FISH SAFE STABILITY EDUCATION PROGRAM – A SUCCESS STORY

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Abstract

A fishing vessel capsizes and the call for stability education resumes. This paper introduces an industry driven stability education program where fishermen's prior experience is central to their learning. The course is presented with indirect instruction techniques that include case studies, simulation with a model, co-operative learning, learning games, guided discussion, skillful questioning and storytelling to actively engage fishermen and build a strong conceptual understanding of the stability principles relevant to their fishing operations. Findings from the quantitative and qualitative summative program evaluation indicate that many fishermen have made changes to their boats and/or operating practices as a result of taking the course.

Introduction

Fishermen untie the lines and put to sea with the promise of a good catch and a safe return home to their family and friends. Tragically numbers tell another story. The International Labour Organization (ILO) Occupational Safety and Health Branch estimate that worldwide there are 24,000 fatalities a year in the commercial fishing fleet. The Canadian Transportation Safety Board reports that since 1993 over 500 Canadian fishing vessels have been lost and more than 200 fishermen did not come home.

Each time a fishing vessel capsizes there is a renewed call for stability training. The fishing community mourns, fishermen talk among themselves about what happened, insurance companies pay out claims, and the agencies responsible for safety training revisit the conundrum of why fishermen don't seem to be getting the safety message about stability.

In 1975 ten vessels capsized with 14 fatalities during the B.C. herring fishery. The West Coast Fishing Casualties Investigation Report recommended that seamanship training and education in stability should commence immediately to help crews become aware of the limitations of their vessels.[1]

Why existing stability training and safety awareness efforts do not seem to be working is a complex problem that involves the inter-relationship between fishermen, traditional teaching methods, and the learning environment. More attention needs to be directed at investigating how people interact to form a learning context. Different methodologies to better involve and engage fishermen in the learning process need to be explored.

Fish Safe took on that challenge in July of 2005 when they began researching what a stability course for fishermen would look like. This paper describes the Fish Safe Stability Education Program (FSSEP) in the context of an adult education program planning model, including epistemological considerations that guided instructional design. Findings from the recent quantitative and qualitative summative evaluation are encouraging in that many fishermen who attended have made changes to their boat and/or operating practices after taking the course.

Fish Safe

Fish Safe is a program developed and funded by the B.C. Seafood Alliance, and is responsible for promoting safety and health programs identified by the Fish Safe Advisory Committee. That committee actively includes fishermen, marine educators, naval architects, marine insurers, fishing companies and marine regulators with a collective mandate that fishermen will own and be responsible for safety on their vessels. Fish Safe is the responsibility of the Fishing Industry Safety Coordinator and Program Manager, and is funded by commercial fishermen through a partnership program with WCB. Insurance assessments are collected from fishermen by the WCB. Fishermen agreed to add an additional levy to have a portion of the assessments allocated to Fish Safe for the development of safety programs and tools. An annual budget of $250,000 has been set aside for Fish Safe over the next five years. Fish Safe also uses this core funding to secure other funding initiatives.

A proposal was submitted to Transport Canada that outlined the need to design a stability education program. In 2005 TC provided $125,000 in funding to design a stability program, develop all instructional materials as well as to deliver and fully evaluate a pilot course that could also serve as a model for a national program.

