

Design and Implementation of an Academic Ramp in English, Math, and Physics for Freshmen Maritime Students in the Philippines

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Abstract: Maritime transport plays a vital role in the world economy carrying 97% of world trade. Modern navigation equipment has paved the way for faster and more sophisticated sea vessels. The complexities of the rules and regulations governing modern merchant marine shipping prompted the introduction of new requirements for maritime education and training as outlined in the Standards for Training, Certification, and Watchkeeping 1995. The world's merchant marine fleet is manned by some 1.2 million-strong skilled seafarers. The Philippines, with 280,000 registered seafarers, is the world's largest seafarer supply nation, providing 28.1% of the available pool of seafarers. Recent studies, however, have noted the need to increase the number of Filipino seafarers who are qualified for senior officership positions on board sea vessels. The paper describes the pilot study, conducted during the summers of 2004 and 2005, aimed at improving the quality of inputs to maritime institutions. An intensive review course covering topics in English, Math, and Physics was conducted during an eight-week period for selected incoming first year students of Philippine maritime institutions. The students' academic performance and recommendations for future endeavors are reported.

Keywords: maritime education, academic ramp, Philippine maritime institutions

Introduction

Maritime transport plays a vital role in the world economy carrying 97% of world trade (Wang and McOwan, 2000). Shipping is an essential industry to a nation's import/export activity with an estimated 90%, by weight (or 70%, by value), of the global trade being served by ocean carriers (Chen, Yen, and Pan, 2003). Technological advances have given rise to modern navigation equipment paving the way for sea vessels to increase in number and become faster and more sophisticated. Modern technology, coupled with the complexities of the rules and regulations developed by national and international authorities governing modern merchant marine shipping, has prompted the introduction of new requirements for maritime education and training as outlined in the Standards for Training, Certification, and Watchkeeping (STCW 95). Some 1.2 million-strong skilled seafarers man the world's merchant marine fleet. Maritime education is highly valued by countries whose economies are highly related to international maritime trade.

Today the Asian region is considered the 'powerhouse' of global shipping accounting for nearly two-thirds of the world's seafaring population (Wang and Zhang, 2000). The Philippines, with 280,000 registered seafarers, is the world's largest seafarer supply nation, providing 28.1% of the available pool of seafarers in the world with a per capita income of

US\$ 1,040 (Businessline, 2004). The Philippine Overseas Employment Agency (POEA) reported that during the year 2000, the 200,000 Filipino seafarers who were deployed in international sea vessels contributed more than US\$ 5 million to the Philippine economy (Businessworld, 2001).

The feasibility study, “Improving the Training and Supply of Filipino Senior Officers Qualified at the STCW 95 Management Level”, conducted during the last quarter of 2001 by researchers from the Warsash Maritime Centre highlighted the need to increase the number of Filipino seafarers who are qualified for senior officership positions on board sea vessels. The findings of this feasibility study support an earlier report (Businessworld, 1997) that noted a marginal decline in the number of Filipino chief engineers, with master seafarers increasing by only 10% and total officer populations growing by only 3.7% during the period 1994-1997. The report further added that other countries with more structured training programs, better control of training facilities, and in many cases, with dedicated government backing will produce better-quality seafarers who will step in to fill the shortfall in the supply of senior officers for sophisticated and environmentally-sensitive ships. Thus, the researchers from the Warsash Maritime Centre recommended the “development of an academic ramp in the form of a model course or courses covering basic maths, physics, and other relevant subjects necessary to undertake maritime training in accordance with STCW standards and for possible adoption by the IMO”. The report recognized the general consensus that a “knowledge gap” exists between the level attained by students graduating from high school and the level that is needed to cope with maritime courses (STCW standards). A research that will look into the “knowledge gap” will be worthwhile, but something to be looked into on a long-term basis. To “bridge” this gap on a more immediate timeframe, the idea of an academic ramp was conceived.

The Maritime Academic Ramp in English, Math, and Physics

During the summer of 2004, fifty incoming freshman students of the Maritime Academy of Asia and the Pacific (M.A.A.P.) – Kamaya Point, Bataan, Philippines underwent a two-month intensive review on the following areas: English, Mathematics, and Physics. The first month of the program was held at the De La Salle University – Manila campus; the second month of the program was held at the M.A.A.P. campus in Bataan. Fifty of the incoming one hundred and fifty first year students (SY 04-05) of the Maritime Academy of Asia and the Pacific (M.A.A.P.) – Kamaya Point participated in the Maritime Academic Ramp Project. Thirty participants have residences outside of Metro Manila and were housed in a dormitory during the first month of the program. A dormitory master, provided by M.A.A.P., took care of the students staying in the dorm. The remaining twenty participants, who resided in Metro Manila, commuted to and from the University.

