

**LOCK HAVEN UNIVERSITY OF PA  
B.S. in Education: Secondary Education,  
Mathematics Certificate**

**Program Guidebook**

Fifth Edition, 2009 – 2010

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## INTRODUCTION

**NOTE:** This guidebook is intended to inform the student of the current practices and requirements of the Secondary Mathematics Education track within the Department of Mathematics at Lock Haven University of Pennsylvania. As education is a profession that is directed by outside agencies at the state and national level, practices and requirements are subject to change at any time, as “best practices” may dictate. It is the students’ responsibility to keep up with these changes by attending meetings and asking questions. Furthermore, this guidebook is not a formal legal document and therefore has hopefully been written in a more “common” language that the underclassman will appreciate and understand.

Welcome to Lock Haven University of Pennsylvania’s Secondary Mathematics Education Program. This is an exciting time to be in the field of education and an even more exciting time to be a secondary mathematics education student at Lock Haven. There is a lot happening in education in general and here at Lock Haven in particular. We are very proud of the accomplishments that Lock Haven University has made in the past and are excited about the contribution that you will make as we proceed into the future. You should be confident in the fact that you have chosen the right place to help you become a math teacher!

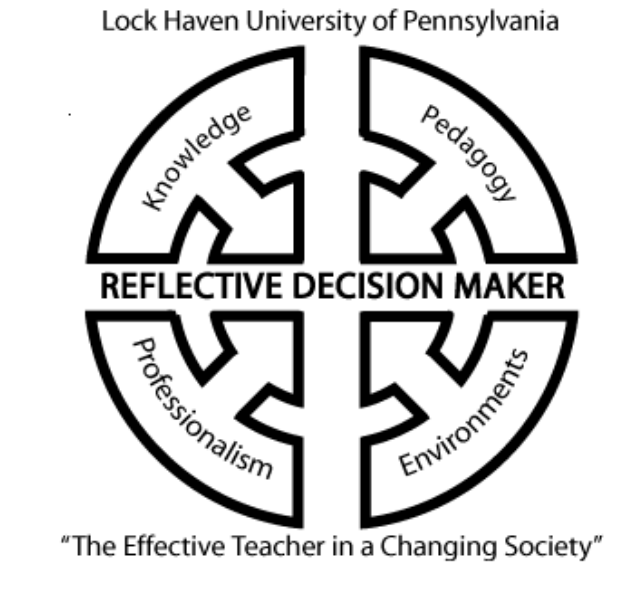
The Mathematics Education track within the Department of Mathematics is designed to prepare individuals to teach mathematics in grades 7-12 and to assist them in obtaining a Pennsylvania certificate to teach in the secondary schools in the Commonwealth. A collaborative effort between the Department of Mathematics and the Teacher Education Programs provide the breadth and depth of educational experiences necessary for students to succeed as secondary mathematics teachers. This guidebook is designed to familiarize you with the basic experiences, expectations, and requirements of Lock Haven’s Secondary Mathematics Education degree and certification program.

As a student, you must satisfy both the baccalaureate degree and the certification requirements of Lock Haven University and of the Pennsylvania Department of Education. Lock Haven has designed a program in which you can meet both of these goals in four years or 120 semester credit hours.

This guidebook will introduce you to the Teacher Education Programs at LHU in general and the Secondary Mathematics Program in particular. It is very important that you become familiar with all the contents of this guidebook so you are informed and knowledgeable about the program and its requirements and expectations.

## **LHUP TEACHER PREPARATION CONCEPTUAL FRAMEWORK** (from the LHUP Teacher Education Programs)

Lock Haven University has gone to great lengths to create a Conceptual Framework that will guide all teacher preparation programs at the University. This Conceptual Framework has been written by a team of University personnel, K-12 teachers, and K-12 administrators. As you read the following document, keep in mind that this is the overall philosophy from which your Secondary Mathematics Program has been developed. Afterward, you will examine the Mission and Vision Statement for the Secondary Mathematics Education Program and a more specific Conceptual Framework that is specific to Secondary Mathematics Education.



