

Chapter VII: JUNIOR TESTING

Who takes it?

Students when they earn 75 credit hours. Half of the students take the mathematics and science modules of the CAAP test and the remaining half take the James Madison University-sponsored Scientific and Quantitative Reasoning Exam (JMU).

When is it administered?

Either in the fall or spring semester at specially arranged times by the Assessment and Testing Office.

How long does it take for the student to complete the instrument?

Approximately 1 ½ hours.

What office administers it?

The Assessment and Testing Office, Violette Hall 1130.

Who originates the assessment?

The CAAP comes from ACT and the JMU from James Madison University in cooperation with Truman faculty on the PIGS Committee.

When are results typically available?

For the individual student and the student's advisor, results are available near the end of the semester the test is taken for the CAAP exam. Individual reports are not available for the JMU. University reports for the fiscal year are typically available in late July.

What type of information is sought?

Information about the skills used in the liberal arts based general education curriculum. The CAAP can provide measurement in: writing, mathematics, reading, critical thinking, and science, although only the mathematics and science exams were administered. The JMU tests students in quantitative and scientific reasoning.

CAAP: American College Testing
Program
500 ACT Drive
Iowa City, IA 52243-0168
1-800-294-7027
<http://www.act.org/caap/index.html>
e-mail: outcomes@act.org

The Center for Assessment and Research
Studies
James Madison University
MSC 6806
Harrisonburg, VA 22807
540-568-6706
<http://www.jmu.edu/assessment>
e-mail: assessment@jmu.edu

From whom are the results available?

Assessment and Testing Office.

To whom are the results regularly distributed?

Individual results are communicated to students and their advisors. University and discipline averages are sent to the Provost, Deans, Assessment Committee, and selected administrators. University-wide results are also available through this *Almanac*.

Are the results available by department or discipline?

Yes.

Are the results comparable to data of other universities?

The CAAP provides comparative data norms for each test module. The JMU does not have comparative data available.

Report on Assessment Research Project comparing CAAP versus the James Madison University Scientific and Quantitative Reasoning Exam (SR/QR) for the Assessment of Scientific and Quantitative Reasoning Skills by Junior Level Students

The University has a long history of assessing both scientific and quantitative reasoning skills by a variety of instruments and practices such as, but not limited to, the senior portfolios and testing juniors with standardized tests with the assumption that these skills should have been obtained by that time in a student's academic career. Traditionally, some combination of CAAP and/or AP modules that dealt with these two skill sets were administered to subsets of Junior standing students in both the fall and spring semesters. Although these two instruments yielded some measure of skill proficiency and allowed national comparison, they were lacking in their ability to inform curriculum change as scores are not traceable to specific outcomes associated neither with the Mode of Inquiry nor with the classes offered to service these skill areas. The research team of Drs. Glenn Wehner (Agriculture), Phil Ryan (Mathematics and Computer Science), Ian Lindevald (Physics), Karen Smith (Psychology) and initially Dr. Sue Peiper (Assessment Specialist) made up the research team with Dr. Peiper serving in the first year of the study prior to an employment change and Dr. Smith joining the team in the second year. The NSF funded project was initiated by Dr. Donna Sundre with the Center for Assessment and Research Studies (CARS) at James Madison University (JMU) (Harrisonburg, VA) to determine the efficacy and universal application of a 90 minute examination to measure SR/QR skills across universities of varying missions. Participating institutions included JMU, Truman State University, St. Mary's University (San Antonio, TX), Virginia State University (Petersburg, VA), and Michigan State University (East Lansing, MI). The Truman team traveled to the JMU campus in the summers of 2007 and 2008 for on-site faculty institutes associated with the research project to allow exchange with teams from the other institutions. The Truman team also continued to meet regularly for analysis of data and research question development and analysis throughout those two years until present. This report constitutes only one venue of result dissemination.

In the academic years 2007-8 and 2008-9, half of the juniors of record were randomly selected to take either the SR/QR from JMU or both the CAAP modules testing scientific reasoning and quantitative reasoning, respectively. There were 2283 total juniors tested for the two years of the study. An additional subsample (N=135) of first-time students prior to having a class in either

mode were also tested in 2008-9 to evaluate a value-added model for the JMU test. There was good reliability of the entire JMU test with a Cronbach's alpha of approximately 0.80-.81 for the Juniors and .86 for the first-year students which was very comparable to the self-reported reliability (<http://www.act.org/caap/pdf/handbook/Chapter4.pdf>) for the CAAP of .84-.86. The test results for the JMU and the CAAP were stable over the two years of the study. It was also interesting to note that Juniors did significantly better (about 10 points) on the JMU instrument than first-time students indicating some insight into the efficacy of pre- and post-test methodology to assess increased proficiency in these skill areas.

