Fishing Vessel Stability Education Program

"An Informed Blueprint for Program Design"

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ABSTRACT

A fishing vessel capsizes and the call for stability education resumes, suggesting that past and current programs are not contributing significantly to prevention. This paper introduces an industry driven educational program where fishermen's prior experience is central to their learning. Instructional design is problem based and includes a hands on model. The program, informed by the literature, is described within the framework of an adult education planning model including epistemology, needs assessment, learning outcomes, instructional design, facilitation, evaluation and implications. The program was recently nominated for a national safety achievement award.

Keywords: *fishermen, education, stability*

1. 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 Transportation Safety Board of Canada (TSB) investigates marine occurrences, and their statistics indicate that since 1993 over 500 Canadian fishing vessels have been lost and more than 200 fishermen did not come home. The Workers' Compensation Board of British Columbia (WCB) recently issued a media release that reports 157 fishing vessels have capsized and 66 lives have been lost in British Columbia since 1975.

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 two week B.C. herring fishery. The West Coast Fishing Casualties Investigation Report (1975) recommended that seamanship training and education in stability should commence immediately to help crews become aware of the limitations of their vessels.

In 1995 the Canadian fishing vessel *Pacific Bandit* capsized. The TSB recommended that the "Department of Transport…immediately undertake a safety promotion program for operators and crews of small fishing vessels to increase their awareness of the effects of unsafe operating practices on vessel stability" (TSB, 1995).

Transport Canada responded saying that in 1995 Phase I of an evaluation study titled "Non-Regulatory Marine Occurrence Prevention Programs" was completed. The objective of the study was to provide information on the "relevance and effectiveness of current marine occurrence prevention programs".

The conclusions of Phase 1 "recognized the relationship between education, awareness, positive safety attitudes and changed behaviours". The findings also noted that to reach the appropriate audience "*effective means of delivering the safety message be utilized*" [italics added].

In 1997 the *Pacific Charmer* capsized and two fishermen perished. A paper presented at SARSCENE '99 about this loss suggests that educators should focus on the way people construe the world differently, and develop educational concepts and processes tailored to the multiple realities inhabited by fishermen. The author continues, suggesting that educational programs for fishermen should use techniques that elicit and make use of learners' backgrounds and experience. Additionally, safety education for fishermen should be participatory and include active collaboration with learners, and that ideally fishermen should run the programs (Boshier, 1999).

Five people perished when the *Cap Rouge II* capsized in 2002. The TSB Marine Investigation Report notes that since 1990 there have been a number of publications, Ship Safety Bulletins, and training efforts directed at safety awareness and stability, but these have shown "limited success". It is suggested any education program for fishermen about stability should follow good practices of adult education and "employ educational techniques which are most likely to impart useful knowledge to operators" (TSB, 2003).

With fishing vessels continuing to capsize in spite of the proliferation of well intentioned pamphlets, safety manuals, Ship Safety Bulletins, Hazard Alerts and certification courses, what have fishermen learned? At the Coroner's Inquest (2004) held following the capsize of the *Cap Rouge II*, the skipper's words are insightful:

He testified that the TCMS Fishing Vessel Master IV certification course had little information about fishing vessel stability, concentrated on loading deep sea vessels, and was taught by an instructor with no fishing experience.

One of the recommendations from the Coroner's Inquest was that Fishing Master certification should include ship stability theory and free surface principles taught in a manner that is practical and understandable for fishermen.

Why existing stability training and safety awareness efforts do not seem to be working is a complex problem that, among other factors, involves the inter-relationship between fishermen, traditional training methods, and the learning environment. More attention needs to be directed at investigating how people interact to form a learning context (Merriam S.G. and Caffarella, R.S., 1991). There would seem to be little disagreement about the need for stability education and safety training. It has been 31 years since the *Bravado* capsized and six fishermen died in 1975. Different methodologies and solutions to better inform fishermen about fundamental principles of stability need to be explored.

Fish Safe took on that challenge in July of 2005 when they submitted a comprehensive funding proposal to both Transport Canada and the Workers' Compensation Board for the Fish Safe Stability Education Program (FSSEP). This paper describes the FSSEP in the context of an adult education program planning model, including epistemological considerations that guided instructional design. Funding sources, program limitations and implications are also discussed.

2. 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.

The B.C. Seafood Alliance is a non-profit organization established in 1999 and is an um-

brella group that brings together traditional capture fisheries, aqua-culture operations, seafood processors, marketers and exporters who collectively represent British Columbia's seafood industries. The Alliance is governed by a Board of Directors with substantial experience in the fishing industry, and who represent the majority of all fish harvesters.

