Information and Planning Handbook for Students Pursuing Biology, Grades 9-Adult; Chemistry, Grades 9-Adult; or General Science, Grades 5-Adult Teaching Specialization

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Introduction

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Students seeking admission, retention, and certification in the Teacher Education Program at Shepherd University must assume personal responsibility for knowing and fulfilling all the requirements upon which their successful participation is dependent. These requirements include adherence to University-wide policies and procedures as well as those specific to the degree program. For the BA degree, the three components of Teacher Education are:

1) University Core Curriculum
2) Professional Education
3) Specialty Studies

For the MAT, the components are:

1) Professional Education
2) Specialty Studies

The secondary education student seeking a specialization in one or more of the natural science fields must expect immersion in curricula which demand commitment to personal and professional development of the highest caliber. The Shepherd University Teacher Education Program is designed to ensure that the student who successfully completes it possesses the knowledge bases, skills, and attitudes requisite for thoughtfully and effectively confronting the tasks of and problems inherent in teaching.

This guide is to acquaint the prospective middle school or high school science teacher with the objectives and requirements of the Teacher Education Program with an emphasis on the science education specializations (Biology, Grades 9-Adult; Chemistry, Grades 9-Adult; and General Science, Grades 5-Adult). It will provide information about procedural matters related to entering, progressing through, and completing a program. Information is also included to assist the student in planning a program of study and in maintaining a record of progress.

No claim is made for the completeness of this information and this resource is not intended to be a substitute for the Shepherd University Catalog; indeed, the first recommendation offered here is that the student carefully study the Shepherd University Catalog. Changes and updates to the Shepherd University Catalog affecting the Teacher Education Program are available through the Professional Education Unit Council (PEUC), the certification specialist, and/or the Natural Sciences Teaching Specializations Coordinator (NSTSC).

Definitions of Some of the Terms Used in This Handbook

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General Terms

Teacher Education Program (TEP) - The field of study which prepares a student to teach.

Secondary Education - Usually considered being teaching and learning as it occurs in grades 9-12.

Program Components and Grade Point Average Designations

Specialization, Teaching Specialization, Specialty (Studies), or Teaching Field – Specialty studies consists of the content courses, co-curricular components, and specialty science requirements relevant to professional studies components. Content courses required in the Biology, Grades 9-Adult program; or the Chemistry, Grades 9-Adult program; or the General Sciences, Grades 5-Adult program as listed in the Shepherd University Catalog or its supplement and this handbook.

Professional Studies - Courses beginning with the EDUC prefix required for certification and referred to as the Secondary Education Core in the Shepherd University Catalog or its supplement, and this handbook.

Core Curriculum - The core of courses required by Shepherd University for any baccalaureate degree and referred to as the Core Curriculum in the Shepherd University Catalog or its supplement, and this handbook.

Educational Studies - The specialization courses and the professional education courses combined.

Overall – All of the courses taken for credit toward graduation. This includes Professional Studies, Core Curriculum and Electives used to fulfill certification requirements for specializations and admissions requirements for the MAT degree.

Organizational Units and Positions

Education Preparation Program (EPP) - A body composed of the Director of Teacher Education / Department of Education Chair, all Department of Education faculty, all Specialization Coordinators, and all faculty (both full time and part time) who teach required courses specifically designed for the Teacher Education Program.

Education Program Preparation Council (EPPC) - The policy-making body in the PEU, consisting of the Director of Teacher Education/Department of Education Chair, all Department of Education faculty, all Specialization Coordinators, and two student representatives.

Natural Sciences Teaching Specializations Coordinator (NSTSC) - The person appointed by the Dean of the School of Natural Sciences and Mathematics to advise students majoring in secondary education with
teaching one or more specializations in the natural sciences.

Director of Teacher Education (DTE) - The chief administrator of the TEP. One of the members of the EPP and PEUC.

College of Natural Sciences and Mathematics (CNSM) - One of the four academic schools of the University. The School that has the Biology, Grades 9-Adult; Chemistry, Grades 9-Adult; and General Science, Grades 5-Adult teaching specializations.

Department of Education - The academic department within the School of Education and Professional Studies responsible for specializations in Elementary Education and Early Childhood Education, and for teaching most of the Professional Education (EDUC) courses.

Specializations

The following Secondary Science specializations are offered for both baccalaureate BA and graduate MAT degrees:

Biology Education, Grades 9-Adult

Chemistry Education, Grades 9-Adult

General Science Education, Grades 5 – 9

Students who wish to complete the content for multiple specializations must choose one specialization for their degree and complete additional specializations as endorsements.

Special accommodations for portfolios and resource units as well as for student teaching must be made for students seeking endorsements. Arrangements need to be made with the Director of Teacher Education, the certification specialist, the placement coordinator, and the Natural Sciences Teaching Specializations Coordinator (NSTSC).

Characterization of and Goals of the Science Education Programs of Shepherd University

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Because the teaching profession is quite demanding, the teacher preparation programs in the natural sciences at Shepherd University are quite rigorous and admission to the University does not confer admission to the teacher education program or permission to pursue a science education course of study. Admission to the teacher education program and permission to pursue a science education specialization, privilege to continue such (retention), and admission to student teaching are achieved only by satisfactory progression through a set of courses, exams, co-curricular assignments, and faculty evaluations. Progress is monitored via a screening process, the Juncture Review system for undergraduate and the retention system for graduate degree programs.

Goals of the Science Education Programs

• In recognition of the need to provide prospective science teachers a program of study wherein science content courses, pedagogy courses, and clinical experiences are connected and integrated, the Secondary Science Education Program adopts, and endorses the theme, objectives, and program goals and learner outcomes of the Shepherd University Teacher Education Program.

• In recognition of the critical importance of science content, and the validity of the constructivist approach to learning it, the Secondary Science Education Program shall provide prospective secondary school science teachers coursework and other experiences that:

1. Involve them in actively investigating natural phenomena and allow them to construct conceptual schemes that are consistent with currently accepted scientific understanding

2. Address issues, events, problems, and topics of current significance in science that are of importance and interest to the community at large

3. Introduce them to and involve them in the use of research literature, media, and technological resources that expand their science knowledge base and their ability to access further information

4. Build on their current science knowledge base, skills, and attitudes

5. Incorporate ongoing reflection on the process and outcomes of the scientific enterprise

6. Encourage and support collaborative work in and out of the science classroom and laboratory.

• In acknowledgment of the necessity to integrate the knowledge base in science with the knowledge bases in pedagogy, learning, and student development, the secondary science education program shall provide prospective secondary school science teachers coursework and other experiences that

1. Promote the integration of all pertinent aspects of science and science education;

2. Occur in a variety of places (e.g., science labs, computer labs, field sites of various sorts, and schools) that are appropriate environments for effective science teaching/learning because they

provide real situations where professors and teacher candidates can inquire, investigate, and expand their knowledge and skills.

3. Use inquiry, reflection, interpretation of research, and guided practice to build understanding and skill in science teaching.

• In recognition of how essential lifelong learning is, the Secondary Science Education Program shall provide prospective secondary school science teachers coursework and other experiences that

1. Provide regular, frequent opportunities for individual and collegial examination and reflection on
teaching/learning practices.

2. Provide systematic opportunities for the teacher candidates to receive feedback about:
– their preparation to teach in their discipline,
– choices they make in respect to portfolio and resource unit inclusions,
– course choices, co-curricular choices, etc.,
– the various interactions they have with students prior to teaching,
– their teaching, and to use that feedback in a commitment to excellence.

3. Support the sharing of teacher/learner experiences through participation in seminars and other such forums.

4. Provide access to and opportunities for teacher candidates to use current research and experiential knowledge in formal and informal ways; and

5. Foster a familiarity with current research in the science specialty and in education, especially in the areas of pedagogy and curriculum.

• In recognition of Shepherd University's mission as a state supported university to educate teachers who can function effectively within the public schools of the State of West Virginia, the instructional goals and objectives of the current West Virginia Science Curriculum Framework, which are:

1. To develop an understanding of the nature of science.

2. To cultivate scientific attitudes and values, to develop an understanding of the limits of science, and to evaluate scientific advances and technological applications as they impact science.

3. To develop thinking skills and processes for investigating the world, solving problems, and making decisions.

4. To acquire skills for learning through concrete manipulations of the tools and materials of science.

5. To demonstrate the interconnectedness of the fields of science by emphasizing the themes of systems, change, and models throughout the curriculum, and establishing connections with other discipline areas and daily life experiences.

• It shall be made known to prospective science teachers, and the Secondary Science Education Program shall provide prospective secondary school science teachers coursework and other experiences that

1. Allow them to plan and develop activities that guide and facilitate student learning of science content by actively involving them in the processes of discovery and inquiry, and encourage curiosity, chance-taking, and hypothesis formation inside and outside of the classroom/laboratory;

2. Give them opportunities to select science content and adapt and design learning activities to meet the interests, understanding, abilities, experience, and special needs of their students, and immerse
them in activities that will allow them to more fully appreciate the fact that scientific concepts can be described mathematically, and that computers can greatly facilitate this essential task;

3. Provide them opportunities to select and develop teaching and assessment strategies that support the development of student understanding and nurture a community of science learners by promoting individual and cooperative problem solving;

4. Allow them to select and develop teaching strategies which will give their students accurate understanding of the nature of science (its open-endedness, its limitations, its goals, etc.), and help them develop positive attitudes toward the scientific enterprise;

5. Provide them opportunities to select and develop teaching and assessment strategies that promote the development of an understanding of the mien history has on current science, and encourages students to recognize, appreciate, and use conceptual themes that are common to all of the natural sciences;

6. Provide them opportunities and reasons to develop critical thinking skills and engage in reflective problem-solving as science students and as science teacher candidates;

7. inculcate in teacher candidates a genuine concern for safety in all science teaching environments (field, laboratory, etc.);

8. Encourage them to critically examine and evaluate and to select and develop instructional activities that will get their students to critically examine and evaluate scientific and technological products, and consider how these products may impact society.