### The Reflective Decision Maker Model

Lock Haven University of Pennsylvania (LHUP) endorses a model for teacher education that has the teacher as a reflective decision maker at its core, recognizing that teachers function in a changing society. Emphasis is placed on the teacher as a thinking, evaluative professional who takes action within a changing social, economic, technological, and professional environment.

The teacher education program at LHUP provides educational experiences to prepare future teachers who understand that productive students must engage in problem solving, fill leadership roles, and serve as cooperative group members within an environment that fosters the self-esteem of all involved. Our candidates know that effective teachers must continuously reflect on their actions as teachers. The concept of the reflective teacher relates well to the view of teacher as instructional decision maker that was first developed in the late 1970's and continues to be discussed today. The instructional decision maker must know what to teach and how to teach diverse learners in a variety of learning environments. Reflection includes action, and thus calls for decision making on the part of the teacher. The reflective decision maker, however, makes instructional decisions in a much more tentative way than a managerial decision maker,

considering a wider range of contextual factors, and maintaining a consciously critical attitude towards decisions. Although decision makers must engage in reflection and revision, traditionally they have tended to see the range of reflection as being of narrower scope than do those who see reflection as the governing factor in teaching.

To be effective as reflective decision makers, candidates in the teacher education program at LHUP must demonstrate knowledge and skills in four elements. Candidates need to plan for instruction giving consideration to contextual factors, know the content they teach, be able to implement a variety of teaching strategies, and be able to demonstrate professional teaching behaviors including self-evaluation, effective communication skills, and ethical teaching behaviors. In order to be successful as a reflective decision maker, LHUP preservice teachers must have practice in decision making and reflection as part of their educational experiences. The faculty at LHUP is committed to providing learning experiences that will equip our students with the knowledge and the experience to be reflective decision makers.

### Element One: What To Teach

We find ourselves in an age of educational reform that sees the field of education being influenced by national and state governments, international comparisons with other nations, and the visions of various professional organizations. The world is shrinking due to constant technological advances, and recent history has shown us that humans are capable of affecting the global environment both positively and negatively. What then should students in schools be taught, and furthermore, what do teachers need to know in order to teach these school students?

To address these questions as they relate to teacher preparation at Lock Haven University, we receive guidance from numerous sources, including the Pennsylvania Department of Education, the United States Department of Education and various national professional associations. For example, the federal *No Child Left Behind Act* of 2002 (NCLB) requires local school districts to ensure that all teachers hired to teach core academic subjects are highly qualified (U.S. Department of Education, 2002). This legislation defines a "highly qualified teacher" as one with full certification, a bachelor's degree and demonstrated competence in subject knowledge and teaching (U.S. Department of Education, 2002). NCLB legislation also requires states to test children in various core subject areas. The Pennsylvania Department of Education (PDE) established rigorous academic standards and assessments to facilitate student achievement through its Chapter 4 legislation. The academic standards therein describe the knowledge and skills which students will be expected to demonstrate before graduating from a public school in Pennsylvania and encompass the following subject areas: Reading, Writing, Speaking and Listening, Mathematics, Science and Technology, Environment and Ecology, Social Studies (civics and government, geography, economics and history), Arts and Humanities, Career Education and Work, Health, Safety and Physical Education, Family and Consumer Science, and World Languages. In addition to the PDE, national organizations such as the National Council of Teachers of Mathematics (NCTM), National Science Teachers Association (NSTA), etc., are currently working to reform education in the United States. Many have published guidelines and standards not only for what school students should know and be able to do by the time they graduate from secondary schools but also how instruction and teacher preparation should be

conducted to achieve the visions of the various reform movements. In summarizing the current climate of reform, Borko and Putnam suggest:

“Virtually all reform efforts are calling for changes in our educational system that will help students to develop rich understandings of important content, think critically, construct and solve problems, synthesize information, invent, create, express themselves proficiently, and leave school prepared to be responsible citizens and lifelong learners (1995).”

The National Council for Accreditation of Teacher Education (NCATE) recommends that student learning must mean not only basic skills but also the knowledge and skills necessary to succeed as a responsible citizen and contributor to the new economy. Curriculum integration has long been proposed as a way of organizing the "common learnings" or life skills considered essential for all citizens in a democracy (Vars & Beane, 2005). The intent is to help students make sense out of their life experiences and learn how to participate in a democracy (Beane, 1997). Much of this resonates with the philosophy espoused by John Dewey many years ago in *Democracy and Education*, where he suggested that schools should produce young people who were ready to take their place in a democratic society (1926).