3. FUNDING

Fish Safe is funded by the B.C. Seafood Alliance in partnership with the WCB. Assessments are collected from the fishing industry by the WCB who thereby is able to provide no fault insurance, and to fund prevention services. This partnership allows an opportunity for the fishing industry to have a portion of the assessments allocated to the industry or to add additional assessments for the development of safety program. An annual budget of $250,000 has been set aside over the next five years.

A separate proposal was submitted to Transport Canada Marine Safety (TCMS) that outlined the need to design a stability education program based on 30 years of recommendations to do so. In 2005 TCMS 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 national programs.

A Joint FAO/ILO/IMO Working Group met in January 1998 and January 1999 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.

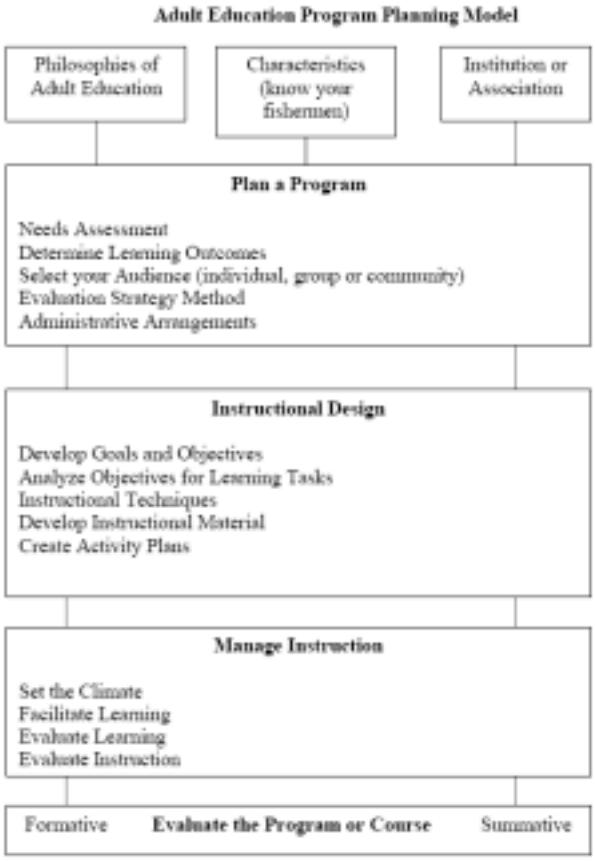
The revised draft (1999) notes that "the government should make financial contributions to training schemes carried on by local government or private bodies" and that training for fishers "should be given without charge to the trainees". The draft also suggests that trainers should be given appropriate teacher training, and have practical fishing experience.

To this end additional funding of $105,000 from TCMS was secured in 2006 to train fishermen to facilitate the FSSEP, and also to subsidize the cost of delivering the course.

Following the success of the 30 hour pilot course in February 2006, 91 fishermen completed the FSSEP courses by June. Beginning in the Fall 2006 two courses are scheduled each month in different locations. Fish Safe decided on four locations along the B.C. coast that will make the FSSEP easily accessible to all fishermen. The goal is to have a fisherman/facilitator in each geographic area. Fish Safe has assembled four tool boxes 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.

4. PROGRAM PLANNING MODEL

Fish Safe contracted a professional educator with twenty years experience in the commercial fishing industry and who had also instructed at the Pacific Marine Training Campus in Vancouver for several years. Together with the Fishing Industry Safety Coordinator, a 3rd generation commercial fisherman, they developed the FSSEP guided by the literature and following the steps of a program planning model shown below.



5. 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. Knowledge that is objective can be verified by procedures such as those found in science or mathematics. Instruction is teacher centered. As the "expert" the teacher "transmits" decontexualized knowledge and facts to essentially passive students who are expected to replicate content into operating practices. Instructional design typically uses lectures, text books, and work books of repetitive exercises to ensure content mastery.

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 relies on instructional design that is problem based with multiple activities including group work with experimental inquiry, case studies, personal narrative, and simulations to realize a learning outcome.

6. NEEDS ASSESSMENT

Most program planning models are front end loaded with some kind of a needs analysis (Kemp 1985; Knowles 1980). Fish Safe did not conduct a formal needs assessment – the history of capsizings corroborates a resounding need for stability education.

The word need, as used in educational program planning, has two parts that reflect a discrepancy between a present state of affairs (PSA) and a description of some more desirable future state of affairs (FSA). The owner of the discrepancy is the person or group of persons who would have to act differently if the FSA were to be realized. The owner of a *prescriptive* need is not the person or persons who would be required to change attitudes or behaviors, for example a government regulated mandatory safety course. In contrast is a *motivational* need where the owner of the discrepancy perceives the need, and thus actively buys into, for example a voluntary course on vessel stability. The success of a program is exponential when there is total agreement between prescriptive and motivational needs, or when a program is driven entirely by motivational needs.

