THINKING OUTSIDE ISD: A MANAGEMENT MODEL FOR INSTRUCTIONAL DESIGN

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THINKING OUTSIDE ISD:
A MANAGEMENT MODEL FOR INSTRUCTIONAL DESIGN

by

Tony DeWayne Taylor

Abstract of a Dissertation
Submitted to the Graduate Studies Office
of The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy

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ABSTRACT

THINKING OUTSIDE ISD:
A MANAGEMENT MODEL FOR INSTRUCTIONAL DESIGN

By Tony DeWayne Taylor

The purpose of this study was to examine the effectiveness of an instructional system management-level model proposed by the author designed to orchestrate the efficient development and implementation of customer requested curriculum. The three phases of systems-based model are designed to ensure delivery of high quality and timely instruction are: 1) the assessment and documentation of organizational training requirements; 2) project management control of curriculum development; and 3) the implementation of relevant instruction by competent instructors. This model also provides 4) measurable and quantifiable course evaluation results to justify return on investment and validate its importance with respect to the customer’s organizational strategic objectives.

The theoretical approach for this study was systems theory-based due to the nature of the instructional systems design model and the systematic design of the management model. The study was accomplished using single-case study application of qualitative style of inquiry as described by Patton (2002). Qualitative inquiry was selected to collect and analyze participant holistic perspective assessment of effectiveness, relevance, and timeliness of the instructional design management model.

Participants for this study included five managers, five subject matter experts, and six students assigned to a military organization responsible for the collection of hydrographic data for the U.S. Navy. Triangulation of data sources within the qualitative
framework of the study incorporated the three participant groups—managers, SMEs, and students—incorporated multiple views of the course development and implementation to validate the findings and the remove researcher bias.

Qualitative coding was accomplished by importing transcribed interviews into Microsoft Excel and sorted using Auto-Filter. The coded interviews indicated effective functionality in the views of the model from each of the three participant groups. Results from a pre-test/post-test comparative analysis indicated a significant difference between the pre-test and post-test mean at the p < .001 for the six students. Although the subject of the case study was within a military training environment, the application of the proposed instructional systems managerial model can be applied to the design, development, delivery, and assessment of instructional material in any line of study where quantifiable effective learning is the goal.
ACKNOWLEDGEMENTS

There are many individuals who enabled me to complete this study. I would first like to thank my committee, Dr. Shelia Brown, Dr. Sherry Herron, Dr. Susan Ross, Dr. David Wells, and especially my committee chair, Dr. Sharon Walker for their patience, invaluable guidance, and faith in my ability.

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A special note of appreciation is for my parents. For my dad who taught me the meaning of integrity, persistence, and the value of hard work, and to my mom whose continuous encouragement and first-class typing and transcribing skills, enabled me to complete this study and my academic journey.

Finally, to my lovely wife, Carolyn. Thank you for listening to my ramblings and for helping me to maintain my focus. Words cannot express my gratitude for your endless love and encouragement throughout my studies.
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<table>
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<th>Abbreviation</th>
<th>Definition</th>
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<tbody>
<tr>
<td>ADDIE</td>
<td>Analysis, Design, Develop, Implement, Evaluate</td>
</tr>
<tr>
<td>AF</td>
<td>Air Force</td>
</tr>
<tr>
<td>CO</td>
<td>Commanding Officer</td>
</tr>
<tr>
<td>COI</td>
<td>Course Outline of Instruction</td>
</tr>
<tr>
<td>CTTL</td>
<td>Course Training Task List</td>
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<tr>
<td>DoD</td>
<td>Department of Defense</td>
</tr>
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<td>FST</td>
<td>Fleet Survey Team</td>
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<tr>
<td>HDBK</td>
<td>Handbook</td>
</tr>
<tr>
<td>HIC</td>
<td>Hydrographer In Charge</td>
</tr>
<tr>
<td>Hr</td>
<td>Hour</td>
</tr>
<tr>
<td>IDM</td>
<td>Instructional Design Manager</td>
</tr>
<tr>
<td>IHMEP</td>
<td>International Hydrographic Management and Engineering Program</td>
</tr>
<tr>
<td>IHO</td>
<td>International Hydrographic Organization</td>
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<tr>
<td>IPISD</td>
<td>Interservice Procedures for Instructional Systems Development</td>
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<tr>
<td>ISD</td>
<td>Instructional System Design</td>
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<tr>
<td>ISMM</td>
<td>Instructional Systems Management Model</td>
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<td>JTA</td>
<td>Job-Task Analysis</td>
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<tr>
<td>L</td>
<td>Lecture</td>
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<td>LP</td>
<td>Lesson Plan</td>
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<tr>
<td>M5</td>
<td>IHO Manual 5</td>
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<tr>
<td>MGR</td>
<td>Manager</td>
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MH2 ........................................................................................................Military Hydrographer Level 2
MPEG ........................................................................................................Moving Pictures Expert Group
Mp3 ........................................................................................................MPEG Audio Layer 3
NAVEDTRA ............................................................Naval Education and Training Instruction
NAVOCEANO ...........................................................Naval Oceanographic Office
NAVOCEANOINST ..............................................Naval Oceanographic Office Instruction
NETC ............................................................................................Naval Education and Training Command
NMOPDC ......... Naval Meteorology and Oceanography Professional Development Center
OBJ .............................................................................................................Objective
OJT ...........................................................................................................On-the-job training
OPM ........................................................................................................Office of Personnel Management
PDD South ..........................................................Professional Development Detachment South
PE ........................................................................................................Performance Exercise
PPT ........................................................................................................PowerPoint Presentation
Q ..............................................................................................................Question(s)
RQ ..............................................................................................................Review Questions or Research Question
S ................................................................................................................Student
SAT ........................................................................................................Systematic Approach to Training
SKA ......................................................................................................Skill, Knowledge, Attitude
SME ......................................................................................................Subject Matter Expert
STU ........................................................................................................Student
TPP ........................................................................................................Training Project Plan
USM ..............................................................................................The University of Southern Mississippi
CHAPTER I
INTRODUCTION

Education and training professionals use instructional design to create training solutions for organizations with personnel or procedural deficiencies. The complexity of delivering instruction varies not only with the subject matter, but also with the delivery method. The instruction may be delivered via a lecture in a traditional classroom, computer-based instruction, or on-site for industrial training. Regardless of the intended audience, all instructional design models have the same basic purpose: to provide curriculum development teams with a methodical development plan to create training material to fulfill an educational or training need where effective learning is the goal.

The conceptual framework for this study is the application of instructional system design from an instructional design managerial construct. Instructional system design (ISD) is a well-documented system; however, the managerial perspective of the application of instructional design principles and project management coordination of non-curriculum development personnel outside the ISD system made this study unique.

The theoretical approach for this study is systems theory-based due to the systematic nature of the instructional design model. The study was accomplished using single-case study application of qualitative style of inquiry. The case study subject was the Military Hydrographer Level 2 (MH2) course, a new course developed in 2006 for the U.S. Navy. Although the subject of the case study was within a military training environment, the application of the proposed instructional systems managerial model can be applied to the design, development, delivery, and assessment of instructional material in any line of study where quantifiable effective learning is the goal.
The study analyzed the effectiveness of the instructional design management model employed in the creation of the MH2 course. The model began with the basic ISD model and has evolved into a systems theory- and project management-based instructional design model where course development is heavily dependent upon subject matter expert (SME) assistance due to the uniqueness of the desired training. I take no credit for inventing the processes within management model I propose and analyzed with this study. I have, however, conducted extensive research, developed timesaving processes and procedures, and tried many approaches to develop and manage systems-based instruction. The evolution of the model I propose began with my initial ISD training.

Instructional System Design Foundation

Throughout my twenty-year military career, I participated in the application of ISD in many different ways. My first experience with ISD came shortly after I joined the Air Force as a weather specialist in 1981. On the first day of the course, I immediately noticed a difference between a military class and the course work I did in high school and college. Being a new Air Force recruit, I assumed all military technical school instruction was conducted in this manner.

I attended many different training courses in the military and also attended a few training classes in civilian schools as I progressed through my military career. The civilian training varied from contracted training courses on specific equipment to seminar-style management instruction. Although the civilian training was more relaxed, I found it difficult to follow instruction; the instructor methodologies lacked the regimented pattern to which I had become accustomed. It was not until the mid-point of
my career when I became a technical school instructor for the Air Force that I learned the origin and purpose of the regimented military style of instruction.

Military instructors must pass a technical training instructor course before entering a military classroom. The six-week course requires numerous speeches where students develop their own visual aides, written tests, and performance assessments. The course also teaches the “military style” of instruction, the pedagogical standards of how to instruct and manage a classroom, and the basic principles of ISD.

The mechanics of teaching military technical school instruction is taught through an acronym. The acronym, ARLO PAE SRAC, is a story about a man, Arlo, who is ordered to pay Srac. Defining the misspelled acronym: Attention, Recall, Lesson Objective, Presentation, Ask (questions), Elicit (answers), Summarize and Recall (the lesson), Assess, and Closure. This is more appropriately known as the “Nine Events of Instruction” developed by Robert Gagné (1992). Gagné developed the nine steps of instruction between 1949 and 1958 for pilot training courses when he was the director of the Air Force Perceptual and Motor Skills Laboratory (1962a). His nine events of instruction, more specifically described in his 1992 book, *Principles of Instructional Design*, are:

1. Gain attention.
2. Inform the learner of the lesson objective.
4. Present stimuli with distinctive features.
7. Provide informative feedback.
9. Enhance retention and learning transfer.
Gagné’s nine events of instruction are parts of a larger system of instruction design called the ISD process. The Air Force ISD model, also developed for the Air Force by Gagné (1965), is the standardized method of instructional development. According to the 2002 edition of AFH 36-2235, Vol. 10, Information for Designers of Instructional Systems Application to Education, the Air Force ISD model has five steps:

1. Analyze system requirements.
2. Define education and training requirements.
3. Develop objectives and tests.
4. Plan, develop, and validate instruction.
5. Conduct and evaluate instruction.

The five steps listed above appear slightly different in the Air Force ISD model provided in the same reference (Figure 1). The fifth step, “Conduct and evaluate instruction” appears to be a combination of “Implementation” and “Evaluation” phases. Evaluation, as it applies to conducting instruction, varies slightly from inter-phase evaluation implied by the illustration. Evaluation in Figure 1 should be interpreted as evaluation of horizontal consistency. The middle ring of the model represents the four groups involved in course support: management, support, administration, and delivery. The figure implies management is primarily involved with analysis; support represents assistance from instructional design specialist and SMEs; administration involves the curriculum developers; and delivery represents the classroom instructors. All course-related actions and decisions must be conducted within the constraints defined for the course such as subject, location, course capacity, and available funds.
The five steps of ISD represent an almost natural method of developing instruction. Air Force Handbook 36-2235 states, "Even if there were no ISD process, a logical, sequential process is needed to tie planning, development, execution, and evaluation together. This systematic process is what any good curriculum developer or instructor accomplishes, consciously or unconsciously, for course planning" (2002b, p. 5).

Through the next four years of instructor duty, I had many opportunities to rewrite portions of existing courses and develop new areas of instruction. To prepare for these projects, I attended several ISD-focused training classes to include: developing test and measurement procedures, writing criterion-based objectives, and formulating advanced ISD principles. The final duty assignment of my Air Force career was once again in training, this time as the manager of training for enlisted meteorology courses. The primary responsibility of a training manager is to ensure courses are developed properly to meet the requirements of the Air Force weather mission and its enlisted personnel. The
mission of the Air Force weather service was undergoing a top-to-bottom reorganization that completely changed weather training of its enlisted personnel. Senior Air Force weather leadership orchestrated the reorganization and I was part of the training team assigned to assist the leadership in assessing and developing new training requirements based on the newly reorganized Air Force Weather Agency. These new training requirements were developed into a new line of meteorology courses to train enlisted personnel in the new weather support agency.

I developed an extensive knowledge of ISD throughout my 20-year military career as a student, instructor, curriculum developer, and as a training manager. It was logical to follow my interest in ISD into my post-military career following my retirement in 2001.

Evolution of the Instructional Design Model

My post-Air Force career started at the Naval Oceanographic Office (NAVOCEANO) as a curriculum developer in 2002. The organization is responsible for developing and applying U.S. Naval oceanographic technology in support of the Department of Defense (DoD) and U.S. national and international interests. Oceanography is academically divided into four science disciplines: chemical, biological, geology and physical. The NAVOCEANO organizationally divides oceanography along functional lines of acoustics, bathymetry, physical oceanography, geophysics, and hydrography. This oceanographic-based information is further refined to support U.S. Naval capabilities. Hydrography is the science of charting the ocean floor, rivers, or lakes primarily through acoustics to promote safety of maritime navigation. Hydrographic curricula focuses on areas of acoustics, geodesy, bathymetry, precise positioning with
global satellites, tides, marine geology, oceanography, meteorology, marine cartography, international law of the sea, nautical science, mathematics, and statistics.

The first course in which I was assigned to work was the International Hydrographic Management and Engineering Program (IHMEP); a six-month course for international Naval officers studying hydrography, is sponsored by the U.S. State Department and taught at NAVOCEANO. The 26-week program operates under the international certification granted by the International Hydrographic Organization (IHO) to NAVOCEANO for curricula that meets the IHO's international standard for hydrographic training and education at the Category B level. Category B level hydrographic training is equivalent to undergraduate-level science courses and is focused on promoting international surveying studies and standards for career hydrographers. The University of Southern Mississippi (USM) offers a graduate-level, IHO Category A certified course, where graduates earn a Master's of Hydrography degree.

The IHO academic board controls the curricula for both Category A and B level courses. The board establishes minimum international hydrographic competency standards based on the current technology available to global hydrographers. Although the IHO mandates the competencies that are taught, the method in which they are taught is at the discretion of the certified education/training organization.

My involvement with IHMEP was initially limited to ensuring the classroom material was epistemologically sound. I began the task by reviewing the instructional design, the IHO requirements, and organizing the course into ISD phases, illustrated in Figure 2. Next, I started with collecting classroom material presented by NAVOCEANO and contracted instructors and other subject matter and evaluating it against the Category
B competency standards. I also reviewed each examination administered in the course and evaluated its validity against the IHO standards and the stated course objectives. Inadequate or incomplete requirements were reported to the education and training division director for resolution.

Figure 2. Author’s interpretation of ISD Model instructional design details related to the IHMEP in 2002.

In February 2002, I was asked to assist in developing a new introductory hydrography course to for NAVOCEANO staff support members, new employees, and summer intern college students. The Hydrography Department director wanted the course to have basic theory, hands-on portions and cover the entire hydrographic process emphasizing quality. The director stated the course needed to be ready by the middle of June and not exceed 10 days.
I formed a committee of four senior SMEs, each with 20 or more years of hydrographic experience. Before we began designing the course, I described an overall development plan in the form of an ISD model (Figure 3) on a classroom white board, using common terminology to avoid confusion with training profession terminology.

![ISD Model](image)

**Figure 3.** Recreation of the Introduction to Hydrography Course ISD Model.

Once the committee understood the purpose and direction of the project, we began to identify introductory level competencies and potential SMEs to assist in the development of the competencies. By the conclusion of the meeting, we had completed the first phase of ISD, Analysis of Requirements, by documenting the purpose of the course, the course goal, and identifying the target audience. We also initiated the second
phase of ISD, the identification of the training requirements, by listing the desired hydrographic competencies in the course training task list (CTTL).

The second phase of ISD was completed in a second meeting with the same group of SMEs. I asked the group to review the list of objectives I drafted from the CTTL, as well as a rough draft of the course schedule. The objectives were written using Bloom’s **Taxonomies for Cognitive and Psychomotor Skills** (Bloom and Krathwohl, 1956) and the course schedule was loosely organized and similarly to that of IHMEP. The senior SMEs approved the objectives, part of the third phase of ISD, and course schedule after a few minor clarifications.

The second half of the second phase of ISD, preparing tests, began through the coordination with the SMEs and their supervisors. This phase of the curriculum project requests worker-level SMEs to develop and/or revise the curriculum during their workday, which requires prior approval from their supervisors. Some supervisors readily approved and exhibited an interest in the project. A couple of supervisors disagreed, thereby requiring additional SMEs to be identified. The third project meeting included the original group of senior SMEs combined with the second group of 12 SMEs who would be developing the course materials. I provided an overview briefing of the project and examples of curricular materials they were to produce for the course. During the meetings, I asked them to provide a minimum of 10 multiple-choice questions for each of their assigned objectives and to write an outline-format lesson plan. The outline-format lesson plan contains more detail than a normal bullet-text outline. The purpose is to provide enough detail in the outline so that another SME could instruct from the lesson plan. Initially the SMEs seemed reluctant; however, the senior SMEs assisted in
emphasizing the importance of the task and answering technical questions that were beyond my comprehension. A verbal deadline of two-weeks was established for written questions at the conclusion of the meeting.

The third phase of ISD (Plan, Develop, and Validate Instruction) overlapped part of the third phase with tasking the SMEs to develop lesson plans. My plan was to have my coworkers assist in the review and validation of the submitted tests and lesson plans. The development and validation portions of the fourth phase became increasingly difficult as SMEs failed to meet deadlines and supervisors rescinded their original permissions. I attempted to keep the project on track by working with the struggling SMEs individually and extending deadlines. These extensions required valuable time be reallocated away from the review and validation of submitted materials. The redirection of SME manpower away from the project was due to its low priority.

The delivery of instruction to the initial class signified the beginning of the fourth phase of ISD: deliver and evaluate instruction. The course was conducted on time as requested by the Hydrography Department director although some course materials were significantly less developed. The students were asked to provide course feedback on a simple, five-point Likert-scale and the results were briefed to the department director following the course. The department managers and director were impressed with course noting they, “...had tried to create an intro course such as this since 1992” (Higgins, personal communication. June 15, 2006).

The course was made possible through the employment of ISD principles and the diligent work of the SMEs; it is unfortunate the course was only offered twice in 2002.
The plan was to offer the course again the following spring; however, an operational need with a higher priority soon consumed the limited training resources.

A small, hydrographic team composed of junior military officers from the newly established Fleet Survey Team (FST), a division within the Hydrography Department, was surveying in summer of 2003. The team leader was a Category A graduate from the USM Master's of Hydrography course. Unfortunately, he was the only team member with any formal hydrographic training and the team suffered with a number of survey difficulties, most stemming from the lack of competently trained personnel. The survey was a lesson learned and action was quickly taken to remedy the situation.

The NAVOCEANO Commanding Officer (CO) was coincidentally returning from an overseas trip where he visited the United Kingdom's (UK) 12-week Category B course when he learned of the FST survey. The CO tasked our training office to develop a 12-week, certifiable Category B course for NAVOCEANO civilian and military personnel with the first class to be conducted within six months. The tasking mandated the course design, course objectives, target audience, course length, and delivery date. Skipping ISD phases may sound like a time saving idea, but it is frequently disastrous. Rothwell warns, "If this step [Analysis] is not handled well, the training cannot be effective" (2006, p. 5.). Figure 4 illustrates how the order essentially removed both analysis and design phases from the ISD model process.
Figure 4. Author’s interpretation of the ISD Model of the Operational Hydrography Course without Analysis or Design Phases.

The development of the Operational Hydrography course was a turbulent experience. At the time, I was the newest member on the training development staff but my training development experience was equal to that of the training division director. The other three members on the training staff were primarily senior surveyor SMEs who had not surveyed in a number of years. Other than director and myself, there was virtually no formal course development experience on the staff. The director transferred a few weeks after the tasking and the position remained vacant for several months. Although I was by far the most junior member on the training staff, the task of orchestrating the course development was ultimately mine.
Most of the Operational Hydrography course was assembled from existing information; however, a portion had to be developed due to changes in the IHO standard and NAVOCEANO unique surveying requirements. The class began on time as directed, but it had multiple problems. The course was difficult to develop under the mandated restrictions because it required the curriculum development team to squeeze 26-weeks of IHMEP material into the 12-week Operational Hydrography course.

The IHO requires hydrographic courses seeking the Category B certification to contain 345 competencies (plus or minus a few depending upon which optional focus area is selected). In order to complete instruction in all Category B objectives in the 12-week Operational Hydrography course, the course had to average nearly six objectives a day; nearly one objective an hour. The number of cognitive objectives and limited class time did not allow the students' time to study and master the objectives. The fast-paced course also severely limited the time students could spend with the equipment.