Helping students develop rich understandings of important content requires teachers to possess understandings that go far beyond the content officially being taught. For example, many argue that teachers need to know about the subjects they teach (Anderson, 1991; Ball, 1991; Banks, 1971, 1991; Buchman, 1984; Grossman, 1990; McDiarmid, 1992; Shulman, 1986, 1987; Watts, 1972; Wilson, 1991). This means that they know how new knowledge is created or discovered and tested, major debates and disagreements in the field, the principal perspectives or “school,” how the field has developed, and who has not and why (Ball & McDiarmid, 1990; McDiarmid, 1992; Scwab, 1964; Shulman, 1986, 1987). The National Board presented its view of what teachers should know and be able to do--its convictions about what it values and believes should be honored in teaching:

The fundamental requirements for proficient teaching are relatively clear: a broad grounding in the liberal arts and sciences; knowledge of the subjects to be taught, of the skills to be developed, and of the curricular arrangements and materials that organize and embody that content; knowledge of general and subject-specific methods for teaching and for evaluating student learning; knowledge of students and human development; skills in effectively teaching students from racially, ethnically, and socioeconomically diverse backgrounds; and the skills, capacities and dispositions to employ such knowledge wisely in the interest of students (1989).

To this end, all prospective teachers at LHUP are required to complete a rigorous program of general education studies at a high level (minimum overall GPA of 3.0). Secondary education majors at LHUP complete what is nearly the equivalent of a pure degree in their chosen field in addition to the general education requirements with the same high level of expectation. Likewise, Elementary, Special Education, and Health and Physical Education majors complete very specialized coursework appropriate to their fields of licensure. Naturally, all education majors

also engage in coursework in learning theory and pedagogy as they apply to their fields of licensure. Subject matter knowledge, while no guarantee of effective instruction, is nevertheless a necessary and critical component.

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### Element Two: How to Teach: Research, Theory, and Practice – Technology, Assessment

Recognizing the deficiencies that would occur if “what to teach” was all that was contained within a Conceptual Framework for a teacher education program, this section describes Lock Haven University of Pennsylvania’s (LHUP) belief that it takes more than providing pure content knowledge to educate future teachers. Although strong content knowledge and verbal skills have demonstrated research links to higher student achievement, they may be necessary but not sufficient conditions for quality teaching and learning. In addition, the faculty at LHUP recognizes the increasingly important role that technology and assessment have in the education of future teachers. Finally, the faculty at LHUP believes that reflection on this element of the Conceptual Framework is vital to growth in this area.

While educators and researchers have agreed that content knowledge influences student achievement, no evidence suggests that possessing content knowledge alone is enough to be an effective teacher (Berry, 2001; Wilson, Floden, & Ferrini-Mundy, 2002). In fact, some researchers have claimed that the connection between teachers’ subject knowledge and student achievement is mixed, positively influencing student learning up to a certain level of basic competence but less important afterward (Darling-Hammond, 2000; Monk, 1994).

Teacher education course work is sometimes more influential than extra subject matter coursework (Monk & King, 1994). Monk (1994) also examined the connection between students’ achievement and their teachers’ coursework in teaching methods and found a positive

correlation. In addition, systematic study of learning processes results in more effective teaching behaviors and increases in student achievement (Munro, 1999). Moreover, McDiarmid and Wilson's (1991) study demonstrated that teachers with only subject matter knowledge with alternative certification had strongly held misconceptions about appropriate ways to teach the content and were unable to integrate their subject matter knowledge with teaching practices to allow for effective instruction. Finally, Ferguson and Womack (1993) found that the amount of education course work teachers completed explained about 16% of the variance in teaching performance, more variance than was accounted for from teachers' content knowledge.

