SECTION IV – EVIDENCE FOR MEETING STANDARDS

Assessment 2:
Candidate Content major GPA
also including attached NSTA content analysis form

(1) narrative

a. Description of the assessment and its use in the program

In this assessment, candidate grades in their content discipline are analyzed. This measure provides key information about candidate performance in foundational and advanced courses and also provides important information about the outcomes associated with demographic and curricular changes that have been implemented in each content program. In association with the attached content analysis form for the three science single-field licensure areas offered at TCNJ (Biology, Chemistry, and Physics), this assessment ensures that all science candidates are comprehensively prepared in their content area.

b. A description of how this assessment specifically aligns with the elements and standards it is cited for in Section III. Cite SPA standards by number, title, and/or standard wording.

NSTA Standards Addressed by this assessment:
NSTA Standard 1: Content Knowledge including the following elements: 1a) Understand the major concepts, principles, theories, laws, and interrelationships of their fields of licensure and supporting fields as recommended by the National Science Teachers Association. 1b) Understand the central concepts of the supporting disciplines and the supporting role of science-specific technology.
Standard 6: Professional Knowledge and Skills 6a) Engage in professional development opportunities in their content field such as talks, symposiums, research opportunities, or projects within their community.

c. A brief analysis of the data findings;

In each of the three science programs, Biology, Chemistry, and Physics, most candidates are succeeding in completing their content area coursework successfully and achieving a broad and deep content education. As with all assessment data in these programs, the statistical interpretation of the data are somewhat limited by small populations, however, because this assessment includes all students in the programs (i.e. not just completers), the data analysis is somewhat more robust. A clear finding of the assessment is that all three programs have fairly similar profiles with regard to the grade outcomes of required student coursework.

The average student in the science secondary education programs enrolls in 2 to 4 content area courses per year, with a mean just below 3 courses per year for Biology and Physics and just above 3 content courses per year for Chemistry students. Given the intensive nature of TCNJ laboratory science courses, the program faculty believe that 3-4 content courses per year is the appropriate number for our students. The average of 3 courses per year is brought down by some of students who struggle with the content coursework and are intentionally spreading the content over 5 years rather than the typical 4 or are considering transferring into another major.

Mean GPA for science candidate students is comfortably above the 2.0 threshold required for graduation from the content programs. Nevertheless, mean GPA in the content areas is fairly close to the 3.0 total GPA required to enter the student teaching experience and the 3.0 cumulative GPA now required by State of New Jersey. As in many science programs nationwide, the mean School of Science GPA for all students at TCNJ is significantly below the college-wide mean. The science program faculty believe that a student completing the science content majors with a 2.75+ GPA has demonstrated proficiency in the discipline. Despite the success of the majority of the candidate students, a significant portion (approximately 1/4) do fail to meet the 2.0 GPA requirement or choose to change majors due to difficulty in the content courses. As is appropriate, these students are redirected to other majors and cannot complete the program toward licensure. Nevertheless, given the serious undersupply of science educators in New Jersey, the data suggest program faculty need to consider approaches to increase program entrants and completion rates.

Although not intentionally addressed by this assessment, the data collection allowed us to determine that completion rates of students in science secondary education programs were comparable to TCNJ School of Science averages for all students. Not surprisingly given the longer list of requirements for a dual science and secondary education degree, the 4 year graduation rates were somewhat lower than the TCNJ college-wide average.

d. An interpretation of how that data provides evidence for meeting standards, indicating the specific SPA standards by number, title, and/or standard wording;

Standard 1a is addressed by the content course grade analysis, which demonstrates that students are successfully attaining the expected levels of competency in the content as they progress through the program. Standards 1b and 6a are addressed by the attached NSTA content analysis form, demonstrating that standards 1b and 6a are required parts of the curriculum for each of the three licensure areas.

(2) Assessment Documentation

e. The assessment tool itself or a rich description of the assessment

Student by student grades in each content program course (Biology courses for Biology candidates, Chemistry courses for Chemistry candidates, and Physics courses for Physics candidates) were collected for three academic years: 2016-2017, 2017-2018, and 2018-2019. The grade point average in content courses was analyzed statistically from each of the three programs.

f. The scoring guide for the assessment

The assessment calculates the number of students enrolled in each program, the number of students that were actively taking courses in the program, the number of contents courses taken per student, the mean GPA per student, the maximum grade point average, the minimum grade point average, and the standard deviation of the individual student GPA. To graduate, each content major requires students to achieve a 2.0 GPA in major coursework and a minimum grade of C in foundational courses.

g. Charts that provide candidate data derived from the assessment.