An interesting benefit of the JMU instrument is that all questions were previously mapped to Truman outcome statements for both SR and QR with several questions mapping to more than one outcome. Only two Truman outcome statements (Life Science outcome 4 dealing with unifying principles of organisms and evolution influences and Mathematical Reasoning outcome 5 dealing with the role of mathematics in history) did not have any JMU questions mapped to them, so five items were written locally to evaluate these two outcomes bringing the original 66 item JMU test to 76 items for the Truman version.

Several research questions were developed by the Truman research team to delineate efficacy of both instruments of assessment. Correlation ($p < .05$) of the SR/QR scores and CAAP scores with the number of classes taken at Truman in science and quantitative areas demonstrated significance of the CAAP math with the number of Biology (0.156), Chemistry (0.270), Computer Science (0.203), Economics (0.127), Mathematics (0.190), Physics (0.316), Sociology and Anthropology (-0.151), and Statistics (0.125). For the CAAP science, correlations between number of classes and scores were: Agriculture Science (-0.030), Biology (0.215), Chemistry (0.277), Computer Science (0.091), Economics (-0.103), and Physics (0.279). Correlations of the SR/QR with number of classes revealed associations with Biology (0.118), Chemistry (0.146), Computer Science (0.068), Physics (0.148), and Political Science (0.109). A second question examined if ACT science and math subscores correlated with science and math subscores on the two assessment instruments.

CORRELATIONS			
	CAAP Math	CAAP Sci.	JMU
ACT Math	.685	.543	.517
ACT Sci.	.516	.635	.518
Comp	.586	.655	.618

The team was also interested to see if the SR/QR instrument discriminated science/math majors for non science/math majors. Science/math majors averaged 85.3% on the exam while other majors averaged 79.7%. These differences are significant ($p < .001$) for the overall score and for each of the outcome subscores.

When examining the performance of students on both instruments that had taken Statistics 190, too few students without STAT 190 credit were available in the sample to get a significant test against those that had taken the course. However, the correlations for Truman STAT 190 course grades with the instruments were: SR/QR (0.318), CAAP Math (0.374), and CAAP Sci. (0.282).

A final research question centered on the comparison of the SR/QR test scores for juniors versus first-year students. First-year students averaged raw scores of approximately 51% versus juniors 07-08 of 62% and juniors 08-09 of 63%. The first-year and Junior scores are significantly different at $P < .01$.

It appears that both the CAAP and the JMU SR/QR test can adequately measure student achievement in the areas of scientific and quantitative reasoning with an added benefit of the JMU instrument being directly tied to the outcome statements allowing the instrument to inform faculty concerning strengths and weaknesses in student preparation in each of the outcomes. This could accelerate and inform curriculum change to best serve our students.

**Sophomore/Junior Testing
FY02-FY09
CAAP Scale Scores and Percentiles**

2001-02 FY02	2002-03 FY03	2003-04 FY04	2004-05 FY05	2005-06 FY06	2006-07 FY07	2007-08 FY08	2008-09 FY09
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MATHEMATICS	N=472	N=440	N=365	N=366	N=335	N=309	N=128	N=381
Sophomores/Juniors	60.11	60.46	61.05	61.31	61.16	61.73	61.78	60.69
Post-Test%ile*	72.99	74.14	82.20	84.24	83.64	85.19	90.34	85.14
# >= 50 percentile	284	263	215	272	287	286	110	312
# >= 80 percentile	123	113	107	151	179	194	76	201

SCIENCE REASONING	N=462	N=474	N=398	N=348	N=350	N=303	N=134	N=377
Sophomores/Juniors	60.53	60.66	61.27	62.95	63.99	64.79	64.31	64.24
Post-Test%ile*	49.24	49.28	53.43	68.55	75.93	79.74	80.55	80.2
# >= 50 percentile	264	258	236	234	280	261	108	288
# >= 80 percentile	107	112	98	120	170	163	67	174

* User norms used to determine the post-test percentiles correspond to the approximate semester/year students would have taken their junior test. Example: a student who graduated in FY 05 probably took his/her junior test in the fall of 2003; therefore, the fall 2003 norms were used for determining the post-test percentiles for FY05.