



SCHEV Assessment Report Quantitative Reasoning & Civic Engagement 2018-19

Prepared September 2019



Background

SCHEV's policy on Student Learning Assessment and Quality in Undergraduate Education (June 8, 2017) mandates that (applicable) institutions assess student achievement in at least six competency areas. Four core competencies must be assessed by all institutions:

1. Civic Engagement
2. Critical Thinking
3. Quantitative Reasoning
4. Written Communication

Two additional competencies that reflect ongoing institutional priorities for student learning and development shall be selected by individual institutions. For VMI, these are:

5. Oral Communication
6. Scientific Reasoning



Data Collection & Reporting Schedule

Competency	Year
Civic Engagement	2018-2019 (Repeats 2021-2022)
Quantitative Reasoning	2018-2019 (Repeats 2021-2022)
Critical Thinking	2019-2020 (Repeats 2022-2023)
Written Communication	2019-2020 (Repeats 2022-2023)
Oral Communication*	2020-2021 (Repeats 2023-2024)
Scientific Reasoning*	2020-2021 (Repeats 2023-2024)



VMI Core Curriculum

The VMI [Core Curriculum](#) is a common and mutually reinforcing set of courses and experiences designed to cultivate the essential characteristics of the citizen-soldier—a person of character who is able to anticipate, respond, and lead in a complex and changing world.

The VMI Core Curriculum (CC) is thus organized into four components:

- A. Key Competencies (e.g., quantitative reasoning)
- B. Foundations of Citizenship and Leadership
- C. Perspectives on Civilization and Human Achievement
- D. Integrative Experiences

All six SCHEV competencies, with the exception of Civic Engagement, are assessed within VMI's core curriculum courses.



Quantitative Reasoning



Quantitative Reasoning

What is Quantitative Reasoning?

Quantitative Reasoning (QR) is the application of basic mathematical skills to the analysis and interpretation of real-world data and problems across disciplines.

Quantitative Reasoning is more than “doing math.” Rather, it is the application of mathematical techniques that allow the drawing of conclusions from a set of data, and the solving of problems in the context of a discipline, done in such a way that the results are relevant to our world.

As VMI is dedicated to producing leaders of our nation, we hold our cadets to high QR standards.



Quantitative Reasoning Sequences

Quantitative Reasoning, a Key Competency, is assessed in two different math sequences, as different majors have different mathematical needs.

- Sequence 1. Applied Mathematics, Chemistry, Physics, Civil & Environmental Engineering, Electrical & Computer Engineering, and Mechanical Engineering majors take calculus: MA 123 & 124.
- Sequence 2. All other *majors take MA 101 & 102, which includes Probability/Statistics, Modeling, and Sensitivity Analysis.

**Note:* Computer Science majors may take either sequence.



QR Student Learning Outcomes

At VMI, we assess students' QR skills through the following five learning outcomes:

1. Connect ideas of modern mathematics to applications in real-world settings;
2. Understand the relationship between variables and parameters of mathematical models and the patterns or phenomena they represent;
3. Formulate a problem using appropriate mathematical techniques and expressions;
4. Apply mathematical techniques to solve quantitative problems;
5. Communicate a solution in a manner that clearly indicates the line of reasoning.



SLOs Measurement

The student learning outcomes are measured through questions embedded in the tests and final exams in each course sequence (MA 101 & 102; 123 & 124).

Each cadet's performance is tracked throughout the course sequences, with a final score being determined by their total achievement.

Success is determined through proficiency rates. The target proficiency rate is 70%.



Results

Cadets Demonstrating Proficiency in 2018-19

Learning Outcome	% Proficient
1: Connect math and application	82.4%
2: Understand relationships and patterns	82.7%
3: Formulate a problem	56.4%
4: Apply techniques and solve problems	68.2%
5: Communicate solution and reasoning	76.4%



Discussion & Future Actions

Two outcomes failed to meet target proficiency rates:

- Problem formulation
- Application of techniques to solve problems

Actions

Each year, the faculty in the Department of Applied Mathematics meet to discuss overall student performance, including proficiency rates and strengths and weaknesses in the course sequences.