The students heavily criticized the course citing it as a, “fire hose of information;” another described it as, “death by PowerPoint.” A second iteration of Operational Hydrography was conducted in September 2004 and ended with similar criticisms from the attendees. The new training supervisor cancelled the third iteration of Operational Hydrography course, scheduled for January 2005, due to lack of participants. The decrease in students was due, in part, to the downsizing of the Hydrography Department through voluntary early retirements in late 2004; however, the tempo of NAVOCEANO operations and survey commitments did not change. The increased workload and survey commitments on department personnel severely limited the availability of SME instructors and students.
An important lesson learned from the failure of the 12-week Operational Hydrography course is not to allow the customer, in this case senior management, to dictate the course development variables. Another lesson is to ensure clear communication of the training development task and its consumption of resources. The organization needed a hydrographic training course to correct an operational problem; however, it is unclear if senior management understood the degree of difficulty inherent with a Category B course due to the transferal of the single point of contact. Another lesson learned is not to assume a simple solution. There are far more significant differences between the 26-week IHMEP and the 12-week U.K. Category B courses than just time.

Prospective UK Category B students spend two years aboard Royal Navy vessels prior to attending the UK Category B course. The two-years of nautical experience and documented qualifications allowed the UK course to waive many of the IHO requirements, thus reducing the Category B requirements to 12-weeks of training. The Operational Hydrography course students were newly assigned personnel without any prior qualifications or preparatory training.

The apparently easy solution viewed by senior management essentially skipped the analysis phase of ISD. Instructional design professionals know that when organizations skip the analysis phase of ISD and try to jump right into designing a course, they frequently encounter problems later in the design or delivery of the course (Rothwell et al., 2006., p. 10).

The next course I was asked to assist in developing was a NAVOCEANO shipboard position training and certification course for Data Managers in July 2004. Data
Managers are personnel who, as part of the survey team, are responsible for the collection and storage of all forms of data collected by the ship survey equipment. They are also responsible for maintaining the currency of the software for the various computer systems onboard and the maintenance of the shipboard network systems. Three Data Manager SMEs without course development experience were attempting to develop the course but experienced difficulties. The lead SME requested my assistance barely a week before the class was to depart on a NAVOCEANO ship. The request for assistance was a significant challenge because it was too late to change the design or development strategy, but I could help with the implementation phase. Figure 5 illustrates the instructional design situation of the 2004 Data Manager course.

Figure 5. Author’s ISD interpretation of the 2004 Data Manager Course Illustrating Missing Analysis and Design Phases.

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Personnel designing the training attempted to define the training need in terms of Data Manager duties. The instructional strategy was to conduct both lecture and hands-on exercises while underway onboard a NAVOCEANO vessel. The course curriculum consisted of PowerPoint presentations and a few outlines for the students to follow. There were no lists of objectives, quizzes, tests, or hands-on exercises. The situation was even more difficult because there was no official description of Data Manager duties and responsibilities.

I asked the SME team the specific responsibilities of Data Managers in order to initiate a list of competencies. Learning objectives were developed from the competencies and written and performance tests were developed to measure the students’ mastery of the presented material. The SME team and I began documenting competencies for other shipboard positions for possible publication and development of additional training courses. By the end of the week training, the SME team and I drafted a shipboard duties and responsibilities document. This document was later adopted by NAVOCEANO survey operations and approved in May 2005 as an official instruction called NAVOCEANO Instruction 12430.5, *Field Position Descriptions and Assessments*.

The SMEs team learned the basics of good instructional design and the importance of having an instructional specialist design training. The SMEs may be experts at their respective jobs, but if they do not know how to effectively develop training, the result could be disastrous. One significant success from the course was the development of the NAVOCEANO instruction standardizing specific duties and responsibilities for each of seven survey crew personnel positions. This instruction is the source document for many NAVOCEANO survey crew training courses.
The success of the Data Manager course led to a job offer from one of the SMEs. I accepted an offer to create and manage the Hydrography Department Employee Development Program with the contingency that I be granted the authority and freedom to design and develop training courses according to my instructional design methodology. My first project was to develop a training plan to create training and certification courses for each of the NAVOCEANO shipboard positions beginning with the positions typically filled by hydrography department personnel.

The first shipboard training course developed using the new instruction was the Lead Bathymetrist training and certification course, Figure 6. The Lead Bathymetrist is responsible for multibeam sonar calibration, survey planning, quality data collection assurances, and verification of bathymetric data in ocean depths 200-meters or greater.

Figure 6. Author’s ISD Design of the Lead Bathymetrist Course Developed in 2005.
The course prerequisites and experience requirements were identified during the analysis phase and established as the student selection criteria. During the design phase, I identified, received supervisor approval, and divided the competencies among 22 SMEs, each working part-time, within the department—each selected by their expertise. Project management techniques were employed within the design phase due to the large number of developers and the size of the project.

The Lead Bathymetrist course was the first course developed for NAVOCEANO using project management and quality assurance techniques. The assessment of course training tasks included process mapping of all tasks for which the Lead Bathymetrist is responsible while underway and the NAVOCEANO governing instruction specifying the duties and responsibilities. The combination of these two resources enabled a detailed list of training competencies to be documented. This list was reviewed by several qualified Lead Bathymetrist, then approved by senior management.

The SMEs were selected and assigned various course elements to develop based upon their specialties. To enable the SMEs to quickly develop course material in the desired format, course templates were developed for the student workbook, lesson plans, written tests, and hands-on performance exercises. The SMEs received training in how to properly use the templates prior to them beginning their course development. Each objective was divided into individual elements for the SME to develop to facilitate the SMEs in understand their development responsibilities and progress. Each objective was divided into tasks: lesson plan, workbook, review questions, multiple-choice questions, PowerPoint presentations (if needed), and performance exercises. Each element was
given a percentage based upon the estimated magnitude of effort to complete the tasks for the objective. Each SME received feedback as to his/her progress and course deadlines.

The development phase began to slow due to SMEs withdrawing from the project for various reasons; management excused some, while others were not. The decrease in the SME manpower continued until the estimated completion date exceeded the course delivery date. Management was kept informed during the depletion of the SME pool and was forced to assign five personnel full-time to the development of the course. Although some of the SME expertise was missing, the full-time curriculum developers were able to complete their assigned objectives in time.

One of the new items incorporated into the Lead Bathymetrist course was the inclusion of the performance exercises, also known as checkrides, for shipboard equipment evaluations. The term checkride is an aviation term commonly used to describe in-flight evaluation of aircrew members. The design of a shipboard checkride is similar to a checklist with “go” or “no-go” columns. As the trainee progresses through the necessary steps, the evaluator checks whether or not the trainee can accomplish each step. The total number of successful steps divided by the total number of steps provides an objectively determined percentage documenting the task was successfully completed. The purpose of the checkrides is to eliminate subjective, hands-on evaluations and to provide objective source documentation for the trainees’ training records. The checkrides could also be used in annual recertification intervals to ensure the surveyor is maintaining his/her skills. The checkrides were developed for the course to document the hands-on certification of Lead Bathymetrist competencies as prescribed by NAVOCEANOINST 12430.5.
The initial Lead Bathymetrist course was successful. However, it almost failed due to the number of SMEs who “backed-out” or were relieved of their commitments. An important lesson learned is to obtain SME commitment from management in writing. And, when SMEs withdraw from the project, ensure management replaces them before they are released from the project. Even though the project management techniques were effective, specific details in curricular development estimation still needed to be resolved to more accurately estimate curricular development time. This estimate of commitment became more pressing as NAVOCEANO personnel continued to decrease.

A restructuring of the organization in March 2006 resulted in the transition of all training responsibilities for NAVOCEANO personnel to the Naval Meteorology and Oceanography Command Professional Development Center (NMOPDC) and terminated the training position in the Hydrography department. I transferred to the NMOPDC as a result of the reorganization and immediately began developing the next NAVOCEANO shipboard survey position training course, the Survey Watchstander.

The Survey Watchstander is the entry-level surveyor position onboard NAVOCEANO survey vessels. The course was developed at the request of the deputy director of the Survey Operations department for the purpose of training new employees. I created a list of Survey Watchstander competencies based on NAVOCEANO instruction 12430.5, Field Positions and Assessments. Since I was the only instructor in NMOPDC with NAVOCEANO oceanic surveying experience and understood the duties and responsibilities of the Survey Watchstander, I designed and developed the course.

Course development was a combination of modification of existing material and development of new materials. To stay focused and to negotiate the course delivery date,
I used the course development tracking tool I designed during the Lead Bathymetrist course. I organized the course training objectives into units and subdivided the units into sections. Each objective is then divided into its components to facilitate estimation of magnitude of effort required for each objective. The end product of this process is a custom-design instruction module that includes instructor lesson plans, visual aids, written and performance tests, and a student workbook with review questions. Table 1 illustrates the average level of effort for each objective component based on personal experience.

Table 1.

Curriculum development estimation of effort.

<table>
<thead>
<tr>
<th>Objective Component</th>
<th>% of Total</th>
<th>Development Estimation (in Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written Test (WT)</td>
<td>10%</td>
<td>2.0 hours (for 20 multiple choice questions)</td>
</tr>
<tr>
<td>Performance Test (PT)</td>
<td>10%</td>
<td>2.0 hours (if required)</td>
</tr>
<tr>
<td>Lesson Plan (LP)</td>
<td>40%</td>
<td>20.0 hours per hour of lecture</td>
</tr>
<tr>
<td>PowerPoint slides (PPT)</td>
<td>20%</td>
<td>5.0 hours per hour of lecture</td>
</tr>
<tr>
<td>Workbook (WB)</td>
<td>10%</td>
<td>2.0 hours per hour of lecture (merging LP and PPT)</td>
</tr>
<tr>
<td>Review Questions (RQ)</td>
<td>10%</td>
<td>1.0 hour</td>
</tr>
</tbody>
</table>

An additional measure developed during the Survey Watchstander course is the curriculum development-tracking tool. I created the tracking tool for three purposes: first, to determine the curriculum development in total hours. The total hours can also be divided among SME specialties to estimate the number of hours of curricular development assistance to request from SME supervisors. The second purpose, to estimate the number of course development days, employed a variable contingent upon the number of curriculum developers/SMEs and the amount of pre-existing material. The third purpose was to monitor the development of individual objectives and the course as a
whole. Individual objective tracking enables the team-leader to monitor individual developer’s effort and documents the justification for additional manpower if necessary. The statistical output also provides a detailed, quick summary of course development progress. Senior management of any organization expects updates as to project completion, our organization requires weekly updates concerning the progress of courses under development or revision. Resource conscience managers prefer quantitative statements of project completion to nebulous qualitative phrase such as course development is progressing “well” or “it’s doing fine.” I developed the course development chart seen in Figure 7 to summarize course progress information.

![Survey Watchstander Course Development](image)

Figure 7. Author’s Survey Watchstander Course Development graph representing the 14\(^{th}\) day of development, where the course is 80 percent complete and approximately 7 days ahead of schedule or 25.6 percent ahead of projected development schedule.

The development of the Survey Watchstander course was completed on time as indicated in Figure 8, but the timing was close. Course development, much like any other
project, seems to require more effort toward the end in order to complete the project than it logically should. I call this effect “The 90 Percent Rule” where it seems that 90 percent of the effort is spent completing the last 10 percent of the course. Course development appeared to slow during the last seven days due to quality control review of material and student workbook assembly. Inclusion of these tasks in the course development estimate process will be beneficial in terms of resource management and SME scheduling.

**Figure 8.** Linear programming of projected course development (straight line) provides a quick estimate of timing, but it does not adequately represent the true course development effort. The actual development of the course (top line) was completed on schedule.

The Instructional Systems Management Model

The proposed instructional systems management model (ISMM) is the result of my instructional design experiences developing oceanic and hydrographic surveying courses for NAVOCEANO and FST. Although the model was developed for the military training environment, the management model can be applied to commercial training
projects, any post-secondary education course and employee training for any size
corporation. The model is considered to have two separate, but interconnected systems,
the ISD system and the instructional design management system.

The core of the ISMM (Figure 9) is the ISD model where the five phases of ISD
are executed. Concurrent with the ISD model are the three instructional design related
management areas that represent the different phases for responsibility of the
instructional design manager (IDM). The two levels of the model are interconnected
because the requesting organization cannot design and develop the class without the
IDM. Similarly, curriculum developers cannot develop without the customer analysis
conducted by the IDM. Further, the instructors cannot instruct without the IDM planning
and coordination of resources to develop the material, and the identification of student
entry requirements. In other words, the ISD system interacts with the ISMM to identify,
organize, develop, implement, and evaluate course-related decisions in effort to deliver
quality training in support of the requesting organization. The success of course design
and development is directly related to the ability of the IDM to implement ISD through
the ISMM. The following description of the model is presented from an IDM perspective
and includes terminology used by Navy curricular design and development specialists.
Instructional systems design for training courses is normally accomplished by the course development team leader, one or two training specialists with the assistance of numerous support personnel, and SMEs with expertise in the subject matter. The management of course development—from initial customer requirement determination through implementation, evaluation, and analyses of the pilot course—is the responsibility of the IDM. The manager guides new course development through three ISMM phases:

1. Customer Training Requirements Management
2. Curriculum Development Management
3. Classroom Implementation Management
Customer Training Requirements Management

The first phase of ISMM is the assessment and analysis of customer training requirements. The IDM meets with the management or a management designee of the requesting organization to analyze and identify the training needs of the employee and to understand the duties and responsibilities of the trained employee and the manner in which they will fulfill an organizational need. Figure 10 illustrates the three objectives the development team leader must accomplish in this phase.

Figure 10. Customer Training Requirements Management Phase illustrating the different sources of information the IDM must consider in developing training requirements for course development.

My experience with organizations requesting training is the organization recognizes it has a deficiency in its performance, but it does not know how to conduct a thorough job-task analysis (JTA) and or a training needs assessment to identify the necessary competencies or skill sets to be trained. Job-task analyses are extensive and expensive processes—workers document every task they perform on the job, frequencies of task are calculated and criticality of each task is determined. The process normally
includes lengthy analysis by commercial skill analysts in order to produce a lengthy document of job-tasks from which training courses designed and developed. When the requesting organization does not have the time or funds for an extensive JTA, I use a simpler approach I developed to determine the list of competencies to include in the requested course. My approach to determining training requirements is much quicker than the JTA and is proven to work. Regardless of whether the request for training is for a single skill-training seminar or a lengthier course designed to provide a full set of skills for a specific position within the organization, the Funnel Approach (Figure 11) is a quick method that works well.

![Figure 11. The author’s Funnel Approach to job-task analysis. The approach is designed to be an effective, time-saving alternative to the lengthier job-task analyses process.](image)

The Funnel Approach begins with a macro view of the organization to assess how the requested training will support the organization in its current state or facilitate the fulfillment of a long-range strategic goal. Second, I analyze the major processes of the
organization related to the requested training to develop an understanding of the roles and responsibilities of the target training audience and other personnel. I then create a process map illustrating the job, its individual tasks, and the interactions of personnel through the process. I ask SMEs from the organization to review the process and identify the required competencies the target training audience needs in order to accomplish each task. The result is a list of competencies to be included in the requested training. The next step is to determine the proficiency level for each competency individually or for the entire set.

The IDM must also determine the level of proficiency at which the training is to be conducted such as introductory, intermediate, or advanced. The IDM collaborates with the customer in developing a detailed list of objectives based on the competencies and proficiency levels specified by management. The IDM drafts a list of objectives and incorporates them into the course development tracking spreadsheet. The spreadsheet is modified to reflect any pre-existing material to reduce the overall course development estimate. Once complete, the spreadsheet provides an estimate of the number of hours required in developing the course. This estimate is used to determine if resources are available to pursue course development. If resources are available, then the estimate is used to negotiate for SME assistance to develop the course and the anticipated course implementation date.

Once management of the organization requesting the training approves the list of objectives, the list is then referred to as the CTTL, a Naval Education and Training Command term defined by the course development manual NAVEDTRA 130A, page 3-3. The CTTL is the guiding document used in determining the magnitude of course development efforts. The CTTL is used to determine the number of curriculum
developers and SMEs needed in the curricular development process. The CTTL is used to develop the training project plan (TPP). The NAVEDTRA 130A, page 2-3-1 specifies that the TPP documents the mission of the course, the justification for development, any safety risks, the curricular development method, resource requirements, and course development milestones. Output from the first phase are the TPP and CTTL, both documents are critical guiding documents for the curricular development team.

Curriculum Development Management Phase

Curriculum development refers to the development of curriculum for presentation in the classroom. Management of the curriculum development phase, Figure 12, begins with the approval of the TPP and the CTTL documents in the ISD analyses step. These two documents guide the design and development of the course material within the project timeline.

Figure 12. Curriculum Development Management Phase representing the design and development areas of responsibility. The outside resources that IDMs must consider are mandatory guidance and the inclusion of training support from SMEs.
The design step of ISD begins with selection of instructional strategies. The strategy selected is dependent upon the purpose of the course, the intent of the objectives, resources available, and existing instruction or material. Most oceanic and hydrographic training courses consist of classroom lectures, field exercises with equipment, and computer-based training on job-related software due to the relative ease of course development. Other strategies such as Internet-based, videoconference, and self-paced training are normally not used for initial pilot course due to the extensive development time and expense required for development. Migration of well-established classroom courses to web-based instruction is a possibility providing the courses do not contain performance objectives requiring equipment operation.

The IDM is responsible for developing a curriculum development plan and assembling a curriculum development team of developers and SMEs. The project management-related techniques I use ensure the curriculum development staff and SMEs understand the course development plan and meet all development deadlines. I begin by creating a work breakdown structure (WBS) from the CTTL and estimating the amount of time required developing the course material. The first step in creating the estimate is to determine what material or other instruction sources exist.

The manager and other curriculum specialist research government holdings of pre-existing training material, commercial vendors and university sources. Government agencies frequently share instructional material because government produced material is not subject to copyright restrictions. If non-government produced material is required for the course, appropriate copyright permissions are required. As the development team gathers pre-existing materials, they are reviewed to ensure their validity in accordance
with guiding instructions and manuals and that it meets the course objectives. Once the review is complete, I create use the WBS and estimate the time to develop the material, the amount of manpower needed, and an estimate of production costs.

The WBS is created from the behavioral objectives listed in the CTTL. I like to break the objectives into their individual components—written tests (WT), performance exercises (PE), lesson plans (LP), PowerPoint presentations (PPT) and/or visual aids, and the student workbook (WB) which includes writing the student material, review questions (RQ) and workbook assembly. The total number of components required for each objective may vary slightly because only skill-related performance objectives require performance exercises to measure the students’ mastery of the hands-on skill and not all objectives require PowerPoint presentations. The objectives and their required elements are then entered into a WBS, Figure 13, for time estimation. I use Microsoft Excel to build the WBS to facilitate time calculations.

<table>
<thead>
<tr>
<th>CTL</th>
<th>Reference</th>
<th>Objective</th>
<th>SME</th>
<th>OBJ (SKA)</th>
<th>WT Q</th>
<th>PE</th>
<th>LP</th>
<th>PPT</th>
<th>RQ</th>
<th>WB</th>
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<tbody>
<tr>
<td>#</td>
<td>Objective</td>
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*Figure 13.* The first three lines of a WBS created by the author for new course development. Time estimates referenced are based upon the author’s experience and are detailed in Table 1.

Once the WBS is assembled, I meet with SMEs, instructors, and curriculum developers to develop course lecture estimates. The SMEs and instructors review the objectives listed in the CTTL and provide estimates as to the length of time required presenting the objective. This estimate is reviewed and revised if necessary. The estimated lecture hours serve two purposes—as a partial estimate of course length and as an estimate as to the amount of time required for course development. The length of the
estimated lecture affects the time estimate to develop LP, PPT, and the WB, while the
WT, PE, and RQ tasks tend to be consistent. The other portion of course length
estimation is the allowance of time for course introduction the first day, test
examinations, demonstration, and performance of hands-on skills and graduation. The
WBS provides total time estimation for development of curriculum, a portion of which
may require SME assistance to develop. I use the WBS development estimates to request
SME assistance in man-hours for course development. At this point the curriculum
development team is ready to begin development.

I schedule the development of course material with the goal of meeting the
requesting organization's desired delivery date with additional time set aside for quality
control of the curricula, and when possible, five working days for contingency purposes.
To effectively manage the development of the course, the IDM must be able to control
the development of course material. All projects must have a development plan and be
able to determine the progress of development against the plan (Lewis, 2007, p. 34). To
accomplish the development of a course, I use the WBS of the CTTL to plan the
development schedule and arrange the development of the objectives into an achievable
sequence, as demonstrated in Figure 14. To measure the progress of development of the
course, I assign development effort values to each of the behavioral objective elements.
The objective column alerts the curriculum developers as to what type of WT questions
to write and whether or not a PE is required. The gray boxes in CTTL objective 12.4,
12.5 and 12.7 indicate which of the elements that are not necessary to the develop for the
objective.
Figure 14. Sample of the author’s course development tracking schedule illustrating five objectives in Unit 12. Two SMEs have completed three of the five objectives in Section 12.1 and the other two objectives are each 40% complete.