First-year teachers will not be effective unless they have previously conducted serious inquiry into life in the classroom. Only when that inquiry is completed and a tentative philosophy of education is formed should the traditional tasks confronting the first-year teacher be undertaken.

The Role of the Natural Sciences Teaching Specializations Coordinator (NSTSC)

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Secondary Education Majors with specializations in the natural sciences are strongly encouraged to be advised by the NSTSC, however students may select any faculty advisor within their teaching specialization. Graduate students are assigned the graduate advisor for the MAT. Advisors help the student map out his/her program of studies, assist the student in choosing a second teaching specialization (if needed or desired), offer guidance as needed, identify upcoming obstacles that must be overcome, and assist in evaluating the student as he/she seeks admission into and progresses through the program. The NSTSC oversees progress through curricular and co-curricular requirements for both graduate and undergraduate programs. Thus, all teacher education students will need to consult with the NSTSC to be sure they complete and document all curricular and co-curricular requirements for student teaching and for certification. The NSTSC maintains files concerning curricular and co-curricular requirements for each catalog year and cohort year as well as files concerning student progress through these requirements. A reminder: Although the NSTSC and/or other academic advisors make a sincere effort to advise the student, the final responsibility for admission into, progression through, and completion of programs rests with the student.

Any applicant for admission to Shepherd University who has attended another institution of collegiate rank will be classified as a transfer student, whether or not credit was earned. The University does not, under any condition, disregard college or university courses taken or credits earned elsewhere. Transfer students and graduate MAT candidates must report previous and current enrollments at all other colleges and universities and have official transcripts sent to Shepherd University. The Registrar's office (undergraduate) and the Graduate office (MAT) will initiate a process to determine which courses being transferred will be accepted as substitutes for required courses in the Core Curriculum, Natural Science Specialization, and Professional Studies curricula. Where appropriate, the NSTSC further evaluates transcripts and approves course substitutions for specialty studies following curricular requirements set forth for science teacher education by the National Science Teachers Association (NSTA), the Council for the Accreditation of Educator Preparation (CAEP), and the WV Department of Education (WVDOE). Students may consult with the NSTSC concerning transfer credits or graduate admission requirements for specialty content courses.

The Undergraduate Curricula

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UNDERGRADUATE CURRICULAR NOTES

A person who wishes to pursue an undergraduate major in Secondary Education with one or more natural science specializations should work with the NSTSC to map out a strategy to follow in taking the courses since courses are offered on a rotational basis. Some courses have pre-requisites and/or permissions which can be addressed with the NSTSC.

One should be able to complete these programs with eight semesters of study if one has the prerequisite skills and knowledge base to allow ordinary progression through the program, and carries 16 - 18 semester hours per semester. Sample program progressions for all science teaching fields are given below.

SAT, ACT, and/or Accuplacer scores are used to place students into appropriate level MATH courses. In these cases, students must obtain an override for the course based on the test score – if such overrides cannot be obtained, students must take all MATH pre-requisites for all courses. Students must complete pre-requisite MATH courses if their test scores do not place them at the level of the requisite MATH courses for the program.

CHEM 207, 207L and 209, 209L assume a level of MATH roughly equivalent to completion of MATH 105 College Algebra.

Junior or Senior status is required to register for 300-level courses and higher. Overrides must often be obtained for 300-level and higher courses. Overrides must usually be obtained for classes designated as "science majors only"– since teacher education students are education majors.

Some pre-requisite overrides may be possible for some electives depending on the course and the students' background.

Course substitutions may be possible for some content courses, depending on the course and the students' background. Students are very strongly encouraged to complete the exact courses in the curriculum; however, students may (at the discretion of the appropriate Department & the NSTSC) substitute other courses.

Biology Education

Secondary Science Education – Biology, Grades 9 - Adult

Name: **Date:**

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Checklist of Courses - Biology, Grades 9-Adult

Subj No.	Title	Hours	Grade	GPA
Education Courses				
EDUC 150	Seminar in Education	1	_____	
EDUC 200	Foundations of Education	3	_____	
EDUC 320	Psych. & Soc. Cond. of Learn.	4	_____	
EDUC 360	Survey Except. Children	3	_____	
EDUC 370	Creating Learning Environ.	4	_____	
EDUC 380	Tech. in 21st Century	3	_____	
EDUC 400	Inclusion in Reg. Class.	3	_____	
EDUC 423	Sp. Mthds. Teach. Science	3	_____	
EDUC 443	Reading in Content Areas	3	_____	
EDUC 456	Student Teaching 5-12	9	_____	_____ EDUC
Specialty Content Courses				
BIOL 211	Fund. Biology I: Cell & Mcl	4	_____	
BIOL 212	Fund. Biology II: Organismal	4	_____	
GSCI 301	Physical Geology	4	_____	
PHYS 201	College Physics I	3	_____	
PHYS 201L	College Physics I Lab	1	_____	
PHYS 202	College Physics II	3	_____	
PHYS 202L	College Physics II Lab	1	_____	
MATH 314	Statistics	3	_____	
BIOL 225	Human Anatomy & Physiology	3	_____	
BIOL 226	Human Anatomy & Physiology	3	_____	
BIOL 302	Microbiology	4	_____	
BIOL 305	Cell Biology	4	_____	
BIOL 344	Genetics & Evolution	4	_____	
BIOL 425	Principles of Biol. Research	3-4	_____	
BIOL 303	General Ecology	4	_____	
CHEM 207	General Chemistry	3	_____	
CHEM 207L	General Chemistry Lab	1	_____	
CHEM 209	General Chemistry	3	_____	
CHEM 209L	General Chemistry Lab	1	_____	
MATH 205	Calculus w/ Applications	4	_____	_____CONTENT
Remaining Core Curriculum requirements:				
Wellness	GSPE, FACS, or NURS	3	_____	
ENGL 101	Written English I	3	_____	
ENGL 102	Written English II	3	_____	
XXX xxx	Arts Core Curriculum (AR)	3	_____	
(ART 103 recc)	_____		_____	
COMM 202	Fundamentals of Speech	3	_____	
XXX xxx	Humanities Core Curr (HM*)	3	_____	
Course: _____			_____	
HIST 1xx	History Core Curriculum	3	_____	
XXX xxx	Social Science Core Curr (SO*)	3	_____	
SOC 203 or PSYC 101 recc _____			_____	_____ OVERALL GPA

***** Must have at least one CK designation among these core curricular courses

MD, CK, GL requirement _____

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BIOLOGY EDUCATION 9 – ADULT Four-year Progression

Secondary Education, Biology

FALL		**FIRST YEAR**			**SPRING**		**FIRST YEAR**	
Sub./Course No.	**Tier**	**Title**	**Credit**		**Sub./Course No.**	**Tier**	**Title**	**Credit**
BIOL 211		Fundamentals I: Molecular/Cellular Function	4		BIOL 212		Fundamentals II: Diversity of Life	4
CHEM 207/207L	1	General Chemistry/Lab I (LS[1])	4		CHEM 209/209L	1	General Chemistry/Lab II (LS[1])	4
ENGL 101	1	Writing-Rhetoric I (CC[2])	3		ENGL 102	1	Writing-Rhetoric II (CC[2])	3
COMM 202	2	Fundamentals of Speech (HM[6]-GL)	3		MATH 314		Statistics (MA)	3
EDUC 150	1	Seminar in Education (FY[4])	1		HIST 1xx	1	Choose History with advisor (CC)	3
		TOTAL	**15**				**TOTAL**	**17**
FALL		**SECOND YEAR**			**SPRING**		**SECOND YEAR**	
Sub./Course No.	**Tier**	**Title**	**Credit**		**Sub./Course No.**	**Tier**		**Credit**
BIOL 303		General Ecology	4		BIOL 305		Cell Biology	4
BIOL 225		Human Anatomy and Physiology I	3		BIOL 226		Human Anatomy and Physiology II	3
EDUC 200		Foundations of American Education (SO[8]-MD)	3		Core-Arts (AR[5])	2	Choose CK, GL, or MD with advisor (CC[5])	3
MATH 205	1	Calculus with Applications (MA[3])	4		Core-Humanities (HM[6])	2	Choose CK, GL, or MD with advisor (CC[6])	3
Core-Wellness (WE[7])	2	Choose Wellness with advisor (CC)	3		EDUC 320 Core-Social Sciences (SO[8])	2	Social and Psychological Conditions of Learning SO[8]-MD	3
		TOTAL	**17**				**TOTAL**	**16**

FALL		**THIRD YEAR**			**SPRING**		**THIRD YEAR**	
Sub./Course No.	**Tier**	**Title**	**Credit**		**Sub./Course No.**	**Tier**	**Title**	**Credit**
BIOL 344		Genetics	4		BIOL 302		Microbiology	4
GSCI 301		Physical Geology	4		Core-Social Sciences (SO)	2	Choose CK, GL, or MD with advisor (CC)	3
PHYS 201/201L		College Physics I/Lab	4		PHYS 202/202L		College Physics II/Lab	4
EDUC 360 (SO-MD)	2	Survey of Exceptional Children (CC[6])	3		EDUC 370		Creating Learning Environments	4
		TOTAL	**15**				**TOTAL**	**15**
FALL		**FOURTH YEAR**			**SPRING**		**FOURTH YEAR**	
Sub./Course No.	**Tier**	**Title**	**Credit**		**Sub./Course No.**	**Tier**	**Title**	**Credit**
BIOL 425		Principles and Practice of Research OR	4		EDUC 400		Inclusion in the Regular Classroom	3
BIOL 350		Principles and Practice of Research for Teachers	3		EDUC 457		Student Teaching, Grades 9-12 (CP and WM[9])	9
EDUC 380		Technology in 21st Century Teaching and Learning	3					
EDUC 423		Special Methods of Teaching Science	3					
EDUC 443		Reading in the Content Area	3				**TOTAL**	**12**
		TOTAL	**13-14**					
August, 2017							**DEGREE TOTAL**	**120**

NOTES: *The prerequisite for MATH 205 is competence equivalent to successful completion of MATH 108 and the prerequisite for MATH 314 is competence equivalent to successful completion of MATH 105.

