

## TECHNICAL COMMUNICATIONS – A PRECURSOR TO INTERNATIONAL COLLABORATION IN MARITIME RESEARCH AND DEVELOPMENT

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**Abstract.** In the twenty first century, the role of undergraduate research and development (R&D) - particularly in the scientific and technical disciplines – is becoming increasingly significant. Maritime universities, while distinguished by mission and culture, are actively seeking avenues to contribute towards innovation and growth in their industry. To participate in these R&D endeavors, maritime academies often form strategic alliances with large research universities and institutes to work in the traditional fields of marine engineering, naval architecture, and now in the burgeoning area of renewable energy sources. Yet global problems often warrant international collaboration, and here success is predicated on the ability of each maritime university to engage in effective technical communications. This includes specific training in the preparation of cover letters, resumes, technical documents and reports, communication of calculations, proposals, as well as oral and visual communication. In May 2008, an initiative was launched by the Maine Maritime Academy (MMA) and the Admiral Makarov State Maritime Academy (AMSMA). The first phase of this collaboration featured a visiting MMA professor who delivered a course in technical communications (in both English and Russian) on the AMSMA campus. In the Fall 2010 semester, an AMSMA professor will visit the MMA campus to teach traditional engineering courses and to participate in on-going research projects. The objective of this collaboration, under the aegis of technical communications, is to promote greater faculty and student exchanges among the International Association of Maritime Universities (IAMU).

### INTRODUCTION

Throughout the world, many college students garner a valuable learning experience through foreign study programs. In most cases, the academic semester abroad requires proficiency or fluency in a foreign language. Students often complete several years of language training at their college before embarking on a term of full immersion in the language and culture of the host institution. While many students pursue this opportunity as part of their major field of study, e.g. literature or history, a number utilize the semester abroad as an enriching academic experience that will complement their training in engineering, business, or other technical disciplines. In this respect, the International Association of Maritime Universities (IAMU) has a tremendous opportunity to expand student exchanges and foreign study programs, which in doing so, will broaden the appeal of the sister IAMU institutions to prospective students and will enhance the quality of maritime education.

The author recognized that proficiency and fluency in a number of foreign languages was present on the campus of Maine Maritime Academy (MMA), as spoken by faculty, staff, and students. This list includes Spanish, French, German, Chinese, Persian, Japanese, Russian, and Arabic. He also observed a strong demand on the part of MMA's engineering students to learn a foreign language and to participate in a semester abroad, either as a student or in fulfillment of the cooperative industrial field experience [1]. Recalling his own foreign study experience at Moscow State University, as part of an exchange with Dartmouth College, the author set out to establish collaboration between MMA and the Admiral Makarov State Maritime Academy (AMSMA).

In October 2007, Paul Wlodkowski, Associate Professor and Head of the MMA Marine Systems Engineering program, and Elena Kozlova, Head of the AMSMA International Relations Department,

began work on establishing the framework of this IAMU exchange program. After a series of meetings during a preliminary visit to St. Petersburg, Russia in March 2008, it was decided to develop a specialized course for AMSMA engineering students in technical communications, which would be delivered in both English and Russian.

The motivation and rationale of this effort is also reflected in the imperative to provide a global education for engineers, in general. Many prominent educators and industry leaders are calling for the engineering profession to be re-engineered. The Newport Declaration calls for “all engineering students to develop the skills and attitudes necessary to interact successfully with people from other cultural and national environments” [2]. Accordingly, because of the international nature of the maritime industry, and the increasing role of undergraduate research and development (R&D), it will be necessary to forge strategic alliances with universities at home and abroad for the purposes of solving global problems. For these ventures to be successful, however, IAMU institutions will need to engage in effective technical communications.

## **TEACHING TECHNICAL COMMUNICATIONS**

The great American writer and lecturer Dale Carnegie [3] often said that professional success is attributable to 15 % technical skills and 85 % interpersonal and communications skills. Proceeding from this philosophical underpinning, the instructor of technical communications stresses that the skills of presenting designs, equations, and technical ideas are just as important as the science and mathematics behind them. While many recognize that the corporate sales and marketing personnel are tasked with communicating the organization’s message externally, fewer appreciate that the engineers are the consummate internal communicators who must first advance their ideas over competing proposals. Inculcating the importance of technical communications to a marine engineering student’s future career is critical albeit a challenging task.

Technical writing differs significantly from other conventional forms due to the necessity of communicating calculations, charts, graphs, schematic drawings, and mathematical equations. For these reasons, and because its objectives are to secure employment, to explain sophisticated technical information to a general public, or to advance proposals, it is a distinct discipline that needs to be studied and constantly practiced [4]. One of the major themes of technical communications is the “reader-centered approach” in which the student learns to analyze the wider corporate audience, to concentrate on persuasive strategies, and to focus on the ways multiple readers will respond, moment by moment [5].

