

**Program Outcome Assessment Summary Report
2012/2013 Academic Year**

Department of Computer Science
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1. Summary of Actions Taken in Response to AY11/12 Assessment

Following is a summary of actions taken on recommendations from the AY11/12 assessment summary:

1. A new course covering the societal impacts and ethical issues of computing was proposed in collaboration with the Philosophy program. A shared tenure-track position between Computer Science and Philosophy was proposed by both departments in order to support that course along with other Philosophy courses. The position was not granted.
2. New ORLOs were created for CSCD 110, 210, and 211. These ORLOs provide backup coverage of outcome (e) which are only assessed in PHIL 212 when the University performs assessment of similar general education goals and objectives. The new ORLOs also cover outcomes (a), (g), (h), and (i). The CSCD 110 ORLO was immediately applied, but the CSCD 210 and 211 ORLOs will not be applied until AY13/14.
3. The ORLO for CSCD 340 was modified to add coverage of outcome (c), which could not be covered by PHIL 212. This new ORLO was immediately applied during the AY12/13 cycle.
4. The ORLO for CSCD 350 was modified to add coverage of outcomes (c) and (e). This new ORLO was immediately applied during the AY12/13 cycle.
5. It was recommended that all CSCD 490 teams participate in the teamwork and technical performance rubrics. This did not happen for the teams supervised by one faculty member.
6. The assessment plan was updated to reflect all assessment changes to date. This included modifications to the program's Educational Objectives arising from a review by the department's Professional Advisory Board during AY 12/13.

2. Summary of Program Outcome Assessment in AY12/13

The following table summarizes the assessment methods applied to Program Outcomes during the 2012/2013 academic year. Details of the assessment data are provided in the sections that follow.

Program Outcome	Assessed Via
a) Students will have the ability to use current techniques, skills, and tools necessary for computing practice.	APE, CSCD 110, CSCD 240, CSCD 300, CSCD 320, CSCD 327, CSCD 340, CSCD 350
b) Students will recognize the need for, and will have the ability to engage in, continuing professional development.	Senior Project Oral Communication Rubric, CSCD 340
c) Students will have the ability to analyze the local and global impact of computing on individuals, organizations, and society.	CSCD 340, CSCD 350
d) Students will have the ability to communicate effectively with a range of audiences.	Senior Project Oral Communication Rubric
e) Students will have an understanding of professional, ethical, legal, security, and social issues and responsibilities.	CSCD 110, CSCD 350
f) Students will have the ability to function effectively on teams to accomplish a common goal.	Senior Project Teamwork Rubric
g) Students will have the ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.	APE, CSCD 260, CSCD 300, CSCD 320, CSCD 327, CSCD 340, CSCD 350, Senior Project Technical Rubric
h) Students will have the ability to analyze a problem and identify and define the computing requirements appropriate to its solution.	APE, CSCD 240, CSCD 260, CSCD 300, CSCD 320, CSCD 350, Senior Project Technical Rubric
i) Students will have the ability to apply knowledge of computing and mathematics appropriate to the discipline.	APE, CSCD 110, CSCD 240, CSCD 260, CSCD 300, CSCD 320, Senior Project Technical Rubric
j) Students will have the ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.	CSCD 300, CSCD 320, Senior Project Technical Rubric
k) Students will have the ability to apply design and development principles in the construction of software systems of varying complexity.	CSCD 350, Senior Project Technical Rubric

The following table summarizes assessment findings from each of the major assessment methods that were used in AY12/13. In class ORLO assessments are listed only where concerns were expressed. See Section 6 for a complete summary of the ORLO report findings from each course.

Assessment Instrument	Result of Assessment
APE Exam	No concerns.
CSCD 110 ORLO	Objective i.i (The student will understand arithmetical order of operations) was not met. Some concern was also expressed about difficulties in assessing the outcome relating to flowcharts and pseudocode.