By the end of the two-month Academic Ramp Course, statistically significant improvement in the average test scores of the group was observed in the following areas:

- English / Language usage [verbal ability]
- Mathematics / Numerical ability

It was also observed that the low scorers (bottom 50% of the group) showed statistically significant improvement in test scores in their numerical ability, reading comprehension, and language aptitude.

During the summer of 2005, the participants in the program included fifty incoming first year students of the Maritime Academy of Asia and the Pacific – Kamaya Point and twenty-four incoming first year students from the Philippine Merchant Marine Academy (Zambales). This group comprised the Luzon-based participants of the Academic Ramp Project, who were housed in a dormitory near the De La Salle University campus during the first month of the program. A dormitory master, provided by M.A.A.P., took care of the students staying in the dorm. During the second month of the program, the M.A.A.P. & the P.M.M.A. students joined their fellow incoming students at their respective campuses.

The Visayas-based group was composed of twenty-seven incoming first year students from John B Lacson Colleges Foundation – Molo (Ilo-ilo City) and twenty-three students from the University of Cebu – Maritime Education Training Center. The participants of the Maritime Academic Ramp Project for the Visayas group were housed in the dormitory facilities of John B Lacson Colleges Foundation – Molo (Ilo-ilo City) throughout the six weeks of the program.

Results and Discussion

At the beginning of the Academic Ramp Course, the students were given the Abstract Reasoning instrument. The summer 2005 group’s average score of 37.16 out of fifty items (about 75% of the items, correct) predicted the examinees’ capacity for logical thought. This average score is lower than the average score obtained by the 2004 pilot group (41.98 out of fifty items, 82% items correct) [see figure 1].

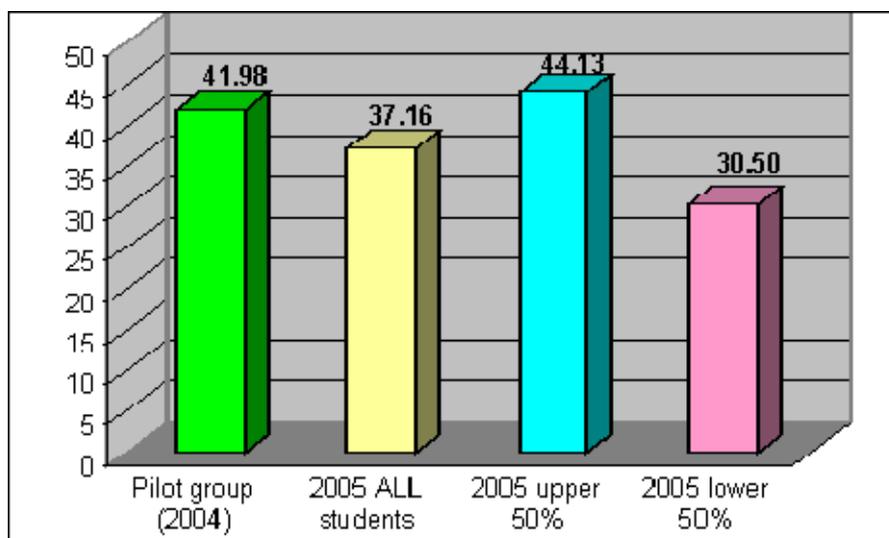
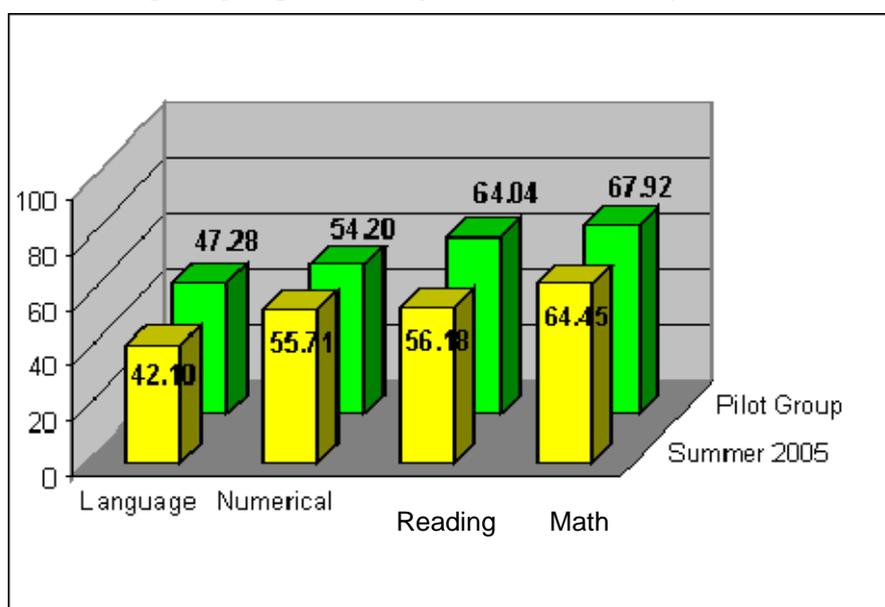