More recent research by Wenglinsky (2002) has revealed that the greatest influence on student's achievement comes from classroom practices and the professional development that supports the students' efforts. Wenglinsky's research indicated "regardless of the level of preparation students bring into the classroom, decisions that teachers make about classroom practices can either greatly facilitate student learning or serve as an obstacle to it" (p.7). That is, teachers' pedagogical decisions and activities, separate from but related to teacher subject matter knowledge, independently make a difference in student achievement.

Instructional technology is not only a legitimate discipline area but an integral part of virtually every area of study and learning faced by today's students of all ages (Knapp and Glenn, 1996; Lever-Duffy, McDonald, & Mizell, 2003). Today's teachers are responsible for students who work and learn in the rapidly advancing, technological world. Reflective decision makers use instructional media and technology to effectively facilitate planning, delivery, assessment, and reinforcement of student learning. It is therefore essential that reflective decision makers have an evolving conceptual understanding and ongoing adaptability to new technology for tomorrow (Galloway, J. P. & Blohm, P., 1997; Galloway, J. P., 1990).

Assessment-guided instruction is an extremely important practice and directly relates to pedagogy and the proper use of instruction. Teachers systematically assess student progress by employing multiple authentic assessment strategies during all phases on instruction. Using this assessment data, teachers are able to make judgments about the relative progress of students in their classrooms and subsequently formulate plans for future lessons and activities. Teachers track what students are learning, as well as what they, as teachers, are learning about their pedagogy and their students (Ormrod, 1998). Varying levels of assessments, including high stakes assessments, hold teachers accountable for the appropriateness and quality of instruction that students receive.

The Lock Haven University of Pennsylvania Teacher Education Programs have included several means to provide beginning teachers with the type of education that will allow them to make wise pedagogical decisions, appropriately incorporate technology into their teaching, and properly assess their students as well as themselves. Required courses include appropriately sequenced Field Experiences in which students can practice the techniques discussed. In addition, LHUP's programs require students to reflect on the theories presented and their implementation in the classroom.

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### Element Three: Contextual Factors: Learners and the Learning Environment

Candidates in the teacher preparation program at Lock Haven University of Pennsylvania (LHUP) must demonstrate proficiency in identifying important contextual factors that affect teaching and learning. Contextual factors include but are not limited to school and community environments, classroom environments, and the diversity of learners including racial, socioeconomic, language, gender, religious, learning differences, and sexual orientation.

Community and school populations, often defined by socioeconomic levels as well as racial and ethnic diversity, are important considerations in planning effective educational programs. Current research suggests that the community characteristics have a measurable impact on child development and student learning (Holloway, 2004). Within the broad community context, educators need to identify the families in the communities they serve. Since a primary learning environment for students is the home, teachers need to consider the home environments, family structures, and the level of parental support when planning for instruction. Equally important is that teachers and students connect the school experiences with outside learning activities (Bransford, Brown, & Cocking, 2000). This connection allows students to see the value in the education received in the school environment creating a basic understanding of how the school based learning experiences can be applied in the home and community settings. Through numerous required field experiences, including community service, teacher candidates at LHUP learn about and reflect upon the communities in which they will be teaching.

Classroom environment refers to the pervasive atmosphere, ambience, tone, or climate within a particular setting (Dorman, 2002). Dorman also indicates that strong evidence links positive psychological learning environments to increased student achievement. The Teacher Education Programs at LHUP recognize the importance of identifying and modeling elements of positive learning environments for our teacher education candidates in an effort to affect increased learning outcomes. Creating a positive learning environment requires the classroom teacher to foster relationships with students that demonstrate acceptance, respect, and an understanding of the student's knowledge and skills. These relationships form the foundation of a classroom climate in which all students are encouraged to learn. This positive learning environment is further established when the classroom teacher constructs a learner-centered environment whereby students are prompted to explain and develop their own knowledge structures by predicting and explaining various situations (Bransford, Brown, & Cocking, 2000). Learner-centered environments require an understanding by the teacher of the students' knowledge, skills, and personal beliefs that are brought to the educational setting (Ladison-Billings, 1995). The teaching methods' courses at Lock Haven University address learner-centered environments as a method of differentiating instruction in order to meet varying student needs. Teachers who strive for positive learner-centered environments are able to be more culturally responsive,

thereby maintaining the student's cultural integrity while fostering academic success (Phuntsog, 1999).