CSCD 240 ORLO	Objective h.i (The student will write a Makefile that ensures no unnecessary compilation) was not adequately met because no assignment required the compilation of multiple target files. Concern was expressed that students are weak on bitwise operations and base conversions.
CSCD 350 ORLO	Concern expressed over a general lack of software design ability demonstrated by students in the class. Concern expressed that CSCD 350 now covers a wider range of outcomes than other courses, creating a disproportionate burden on the instructor.
Senior Project Oral Presentation Rubric	No concerns.
Senior Project Teamwork Rubric	No concerns except that the rubric was not applied to all senior project teams.
Senior Project Technical Performance Rubric	No concerns except that the rubric was not applied to all senior project teams.
Masters Oral Presentation Rubric	Some concern over drop in Response to Questions and Elocution, although scores in all categories remain acceptable.

The Computer Science Assessment Committee makes the following recommendations as a result of AY 12/13 assessments. It is recommended that ...

1. the department's Design Patterns course, which is presently considered an advanced elective, be renumbered at the junior level and required as a pre-requisite to CSCD 350. This will be submitted to CPAC for approval during AY 13/14, and effective during AY 14/15.
2. we retract the statement added to the Advancement Programming Exam guidelines, as a result of AY 10/11 assessment, instructing that the APE should be written to test implementation skills as opposed to design and analytic skills.
3. the Assessment Committee meet with CSCD 110 instructors to emphasize the need for this course to focus on algorithmic thinking and to discuss possibilities for assessing it, including the use of pseudocode, along with possibilities for remediating student difficulties with arithmetic order of operation due to poor math skills.
4. coverage of bitwise operations and number bases be added to CSCD 240, along with associated learning objectives supporting student outcome (i). It is also recommended that the makefile objective be clarified in order to require compilation of multiple source files.
5. the CSCD 240 ORLOs be simplified by remapping objective h.i to student outcome (i) instead of (h).
6. the new ORLOs for CSCD 210 and 211 be used this year.
7. the ORLOs for CSCD 330 be applied this year.
8. the Teamwork and Technical Performance rubrics be applied to all CSCD 490 project teams in this cycle.
9. the ORLOs for CSCD 350 be simplified to remove coverage of outcomes (a) and (g), which are well covered elsewhere.
10. the CSCD 555 course be formalized as a course in which students develop a research proposal and that the department develop an assessment instrument specifically for the course. The instructor should also consider having students give a presentation in that course..

11. CSCD 490 students be asked to join a Linked In group in order to make it easier to contact students post-graduation. A new ORLO template should be created for CSCD 490, linked to Outcome (b), asking the instructor to formally report how many of the students joined the group.

3. Advancement Programming Exam Scores

APE scores support Program Outcomes (a), (g), (h), and (i). APE exams were administered during each quarter of the academic year plus summer 2011. An 80% was required to pass the exam. Exam section topics are:

- (1) Linked List Manipulation 20%
- (2) Recursion 20%
- (3) Data Abstraction and Class Design 30%
- (4) General Programming 30%

Summary data for AY 12/13 and the preceding two years:

	Previous Year	Last Year	This Year
Number of Exams Taken	144	138	167
Overall Average Score	78.9%	79.0%	79.9%
Overall Pass Rate	64.6%	63.0%	67.5%
Failures on 3+ Attempt	2.1%	4.0%	3.0%

Fig 3.1 shows subsection scores along with pass rates for this year alongside the previous two years.