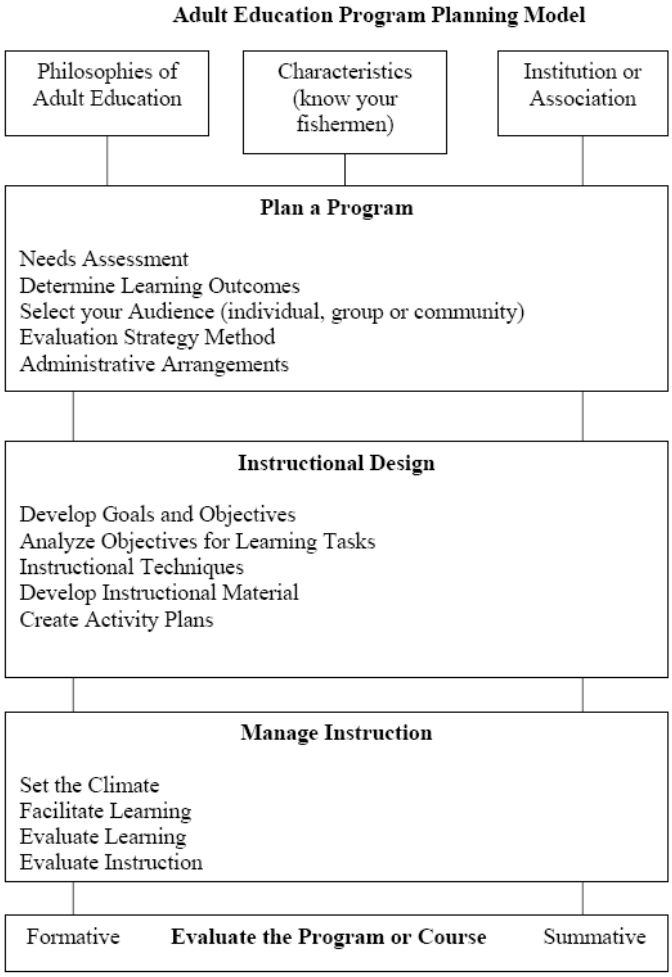
Internationally fishing vessel safety is the responsibility of the Food and Agriculture Organization/International Maritime Organization – both part of the United Nations. A Joint FAO/IMO Working Group met to revise the Document for Guidance on Fishermen's Training and Certification, taking into account recommendations and guidelines from relevant resolutions of the 1995 STCW-F Conference (Standards for Training and Certification for Watchkeeping – Fishing). The revised draft notes that "the government should make financial contributions to training schemes carried on by local government or private bodies" and that training for fishermen "should be given without charge to the trainees".[8]

The draft also suggests that trainers should be given appropriate teacher training, and have practical fishing experience. To this end additional funding of $105,000 from TC was secured in 2006 to train fishermen to facilitate the FSSEP, and also to subsidize the cost of delivering courses.

Following the success of the 30 hour pilot course in February 2006, ten FSSEP courses were delivered by June. At the end of June 2010, 90 courses have been *voluntarily* attended by over 800 commercial fishermen in 19 coastal locations. There is a fisherman/facilitator in each geographic area. Four tool boxes were assembled by Fish Safe that contain all course equipment including a simulation model and all facilitation resources for learning activities. This tool box format is to ensure that the FSSEP is delivered with consistency by facilitators in all locations.

Program Planning Model

Fish Safe contracted a professional educator (M.Ed.) with twenty years experience in the commercial fishing industry and who had also instructed at the Pacific Marine Training Institute for several years. Together with the Fish Safe Project Manager, a third generation commercial fisherman, they developed the FSSEP carefully considering all elements of responsible adult education program planning. Fishermen had input throughout the design process.



Philosophies of Adult Education

A traditional branch of philosophy is epistemology – the exploration of the nature and origin of knowledge, how we come to know things and how knowledge is possible. Traditionally, stability training has been situated in an objectivist epistemology. Briefly this position sees knowledge as disinterested fact forms independent of the individual mind. Instruction is teacher centered. As the "expert" the teacher transmits de-contexualized knowledge often in a lecture format.

In contrast, the FSSEP is anchored in a constructivist epistemology. Central to constructivism is the tenet that learning is an interactive and social process. Learners create new ways of knowing and practice by incorporating past experience and knowledge with new information. The instructor is a facilitator who coaches, mediates, prompts and helps learners develop and

assess their understanding, and thereby their learning. Constructivist learning uses indirect instruction that includes group work, cooperative learning activities, learning games, personal narrative, and simulations to realize a desired learning outcome. A constructivist epistemology is about *engaging* learners.

