 2 and 3 show students in anchoring training towards the planned anchorage.

(4) ROC slows down the main engine, adjusting the course. ROC stops the ship, applying the main engine to sternway so that it can anchor to the planned anchorage.

(5) ROC lets go the anchor to the planned anchorage, and lets out cables of predetermined length and stops the main engine. ROC then dismisses the anchoring station.

(6) The students carry out self-evaluation based on an evaluation rubric shortly after the end of training. A rubric is indispensable to evaluation of learning, for numerous reasons [7]:

*i)* A rubric evaluates students' performance from many sides.

*ii)* A rubric demonstrates a shared viewpoint and standard of evaluation among students and teacher.

*iii)* Different evaluation levels can serve as students' desired value.

*iv)* A rubric evaluates based on a clear standard rather than on a teacher's intuition.

*v)* A rubric can standardize an evaluation basis and criteria of judgment among two or more teachers, and perform evaluation with high validity and reliability.

Moreover, a rubric places the learning target in front of the student, thereby clarifying the learning to be tackled. Moreover, studies show that rubric evaluation is effective [8].

(7) Anchoring training is discussed in each group. While each team member presents his ship handling notes, the students listen to each other's presentations. In doing so, students consider many things and engage in active thinking [9].

Good points and points for improvement in training performance are discussed in each team. Then, the contents discussed by each team are presented to all teams. At the same time, instructors comment based on an evaluation rubric.

(8) The students consider and report improvements to the evaluation rubric used in self-evaluation.

To sum up, in this training sequence, the required self-evaluation and evaluation rubric improvement were introduced as contents to be applied to active thinking.

### III. RESULTS OF ANCHORING TRAINING

Anchoring training was carried out with 67 3<sup>rd</sup>-year students from the Undergraduate Maritime Systems engineering course at Tokyo University of Marine Science and Technology, faculty of Marine Technology in May and June 2017. The planned route and an example of the training track carried out are illustrated in Fig. 4.

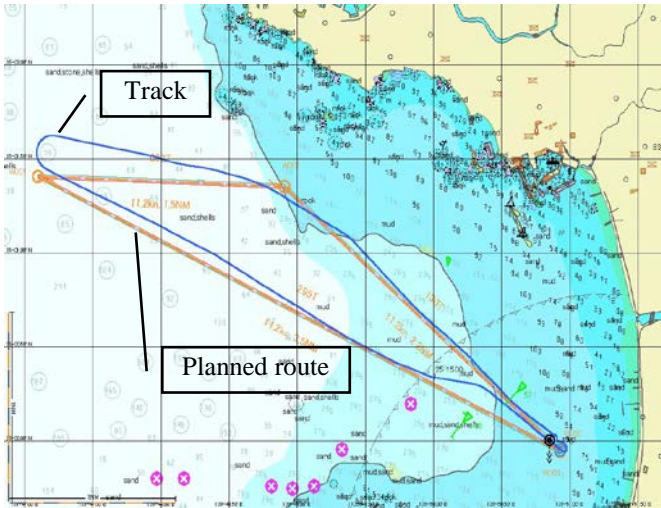


Figure 4 Planned route and track

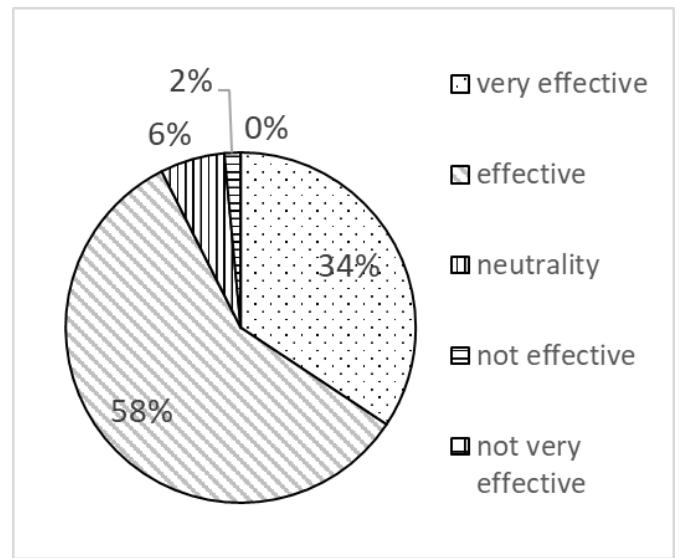


Figure 6 Student feedback on self-evaluation

#### A. Student feedback about the anchoring training

We carried out a student questionnaire about the anchoring training. Students' feedback on the whole training is shown in Fig. 5. 'Very helpful' and 'helpful' constituted 97% of responses. No students responded 'it was not helpful' or 'it was not very helpful'. One person who answered 'neutral' had no comment. One more person commented affirmatively: 'I experienced the substantial contents'.