I devised a method of tracking the progress of course development by using the percentage complete column from the course development-tracking schedule. I total the percent complete for all behavioral objectives in the course, then divide by the total by the number of objectives to produce a percentage of the total course complete. This figure is entered into a series formula in Microsoft Excel to produce a graph charting the course development progress. I schedule the development of the course by estimating the percentage of course development per day throughout the development period. The actual course development is compared to the estimated course development on a daily basis; an example of my course development-tracking chart can be seen in Figures 7 and 8.

Deviations from the plan are carefully monitored for possible activation of contingency actions. If the actual development progress is five percent behind the planned development, I determine if the developers and SMEs are not devoting the appropriate amount of development time to the project. If development is 10 percent behind schedule, I ask for additional manpower. If development is 20 percent or more behind, I replan the course development and/or negotiate for a later course delivery date.
The first step in the development phase is to design the necessary assessment tools for the course. This phase includes multiple-choice tests for formative and summative evaluations, review questions for the student workbook, and performance tests. First, the tests are written to focus on the most important knowledge, tasks, or procedures associated with each objective. After the assessment tools are developed the next step is to develop the material for the student workbooks.

Student workbooks are a necessity in the classroom because they provide the student a mechanism in which to follow the lectures and exercises. I have experimented with several versions of student workbooks and have discovered that students prefer a well-developed workbook written in paragraph form with relevant review questions at the end of each unit. I developed Microsoft Word templates to promote a consistent appearance throughout the workbook. If pre-existing materials are selected for an objective, the materials are reformatted to complement the appearance of the workbook. If pre-existing materials are not available, the SME develops materials from appropriate references.

The next step is the incorporation of visual aids, which are carefully selected to enhance and reinforce the lecture. Some visual aids are available from reference sources, while others are created. Visual aids are often PowerPoint slides; nautical charts are also used; and, survey equipment is also incorporated as visual aids—if it is available and small enough to carry into a classroom. When the visual aid slides are complete, relevant imagery and diagrams are inserted into the text to complete the workbook.

The next item to develop is the instructor LPs. The LPs are easy to develop because they are truncated versions of the student workbook text and are outlined
following a template for consistency. The length of the LP is important because it assists the instructor in pacing the length of the lecture. An extemporaneously speaking instructor can deliver approximately five to six pages of text each hour of lecture. The LP should focus on the most important points of the objective and be proportionately represented on quizzes and written tests.

The final step in developing the workbook is the student feedback form. I developed a five-point, Likert-scale assessment instrument to elicit student impressions of course material, instructor presentation, and condition of equipment and facilities for each terminal objective area. This evaluation is normally a subsection of a larger unit of instruction. There are also a few short answer questions asking the students to specifically list items not required, missing, or should be deleted from the course. The feedback form is included within the binding of the workbook to facilitate the students’ immediate assessment of the course while it is in progress. The form is introduced during the first hour of class and instructors routinely remind the students to keep their feedback forms up to date throughout the length of the course.

Reproduction of student workbooks is normally accomplished with in-house resources for pilot courses—providing the class size is small and the student workbook and other materials are within office resource capabilities. Editing, printing, and binding of the student workbooks are tasks accomplished by the curriculum development team. Changes and corrections identified in the pilot course are made shortly after the conclusion of the course. Subsequent course materials are mass-produced through government-printing services. The focus of management then shifts to the classroom after all course materials are printed and ready for the students.
Classroom Implementation Management Phase

The classroom implementation phase marks the transition of management of course development to implementation and includes ISD steps of implementation, evaluation, and post-course analyses as illustrated in Figure 15. External training supports resources of curriculum development; SMEs may also serve as instructor support resources during the pilot course. Experience has shown that not all SMEs enjoy teaching and additional instructor support must be drawn from the curriculum development staff or from the requesting organization. Coordination for instructor support from organizations outside the managerial control of the IDM must be executed well before the implementation of the course. It is best to secure instructor support commitment in writing to avoid implementation interruptions.

![Classroom Implementation Management Phase diagram](image)

*Figure 15.* Classroom Implementation Management Phase diagram illustrating instructional design management responsibilities in the delivery of the course to the target audience, evaluation of the instruction, and coordination of instructor support.
The IDM is responsible for organizing pilot course classroom instruction, to include instructor and equipment support and for ensuring instructors are properly prepared and ready to teach the class. Instructor staffing for pilot courses we develop are normally filled by both the curriculum development team and SMEs. The instructional strategy implemented during pilot courses for our organization is for the SMEs to teach their pilot course material while NMOPDC instructors listen and study the material for future instruction. This strategy is not possible in every new course being implemented due to the limited NMOPDC staff and the degree of difficulty and prerequisite knowledge required.

Prior to the first day of class, the IDM conducts a final team meeting with all instructors to review teaching responsibilities, classroom pedagogy, administrative policies, emergency contact numbers, and to identify any conflicts. I usually tell the new instructors the story of ARLO PAE SRAC and Gagné’s nine events of instruction during this meeting to give the SMEs an introduction to pedagogical styles. I also explain that classroom instruction is not only important to the course, but in supporting larger systems of personnel qualifications and mission accomplishments. And perhaps most importantly—to have fun.

Evaluation is the next step in the ISD system and begins simultaneously with the delivery of instruction. Evaluation occurs at many different course levels, including pilot course monitoring by the IDM, evaluation of the students, evaluation of the course by the students, and evaluation of the course posthumously by the customer through supervision of the graduate.
When the class begins, the IDM or designee monitors the course to ensure the instruction is executed as designed and to provide general pedagogical guidance. The IDM maintains contact and closely manages the class progress and ensures the smooth sequence of instructors. Additionally, the Naval Education Command mandates extensive, pilot course documentation requirements in NAVEDTRA 130A, Vol. 3. These documentations include: LP, trainee guide (workbook), tools and equipment, support materials, media quality, instruction accuracy and adequacy, and testing evaluations.

Course evaluation occurs at four different levels according to Kirkpatrick (1998), student reaction to the course, student learning, behavior (job transfer), and results (long-term retention of learning). The student reaction is captured with the student feedback form included in the student workbook to facilitate students’ immediate detailed reactions to course material through administering post-course surveys where details atrophy with time. Student learning is assessed through classroom interaction, workbook reviews, end of unit quizzes, and summative multiple-choice exams. Pre- and posttests are used to baseline the class at the beginning and to assess net cognitive gain as a result of the course. The pre-verses posttest delta has proven to be an effective statistic to brief to senior management. Psychomotor assessments are performed during hands-on demonstrations and performance exercises. Summative evaluations are accomplished “one-on-one” with the student trainees with objective performance evaluation checkrides. The final two Kirkpatrick evaluation levels, job transfer and long-term results, occur in the post-course analyses.
Completing the Circle: Fulfillment of the Customer Training Requirements

The first iteration of a new course is complete when a post-course result briefing is given to the customer during the ISD analyses step. The briefing given by the team leader to the management of the requesting agency includes input from student feedback, student performance scores and instructor assessments to quantify the performance of the course. The IDM also provides the NMOPDC leadership a more detailed instructional design, focused briefing.

Graduates and supervisors are surveyed a few months after the course to assess the third Kirkpatrick evaluation level, behavioral changes (transfer of training to the job), following the course. One survey is sent to the graduate asking a few questions relative to his/her application of knowledge and skills on the job, and if not, what content should be added to the course. The second survey is sent to the graduate’s immediate supervisor or anyone else who is in direct observation of the graduate’s performance. The supervisor questionnaire is similarly worded but from a supervisory prospective.

Kirkpatrick’s fourth level, (long-term results) is not normally measured directly by the training organization, but through the customer in the form of annual performance reviews, qualification exams, and fulfillment of strategic goals. Feedback may be requested from the training organization and any trend noted by the organization is welcome. These last two Kirkpatrick evaluation levels may be included in the post-course analyses or the pre-course analyses for successive iterations. The purpose of the circular ISD steps is to facilitate continual course improvement. It is the responsibility of the IDM to seamlessly coordinate the ISD process with the requesting agency, development team, and all instructors delivering the curriculum to the students.
The NMOPDC is responsible for developing advanced oceanographic and hydrographic training for NAVOCEANO and FST. Training is required in a broad area of oceanographic and hydrographic specialties. However, the NMOPDC instructors and curriculum development specialists do not possess practical oceanic surveying skills in all areas in which NAVOCEANO and FST require training. This is an area in which SMEs with operational experience is needed to assist in developing courses, especially specialized equipment operation and survey position certification courses. Therefore, an effective instructional design model beyond normal ISD methodology is necessary to assess, conceptualize, design, develop with assistance of SMEs, execute, and document highly specialized oceanic surveyor training and certification courses for U.S. Navy personnel. Although ISD forms the heart of the instructional design process, there is another larger, inter-linked, managerial-focused system outside the five-step ISD model. This managerial system must carefully coordinate assessment of training requirements, SME availability, curriculum development schedule, availability and preparation of instructors, and the quality of instruction measured against the requesting organization’s training requirement.

Problem Statement

The central problem is the need to develop an effective instructional systems, management-level model that orchestrates the efficient development and implementation of desired curriculum. The three phases of course development that management must carefully control to ensure delivery of high quality and timely instruction are: 1) the assessment and documentation of organizational training requirements; 2) project management control of curriculum development; and 3) the implementation of relevant
instruction by competent instructors. This model must also provide, 4) measurable and quantifiable course evaluation results to justify return on investment and validate its importance to the organization’s strategic objectives.

Research Questions

- Does the instructional systems management model effectively coordinate with management to accurately document the desired training requirements of the organization?

- Does the instructional systems management model efficiently direct the curriculum development team in creating quality curricula in a timely manner?

- How effective is the instructional systems management model in orchestrating quality instruction that provides knowledge and skills graduates need to perform job-related tasks?

- How effective is the instructional systems management model in delivering properly trained personnel as requested?

Definitions

**Bathymetry** – Bathymetry is the measuring and recording of ocean floor depths through the use of acoustic devices.

**Fleet Survey Team (FST)** – FST is an U.S. Navy organization of civilian, military officers and enlisted hydrographers who deploy around the world to perform hydrographic missions in support of U.S. Navy and DoD requirements.

**Hydrography** – a multidisciplinary science containing advanced studies of acoustics, geodesy, precise positioning, marine geology, oceanography, meteorology, cartography,
mathematics, and statistics. Hydrography is normally limited to depths of 200 meters (600 feet) or less.

**Naval Oceanographic Office (NAVOCEANO)** – The Naval Oceanographic Office is responsible for the development and application of oceanographic technology in support of the U.S. Navy mission.

**Naval Meteorology and Oceanography Professional Development Center (NMOPDC)** – The NMOPDC is responsible for the development and implementation of training and education courses to enhance the knowledge and instructional strategies of NAVOCEANO and FST personnel in these highly specialized.

**Subject Matter Expert** – SMEs are non-training organization personnel who are highly proficient in both knowledge and hands-on experience in specific subject areas. They are essential in the development of highly specialized training course materials; however, they do not necessarily possess curriculum development or classroom pedagogical skills and must receive guidance as part of course development and implementation.

**Templates** – Templates are various course development files created as format examples for SMEs to emulate while creating curriculum. Templates utilized on the development of the MH2 course include lesson plan (LP), multiple choice test bank, and performance examination (PE).

**Delimitations**

1. The focus of this study is limited to the ISMM and ISD processes of creating a training course. It does not include any aspect of performance of the attendees during or following the delivery of curricula.
2. The subject course of this study is specialized military training for U.S. Navy personnel. It does not follow normal conventions associated with formal education courses.

3. Similar sounding terms such as curriculum models and/or instructional models are not associated with instructional design or curriculum development models and will not be discussed in this study.

4. The definition of curriculum development in the literature is synonymous with instructional design; therefore, instructional design will be preferred terminology unless the focus is explicitly upon the development of curriculum such as lesson plans, workbooks, tests, and/or other classroom-related curriculum.

5. The term "subject matter expert" is not synonymous with "expert instructor." A SME is an expert on a topic, a function, or a task.

6. The PDD South does not own any hydrographic training equipment and must rely upon borrowed equipment from FST.

7. All variables not specified are beyond the scope of this study.

Assumptions

1. Given the parallel discussion of curriculum development and instructional design in the literature, the definition of curriculum development is assumed congruent with instructional design.

2. Subject matter experts (SMEs) who develop course material are assumed not to have any prior training in curriculum development or design.
3. The study assumes the training development system is a closed system, i.e., all training requirements specified are in support of the requesting agency only, and not affected by, nor has an affect on, outside agencies.

Justification of the Study

Justification for this study may be found at many levels. First, this model is applicable in any learning situation, whether military or civilian, contract training or in-house training sources; for any businesses of any size who must objectively assess their return on training investments; and for any post-secondary school setting where effective student learning is the goal. Second, technological advances in science and electronics create the need to increase the responsiveness, relevancy, and speed of development of training. The curriculum design model in this study is an effort to reduce the curriculum development time and increase the relevancy of the material by including subject matter experts in the development process. Finally, no other study of this kind with an emphasis on the IDM’s responsibilities was discovered during the literature review. This unique view of instructional design is useful for any mid-level manager responsible for the design, development, delivery, and assessment of instructional material.
CHAPTER II

REVIEW OF RELATED LITERATURE

The review of literature defines the epistemological differences between training and education and between curriculum and instructional design. The literature review examines the philosophical and educational foundations of ISD and briefly reviews different types of instructional design models and the evolution of ISD in the military. The review focuses the managerial responsibilities and considerations instruction design managers must coordinate, control, and orchestrate in the development and implementation of new course development and instruction.

Epistemological Terminology Related to Instructional Design

Instructional design for the purpose of providing training is different from designing instruction for education courses and programs. Although both training and education have similar pedagogical methods of classroom delivery and share the same epistemological roots, the difference between education and training is the purpose of the course itself. Education is defined by the Merriam-Webster Dictionary as “the knowledge and development resulting from an educational process” and educate as "to develop the knowledge, skill, or character of..." (p. 366). Further, the definition of training is defined as “the state of being trained” (p. 1248) and trained is defined as “to form by instruction, discipline; to teach so as to make fit, qualified, or proficient.” (p. 1247). The emphasis on the terms qualified and proficient imply an evaluation of skills and knowledge in application to a specific job or task. Clark (1995) delineates the differences between education and training in terms of evaluation as, “Education is training people to do a different job... Unlike training, which can be fully evaluated immediately upon the
learners returning to work, education can only be completely evaluated when the learners move on to their future jobs or tasks.” Nadler (1984) states the purpose of training as “...learning that is provided in order to improve performance on the present job.

The literature frequently references curriculum development, curriculum design, and instructional development, and instructional design synonymously. Curriculum, according to Finch and Crunkilton (1999) is defined as, “the sum of the learning activities and experiences that a student has under the auspices or direction of the school” (p. 11) and as, “the planned interaction between instructors and student that (hopefully) results in desirable learning” (p. 12). The development of instruction and curriculum is the preparation for the presentation of the course in the classroom, illustrated in Figure 16.

![Figure 16. Instructional Development and Curriculum Development spheres of curriculum and instructional tasks. The intersection represents the Design, Develop, Implement, and Evaluation phases of ISD.](image)

Instructional design has a different connotation than instructional development defined by Finch and Crunkilton (1999). Gagné (1999) considers instructional design to have an immediate phase and a long-range phase. The immediate phase is the instructor or teacher preparing lesson plans while the long-range aspect of instructional design is concerned with course sequence or the entire instructional design system (p. 4). Gagné's long-range phase definition of instructional design is synonymous with Finch's and Crunkilton's curriculum development definition. For the purpose of this study, instructional and curriculum development will refer to the development of material for presentation to the class and instructional design will refer to the long-range aspect of development of instruction as defined by Gagné.

Philosophical and Educational Foundations of ISD

The philosophical foundation of instructional design is found in the early psychology tradition of behaviorism. Thorndike's (1898) experiments introduced the law of effect where, "Responses to a situation that are followed by satisfaction are strengthened; responses that are followed by discomfort are weakened." Pavlov's stimulus-response experiments (1927) led to the establishment of the classical conditioning learning theory. Skinner (1938) furthered the stimulus-response studies of Thorndike and Pavlov with his operant conditioning principles where a response reinforced by a stimulus is likely to be strengthened and occur again. Reinforcement of proper voluntary student responses occurs in classroom instruction whenever instructors praise students for correct answers, an important event in Gagné's nine events of instruction (1980).
Constructivism is also an important influence on instructional design (Dick, Carey & Carey, 2005, p. 4). The psychological view of constructivism varies widely but centers on Piaget’s concept of cognitive structure where humans construct their own knowledge (individual constructivism), rather than rote memorization (Ormrod, 1999, p. 171). Bruner (1966) theorized that his spiral organization of instruction is divided into 1) a predisposition toward learning, 2) a format that is easily grasped by the learner, 3) a proper sequence, and 4) a nature and pacing of rewards and punishments. Individual constructivism occurs when the instructor elaborates on a teaching point through the use of examples or stories to assist the students’ construction of knowledge.

Learning objectives also have their roots in the behaviorism tradition as desired student responses to curriculum stimuli. In 1948, psychologist Benjamin Bloom organized a team of educational psychologists from the University of Chicago to analyze and develop educational classifications in effort to standardize learning objectives. The group identified three domains of learning: cognitive, psychomotor, and affective. The first domain, or taxonomy, the group published was the cognitive domain, which consists of six levels: knowledge, comprehension, application, analysis, synthesis, and evaluation (Bloom & Krathwohl, 1956). Meanwhile, Skinner (1954) proposed that successful, self-paced learning could be achieved by an individual providing the lessons had clear behavioral objectives that was presented in small, reinforcing blocks of instruction. Mager (1962) introduced criterion-referenced objectives where the learning objective prepared the learner for instruction by stating the task to be completed, the condition under which the evaluation would occur, and the standard (the criterion). The affective domain (Krathwohl, Bloom, & Bertram, 1973) and the psychomotor domain (Simpson,
1973) taxonomies were published two decades later. The taxonomies are critical for the proper balance of level or complexity of curriculum with respect to the desired attendee competencies as specified by the course goal. For each level, specific learning behaviors were defined, as well as appropriate descriptive verbs that could be used for writing instructional objectives.

Proper sequencing of learning objectives is one of the most important issues for a curriculum designer to consider in developing instruction. Instruction should be sequenced in a manner that would facilitate the learning process for the audience. Ausubel and Ausubel (1963) studied the development of learning strategies and determined children link thoughts together to develop memory; this process is known as the assimilation theory. An assimilation theory study by Novak and Musonda (1991) involving “how” first and second grade students develop cognitive knowledge led to the creation of concept mapping. Children in the study drew pictures of how they linked different elements of knowledge together. Brunner suggests in his spiral organization (1966) that instruction should be developed at a level that is readily grasped by the audience and sequenced from simple to complex. Likewise, Reigeluth’s and Stein’s elaboration theory (1983), an extension of Ausebel’s and Novak’s theories, states as one of the seven strategy components is an elaborative sequence—which is defined as simple to complex sequence of instruction. The structural learning theory of Scandura and Scandura (1980) demonstrates the simple to complex strategy through the teaching of mathematics to young children. Finch and Crunkilton (1999) argue there is little guidance in the literature to guide curriculum developers in the proper sequencing of instruction (p. 202). Instead, they point to the practical experience of instruction designers, expert
guidance, or simple common sense for the sequencing of instruction. Specific techniques referenced by Finch and Crunkilton (1999) are summarized in Table 2. Several instructional theorists argue that the simple to complex instructional sequence is the most appropriate.

Table 2.