Instructional Design – indirect instruction

The learning outcome of the FSSEP is *fishermen will take ownership of fundamental principles of stability and make them central to all decisions about vessel operations*. That outcome is supported by four goals:

1. Develop a stability vocabulary
2. Identify and minimize threats to stability
3. Demystify stability books
4. Write stability instructions

Instructional design is deciding how something is going to be taught so as to achieve the learning outcome. An instructional technique is the way a teacher establishes a relationship between the learner and the subject. For each of the supporting goals specific learning activities were designed. Fishermen prove Archimedes Principle using a tank and bread pan boats. Plastic boats of different designs demonstrate reserve buoyancy. A hands-on model lets fishermen prove vocabulary terms associated with centre of gravity, centre of buoyancy, tender and stiff vessels, and the GZ righting lever. A "top heavy" boat becomes one with a high VCG. Play dough and metre sticks are used to feel the shift of G towards a weight added and away from a weight discharged.

Personal narratives and Transportation Safety Board Reports of fishing vessel incidents (case studies) underscore the cumulative nature of threats to stability. Simple instructional tools have been developed that allow fishermen to feel the effects of free surface, a high VCG, or lifting weights with the boom. Stability books are demystified when fishermen understand the terminology. Writing vessel specific instructions is framed by identifying threats to stability. Stories are part of discussions, solutions are formed through cooperative learning activities, and learning games are used for review.

The instructional design that defines the FSSEP is called indirect instruction, or sometimes discovery learning. Through indirect instruction techniques, how fishing vessel stability "works" is shown without a lot of math and baffling equations. Of interest is that indirect instruction is replacing the traditional lecture in physics departments across North America. The Massachusetts Institute of Technology has replaced the introductory physics course lectures with smaller classes that emphasize hands-on, interactive, collaborative learning. M.I.T. is not alone. Other universities are changing their ways, among them the University of Maryland, the University of Colorado at Boulder, Harvard, and the University of British Columbia. In these institutions physicists have been pioneering teaching methods drawn from research showing that most students learn fundamental concepts more successfully, and are better able to apply them, through interactive, collaborative, student-centered learning.

Indirect Instruction

Indirect instruction is learner centred rather than teacher centred. It is problem based learning that uses case studies, cooperative learning activities, skillful questioning as learning probes, simulation, learning games, guided discussion groups – and enables participants to integrate new concepts with their prior experience to create knowledge. There is a significant amount of evidence that suggests that "learners use their current knowledge to construct new knowledge and that what they know and believe at the moment affects how they interpret new information."[11]

A fictional case study is used as a pre-assessment strategy to determine participants' knowledge about stability, and TSB Occurrence Reports provide real-life case studies. Cooperative learning activities allow fishermen to explain concepts and patterns to each other, and learning games reinforce stability vocabulary by using correct terminology to advance fishing vessels on a playing board. Guided discussions where fishermen tell their own stability stories is an important part of the instructional design. Instructional techniques that do not allow participants to relate their prior experiences are often seen as irrelevant and not effective for learning, and indeed may be rejected.[12]

Simulation is a structured situation where learners are involved with a setting and objects that represent a real situation as much as possible. The FSSEP uses a model with cross-connected fuel tanks, which has a number of interchangeable decks with different gear configurations. A vessel originally designed for gillnetting can be modified for a trap fishery that shows the raised C of G and tendency towards tenderness or instability. There is a wheelhouse deck than can be loaded with spare gear, lockers and freezers, and a deck that shows the effect of free surface on vessel stability.

Fish Safe has produced a video/dvd called "Measuring Stability" that engages viewers in an inclining experiment to establish GM and lightship KG. Fishermen can simulate the steps of an incline with the model. An interactive handbook has been written called "Fishing Vessel Stability – Make it your Business" that contains the curriculum inter-woven with personal stability stories of survival and tragedy.