1)

Year	Number of students enrolled	Number active in content courses	Mean GPA	Max GPA	Min GPA	Std Dev. of stud. GPA
Biology candidates						
2016-2017	12	11	2.83	3.82	2.25	0.56
2017-2018	14	13	2.97	4.0	2.0	0.62
2018-2019	18	16	3.04	4.0	2.0	0.68
Chemistry candidates						
2016-2017	6	6	3.00	3.57	2.5	0.37
2017-2018	10	10	2.77	3.75	1.84	0.68
2018-2019	8	8	2.55	3.76	1.21	0.81
Physics candidates						
2016-2017	10	10	3.10	4.0	1.84	0.76
2017-2018	17	17	3.22	4.0	1.22	0.90
2018-2019	25	25	2.96	4.0	1.29	0.81

2)

NSTA Content Analysis form is attached

Each of the three programs have also made curricular changes over the past several years to ensure that teacher candidates are fully engaged in the training related to the scientific method and the process of scientific discovery. Each department has recently strengthened their colloquium series of distinguished visiting speakers and taken steps (such as required attendance through the PHY299 and BIO 498 courses) to ensure that science teacher candidates actively engage in these events. The importance of participating in the scientific intellectual community and the process of scientific discovery is underscored by the implementation of NSTA/CAEP assessment 6, on which our students are performing well. We also emphasize not only content knowledge (assessments 1 and 2), but also the students' ability to acquire, synthesize, apply and finally, to communicate that knowledge in both written and oral form. The demonstration of these skills is evident by our students' performance on assessment 6. Our curricula require that at least two discipline-specific, writing-intensive courses be taken by all students, so high GPA's (assessment 2) also indirectly reflect this proficiency. In order to be recommended for teacher certification, TCNJ requires a 3.0 GPA at graduation. Thus, we hold our teacher candidates to high academic standards.

BIOLOGY – SECONDARY EDUCATION (BIOL_BS_02)
BS DEGREE – 32 COURSE UNITS

MAJOR COURSE REQUIREMENTS

Fulfill via completion of course requirements in three categories

Core Courses (5)	**Major Options (4) Specialization Courses (8)** (13 course units)	**Correlate Courses** (7)
BIO 099 – Orientation Seminar (zero-credit)	Biology option course (by advisement)	CHE 201 – General Chemistry I
BIO 185 – Themes in Biology	Biology option course (by advisement)	CHE 202 – General Chemistry II
BIO 211 – Biology of the Eukaryotic Cell	Biology option course (by advisement)	CHE 331 – Organic Chemistry I
BIO 221 – Ecology & Field Biology	Organisms and Evolution Biology option course (from approved list)	CHE 332 – Organic Chemistry II
BIO 231 – Genetics	SED 099 -- Education Seminar (zero-credit)	PHY 201 – General Physics I
BIO 498 – Biological Seminar *(Capstone)*	EFN 299 – School and Community	MAT 127 – Calculus A
	SED 224 – Adolescent Learning and Development	MAT or STA course (choose from:) MAT 128 – Calculus B MAT 200 – Discrete Mathematics STA 215 – Statistical Inference
	SPE 103 -- Social and Legal Foundations of Special Education	
	PHY 390 – Meth of Teaching Science	
	SED 399 – Pedagogy in Secondary Schools (1.5 units)	
	RAL 328 -- Reading in Secondary Education (0.5 units)	
	BIO 490 – Student Teaching (2 course units)	
	SED 498 – Capstone	

LIBERAL LEARNING REQUIREMENTS

Fulfill via completing course requirements in one of four options:

Option 1 – Breadth Distribution from Approved List

Arts & Humanities (3 courses)	**Social Science & History** (1 courses)	**Natural Sciences & Quantitative Reasoning** *(Requirements fulfilled by major course)*
Literary, Visual, or Performing Arts course	Behavioral, Social or Cultural Perspectives *(satisfied by major courses)*	Natural Science course (with lab)
World Views/Ways of Knowing course	Behavioral, Social or Cultural Perspectives *(satisfied by major courses)*	Quantitative Reasoning course
Literary, Visual, or Performing Arts course or World Views/Ways of Knowing course	Social Changes in Historical Perspective course	Natural Science course or Quantitative Reasoning course

Option 2 – Designated Interdisciplinary Concentration (see www.tcnj.edu/~liberal/concentrations/index.html)

Option 3– Self-designed Interdisciplinary Concentration (see www.tcnj.edu/~liberal/concentrations/index.html)

Option 4 – Second Major

CIVIC RESPONSIBILITIES, PROFICIENCIES & ELECTIVES

Fulfill via completion of course requirements in three categories

Civic Responsibilities	**Intellectual & Scholarly Growth**	**Electives** (0)
IDS 103 – Community Engaged Learning (*zero-credit requirement*)	IDS 102 – Information Literacy online tutorial (*zero-credit requirement*)	
	(WRI 101 or 102 may be required freshmen year.)	
Concepts – *(fulfilled through liberal learning, other courses, or sustained experience)*	**Writing Intensive Courses**	
Gender	FSP First Seminar course	
Global Perspective	Mid-level course *(fulfilled by BIO 221)*	
Race & Ethnicity *(satisfied EFN 299)*	Capstone course *(fulfilled by core course)*	
	Second Language (0-2 *based on placement*))	
	Demonstrated proficiency at the low intermediate level (103) if continuation of language studied previously. Two courses (101 & 102), if new language is taken.	

Note: Full list of graduation requirements can be found in The College bulletin and department website.

CHEMISTRY – SECONDARY EDUCATION (CHEM_BS_02, 04, OR 06)
BS DEGREE – 32 COURSE UNITS

MAJOR COURSE REQUIREMENTS

Core Courses (9)	**Specialization Courses*** (9)	**Correlate Courses** (4)
CHE 201 – General Chemistry I	SED 099 – Education Seminar (0 units)	MAT 127 – Calculus A
CHE 202 – General Chemistry II	SED 224 – Adolescent Learning & Development	MAT 128 – Calculus B
CHE 310 – Analytical Chemistry	EFN 299 – Schools, Communities and Culture	PHY 201 – General Physics I
CHE 331 – Organic Chemistry I	SPE 103 – Social and Legal Foundations of Special Ed.	PHY 202 – General Physics II
CHE 332 – Organic Chemistry II	SED 399 – Pedagogy in Schools (1.5 units)	
CHE 371 – Quantum Chemistry	PHY 390 – Methods of Teaching Science	
CHE 372 – Chem. Thermodynamics	RAL 328 – Reading in Secondary Education (0.5 units)	
CHE 430 – Biochemistry	CHE 490 – Student Teaching (2 units)	
	SED 498 – Collaborative Capstone for Prof. Inquiry	
CHE 451 – Inorganic Structure and Bonding *or* CHE 452 Inorganic Reactions and Mechanism	**Options Courses** (4/2/2)	
	CHE 365 – Chemical Aspects of the Environment	
	CHE 360 Forensic Chemistry	
Seminar Courses (Required)	CHE 370 Special Topics in Chemistry	
CHE 099 – Orientation Seminar (0)	CHE 410 Instrumental Analysis/Advanced Analytical	
CHE 316 – Sophomore Sem. (0.25)	CHE 451 – Inorganic Structure and Bonding *or* CHE 452 Inorganic Reactions and Mechanism (excludes course used to fulfill core requirements)	
CHE 317 – Junior Seminar (0.25)		
*See the **Secondary Education Sequence Planning Sheet** for the minimum standardized test scores, grades, and GPA required for advancement.	CHE 470 Advanced Topics in Chemistry	
	CHE 474 Special Topics in Biochemistry CHE 476 Special Topics in Organic Chemistry CHE 478 Special Topics in Condensed Matter CHE 471 Forensic Applications of Mass Spectrometry	
	CHE 493 Independent Research	
	XXX Approved Outside Courses (For Physical Science certification, see the Undergraduate Bulletin)	

ACS Approved Degrees

BS_CHEM_02
CHE 493 (2 units), and two 400 level courses with or without lab.