A requirement of Part 24 of the WCB Regulation is that all fishing vessels have written stability guidelines on board that cover loading/discharge sequences, ballasting, fuel

transfer operations etc. as well as a stability data book. At a well attended industry meeting to address how to meet these regulatory requirements, fishermen with a unified voice said that "regulation without education" was unacceptable and asked Fish Safe to design a useful and relevant educational program on stability. Another consideration taken into account by fishermen was the final draft stage of Transport Canada's *Fishing Vessel Safety Regulations*. These new regulations, projected to be in force in 2007, will apply to vessels less than 24 metres and will require some kind of stability documentation for all fishing vessels.

7. LEARNING OUTCOMES

The learning outcome for fishermen who complete the FSSEP is:

You will take ownership of fundamental principles of stability, and they will be central to your every day reality when making any decision that effects your vessel's operations.

A learning outcome is a broad statement of what participants will take away from a program. Curriculum development with learning outcomes has its origins in systems theory and constructivism, and includes authentic assessment. In contrast, curriculum development with a content approach is situated in liberal philosophy, and assessment is with norm referenced exams. The competency approach stems from behaviourist learning theory, and assessment is by criterion referenced competencies.

Although the FSSEP does not have any formal learning contract, the following are promises to participants that reflect a constructivist epistemology:

- Your experience as a commercial fisherman is respected and you are encouraged to talk about your fishing experiences
- You will be actively engaged in learning
- You will work with real life problems related to stability and commercial fishing
- Your questions are valuable and they will all be answered

8. CURRICULUM GOALS

A curriculum goal is a general statement of what participants will learn in a course. The curriculum goals of the FSSEP are:

- You will have a stability vocabulary that will enable you to talk about stability with personal authority
- You will be able to read a stability data book and find information in that book that can help you make operational decisions when fishing
- You will appreciate the cumulative nature of threats to vessel stability
- You will be able to write stability instructions specific to your vessel and fishing operations

From the goals, detailed activity plans with objectives and learning tasks were written. In theory, if participants can do all the learning tasks, they can do the objective. If they can do all the objectives, they can achieve a goal. If all the goals are achieved participants will complete the course, and realize the learning outcome. In practice this algorithmic approach becomes a bit blurred, however it is an important tool for organizing curriculum.

Womack and Johnson have written with considerable insight about teaching stability principles to fishermen and suggest that a successful program not try to teach how to calculate a vessel's stability which is the "province of naval architect" (2003). The curriculum of the FSSEP contains only very limited math and is based on the Transport Canada syllabus for the stability component of the Fishing Master III certification. Initially it was thought that it would be advantageous if the program was directly linked with Transport Canada certification. It soon became clear however that the FSSEP's success was because it was industry driven and owned, independent from any regulatory body.

9. INSTRUCTIONAL TECHNIQUES

Once curriculum goals, objectives, and learning tasks were identified, instructional techniques, grounded in constructivist theory and congruent with the learning outcome, were determined. Borich (1992) identifies two broad classifications of learning outcomes based on complexity of behaviors:

Type 1	**Fact**: C of G is where weight of ship and deadweight act downward **Rule**: G moves towards weight added **Action sequence**: weight added low down lowers the C of G
Type 2	**Concept**: Skipper has control of C of G by how ship is loaded **Pattern**: C of G changes during a fishing trip **Abstraction**: Maintain a stable vessel through a fishing trip

The FSSEP learning outcome is that fishermen will make fundamental principles of stability central to their everyday reality when making operating decisions, which is a Type 2 learning outcome. Type 1 learning outcomes require lower cognitive behavior and are usually taught by *direct* instruction, i.e. lecture. Type 2 outcomes require higher cognitive behavior and are achieved with *indirect* instruction where the learning process is inquiry, the result is discovery and the learning context is a problem.

9.1 Indirect Instruction

Indirect instruction is learner centred rather than teacher centred. It is problem based learning that uses case studies, cooperative learning activities, critical questioning, decision making, simulation, learning games and guided discussion groups – and enables participants to integrate new concepts with their prior experience to create knowledge.

A fictional case study is used as a pre-assessment strategy to determine participant's knowledge about stability, and TSB 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 (Guy, 1999).

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 was developed called "Fishing Vessel Stability – Make it your Business" that graphically and colourfully illustrates the curriculum, and also features 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 (Kolb, 1984). 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 (Biehler & Snowman, 1997; Wlodkowski, 1998).

10. 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 (Boshier, 1999; Herbert, 2000). Petursdottir, Hannibalsson, and Turner (2001) suggest that a program runs the risk of failing without the support and involvement of fishermen, and that when possible experienced fishermen should be instructors.