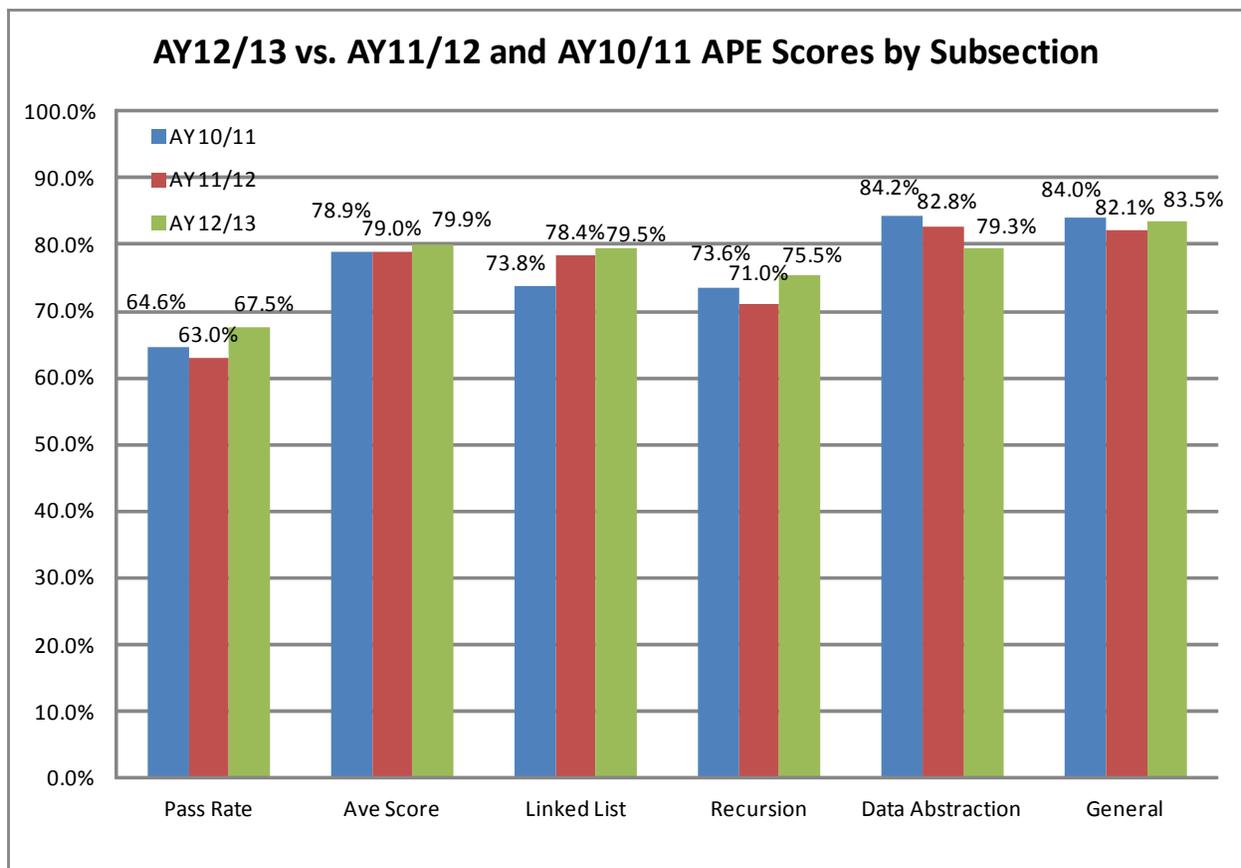


Fig. 3.1 – Summary APE Data by Exam Section

The average overall exam score was 79.9% with a standard error on the mean of 1.7%. This is not significantly different from the previous two years. The overall pass rate was higher than the preceding two years. A higher percentage of students passing with an average score that is unchanged indicates some increase in dichotomy between students who are doing well and those who are not. Core course instructors also report, anecdotally, that their grade distributions seem to be increasingly bipolar.

The proportion representing failures on a third attempt fell to 3%, which falls between the previous two years.

Subsection scores were reasonably balanced, with little change in average performance other than a drop in Data Abstraction. This drop appears to be consistent with observations of deficiencies in software design skills arising from other assessments, in particular CSCD 350.

This data supports recommendations arising primarily from ORLO assessments (recommendations 1 and 3 in section 2).