[1] CC Life Science; [2] Core Curriculum; [3] CC Math; [4] CC First-Year Experience; [5] CC Arts; [6] CC Humanities; [7] CC Wellness; [8] CC Social Sciences; [9] Serves as both the Writing in the Major and Capstone requirements.

Secondary Science Education – Chemistry, Grades 9 - Adult

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Name: **Date:**

Subj No.	Title	Hours	Grade	GPA
Education Courses				
EDUC 150	Seminar in Education	1	_____	
EDUC 200	Foundations of Education	3	_____	
EDUC 320	Psych. & Soc. Cond. of Learn.	4	_____	
EDUC 360	Survey Except. Children	3	_____	
EDUC 370	Creating Learning Environ.	4	_____	
EDUC 380	Tech. in 21st Century	3	_____	
EDUC 400	Inclusion in Reg. Class.	3	_____	
EDUC 423	Sp. Mthds. Teach. Science	3	_____	
EDUC 443	Reading in Content Areas	3	_____	
EDUC 456	Student Teaching 5-12	9	_____	
			_____	EDUC
Content Courses				
BIOL 211	Fund. Biology I: Cell & Mcl	4	_____	
BIOL 212	Fund. Biology II: Organismal	4	_____	
GSCI 301	Physical Geology	4	_____	
PHYS 201	College Physics I	3	_____	
PHYS 201L	College Physics I Lab	1	_____	
PHYS 202	College Physics II	3	_____	
PHYS 202L	College Physics II Lab	1	_____	
MATH 205	Calculus w/ Applications	4	_____	
CHEM 315	Organic Chemistry I	3	_____	
CHEM 315L	Organic Chemistry Lab I	1	_____	
CHEM 316	Organic Chemistry II	3	_____	
CHEM 316L	Organic Chemistry Lab II	1	_____	
CHEM 321	Analytical Chemistry	3	_____	
CHEM 321L	Analytical Chemistry Lab	1	_____	
CHEM 340	Physical Chemistry I	3	_____	
CHEM 340L	Physical Chemistry I Lab	1	_____	
CHEM 329	Biochemistry I	3	_____	
CHEM 330	Biochemistry II	3	_____	
CHEM (Elective) _____		3(4)	_____	
CHEM 207	General Chemistry	3	_____	
CHEM 207L	General Chemistry Lab	1	_____	
CHEM 209	General Chemistry	3	_____	
CHEM 209L	General Chemistry Lab	1	_____	
MATH 314	Statistics	3	_____	
			_____	CONTENT
Remaining Core Curriculum Requirements				
Wellness	GSPE, FACS, or NURS	3	_____	
ENGL 101	Written English I	3	_____	
ENGL 102	Written English II	3	_____	
XXX xxx	Arts Core Curriculum (AR)	3	_____	
(ART 103 recc)	_____		_____	
COMM 202	Fundamentals of Speech	3	_____	
XXX xxx	Humanities Core Curr (HM*) _____	3	_____	
HIST 1xx	History Core Curriculum	3	_____	
XXX xxx	Social Science Core Curr (SO*)	3	_____	
SOC 203 or PSYC 101 recc	_____		_____	
			_____	OVERALL GPA

***** Must have at least one CK designation among these core curricular courses

MD, CK, GL requirement _____

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CHEMISTRY EDUCATION 9 – ADULT Four-year Progression

Secondary Education, Chemistry							
FALL		**FIRST YEAR**		**SPRING**		**FIRST YEAR**	
Sub./Course No.	**Tier**	**Title**	**Credit**	**Sub./Course No.**	**Tier**	**Title**	**Credit**
BIOL 211		Fundamentals I: Molecular/Cellular Function	4	BIOL 212		Fundamentals II: Diversity of Life	4
CHEM 207/207L	1	General Chemistry/Lab I (LS[1])	4	CHEM 209/209L	1	General Chemistry/Lab II (LS[1])	4
ENGL 101	1	Writing-Rhetoric I (CC[2])	3	ENGL 102	1	Writing-Rhetoric II (CC[2])	3
COMM 202	2	Fundamentals of Speech (HM[6]-GL)	3	MATH 314		Statistics (MA)	3
EDUC 150	1	Seminar in Education (FY[4])	1	HIST 1xx	1	Choose History with advisor (CC)	3
		TOTAL	**15**			**TOTAL**	**17**
FALL		**SECOND YEAR**		**SPRING**		**SECOND YEAR**	
Sub./Course No.	**Tier**	**Title**	**Credit**	**Sub./Course No.**	**Tier**		**Credit**
CHEM 315/CHEM 315L		Organic Chemistry I and Lab	4	CHEM 316/CHEM316L		Organic Chemistry II and Lab	4
CHEM 340/ CHEM 340L		Physical Chemistry I and Lab	4	Core-Wellness (WE[7])	2	Choose Wellness with advisor (CC)	3
EDUC 200		Foundations of American Education (SO[8]-MD)	3	Core-Arts (AR[5])	2	Choose CK, GL, or MD with advisor (CC[5])	3
MATH 205	1	Calculus with Applications (MA[3])	4	Core-Humanities (HM[6])	2	Choose CK, GL, or MD with advisor (CC[6])	3
		TOTAL	**15**	EDUC 320 Core-Social Sciences (SO[8])	2	Social and Psychological Conditions of Learning SO[8]-MD	3
						TOTAL	**16**

FALL		THIRD YEAR			SPRING		THIRD YEAR	
Sub./Course No.	**Tier**	**Title**	**Credit**		**Sub./Course No.**	**Tier**	**Title**	**Credit**
CHEM 329		Biochemistry I	3		CHEM 330		Biochemistry II	3
GSCI 301		Physical Geology	4		CHEM Elective		Chemistry Elective	3-4
PHYS 201/201L		College Physics I/Lab	4		PHYS 202/202L		College Physics II/Lab	4
EDUC 360 (SO-MD)	2	Survey of Exceptional Children (CC[6])	3		EDUC 370		Creating Learning Environments	4
Core-Social Sciences (SO)	2	Choose CK, GL, or MD with advisor (CC)	3					
		TOTAL	**17**				**TOTAL**	**15-16**
FALL		**FOURTH YEAR**			**SPRING**		**FOURTH YEAR**	
Sub./Course No.	**Tier**	**Title**	**Credit**		**Sub./Course No.**	**Tier**	**Title**	**Credit**
CHEM 321/321L		Analytical Chemistry with Lab	4		EDUC 400		Inclusion in the Regular Classroom	3
EDUC 380		Technology in 21st Century Teaching and Learning	3		EDUC 457		Student Teaching, Grades 9-12 (CP and WM[9])	9
EDUC 423		Special Methods of Teaching Science	3					
EDUC 443		Reading in the Content Area	3					
		TOTAL	**13**				**TOTAL**	**12**
August, 2017							**DEGREE TOTAL**	**120**

NOTES: *The prerequisite for MATH 205 is competence equivalent to successful completion of MATH 108 and the prerequisite for MATH 314 is competence equivalent to successful completion of MATH 105.

[1] CC Life Science; [2] Core Curriculum; [3] CC Math; [4] CC First-Year Experience; [5] CC Arts; [6] CC Humanities; [7] CC Wellness; [8] CC Social Sciences; [9] Serves as both the Writing in the Major and Capstone requirements.