The student feedback on the self-evaluation exercise is shown in Fig. 6. The responses 'it was very effective' and 'it was effective' constituted 92% of responses. The comment of the one student who responded 'It was not effective' is as follows: 'I thought that I understood even if it does not carry out specially'.

On the other hand, the examples of the comment of the students who answered 'It was very helpful' are shown below.

'I understood deeply by self-evaluation'.

'I think that my own ship handling could be improved objectively'.

'I was able to think over calmly what is important or what should be taken into consideration by an actual voyage'.

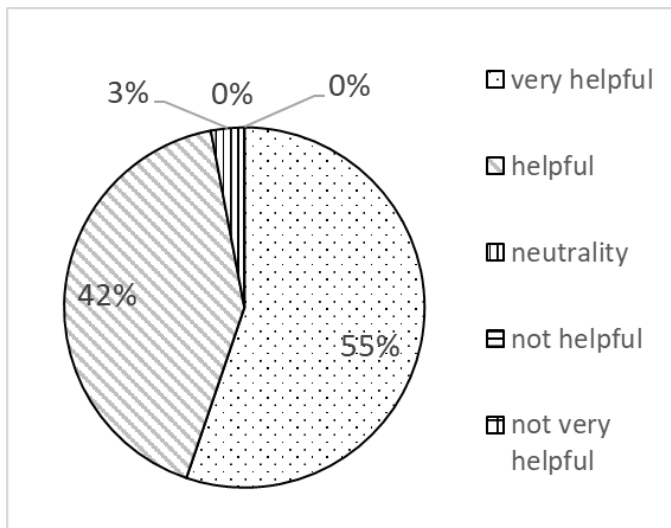


Figure 5 Student feedback on the whole anchoring training

'I think that it is useful for me for next time so that my actions will be improved further'.

'It was a good opportunity to consider whether there is something I can improve for myself'.

'Evaluating the recollection of my ship handling was useful for the review'.

'What is insufficient? Moreover, how should I improve? I was able to perform self-analysis.'

'I have grasped that I was able to do it, and recognize a weak point'.

As mentioned above, by evaluating oneself calmly, the students can understand their good points and points of improvement. We believe that this process boosts acquisition and fixing of knowledge and skill.

The student feedback on the debriefing after anchoring training is shown in Fig. 7. The replies 'It was very good' and 'It was good' constituted 95% in all. In the debrief, the students look back upon their own ship handling after the end of anchoring training, and then discuss these results. The students

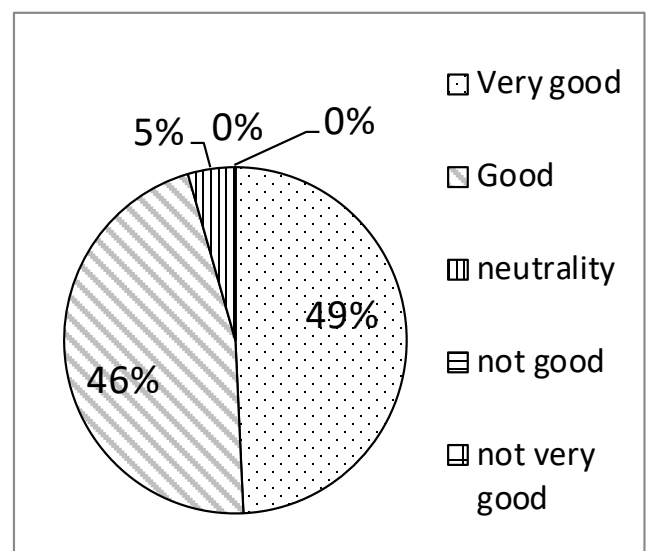


Figure 7 Student feedback on the debrief

self-evaluate their own method of give-way to the other vessels, ship's course setup and increasing and decreasing ship speed. Moreover, they present their good points and points for improvement. Furthermore, the instructors comment about the students' ship handling. In addition, the instructors explain the main point and technique in anchoring training. We believe that the knowledge and skill about a student's ship handling was solidified by these debriefs.

#### *B. Confirmation of the training effect by debriefing*

In debriefing, students presented the following examples of good points and points for improvement. It is thought that students' master knowledge and skills from these, and that they think actively in this process and aim at an improvement.

Examples of good points mentioned in the team debriefs:

(1) It was good to share and determine opinions in the navigation plan.

(2) Every person's role could be learned by having prepared time to plan the navigation plan in four-person teams, and ideas of each member could be summarized.