4. Senior Project Rubric Scores

Oral Communication rubrics were applied to senior project teams during Fall, Winter, Spring, and Summer, in sections of both CSCD 488 and CSCD 490.

Teamwork and Technical Performance rubrics were applied to the work of CSCD 490 senior project teams during Spring and Summer.

These assessments are tied to Program Outcomes as follows:

Oral Communication Rubric Scores: (b), (d)

Teamwork Rubric Scores : (f)

Technical Rubric Scores: (g), (h), (i), (j), (k)

4.1 Oral Communication

Fig 4.1 shows the average scores for presentations from the Fall, Winter, Spring, and Summer offerings of CSCD 488 and CSCD 490. The Professional Development Awareness score relates to Program Outcome (d), and the other scores relate to Program Outcome (b).

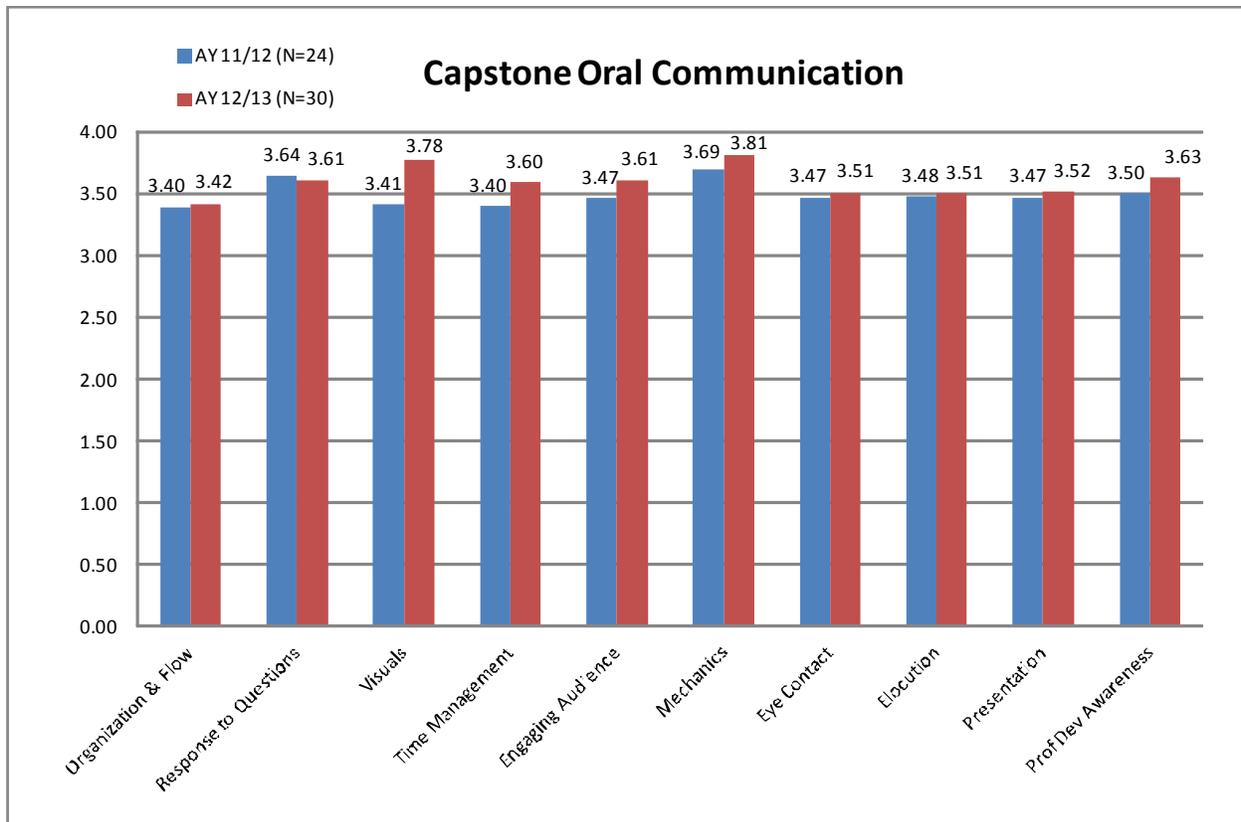


Fig. 4.1 – Project Oral Communication Rubric Scores

Performance was better than last year in all categories except for “Response to Questions” which was not significantly different. The results indicate that students are performing well against these learning objectives. No action based on Oral Communication data is recommended.