The variety of instructional techniques associated with indirect instruction are likely to appeal to a greater variety of learning styles than direct instruction with lectures.[13] There is also evidence that indirect instruction enhances motivation to learn, in part because it draws extensively on the prior experience that participants bring to the learning environment.[14]

Facilitation

From the previous section on instructional techniques, the FSSEP does not use a teacher/expert who "transmits" facts, but rather a facilitator who enables and guides collaborative learning activities. Facilitating learning can be more challenging than teaching because the facilitator is always actively involved with the learners. Critically important to the success of the FSSEP is

the credibility of the facilitator.[15] A program runs the risk of failing without the support and involvement of fishermen, and that when possible experienced fishermen should be instructors.[16]

Two fishermen in the pilot course offered in February 2006, stepped up to the plate and said they would like to be facilitators. One of these fishermen was initially very resistant to integrating new knowledge, maintaining that he'd fished successfully for twenty years and that the "feel" of the boat was a sufficient indication of stability. Dispelling these kind of common myths is an important part of the FSSEP. On the third day this particular fisherman had an epiphany and is now the lead FSSEP fisherman/facilitator.

Fish Safe developed a comprehensive Facilitator's Guide with activity plans and resources that was the basis of the first Facilitator's Workshop which followed the pilot course. There have been two subsequent Facilitator Workshops, one on questioning techniques, and the most recent a technical workshop on stability KN curves. Increasing facilitators' technical knowledge about stability is important because "numerous studies demonstrate that any curriculum is mediated by a teacher's understanding of the subject".[17] Facilitators mentor amongst themselves, as well as initially being mentored by the professional educator.

Brookfield explains that journals are a way for teachers to reflect on their practice.[18] After each FSSEP course, facilitators complete a Facilitator's Log Book and entries are circulated to all facilitators. An audit process is also in place and identified, for example, the need for a workshop on questioning techniques. Fisherman/facilitators are remunerated by Fish Safe. They provide passion for free.

Formative and Summative Evaluations

Responsible adult education programs have two kinds of evaluation. Formative evaluations are ongoing and are done from direct participant feedback and course evaluations. During the first year the FSSEP was "fine tuned" both by the fishermen facilitators and by the fishermen who attended each course.

A summative evaluation is a more in depth examination to determine whether a program has merit and worth. In education, programs have merit if the learning outcome was achieved. For example if fishermen go back to their boats and make changes or establish work practices to mitigate threats to stability then the program has merit. Worth is associated with whether a program actually meets the needs of the fishing industry.

Summative Evaluation of the Fish Safe Stability Education Program

By spring of 2008 nearly 600 fishermen had voluntarily attended the FSSEP. This provided a significant enough sampling population to conduct a summative program evaluation. One purpose of this evaluation was to determine if fishermen who attended the course changed anything on board their vessels or anything about their operating practices to minimize threats to stability as a result of what they learned. Another reason for the evaluation was to assess how the course was received, and whether any substantive changes needed to be made.

The Applied Research and Evaluation Services (ARES) at the University of British Columbia was contracted to conduct a quantitative and qualitative summative evaluation of the FSSEP. A questionnaire was developed that had eleven "top of mind" open ended text box questions in order to obtain spontaneous responses. There were eight Likert-style numeric rating questions and six demographic questions associated with age, years fishing, gear type and position held on the boat. In May of 2008 the questionnaire was sent to all fishermen who had attended the FSSEP. The questionnaire could be answered either with hard copy or on line, with three volleys and reminders. Raw data from open ended questions was analyzed using SPSS (Statistical Package for the Social Sciences) software. In the ARES evaluation findings the executive summary states:

> ***"Participants expected to get, and received, knowledge about vessel safety and stability. They ranked the course, instructors, and instruction very highly, with particular emphasis on the practical application of course content and the relaxed and interactive course delivery."***

Of 574 potential respondents, 164 replied, a return rate was just under 30%. ARES Director, Dr. Bill Mercer noted that this return rate was exceptionally high, and that typically similar questionnaires have a 10-12% return. ARES also noted the exceptional amount of raw data generated from the open ended questions, both suggesting a high amount of enthusiasm for the FSSEP. Overall the course was rated by 89.4% as being 'excellent' or 'very good'.