Candidates in the Teacher Education Programs at LHUP are prepared to create culturally responsive environments by receiving adequate knowledge about cultural differences and culturally relevant instructional practices, as well as completing required diverse field experiences. From initial course work in education through student teaching, our teacher education candidates investigate and reflect upon the impact that race, ethnicity, gender, sexual orientation, language, disability, socioeconomic status, student interests, and learning styles have on the educational experience. The recognition that learners are coming from diverse backgrounds and have diverse learning needs is important in planning effective educational experiences. In fact, teacher preparation programs need to focus on multidimensional teaching methods in order to reach all students in inclusive settings (Obiakor, 2001). LHUP strives to prepare teachers to teach diverse learners using a variety of teaching methods. According to Arends (2004), meeting the diverse needs of learners is a responsibility that educators must meet to ensure that every student has an equal opportunity to learn.

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#### Element Four: Professionalism: Ethics and Dispositions

Lock Haven University's Teacher Education Program requires that candidates consistently demonstrate professional behaviors and attitudes that are essential to the teaching profession. It is no longer sufficient for teachers to have knowledge and skills in academic subjects; they must also have employability skills (Wayda & Lund, 2005). Employability skills are those observable and measurable teacher behaviors such as punctuality and oral communication skills that often determine the success or failure of a beginning teacher (Goodlad, 2002). Developing professional behaviors including dispositions, ethics, and caring communication skills is an integral part of LHUP's Teacher Education Program.

Employability skills are determined by a person's professional disposition. According to Wayda and Lund (2005), a positive disposition toward being a teacher is indicated by a preservice teacher who values learning and knowledge, diversity, collaboration, professionalism, and personal integrity. The Teacher Education Programs at LHUP recognize the importance of modeling and assessing candidate dispositions that we believe are necessary for employment in education. Examples of employability skills include but are not limited to initiative, dependability, commitment to the profession, interpersonal and oral communication skills, resourcefulness, and self-evaluation skills. These skills are valued and determined to be necessary skills of all teachers. Additionally, the research recommends that teachers develop the ability to identify, analyze and resolve ethical issues that they face in the classroom, school and community (Clever, Edwards, et.al., 2000; Benfu, 2000) and to plan for and teach strategies for moral development (Benninga, 2003; Bebeau, 1999).

Professionalism also requires a commitment to being a life long learner. Commitment to life long learning is evident in those teachers who continuously self-reflect, accept feedback from mentors, peers and supervisors, and seek professional development opportunities outside of the classroom. Self-reflection is based on Dewey's theoretical perspective of critical inquiry and how it relates to practice (Van Gyn, 1996). Reflection allows the teacher to identify effective practices through a careful investigation of his or her own teaching experiences so that intellectual and professional growth may take place. Preservice teachers must develop the skill of self-reflection in order for them to continuously grow as professionals, especially once they have left the university setting.

Research emphasizes the importance of expanding the teacher's knowledge of discipline and pedagogical skills through professional development programs, as well as by keeping abreast of new developments through research of current literature. Because we live in a changing society, life-long learning is essential for the on going development of knowledgeable citizens (National Commission on America's Future, 1996; Darling-Hammond & Sykes, 1999).

Lock Haven University requires teacher candidates to demonstrate caring communication skills. These skills can be defined as the ability to recognize and respond to individual differences, needs and desires of students, as well as the ability to display a genuine love of teaching students through honor, respect, sense of humor, enthusiasm, and the ability to motivate, challenge and engage students (from the American Association of School Personnel Administrators, 1997). Effective teachers do care for their students and recognize that students need to be aware that

others care about them. In order for caring to be evident, teachers and students must learn to listen to each other, and communication must take place. According to Kessler (1999), teachers who care about their students help them to develop a sense of belonging to a community.

Rogers and Webb (1991) underscore the importance of caring by reporting that good teaching is inextricably linked to specific acts of caring.

Teachers must develop a wide range of strategies to effectively communicate with students in the class, the parents in the home, the teachers and staff in the school, and the administrators in the school district. Notes, checklists, report cards, phone calls, and teacher-parent conferences provide a variety of communicative methods through which teachers prove to all students that they are cared for in the classroom and beyond. Moreover, each day teachers need to provide a safe learning environment where students are valued for who they are and where their individual perspectives are considered.