Additionally, course coordinators remind faculty throughout the semester of desired outcomes, and report student performance to the Core Curriculum Oversight Committee, which tracks learning outcome performance across multiple domains.

This year, discussion has been focused on pedagogical strategies to improve problem formulation. Specifically, instructors will place greater emphasis on cadets' opportunities to practice and receive feedback in this area before final testing occurs. We are also exploring the use of new assessment methods/instruments in the calculus sequence.



Civic Engagement



Civic Engagement

What is Civic Engagement?

Thomas Ehrlich asserts “Civic engagement means working to make a difference in the civic life of our communities and developing the combination of knowledge, skills, values and motivation to make that difference.” Thus, the scope of civic engagement can be expanded to military duty, i.e., those who serve the nation also serve the civic aspects of the country.

At VMI, all cadets must complete four years in a ROTC program – Air Force, Army, or Navy-Marine Corps.

Depending upon the Country’s needs, as well as student interests, students can commission as officers in the active duty services, the National Guard, or Army Reserves, either immediately upon graduation or in subsequent years.



CE Student Learning Outcomes

At VMI, we measure civic engagement through the following learning outcomes:

1. Cadets will, upon graduation, be prepared to defend their country “in times of national peril.”
2. Cadets will participate in community service activities as part of their cadetship.



SLOs Measurement

The overall rate of cadets commissioning in the armed forces (Outcome 1) and participation rates in VMI-facilitated community service activities (Outcome 2) are used to determine the extent to which outcomes are being met. Targets are:

- (1) An annual commissioning rate in the armed services of at least 50% of the graduating class.
- (2) At least 25% of non-commissioning cadets will participate annually in VMI-facilitated community service opportunities.

Note: All cadets participate in the ROTC all four years at VMI. All cadets participate in military Field Training Exercises (FTXs) during their first two years. Cadets seeking a commission in the armed forces continue military FTX activities as part of their service requirements. Cadets who do not seek a commission participate in community service opportunities each year during their third and fourth year at VMI. Twenty-five percent of non-commissioning cadets represents about 70% of the non-commissioning cadets enrolled in their third or fourth year at VMI.



Commissioning Profile 2018-19



Army Commissioning: 674
Army Non-Commissioning: 135
Total: 809

**All 1685 cadets
participate in
ROTC.**



Navy Commissioning: 256
Navy Non-Commissioning: 76
Total: 332



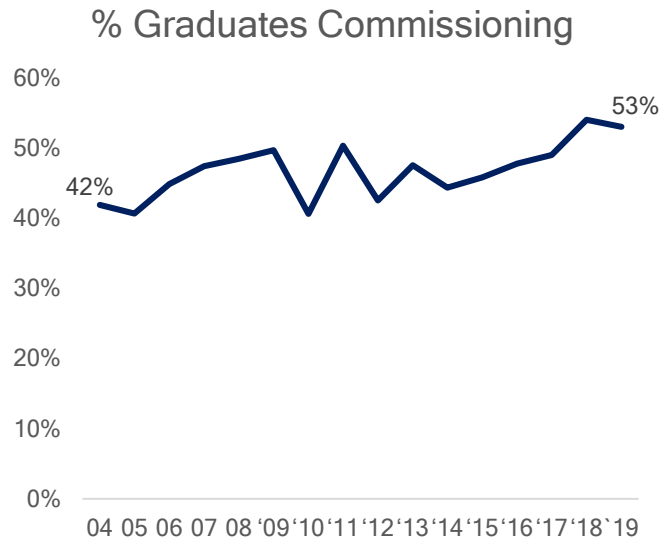
Marine Commissioning: 175
Marine Non-Commissioning: 25
Total: 200



Air Force Commissioning: 253
Air Force Non-Commissioning: 91
Total: 344



Commissioning Rates



	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19
Foreign	3	2	6	4	2	5	3	4	4	5
Coast Guard					1	0	2	0	0	0
Navy/Marine Corps	41	47	42	49	52	49	48	45	47	35
Air Force	14	21	10	11	13	13	10	14	37	24
Army	63	97	67	99	85	101	117	119	129	103
Number Commissioning	121	167	125	163	153	168	180	182	217	167
Number of Graduates	298	332	294	343	345	367	377	370	402	318
% Graduates Commissioning	40.6%	50.3%	42.5%	47.5%	44.4%	45.8%	47.8%	49.2%	54.0%	52.5%



Community Service Results

Non-commissioning cadets participated in service-related activities Friday, 5 April through Tuesday, 9 April. Internally, we call this program Commandant's FTX (field training exercises).