Figure 1: *Abstract Reasoning Scores*

Figure 2 presents the results of the Language Usage exam where the examinees posted a 42% rating (average raw score of 21.02 correct out of fifty items). The Numerical Ability and Mathematics Achievement Test scores complement each other (correlation coefficient, $r = 0.883$). The average raw score of 22.29 correct out of forty items (55.7%) for the Numerical Ability test is slightly higher than the entry-level profile of the pilot group (54.2%). The summer 2005 group obtained an average score of 32.23 out of fifty items (64.5% correct) for the Mathematics Achievement Test. This average score is slightly lower than the 68% correct posted by the pilot group. The students' Reading Achievement entry-level score (56% correct) is much lower than the pilot group's Reading Achievement entry-level score (64% correct).

Figure 2: *Entry Level Profile*

At the end of the Academic Ramp Course, the students were again given the standardized exams. Comparing the summer 2005 students' performance at the beginning and at the end of the course reveals that the increase in the Language Usage exam scores from 21.02 items [42%] correct (entry-level) to 22.54 items [45.1%] correct (post-course) is statistically significant [see figure 3].

Figure 3 also presents the increase in the Numerical Ability and Mathematics Achievement Test scores, reflecting high gains in student learning. For the Numerical Ability, the group's average scores increased from 22.29 items [55.7%] correct (entry-level) to 25.97 items [65%] correct (post-course) is statistically significant. The Mathematics Achievement Test scores likewise show a statistically significant increase in the group's average scores, from 32.23 items [64.5%] correct (entry-level) to 35.99 items [72%] correct (post-course).

Unlike the Reading Achievement test results of the summer 2004 pilot group, the summer 2005 participants showed a statistically significant increase in scores during the duration of the program (56% correct, entry-level, to 62.25% correct, post-course) [see figure 3].

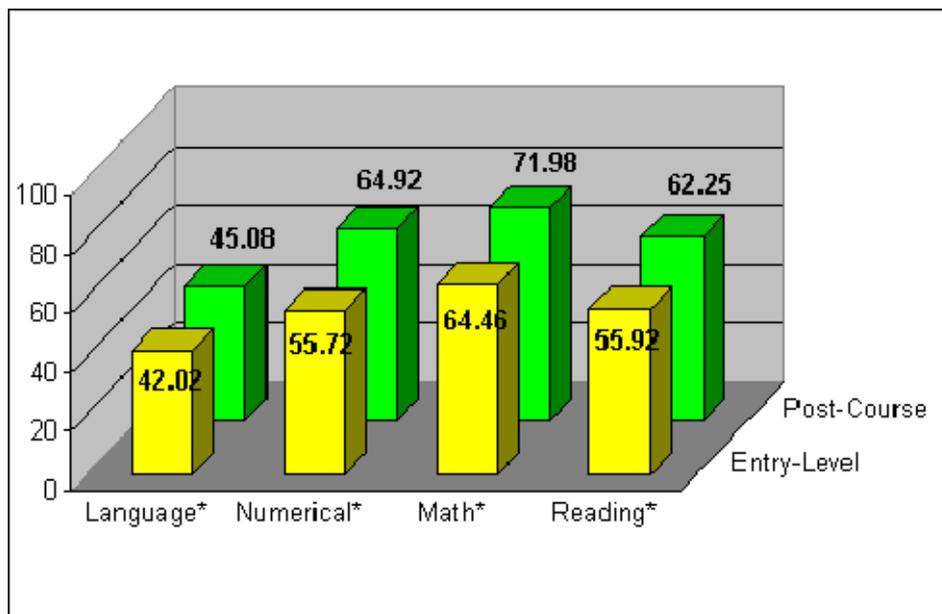


Figure 3: *Entry-Level and Post-Course Scores of the Summer 2005 Group*

** statistically significant increase in test scores in this area*

To verify if the Academic Ramp Course was able to assist the lower half of the students in the group, analysis of scores was done on the top 50% of the group and the bottom 50% of the group. Although for the top 50%, the improvement in scores seemed minimal (ranges from 3 to 5 percentage points) [figure 4], the bottom 50% posted gains of ten percentage points, when comparing their entry-level and post-course scores [figure 5].