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 had fished successfully for twenty years and that the "feel" of the boat was a sufficient guideline to 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 as the basis of the first Facilitator's Workshop that followed the pilot course. It gave fisherman/facilitators an opportunity to reinforce their knowledge about stability by giving impromptu presentations, and also introduced several facilitation skills associated with indirect instruction. The two fishermen who have delivered the FSSEP were mentored during their presentations by either an educator/fisherman or a marine surveyor well known in the fishing industry. This mentoring process is still in place.

Other fishermen have contacted Fish Safe asking how they can become facilitators. The criteria are that they participate in the FSSEP, have credibility in industry, and are willing to participate in facilitation skills workshops. There is a second Facilitator's Workshop planned that has additional fisherman and the marine surveyor mentioned above, keen to attend. A learning style inventory will open the workshop, and indirect instruction skills and activities are directly related to the curriculum of the FSSEP. Participants will be video-taped giving a 15 minute facilitation of a selected topic from the core curriculum for self and peer critique.

Brookfield (1990) explains that journals are a way for teachers to reflect on their practice. After each FSSEP course, facilitators complete a Facilitator's Log Book and entries are circulated to all facilitators. Several of the comments and insights from the log book entries will be included in the second Facilitators Workshop. Fisherman/facilitators and mentors are remunerated by Fish Safe. They provide their passion for free.

11. EVALUATION

The FSSEP has four evaluation components; participant, formative, summative, and statistical. These multiple levels are part of ethical and responsible program planning and have considerable impact on continued funding support.

11.1 Participant Evaluation

There are two reasons why participant evaluation is important. The first is to let participants know whether they have learned operational practices that reflect basic stability principles, and the second is to determine whether the FSSEP has enabled fishermen to

do so. Traditional direct instruction with Type 1 learning outcomes uses multiple choice or matching type instruments that assess recall and recognition of decontextualized terms and concepts. Indirect instruction evaluation instruments are authentic assessments that situate learners in a real life situation and evaluate their responses to questions about the scenario.

The FSSEP uses carefully designed case studies as well as visual clips from videos and dvds, such as "The Deadliest Catch Second Season" that documents the perilous Alaskan King Crab fishery in the Bering Sea. Fishermen are asked to first identify potential threats to stability. Then to discuss basic stability principals in the context of operational practices that can mitigate risk of capsize. The visual clips also enable fishermen who may not be able to read or write to do a verbal assessment.

11.2 Formative Evaluation

The FSSEP has a comprehensive three part Likert rating scale evaluation instrument that asks participants to respond to questions about their perceived mastery of course content, the course itself, and the facilitator. Additional formative insight has been the Facilitator Log entries. For example a log entry read "the guys were kind of frustrated when we did displacement tables because of the adding and subtracting, they couldn't get the calculators to work". The buttons on the calculators were too small, and Fish Safe now provides calculators with larger ones.

11.3 Summative Evaluation

Several of the questions in the evaluation instrument described above are designed to give a summative profile of the FSSEP. Fish Safe has created a data base where responses to all three parts are recorded and response patterns are flagged and action taken. It became evident that many participants did not feel that they were able to properly write stability instructions for their vessel. Fish Safe has now created a template for writing instructions that gives FSSEP participants better guidance. The overall response from fishermen is enthusiastic and highly supportive of the program.

"Thank God this course has finally been made available-someone is taking our jobs as commercial fishermen seriously and showing respect for fishing families lives…" Fred Hawkshaw, commercial fisherman

Additional summative evaluation is expected to be included in the Fish Safe Phase II project funding proposal to TCMS. Using qualitative ethnographic research techniques, it is proposed to conduct on board interviews with skippers and crew who have participated in the FSSEP and those who have not, and compare to see if the FSSEP has influenced operating practices.

11.4 Statistical Evaluation

The end purpose of the FSSEP is to reduce the number of vessel capsizes and lives lost. The Fish Safe data base is able to track all fishermen who complete the FSSEP. A study will be conducted that correlates the effectiveness of the FSSEP by looking at whether vessels that may have capsized were operated by fishermen who attended the course. Confounding variables will be included in the study findings.

12. CONCLUSIONS

The FSSEP has been guided by considerable expertise contained in the literature. As a blueprint for program design it is easily adapted to specific fishery concerns in other regions to form the basis of a national program. International implications include developing countries with artisan fisheries and low levels of literacy where story telling and narrative is traditionally a primary tool for learning.

The FSSEP has the support of marine insurers, surveyors, and the naval architect community, and was recently nominated for the Canadian Society of Safety Engineers Annual Achievement Award.

Because the FSSEP is situated in a non-traditional paradigm for learning, rigorous program evaluation also constitutes research and has the promise of informing other commercial fishing safety programs. It has been suggested that program evaluation and educational research are intrinsically married in that "evaluation is the application of research skills to determine the worth of an educational practice" (McMillan and Schumacher, 1993).

Any training or educational program for fishermen must acknowledge the fact that safe operating practices about stability learned in an educational program 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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