Secondary Science Education – General Science, Grades 5 - Adult

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Name: **Date:**

Checklist of Courses – General Science, Grades 9-Adult

Subj No.	Title	Hours	Grade	GPA
Education Courses				
EDUC 150	Seminar in Education	1	_____	
EDUC 200	Foundations of Education	3	_____	
EDUC 320	Psych. & Soc. Cond. of Learn.	4	_____	
EDUC 360	Survey Except. Children	3	_____	
EDUC 370	Creating Learning Environ.	4	_____	
EDUC 380	Tech. in 21st Century	3	_____	
EDUC 400	Inclusion in Reg. Class.	3	_____	
EDUC 423	Sp. Mthds. Teach. Science	3	_____	
EDUC 443	Reading in Content Areas	3	_____	
EDUC 456	Student Teaching 5-12	9	_____	_____ EDUC
Content Courses				
CHEM 207	General Chemistry	3	_____	
CHEM 207L	General Chemistry Lab	1	_____	
CHEM 209	General Chemistry	3	_____	
CHEM 209L	General Chemistry Lab	1	_____	
GSCI 301	Physical Geology	4	_____	
PHYS 201	College Physics I	3	_____	
PHYS 201L	College Physics I Lab	1	_____	
PHYS 202	College Physics II	3	_____	
PHYS 202L	College Physics II Lab	1	_____	
MATH 205	Calculus w/ Applications	4	_____	
BIOL 225	Human Anatomy & Physiology	3	_____	
BIOL 226	Human Anatomy & Physiology	3	_____	
GSCI 302	General Astronomy	4	_____	
GSCI 303	Meteorology	4	_____	
BIOL 211	Fund. Biology I: Cell & Mcl	4	_____	
BIOL 212	Fund. Biology II: Organismal	4	_____	
MATH 314	Statistics	4	_____	
BIOL (Elective) _____		3-4	_____	
CHEM(Elective) _____		3-4	_____	
GSCI(Elective) _____		3-4	_____	_____ CONTENT
Remaining Core Curriculum requirements:				
Wellness	GSPE, FACS, or NURS	3	_____	
ENGL 101	Written English I	3	_____	
ENGL 102	Written English II	3	_____	
XXX xxx	Arts Core Curriculum (AR)	3		
(ART 103 recc)	_____		_____	
COMM 202	Fundamentals of Speech	3	_____	
XXX xxx	Humanities Core Curr (HM*)	3		
Course: _____			_____	
HIST 1xx	History Core Curriculum	3	_____	
XXX xxx	Social Science Core Curr (SO*)	3		
SOC 203 or PSYC 101 recc _____			_____	_____
				OVERALL GPA

***** Must have at least one CK designation among these core curricular courses

MD, CK, GL requirement _____

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GENERAL SCIENCE EDUCATION, Grades 5 – Adult, Four-year Progression

Secondary Education, General Science

FALL		FIRST YEAR		SPRING		FIRST YEAR	
Sub./Course No.	**Tier**	**Title**	**Credit**	**Sub./Course No.**	**Tier**	**Title**	**Credit**
BIOL 211		Fundamentals I: Molecular/Cellular Function (LS[1])	4	BIOL 212		Fundamentals II: Diversity of Life (LS[1])	4
CHEM 207/207L	1	General Chemistry/Lab I	4	CHEM 209/209L	1	General Chemistry/Lab II	4
ENGL 101	1	Writing-Rhetoric I (CC[2])	3	ENGL 102	1	Writing-Rhetoric II (CC[2])	3
COMM 202	2	Fundamentals of Speech (HM[6]-GL)	3	MATH 314		Statistics (MA)	3
EDUC 150	1	Seminar in Education (FY[4])	1	HIST 1xx	1	Choose History with advisor (CC)	3
		TOTAL	**15**			**TOTAL**	**17**

FALL		SECOND YEAR		SPRING		SECOND YEAR	
Sub./Course No.	**Tier**	**Title**	**Credit**	**Sub./Course No.**	**Tier**		**Credit**
GSCI 301		Physical Geology	4	Science Elective		Choose Science Elective and Lab (upper level) with advisor	4
BIOL 225		Human Anatomy and Physiology I	3	BIOL 226		Human Anatomy and Physiology II	3
EDUC 200		Foundations of American Education (SO[8]-MD)	3	Core-Arts (AR[5])	2	Choose CK, GL, or MD with advisor (CC[5])	3
MATH 205	1	Calculus with Applications (MA[3])	4	Core-Wellness (WE[7])	2	Choose Wellness with advisor (CC)	3
Core-Humanities (HM[6])	2	Choose CK, GL, or MD with advisor (CC[6])	3	EDUC 320 Core-Social Sciences (SO[8])	2	Social and Psychological Conditions of Learning SO[8]-MD	3
		TOTAL	**17**			**TOTAL**	**16**

FALL		THIRD YEAR		SPRING		THIRD YEAR	
Sub./Course No.	**Tier**	**Title**	**Credit**	**Sub./Course No.**	**Tier**	**Title**	**Credit**
GSCI 303		Meteorology	4	GSCI 302		General Astronomy	4
Science Elective		Choose Science Elective (upper level) with advisor	3-4	Core-Social Sciences (SO)	2	Choose CK, GL, or MD with advisor (CC)	3
PHYS 201/201L		College Physics I/Lab	4	PHYS 202/202L		College Physics II/Lab	4
EDUC 360 (SO-MD)	2	Survey of Exceptional Children (CC[6])	3	EDUC 370		Creating Learning Environments	4
		TOTAL	**14-15**			**TOTAL**	**15**
FALL		**FOURTH YEAR**		**SPRING**		**FOURTH YEAR**	
Sub./Course No.	**Tier**	**Title**	**Credit**	**Sub./Course No.**	**Tier**	**Title**	**Credit**
Science Elective		Choose Science Elective and Lab (upper level) with advisor	4	EDUC 400		Inclusion in the Regular Classroom	3
EDUC 380		Technology in 21st Century Teaching and Learning	3	EDUC 457		Student Teaching, Grades 9-12 (CP and WM[9])	9
EDUC 423		Special Methods of Teaching Science	3				
EDUC 443		Reading in the Content Area	3				
		TOTAL	**13**			**TOTAL**	**12**
August, 2017						**DEGREE TOTAL**	**120**

NOTES: *The prerequisite for MATH 205 is competence equivalent to successful completion of MATH 108 and the prerequisite for MATH 314 is competence equivalent to successful completion of MATH 105.

[1] CC Life Science; [2] Core Curriculum; [3] CC Math; [4] CC First-Year Experience; [5] CC Arts; [6] CC Humanities; [7] CC Wellness; [8] CC Social Sciences; [9] Serves as both the Writing in the Major and Capstone requirements.

The Graduate Curricula

Graduate students must complete specialty studies courses or their equivalents, as determined by the NSTSC, as part of admission to the graduate program. Whenever possible, graduate students should enroll in the graduate level Special Methods of teaching science course (3). Many graduate courses are only offered on an as-needed basis. Graduate students are encouraged to consult with the NSTSC for possible graduate science courses.

Currently approved graduate level content courses include:

BIOL 501 - Evolution
BIOL 507 - Genomics and Bioinformatics
GSCI 543 - Environmental Chemistry
GSCI 599 - Special Topics: General Science
GSCI 699 - Special Topics: General Science
GSCI 540 - Principles of Scientific Investigation
GSCI 541 - Historical Geology
GSCI 542 - General Astronomy

Core courses, 27 Hours:

- EDUC 500 - Advancing the Use of Technology in the Classroom **(3 cr)**
- EDUC 503 - Reading in the Content Area **(3 cr)**
- EDUC 527 - Inclusion Seminar **(3cr)**
- EDUC 560 - Survey of Exceptionalities **(3 cr)**
- EDUC 581 - Social Foundations of American Education **(3 cr)**
- EDUC 582 - Learning in Contexts **(3 cr)**
- EDUC 583 - Planning, Conducting, and Assessing Instruction **(3 cr)**
- EDUC 584 - Classroom Ecology **(3 cr)**
- EDUC 585 - Content Pedagogy **(3 cr)** OR
- Any graduate level Special Methods course (3)

Electives (choose from the following list), 6 Hours:

- EDUC 520 - Conceptual Development for Integrating Language Arts and Social Studies **(3 cr)**
- EDUC 521 - Conceptual Development of Integrating Mathematics and Science **(3 cr)**
- Any approved graduate level course in candidate's content area (3-9)

The Co-Curricular Requirements

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Co-curricular requirements include activities or achievements the student must display, many of which occur outside of coursework. Some of the co-curricular requirements described here are also parts of coursework. In some cases, students may be given instructions or rubrics as a part of a course that are different to those given here. Students should pay strict attention to their coursework instructions to fulfill curricular requirements for their courses. However, many of the co-curricular requirements overlap significantly with course requirements and students are expected to be able to utilize the coursework assignments, in as much as it is possible, for some of the co-curricular assignments – yet some additions and/or changes may be required to fulfill the co-curricular requirements. Passing or meeting standards for an assignment as part of a course assignment does not guarantee the same assignment will meet standards when submitted as part of the co-curricular requirements. Co-curricular requirements and their rubrics may change to meet changes in standards for pre-service teachers as part of accreditation processes or curriculum revisions. Students should check with the NSTSC concerning changes or revisions to co-curricular requirements when applying for Juncture Review (1, 2, or 3), for retention, or for graduation in all degree programs to receive appropriate advising concerning meeting co-curricular requirements.

Science Education Portfolio Guidelines

(adapted from Kent State University's Science Education Portfolio)

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Your portfolio is a collection of documents that demonstrate to others that you have certain specific knowledge and abilities. Sometimes the material you use for your portfolio is a record of your performance when you successfully complete a teaching task. Sometimes it is a class paper/assignment showing that you have learned a particular concept or understand a particular issue. *Think of your portfolio as a set of materials especially assembled to showcase your work and your talents*. Your portfolio will include documents created in science courses and professional education courses.

Organizing Your Portfolio

A portfolio should be a collection that is easily stored, carried and shown. We suggest a three-ring binder; one with a zipper is probably best since you may sometimes want to carry "loose" items like a tape or a disk. Since most of the documents you will choose to display in your portfolio are one-of-a-kind original documents, you will need to protect them. The best way to do this is to purchase acetate sleeves which hold 8 ½ X 11 sheets of paper. If you include items that do not have obvious meanings, be sure to provide the reviewer with captions explaining the items.