- As many as 482 cadets (> 25% of the entire Corps) worked on various projects with multiple organizations within the Lexington/Rockbridge area.
- Specifically, there were 20 separate external community service or government-support projects, totaling over 4,700 labor hours of collective, local community service
- On-Post, there were 13 internal-support projects that helped clean up VMI, plus nine additional miscellaneous support activities.

The next slide provides more detail.



Organizations/Projects

Organization	Saturday 6-Apr-19	Sunday 7-Apr-19	Monday 8-Apr-19	Tuesday 9-Apr-19
Boy Scouts of America	11	11	11	11
Boxerwood Nature Center			9	
First Baptist Church				9
Fishing Club	13	13	13	13
Frontier Culture Museum	9	13	15	15
Virginia Outdoors Federation		7		
Hull's Drive-In				11
Lime Kiln Theater	10	12	11	
Natural Bridge Appalachian Trail Club	12		13	
New Market Trip			15	17
Project Horizon				14
Rockbridge Area Community Services				
Rockbridge Area Health Center	9			
Rockbridge SPCA			13	
Roots & Shoots	6			
South River Volunteer Fire Department		10	10	
Special Olympics	90			
Timber Framing Club	29	29	26	28
Va Dept of Forestry				9
Yellow Brick Road Early Learning Center		8		3
AFROTC M17 Range			5	
Barracks Storage Cleanup		7		
Barracks Study Room Cleanup			6	
Chessie Trail Maintenance Project		21	22	23
Chessie Trail Cleanup Group1		35		
Chessie Trail Cleanup Group2		30		
General Post Cleanup				176
Hinty Hall Exterior Cleanup				9
McKethan Park Cleanup			175	
S4 Supply Closet Cleanup			13	
Mud Room Cleanup		2		
North Post Cleanup		15		
North Post Obstacle Maintenance		15		
North Post Trail Project				13
Spring FTX Ops	6	6	7	7
Spring FTX Guard	48	48	48	48
Spring FTX EMTs	19	19	19	19
Trunk Room Cleanup				
VMI Theater Cleanup				6
VMI Yearbook	4	5	4	4
VMI Firefighting Club	10	10	10	10
VMI Ducks Unlimited Club	17	17	17	17
CIS Club	9	9	9	9
Azalea Festival Permit	8	8		
Individual Permits to Miss	35	13	11	10
NCAA Excused	Baseball, Track, LAX, WWPLO	Baseball, Track, LAX, WWPLO	Baseball, Track, LAX	Baseball, Track, LAX
	345	363	482	481



Discussion & Future Actions

The targets of both civic engagement outcomes were met.

Commissioning rates were above the target of 50%. We are always actively working with all four ROTC detachments to increase scholarship opportunities and further increase commissioning rates. Over the last decade, we have increased rates more than 10 percentage points.

In terms of community service, the target of at least 25% of non-commissioning cadets participating in Commandant's FTX was exceeded. Notably, the program was significantly revamped this year in order to have it be more cadet-led, as well as have it capture more of the non-commissioning cadets. We used the mantra "Every cadet engaged, every day" to capture the philosophy shift.

In past years, companies of cadets were assigned to projects, meaning some projects had a surplus of cadets who could not be effectively used. This made the project management easy, but largely ineffective. This year, we implemented a troop-to-task analysis, where each project had a task and requested team size, and we allotted cadets accordingly. This shift meant more work for Commandant's Staff, but led to much better project execution and participation tracking.

Most cadets worked on projects with organizations they had no previous contact with, and the cadets-in-charge were generally ones who were not in other leadership roles. We got very, very close to every cadet engaged, every day goal- and did it largely with cadets running things. A resounding success, overall.