(3) Since a sufficient plan was made, I think that it was good. I understood that a detailed plan is important.

(4) Since division of roles was clarified in the previous arrangement in the planning stage, ROC ordered directions positively and RO10 and RO30 carried out the orders from ROC appropriately.

(5) The fishing boats were drifting near a way point. According to a report of the radar distance by RO30 and a report of the ship's position by RO10, I altered the course before the way point.

(6) I was able to avoid at a suitable distance when I gave way to a fishing boat.

(7) I made arrangements with RO30, and had the radar distance reported by RO30. Therefore, the distance to the anchoring position had been grasped not only from the target's direction but also from the radar distance.

(8) Early finds of a bow target, a report and the deviation from the course line by use of a bow mark were reported appropriately.

(9) Using the bow mark, I corrected the course appropriately in order to navigate a planned route.

(10) Since I found out the flag staffs of fishing gears at an early stage, and I avoided them; it was good.

Examples of good points mentioned in the whole-class debrief:

(1) Using the navigation plan in the team, students mastered the knowledge about ship handling for anchoring, or understood the process.

(2) Through the exchange of opinions in the navigation plan, students could think actively, and we think we solidified our knowledge.

(3) We think that the question about ship handling was solved, and an understanding was promoted by this exchange of opinions.

(4) We think that the ROC's explanation in the briefing of the navigation helped us all solidify our knowledge, and promoted active thinking.

(5) We think that the role of each member in a team became clear in the planning stage, where each member understood the whole anchoring training.

(6) Students discovered at an early stage the importance of observing.

(7) Students understood a suitable distance to the other vessel or boat according to a situation, when avoiding the other vessel or the fishing boat.

(8) Students could understand the look-out's importance, and we think they understood the closest approach distance of the other vessel.

(9) We think that the students mastered the usage of the bow mark in a route sailing.

(10) As a method of getting to know the distance to the anchorage, students understood the usage of the target of the transverse direction and radar distance.

These good points suggest that the students were able to execute in training, or understood at least, if not have mastered. By carrying out exchange of opinions, all team members' understanding deepened to share this good point within a team. Moreover, each student's understanding of ship handling improved through a presentation of these good points.

On the other hand, the following points for improvement are discoveries through training. In debriefing, trainees can understand these and improve their future performance.

Examples of a point for improvement:

(1) Trainees are realizing the necessity for training, and recognizing the importance of forming a further detailed plan.

(2) Since a navigation officer has many roles, he is required to have a large view, without being caught by one thing, and to take a suitable action in the moment.

(3) The influence of wind and current is significant. Since influence increases especially at a slow ship speed, equipment such as a bow mark should be utilized.

(4) A sufficient distance should be maintained to the fishing boat, and it should be able to pass.

(5) Correction of the gap for navigating a planned route needs to be made boldly, and a backup course needs to be set up at an early stage.

(6) When altering a course, the distance to the new course must be considered and the rudder should be turned.

(7) Telling ship handling intention and directing concretely are important.

Moreover, it is thought that every student's understanding of ship handling is improved through a presentation of these improvement points.

We believe that these points will help achieve improvement of ship handling knowledge and skill, as well as leadership and teamwork.

#### IV. IMPROVEMENT IN THE EVALUATION RUBRIC

The evaluation rubric was used for self-evaluation, mutual evaluation and an instructor's evaluation. We set it up as a

student evaluation rubric, and imposed an assignment that solicits student improvements to this evaluation rubric. Evaluation contents and criteria of the evaluation list are considered carefully, and students consider improving the evaluation list actively, so it is thought that an understanding progresses. We believe that this process hones a student's

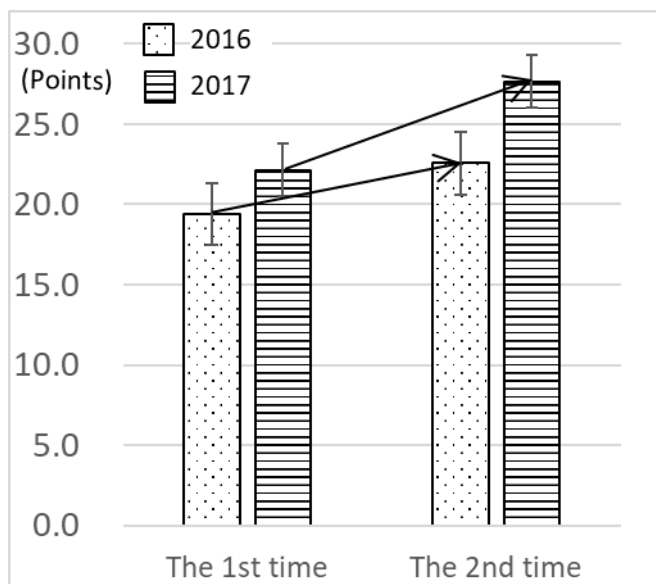


Figure 8 Comparison of the instructors' evaluation scores in 2016 and 2017

knowledge and skill.