You will also need dividers; one for each of the six sections listed below (the NSTA competencies for teacher preparation). In each section you should place a one-page reflective statement explaining the materials you chose to illustrate your skills for that section; this is followed by the materials themselves. You may make subsections within each section to better organize your portfolio. You will need at least 2-3 exemplars of your excellence per section – some sections may require more items to display your expertise.

Sections of the Portfolio

A) Front Material

- Cover page (Name, Semester, Juncture 1 or Juncture 2)
- Table of Contents
- Philosophy of Science Education (See guidelines)
- Transcript of all College coursework (unofficial)
- Resume

B) Science Teacher Competencies

For each section 1-6, include a reflective statement outlining the contents of the section (what you chose to include as evidence, and why you chose it) as well as your understanding of what that standard "looks like" in practice. A more detailed description of each of the categories can be found in the Science Specialization Manual.

C) Science Portfolio Categories:

1. Content Knowledge
2. Content Pedagogy
3. Learning Environments
4. Safety
5. Impact on Student Learning
6. Professional Knowledge & Skills

COURSES Used to Collect Artifacts: All Science Courses; All Education Courses (EDUC 150, 200, 360, 320, 370, 380, 423, 443)

***RELATED ASSIGNMENTS*:** Science Courses: labs, tests, reports, projects; Education Courses: assignments, tests, reports, projects, presentations, lesson plans, unit plans, philosophy statements, evaluations of your teaching, field assignments, journals, reflections.

Assessment of Portfolio

Your portfolio will be reviewed by the science specialization coordinator.

For the Undergraduate Juncture 1 review, candidates' portfolios must contain elements showing a sufficient level and quality for standards 1a and 1b as well as showing progress toward meeting standards for all others in order to receive a satisfactory review that allows the candidate to apply for admission to teacher education. Following Juncture 1, undergraduate candidates must continue to add to their portfolios for all standards, including standard 1a and 1b.

For Juncture 2 review, undergraduate candidates' portfolios must exhibit sufficient level and quality for standards 1, 2, 3, 4, and 6 as well as showing progress toward meeting standards for standard 5. Juncture 2 candidates must also include a sufficient Science Unit Plan and Safety Plan. If the candidate cannot demonstrate sufficient capabilities in all Portfolio standards 1,2,3,4 & 6 and all Unit plan and Safety plan standards, he/she will not be allowed to enter student teaching. For both the Juncture 1 and Juncture 2 review the portfolio must receive an acceptable rating for the Portfolio Layout element.

For graduate retention, students must display progress toward standards 1, 2, 3, 4, and 6. Graduate students must submit a complete Science Safety Module including a Safety Plan before beginning Student Teaching.

Science Portfolio Main Category Descriptions

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NSTA Standard 1: Content Knowledge
Effective teachers of science understand and articulate the knowledge and practices of contemporary science. They interrelate and interpret important concepts, ideas, and applications in their fields of licensure.

Preservice teachers will:

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.
1c) Show an understanding of state and national curriculum standards and their impact on the content knowledge necessary for teaching P-12 students.

NSTA Standard 2: Content Pedagogy

Effective teachers of science understand how students learn and develop scientific knowledge. Preservice teachers use scientific inquiry to develop this knowledge for all students.

Preservice teachers will:

2a) Plan multiple lessons using a variety of inquiry approaches that demonstrate their knowledge and understanding of how all students learn science.
2b) Include active inquiry lessons where students collect and interpret data in order to develop and communicate concepts and understand scientific processes, relationships and natural patterns from empirical experiences. Applications of science-specific technology are included in the lessons when appropriate.
2c) Design instruction and assessment strategies that confront and address naïve concepts/preconceptions.

NSTA Standard 3: Learning Environments

Effective teachers of science are able to plan for engaging all students in science learning by setting appropriate goals that are consistent with knowledge of how students learn science and are aligned with state and national standards. The plans reflect the nature and social context of science, inquiry, and appropriate safety considerations. Candidates design and select learning activities, instructional settings, and resources--including science-specific technology, to achieve those goals; and they plan fair and equitable assessment strategies to evaluate if the learning goals are met.

Preservice teachers will:

3a) Use a variety of strategies that demonstrate the candidates' knowledge and understanding of how to select the appropriate teaching and learning activities – including laboratory or field settings and applicable instruments and/or technology- to allow access so that all students learn. These strategies are inclusive and motivating for all students.
3b) Develop lesson plans that include active inquiry lessons where students collect and interpret data using applicable science-specific technology in order to develop concepts, understand scientific processes, relationships and natural patterns from empirical experiences. These plans provide for equitable achievement of science literacy for all students.

3c) Plan fair and equitable assessment strategies to analyze student learning and to evaluate if the learning goals are met. Assessment strategies are designed to continuously evaluate preconceptions and ideas that students hold and the understandings that students have formulated.
3d) Plan a learning environment and learning experiences for all students that demonstrate chemical safety, safety procedures, and the ethical treatment of living organisms within their licensure area.

NSTA Standard 4: Safety

Effective teachers of science can, in a P-12 classroom setting, demonstrate and maintain chemical safety, safety procedures, and the ethical treatment of living organisms needed in the P-12 science classroom appropriate to their area of licensure.

Preservice teachers will:

4a) Design activities in a P-12 classroom that demonstrate the safe and proper techniques for the preparation, storage, dispensing, supervision, and disposal of all materials used within their subject area science instruction.
4b) Design and demonstrate activities in a P-12 classroom that demonstrate an ability to implement emergency procedures and the maintenance of safety equipment, policies and procedures that comply with established state and/or national guidelines. Candidates ensure safe science activities appropriate for the abilities of all students.
4c) Design and demonstrate activities in a P-12 classroom that demonstrate ethical decision-making with respect to the treatment of all living organisms in and out of the classroom. They emphasize safe, humane, and ethical treatment of animals and comply with the legal restrictions on the collection, keeping, and use of living organisms.

NSTA Standard 5: Impact on Student Learning

Effective teachers of science provide evidence to show that P-12 students' understanding of major science concepts, principles, theories, and laws have changed as a result of instruction by the candidate and that student knowledge is at a level of understanding beyond memorization. Candidates provide evidence for the diversity of students they teach.

Preservice teachers will:

5a) Collect, organize, analyze, and reflect on diagnostic, formative and summative evidence of a change in mental functioning demonstrating that scientific knowledge is gained and/or corrected.
5b) Provide data to show that P-12 students are able to distinguish science from nonscience, understand the evolution and practice of science as a human endeavor, and critically analyze assertions made in the name of science.
5c) Engage students in developmentally appropriate inquiries that require them to develop concepts and relationships from their observations, data, and inferences in a scientific manner.

Standard 6: Professional Knowledge and Skills

Effective teachers of science strive continuously to improve their knowledge and understanding of the ever changing knowledge base of both content, and science pedagogy, including approaches for addressing inequities and inclusion for all students in science. They identify with and conduct themselves as part of the science education community. Preservice teachers will: 6a) Engage in professional development opportunities in their content field such as talks, symposiums, research opportunities, or projects within their community. 6b) Engage in professional development opportunities such as conferences, research opportunities, or projects within their community.

Science Education Portfolio Standards

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Progress toward meeting portfolio standards will vary depending on the students' standing (Juncture 1, 2, or 3) and their progress through the teacher education program. Unit Plans included within the portfolio

NSTA Standard 1: Content Knowledge can be met with elements from science courses, sample technical writing with figures/graphs, college transcripts, and some education courses. Include any standardized test scores (ACT/SAT, CORE, Praxis). Praxis content checklist and/or Science curriculum checklist should also be included for undergraduates. Grade distribution forms should be included for undergraduates.

NSTA Standard 2: Content Pedagogy is typically met with work toward Lessons plans and/or Unit plans, assignments from coursework, and journal articles about how science should be taught in the United States.

NSTA Standard 3: Learning Environments is typically met with work toward Lessons plans and/or Unit plans, assignments from coursework, documentation and/or reflections on classroom observations or field-work.

NSTA Standard 4: Safety is typically met with work toward Lessons plans and/or Unit plans and assignments from education courses – particularly EDUC 423. This includes a Safety Module and Safety Plan, typically constructed during EDUC 423 or the appropriate graduate special methods course.

NSTA Standard 5: Impact on Student Learning is typically met with work toward Lessons plans and/or Unit plans and a Teacher Work Sample, constructed during student teaching. Other items can include assignments from coursework, documentation and/or reflections on classroom observations or field-work.

Standard 6: Professional Knowledge and Skills is typically met with participation in an approved conference, workshop, internship, or scientific investigation – usually performed in association with EDUC 423 or the appropriate graduate special methods course. Students must obtain approval for their activities from the NSTSC and provide appropriate documentation.

Standard 7: Portfolio Layout The portfolio must be organized into sections and elements of the portfolio must be easily found. Reflections and/or comments must be clear.

Guidelines & Instructions for Writing your Personal Philosophy of Science Education

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This philosophy statement should be thoughtful and concise. Ideally, it will be a 1- to 2-page statement that summarizes your outlook on various aspects of science education. This philosophy statement should be placed at the beginning of your professional portfolio. You should expect that a principal or other potential employer would read your philosophy statement with some care.

Your philosophy statement should address the three topics outlined below. Many students find it useful to organize the philosophy statement into three paragraphs, one for each topic.