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## **SECONDARY MATHEMATICS PROGRAM MISSION STATEMENT**

The mission of the Secondary Mathematics Education Program at Lock Haven University is to develop excellent contemporary teachers of secondary mathematics, primarily through a program that offers outstanding instruction in mathematics content, methods of teaching mathematics, and general educational issues, with early, appropriate, and supportive experiences in real classrooms. The contemporary teacher of secondary mathematics fully understands the content being taught, facilitates a student-centered approach to learning that encourages the construction of mathematical understanding, and uses appropriate technology, within a culturally diverse classroom.

## **SECONDARY MATHEMATICS PROGRAM VISION STATEMENT**

The creators and sustainers of Lock Haven University's Secondary Mathematics Education Program aspire to develop the premier program for educating Pennsylvania secondary mathematics teachers in the state. Through strong content preparation, research-based pedagogical preparation, appropriate field experiences, up-to-date technologies, and excellent modeling of instruction, we will create an environment rich in intellectual rigor and full of practical experience.

## **SECONDARY MATHEMATICS EDUCATION PROGRAM CONCEPTUAL FRAMEWORK**

### Major Themes

- developing content knowledge
- developing pedagogical-content-knowledge
- exposure to excellent teaching
- obtaining general educational knowledge
- providing developmentally appropriate field experiences
- observing and developing professional dispositions

The certification program in secondary mathematics at Lock Haven University correlates with the LHUP Teacher Preparation Conceptual Framework by providing the opportunities and experiences necessary for beginning teachers to reflect on the perspective of secondary schools and the profession in general. At the heart of Lock Haven's Secondary Mathematics Education Program is the vision that has been set forth by the National Council of Teachers of Mathematics (NCTM), the principal professional organization for mathematics education, the Pennsylvania Department of Education (PDE), and the United States Department of Education (USDE). These three entities help in (and often dictate) the modification of the existing program. Indeed, teaching to meet the goals and the visions of these three organizations requires a great deal of reflective decision making, because what students learn depends to a large extent on how it has been learned. Consequently, this certification program strives to blend the learning of mathematics with the learning of pedagogy specific to the teaching of mathematics.

In addition to the visions of these three entities, other organizations such as the National Council for the Accreditation of Teacher Education (NCATE), the Interstate New Teacher Assessment and Support Consortium (INTASC), and the International Society for Technology in Education (ISTE) have set rigorous standards which provide guidance and governance for Lock Haven University's Secondary Mathematics Education Program. It is Lock Haven's Secondary Mathematics Education Program's goal to make the best use of these professional organizations in helping to develop and maintain a program that will produce excellent teachers of mathematics. To that end, the Department of Mathematics has created a program that includes opportunities and experiences that meet the standards of the above mentioned organizations.

The Department of Mathematics at Lock Haven University is deeply concerned with the teaching and learning of mathematics and the importance of developing excellent secondary mathematics teachers for the future. The faculty strives to lead students to grasp both the beauty and power of mathematical ideas and to prepare the prospective teacher to teach creatively using constructivist, diverse learning, and multicultural educational theories.

Effective teachers are those who deeply know the content they are teaching. Effective teachers are those who stimulate their students to learn. Effective teachers are those who are reflective problem solvers themselves, and who can create an atmosphere in which their students can become reflective problem solvers.

In Lock Haven University's Secondary Mathematics Education program, students will carefully examine the core content knowledge needed for a Bachelor of Science degree in mathematics. Students will study this content through a problem solving process, using reasoning and proof, communication, multiple representations, and making connections within mathematics and with outside disciplines. The study of this mathematics will often occur through the utilization of appropriate technology.

In addition to the careful examination of the core content knowledge needed for a B.S. in mathematics, students in this Secondary Mathematics Education track will have the opportunity to examine specific mathematics education concepts. These concepts include a careful study of the methods used to properly teach mathematics (pedagogical-content-knowledge) and an in depth analysis of the secondary curriculum from an advanced standpoint. In the Secondary Mathematics track, students are prepared to examine and critically evaluate the coherence of a curriculum in terms of how it reflects central and important mathematics and to reflect on its articulation across grade levels.