This anchoring training is held each May, and then again each October. The results of having evaluated the instructors' evaluation in 2016 and 2017 are shown in Fig. 8. The maximum score in this evaluation is 36.

Since in both 2016 and 2017, the score of the 2nd time was higher than that of the 1st time, the figure shows improvement in skill. Moreover, the figure shows that the 2017 increase (+24.8%) is larger than the 2016 increase (+16.5%). One difference between these two years is that the evaluation rubric improvement assignment was given only to 2017 students, not to 2016 students. Although there may be other factors, we think that the evaluation rubric improvement assignment likely had a substantial effect.

## V. CONSIDERATION

We conducted anchoring training for mastering active thinking as a part of seamanship literacy. To urge active thinking, we introduced self-evaluation and an evaluation rubric improvement assignment.

Since students draw up the ship handling plan in anchoring training, they are obliged to engage in active thinking. The ship handling plan creation in anchoring training is performed by the students, and we witness the effectiveness. In creating the ship handling plan, students apply a trial-and-error method, share their opinions and draw up a plan. Students express their opinions and hear the opinions of others. We find that carrying out improvement and development of each opinion impacts the dialog in group work. In the dialog in this group work, active thinking becomes indispensable.

As for active thinking, the self-evaluation introduced into anchoring training is found to be effective. Students consider self-evaluation a positive, and 92% of students answered that it was effective. Carrying out the self-evaluation from students' comments, the students look back upon their own ship handling calmly, with awareness of the good points and the points for improvement. It is thought that active thinking led the students to master ship handling knowledge and skill. We have come to believe that the effectiveness of self-evaluation in seamanship education is substantial.

The instructor created the original evaluation rubric, not the students. If the students create it, then the anchoring training will be considered deeply and will likely be more effective. On the other hand, since anchoring training is the first experience for almost all students, much time is needed for creating the evaluation rubric. Then, by assigning the assignment of improving the evaluation rubric after the training implementation to the students, we aimed at solidifying student knowledge while considering the anchoring training deeply. The assignment of improving the evaluation rubric was imposed to the students in 2017, not having been carried out in 2016. The rate of evaluation improvement in 2017 was clearly higher than that in 2016. From this, the assignment of improving the evaluation rubric can be said to be one cause of improvement in the anchoring skill. Moreover, by performing the assignment, the understanding progressed.

We now believe that the debrief has the effect of solidifying knowledge and skill about active thinking and ship handling. What each student considered becomes clear by discussing the good points and the points for improvement by the team members after the end of training. It becomes training in active thinking. Furthermore, when students give a presentation, they gain a deeper understanding of ship handling skill. Moreover, even the students who merely hear the presentation gain a deep understanding of anchoring and ship handling.

## VI. CONCLUSION

Anchoring training is a training which students perform actively, so active thinking is urged in order to boost ship handling knowledge and skill mastery. By introducing self-evaluation into anchoring training, we can introduce active thinking. Furthermore, to improve the evaluation rubric, the active thinking further deepens, leading to improvement in problem-solving skills. Debriefing is effective for active thinking as well as for solidifying knowledge.

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## Authors



### Yoshiaki Kunieda

Yoshiaki Kunieda (male) graduated from Kobe University of Mercantile Marine in 1982, and then worked for the National Institute for Sea Training in Japan. In 2014, he moved to Tokyo University of Marine Science and Technology as a Professor of Maritime Systems Engineering. He is a member of the Japan Institute of Navigation, the Japan Society of Naval Architects and Ocean Engineers and other societies and institutes.



### Koji Murai

Koji Murai (male) received his B.Sc., M.Sc. degrees from Kobe University of Merchant Marine, Japan in 1992, 1995, and D.E. degree from Osaka University, Japan in 2003. He is currently professor in Department of Maritime Systems Engineering, Tokyo University of Marine Science and Technology. His main research is Evaluation of mental workload in simulator-based and real ship handling using physiological index, *Kansei*, and Human factor of marine field.



### Hideyuki Kashima

Hideyuki Kashima (male) graduated from Tokyo University of Mercantile Marine in 1992, and then worked for the National Institute for Sea Training in Japan. He moved to Tokyo University of Marine Science and Technology as a Captain of Training Ship Shioji Maru and as a Professor of Faculty of Marine Technology in 2014. He is a member of the Japan Institute of Navigation and Japan Society for Maritime Activity.