The Goals of Science Education

e.g. The Nature of Science; science content
Processes/Methods
Societal issues
Personal needs; careers
"Scientific Literacy"
This is your answer to the question, *What should students be learning in science class, and why?*

Science Teaching and Learning

e.g., Instructional Methods; Assessment; learning environment; Teacher-Student relationship
This section describes your answers to questions such as:
What is your teaching style?
How is it connected to your knowledge of student learning?
What is your philosophy of assessment?
What is your ideal learning community?

Professional Responsibilities

e.g., To students, parents, colleagues, school, community; to the profession; to yourself.
This section describes your answers to questions such as:
What is your role as a science teaching professional?
How do you hope to contribute to the community of secondary teachers and more specifically, science teachers?

Portfolio Assessment Form

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According to Policy and Procedures of the Shepherd University Teacher Education Program (TEP), students must have made satisfactory progress in portfolio development to obtain admission to the TEP at Juncture Review 1, and to be eligible for student teaching at Review Juncture 2. Portfolios are to be assessed by students' advisors on a periodic basis using the Portfolio Assessment Form, a facsimile of which appears below:

Portfolio Assessment Form

Student Name _____

Review Juncture 1 Date:_____

Satisfactory Progress_____ -OR- Needs Improvement_____

Review Juncture 2 Date:_____

Satisfactory Progress_____ -OR- Needs Improvement_____

Review Juncture 3 Date:_____

Satisfactory Progress_____ -OR- Needs Improvement_____

Comments:

If a portfolio needs improvement, the student must present the portfolio with this form (with comments) until satisfactory progress is achieved. Satisfactory progress must be made before the student can be considered for each Juncture Review.

Advisor Signature_____ Date_____

UNIT PLAN

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While enrolled in EDUC 423: Special Methods of Science, or the appropriate graduate special methods course, teacher education students must be concurrently enrolled in an education course which includes a field component. These courses require creating a 2 week unit of instruction geared toward a class in which they are completing their field placement. Student teachers must demonstrate their ability to plan a unit of instruction that is effective for all learners, which includes an in-depth knowledge of science content, science pedagogy, and assessment. The unit is built around a topic or theme that is appropriate to the field placement. The unit addresses NSES standards as well as applicable West Virginia Content Standards and Objectives.

Below is a facsimile of a Unit Plan assignment. For your science education portfolio, pay careful attention to section II. Topics to be covered in the unit.

Unit Plan Assignment

In this assignment, you will create a 10-day unit plan. You should arrange with your cooperating teacher to teach all or part of this unit (if possible) during the next several weeks.

I. Format

A. Unit Overview *(The following should be done just once for the entire unit.)*

- **Name:**
- **Intended Grade Level:**
- **Class (Earth Science, Biology, etc.):**
- **Unit:**
- **Topic:**
- **National Science Education Standards (NSES):**
  List:
  1. NSES Standard (Choose one of A-G, but be sure to copy & paste the entire statement).
  2. NSES Sub-Heading:
  3. NSES fundamental concept/principle:

  Note: a. It is OK to use more than one Standard, Sub-Heading, or fundamental concept/principle.
  b. It is OK to cross disciplinary boundaries, e. g. to use a “life science” standard in a “physical science” class.

- **West Virginia Content Standards and Objectives (Science):**

  List (again, copy & paste entire statements):
  1. Content Standard
  2. Objective
  3. Performance Descriptor

  Note: Keep in mind that “science and technology,” “scientific inquiry,” “scientific ways of knowing,” etc. are *intended* to cross disciplinary boundaries.)

- **Materials & Resources needed for the Entire Unit:**
  What lab or demonstration materials will be needed? Try to be complete. Be sure to include the "obvious" materials here: If you plan to use an overhead projector, write "overhead projector," "overhead sheets," "Vis-à-vis markers," etc.; if you plan to use the textbook, write "textbook." This should be a master list that you can use to prepare for an upcoming unit, so rather than having materials broken down by *day*, have them grouped by *type* (e.g., Chemicals from Stockroom; Consumables; Text Materials; Lab Equipment; Demonstration Apparatus; etc.).
- **Assessment:**
  How will you assess students' knowledge base at the beginning of the unit? How will you use this information to shape your instruction? At the conclusion of the unit, how will you determine whether or not your students achieved the NSES and West Virginia Content Standards and Objectives that you listed above? The Unit Plan must include assessment measures throughout that are tied to the learning objectives. Some assessment measures must also support students' self-reflection and self-evaluation.

B. Daily Lesson Plans (You will write one of these for each day for a total of 10.)

- **Instructional Objectives:**
  Be sure to stay focused – these should be tied to the Standards, but not written in the same way. Others should be able to spot the **a**udience (who?), **b**ehavior (what?), **c**ondition, and **d**egree in your objectives.
- **Period Plan:**
  Time Activity
  ___ min. ----------
  ___ min. ----------
  etc.
- **Materials & Resources needed for the Lesson:**
  What lab or demonstration materials will be needed? Try to be complete. Be sure to include the "obvious" materials here: If you plan to use an overhead projector, write "overhead projector," "overhead sheets," "Vis-à-vis markers," etc.; if you plan to use the textbook, write "textbook."
- **Assignment:**
  This is not required. Use an assignment only if you have an appropriate one in mind.

- **Diagnostic or Formative Assessment:**
  Concentrate on how you will know whether or not the students are "getting it" during the lesson, not how you will evaluate them at the end of the unit. This needs to be tied to your instructional objectives for the lesson. Some assessment measures must also support students' self-reflection and self-evaluation.

- **Safety Procedures:**
  You should consider safety issues for all learning tasks, including demos and labs, preparation and storage of materials, field trips and field study, use and care of living things. Your safety considerations will be assessed according to the standards outlined in the Safety Module scoring guide that are appropriate to the task.

II. Topics to be Covered in the Unit

As you consider the scope and sequence of the unit, and the details of your lessons, keep in mind the following requirements for your Unit Plan:

1. **Science content** must be accurate and grade-appropriate. The Unit Plan should indicate your understanding of students' likely conceptions regarding the topic(s) to be covered and supporting disciplines. Attention should also be given to NSES Unifying Concepts a, b, and c* and to applications of your science topic to your students' personal lives.

*The "Unifying Concepts" include:

a. Illustrating scientific processes, relationships, and patterns. Also, understanding how scientific knowledge is organized (e. g. the periodic table, the Linnaean system of classification, etc).

b. Understanding the nature of scientific evidence (e. g. the importance of experimental blinding) and the use of models in scientific explanation (e.g. the Bohr atom is useful for understanding, but incomplete).

c. The centrality of careful measurement to determining things that stay the same (e. g. the charge of an electron or the local acceleration due to gravity) and things that change over time (e. g. continental positions, the earth's magnetic field strength, species population densities).

d. Evolution of natural systems and the causes for such evolution.

e. Interrelationships of form and function in living or nonliving systems (e. g. the fish maw ("swim bladder") for regulating buoyancy, the structure of the sun).

2. The **"Nature of Science"** (NOS) must be addressed in the course of the Unit Plan. This could include one or both of the following:

(a) discussion of the historical development of science ideas or concepts relating to your Unit Plan topic

(b) use of models or processes for explaining science.

3. Students must be engaged in **scientific inquiry** during the course of the Unit. You will guide your students through the process of developing scientific ideas from observations, data, and experimental results. You can use a discovery or guided inquiry approach where students collect and interpret data using applicable science-specific technology.

4. The Unit Plan must include appropriate teaching and learning activities including laboratory or field settings and applicable instruments or technology to allow access so that **all** students learn.

5. The Unit Plan must address **safety procedures** including chemical safety or the ethical treatment of living organisms as appropriate. Provide a Safety Plan or make reference to your Safety Plan developed in the Special Methods of Teaching Science course.

SAFETY PLAN

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The safety plan must address each of the ten areas of concern listed below, outlining specific rules and procedures that must be followed by teacher and student (as appropriate). The safety plan must include a description of actions such as instructing and informing, developing safety contracts, managing behaviors, posting behaviors, developing routines, making inspections, and developing safety procedures and illustrative examples.

1. Maintaining safety equipment and following emergency procedures,
2. Handling, labeling and securing equipment and materials.
3. Ensuring student knowledge of safe procedures and potential hazards.
4. Ensuring proper clean up and disposal of hazardous materials.
5. Responding to student injuries.
6. Managing student behaviors.
7. Ensuring proper and ethical treatment and care of animals, as appropriate.
8. Ensuring safety of students with allergies, handicaps, or medical conditions.
9. Ensuring compliance with laws related to collection of natural materials.
10. Ensuring continuous and proper supervision of students.

Resources:
Materials available from NSTA www.nsta.org

1. See general and discipline-specific guidelines in *Investigating Safely: A Guide for High School Teachers* (Texley, Kwan, and Summers, NSTA 2004)
2. Science Laboratory Safety Manual by Linda Stroud, NSTA
3. The NSTA-Ready Guide to Safer Science Volume 1, 2 and 3 by Kenneth Russel Roy, 2007

Online Resources:

Laboratory Safety Workshop, *http://www.labsafety.org/*
Flinn Safety Manual *http://www.flinnsci.com/Sections/Safety/safety.asp*

Professional Development and Engagement Requirement

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The professional engagement requires students to perform scientific research and/or to attend a professional conference and provide a written account of their activities. Students must select a professional engagement activity, such as scientific research in a research lab or attendance at a scientific conference (which can include science education). All professional engagement activities must supervised and both the activity and supervisor must be approved by the NSTSC (Natural Sciences Teaching Specializations Coordinator). Attendance and/or participation at the WVAS (West Virginia Academy of Science) or the WVSTA (West Virginia Science Teacher's Association) with any Shepherd University School of Natural Science and Math faculty as a supervisor is pre-approved by the NSTSC. Supervisors will serve as references that the student participated in the activity as described on the approval form and/or the student's engagement report.