While observing and studying excellent teaching in the content area of mathematics, students also spend time studying many aspects of education in general. These aspects include the psychology of the learner, classroom management issues, technological media in the classroom, and the social foundations of the United States system of education. These courses are imperative in that they help the mathematics education student place their content area into the larger scope of the educational process.

“Teaching mathematics well is a complex endeavor, and there are no easy recipes for helping all students learn or for helping all teachers become effective” (NCTM, 2000, p.16). However, in order to ease the tension that exists between being a student and becoming a teacher, Lock Haven University's Secondary Mathematics program provides ample opportunity for its students to gain experience, support, and encouragement during this transition, beginning with an early field experience. Effective mathematics teachers cultivate a challenging and supportive classroom environment; effective teachers engage their students in real problem-solving activity; effective mathematics teachers are reflective when it comes to their teaching and have sufficient—and sufficiently supported—access to professional development (Grouws, Cooney, and Jones, 1988; National Commission on Teaching and America's Future, 1996).

The Secondary Mathematics Education Program at Lock Haven University believes that conceptual understanding, factual knowledge, and procedural facility are all important aspects of learning mathematics. By combining instruction in university-level mathematics with instruction in pedagogy, and making the connection among content, pedagogy, and secondary mathematics, this program prepares beginning teachers to make the kinds of decisions that lead to students' willingness to engage in mathematical activity as well as to their achievement.

Finally, the Secondary Mathematics Education Program at Lock Haven University believes that professionalism is a key factor in the success of a teacher. Speaking appropriately and properly to peers, those in authority, and students is a key to being an excellent teacher. Being prompt, prepared, appropriately dressed, and enthusiastic about the topics at hand are also attributes of a true professional. Maintaining contact with professional organizations is vital to professional

development, as is being a reflective practitioner. Therefore, students are periodically evaluated on their professional dispositions, encouraged to join professional organizations inside and outside of the university, and expected to consistently reflect on their beliefs and actions.

This framework, informed by both experience and scholarship is what drives Lock Haven University's Secondary Mathematics Education program. The Department of Mathematics strives to embody this framework and to encourage reflection on it by its students, faculty, supporting faculty, and field experience cooperating teachers. We believe that this Conceptual Framework provides a strong basis for developing outstanding secondary mathematics teachers.

#### References

- Grouws, D.A., Cooney, T.J., & Jones, D. (1988). *Perspectives on Research on Effective Mathematics Teaching*, Reston, VA: NCTM.
- Jones, D. (1995). Making the Transition: Tensions in Becoming a (Better) Mathematics Teacher. *Mathematics Teacher*, 88(3), 230-234.
- National Commission on Teaching and America's Future. (1996). *What Matters Most: Teaching for America's Future*. New York: National Commission on Teaching for America's Future.
- NCTM (2000). *Principles and Standards for School Mathematics*. Reston, VA: NCTM.

## **PROGRAM OF STUDY**

Your program of study in the Secondary Mathematics Education Program consists of a set of Core Courses (which are the same as those for the B.A. degree in mathematics with the exception of Calculus 4), a set of mathematics courses from the Pure Discipline, one course from the Applied Discipline of mathematics, a set of Professional courses from the Mathematics Education Discipline of mathematics, a set of Professional Education courses from supporting departments, and a set of General Education and Elective courses. These are outlined below.

### **Core Courses (27 credits)**

COMP160	Programming I	(3 credits)
MATH141	Calculus 1	(3 credits)
MATH142	Calculus 2	(3 credits)
MATH243	Calculus 3	(3 credits)
MATH205	Foundations of Mathematics	(3 credits, spring only)
MATH310	Modern Algebra I	(3 credits, spring only)
MATH311	Elements of Linear Algebra	(3 credits, spring only)
MATH401	Real Analysis I	(3 credits, fall only)
MATH???	Elective 102, 107, 112, or above	(3 credits)

### **Pure Discipline (9 credits)**

MATH225	History of Mathematics	(3 credits, fall only)
MATH302	Number Theory	(3 credits, fall only)
MATH307	Foundations of Geometry	(3 credits, fall only)