4.2 Teamwork

Fig 4.2 shows the average scores for the teamwork performance senior project teams from the Spring and Summer offerings of CSCD 490. These scores relate to Program Outcome (f).

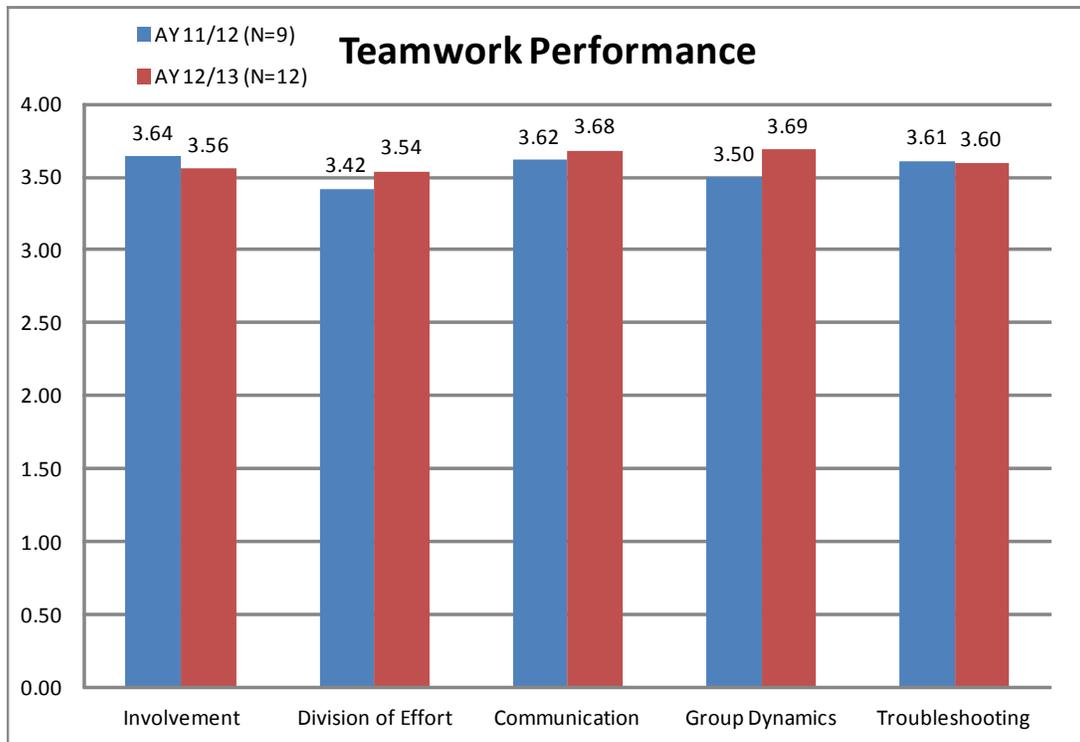


Fig. 4.2 – Project Teamwork Rubric Scores

The scores indicate that students' continue to perform well against these learning objectives. No specific action based on Team performance data is recommended.

This rubric, however, was not applied to all senior project teams. It is recommended that data from all senior project sections be collected during AY 13/14.

4.3 Technical Performance

Fig 4.3 shows the average scores for the technical performance of 9 senior project teams from the Winter and Summer offerings of CSCD 490. These scores relate to Program Outcomes (g), (h), (i), (j), (k).