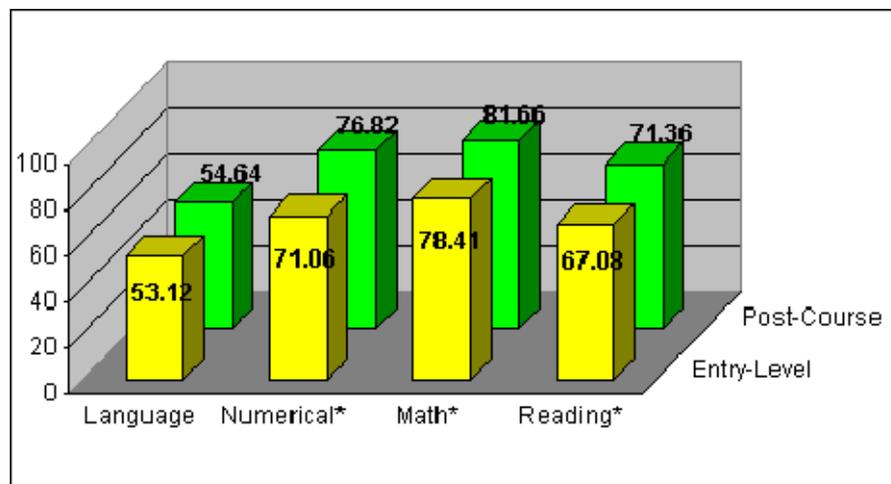


Figure 4: *Entry-Level and Post-Course Scores of the Summer 2005 Group*
(upper 50% of students)

** statistically significant increase in test scores in this area*

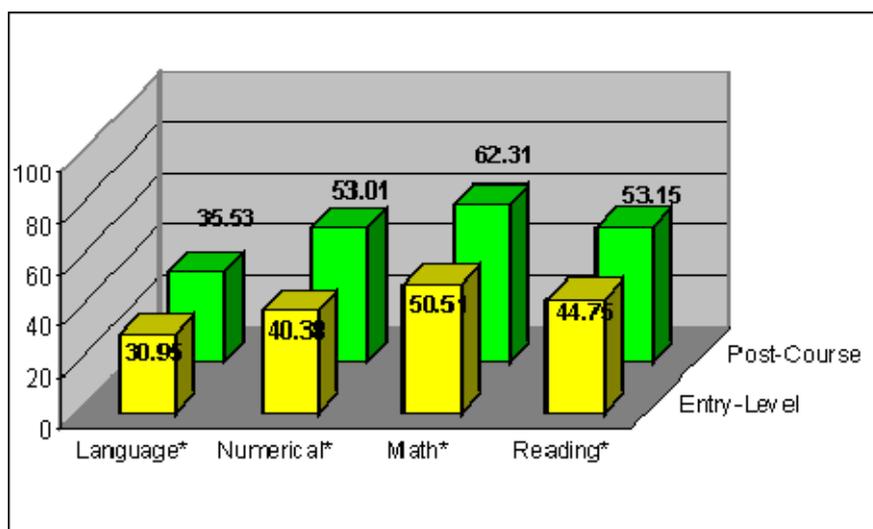


Figure 5: *Entry-Level and Post-Course Scores of the Summer 2005 Group*
(lower 50% of students)

** statistically significant increase in test scores in this area*

The curriculum (cf. appendix A) for the Academic Ramp Course, prepared and pilot-tested to a group of fifty incoming students of the Maritime Academy of Asia and the Pacific during the summer of 2004 and utilized for a new batch of students coming from two maritime schools in Luzon and two institutions in the Visayan region during the summer of 2005 provided interesting insights. By the end of the Academic Ramp Course during the summer of 2005, statistically significant improvement in the average test scores of the group was observed in the following areas:

- English / Language usage [verbal ability]
- Mathematics / Numerical ability
- Reading Comprehension

It was also observed that the entry-level low scorers (bottom 50% of the group during the initial assessment) showed considerable gain in test scores in their numerical / mathematical ability, reading comprehension, and language aptitude. The Academic Ramp Course demonstrated that it is possible to “ramp” high school graduates’ knowledge to a level that will better prepare them for the rigors of maritime studies.