**Examples of Instructional Sequencing**

<table>
<thead>
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<tr>
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<td>concrete</td>
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<td>specifics</td>
<td>generalizations</td>
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<tr>
<td>observing</td>
<td>hands-on</td>
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<tr>
<td>skill acquisition</td>
<td>skill application</td>
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<tr>
<td>familiar</td>
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<td>less difficult</td>
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<td>more interesting</td>
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<td>known</td>
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**Curriculum and Instructional Design Models**

According to Finch and Crunkilton, models are, “defined as a simplified yet communicable representation of a real-world setting or situation...if [it] can convey realistically what is going on, it is said to be useful” (1999, p. 28). Olivia (1997) advises, “Those who take leadership in curriculum development are encouraged to become familiar with various models...” additionally, “…some models are in the form of diagrams, others are lists of steps that are recommended to curriculum workers” (p. 158).
A variety of instructional design models were developed during the latter half of the twentieth century. The instructional design models or procedures are defined in the literature as: a systems approach to instruction (Kruse, 2006); systematic approach to training (DoD, 2001); instructional design (Dick, Carey, & Carey, 2005); rapid instructional design (Piskurich, 2006); and instructional systems design (Gagné, 1980). Gagné (1992) defines instructional system design models as, “...the systematic process of planning instructional systems...” and instructional systems as, “...the systematic application of...instructional design and development” (p. 20). Each of the models and procedures approach the application of instruction with similar epistemological methodologies relative to course development.

Instructional design models are found in linear form, step-by-step form, and as circular continuous systems. Tyler’s (1970) Curriculum Model, Figure 17, is an example of a linear curriculum model without a visible feedback loop. The final phase of the Tyler model is evaluation; however, Tyler does not illustrate how the evaluation is “fed-back” into the previous phases of curriculum development. The absence of the feedback loop in the diagram is most likely attributed to the model being developed before the systems movement in educational development.
Figure 17. The Tyler Curriculum Model (1949) is a representation of a linear instructional design model. The model was developed before the systems movement and did not have a distinct feedback loop from the evaluation phase to earlier phases of development.


Another early model is the Olivia Curriculum Development Model (1976) seen in Figure 18. The Olivia model includes a feedback loop from the evaluation phase back to each of the earlier phases to facilitate improvement in instruction.
Figure 18. Simple Linear Model of Curriculum Development by Olivia in 1976. The model is an early representation of an instructional design system with feedback from evaluation to each of the previous phases of development.


Another instructional design system model is the Systems Approach Model (Dick, Carey, & Carey, 2005, p. 1), Figure 19. The model was first introduced in 1976 and has evolved into being widely known (Gagné, 1992, p. 21).

Figure 19. This Instructional Systems Design Approach Model to curriculum and instructional development is the latest version the Dick, Carey, & Carey, (2005) model.


The depiction of the three models may vary, but each can be classified as an instructional systems model regardless of organizational form. Instructional design
models that contain the distinct phases or steps of analysis, design, development, implementation, and evaluation are categorized as *Instructional Systems Design (ISD)* (Dick, Carey, & Carey, 2005, p. 3). The ISD Model is the primary training curriculum design model used by the U.S. military (Swain, 2006, p. 4).

**Evolution of ISD in the Military**

The roots of ISD extend back to World War II and the educational research of notable psychologist such as Robert Gagné, Leslie Briggs, Robert Miller, and many others (Reiser, 2001). After the war, the psychologists continued working on training and educational methodologies at institutions such as the American Institutes for Research and the Perceptual and Motor Skills Laboratory where Gagné was director 1949 to 1958 (Reiser, 2001). In 1962, Miller published methods for analyzing tasks that are performed during the execution of a job. Gagné (1962a) published his research summarizing military training and learning principles. Gagné refined principles of instructional design and nine conditions of learning (1965). The concept of approaching educational problems with systematic solutions studied by a number of psychologists in the 1940s and 1950s was summarized by Gagné in *Psychological Principles in System Development* (1962b). Bertalanffy summarized his series of research in systems theory from 1947 to 1969 in *General Systems Theory* (1969). Gagné and Briggs describe a systems approach to instructional design process in *Principles of Instructional Design* (1992) citing systems approach as, “The planning of instruction in a highly systematic manner with attention to the consistency and compatibility of technical knowledge at each point of decision...” (p. 14).
The U.S. Air Force began using ISD in 1965 to provide critical technical skills training (U.S. Air Force, 1993, 2002b). In 1975, the U.S. Army, Navy, and Marines followed with a similar instructional design process referred to as the Systematic Approach to Training (SAT) which was part of the Interservice Procedures for Instructional Systems Development (IPISD). The IPISD Model, illustrated in Figure 20, was specifically designed to facilitate cost-saving interservice training between the military branches by combining large-volume technical instruction schools (Branson, Rayner, Cox et al., 1975).

Figure 20. The Interservice Procedures for Instructional Systems Development (IPISD) Model (Branson, Rayner, Cox et al., 1975).

Another instructional design model appears in the literature in the late 1980s that is identical to ISD, i.e., analysis, design, development, implementation and evaluation. This design is referred to as the ADDIE model (Grafinger, 1988; Kruse, 2006; Rothwell et al., 2006). Finding the source of ADDIE is problematic. According to Molenda’s article In Search of the Elusive ADDIE Model (2006), after describing his extensive research stated “the ADDIE Model is merely a colloquial term used to describe a systematic approach to instructional development, virtually synonymous with instructional systems development (ISD).” The earliest published reference to ADDIE, as cited by Molenda, Figure 21, is Grafinger’s (1988) reference to “ADDIE processes within an ISD model”, but not as a model itself.

![ADDIE Model Diagram]

Figure 21. Possibly the earliest known reference to the ADDIE Model in the literature is attributed to Grafinger (1988) by Molenda (2003).

The synonymous definitions and similar appearances of ISD, SAT, and ADDIE are essentially irrelevant to the instructional designer. The use of these acronyms tends to follow partisan lines of varying military branches and university research. Regardless of model form or the name to which instructional design is referred, it is still a systematic approach to planning, implementation, and evaluation of instruction. Gagné summarizes instructional design models as, “All stages of any instructional systems model can be categorized into one of three functions: (1) identifying the outcomes of instruction, (2) developing the instruction, and (3) evaluating the effectiveness of the instruction” (1992, p. 21).

Management of Instructional Systems

Management of instructional systems can be functionally divided into the same three functions Gagné categorized with the addition of managing the implementation of instruction in the classroom. The four phases of instructional design management proposed by the author for use in developing oceanic and hydrographic courses for the military, are illustrated in Figure 22: 1) customer requirements, 2) management of curriculum design and development, 3) management of instruction, and holistically, 4) the evaluation of the instruction. Research studies and literature are replete with references to ISD as a project management tool, but few references address the role and specific responsibilities of the manager or team leader of an ISD project from a management perspective (Kim, 1997).
The term “customer” is used to denote the relationship between the IDM and the organization requesting the training regardless of who the IDM works for or where he or she is assigned. According to Rummler and Brache (1995, p. 42), the customer view of a service or product providing organization is one that is viewed as being responsive to the customer’s needs. Dr. W. Deming, the famous quality guru is quoted as saying, “We do not know what quality is.” meaning it is the customer that determines the quality of service (Deming, 2007). Organizations recognize the need for training when the performance of its personnel is below expected standards. In order to increase the

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**Figure 22.** Author’s Instructional Design Management Model.

*Management of Customer Training Requirements*

The term “customer” is used to denote the relationship between the IDM and the organization requesting the training regardless of who the IDM works for or where he or she is assigned. According to Rummler and Brache (1995, p. 42), the customer view of a service or product providing organization is one that is viewed as being responsive to the customer’s needs. Dr. W. Deming, the famous quality guru is quoted as saying, “We do not know what quality is.” meaning it is the customer that determines the quality of service (Deming, 2007). Organizations recognize the need for training when the performance of its personnel is below expected standards. In order to increase the
performance of the organization the management must recognize and commit to the development of the capabilities of its personnel. According to Senge, “An organization’s commitment to and capacity for learning can be no greater than that of its members.” (2006, p. 7).

Accurate analyses and documentation of the requesting organization’s training requirements is critical to the success of the course and should be directly beneficial to the requesting organization in terms of enhanced capabilities or enabling of strategic goal achievement. According to Dick, Carey, & Carey, (2005):

When instruction is developed for a client, the client must be convinced that if learners achieve the instructional goals, then a significant organizational problem will be solved or an opportunity will be realized through the use of the new skills (p. 26).

Requests from organizations for new training courses must be approached with caution. According to Rummler and Brache (1995), the request for training is a result of an organization recognizing performance deficiencies, but it typically does not conduct a thorough job-task analysis prior to the request (p. 201). The DoD guidance to all military branches involved in ISD is the DoD Handbook (MIL-HDBK-29612-2A), Instructional Systems Development/Systems Approach to Training and Education Services. This Handbook specifies, “Analysis is the process used to identify critical tasks and identify the standards, conditions, performance measures and other criteria needed... Training is based on the tasks identified in analysis” (p. 7). Another term commonly used in stating training requirements, but has a variety of meanings, is the word “need” (Stufflebeam,
1985), typically in the phrase “training need.” The Air Force identifies four different views of the stating of training needs:

*Discrepancy view.* A need is the difference between "what is" and "what should be." In this definition, the difference between what "is being taught" and what "should be taught" is the discrepancy.

*Democratic view.* Needs are identified by a group of experts (instructional designers, project managers, and others) who, by the democratic process of majority rule, determine what changes need to be made to the instruction.

*Diagnostic view.* Need is determined by identifying concepts, principles, and procedures whose absence or deficiency would hamper the students in meeting job performance requirements.

*Analytic view.* Need is determined by accurately predicting the future instructional needs based on the current instructional situation (Air Force, 2002a, p. 25).

The management of the requesting organization tend to state diagnostic and analytic views of training needs during new course analyses. The training needs or tasks represent the desired psychomotor skills, knowledge, and attitudes the organization expects the students to learn from the instruction (Dick, Carey, & Carey, 2005, pp. 42-43). The IDM accomplishes the task-list documentation by determining the desired qualifications of the trained graduate through job and task analyses, analyses of strategic and operational goals of the organization (Air Force, 2002a, p. 12 and Dick, Carey, & Carey, 2005). If the course is undergoing revision, the training needs or tasks will be determined by
discrepancy and democratic views as determined by the IDM through post-course evaluations or by the requesting organization management, SMEs and/or graduates during post-course interviews and questionnaires.

Gagné's hierarchy of intellectual skills (1999) defines the premise that students must have prerequisite knowledge before attempting to solve problems. Similarly, students must possess certain prerequisite competencies before entering a technical course. These course entry requirements are typically determined through negotiations between the IDM and the requesting organization (Air Force, 2002b, p. 43). Dick, Carey, & Carey, (2005) further specify the need to analyze the learning preferences of the students and the instructional context in which they will be learning. Contrary to Gagné, active learning (Bransford, Brown, and Cocking, 2003, p. 12) or learning-by-doing (Gribbs, 1988) are considered experimental approaches to learning where the students are given problems to solve and time for experimentation and exploration prior to receiving formal instruction. Senge reinforces this constructivist argument with, “The most powerful learning comes from direct experience.” (2006, p. 23); learning comes from trial and error, not from rote memory.

The IDM depends upon the expertise of SMEs and documented guidance such as official directions, instructions and other standard procedures to ensure the training requirements are correctly articulated, accurate, relevant, and future-focused (Gagné, 1992; Finch & Crunkilton, 1999; Dick, Carey, & Carey, 2005). The IDM documents all noted applicable guidance as references for the curriculum development team. If SMEs are to assist the curriculum development team, it is the responsibility of the IDM to
determine the subject areas and estimated number of man-hours SMEs will be needed (Piskurich, 2006, p. 147).

Management of Design and Development of Curriculum

In this phase of instructional design management, the manager designs the course, selects the appropriate instructional strategy, and develops guidance for the curriculum development team to follow during the development of course material. The manager may accomplish this alone or with a small team of instructional design personnel (Piskurich, 2006, p. 11).

The selection of overall course implementation design is dependent upon the analysis of the learner (Dick, Carey, & Carey, 2005), resources, and the environmental conditions required by the behavioral objectives. Military technical courses provide performance skills, knowledge, and attitudinal training to personnel (DoD Handbook, 2001). The instructional strategy selected is dependent upon the instructional goal of the course (Air Force, 2002b, p. 145). Typical instructional strategies include self-directed; self-paced study; classroom lecture; hands-on demonstration and performance; case-study, experimental, games or role playing, computer-based training, video-teleconferencing; and interactive web-based training (Air Force, 2002, p. 78-81).

The IDM develops the behavioral objectives for the course from the CTTL utilizing behavioral taxonomies for cognitive, affective, or psychomotor skills (NETC, 1997a, p. 3-2-1). Mager (1962) emphasized the need for objectives to be clear and concise with precise statements as to what the students will be able to do following the lesson. Criterion-referenced objectives for military courses are derived from the CTTL and divided into terminal objectives, also known as primary objectives—designed to
identify desired learning outcomes (Air Force, 2002b, p. 51 and NETC, 1997a, p. 4-5-1; Mager, 1962). Enabling objectives, also referred to as secondary, supporting or subordinate objectives, are smaller, building block objectives which are prerequisite objectives the learner must learn to fulfill the terminal objective (Air Force, 2002b, p. 52 and NETC, 1997a, p. 4-6-1).

The IDM utilizes the CTTL to plan the development of the course material and estimate the number of developers and SMEs to include on the curriculum development team. This is accomplished by creating a WBS from the CTTL. The CTTL is divided into smaller deliverable elements of the course such as written tests, performance exercises, lesson plans, and other course-related material. Once the objectives are divided into individual elements, a course estimate can be calculated. Inaccurate estimates of course development effort can lead to course development failures, missed deadlines, and cost overruns (Lewis, 2007, p. 56). The WBS is created from the CTTL because the sequence of the course or the sequence of development is not necessary; the Course Outline of Instruction (COI) sequences the course (NETC, 1997b, p. 4-6-1) and the project schedule will sequence the development of the elements (Lewis, 2007, p. 58).

The IDM may be able to develop the behavioral objectives for the CTTL; however, the development of military technical courses frequently requires SMEs to assist the development team. Subject matter experts may be used as reviewers of instructional design and behavioral objectives (Dick, Carey, & Carey, 2005, p. 202) or as part of the instructional development team. When SMEs are needed on the development team, the IDM must request the SME by name, specify the length of time they will be
needed on the project, and obtain the commitment of each SME’s participation in writing (Rothwell et al., 2006, p. 51).

Assessment instruments are developed from the behavioral objectives to assess the degree of mastery the students attain from the instruction. Four types of criterion-referenced tests are: entry behavior tests, pre-tests, practice tests, and posttests (Dick, Carey, & Carey, 2005, p. 146-147). Entry behavior tests are given to prospective students before the beginning of instruction, normally prior to the day of the course. Pre-tests are given on the first day of class prior to any instruction. The purpose of the pre-test is to assess the baseline of the students’ mastery of prerequisite and course-related knowledge and skills. Practice tests are also referred to as quizzes or appraisals; their purpose is to give the students’ feedback as to their degree of mastery of the material. Practice tests normally cover a small portion of a unit or course of instruction. Post-tests occur at the end of the instruction and they are designed to assess the students’ mastery of the terminal objectives. Although the primary purpose of the tests is to assess the students, they also provide valuable feedback to the IDM as to the quality of course material and classroom instruction and may indicate where instruction may need revision (Dick, Carey, & Carey, 2005, p. 149).

The next task for the instructional development team is the development of course-related material. The instructional strategy and delivery method will determine what to develop. The best approach is to determine what instructional products will be needed to enhance the learning (Piskurich, 2006, p. 183). A detailed project management-based model for the development of curriculum is Greer’s ID Project Management Model (2006). The model provides a three-phase instructional development project management
model that is subdivided into 10 steps. The three phases of Greer's model are: 1) project planning, 2) instructional development, and 3) follow-up. The first phase begins with determining the project scope to determine estimates for materials for the production of curriculum. The second phase focuses on gathering information relating to the instruction and the development and testing of course material. The final phase of Greer's model focuses on producing and distributing the developed material. The final step in the last phase is evaluation of the material by receiving feedback from the attendees following course completion. Greer's model focuses on the creation and production of curriculum, it does not address the analysis phase with the requesting organization or the managerial responsibilities of classroom implementation.

Occasionally, instructors and SMEs join the curriculum developers in the development of instructional materials. The inclusion of instructors and SMEs in the curriculum development teams is very beneficial when the material being developed is not part of the skill set of the curriculum developers. However, SMEs rarely understand curriculum development and tend to need assistance (Dick, Carey, & Carey, 2005, p. 40). To assist the SMEs in producing the technical material in the correct format, the IDM should include the use of curriculum development guides (Olivia, 1999, p. 561) or templates. Basic, word-processing style templates for lesson plans, student workbooks, PowerPoint presentations, and test questions will help reduce time of development and still produce a quality product.

Before the newly developed course material is presented in the classroom, it should be tested. Dick, Carey, & Carey, (2005) recommend three formative evaluations: one-on-one evaluation with learners, small group evaluations, and field-trials are
conducted to determine the efficiency and effectiveness of the material. If an SME is assigned to the development team, the SME should provide technical guidance and review the material for accuracy and currency (Dick, Carey, & Carey, 2005). Results of formative evaluations are "fed-back" into the instructional design to improve the quality and relevance of the instruction. The formative evaluation stage can be a lengthy process causing ISD to be criticized by military commanders as being too slow (Swain, 2006, p. 2). A summative evaluation is normally conducted after the course has completed its formative cycle and may be conducted at the conclusion of the field-test or several years later (Gagné, 1992, p. 30).

**Management of Instruction**

Implementation of a field-trial of a new course requires more managerial attention than a routine recurring course. New course implementation requires the IDM to ensure instructors, including SMEs (if tasked); instructional materials; facilities; and equipment are prepared and ready. Instructors or SMEs frequently deliver instruction in a new course due to their expertise in the subject. Curriculum developers may also deliver portions of the instruction if they are qualified in the subject.

**Management of Instructional Design Evaluation**

Training development organizations must be able to prove the expense of training development or contracted instructional services is beneficial to the organization. Determining the cost of training is straightforward, but the return on the investment is not as direct. According to Pisurich, tangible return on investment in training can be in the form of increased productivity, increased efficiency, better quality, better personnel attendance and performance, and less accidents (2006, p. 280). Intangible returns can be
in the form of increased capacity, customer satisfaction, and an integrated diverse workforce with minimal or no equal opportunity conflicts.

A key concept in any instructional design model is the formative evaluation of instruction and the feedback loop (Dick, Carey, & Carey, 2005, p. 315). The feedback loop derived from the formative evaluation of the field-test or pilot course completes the instructional systems design model (Gagné, 1992, p. 30). Evaluation of the instructional design occurs on several levels and begins while class is still in session. First, the monitoring of the pilot course by the IDM ensures the instruction is delivered as designed. Second, evaluations of the course by the instructors and students are completed. And third, the summative evaluations of the pilot courses are compared to the desired training requested.

Field-testing of a new course in the Navy is referred to as a pilot course (NETC, 1997a, p. 7-3-1). The IDM or designate closely monitors the delivery of the pilot course to ensure the course is delivered as designed. Specific curriculum-related areas the IDM monitors during the pilot course delivery are lesson plans, student workbooks, visual aides, and accuracy of instruction delivered by the instructor. The pilot course is monitored throughout its presentation to ensure dualistic instruction does not occur. Olivia (1997) defines dualistic instruction as a situation where the classroom instructor does not deliver the material as developed by the curriculum development team. Incorporating SMEs and instructors into curriculum development will help to minimize dualistic situations. The IDM is also responsible for keeping detailed time for each enabling objective. Feedback from the timesheets will facilitate better distribution of time for each objective through out the course (NETC, 1997a, p. 6-B-3).
The IDM also inspects and monitors the condition of the training facility and all equipment associated with the course (NETC, 1997a, p. 6-C-3). The perceived intensity of classroom environmental conditions such as lighting, temperature, arrangement of tables and chairs, and cleanliness affect each student's ability to learn (Ormrod, 1999, p. 182). Students also become frustrated when classroom equipment or visual aids do not perform correctly (Dick, Carey, & Carey, 2005, p. 295). Students learn by chaining ideas together to learn complex tasks (Ormrod, 1999, p. 42). If equipment fails or is out of calibration to the point it affects the lesson, the students will not learn because the chain of learning events is broken.

Kirkpatrick (1998) describes evaluation of training and instruction from a student performance perspective as having four levels—reaction, learning, behavior, and results. The first level of evaluation is the immediate reaction from the student. Kirkpatrick specifies that a simple Likert-scale form will facilitate the collection of quantifiable detail in minimum time. Space for narrative comments should also be provided to facilitate student elaboration of weak areas of instruction. The questionnaire should be given to all students during class time to maximize response. The next level of evaluation involves how well did the students learn. Kirkpatrick mentions control groups who do not receive the training may be used, but that is not necessary if criterion-referenced behavioral objectives are used. Pre-tests can establish a baseline of prior knowledge to measure against with post-tests. The post-test results provide an indication as to the teaching effectiveness of the instructor. The third level of evaluation cannot be accomplished until some time after the training is complete. Kirkpatrick states the transfer of training to normal behavior can take as long as two to six months (1998, p. 50.). Behavioral
changes—due to training—are determined by questionnaires to both the graduate and the supervisor or trainer. The final level of evaluation according to Kirkpatrick is long-term, performance results of the organization (p. 61). The difficulty at this level for IDMs is the length of time required to collect the metrics.

