SCHEV Assessment Report
Quantitative Reasoning & Civic Engagement

AY2023-24

Prepared September 2024

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

Annual Competency Reporting Schedule	
Competency	**Academic Year**
Civic Engagement	2023-2024 (Repeats 2026-2027)
Quantitative Reasoning	2023-2024 (Repeats 2026-2027)
Critical Thinking	2024-2025 (Repeats 2027-2028)
Written Communication	2024-2025 (Repeats 2027-2028)
Oral Communication	2025-2026 (Repeats 2028-2029)
Scientific Reasoning	2025-2026 (Repeats 2028-2029)

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% for all outcomes.

Results

Cadets Demonstrating Proficiency in AY2023-24		
Learning Outcome	**% Proficient***	**Target Met/No Met**
1: Connect math & real-world application	44%	Not Met
2: Understand relationships & patterns	72%	Met
3: Formulate a problem using appropriate technique	63%	Not Met
4: Apply mathematical techniques to solve problems	61%	Not Met
5: Communicate solutions & clearly indicate the reasoning	49%	Not Met

Target rating is 70% for all the learning outcomes

Discussion & Future Actions

Discussion

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.

Post-COVID, special attention has been placed on monitoring student performance in the MAIs along with D/F/W rates. The MAI proficiency rates have generally been lower compared to their pre-COVID levels.

Actions – Part 1

In response, the faculty of Applied Mathematics have adjusted their pedagogical approach to better match the experiences and abilities of the incoming freshman while maintaining expectations of students upon course completion. This includes the use of an online homework system that provides instant feedback to student practice.

The assessment tools have also been re-examined to ensure students are given opportunity to demonstrate their mathematical skills and understanding, with greater emphasis being placed on assessment through summative assignments.

Discussion & Future Actions

Actions – Part 2

In Fall 2023 a new course sequence, MA 106/126, was piloted to service majors in Economics and Business, Biology, and Computer and Information Sciences. This course sequence covers statistics (MA 106) and polynomial calculus (MA 126).

Due to the nature of the pilot program, the MAIs and QR were not assessed for this report, but results will be collected for the AY2026-27 report.

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 – Army, Marine Corps-Navy, or Air Force-Space Force.

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 two 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.

Commissioning Profile
AY2023-24

All 1,523 cadets participate in ROTC.

Army Commissioning: 726
Army Non-Commissioning: 343
Total: 1,069

Navy Commissioning: 146
Navy Non-Commissioning: 0
Total: 146

Marine Commissioning: 152
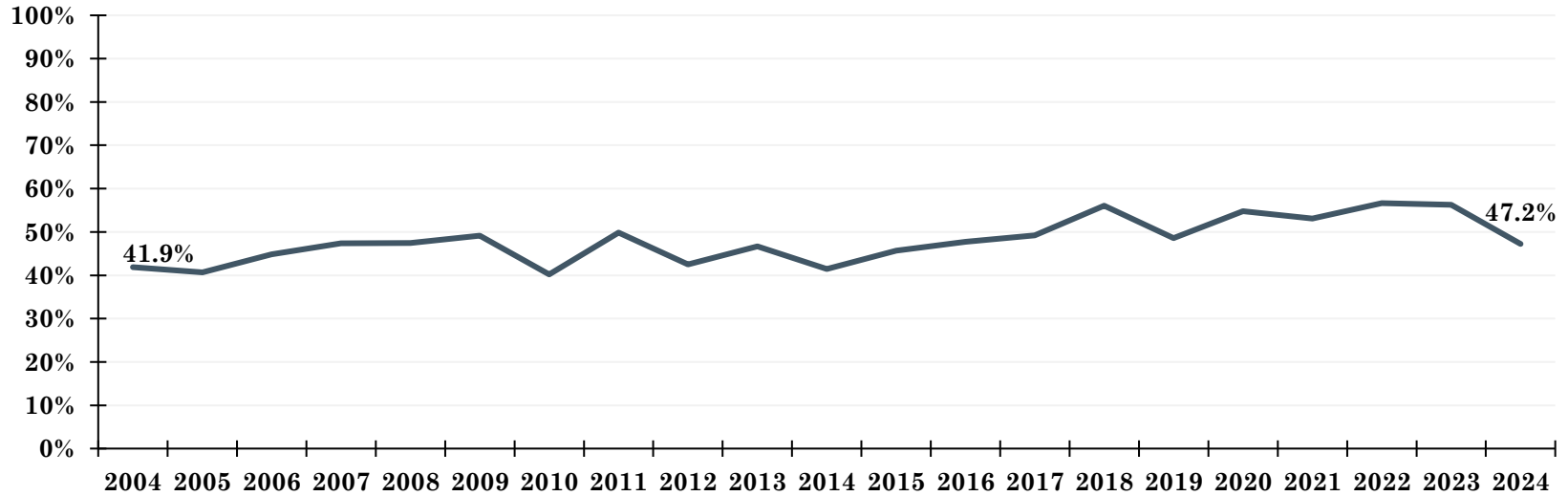**Marine Non-Commissioning: 0**
Total: 152