Future endeavors will focus on further “fine-tuning” the program to be more responsive to the needs of the locality / region. The possibility of expanding the participant base of the study to include maritime institution(s) in the Mindanao (Southern Philippines) region should also be looked into.

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Appendix A – The Maritime Academic Ramp Program Curriculum

English Area

- A. Grammar Review
 - 1. Parts of Speech
 - Content words, Function words
 - 2. Sentence Structure
 - Sentence Completion, Identifying Errors
 - 3. Introduction to Speech
 - Pronunciation Drills
- B. Reading Activities
 - 1. Scanning
 - 2. Skimming
 - 3. Noting Details
 - 4. Making Inferences
 - 5. Drills on Context Clues
 - Verbal Analogy (Single-word Approach; Paired Approach)
 - 6. Semantic Webbing & Graphic Organizers
 - 7. Paraphrasing
 - 8. Summarizing
 - 9. Outlining
- C. Speech Activities
 - 1. One-on-One Conversation
 - 2. Developing Listening Skills
 - 3. Mock Interview
 - 4. Making Introductions
 - 5. Public Speaking
- D. The Essay and Essay Writing
 - 1. Developing the 5-paragraph Essay
 - 2. Formulating the Thesis Statement
 - 3. Developing the Paragraph (Spatial, Chronological, Logical)
 - 4. The Cause-and-Effect Essay
 - 5. The Argumentative Essay
 - 6. Peer Critiquing

Physics Area

To supplement the reading exercises being conducted by the English area teachers, the Physics instructor recommended the use of the text, *Conceptual Physics* by Paul Hewitt, as the student's basic reading assignment in the course. The Physics instructor assigns pages to be read and discussed in small groups (outside of the classroom contact hours). During the

classroom activity, the instructor prepares a short quiz to check the student's understanding of the material covered, and then deepens the material through the lecture discussion. The use of demonstrations, multi-media resources, and film clips aided in the discussions during the course.

Chapter	Topic / Content
1	About Science
2	Linear Motion
3	Nonlinear Motion (projectile, circular motion)
4	Newton's Laws of Motion
5	Momentum
6	Energy
8	Gravity
12	Liquids

Mathematics Area

The mathematics area began with a review of arithmetic rules, followed by operations with fractions and decimal numbers, review of ratio and percentages. Word problems involving linear equations and equations with two unknowns were also given attention. In the math review class, the instructors' approach was for the students to work on the problems, individually at first, and then present their solution to the whole group (using board work). The student explains his solution to the class, and the class, together with the instructor looks at the solution. Possible mistakes and errors in the solution are pointed out and the student is given the chance to re-check his solution.

ARITHMETIC

- Whole Numbers
- Fractions
- Decimals
- Percent
- Ratio and Proportion
- Signed Numbers

ALGEBRA

- Real Number Systems
- Set Operations
- Radicals
- Addition, Subtraction, and Multiplication of Polynomials
- Division of Polynomials
- Special Products and Factoring
- Rational Exponents
- Algebraic and Complex Fractions

Linear Equations and Linear Word Problems

TRIGONOMETRY

Introduction on SOH-CAH-TOA

Analytic Geometry (lines, parabola, circle, ellipse, and hyperbola)

Appendix B – Description of Standardized Tests Used

Abstract Reasoning

The Abstract Reasoning Test is a non-verbal measure of reasoning ability – the ability to think logically and to perceive relationships in abstract figure patterns.

Language Usage

The Language Usage Test is an assessment designed to measure the ability to detect errors in grammar, punctuation, and capitalization. The items reflect present-day formal writing and the ability to use English properly.

Reading Comprehension

The Reading Comprehension Test assesses speed, retention, and accuracy. Passages are read, then questions related to the reading passage are asked at the end.

Numerical Ability

The Numerical Ability Test is an assessment designed to test an individual's understanding of numerical relationships and facility in handling numerical concepts. It measures the ability to understand and work with ideas related to numbers.

The test comprises five clusters:

- o Number and Operations – whole numbers, fractions, and decimals
- o Patterns, Relationships, and Algebra
- o Geometry and Measurement
- o Graphs and Statistics
- o Problem Solving

Mathematics Achievement Test

The Mathematics Test assesses appropriate mathematics content and process skills at every level, grounding questions in realistic situations that are relevant to students' everyday lives. The questions assess students on their knowledge of mathematics as well as their ability to solve problems and communicate and reason mathematically.