Summative evaluations are conducted when the formative stage of the course is complete and no additional development is occurring (Gagné, 1992, p. 338). According to Tallmadge, summative evaluations provide evidence that the course of instruction “...be shown to be valid and reliable, the effects must be of sufficient magnitude to have educational importance...” (1977, p. 2). Summative evaluations are concerned with the effectiveness of the course or instructional system (Gagné, 1992, p. 338). The evidence summarized by an IDM for the summative evaluation includes student scores, student feedback questionnaires, instructor and/or SME comments, graduate surveys, and supervisor/trainer surveys. The summative evaluation—with supporting evidence—is presented to the requesting organization by the IDM, completing the three-phases of instructional design management.
CHAPTER III

METHODOLOGY

This chapter describes the rationale of the selection of qualitative inquiry as the research design, the conceptual framework, and the research methodology. The chapter also describes the data collected, the collection protocol, and the data analyses procedures employed. The categories and roles of the participants and the researcher are described to distinguish the different views of the course design.

Research Design

Qualitative form of inquiry was selected for this research due to the necessity in capturing the descriptive reactions of participants to the instructional design model. Quantitative, Likert-scales do not adequately capture the opinions of the management who accepted the short-term impact on operations for long-term gain in personnel competencies, the SMEs who invested time and effort in the creation of curricula, or the students who studied diligently to learn the necessary skills of hydrography.

The focus of the research concentrated on the performance of the ISMM and its effectiveness as assessed by the managers, SMEs involved in curriculum development, and the students. The effectiveness of a training course and its instructors can be superficially inferred from the quantitative scores of the students. However, it is the unbiased opinions of the instruction received by the students and the impact the new training has on the capability of the organization that are the true measure of the value. It is in this qualitative vein that the unbiased comments and opinions of all participants were sought, captured, analyzed, and reported.
Conceptual Framework

The conceptual framework for this study was the application of ISD from an instructional design managerial construct. Instructional design and ISD, also known as the ADDIE model, are well-documented systems; however, it is the managerial perspective of the application of instructional design principles and project management coordination of non-curriculum development personnel outside the ISD system that make this study unique.

Bertalanffy (1969) attempted to relate different sciences with interconnecting systems through his general systems theory. Bertalanffy states that some sciences, such as physics view problems in closed systems, i.e., systems without influences from outside forces, such as other systems. He argued that the world is more like an open system where an operation of one system affects another. The same interconnectivity is found within the instructional design model of this study with ISD forming the nucleus and the three-phase managerial model operating interactively and simultaneously. Although systematic influences that affect the course can be extrapolated from many layers, this study employed theoretical limitations of the extent of the case and restricted the study to the participants immediately involved with the course.

Research Methodology

The qualitative research methodology chosen for this study was case-study methodology as prescribed by Patton (2002). Patton describes the case study as having a holistic perspective in which everything within the bounded, case study is analyzed in an effort to understand the interconnected relationships of individual components of the case. The discussion of interconnected relationships and the sum of parts being greater
than the whole is synonymous with Bertalanffy's description of his general systems theory. The subject studied within the research case was the application of the instructional design model from a managerial perspective. The IDM must coordinate the three phases of ISMM—documentation of customer training requirements, curriculum development, and implementation in order to produce a successful training course. If any of the three phases fail to perform with the other two, the entire instructional design of the system, including the ISD nucleus, fails.

Patton (2002) also attributes case studies as being context sensitive. In other words, the case study must look at the situation from multiple perspectives. In this study, the three different phases of the model were viewed differently by the management, the SMEs creating curriculum, and the trainees attending the class. Participants from each of the three phases were interviewed with questions addressing each phase. The raw information gathered from the interviews was classified, organized, and synthesized into a manageable matrix for analyses.

Problem Statement

The central problem is the need to develop an effective instructional system, management-level model that orchestrates the efficient development and implementation of desired curriculum. The three phases of course development that management must carefully control to ensure delivery of high quality and timely instruction are: 1) the assessment and documentation of organizational training requirements; 2) project management control of curriculum development; and 3) the implementation of relevant instruction by competent instructors. This model must also provide 4) measurable and
quantifiable course evaluation results to justify return on investment and validate its importance to the organization’s strategic objectives.

Research Questions

- Does the instructional system management model effectively coordinate with management to accurately document the desired training requirements of the organization?
- Does the instructional system management model efficiently direct the curriculum development team in creating quality curricula in a timely manner?
- How effective is the instructional system management model in orchestrating quality instruction that provides knowledge and skills graduates need to perform job-related tasks?
- How effective is the instructional system management model in delivering properly trained personnel as requested?

Participants

Participants were management, SME curriculum developers, and graduates from the MH2 course, all of whom were identified by alphanumeric pseudonyms. The manager pool included five managers; two mid-level managers were involved in identifying course competencies and the creation of curricula; the other three were senior managers whose roles were predominately executive leadership and approving officials. There were eight SMEs involved in the development of the course; two of the SMEs were not available during the interview process because they were deployed out of the country in an area where communication was limited. The FST management requested that I not interview the deployed team due to mission limitations. One FST SME who has retired
since the course could not be interviewed due to medical limitations. The course graduated six students, all of whom were interviewed. All participants were purposefully selected based upon their roles in the course and their interest in this study. All interviews were conducted with documented permission from the participants following the interview protocol approved by the doctoral committee, and in full compliance of the USM Human Subjects Protection Review Committee.

Data Collection

The primary method of data collection was face-to-face recorded interviews with the participants conducted in February and March of 2007. The approach was the standardized open-ended interview process. According to Patton (2002), the standardized open-ended interview is a carefully worded and arranged with the intention of asking each respondent the same questions generally using the same words (p. 342). Interviews were conducted in the FST office spaces at Stennis Space Center, MS during the participants' normal working hours. Three interviews were conducted via recorded phone conversations from the participants' homes.

The primary data collection device employed during the face-to-face interviews was a digital audio recorder that recorded the interviews in Moving Pictures Expert Group (MPEG) Audio Layer 3 (Mp3) format. The digital format facilitated e-mailing of raw interviews to the transcriptionist. A secondary data collection device used during the face-to-face interviews was a digital video recorder that served as a supplemental data source for recording significant non-verbal feedback and as a backup recording device.

Field notes were taken during the observation period and throughout the data collection process. The notes documented the date, location, participants, activities,
descriptive information, and other notable observance that facilitated the analyses (Patton, 2002, p. 303). Field notes were also used during the interview, as Patton suggested, to note key words, thoughts, or themes during the interview. This process helped the author to monitor and track questions asked as well as answers received (2002, p. 383).

Data Analysis

Qualitative inquiry studies, especially those where the researcher is in an active role, must incorporate analysis protocols in an effort to remove bias from the study. This was achieved through an analysis strategy called triangulation. Denzin (1989) states that by using multiple data sources, bias can be removed from single-observer studies. According to Patton (2002), four kinds of triangulation strategies can improve the credibility of qualitative research studies. The four methods of triangulation described by Patton (p. 556) are:

1. Methods triangulation: Verifying the consistency of findings generated by different data collection methods.
2. Triangulation of sources: Verifying the consistency of different data sources within the same method.
3. Analyst triangulation: Using multiple analysts to review findings.
4. Theory/perspective triangulation: Using multiple perspectives or theories to interpret the data.

Although some different data collection methods exist, such as the NMOPDC online graduate survey and end-of-course survey, the feedback does not address the formulation of the training requirements or curriculum development; therefore, methods triangulation is not an option. Analyst triangulation is also not an option due to the single-researcher, focused study. Triangulation of sources and theory/perspective triangulation
are similar in that they employ multiple interviews; however, theory/perspective triangulation examines the responses to the same interview questions from different populations. Therefore, the triangulation of sources was used as it was the most appropriate form of triangulation for the study.

Patton (2002) describes triangulation of sources as "comparing the perspectives of people from different points of view" within the same qualitative method, such as the case study for this qualitative research. Patton continues by stating it also is used for "checking interviews against program documents and other written evidence that can corroborate what interview respondents report" (2002, p. 559). The triangulation of qualitative data sources was formulated through the interview questioning protocols for the different participant roles during the initial MH2 course development and implementation. The following tables represent the correlation of interview questions, by role, with the research questions (RQ).

Table 3.

Management (M) Interview Protocol.

<table>
<thead>
<tr>
<th>Instrument Question</th>
<th>RQ-1 (Requirements)</th>
<th>RQ-2 (Curriculum)</th>
<th>RQ-3 (Instruction)</th>
<th>RQ-4 (Evaluation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-1</td>
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<tr>
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<tr>
<td>M-3</td>
<td>X</td>
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<td>M-4</td>
<td>X</td>
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<td>M-5</td>
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<td>M-6</td>
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<td>M-12</td>
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</tbody>
</table>

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Table 4.

**Subject Matter Expert (SME) Interview Protocol.**

<table>
<thead>
<tr>
<th>Instrument Question</th>
<th>RQ-1 (Requirements)</th>
<th>RQ-2 (Curriculum)</th>
<th>RQ-3 (Instruction)</th>
<th>RQ-4 (Evaluation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SME-1</td>
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<tr>
<td>SME-2</td>
<td>X</td>
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<td>SME-3</td>
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<td>SME-4</td>
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<td>SME-6</td>
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<td>SME-7</td>
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<td>SME-8</td>
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<td>SME-9</td>
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<td>SME-10</td>
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<td>SME-11</td>
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</table>

Table 5.

**Student (S) Interview Protocol.**

<table>
<thead>
<tr>
<th>Instrument Question</th>
<th>RQ-1 (Requirements)</th>
<th>RQ-2 (Curriculum)</th>
<th>RQ-3 (Instruction)</th>
<th>RQ-4 (Evaluation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-1</td>
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<td>S-2</td>
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<td>S-4</td>
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<td>S-5</td>
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<td>X</td>
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<td>S-7</td>
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<td>S-8</td>
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<td>S-10</td>
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<td>X</td>
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<tr>
<td>S-11</td>
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</tbody>
</table>

The original Mp3 files were copied from the digital recorder for backup and e-mailing. The original transcribed interviews in Microsoft Word were protected with passwords to prevent any accidental manipulation, editing, or coding of the original data. All manipulation, editing, or coding during the analyses was accomplished on backup.
copies. All data collection files and interview recordings were “backed-up” in two separate medias. The digital videotapes of the interviews were write-protected and stored.

Evolution and Application of Qualitative Coding

The digitally recorded interviews were transcribed into Microsoft Word and reviewed against the original recording for accuracy. Each interview transcription was combined with other interview transcriptions within the respective participant group by interview question number. Extraneous words and incomplete sentences were removed from all interview responses. Patton provided an example of numerical coding in a qualitative code book used by multiple coders in *Qualitative Research and Evaluation Methods*, Appendix 8.1 (2004, p. 516-517). Carney, Joiner, and Tragou (1997) used a more descriptive method where interviews were not only numerically coded, but the transcript was also coded by participant pseudo-name and transcript sentence for ease of context clarification and quotations. Using numerical coding methodology yielded succinct categories and facilitated electronic manipulation. A sample of the digital code book developed by the above process and sample coded interview is provided in Appendix C.

The transcripts were digitally coded using a four-digit code where the first digit represented the research question and the last three digits denoted categories and sub-categories within each research question. Additionally, each contextual thought of the transcript was delineated and coded with the respective participant category, participant pseudo-name, question number, and participant response identifier. Although the interviews were conducted with specific scripts following the interview protocol matrix defined in Tables 3, 4, and 5, some interview responses within one research question
applied to other research question topics. When this occurred, the transcribed response
was copied and appropriately coded with the four-digit code and the word “duplicate”
was added at the end of the copied response. The coding within each research question
was checked for internal homogeneity within each participant group first, then reviewed
again for all participant groups. External homogeneity check ensured the coding of the
four research questions presented a holistic view of the case study.

The fully coded participant group responses were imported into three separate
Microsoft Excel using delimiters to place the data into desired cells. After checking
alignment of codes and other identifiers, the three groups were merged into a single Excel
tab. The first row of the spreadsheet was formatted to auto-filter data in subsequent rows
under the respective column. Auto-filter facilitated analyses and triangulation of data
from the different participant groups through isolation and filtering by research question,
interview question, participant groups, individuals, individual responses, or coding.
CHAPTER IV

RESULTS

This chapter describes sources of data analyzed and results of qualitative triangulation of sources analyses in the context of the research questions. Sources of data relevant to this case study include pre- and post-tests; qualitative coding of participant interviews and researcher field notes.

Sources of Data

The MH2 course pre- and post-tests were both 50-question multiple-choice exams developed from Category B level hydrographic test banks and new questions were written to assess FST unique competencies. Each question was designed with one correct answer and three distracters. Comparative analyses of the pre-and post-tests were accomplished to quantify magnitude of learning by individual and as a class. Details of the comparative analyses are discussed with research question four.

Qualitative coding of participant interviews provided the most vivid detail of the performance of the instructional design management model. A total of 16 interviews (five managers, five SMEs, and six students) of 19 anticipated interviews were digitally recorded and conducted according to the interview protocols identified in Tables 3, 4, and 5. The three missing interviews were all SMEs. The FST management requested the two SMEs out of the country not be contacted due to mission limitations and the third SMW was not be contacted due to a medical condition. The author theorizes the three missing interviews have a negligible impact on holistic assessment of the study based on the number of interviewed SMEs and the content of their comments.
Problem Statement

The central problem is the need to develop an effective instructional systems, management-level model that orchestrates the efficient development and implementation of desired curriculum. The three phases of course development that management must carefully control to ensure delivery of high quality and timely instruction are: 1) the assessment and documentation of organizational training requirements; 2) project management control of curriculum development; and 3) the implementation of relevant instruction by competent instructors. This model must also provide 4) measurable and quantifiable course evaluation results to justify return on investment and validate its importance to the organization's strategic objectives.

Analyses and Results

Research Question 1: Does the instructional systems management model effectively coordinate with management to accurately document the desired training requirements of the organization?

All five managers agreed training was essential for the success of the organization and that the MH2 class is an important part of the strategic plan. All five managers stated the PDD South course designer did effectively document and coordinate the apprentice-level training requirements with Manager-2 noting, “They did a remarkable job.” The final list of training requirements was a combination of select internationally mandated hydrographic competencies and FST unique requirements. The PDD South led the FST training officers through a process documentation procedure to identify its apprentice requirements. Manager-3 summarized the course training documentation by stating, “So all the competencies ... actually equate to our requirements in the field for accomplishing
our mission.” All five managers were in agreement that no apprentice-level requirements were missing from the course.

All five SMEs agreed that PDD South effectively documented and coordinated the apprentice-level training requirements. SME-1 stated that requirements were “…well documented,” adding “It was clear what they [the lessons] were going to be.” SME-6 stated that the training requirements, “…were clearly laid out…” and SME-2 noted, “…once they [the SMEs] found what the procedure method was everybody was saying it was falling in place pretty well.” The SME-6 was surprised at the magnitude of detail in the requirements by saying, “…it made me realize there’s a lot more to what we do looking at [the training requirements] so I thought it was pretty effective.”

The six students were not part of the documentation process, but when asked how the MH2 class prepared them to be apprentice hydrographers, all students remarked they learned a significant amount and they were better prepared to perform as hydrographers. Prior to the course, Student-3 was concerned that, “…for going out and actually doing survey I’d—personally, I’d get overwhelmed with everything because you try to do it in two weeks and, you know, you’ve got your tides, multibeam, single beam, and you know—prospecting, and then all these new computer programs, and side scan, I would have—I would have been overwhelmed—and forget it. I’m going to stand back here and watch.” Student-3 now feels that the MH2 course is a “…a good segue into surveying…” Student-4 stated, “…it [hydrography] was no longer a foreign language to me. I could understand what people were talking about when discussing the issues and [I] have a basic understanding of how to use [the equipment]. Student-5 stated, “Coming into Fleet
Survey Team I didn’t know anything about hydrography at all and I do have a better understanding now of … the equipment and procedures.”

The consistent theme noted from the students was the desire for more training. The most consistent request from all students was the addition of more hands-on training with the equipment. Two students expressed desires for additional training to be included within the course went beyond the apprentice-level design of the course such as expert level equipment operation and trouble shooting. Manager-4 cautioned, “I suppose the important thing is their thirst for the extra knowledge. I would be nervous about spending extra time doing it because it would lengthen the course.” Manager-2 described the intended result of the course as, “...the MH2 course is our primary mode of training non-Category A hydrographers...the apprentice hydrographer.”

Research Question 2: Does the instructional systems management model efficiently direct the curriculum development team in creating quality curricula in a timely manner?

The course learning objectives were developed from the documented training requirements. Manager-4 described this process as, “The format, the guidance, and everything was laid down from PDD South. And, all the templates were provided to each of the SMEs, so then quite close liaison between the training officer here [at FST] and yourself [the author] to verify that what they were producing was an acceptable standard.” Both PDD South curriculum developers and SMEs developed the necessary course materials following author’s guidance and course curriculum templates. All managers agreed the templates were very beneficial and facilitated course development. Manager-1 stated, “I thought they were very good. They weren’t too complex; they were precise but they captured everything that needed to be done for the course.” Manager-3
agreed by stating, “The templates are, in my opinion, designed in a very simplistic manner to cover the whole range of disciplines that fall within the training course which is an excellent design, because every module is technically complicated. And, in order to capture all of that, you simplified the templates and at the same time all made it all-encompassing, so you did not lose aspects of the training.” Manager-2 added, “We’ve taken a course that could have just gotten by and made it ‘much more meat on the bone’, if you will, and the level of detail and the level of completeness of the instruction and that hard work will pay off in subsequent courses.” When asked as to timeliness of delivery of the initial course, all managers were in agreement that it was delivered on the date specified and instruction began on time.

Close coordination with SMEs was necessary to ensure a course is developed correctly and in a timely manner. The PDD South office is 40 miles from the FST office, so most of the coordination was conducted via phone or e-mail. When asked as to the frequency of contact from the course development manager (the author), the FST training officer stated, “You contacted me quite a bit. I contacted you. We were in contact probably every other day, at least.” When the FST SMEs were asked the same question of the FST Training Officer, they all replied they were contacted at least once a week for a progress report and to ensure they were going to meet the development deadlines. All five SMEs described themselves as volunteers and all stated that course development had a significant level of impact on their normal FST duties. The managers were aware of the burden the SMEs were bearing. Manager-1 stated, “It was difficult; I mean, it was hard to get the SMEs to focus on their surveys that were upcoming or they were still working on, as well as do these additional duties of being an SME and preparing for a class…” adding
“...so it’s a time management and expectation management and motivation in some cases, but we made it work—but it wasn’t easy.” Four of the five SMEs stated the author provided adequate instruction to the FST SMEs; the fifth SME was out of the country during the initial phase of development and did not receive the guidance. The SME-6 stated, “The goals were set out with the objectives so they were clearly laid out what everyone needed to teach.” In regard to the templates, SME-5 stated, “I felt the templates were actually very good.” And, SME-6 described the ease of using the templates as, “…they were, you know, straightforward. Just looking at the templates you could do it straightforward. You could understand it.” Some SMEs were initially resistant to the process of using the instructional development templates; this sentiment is summarized by SME-1, “It took a while at first because everybody...that I talked with wanted to do it their own way. But, once we got into it, we realized ‘this is going to make it easy on everybody’.” All SMEs stated they thought the templates were effective in assisting in the development of the course material.