Two questions on the evaluation survey (Tables 1 and 2) were directly linked to the purpose. The first was "As a result of the course have you changed anything on your vessel to minimize potential threats to stability"? There were 158 responses with 60.1% saying "Yes". Response categorizations were developed by reading all of the responses to a question. Text analysis with SPSS is such that any given response could generate counts in several categories, thus total percentages within a question can add to more than 100%. Specifically responses included lowering the centre of gravity (29.3%), improved structural components (14.6%), and securing seals and hatches (12.2%).

TABLE 1

Q8T: As a result of the course, have you changed anything on your vessel to minimize potential threats to stability? – What?	N	%
Lowering center of gravity	48	29.3%
No changes (nothing) / Vessel already stable/safe	44	26.8%
Improved structural components of vessel	24	14.6%
Secured hatches/seals on windows & manholes etc	20	12.2%
Crew better informed & aware of stability & potential safety concerns	14	8.5%
Drills, checklists and procedures on stability	14	8.5%
No - N/A - Do not own vessel	10	6.1%
Changed or Reduced loads	7	4.3%
Other	7	4.3%
Improved confidence	4	2.4%

The second question was "Have you changed any working practices to minimize potential threats to stability"? There were 150 responses with 62.7% saying "Yes". Improved awareness

and crew safety training was cited by 16.5%, with 11.0% saying increased checks and drills, and 10.4% indicating they now stowed gear in lower positions.

TABLE 2		
Q9T: Have you changed any working practices to minimize potential threats to vessel stability? – What?	**N**	**%**
No changes made / Already safe / Performing safety procedures	39	23.8%
Improved awareness / Training of crew regarding stability & safety procedures	27	16.5%
Checks / follow procedures / drills for stability and safety of vessel & crew	18	11.0%
Relocate or reduce heavy items from high to low on vessel	17	10.4%
Change made to vessel / Procedure influencing stability	16	9.8%
Other	13	7.9%
Secure hatches/seals on windows & manholes etc	10	6.1%
Consider weather conditions and make adjustments accordingly	9	5.5%
Relocate / Reduce loads	9	5.5%
N/A - Do not own vessel / Haven't been fishing since course	8	4.9%
Reduce free surface	4	2.4%

Responses to the open-ended question "did you learn anything from the course" provided further information. Again 158 out of the total 164 participants responded with nearly everyone (96.8%) saying "yes". The breakdown as to what people learned was; vessel stability (31.1%); loading, weight, and vessel roll period (19.5%); free surface (16.5%) and general crew safety (12.2%). Loading and weight distribution, roll period and free surface are all associated with threats to stability that can be mitigated by operational practices.

TABLE 3		
Q7T: Did you learn anything from the course? What?	**N**	**%**
Aspects of vessel stability	51	31.1%
Aspects of loading / weight / rolling the vessel	32	19.5%
Aspects of free surface	27	16.5%
Aspects of Vessel / Crew safety	20	12.2%
Other	15	9.1%
Yes – Refresher / Upgrade knowledge	11	6.7%
Aspects of centre of gravity	9	5.5%
Changed prior beliefs / improved knowledge vessel stability / safety	8	4.9%
Emergency procedures / Disaster prevention	8	4.9%
Increased awareness of crew regarding stability & safety etc	8	4.9%
No - already known	4	2.4%
Everything	4	2.4%
Freeboard	3	1.8%

Accepting that some participants thought the course should be longer, shorter, closer, more in depth, or less in depth – no serious gaps in course methodology or content emerged from the evaluation.