Following the activity, students must submit written documentation that describes their involvement in the activity, addresses NSTA or other curricular standards, the impact of the activity on their understanding of the process of scientific investigation and/or science teaching and how this new understanding relates to professional activities as a science teacher. This assessment aligns with NSTA standards 6a and 6b. Students will be expected to approach or meet standards on all subsections of the instrument and to meet standards as an overall score.

Important Note: A minimum of two different professional development activities are required: One that addresses science content and a second activity that addressed science pedagogy. Indicate on the form which type of professional development you are documenting using the activity (a, science content-area or b, science pedagogy).

PROFESSIONAL ENGAGEMENT ACTIVITY APPROVAL FORM

This form is for approval of students engaging in activities other than attendance at the WVAS (West Virginia Academy of Science) or the WVSTA (West Virginia Science Teacher's Association) annual meetings to fulfill their Professional Development requirement.

Name: _____

Date submitted: _____

Professional Engagement Activity:

_____

_____

_____

_____

This activity includes:

[6a] _____ content-area specific presentation or involvement (ie. Scientific research, conference, symposium, talk, or science-oriented community project)

[6b] _____ pedagogy or science-teaching presentation or involvement (ie. Pedagogical research, conference, symposium, talk, or educational community project)

Date(s) engaged in the activity: _____

Activity Supervisor: _____

Position/Title (not rank) – what position or title qualifies the supervisor for this activity: _____

Institution: _____

Activity Supervisor: _____

(sign) (date)

NSTC Approval (of Activity Supervisor & Activity): _____

(sign) (date)

PROFESSIONAL DEVELOPMENT ACTIVITY REPORT

Name: _____

Date submitted: _____

Professional Engagement Activity:

_____

_____

Date(s) engaged in the activity: _____

This activity includes:

[6a] _____ content-area specific presentation or involvement (ie. Scientific research, conference, symposium, talk, or science-oriented community project)

[6b] ____ pedagogy or science-teaching presentation or involvement (ie. Pedagogical research, conference, symposium, talk, or educational community project)

Two separate activities and activity reports are required – one pertaining to science content [6a] and one pertaining to pedagogy/science teaching [6b].

1. Describe your involvement in the activity, (give full title(s) for any presentations in which you were involved):

_____

_____

2. For my professional development, this activity addressed the following curricular, teaching or professional standards. Specifically identify & enumerate appropriate standards and provide comments to relate the activity to the standards. Include standards from at least two of the following areas: curriculum related to your teaching specialization (or endorsement) **[6a]**, teaching, technology, or professional development standards**[6b].**

_____

_____

_____

3. Address how engagement in the activity enhanced your understanding of the process of scientific inquiry or scientific investigation **[6a]** and/or your understanding of the process of teaching science **[6b]**.

_____

_____

_____

_____

4. How will the knowledge, skills, or insights gained from participating in this activity translate into your professional activities as a teacher – either in the classroom **[6b]** or in other teaching or school-related capacity(ies) **[6a]**?

_____

_____

_____

_____

Resource Unit Requirement

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Description of the Resource Unit

Science Education programs at Shepherd University require the development of a Resource Unit (RU) as part of the students' preparation to teach. Although the RU supports the TEP's emphasis on Teacher as Reflective Problem Solver, it is distinctly different from the professional teaching portfolio.

The professional teaching portfolio is an organized collection of evidence from the student's educational, preservice, and personal experiences. It is a synthesis that the student thinks will convey information about his/her knowledge base, skills, and creativity to the viewer so that viewer can develop a more complete and accurate perception of the student as a potential biology, chemistry, or general science teacher.

The RU is a collection of items that might prove to be of value for the planning and teaching of lessons during student teaching and the first couple of years of in-service teaching, and helps to introduce and familiarize the student with the West Virginia Science Curriculum Framework's Instruction Goals and Objectives for Coordinated and Thematic Science, Grades 5-10, Advanced Biology, Chemistry, and/or Environmental Earth Science.

For the student desiring to become a science teacher, RU development is expected to begin informally when the student first enrolls at Shepherd and declares himself / herself to be majoring in Secondary Education or in the MAT degree program with a Natural Science Specialization. During this informal phase, the student is expected to familiarize him/herself with the RU requirement as spelled out here, and begin collecting and saving resource materials. RU development is an ongoing process, and the NSTSC will examine the RU, offer constructive criticism and suggestions, and rate its progress as satisfactory or unsatisfactory. The student's progress in RU development will be an evaluation criterion in Juncture Reviews 1, 2, and 3.

Materials That Should Be Placed in the Resource Unit:

Copies of laboratory exercises and other hands-on activities (printed and/or electronic), descriptions of and directions for demonstrations (printed and/or electronic), pictures, newspaper articles, brochures, video tapes, audio tapes, items taken from the Internet (printed and/or electronic), journal articles, correspondence with scientists and other experts, listings of URLs and email addresses, a bibliography of personal library books to be used in teaching, etc.

For persons who plan to teach in West Virginia, the materials should be those that will support efforts to meet the West Virginia Science Curriculum Framework's Instruction Goals and Objectives in his/her teaching.

The RU should contain materials related to:

1. The nature of science - materials that describe and illustrate the limits of science; demonstrate science as a process that allows one to answer questions about natural phenomena, and the importance of logic, critical thinking, and creativity in science; reflect the evolving nature of scientific thoughts and models

2. Scientific attitudes/habits of mind - materials that can be used to cultivate scientific attitudes, promote ethical practices, motivate students to apply and use science knowledge bases in their personal decision making, and encourage its use in societal decision making.

3. Scientific processes/thinking skills - materials that can be used in the classroom/laboratory to promote the development of those cognitive skills, psychomotor skills, and affective behaviors that will allow students to actively investigate the natural world, solve problems in a variety of ways, including through the concrete manipulation of the tools and materials of science, and work cooperatively, as well as individually, in solving problems.

4. The history of science - materials that somehow show that significant accomplishments in one scientific discipline affect research and understandings in other disciplines; that scientific investigations must often wait until technology make them possible; that the knowledge base of science is a product of the work of males and females, persons of different racial and ethnic groups, persons of different cultures, persons with various handicaps, etc.

5. Subject matter content - materials that will be useful in developing lessons that will allow the learner to conceptualize subject matter content in terms of systems, changes, and models.

6. The interrelatedness of science, technology, and society - materials that can be used to lead learners to understand the difference between science and technology and observe the application of scientific principles in technology; science as a part of society; the use and limitations of science and technology in solving many, but not all, of the problems of society.

7. Educational, career, and employment opportunities in science and technology; describe the preparation necessary for admission into a scientific profession and/or employment in some area of science or technology.

Electronic Submission of Portfolio and/or Resource Unit Items

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Students may submit some or all of their Portfolios or Resource Units electronically according to the following guidelines. Forms requiring signatures (such as portfolio review and computer competency forms) must be present in a hard-copy format placed in a folder appropriate labeled with the Student's name, teaching, field and any other relevant information. Other hard-copy items (without signatures) may be placed in the same notebook, with an appropriate table of contents, or may be scanned electronically and placed in the electronic submission. For both the electronic Portfolio & Resource unit, USB "flash drives" or "thumb drives" must be provided with the electronic documentation with the understanding that this drive may or may not be returned to the student.

Electronic submission of Portfolios requires a Microsoft word document with a table of contents and appropriate links to each section & subsection of the electronic document. Scanned documents can be placed in this same Microsoft word document as a picture or object. Items that are too large or that cannot be easily read in the word document may be placed either (1) on the same USB flash drive with the electronic document or (2) in the hard-copy notebook with cross-references made to it in both the electronic document and the hard-copy notebook. Extraordinarily large electronic documents may be separated into smaller documents as needed, with each document appropriately labeled "Part 1", "Part 2", etc.

Electronic Submission of Resource units requires a flash drive with a hierarchical filing system that is meaningful as to the organization of the resource unit. Reference to hard-copy items (such as textbooks) may be made within the electronic resource unit.

TEACHER WORK SAMPLE

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During student teaching (EDUC 457 & EDUC 400), all teacher education students complete a Teacher Work Sample (TWS). The TWS entails creating a unit of instruction for the student teaching classroom, developing assessment instruments, administering the assessments and then analyzing the assessment data to determine whether their students learned. The assignment requires teacher education students to demonstrate their ability to plan a standards-based unit of instruction that is developmentally appropriate and builds upon the prior knowledge that students bring with them to the classroom. It also requires that candidates use assessment data to drive their instruction both during the completion of the TWS and after the TWS is completed.

There are 5 sections in the Teacher Work Sample: I - Description of Context and Unit Objectives, II-Profile of a Struggling Learner, III - Assessment Strategies, IV - Data Display and Analysis of Data, and V - Reflective Narrative. The teacher education program requires that the TWS be completed during the first 7 weeks of student teaching. Teacher education students must be at the "Meets Standard" level in each section as well as overall. If this requirement is not met, the TWS must be resubmitted until it meets standards.

Teacher Work Samples must also contain Science-specific elements as outlined below.