All SMEs, both PDD South and FST, created lectures, workbook material, practical exercises, and wrote questions for quizzes and the final exam. The students all agreed the lectures were effective in presenting apprentice-level hydrographic concepts. The students expressed a range of comments when referring to the course workbook. Student-2 stated, “It went right along with the lecture so you could keep up with what the instructor was teaching.” Student-4 expressed value of the workbook by stating, “I think it was really well put together. All the information we needed was in there. And even now, I’m using it as a resource to get ready to go out on my first survey.” Student-5 added, “I liked that for reference. I mean, you could look something up whether it be
while going through the lecture or even at the end of the course while you’re—during the hands-on kind of practical survey. I think that’s a good idea to have that ready and available.” Two of the six students rated it less than satisfactory. Student-3 stated, “... the workbook itself I didn’t think was very effective.” adding “I, personally, didn’t really use it.” Student-1 correctly referred to the workbook as “incomplete.” The final four units of the workbook were not complete by the time the material was presented in class requiring the students to take notes during the lectures. The missing workbook material was completed and distributed following the course completion. All students expressed value in the practical exercises with the equipment. Student-3 stated, “I thought those were highly effective.” in reference to the practical exercises. When asked about the unit quizzes and their effectiveness as self-assessment tools, all students agreed the quizzes were beneficial. Student-4 replied, “The questions were written on a level that required you to understand the concepts.” and Student-2 stated, “If you messed up on a couple of questions, you’d know what you needed to work on.” Student-6 added, “They were with it. The quizzes weren’t just full of a bunch of useless questions that we needed to know. A lot of the questions were the main points that we needed to know. So, I thought the weekly quizzes were good.”

Research Question 3: How effective is the instructional systems management model in orchestrating quality instruction that provides knowledge and skills graduates need to perform job-related tasks?

All managers agreed the key to successful participation of SMEs in instruction is dependent upon early coordination and documentation of schedules. Manager-2 noted, “... PDD South had tasked us to formulate that schedule ourselves,” adding “... we
identified instructors early in the course.” Manager-4 added, “Once we ascertained which subjects the SMEs were going to do, they obviously started to work on producing those SME plans—the curriculum, the contact, or what was actually put together fairly early on.” However, the highly variable operations of FST caused changes in instructor schedules. Manager-1 describes, “As our operational schedule changed, we had to adjust and so other people stepped up to teach classes they weren’t necessarily scheduled to teach…” Maintaining the schedule, Manager-3 stated, “On several occasions, Mr. Taylor [PDD South instructional design manager] sent out notifications of due dates and he tracked us via email and phone calls. It was very effective.”

The variations in the instructor schedule driven by FST operational changes affected some SMEs, but not all of them. Two of the five SMEs expressed dissatisfaction with variation of the instructor schedule noting they had less than a week to prepare. The other three SMEs interviewed expressed advanced notification as “adequate” or “sufficient.” The SME-1 stated he had “A month” notification and SME-6 said, “I believe it was two to three months ahead… so I had plenty of time.” When the SMEs were asked as to the magnitude of instruction had on their normal duties on a scale of 1 to 5 (1 being no impact and 5 representing significant impact). Two SMEs reported 5 and the other three rated the impact as 2, 3, and 4. All SMEs stated instructing had an impact on their duties. The SME-4 vocalized his view as “It is one of the things… we do not take into consideration when you’re an SME and we’re serious about being an SME, then you really need to just push everything else aside and become totally immersed and involved in setting up your instruction.” Other SMEs noted dichotomy in prioritization within the organization between operational duties and training development duties, one noting,
“...obviously, you can’t have two number one priorities...” Manager-3 noted, “...the impact is when you remove a member of FST from their normal line of duties and responsibilities and they are now set into a new role as an instructor; just the prep time alone takes away from their normal duty assignments.”

The students’ view on instruction included lecture by PDD South instructors and FST SMEs, as well as hands-on demonstrations and practical exercises. All students agreed the PDD South instructors were knowledgeable and effective as instructors. Two students expressed confusion over PDD South instructor references to larger white ship surveying. Four of the six students were of the opinion the FST instructors were not well prepared. Student-3 captured this dichotomy by stating, “It’s difficult to...try to teach something you really do not understand so I guess FST SMEs, in—as a general, were a little less prepared than were the PDDs just based on the fact I don’t know if they really fully understood what they were teaching. But I guess the same could be said for the PDDs.” In practical exercises the students unanimously preferred learning from the senior civilian SMEs. Student-3 noted the senior civilian hydrographer, “...knowledge is invaluable because ... they’re trying to impart on you what they’ve learned in twenty years and they know the quirks of it and they know how to, you know, hook it up and everything.” Student-2 said, “And they show you the “how to do” so as it had to be done out in the field.... They actually go out on these type surveys. .... so they would know what goes on and what exactly is needed to be known once were out there. ....” Student-6 added, “And the little thing that comes to mind is ‘Been there, done that.’ Those guys have all been out in the field; they’ve all surveyed; they know all the little nuances of the equipment and some of the little rules of thumb that, maybe, that can help you out ...
when you’re out on survey.” When asked if there were any disadvantages to using SMEs as instructors, four of six students noted interference with their primary jobs as a disadvantage. Student-6 noted, “Yeah, the disadvantage is that they have a job to do. Their full time job is that..., they work for Fleet Survey Team.” Student-4 added, “…I think their experience and their method of teaching and everything is still very much a positive thing for this course.”

*Research Question 4: How effective is the instructional systems management model in delivering properly trained personnel as requested?*

All five managers agreed in their affirmative replies that the MH2 course was effective. When asked about the graduates’ knowledge of hydrography, Manager-1 stated that the MH2 course, “Greatly increased it.” Manager-2 testified as to the graduates’ hydrographic competence during survey by stating, “The graduates who completed the course in November are out the door right now and they are far and above in better shape than our folks that have not had that course.” Manager-5 commented, “It’s great. It’s springboards into daily operations; what we’re expecting of them.” Manager-3 elaborated further by stating, “Members of my department are taking what they’ve learned through the course study and are applying that through our weekly command training modules and there’s been a lot of enthusiasm, a lot of extra research, both information and also self-imposed training, so it’s really helped us out.” One manager remarked, “I noticed the difference when I took a team on survey—the ones that hadn’t had any training and the ones that actually had; the other [trained] person was several marching paces ahead, which is significant...” Manager-2 clarified the apprentice-level of the graduates by stating, “It’s worth the time and effort... it certainly does make them more proficient.”
Two of the five SMEs had recent survey experience with graduates from the MH2 course. SME-4 complemented Student-2’s recent performance on survey stating the graduate “performed very well...he did super.” SME-6, the other SME with direct graduate observation stated, “I had one of the students go with me on survey and he—he was on top of everything, so it obviously worked good. ... he knew basically the whole thing—everything to do with the survey; he had a good understanding of it.” When asked if any of the graduates had mentioned the need for additional subjects to be added to the course, none of the five SMEs noted any specified subject area; three of the five, however, commented additional hands-on experience was expressed.

All students were in agreement that the course had prepared them as apprentice hydrographers. Student-5 indicated more self-confidence by stating, “Coming into Fleet Survey Team I didn’t know anything about hydrography at all and I do have a better understanding now...” Student-1, who has not surveyed yet stated, “…it taught me a lot; MH2 gave me all the basics...” Student-2, just returning from an overseas deployment stated, “It helped me out a lot because I was pretty much running all the equipment in Hypack and with the single beam and the side scan for the... after the first week that we were in Japan and the rest of the time I was pretty much running all this stuff by myself...” Student-6 retired a few months after the course, but when interviewed he stated, “Of course, it perfectly natural getting a chance to do an actual survey afterward, but I would say that just without that, I would have thought the training would have been an effective course.”

Comparative analyses were performed on the pre-tests given on the first day prior to any instruction and the final exam given on the last day of class in the ninth week.
Table 6 displays the results of a comparative analyses of the 50-question, multiple-choice pre-tests to a slightly different version post-tests. The content of the two tests is nearly identical with only slight differences wording of the questions and/or the responses. Both examinations were designed to assess the same course objectives with the same number of questions. The analyses indicates an average increase in student cognition of hydrography of 38.3%. The increase on the students' job-related knowledge is described by management as "phenomenal" and "very effective". Manager-2 commented, "... it does give them a much better frame of mind rather than walking around as a robot not understanding what's going on. They're now able to contribute and get a synergy going with the other surveyors." Manager-5 summarized the effectiveness of the course by stating, "I think this course is essential now and I want as many [personnel as possible] to go through it."

Table 6.

Student Pre-Test and Post-Test Scores.

<table>
<thead>
<tr>
<th>Student Pseudo Name</th>
<th>Pre-Test Score %</th>
<th>Post-Test Score %</th>
<th>Knowledge Gained %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1</td>
<td>42</td>
<td>82</td>
<td>+40</td>
</tr>
<tr>
<td>Student 2</td>
<td>38</td>
<td>80</td>
<td>+42</td>
</tr>
<tr>
<td>Student 3</td>
<td>50</td>
<td>86</td>
<td>+36</td>
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<tr>
<td>Student 4</td>
<td>52</td>
<td>88</td>
<td>+36</td>
</tr>
<tr>
<td>Student 5</td>
<td>46</td>
<td>80</td>
<td>+34</td>
</tr>
<tr>
<td>Student 6</td>
<td>48</td>
<td>90</td>
<td>+42</td>
</tr>
</tbody>
</table>

Mean 46.0 84.3 +38.3

Student pre-test (M = 46.0, SD = 5.22) and post-test (M = 84.3, SD = 4.27) scores. The results indicated a significant difference between the pre-test mean and the post-test mean at the p < 0.001 level (p = 1.24E-06 or 0.00000124).

A two-tailed, t-test was conducted to evaluate whether the change in grades between the pre-tests and post-tests was the result of the instruction the MH2 students...
received. The results indicated the difference between the pre-test mean and post-test mean is significant at $p < 0.001$ level ($p = 1.24E-06$ (0.000000124)).

Summary

Triangulation of the opinions and observations of the managers, the SMEs, and students formulated the qualitative assessment of the performance of the instructional design management model analyzed in the four research questions. First, the analyses proved the instructional design management model was effective in its assessment, coordination, and documentation of FST apprentice-level competencies. Second, the project management techniques, effective guidance to the SMEs and curriculum development tools employed during the development phase was instrumental in the on-time delivery of the course. Third, the instruction was effectively scheduled and delivered by properly selected, competent instructors. Finally, the initial return on investment was quantified through the significant increase in the students' hydrographic competencies documented by their test scores. More importantly, the students displayed an increase in interest in hydrography and confidence as they prepared and participated in their first surveys. The return on investment will become more evident as the organization assesses efficiency of the deployed survey teams. The course directly supports the FST strategic objectives by facilitating the rapid development of apprentice-level competencies. Further, the course reduces the training burden on the HIC allowing the team leader to concentrate on the details of the survey. This finding ultimately supports the FST primary mission, the rapid collection of quality hydrographic data in support of the U.S. Navy.
CHAPTER V

CONCLUSION

The purpose of this study was to analyze the effectiveness of the instructional design management model and its ability to orchestrate, develop, and implement requested curricula. The managerial perspective of the application of instructional design principles and project management coordination of non-curriculum development personnel, the SMEs, outside the ISD system made this study unique.

The theoretical approach for this study was systems theory-based due to the nature of the instructional systems design model (Gagné, 1992) and the systematic (Bertalanffy, 1969) design of the management model. The study was accomplished using single-case study application of qualitative style of inquiry as described by Patton (2002, p. 447). Qualitative inquiry was selected to collect and analyze participant holistic perspective assessment of effectiveness, relevance, and timeliness of the instructional design management model (Patton, 2002, p. 41). Triangulation of data sources within the qualitative framework of the study (Patton, 2002, p. 559) incorporated the three participant groups—managers, SMEs, and students—incorporated multiple views of the course development and implementation adding validity to the findings and the removal of research bias (Patton, 2002, p. 556).

The events leading to this study are many—the need to develop relevant training to fulfill customer training requirements for improving the performance of assigned personnel (Rummler & Brache, 1995; Nadler, 1984); the need to design and deliver quality instruction in the format that maximized the student’s ability to learn (Piskurich, 2006); and the desire of efficient transfer of training to the workplace.
(Dick, Carey, & Carey, 2005, p. 26; Kirkpatrick, 1998). These needs and desires are not exclusive to the military environment, but are also found in public and private schools, trade schools, universities, and commercial industry. The instructional design management model is applicable to any learning environment or audience, and was employed in the development of the MH2 course for FST. The four research questions for this study focused on the three phases of the instructional design management model and the holistic evaluation of the entire system.

Problem Statement

The central problem is the need to develop an effective instructional systems, management-level model that orchestrates the efficient development and implementation of desired curriculum. The three phases of course development that management must carefully control to ensure delivery of high quality and timely instruction are: 1) the assessment and documentation of organizational training requirements; 2) project management control of curriculum development; and 3) the implementation of relevant instruction by competent instructors. This model must also provide 4) measurable and quantifiable course evaluation results to justify return on investment and validate its importance to the organization’s strategic objectives.

The ISMM has four phases of managerial focus—customer requirements, curriculum development, implementation, and the assessment of the output of the instruction against the customer requirements. The purpose of the ISMM grew from the need to efficiently plan and implement hydrographic instruction for the U.S. Navy. The instructional design management model is an example of Bertalanffy’s general systems theory (1969) in that it is systems-based in design and application. Bertalanffy introduced
the concept of studying not only the parts and processes separately, but the organization and dynamic interaction of the parts and processes in order to understand and resolve the problems of the system (1969, p. 31). The instructional design management model performs as an open system of inter-related system of management processes employed to ensure successful design and implementation of systems-designed instruction. The management system is considered an open system because, according to Bertalanffy (1969, p. 150) it is reactionary to outside influences; it adjusts itself and other interconnected systems such as ISD and also reacts to the processes and output measures of the ISD model. The two systems are inextricably interconnected and must function cohesively to effectively develop and deliver instruction as requested by the customer (Piskurich, 2006, p. 9).

The first phase of the model involves determining the customer’s training needs. The process began with a request from the FST management to NMOPDC for an apprentice-level hydrographer course. The FST civilian and military personnel have worldwide deployment responsibilities to support the hydrographic needs of U.S. Navy. The FST mission is expanding and so is the size of the organization. Management of FST theorized the projected rapid increase in untrained personnel would increase the training burden during survey operations that the HICs were already suffering. Notes from my initial meeting with FST management indicated they needed a training course to fulfill four broad organizational goals. The FST management stated they wanted a course that would (1), provide a base of apprentice-level personnel for survey duty; (2) reduce the training burden on the HIC and other experienced personnel during the survey; (3) enhance data quality; and (4) facilitate overall mission readiness and capacity. Manager-1
stated during his interview, "We can't do our job without training," and Manager-5 added that the MH2 course was, "...essential to our training plan." The FST management was preparing the first steps of developing the personal mastery of its personnel (Senge, 2006, p. 7). The next step was to determine the necessary competencies for the course.

Course competencies are determined by conducting a modified training needs assessment based on multiple sources (DoD Handbook MIL-HDBK-29612-2A, 2001; U.S. Air Force, 2002a; OPM, 2001). The FST recognized the need, but needed professional assistance to determine the exact extent of the apprentice hydrographer requirements. The literature is replete with references to management resisting training needs analyses or requesting training be developed without conducting an organizational analysis to identify performance deficiencies (Dick, Carey, & Carey, 2005; Piskurich, 2006; Rothwell et al., 2006; U.S. Air Force, 2002a; Rummler & Brache, 1995). According to the U.S. Air Force Handbook guide on training needs assessments (2002, p. 3), "Failure to accurately assess the need for training at the beginning of the process can result in time and money being wasted on developing training for non-training-related problems or developing inadequate or unnecessary training to solve training-related problems." This warning applies to any organization undertaking a needs assessment. The training needs assessment process requires management to first assess the optimal or desirable set of competencies for a specific position or level of employees. Second, the management must assess the current level of competencies their employees possess. The difference between optimal and current state of personnel is a training deficiency or requirement (U.S. Air Force, 2002a, p. 14). Each competency identified as a need is delineated by type (cognition or psychomotor skills) and by level of mastery (apprentice,
journeyman, or master). Cognition skill levels are identified by Bloom’s Taxonomy (Bloom, 1956) and psychomotor skills mastery levels identified by Simpson (1973).

The hybrid approach of discrepancy need and democratic need assessment procedures (Air Force, 2002a, p. 25) determined the specific competencies for the MH2 course. The 2006 update of the 9th edition of the IHO Manual 5 (M5), *Standards of Competence for Hydrographic Surveyors*, was the initial resource for developing the list of apprentice-level competencies for the FST surveyors. The FST training managers selected relevant Category-B competencies from the M5 applicable to FST surveying procedures and equipment, but still needed to identify competencies for FST unique competencies. The FST did not have specific published references as to its apprentice duties and responsibilities during a survey. The author led the FST training management team through a project management mapping process (Rummler & Brache, 1995, p. 49) to identify the unique survey tasks. The FST survey team process map graphically identified the duties and responsibilities of each survey team member and their interactions. This diagram led to the formulation of the FST unique apprentice-level competencies. The two sets of competencies, the Category-B and the FST unique competencies, were merged into a single course outline for FST management approval. Management approval was necessary to ensure the course outline captured the specific training requirements the organization needed (Piskurich, 2005; Gagné, 1992; Finch & Crunkilton, 1999; Dick, Carey, & Carey, 2005).

The MH2 course outline divided the competencies into 58 separate lessons within 18 units with a total of 166 criterion-referenced objectives (Air Force, 2002b, p. 51; NETC, 1997a, p. 4-5-1; Mager, 1962). The author created a draft schedule from the
initial draft outline noting areas where PDD South was not able to provide training due to the uniqueness of the FST equipment. To successfully implement the course we would need the commitment of FST SMEs during FST unique subjects while the PDD South instructors would teach the theory and concepts of hydrography. In essence, we were creating an instruction team where the sum of our collected skills (PDD South—theory and FST—hands-on) exceeded the capabilities of either team individually (Senge, 2006). Management of FST was warned that course development would have a significant impact on the SMEs. The SMEs required guidance from PDD South (Olivia, 1999, p. 561) on curriculum development (Dick, Carey, & Carey, 2005, p. 40), and course development templates to smooth the development process (Piskurich, 2006, p. 9). The FST management recognized the importance of SMEs in both the development of curriculum and as instructors in areas of FST unique skills and committed the organization to the development effort (Dick, Carey, & Carey, 2005, p. 26). Manager-2 commented that, “We realize that...if we want this to be a course for FST, [it will] have to be by FST for the practical exercises. We can’t expect that all our equipment to be understood by external instructors...” The amount of time estimated to develop the course was based on existing object-oriented learning material (Piskurich, 2006, p. 8) and on the estimations of course material to develop. The author identified areas where FST SMEs were required and provided estimates of approximate time to develop (Rothwell et al., 2006, p. 51). After reviewing the estimated magnitude of effort, the FST management requested the inaugural MH2 course to start on September 11, 2006, one month earlier than anticipated. The date was selected based upon the availability of SME instructors,
survey vessel maintenance schedule, and the need for apprentice surveyors beginning to deploy on survey in December (Piskurich, 2006, p. 92).

The approval of the apprentice-level competencies from FST management and the commitment of use of SMEs led to close consultation with FST training management in the identification and scheduling of SMEs. The initial meeting with the SMEs occurred in June 2006, but was poorly attended. A second SME training and guidance session was accomplished the following week was well attended. During the second SME training session, the author explained the purpose of the course, the target delivery date, the curriculum development process, and introduced the SMEs to the three course development templates—lesson plan, multiple-choice test bank and practical exercise templates. Manager-3 stressed to the attendees this was a collaborative effort with PDD South for the benefit of FST personnel and to facilitate mission accomplishment (Senge, 2006, p. 9).

Communication with the curriculum development team is crucial, especially in the beginning days of the development. The PDD South office is 40 miles east of the FST facility, so most of the communication was accomplished via e-mail and phone calls. The communication procedures established included nearly daily direct communication between myself as the IDM and the FST training manager or his alternate. In regard to FST SME assignments, Manager-2 recalled, “… PDD South had tasked us to formulate that schedule ourselves…we identified instructors early in the course.” This method was chosen because the expertise or the availability of the SMEs was not known; plus, it facilitated management’s ability to adjust SME assignments to meet operational
obligations (Senge, 2006, p. 219). The total development team consisted of eight FST SMEs and two PDD South curriculum developers/instructors (Piskurich, 2006, p. 11).