Air Force Commissioning: 156
Air Force Non-Commissioning: 0
Total: 156

Commissioning Rates

Annual Commissioning Percentage

41.9%

47.2%

Annual Commissioning Percentage															
Armed Service	'10	'11	'12	'13	'14	'15	'16	'17	'18	`19	'20	'21	'22	'23	'24
Foreign	3	2	6	4	2	5	3	4	4	5	5	5	4	4	5
Coast Guard	0	0	0	0	1	0	2	0	0	0	0	0	0	5	2
Navy/Marine Corps	41	47	42	49	52	49	48	45	57	35	49	46	53	33	52
Air Force	14	21	10	11	13	13	10	14	37	24	23	35	33	19	8
Army	63	97	67	99	85	101	117	119	133	103	130	120	123	132	95
# Commissioning	121	167	125	163	153	168	180	182	231	167	207	206	213	193	162
# Graduates	301	335	294	349	369	368	377	370	412	344	378	388	376	343	343
% Graduates Commissioning	40.2%	49.9%	42.5%	46.7%	41.5%	45.7%	47.7%	49.2%	56.1%	48.5%	54.8%	53.1%	56.6%	56.3%	47.2%

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Community Service Results

Non-commissioning cadets participated in service-related activities Friday, 5 April through Tuesday, 9 April 2024. Internally, we call this program Commandant's FTX (field training exercises).

- Greater than 25% of the non-commissioning cadets worked on various projects with multiple organizations within the Lexington/Rockbridge area.
  - Specifically, there were 21 separate external community service or government-support projects, totaling over 4,700 labor hours of collective, local community service
  - On-Post, there were 16 internal-support projects that helped clean up VMI.

The next slide provides a sample of some of the projects and participation.

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Sample of Organizations/Projects - Participation

Organization	Saturday 6-April-24	Sunday 7-April-24	Monday 8-April-24	Tuesday 9-April-24
Rockbridge SPCA		16		
Rockbridge Conservation	6	5		
Timber Framing Club/Timber Framers Guild Event			30	
Boxerwood Nature Center			6	
Rockbridge Area Habitat for Humanity	10		10	6
VMI Physical Plant			2	2
Lime Kiln Theater	14	14	12	
Rockbridge Area Transportation System	4			
American Legion Post 126, Buena Vista, VA	10		7	9
Department of History			3	
Barnstable Farm House, LLC.		5		3
P1 Heat Plant				5
P2 Physical Plant	1	1	1	1
Dept of Psychology				32
Cadet Life	8	10	10	15
Town of Glasgow			4	
Rockbridge Area Relief Association	3		3	3
COLLIERSTOWN PRESBYTERIAN CHURCH	4			
Virginia Museum of the Civil War - New Market Battlefield State Historical Park			3	3
VMI Physical Plant	10	5	4	7
P2 - Custodial			8	8
P2 - Administration			1	
Yellow Brick Road Early Learning Center	6	3		
Gentle Acres Animal Haven	4		4	3
Friends of the Chessie Trail	6	6		
S4 Staff	4	6		
Virginia Military Institute – Planning and Operations	3	3	3	3

Discussion & Future Actions

The community service outcome was met, while the commissioning rate did not meet the target, so the commissioning outcome was not met.

The commissioning rate was below the 50% target; however, this was the first time in the past five academic years that the target was not met. We are always actively working with all four ROTC detachments to increase scholarship opportunities, engage with and educate cadets about the opportunities to commissioning, and further increase commissioning rates. Overall, over the last decade, we have increased our commissioning rate by 5 percentage points until this year.

In terms of community service, the target of 25% of non-commissioning cadets participating in Commandant's FTX was exceeded. Notably, the revamp to the program a few years ago to have it be more cadet-led, as well as have it capture more of the non-commissioning cadets has maintained our participation rate. "Every cadet engaged, every day" is the mantra which represents the philosophy shift towards more cadets participating in community service during FTX.

We continued to use a troop-to-task analysis, where each project had a task and requested team size, and we allotted cadets accordingly. This approach has 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 were very, very close to our "Every cadet engaged, every day" goal - and did it largely with cadets leading the activities. This approach continues to be a resounding success, and we will continue to identify ways to get more cadets involved.