BS_CHEM_04
two 400 level courses with lab.

Non-ACS Approved Degree

BS_CHEM_06
One 400 level course and one 300 or 400 level course (with or without lab).[a]

[a]One unit CHE 493 counts as a 300 level course.

LIBERAL LEARNING REQUIREMENTS

Option 1 – Breadth Distribution from Approved List

Arts & Humanities (2-3 courses)	**Social Science & History** (2-3 courses)	**Natural Sciences & Quantitative Reasoning** (Requirements fulfilled by major course)
Literary, Visual, or Performing Arts course	SED 224 – Adolescent Learning & Development (Behavioral, Social, or Cultural Perspectives)	Natural Science course (with lab)
World Views/Ways of Knowing course	EFN 299 – Schools, Communities and Culture (Behavioral, Social, or Cultural Perspectives)	Quantitative Reasoning course
Literary, Visual, or Performing Arts course or World Views/Ways of Knowing course or Social Changes in Historical Perspective course		Natural Science course or Quantitative Reasoning course

Option 2 – Designated Interdisciplinary Concentration (see www.tcnj.edu/~liberal/concentrations/index.html**), Option 3– Self-designed Interdisciplinary Concentration (**see www.tcnj.edu/~liberal/concentrations/index.html**), Option 4 – Second Major**

CIVIC RESPONSIBILITIES, PROFICIENCIES & ELECTIVES

Civic Responsibilities	**Intellectual & Scholarly Growth**	**Electives 5 or as needed to meet 32 course graduation requirement**
IDS 103 – Community Engaged Learning (*zero-credit requirement*)	IDS 102 – Information Literacy online tutorial (*zero-credit requirement*)	Elective course
	(WRI 101 or 102 may be required freshmen year)	Elective course
Concepts – *(fulfilled through liberal learning, other courses, or sustained experience)*	**Writing Intensive Courses**	Elective course
Gender	FSP First Seminar course	Elective course
Global Perspective	Mid-level course *(fulfilled by core courses, see bulletin)*	Elective course
Race & Ethnicity (fulfilled by EFN 299)	Capstone course *(fulfilled by CHE 4xx courses, see bulletin)*	
	Second Language (0-3 *based on placement*)[e]	

[e] *Demonstrated proficiency at the low intermediate level (103) if continuation of language studied previously. Two courses (101 & 102), if new language is taken.*

Note: Full list of graduation requirements can be found in The College bulletin and department website.

PHYSICS & SECONDARY EDUCATION DUAL MAJOR – (PHYS_BS_02)
BS DEGREE – 32 COURSE UNITS (APPLIES TO STUDENTS ENTERING IN/AFTER FALL 2017)

MAJOR COURSE REQUIREMENTS

Core Courses in Physics (7.25 course units)	**Major Options** (10 units)	**Required Courses for Secondary Education** (7 additional units)	**Correlates** (2 units)
PHY 099 – Orientation Seminar (0 U.)	**Physics options (5 Units)** [a]	SED 099 – Orientation Seminar (0 U.)	MAT 127 – Calculus A
PHY 203 – Physics I for Physicists	1. PHY 390 2. PHY 490 (unit 1 of 2)	CHE 201 – General Chemistry I	MAT 128 – Calculus B
PHY 204 – Physics II for Physicists	3. PHY 490 (unit 2 of 2) 4. Lab Option:	SED 224 – Adolescent Learning and Development	
PHY 299 – Research seminar (0.25 U.)	5. PHY Option:	SPE 103 – Social & Legal Foundations of Special Ed.	
PHY 306 – Mathematical Physics	**Specialization Options (5 units)** [b]	EFN 299 – Schools and Communities	
PHY 321 – Modern Physics	1. CHE 201 2. RAL 328 (0.5 U)	RAL 328 – Reading in Secondary Education (0.5 U.)[1]	
PHY 356 – Thermal Physics	3. SED 399 (1.5 U) 4. Option:	PHY 390 – Methods of Teaching Science[1]	
PHY 401 – Classical Mechanics	5. Option:	SED 399 – Pedagogy in Secondary Schools (1.5 U.)[1]	
PHY 421 – Electromagnetic Theory I		PHY 490 – Student Teaching (2.0 U.)[1]	
a) Can be any 200+ level PHY courses, incl. 1 lab unit (PHY390 and 2 units of PHY490 are pre-set from Sec. Ed. req.)		SED 498 – Capstone for Professional Inquiry[2]	
b) Any science, engineering, or education course (max. of 3 100-level courses; CHE201, RAL 328, SED399 pre-set)		*1) These 3 courses are co-requisites and are typically taken together in the spring of the 3rd year as Clinical Experience I*	
Note: Many classes run only specific semesters see planning grid: https://physics.tcnj.edu/academics/course-descriptions/		*2) SED 498 is a required capstone for Dual Major, taken with student teaching, fall of 4th year only.*	