To keep the curriculum development on track, the author created a curriculum development tracking chart. The tracking chart was a work breakdown structure of the course material that needed to be developed for the course (Lewis, 2007, p. 56). Each objective in the course had certain instructional elements that needed to be created or edited if it came from the object-oriented pool of existing material (Piskurich, 2006, p. 8). The tracking chart was updated daily and received FST SME updates at least weekly from the FST training manager. Managers at both organizations were kept abreast of the progress. The updates increased in frequency during the last month of development prior to the commencement of the course. Within the last month of development the FST training manager informed the author of several SME instructional changes. Interviews with managers and SMEs indicated there was a change in the FST deployment schedule that necessitated a change in the SME schedule. The changes to the schedule were excessive to SME-4 as he referred to the instructor schedule as “flip-flopping” and describing it as “sloppy.” This negative comment was a single occurrence and was not representative of the majority. It was, however, still troubling as the manager of the development and instruction schedule. The SMEs’ time is limited and their expertise is necessary to the success of the course; it is important the SMEs believe their expertise is respected (Piskurich, 2006, p. 147). Further investigation into the SME-4’s comments proved they are not caused by course development but rather by the high operational tempo and inherent variability of the day-to-day operations of FST. Manager-2 explained, “Of course, eventualities came up and things changed, like they always do, and so it was
an ongoing coordination effort, most of the time successful, but it comes down to effective communication between us and PDD South."

The changes in FST SME personnel in August 2006 appeared negligible from a curriculum development manager prospective because other SMEs were eventually named. Interviews with the FST SMEs revealed my prediction was correct—the impact on the SMEs was considerable. Four of the five SMEs noted they experienced difficulty in preparing their lessons due to the needs of their primary job responsibilities. Three of the five interviewed SMEs rated the impact of preparing course material for their assigned areas as "significant" while the other two reported milder impacts. Manager-3 explained, "...the impact is when you remove members of FST from their normal line of duties and responsibilities and they are now set into a new role as an instructor, just the prep-time alone takes away from their normal duty assignments." Two of the three SMEs vocalized their dissatisfaction with the development process; SME-5 thought the IHO M5 guidance for his unit was "lacking" while SME-4 did not care for the templates calling them "too restrictive." Neither of these SMEs attended the SME guidance meetings in June because they were deployed on surveys. It is not clear when they received their assignments, but their names were provided in an update in late August. These same two SMEs were also dissatisfied with the dichotomy between the priority of their normal duties and the new duties of developing instructional material. Management was aware of these stresses as indicated by Manager-1, "It was difficult; I mean, it was hard to get the SMEs to focus on their surveys that were upcoming or they were still working on, as well as, do these additional duties of being an SME and preparing for a class," adding "...it
wasn’t easy.” As Manager-4 stated, “The operational tempo didn’t change because of the course.”

Production of the student workbook began two weeks before the class was scheduled to convene. A limited number of workbooks were prepared because the class was a pilot class and changes were expected. Professional printing of pilot course material is not cost-effective. The FST SMEs were not expected to complete their lessons until approximately four weeks after the course started. This schedule was established due to the extra time required by the FST SMEs to develop their unique training material; thus, the sequence of the course development was not same as the COI. The COI sequences the course (NETC, 1997b, p. 4-6-1); the project schedule and course development tracking chart sequenced the development of the elements (Lewis, 2007, p. 58). This maximized time for the SMEs to prepare, but it also meant beginning the course with an incomplete workbook. Printing and assembly of the student workbooks began the first week of September as members of the development team completed their lessons. One member of PDD South was assigned to review and format the workbook material to ensure its consistent appearance. The workbooks for the inaugural class were placed in three-ring binders to facilitate the addition of material later in the course.

The third phase of the instructional system design model began for the students on September 11, 2006. From a course manager view, the third phase began with the negotiations with FST management to include SMEs in the instruction. The course schedule was set months in advance of the actual start date to ensure maximum participation of the SMEs.
The first half of the nine-week course was predominately PDD South lectures on theoretical background on oceanography, geodesy, acoustics, horizontal and vertical positioning, and the basic theory of operation of single-beam echo sounders, multibeam echo sounders, and side scan-sonars. All of the PDD South lectures were based on the competencies specified in the IHO M5. The course was designed to present the lecture first, then provide the students hands-on experiences (Senge, 2006, p. 23; Piskurich, 2006, p. 156; Bransford, Brown, & Cocking, 2003, p. 12; Gribbs, 1988). Since the PDD South instructors did not have experience with the FST equipment, this required the hands-on portion of the subject to be presented by a FST SME normally the following day. In some units, the hands-on objectives were combined to facilitate the exposure to more than one system in one day such as single-beam echo sounder with side-scan operations (Piskurich, 2006, p. 159). This methodology of team teaching looked promising given the theoretical background strengths of PDD South and the hands-on experience of the FST SMEs (Senge, 2006, p. 9), but it did have its problems.

Some students were confused by the examples provided during lectures by PDD South because they referenced large vessel, open-ocean style of surveying; FST operates exclusively with small boats, close to shore with hand-mounted equipment. Although the PDD South instructors knew the theoretical background of operations, they did not have the background. As SME-4 stated, “...there’s just no substitute for experience.” Another minor, but irritating, problem with two sets of instructors was the redundancy of concepts in different lessons. Some concepts such as IHO quality standards for surveys are in multiple hydrographic subjects. SME-4 pointed out, “[the problem] with a variety of instructors coming in... is one instructor didn’t know what the instructor before him had
done so it’s very hard to build on a topic,” adding that when he was told by the students that they had already heard the concept explained multiple times, he remarked to the students, “Ok, well I’ll just skip that part of my lecture.”

While PDD South lacked FST experience, they did not lack the ability to explain the theoretical concepts. Student-6, testified, “...both of the instructors knew what they were talking about.” All of the students commented on PDD South as being competent, prepared, and well-organized for each lesson. Student-4 commented, “They always showed up prepared with their material together, ready for that day’s topics, and they had everything arranged for the practical exercises and everything. I thought they were very well prepared.” This student noted the conscientiousness of the PDD South instructors in maintaining their lecture timing and coordination with the SMEs to prepare for the students’ hands-on experience with the equipment. Unfortunately, the equipment was occasionally not ready for the class.

The hydrographic equipment used in the MH2 course came from the FST equipment pool that is used worldwide, year-round by FST. When the equipment returns from deployment, it is returned to the electronics shop for a maintenance review. Some equipment brought to the course from the equipment pool had not been through the maintenance review and did not pass calibration checks. Other equipment with valid maintenance checks did not have valid licenses and operated with limited capability. On other occasions, the equipment required repair by an electronics technician. Each of these situations represented a loss of hands-on opportunity for the students.

Even though the equipment was occasionally troublesome, each of the students spoke highly of the SMEs and the hands-on portion of the class. Student-1 stated,
“They’ve seen all the gear. They’ve actually been on survey so they know what needs to be done.” Student-3 said, “…[SME] knowledge is invaluable because they’re trying to impart on you what they’ve learned in twenty years…” Student-6 highlighted the SME experience by stating, “the little thing that comes to mind is ‘Been there, done that.’ Those guys have all been out in the field; they’ve all surveyed; they know all the little nuances of the equipment and some of the little rules of thumb that, maybe, that can help you out when you’re out on survey.”

The most perplexing quandary for the MH2 course centers on instruction when SMEs from an operational organization are involved in the development and delivery. The FST SMEs have a full-time job as operators, and as Manager-3 pointed out, the effectiveness of the SME decreases because of the time required to prepare for instruction. The PDD South instructors have the theoretical knowledge, but their effectiveness as instructors diminishes because they do not have the FST unique experience. Manager-1 hypothesized additional instructors at PDD South would be beneficial while Manager-2 hinted at a desired end state stating, “…the more we can rely upon PDD South for internal instruction, the better for us.” Manager-3 suggested, and PDD South management supports, the concept of PDD South instructors participating with FST on a short survey to expand their knowledge with experience, but this requires additional instructors at PDD South to schedule such an opportunity due to the current instructional development and delivery requirements.

In the context of the research question regarding the effectiveness of the model in orchestrating quality instruction, the model performed well, although the interviews might indicate otherwise. Both PDD South instructors and the FST SMEs were effective
in their instruction within their respective strength areas and not as effective in their non-traditional roles. In essence, the instructional design management model correctly orchestrated quality instruction for the students by providing the best possible knowledge from PDD South and hands-on skills by the FST SME team (Senge, 2006, p. 216).

The final phase of the instructional system design management model is the analyses of the graduates' performance against the original list of competencies. The competencies developed in the customer requirements assessment phase serves as a quality indicator for managers to assess the return on their investment in the training (Piskurich, 2006, p. 268; OPM, 2001, p. 93). The investment FST committed to the course was the valuable time and efforts of their SMEs, and all managers expected to see results. Many managers see training as an expense without any measurable return when in actuality the return is an indirect return on investment (Piskurich, 2006, p. 280).

Kirkpatrick (1998) outlines four levels of evaluating training—student reaction to the course, student learning, transfer of learned skills to the workplace, and long-term retention of learning. Senior FST managers routinely asked the students how the course was progressing and what their impressions of the course were. These informal assessments were providing FST management the students' immediate reaction to the training, in other words, level-one evaluation feedback according to Kirkpatrick (1998, p. 26). The author presented the second level of evaluation, student learning (Kirkpatrick, 1998, p. 40), to the management in summative form with the comparative analysis between the pre- and post-test scores, as seen in Table 6, shortly after the conclusion of the course. Meanwhile, the managers and SMEs formed their own informal level-two assessments through conversations with the students. Level-three evaluations of student
transfer of learned skills to the workplace (Kirkpatrick, 1998, p. 49) were limited because only two of the six students had participated on a hydrographic survey since graduation. Comments from managers and SMEs indicated the graduates performed well and were valuable assets to the survey. Other quantifiable benchmarks FST can employ to assess level-three effectiveness of training is quality of collected data and efficiency of the survey in terms of time. Kirkpatrick’s level-four evaluation of training and long-term retention (p. 61) will be assessed by the FST training division through OJT, formal job qualification assessments, and annual reviews. Each of these evaluations, both formal and informal, allowed management to formulate its own opinion of the effectiveness of the course. Judging from the feedback, the course was very effective and quantifiable results were provided by PDD South and should be further assessed indirectly by FST in terms of data quality and team effectiveness during surveys.

This small-scale study proved the effectiveness of the ISMM and its ability to document training requirements, develop, and implement requested curricula for a highly technical course. Further, the application of project management principles within the ISMM led to the successful coordination of hydrographic equipment, SME instructors, and curriculum developers in development and instruction of the course. Although the course was successful and the performance of the graduates was impressive, additional study and refinement of the model is needed to maximize its efficiency and its application.

**Recommendations for Further Studies**

Findings of this investigation lead to the following areas of recommended study:
1. Additional studies of the ISMM, specifically the refinement of each of the phases and increasing efficiency through systematic linkages and integration with web-based technology.

2. Additional investigations relative to the application of ISMM in different learning situations such as university courses, public primary and secondary schools, and industrial training centers.

3. Additional study is needed to improve course development, specifically in the area of web-based collaborative tools where the SMEs and the curriculum developers are geographically separated.

4. Rapid development and blending of electronically delivered, self-study material for cognitive competencies in professions with rapidly changing technology coupled with well-sequence OJT by highly skilled SMEs.

Conclusion

This study provided qualitative documentation of the effectiveness the instructional systems design management model. The management model effectively analyzed, coordinated, and accurately documented the training needs of the organization. Second, the model effectively estimated the level of effort and orchestrated the development and implementation of quality training curricula in a timely manner. Third, the model efficiently used the unique, but limited, strengths of both the PDD South instructors and the organization SMEs. Finally, the quality of the training was qualitatively and quantitatively ascertained through measurements against the requested competencies and management expectations. The proven effectiveness of this training
management model and its inherent flexibility for any learning situation makes it a valuable tool for anyone involved in development of educational or training material.
The project has been reviewed by The University of Southern Mississippi Human Subjects Protection Review Committee in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months. Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 27012901
PROJECT TITLE: Thinking Outside ISD: A Management Model for Instructional Design
PROPOSED PROJECT DATES: 01/29/07 to 04/09/07
PROJECT TYPE: Dissertation or Thesis
PRINCIPAL INVESTIGATORS: Toney D. Taylor
COLLEGE/DIVISION: College of Science & Technology
DEPARTMENT: Science and Mathematics Education
FUNDING AGENCY: N/A
HSPRC COMMITTEE ACTION: Exempt Approval
PERIOD OF APPROVAL: 01/31/07 to 01/30/08

Lawrence A. Hosman, Ph.D.
HSPRC Chair
APPENDIX B

PARTICIPANT INTERVIEW PROTOCOL

Management Questions

Course Planning

M-1. (a) Please describe the importance of training in the FST strategic plan.

(b) How does the MH2 course fit into the strategic plan for FST?

M-2. Please describe your role and the extent to which you were involved with the course development such as:

(a) the identification of desired competencies;

(b) the identification of desired objectives;

(c) reviewing official of course content;

(d) approving official of course content.

M-3. What process did FST employ to determine the competencies to be included in the instruction of the MH2 course?

M-4. Please describe the effectiveness the apprentice-level hydrographer training requirements were documented by PDD South.

Course Development/SME Involvement

M-5. How were the FST SMEs involved in course development and instruction

(a) scheduled;

(b) guided in curriculum development tasks?

M-6. What is your opinion of the curriculum development templates provided to FST SMEs?

M-7. In terms of time, how close was the course delivered to management’s desired delivery date?

M-8. Please describe the impact of SME involvement in MH2 development had on FST operations.

Course Instruction/ SME Involvement

M-9. Please describe the notification FST received in regards to scheduling of FST SMEs to instruct in the MH2 course?

M-10. Please describe the impact of SME involvement in MH2 instruction had on FST operations.

Graduate Observation

M-11. What topics have the graduates suggested be added to the MH2 course?
M-12. Please describe the effectiveness of MH2 training on the graduates’ apprentice-level hydrographic
(a) knowledge;
(b) hands-on skills.

M-13. One final question, are there any additional comments concerning the course development and implementation that you would like to make at this time?

SME Interview Questions

Documentation of Training Requirements
SME-1. Please describe how effective the training requirements of an apprentice military hydrographer were documented in the MH2.

SME-2. Please describe how the MH2 course supports the strategic goals of FST?

Course Development
SME-3. (a) On a scale of one to five, please rate the degree of your participation—(1) absolutely voluntary, (2) somewhat voluntary, (3) no opinion, (4) somewhat non-voluntary, (5) absolutely non-voluntary.
(b) Please explain your response.

SME-4. Please describe how the course designer explained to the FST SMEs the
(a) course development goals;
(b) use of course development templates.

SME-5. Please describe how you used the following provided templates
(a) lesson plan template
(b) multiple choice written test template
(c) performance exam template

SME-6. Please estimate the amount of time you spent developing the assigned objectives.

SME-7. In regards to the FST Training Officer, please describe the
(a) frequency he contacted you during your development of material
(b) the nature of the contacts, i.e., progress update, answered development questions, facilitated time to develop the material, assisted in the removal of development barriers such as other taskings.
(c) effectiveness of the contacts.
Course Instruction

SME-8. Describe the amount of notification you received regarding your scheduled time to instruct.

SME-9. (a) On a scale of one to five, to what degree did your involvement as FST SME instruction have on your FST daily duties? (1 = No impact and 5 = significant impact).

(b) Please explain your response.

SME-10. Please discuss the effectiveness of using FST SMEs as instructors in the course instruction.

Graduate Observation

SME-11. Based upon your observation of the graduates, what hydrography-related topics should be

(a) added to the course;

(b) deleted from the course?

SME-12. One final question, are there any additional comments concerning the course development that you would like to make at this time?

Student Interview Questions

Documentation of Training Requirements

S-1. Please describe the effectiveness of how the MH2 course prepared you as an apprentice FST military hydrographer.

S-2. What hydrography-related topic should be

(a) added to the course;

(b) deleted from the course?

S-3. How does the MH2 course support FST’s ability to meet its mission requirements?

Development of Course Content

S-4. Please describe the effectiveness of the following MH2 course material in conveying the concepts of hydrographic surveying?

(a) class lectures

(b) student workbook

(c) equipment/practical exercises

S-5. Were the course subjects presented in logical order? Please explain your response.
Development of Quizzes, Written Tests and Performance Exercises

S-6. How did the following course assessment tools help you to assess your hydrographic knowledge?
   (a) weekly quizzes
   (b) practical exercises
   (c) final exam


S-8. How well did the MH2 prepare you to use FST hydrographic equipment?

Course Instruction

S-9. How prepared were the instructors?
   (a) PDD South instructors
   (b) FST SME instructors

S-10. Please describe the
   (a) advantages of having FST SMEs as instructors.
   (b) disadvantages of having FST SMEs as instructors.

S-11. Please describe the effectiveness of instruction you received in the MH2 course in preparing you to perform as an apprentice hydrographer.

S-12. One final question, are there any additional comments concerning the MH2 course content or presentation that you would like to make at this time?
APPENDIX C

SAMPLE CODE SCHEMA AND CODED INTERVIEW

This appendix includes an excerpt of the coding schema developed for this study and examples of coded interviews. The complete code and all transcribed interviews are available to study participants and officials for review upon request. However, the full version of the code and complete interviews are considered proprietary property of the author and will not be published.

Research Question 3: How effective is the instructional design management model in orchestrating quality instruction that provides knowledge and skills graduates need to perform job-related tasks? [Instruction]

7. Student’s Assessment of
   1. Lectures
      1. Generally acceptable or OK
      2. Effective, right instructors by subject
   2. Workbook
      1. Good – no specifics
      2. Good – flowed with lecture/organization
      3. Incomplete, but units were good
      4. Incomplete – general comment
      5. Not adequate
      6. Not used by student (questionable response...student did use workbook)
      7. Liked technical handouts/inserts
      8. Good, refers to workbook as reference or resource
      9. Typos
   3. Hands-On Practical Exercises
      1. Good – general comment
      2. Good – favorite part of class
      3. Good – experience limited by equipment condition or availability
      4. Good – problem solving experience
      5. Did not feel equipment problem solving should be part of course
      6. Good, but rushed or not enough
      7. Reinforced lecture concepts
      8. Mimicked actual survey requirements or procedures
   4. Quizzes
      1. Helped student self-assess progression through course
      2. Quizzes helped to reinforce important concepts
      3. Good – general comment
   5. Final Exam
      1. Good – general comment
      2. Good – stressed important facts/concepts
      3. Good – comparative analysis with pre-test
      4. Good – made the student do more studying after class was over
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<th>P_p</th>
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<td></td>
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<td></td>
<td></td>
<td>Classroom lectures were ok. I had no problems with them.</td>
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<td>3</td>
<td>711</td>
<td>Stu 1</td>
<td>STU-Q04a</td>
<td>R01</td>
<td></td>
<td>Most of them were related to people coming off white ships which we don’t do that kind of survey so some of the work—it was not relevant. ... They were good.</td>
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<td>711</td>
<td>Stu 2</td>
<td>STU-Q04a</td>
<td>R01</td>
<td></td>
<td>I thought the lectures were pretty effective.</td>
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<td>3</td>
<td>711</td>
<td>Stu 3</td>
<td>STU-Q04a</td>
<td>R01</td>
<td></td>
<td>I really liked when SMEs came in. Some of them had been doing this for ...15, 20 years. They ... they do it the right way but they have an idea of how, you know, you should do it or why you do it and I thought that was most beneficial. Class lectures, as far as teachers, it seemed like when you and Vanessa, you guys were good with the white ships but not really savvy with the FST way .... It was somebody telling us apples and then we’re working with oranges so it was difficult to kind of connect the two.</td>
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<td>3</td>
<td>231</td>
<td>Stu 3</td>
<td>STU-Q04a</td>
<td>R03</td>
<td></td>
<td>But on a teaching level, that was good... The lectures were fairly good according to different subjects, particularly the one where we discussed geodetics.</td>
</tr>
<tr>
<td>3</td>
<td>211</td>
<td>Stu 3</td>
<td>STU-Q04a</td>
<td>R04</td>
<td></td>
<td>... but it was just the material was kind of foggy at times [referring to white ship references]. ...</td>
</tr>
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<td>3</td>
<td>231</td>
<td>Stu 3</td>
<td>STU-Q04a</td>
<td>R04</td>
<td></td>
<td>And near the end, when we actually got to more survey-type topics ... those weren’t prepared to the level that they could have been ahead of time by some of the SMEs.</td>
</tr>
<tr>
<td>3</td>
<td>711</td>
<td>Stu 4</td>
<td>STU-Q04a</td>
<td>R01a</td>
<td></td>
<td>I thought the class lectures were conducive to allow us to get a better understanding of the theory and the way things work. ... I thought the class lectures were effective because the instructor, right before each module, they said what were the objectives, we went through the course material, at the end—-the objectives kind of reinforced what we were supposed to have known.</td>
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APPENDIX D

TRANSCRIPT QUOTES

Research Question 1: Does the instructional systems management model effectively coordinate with management to accurately document the desired training requirements of the organization?