Below is a facsimile of the assignment:

Teacher Work Sample Guidelines*

Purpose

Tracing student progress/development from pre-assessment to post-assessment is a core responsibility of each teacher. At any given point in time, a teacher must be able to answer the question: How do I know what my students know? The teacher work sample demonstrates the teacher candidate's ability to summarize his/her evidence for students' growth along major objectives in the unit and to reflect upon how his/her teaching practices have fostered (or failed to foster) student learning and growth.

In order to complete the teacher work sample, you will need to design a unit of instruction or a series of lessons that you will structure your pre and post assessment around. This unit/series of lessons should include at least a week of instruction, and the unit or series of lessons should incorporate district and state standards. You will need to confer with your mentor teacher in order to determine which topics you should cover in your unit and the timing of when you will teach your unit. If you are a secondary teacher (or a kindergarten teacher with two classes), you will only need to collect assessment data for one class. After you have administered your pre-assessment, you may need to make modifications to your unit based on the data you receive.

After you have taught your unit, you will complete the teacher work sample assignment. The teacher work sample is organized into five major sections:

Part I: Description of Context and Unit Objectives;
Part II: Profile of a Struggling Learner;
Part III: Assessment Strategies;
Part IV: Data Display and Analysis of Data;
Part V: Reflective Narrative.

The Teacher Work Sample should be typed, double-spaced, 12 point font.

Part I - Context and Unit Objectives

This section of the teacher work sample opens with a concise overview of the class, including a description of the student population (for the school as a whole and for your individual classroom) and their past learning experiences (specific to the content covered in your unit) as well as a description of the learning environment of the classroom. You will need to demonstrate in your teacher work sample that the instructional choices you make are based on the context of the learning environment and the student population in your class. The approximate length of this overview is 2-3 paragraphs, double-spaced.

After the class description, include an explanation briefly stating the major unit objectives your assessments aim to measure. These objectives should align with district and state standards. The approximate length is 2 paragraphs, double-spaced.

The total length for Part I will be approximately 2 pages.

Part II – Profile of a Struggling Learner

Select a struggling learner who is in the class in which you will be collecting your data for the teacher work sample. This may be a student who is on an IEP because of a learning disability, or it may be a student who is not on an IEP but is struggling with the course content. Provide a description of this student's learning difficulties and the learning accommodations that are being provided by the classroom teacher. When you analyze the learning of the class, you will focus separately on this individual student's learning gains.

The total length for this section will be approximately 1 page.

Part III - Assessment Strategies

Summary of Pre-Assessment

In this section, the teacher candidate will succinctly describe the pre-assessment(s) used to evaluate students' background knowledge and skill/abilities. Pre-assessments may be in the form of quizzes, short-answer responses, graded writing samples, class discussions with recorded responses, etc. (it does not have to be a paper/pencil assessment).

In this description you should include:
1) an explanation of how the pre-assessment aligns with the unit objectives,
2) a rationale as to how and why you selected this particular assessment format(s),
3) and an analysis of how the pre-assessment(s) informed instructional design.

You may need to make modifications to your instructional unit after you have analyzed the pre-assessment data. Describe what you found out about your students' prior knowledge and how you adjusted your instruction accordingly.

Summary of Post-Assessment

The teacher candidate will describe the post-assessment(s) used to determine student learning. This assessment should relate to the knowledge/skills that were evaluated in the pre-assessment(s), and the post-assessment should provide data that is comparable to the data gathered with the pre-assessment. Summative assessments may include: written tests or essays, student performances or role-plays, problem/solutions, exhibitions, class discussion with recorded responses, etc. In this description you should explain how the post-assessment aligns with the pre-assessment and the unit objectives, and you should provide a rationale as to how and why this particular format was selected.

The total length for Part III will be approximately 1-2 pages.

Part IV – Data Display and Analysis of Data

Overview

The purpose of the analysis of data is for the teacher candidate to begin to answer the question: How do I know whether/what my students have learned? In order to really answer this central question of teaching, teacher candidates must be able to analyze the results of the assessment data. Teacher candidates who are able to accurately analyze student learning are in a better position to use data in making decisions in relation to instruction, curriculum, and differentiation. One of two primary methods of data analysis, quantitative or qualitative, must be used.

Quantitative Data Display

Student scores for the pre-assessment should be displayed quantitatively next to the post-assessment scores in a table. The percent of learning for each student in the class should be calculated. Then graph these data. You should also group students by different categories (such as gender, race/ethnicity, ability, socioeconomic status, etc.) to see if there are any discrepancies in the data between selected groups and the whole class. Then create a graph displaying the comparisons between various groups.

Qualitative Data Display

If you use a pre-assessment that yields qualitative rather than quantitative data, you should still display these data in a table and graph these data. For example, your pre-assessment may be a class discussion responding to the question: What is poetry? You should record student responses as part of your data collection. At the end of the
semester, you can pose the same question as part of your post-assessment data collection. You can then display these qualitative responses in a table and graph (number of responses, number of students that responded) so that readers can compare the class responses provided during the pre and post assessment.

Analysis of Data

After the assessment data have been displayed in graphs and tables, you should summarize how well the students learned the objectives in this unit. This section should include an analysis of which objectives students did and did not meet, paying attention to differences in performance of identified groups (by gender, race/ethnicity, etc.). Make sure to discuss specifically the performance of the struggling learner that you profiled in Part II.

Part IV should include approximately 1 page of text in addition to graphs and tables.

Part V - Reflective Narrative

The reflective narrative portion of the Teacher Work Sample allows teacher candidates to express their conclusions on (1) how and why different students learned or failed to learn and (2) their own teaching strengths and weaknesses in accordance with their data analysis.

Your reflective narrative should include the following:
Who learned, and why? Who did not learn, and why?
In responding to these questions, consider the impact of the context on student learning and the impact of your instructional choices on student learning. In particular, focus on the learning of the struggling learner that you profiled in Part II.
What should you do differently to ensure greater student achievement when you teach this unit again?
What are your strengths in fostering student learning? (curriculum design, instructional strategies, assessment strategies, classroom management, differentiation)
What are your weaknesses in supporting student learning? (curriculum design, instructional strategies, assessment strategies, classroom management, differentiation)
What professional development opportunities might you pursue that would allow you to be more successful in the classroom?

The reflective narrative should be approximately 3-4 pages in length.

The total Teacher Work Sample should include 8-10 pages of text in addition to tables and graphs.

*This teacher work sample is a modified version of the Analysis of Learning used by the University of Denver.

Teacher Work Sample Science Specific Assignment Guidelines

The Teacher Work Sample (TWS) prepared by the science teacher candidate must demonstrate the ability to collect, organize, analyze, and reflect on diagnostic, formative and summative data and show evidence of (1) a change in mental functioning demonstrating that scientific knowledge is gained and/or corrected, (2) show that P-12 students are able to distinguish science from non-science, understand the evolution and practice of science as a human endeavor, and critically analyze assertions made in the name of science and (3) that the students' engagement in developmentally appropriate inquiries require them to develop concepts and relationships from their observations, data, and inferences in a scientific manner.

To accomplish these expectations, in addition to the general directions for the TWS above, the science teacher candidate should pay particular attention to the following details in each part of the assignment.

Part I - Context and Unit Objectives
Be sure to include a description of students' prior learning experiences that are related to the science content covered in your unit as well as a description of the learning environment of the science classroom. You will need to demonstrate that the instructional choices you make are based on the context of the science-specific learning environment. Include an explanation briefly stating the major science unit objectives your assessments aim to measure. These objectives should align with science-specific standards and should be based upon developmentally appropriate inquiries that will require students to develop concepts and relationships from their observations, data, and inferences in a scientific manner.

Part III - Assessment Strategies/Engage in Inquiry
Be sure to describe or show pre-assessment(s) & post-assessments used to evaluate students' science-specific background knowledge and skill/abilities. Assessments must also show students' ability to distinguish science from non-science, understand the evolution and practice of science as a human endeavor, and critically analyze assertions made in the name of science as well as use of inquiry from their observations and data to develop major science concepts, principles, theories, and laws beyond memorization. Your description should provide an analysis of how the pre-assessment informed instructional design to address students' science-specific background knowledge and skill/abilities.

Part IV – Data Display and Analysis of Data
Provide evidence for all students of the knowledge gained as a result of instruction planned from pre-assessment to post-assessment. Your description should include a reflection on diagnostic, formative and summative evidence of a change in mental functioning. Reflect and display data on students' ultimate ability to use inquiry to distinguish science from non-science, to increase their understanding of the evolution and practice of science as a human endeavor, and to critically analyze assertions made in the name of science.

Undergraduate Grades and GPA

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Minimum Grade of "C" Requirements

Students majoring in secondary education seeking one or more teaching specializations in the natural sciences must have a minimum grade of "C" in all Professional Studies Courses, ENGL 101 & 102, COMM 202, and all Content area courses.

Minimum Grade Point Average Requirements

All students seeking certification in education through Shepherd University are required to obtain the following Minimum Grade Point Averages:

Educational Studies	2.75
Content area	2.75
Overall	2.75

The School of Natural Sciences and Mathematics requires science education students to have minimum grade point averages of 2.75 in each of their natural science specializations.

Students may repeat courses to improve grades, however students are only permitted two attempts to obtain a grade of C or higher for each Educational Studies and Content course. Withdrawals include attempts, irrespective of the reason for the withdrawal. Students with special circumstances must consult with the EPPC to petition for exceptions.

Following the last semester before Student Teaching, students must submit Grade distribution forms indicating the number of attempts for each content course to the NSTSC. Students are encouraged to examine GPAs within competencies listed on the grade distribution forms as feedback toward their own content competencies for areas of instruction.