Overall the summative evaluation determined that the FSSEP has both merit and worth. It has imparted practical knowledge about stability to fishermen, and many have gone back to their vessels and made changes either to the vessel and/or gear stowage, or in operating practices to minimize threats to transverse stability. Additionally the findings are that the curriculum of the FSSEP is meeting, in a useful way, the educational needs of the fishing industry, as evidenced by 94.4% of the fishermen saying on the questionnaire that they recommended the course to others, believing it to have the possibility of saving lives through increased knowledge about stability.

Measuring Success

The success of the FSSEP can also be measured by reading through the qualitative raw data collected as part of the summative evaluation.

What made you decide to take the stability course?

- *Highly recommended by fellow fishermen*
- *Had previously capsized by vessel*
- *I thought one day it might save my bacon*
- *Pressure cooker fishery – overloading boats*
- *Was concerned about stability of my vessel when fully loaded with traps and gear*

What did you expect to get out of the course?

- *Stability cures*
- *To be able to understand more about a stability book and what effects stability*
- *Maybe learn something I didn't know – what a surprise*
- *How to avoid a disaster*
- *I thought I had enough know how, I'm totally impressed with what I learned*

What was the best thing about the course?

- *Presented in a user friendly manner with real life examples*
- *Being with friends*
- *That the course was taught by an experienced fisherman*
- *Taught by a fisherman who knows about real life*
- *The discussions*
- *We got to talk about our personal experiences*
- *The way it was taught*
- *Learning the effects of free surface*
- *The real life examples that were used*
- *How little things can cause mishaps*
- *Cleared up a lot of misconceptions I had*
- *The instructor had credibility because he is a fisherman*

Did you learn anything from the course? What?

- *That is usually not one thing that makes a boat unstable*
- *The accumulative effect of alterations and added machinery*
- *What I assumed was safe on the boat was not necessarily so*
- *Freeboard is my friend*
- *The GZ line and how it works*
- *Loading a boat down doesn't necessarily make it a good sea boat*
- *I'll never look at a tote of fish on deck the same way*

The success of the FSSEP is in part due to a few key considerations. First, it is facilitated by fishermen and not by an "expert". Second, the content is relevant to fishing operations. Third, indirect instruction engages fishermen. And four, the course draws on and respects fishermen's experience. These four considerations can well inform other training programs for fishermen.

One fisherman said he took the course because "knowledge is empowerment". Knowledge fosters ownership. And the learning outcome for the stability program is that *fishermen will take ownership of fundamental principles of stability and make them central to all decisions about vessel operations*. Ownership is a true measure of success.

In their own words

"Instructed by a fisherman who knows about real life"
"Stability is not about the 'feel' of my boat"
"Some of the things I have done in the past were wrong, I've been lucky"
"How much I didn't know that I thought I did"
"Someone is taking our jobs as fishermen seriously and showing us respect"
"Discussion style of learning worked good"
"The interaction with others and the model helped me figure out stability"

The FSSEP is aware that there are limitations particularly associated with learning transfer to actual practice. The ethnographic research described above is an evaluation approach that might possibly reveal whether learning transfer about stability has mediated operational practices. In general knowledge taught in a variety of contexts that relate to previous experience lead to greater learning transfer.[23] Interactive instruction takes significantly more time to develop and maintain, which translates into higher costs. Providing technical workshops for fishermen/facilitators on a regular basis is also a cost factor. Additional funding is required to sustain this program and properly evaluate its worth, merit and results.

Any stability education program for fishermen needs to acknowledge the fact that safe stability operating practices may be challenged by the promise of significant financial gain. The FSSEP believes that with stability education, operational decisions will be based on informed risk considerations nested in fundamental principles of stability – and that all fishermen will be in a better position to come home safe to their family and friends.

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