4 111 Mgr 2 MGR-Q04 R01 Yes, yes. They did a remarkable job.
4 111 Mgr 2 MGR-Q04 R02 The course objectives were the first steps and I think that was done very well.
1 34x Mgr 3 MGR-Q02a R02 The MH2 is a specialized modification of a Category B course. So, all the competencies ... actually equate to our requirements in the field for accomplishing our mission.
4 111 SME 1 SME-Q01 R01 ...it was well documented. It was clear what they were going to be—what the lessons were.
4 111 SME 2 SME-Q01 R01 ... they were printed out and collected—very well.
4 111 SME 6 SME-Q01 R02 The objectives seemed clearly laid out ... they were clearly laid out ... step by step.
2 221 SME 2 SME-Q01 R03 ...and I think most of the SMEs had no trouble with the understanding how to put the classroom package together.
2 221 SME 2 SME-Q01 R04 But, I think, once they found what the procedure method was everybody was saying it was falling in place pretty well.
4 111 SME 2 SME-Q01 R05 Overall, it was well done.
4 111 SME 5 SME-Q01 R02 I thought, over all, those were well-identified,
4 111 SME 5 SME-Q01 R04 ...it made me realize there's a lot more to what we do looking at that so I thought it was pretty effective.
4 711 Stu 3 STU-Q01 R04 ...for going out and actually doing survey I'd—personally, I'd get overwhelmed with everything because you try to do it in two weeks and, you know, you've got your tides, multibeam, single beam, and you know—prospecting, and then all these new computer programs, and side scan, I would have —I would have been overwhelmed—and forget it. I'm going to stand back here and watch.
So, I guess for somebody never having seen it before I—it would be a good segue into surveying, that’s how I’d try to phrase it.

…it was no longer a foreign language to me. I could understand what people were talking about when discussing the issues and have a basic understanding of how to use it.

Coming into Fleet Survey Team I didn’t know anything about hydrography at all and I do have a better understanding now of, ... the equipment and procedures ...

I suppose the important thing is their thirst for the extra knowledge I would be nervous about spending extra time doing it because it would lengthen the course.

Right now the MH2 course is our primary mode of training non-Category A hydrographers so the apprentice hydrographer in the MH2 is ... our primary mechanism for training—formally training--our folks.

Research Question 2: Does the instructional systems management model efficiently direct the curriculum development team in creating quality curricula in a timely manner?

The format, the guidance, and everything was laid down from PDD South and all the templates were provided to each of the SMEs so then quite close liaison between the training officer here and yourself to verify that what they were producing was an acceptable standard.

I thought they were very good. They weren’t too complex, they were precise but they captured everything that needed to be done for the course.

I have two points that I’d like to throw out concerning that question: Number 1: The templates are, in my opinion, designed in a very simplistic manner to cover the whole range of disciplines that fall within the training course which [Number 2] is an excellent design because every module is technically complicated and in order to capture all of that you simplified the templates and at the same time all made it all-encompassing so you did not lose aspects of the training. So yeah, very good.

They’re exceptional.
... through much work and coordination, we've taken a course that could have just gotten by and made it "much more meat on the bone," if you will, and the level of detail and the level of completeness of the instruction and—that hard work will pay off in subsequent courses.

(This is a slight modification because you are the FST Training Officer so I'm modifying this question to reflect me so in regards to me, the PDD South course designer, please describe the frequency in which I contacted you during your development of your material.) Weekly. More than weekly. You contacted me quite a bit. I contacted you. We were in contact probably every other day, at least.

It was difficult, I mean, it was hard to get the SMEs to focus on their surveys that were upcoming or they were still working on as well as do these additional duties of being an SME and preparing for a class.

But I think we eventually reach a point that everybody understands that it's something that we have to do because we're helping ourselves.

So it's a time management and expectation management and motivation in some cases but we made it work—but it wasn't easy.

The goals were set out with the objectives so they were clearly laid out what everyone needed to teach.

I felt the templates were actually very good.

Especially there were examples of them. There was a rough, barebones format, then there was an example. I think the example actually was more useful ...

... they were, you know, straightforward. Just looking at the templates you could do it straightforward. You could understand it...

It took a while at first because everybody...that I talked with wanted to do it their own way. But, once we got into it, we realized 'this is going to make it easy on everybody.' And when you see the final product it makes sense.

It went right along with the lecture so you could keep up with what the instructor was teaching. You
could pretty much follow along. Most of the course was like that.

3 728 Stu 4 STU-Q04b R01 I think it was really well put together. All the information we needed was in there. And even now, I’m using it as a resource to get ready to go out on my first survey.

3 722 Stu 5 STU-Q04b R01 I liked that for reference. I mean, you could look something up whether it be while going through the lecture or even at the end of the course while you’re—during the hands-on kind of practical survey. I think that’s a good idea to have that ready and available.

3 725 Stu 3 STU-Q04b R01a ...I didn’t really think that was [adequate]...

3 726 Stu 3 STU-Q04b R01b I, personally, didn’t really use it.

3 727 Stu 3 STU-Q04b R02a There’s a couple parts ... I thought was more pertinent than what the ... workbook .... The NAVCOM, ... instruction books, I got really a lot out of those and the data strings that we received.

3 725 Stu 3 STU-Q04b R02b ... the workbook itself I didn’t think was very effective.

3 727 Stu 3 STU-Q04b R03 (Ok, so you got a lot out of the handout that we gave during the class.) The handout, ...for the most part. ... the handouts was the NAVCOM, ..., the GGA strings, ...tides that I really found useful ...(The NMEA strings) Yes.

3 724 Stu 1 STU-Q04b R01 Incomplete. It kept getting updated the whole time we were in there. And there were, like what, six chapters in the back end that hadn’t even been done...four.

3 721 Stu 1 STU-Q04b R02 The units that were there were ok..

3 731 Stu 3 STU-Q04c R02 I thought those were highly effective.

3 732 Stu 3 STU-Q04c R03 That’s—that’s how I learn best [hands-on] ... to turn on the equipment and see who had one that doesn’t work. I thought that was great.

3 733 Stu 3 STU-Q04c R04a I just wish that we’d all got to do the same thing ... when we got to the survey .... I might have gotten to do tides and she might have gotten to do CARIS.

3 731 Stu 3 STU-Q04c R04b What we did get to do I thought was very effective.

3 741 Stu 4 STU-Q06a R01 The questions were written on a level that required you to understand the concepts, understand what it was discussing.
For example, most of the questions would give—to give the best answer and there may have been one or two—two to three questions that could have fit the answer but if you could totally understand the concepts you were able to give one best answer.

It pretty much tested you over the last couple of days of what you were suppose to be learning. If you messed up on a couple of questions, you’d know what you needed to work on. And then, instead of at the very end of the course, you wouldn’t bomb the test.

Yes, I thought those were good.

They were good questions and the quizzes were what I would have thought would have been stuff that I really needed to know … the questions on the quizzes were what I would—what I would say would be relevant.

They were with it. The quizzes weren’t just full of a bunch of useless questions that we needed to know. A lot of the questions were the main points that we needed to know. So, I thought the weekly quizzes were good.

Research Question 3: How effective is the instructional systems management model in orchestrating quality instruction that provides knowledge and skills graduates need to perform job-related tasks?

... PDD South had tasked us to formulate that schedule ourselves ... we identified instructors early in the course.

Of course, eventualities came up and things changed, like they always do, and so it was an ongoing coordination effort, most of the time successful, but it comes down to effective communication between us and PDD South.

Once we ascertained which subjects the SMEs were going to do, they obviously started to work on producing those SME plans-the curriculum, the contact, or what was actually put together fairly early on.

What became difficult was that some SMEs got things done slightly ahead of others, and then availability of equipment had an impact, the
availability of training equipment had an impact, and therefore, there was fluidity to a certain extent as to when what lesson was taught when.

3 321 Mgr 4 MGR-Q09 R03 But I would say on the whole people got a reasonable notion [of schedule to instruct].

3 321 Mgr 1 MGR-Q09 R03 As our operational schedule changed, we had to adjust and so other people stepped up to teach classes they weren’t necessarily scheduled to teach...

3 321 Mgr 1 MGR-Q09 R04 ... it was fairly well ahead of time.

3 511 Mgr 3 MGR-Q09 R01 The PDD South coordinator, Mr. Tony Taylor, sent out the announcement after meeting with the upper level management of FST to hammer out all the schedules and timelines. On several occasions, Mr. Taylor sent out notifications of due dates and he tracked us via email and phone calls.

3 511 Mgr 3 MGR-Q09 R02 It was very effective.

3 311 SME 1 SME-Q08 R01 I knew ahead of time. I knew before the course was started because I had the schedule.

3 324 SME 1 SME-Q08 R02 (How far in advance did you know?) A month.

3 311 SME 6 SME-Q08 R01a I believe it was two to three months ahead... so I had plenty of time.

3 372 SME 4 SME-Q09b R01 It is one of the things... we do not take into consideration when you’re an SME and we’re serious about being an SME, then you really need to just push everything else aside and become totally immersed and involved in setting up your instruction.

3 372 SME 4 SME-Q09b R02 I don’t think you can be a part-time instructor. I guess by that I mean ‘Ok, yeah, I think I’ll go work an hour on my project over here and then I’ll work on my main job. So, I would say five. Maybe it’s just me not being efficient but you know... I’m saying a five.

2 734 SME 5 SME-Q07b R01 Well, as far as other tasking goes, there was nothing he could do about it.

2 335 SME 5 SME-Q07b R02 ... he emphasized to me that this was top priority of the CO but as I emphasized to him that the little items that had come off also were high priority to CO, i.e., surveys were coming up within a month that weren’t even on the radar. ... I’m getting one direction from the training officer saying ‘the CO
really needs this’ and, you know, time with that was number one priority and my partner is saying ‘the CO really needs this in a timely fashion.’ This is the number one priority to him-obviously, you can’t have two number one priorities...

3 112 Mgr 3 MGR-Q10 R01 Once again, the impact is when you remove members of FST from their normal line of duties and responsibilities and they are now set into a new role as an instructor, just the prep time alone takes away from their normal duty assignments.

3 112 Mgr 3 MGR-Q10 R02 ... the workload is magnified in some cases ... some people’s workload is much higher than others.

3 112 Mgr 3 MGR-Q10 R03a ... as an instructor, it goes along with the same as the SMEs, working on developing the different modules-very time consuming...

4 615 Mgr 3 MGR-Q10 R03b ... but one thing I can say—the SMEs that were tasked outside this organization or within this organization to develop the course material and also instruct were very professional about it and they were sincere to see it succeed.

3 356 Stu 3 STU-Q09b R01 The SMEs... they... it was either hit or miss, some of them really had their stuff down. Others would just kind of ‘Well, I did this stuff last night and here it is’. [Duplicate]

3 xxx Stu 3 STU-Q09b R02 ...

3 354 Stu 3 STU-Q09b R03a But the people that, got thrown into something they’d never done before, ...

3 357 Stu 3 STU-Q09b R03b ...it was kind of a rush job.

3 354 Stu 3 STU-Q09b R04 It’s difficult to, it’s difficult to try to teach something you really don’t, not understand so I guess FST SMEs, in—as a general, were a little less prepared than were the PDDs just based on the fact I don’t know if they really fully understood what they were teaching but I guess the same could be said for the PDDs.

3 421 Stu 3 STU-Q10a R01 ... You have the FST base-the guys who’ve been doing it for 20 years; these guys have a wealth of knowledge up there and they tell you, you know, this is how the equipment and how it works and the same goes for the ETs, ...
3 341 Stu 3 STU-Q10a R02 ...I think that... knowledge is invaluable because ... they're trying to impart on you what they've learned in 20 years and they know the quirks of it and they know how to, you know, hook it up and everything.

3 342 Stu 2 STU-Q10a R01 And they show you the "how to do" so as it had to be done out in the field.... They actually go out on these type surveys. ... so they would know what goes on and what exactly is needed to be known once were out there. ...

3 422 Stu 6 STU-Q10a R01 That's a big plus having FST SMEs to do guest instructing. [Duplicate]

3 342 Stu 6 STU-Q10a R02 And the little thing that comes to mind is 'Been there, done that.' Those guys have all been out in the field, they've all surveyed, they know all the little nuances of the equipment and some of the little rules of thumb that, maybe, that can help you out, ... when you're out on survey.

3 341 Stu 6 STU-Q10a R03 So I thought that was good to have the SMEs out there. It did help out ...

3 345 Stu 6 STU-Q10b R01 Yeah. The disadvantage is that they have a job to do. Their full-time job is that, ..., they work for Fleet Survey Team.

3 345 Stu 6 STU-Q10b R02 They've got all their own little collateral duties to accomplish and a lot of post-survey work and pre-survey work that they're preparing for. And then, at the last minute, it seems like, 'Oh, I've got to get out there to do some instruction.'

3 345 Stu 6 STU-Q10b R03 It seems like they're over-tasked and they—a lot of—there was a lot of pressure in getting these guys to be prepared and to make that a priority but at the same time it seemed like a lot of them had a lot of work dumped on them and they were forced to not pay as much attention to their job as coming in as a SME.

3 422 Stu 4 STU-Q10b R01 ...I think their experience and their method of teaching and everything is still very much a positive thing for this course.

Research Question 4: How effective is the instructional systems management model in delivering properly trained personnel as requested?

4 421 Mgr 1 MGR-Q12a R01 Greatly increased it.
A lot of the folks who went through the first course had no prior hydrographic surveying knowledge and coming out the other end I think they were all pleasantly surprised that they learned something and that they understood it.

I think some of them were a bit nervous going in but they definitely—they definitely had the required knowledge going out to go out and be more “less-dangerous” than when they came in (ha)—go out and contribute right away.

It’s been phenomenal.

The graduates who completed the course in November are—two of them are out the door right now and they are far and above in better shape than our folks that have not had that course.

It’s worth the time and effort so that they... it certainly does make them more proficient, you know.

It’s great. It’s springboards into daily operations what we’re expecting of them.

I think this course is essential now and I want as many to go through it.

It’s been very effective.

Members of my department are taking what they’ve learned through the course study and are applying that through our weekly command training modules and there’s been a lot of enthusiasm, a lot of extra research, both information and also self-imposed training so it’s really helped us out.

Now we’re going to reap the benefits of this in our current survey operation in Western Africa and our upcoming two survey operations in the Philippines and over in Japan.

The advantages that they have seen it and used it and therefore, they’ve got a little bit of confidence when they actually come out to use it, perhaps on their own or with just one or two people around, rather than the instructor keeping a close eye on them.

I noticed that even simple tasks, putting 12-volt batteries in serial parallel, some people are
uncomfortable with that but when they’ve had an instructor they’re a lot happier with doing it than those with just the basic skills and, therefore, it’s been extremely useful.

4 45x Mgr 4 MGR-Q12b R04 I noticed the difference when I took a team on survey—the ones that hadn’t had any training and the ones that actually had the other person was several marching paces ahead, which is significant when you go out.

4 421 Mgr 2 MGR-Q12a R01 It’s been phenomenal.

4 45x Mgr 2 MGR-Q12a R02 The graduates that completed the course in November are two of them are out the door right now and they are far and above in better shape than our folks that have not had that course.

4 421 Mgr 2 MGR-Q12a R03 It’s worth the time and effort so that they—it certainly doesn’t make them more proficient, you know.

4 411 SME 4 SME-Q12 RXX Note from Field Notes on 7 March 2007 at 3:15 pm: SME-4 remarked about Student-2’s recent performance on survey with SME-4 that he “performed very well...he did super.” (Comment outside interview)

4 615 SME 6 SME-Q12 R01a ...I thought it was a really good course, especially for the first one.

4 614 SME 6 SME-Q12 R01b I’m sure it will become more fluid as time goes on.

4 411 SME 6 SME-Q12 R02 I had one of the students go with me on survey and he—he was on top of everything so it, obviously, worked good.

4 421 SME 6 SME-Q12 R03 (He was pretty comfortable with the equipment and knew the procedures and—) Yeah, and he knew basically the whole thing

4 431 SME 6 SME-Q12 R04 ...everything to do with the survey—he had a good understanding of it.

4 711 Stu 5 STU-Q01 R01 I feel a lot better about things that we did on the survey—the equipment and the way that the survey is planned out and suppose to operate.

4 711 Stu 5 STU-Q01 R02 Coming into Fleet Survey Team I didn’t know anything about hydrography at all and I do have a better understanding now of, ... the equipment and procedures.
Well, actually it taught me a lot in MH2, it gave me all of the basics but to become a resident expert or whatever because I'm in charge of training now over here and I got that because I know more than the rest of the enlisted guys and I had to do that stuff on my own.

It helped me out a lot because I was pretty much running all the equipment in Hypack and with the single beam and the side scan for the... after the first week that we were in Japan and the rest of the time I was pretty much running all this stuff by myself for the night with one of my airman. So that gave me a little knowledge beforehand to get some "buttonology" and a little bit of how to use all the equipment before I went and that helped out pretty good.

I basically would say that it was an effective course.

... Of course it perfectly natural getting a chance to do an actual survey afterward, but I would say that just without that I would have thought the training would have been an effective course.

It's great. It's springboards into daily operations what we're expecting of them.

I think this course is essential now and I want as many to go through it.
Lesson Plan Title

Enabling Objective: Insert Enabling Objective here.

I. Introduction
   A. Introduce yourself and the subject. The first few lines are “attention getting” lines.
   B. Read the learning objective. Briefly mention the main points of the lesson in order. “Over
      the next few hours we will be covering (main point 1), (main point 2), etc.
   C. Transition to the first main point of the Body of the lesson.

II. Body (The Lesson/Chapter Itself) Here’s where you are going to tell them.
   A. Main Point 1 – Use bullet sentences. Use enough words to get the point across, not just a
      couple of words. A couple of words may help you, but it will only confuse those who
      will use your lesson plan to teach from.
   B. Main Point 2 – Use only New Times Roman, 12 pt., no bold, no italics, no underlines.
      All the specifics has already been programmed into the Lesson Plan Template .dot file.
      Please do not change the Template, it’s a real pain to fix.
   C. Main Point 3 – How do you get started, you ask? Use “The Rule of Three” to build your
      lesson. That is having a minimum of three supporting points under each level and sub-
      point levels as this outline shows.
      1. First Order Sub-Point 1 (Style: LP3)
      2. First Order Sub-Point 2
      3. First Order Sub-Point 3
         a. Second Order Sub-Point 1 (Style LP4)
         b. Second Order Sub-Point 2
         c. Second Order Sub-Point 3
            (1) Third Order Sub-Point 1 (Style LP5)
            (2) Third Order Sub-Point 2
            (3) Third Order Sub-Point 3
               (a) Fourth Order Sub-Point 1 (Style LP6)
               (b) Fourth Order Sub-Point 2
               (c) Fourth Order Sub-Point 3
                  i. Fifth Order Sub-Point 1 (Style LP7)
# Performance Exercise Template

**Performance Exercise Name**

Reference: (Enter applicable CTS, IHMEP Module and Objective; or IHOM5 ref.)

<table>
<thead>
<tr>
<th>Name:</th>
<th>Date</th>
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<tbody>
<tr>
<td>Evaluator:</td>
<td>Score %</td>
</tr>
</tbody>
</table>

**OBJECTIVE:** (Insert Enabling Objective here.)

**STUDENT MATERIALS AND EQUIPMENT:**
1. List Materials and Equipment required for performance exercise.

**SPECIAL REQUIREMENTS:**
1. Transportation to exercise area or assistance from non-instructors.
2. Multiple instructor requirements (i.e., one instructor per 6 students).
3. Time Required: 16 hours: 3.0 Classroom Lecture, 13.0 PE

**STUDENT REQUIREMENTS:**

<table>
<thead>
<tr>
<th>Sequence of Important Task Steps</th>
<th>Go</th>
<th>No. Go</th>
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<tbody>
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<tr>
<th>Evaluator Remarks</th>
<th>Raw Score</th>
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</table>
Module # - Module Name Test Bank (Style: Title)

1. This is referred to as the stem of a question. The Word style is called "Test Question".
   a. This is a response or answer
   b. The Word style is called "Test Answer"
   c. This is a response or answer
   d. The asterisk indicates this is the correct answer. *

2. The numbers automatically number.
   a. The responses or answers occasionally require renumbering
   b. Select "Format", "Bullets and Numbering", then "Restart Numbering". *
   c. No "all of the above" or "none of the above.
   d. No true or false.

3. Knowledge objectives require written test questions to measure trainee understanding of the material.
   a. Response
   b. Response *
   c. Response
   d. Response
REFERENCES


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Training and Doctrine Command, August 1975. (NTIS No. ADA 019 486 through ADA 019 490).