During May and June 2008, the author delivered a thirty hour course in technical communications to an audience of fourteen AMSMA cadets and one instructor. Most of the students were enrolled in the Academy’s mechanical and electromechanical departments, although several had affiliations with maritime transport management department. Given the technical nature of the course, the AMSMA cadets first had to demonstrate a proficiency in English. To enhance the learning process for the AMSMA cadets, however, the instructor utilized a pedagogy known as language twinning, in which his lectures would lead in English, but subsequent points of clarification, as well as a percentage of the classroom discussion, would be conducted in Russian. Overall, this approach yielded successful results, as evidenced by the quality of the final presentations and course evaluations.

The focus of the AMSMA course was to develop the practice of communications tasks of a working engineer or technologist, with a focus on writing business plans and research proposals. The instructor emphasized the application of effective visual aids to both oral and written communications. The course goals were:

1. To teach students to communicate effectively in professional environments, orally, visually, and in writing, using and understanding the formats most effective for this purpose.
2. To provide students mentored practice in writing and revising technical English.

3. To foster in students the values of responsibility and honesty in the academic setting.

The performance criteria [6] used to assess the cadets is illustrated below in Table 1. In general, the instructor assessed student performance relative to current industrial standards for entry-level engineers, while fully taking into account that English is the second language. Moreover, he evaluated cadet performance based on the following criteria:

- Responsiveness to Audience and Objectives.
- Appropriateness of Format and Form of Argument.
- Quality of Supporting Evidence Presented.
- Appropriate Use of Readability and Accessibility Principles.
- Conformity to Conventions of Standard Technical English.
- Quality and Effectiveness of Visual Aids, where Applicable.

Table 1

**Performance Criteria for Technical Communications Course**

<p><b>1. To teach students to communicate effectively in professional environments, orally, visually, and in writing, using and understanding the formats most effective for the purpose;</b></p> <ul style="list-style-type: none"> <li>• Understand and employ the basic steps of the technical writing process;</li> <li>• Use rhetorical elements appropriate to the audience and objectives of the communication;</li> <li>• Understand and employ standard formats appropriate to the type of communication;</li> <li>• Apply the principles of technical argumentation and persuasion;</li> <li>• Design document layout and graphics for clarity and information accessibility;</li> <li>• Use electronic media for research and communication with colleagues;</li> <li>• Design and deliver effective oral presentations;</li> <li>• Show proficiency in the conventions of standard technical English.</li> </ul>
<p><b>2. To provide students mentored practice in writing and revising technical English;</b></p> <ul style="list-style-type: none"> <li>• Demonstrate examples of an effective technical memorandum, description, proposal, instruction, résumé and employment letter;</li> <li>• Demonstrate the ability to critique technical writings of others in a constructive manner.</li> </ul>
<p><b>3. To foster in students the values of responsibility and honesty in the academic setting.</b></p> <ul style="list-style-type: none"> <li>• Attend class regularly and on time;</li> <li>• Recognize and avoid plagiarism;</li> <li>• Use technical communication ethically.</li> </ul>

Four major written assignments formed the basis of the course, which are listed in Table 2. As revision is an essential element of the technical writing process, the evaluation of each assignment was based on the results of a draft and final versions. The instructor provided each student with written comments and feedback. Moreover, during several recitations, the cadets were able to obtain further critique and evaluation from peer reviews.

Table 2

**Homework Assignments for Technical Communications Course**

Number	Assignment
1	Submit a copy of your RESUME and a LETTER OF APPLICATION, both “ready to mail” to a specific potential employer
2	Submit a written DESCRIPTION in TECHNICAL MEMO format to the solution of a problem from your engineering or technology curriculum. Utilize equation editor.
3	Submit a TECHNICAL PROPOSAL to introduce an innovation to the maritime field or to the curriculum at AMSMA
4	Prepare and present a 5 – 7 minute ORAL PRESENTATION on the Technical Proposal

The culmination of the technical communications course was preparing and delivering a 5 – 7 minute oral presentation on a technical topic approved by the instructor. This presentation went beyond the conventional “how-to” or “show and tell” format. Cadets were asked to develop well organized and cogent technical proposals, feasibility studies, technical descriptions, or critical reviews on a published article, etc. The presentation included at least one graphic element, and part of the final grade assessed that element’s effectiveness and appropriateness. Some of the topics chosen by the AMSMA cadets included the development of specialized cadet shipping programs, the incorporation of metrics to measure the efficiency and quality of a maritime education, the establishment of an all-electronic technical library, the formation of a new training center, as well as ideas to incorporate new types of software in the curriculum. Fig. 1 below illustrates an AMSMA cadet, Aleksey Agarkov, delivering his oral presentation. All students were required to deliver the final presentation in English. In attendance were the AMSMA professors representing several departments, the Head of the International Relations Department, and the Vice Rector for Academic Affairs. After the presentations and question and answer session, the author provided each AMSMA cadet with a certification of successful completion of the technical communications course.