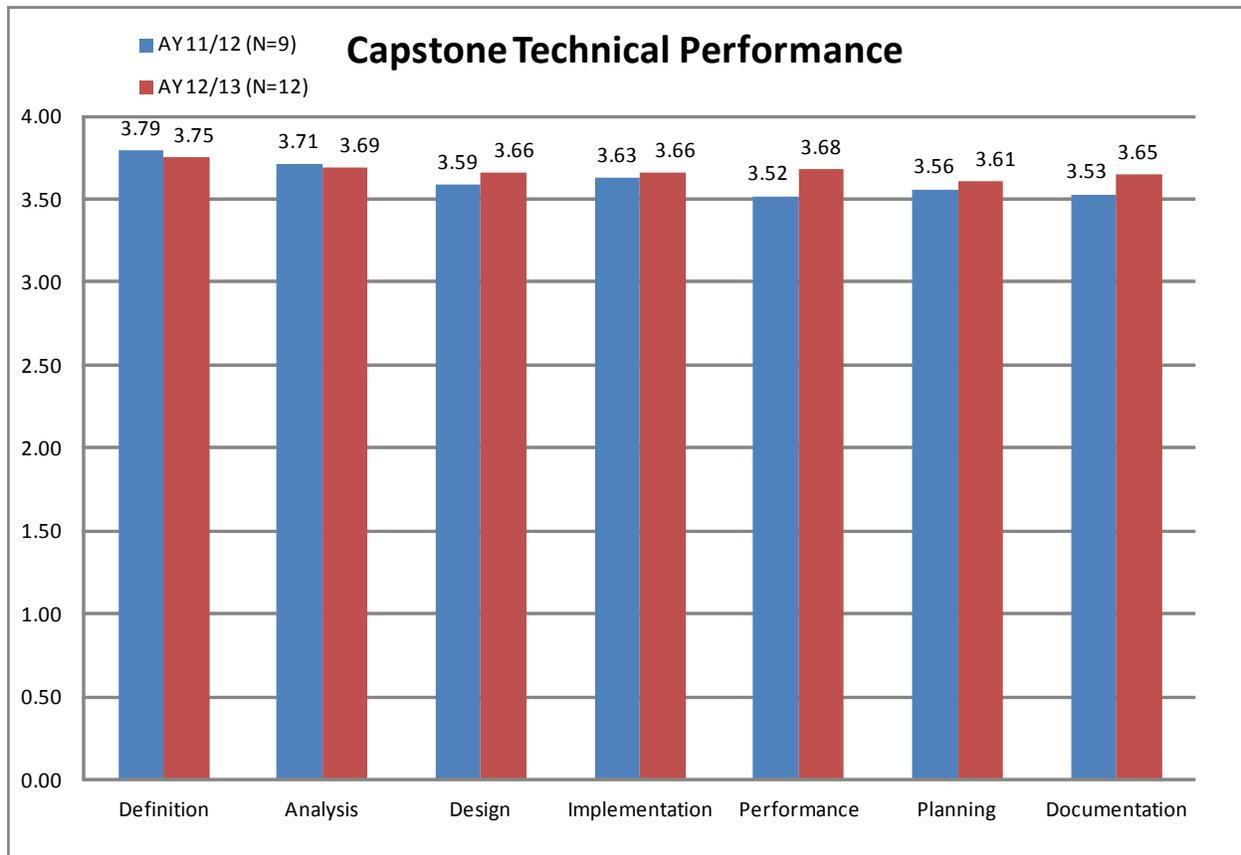


Fig. 4.3 – Project Technical Performance Rubric Scores

The scores indicate that students' continue to perform well against these learning objectives. No specific action based on Technical performance data is recommended.

This rubric, however, was not applied to all senior project teams. It is recommended that data from all senior project sections be collected during AY 13/14.

5. Course-specific Outcome-related Learning Objectives

Course-specific assessments were conducted for the following courses. Here we summarize the findings for each course. Full reports are available in the /faculty_reposit/ABET/ directory for the course.