LIBERAL LEARNING REQUIREMENTS

Dual Major Breadth Distribution from Approved List (other options possible: liberallearning.tcnj.edu)

Arts & Humanities (any 2 courses, different prefixes required)	**Social Science & History** (fulfilled by Education Courses)	**Natural Sciences & Quantitative Reasoning** (Requirements fulfilled by major course)
Course 1:	**Satisfied by SED224**	**Satisfied by Physics Major**
Course 2:	**Satisfied by EFN299**	

CIVIC RESPONSIBILITIES, PROFICIENCIES & ELECTIVES

Civic Responsibilities	**Intellectual & Scholarly Growth**	**Electives**
Community Engaged Learning (0 U) *Met through FSP or C.E.L day*	IDS 102 – Information Literacy online tutorial	Choose free electives to meet 32 course min. & satisfy all requirements
Gender: *Met through a course*	**Second Language** *101 + 102, or through 103 level*	
Global Perspective: *Met through a course*	**Writing Intensive Courses** *WRI 101 or WRI102, if required based on entry*	
Race & Ethnicity: **Satisfied by EFN299**	FSP First Seminar course	
	Mid-level writing course: **Satisfied by PHY390**	
	Capstone course: **Satisfied by SED498**	

Typical recommended 4-year course sequence for Physics and Secondary Education

*Courses with asterisks have some flexibility in which semester they are taken, though this is approximate order is optimized

Year	**Fall Semester Course No. & category**	**Name**	units	**Spring Semester Course No. & category**	**Name**	units
1st year	PHY 099 (Physics core)	Physics Orientation	0	PHY204 (Physics core)	Gen. Physics II	1
	PHY 203 (Physics core)	Gen. Physics I	1	MAT128 (correlate req.)	Calculus B	1
	MAT127 (correlate req.)	Calculus A	1	*CHEM201 (Spec. option 1)	Gen. Chem. I	1
	FSP xxx (liberal learning)	First Seminar	1	*any Language, unit 2	2nd language	1
	*any 2nd Language, unit 1	2nd language	1	SED099	Educ. Orientation	0
2nd year	PHY306 (Physics core)	Math. Physics	1	PHY356	Thermodynamics	1
	PHY321 (Physics core)	Modern Physics	1	*PHY290 (Physics option 1a)	Learning Asst.	0.5
	*PHY299 (Physics core)	Research Fund. Sem	0.25	*EFN299	Schools & Comm.	1
	*SED224	Learning & Devel.	1	*any SCI xxx (Spec. opt. 3)	Science option	1
	*any SCI xxx (Spec. option 2)	Science option	1	*elective	free elective	1
3rd year	PHY421 (Physics core)	Electricity & Mag.	1	PHY390 (PHY option 3)	Sci. Teaching Met.	1
	*PHY xxx (Phy option 2, w/lab)	Physics lab option	1	SED399 (Spec. option 3)	Pedagogy	1
	*PHY290 (Physics option 1b)	Learning Asst.	0.5	RAL328 (Spec. option 5)	Sec. Ed. readings	1
	*Liberal learning Arts/Hum. 1	Liberal learning	1	PHY401 (Physics core)	Classical Mech.	1
	*SPE 103 (Sec. Ed. required)	Special Educ.	1			
4th year	PHY490 (PHY opt. 4&5)	Student-teaching	2	*Lib. Learn. Arts/Hum. 2	Liberal Learning	1
	SED498 (Sec. Ed. req.)	Teaching capstone	1	*any SCI xxx (Spec. opt. 3)	Science Option	1
				*elective	free elective	1
				*elective	free elective	1