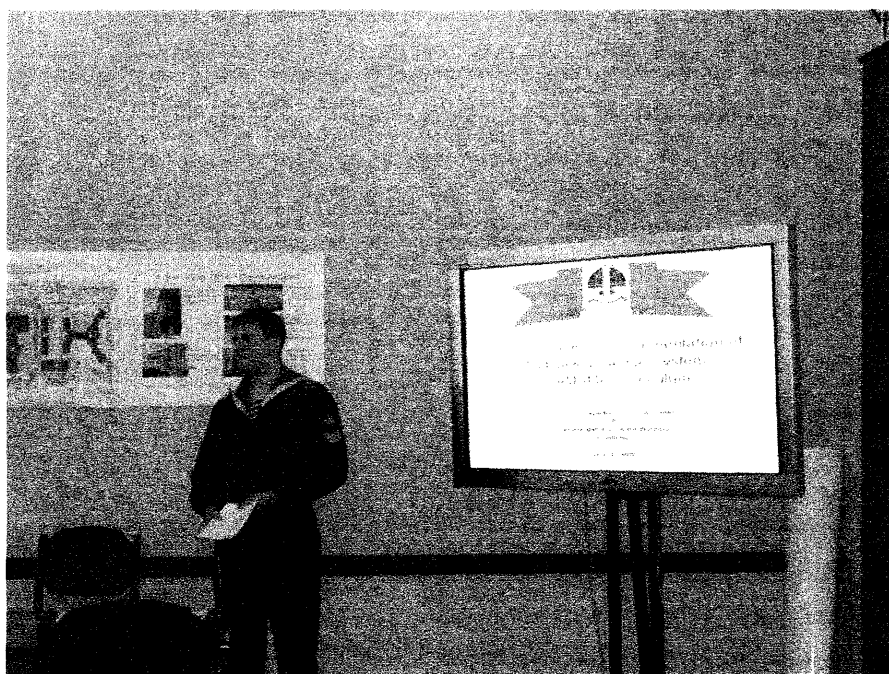


Fig. 1. Delivery of Oral Presentation in Technical Communications at AMSMA

## CONCLUSIONS AND FUTURE WORK

The teaching of technical communications on the campus of the Admiral Makarov State Maritime Academy in St. Petersburg, Russia was a productive and rewarding enterprise. By learning to compose resumes and cover letters, and to scope technical projects with Gantt charts, objectives, budgeting, and a detailed communication of calculations, the cadets have acquired a skill set that will be extremely valuable in the business world and in research and development. Moreover, the collaboration established between MMA and AMSMA highlights the effectiveness and utility of dual language delivery (twinning) of technical coursework. It is a model that can be replicated at other maritime academies for a variety of disciplines. Future plans involve expanding this exchange to the students of the Maine Maritime Academy, who would first complete several years of language training in Russian at home prior to their semester abroad term in St. Petersburg.

During the Fall 2010 semester, an AMSMA professor will reside in Castine, Maine as a visiting professor. As MMA is increasingly involved in research and development efforts in tidal power, off-shore wind, and thermoelectric materials for waste heat recovery, this AMSMA professor could well be involved as a technical resource. This, in turn, will likely evolve into an active collaboration of two IAMU institutions working to solve the global problem of developing renewable energy sources for maritime applications. A precursor to the success of this venture will involve full institutional commitment to the teaching and practice of technical communications.

## ACKNOWLEDGMENTS

The author would like to thank the Admiral Makarov State Maritime Academy for the enthusiastic reception and gracious hosting of his visiting professorship in St. Petersburg during May and June 2008. Particular appreciation is given to Ms. Elena Y. Kozlova, Head of the AMSMA International Relations Department, for her efforts as an architect of the MMA-AMSMA collaboration and for her work in organizing the offering of this specialized course to a number of academic departments. The author would also like to acknowledge Mr. Dmitry V. Isakov, an AMSMA Instructor from the Electromechanical Department, who both completed the course and made significant contributions to incorporating technical communications into the curriculum. Lastly, thanks go to the AMSMA cadets who diligently completed the rigorous assignments and developed their technical English, and in turn, honed the Russian skills of this visiting professor.

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