Course	Term	Outcomes	Result of Assessment
CSCD 110	Winter 13		Objective i.i (The student will understand arithmetical order of operations) was clearly not met. Instructor attributed this to inadequate mathematical skills of incoming students. Some concern was also expressed about difficulties in assessing the outcome relating to flowcharts and pseudocode.
CSCD 240	Spring 13	(a), (h), (i)	Instructor felt that objective h.i (The student will write a Makefile that ensures no unnecessary compilation) was not adequately met because no assignment required the compilation of multiple target files. Concern was expressed that some students are not required to take ENGR 160 and so are weak on bitwise operations and base conversions. Instructor felt these topics and associated learning objectives should be added to the course.
CSCD 260	Fall 12	(g), (h), (i)	Four (of 24) students did not pass the course. Objectives were met for the rest.
CSCD 300	Fall 12	(a),(g),(h),(i),(j)	Objectives met. Aggregate scores (high, low, median) were reported, as opposed to the proportion of students achieving an acceptable level of performance.
CSCD 320	Fall 12	(a),(g),(h),(i),(j)	Objectives met, although instructor expressed concern that students are weak in analysis and design (see also CSCD 350 assessment). Aggregate scores (high, low, median) were reported, as opposed to proportion of students achieving an acceptable level of performance.
CSCD 327	Fall 12	(a),(g)	Objectives met. Instructor has continuing concerns over weakness in database normalization and will try to move this topic up in the term in order to give more time to work with the concepts.
CSCD 330		(a),(g),(i)	Assessment not performed.
CSCD 340	Winter 13	(a),(b),(g)	Objective g.i (The student will write a program or programs that reflects a common operating system task) revealed student weaknesses in number system conversions, which the instructor suggests should be covered in lower division courses (see also assessment for CSCD 240). Performance was also weak on objectives b.i (The student will read a selection of the computing literature and interpret it in their own language) and c.i (The student will read a selection of

			the computing literature and analyze and relate it to the global impact using their own interpretation). Instructor proposes that an additional objective be created in support of outcome (b). The instructor suggests that lower-division core courses introduce topics beyond simple coding.
CSCD 350	Spring 12	(a),(g),(h),(k)	Deficiencies were noted in several objectives, in particular with c.1, d.1, and h.1. Please refer to the full report for details. The deficiencies contain some common underlying themes: (a) Many students' knowledge of the discipline, beyond the simple syntax of coding, is insufficient coming into this course. While they may have learned the basic syntax of an object-oriented language, many have insufficient knowledge of object-oriented design and thus insufficient exposure to language constructs and patterns that support it. A significant number are furthermore under the impression that coding is the only important thing. (b) The present curriculum is pushing too much of the analysis and design portions of the discipline into this single required course. Some more specific deficiencies were also noted: (c) A significant number of students appear to have had insufficient exposure to assertions, proper use of exceptions, and error handling in general. (d) While students have been exposed to generics in the standard library they appear to have made little, if any, use of them for their own code. (e) There are hints that some students are reaching this course with deficiencies in fundamental algorithmic thinking. In discussing this assessment with the instructor, it was also noted that the assessed learning objectives in this course cover an unusual breadth of student outcomes compared to other courses.

6. Master's Oral Communication Rubric Scores

The Oral Communication rubric was also applied at the defense of 4 Master's degree candidates during AY 12/13. The rubric was applied by audience members present at the exam. The results are summarized in Fig. 6.1.

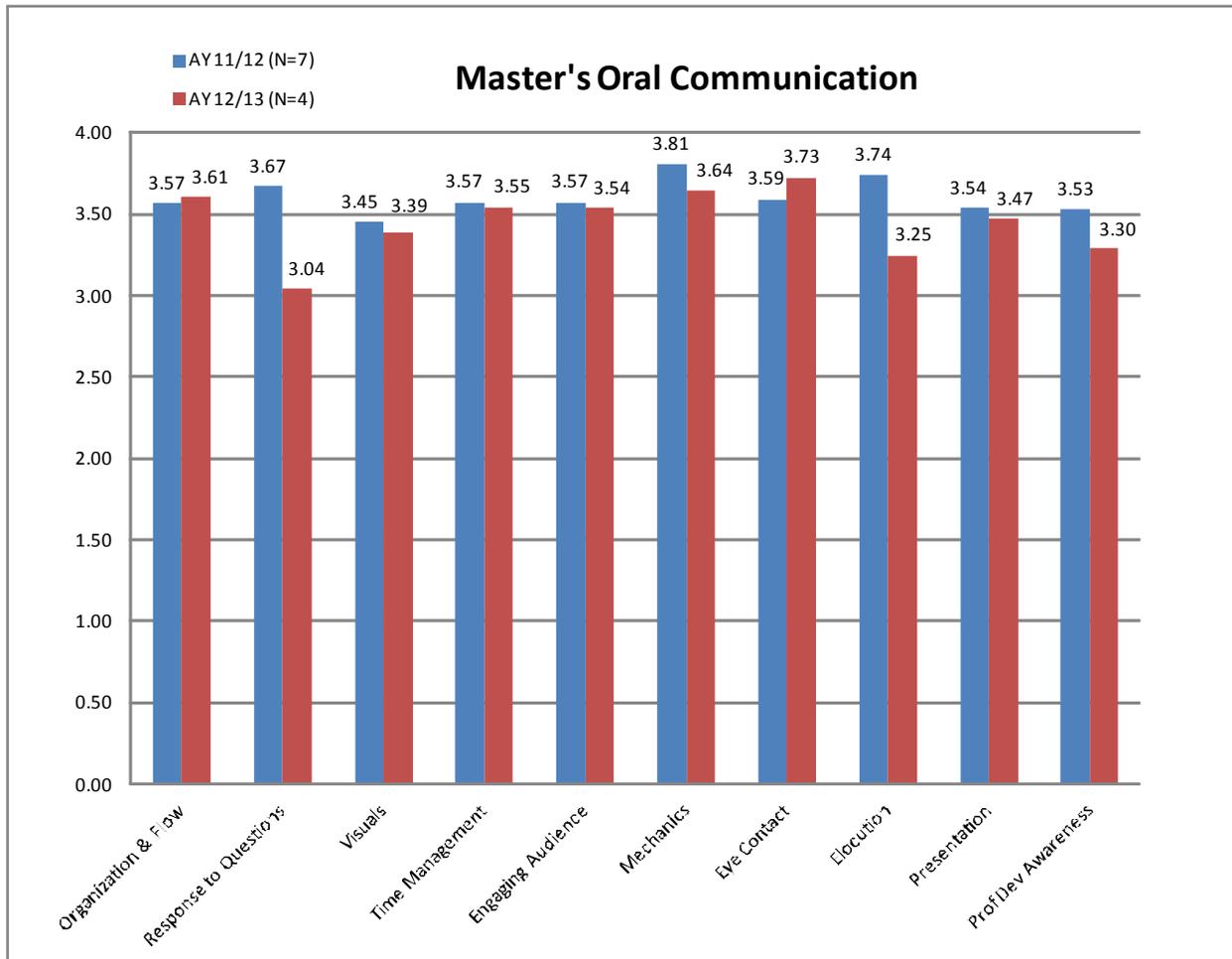


Fig. 6.1 – Master's degree Oral Communication Rubric Scores

Compared to the previous year there were significant drops in the areas of Response to Questions and Elocution, although all scores remain acceptable. It is recommended that the CSCD 555 course be formalized as a course in which students develop a research proposal and that the department develop an assessment instrument specifically for the course. The instructor should also consider having students give a presentation in that course.