### **Applied Discipline (3 credits)**

MATH312	Probability and Statistics	(3 credits, fall only)
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### **Professional Mathematics Education Discipline (19 credits)**

MATH200	Methods of Teaching Mathematics I	(3 credits, spring only)
MATH316	Methods of Teaching Mathematics II	(4 credits, fall only)
MATH493	Student Teaching and Practicum I	(6 credits)
MATH494	Student Teaching and Practicum II	(6 credits)

### **Professional Education Courses from Supporting Departments (22 credits)**

PSYC103	Adolescent Development	(3 credits)
EDTF101	Social Foundations of Education	(2 credits)
EDUC312	Classroom Management	(2 credits)
PSYC201	Educational Psychology	(3 credits)
SPEC202	Cult./Ling. Diversity in Education	(3 credits)
SPEC204	Cog. Dev. of Diverse Learners	(3 credits)
SPEC309	Effective Inst. Strat. for Sts. with Dis. in Incl. Set.	(3 credits)
SPEC345	Literacy Instruction for Sts. with Disabilities	(3 credits)

### **General Education Courses (52 credits)**

Wellness Core	(3 credits)
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Skills core

Composition (3 credits)

Speech (3 credits)

NOTE: Math credits are obtained in major, but credit hours must be made up with electives

Humanities

Art/Music/ Theatre (6 credits)

Literature (3 credits)

Philosophy (3 credits)

Social and Behavioral Sciences

World History (3 credits)

Government/Economics (3 credits)

Sociology/Anthropology (3 credits)

NOTE: Psychology credits are obtained in major, but credit hours must be made up with electives

Natural Sciences (6 credits)

NOTE: It is strongly suggested that Physics be taken here

Electives (16 credits)

NOTE: Twelve of these credits are taken up by the SPEC courses listed above under Professional Education Courses from Supporting Departments. The other four credits can come from any courses you desire.

Additional Requirements (Overlays)

Multicultural (MC)

Students will take two courses designated Multicultural

Writing Emphasis (WE)

Students will take three courses designated Writing Emphasis. The courses are beyond the first-year English composition class. Ideally, these will be taken as one class per year to maintain the writing skills developed in the first-year composition class.

NOTE: MATH225, MATH493 and MATH494 are WE courses.

Information Literacy (IL)

Students will take two courses designated Information Literacy

NOTE: MATH415 and MATH416 are IL courses.

External Experience (EE)

Students will take two units of External Experience, either as part of regular courses so designated or as approved and evaluated non-credit experience.

NOTE: MATH415 and MATH416 are EE courses.

NOTE: If a single course contains more than one designation of WE, MC, IL, and EE, then students may count all of the designations towards fulfilling their emphases requirements. These requirements may be fulfilled by any courses so designated.

The checksheet on the following page may be used to keep track of the courses you have taken, when you have taken them, and the grade received in each. Please note that keeping up with your course requirements is completely your responsibility, although your advisor is there to guide you in making decisions. However, the final decision is always up to the student.

**BACHELOR OF SCIENCE in EDUCATION: SECONDARY EDUCATION, MATHEMATICS CERTIFICATION**

A. <b>PRESCRIBED MAJOR COURSES*</b> (39 s.h.)	<u>WHEN TAKEN</u>	<u>GRADE</u>
COMP160: PROGRAMMING I (3)	_____	_____
MATH141: CALCULUS 1 (3)	_____	_____
MATH142: CALCULUS 2 (3)	_____	_____
MATH205: FOUNDATIONS OF MATHEMATICS (Spring Only) (3)	_____	_____
MATH225: HISTORY OF MATHEMATICS (Fall Only) (3)	_____	_____
MATH243: CALCULUS 3 (3)	_____	_____
MATH302: NUMBER THEORY (Fall Only) (3)	_____	_____
MATH307: FOUNDATIONS OF GEOMETRY (Fall Only) (3)	_____	_____
MATH310: MODERN ALGEBRA I (Spring Only) (3)	_____	_____
MATH311: ELEMENTS OF LINEAR ALGEBRA (Spring Only) (3)	_____	_____
MATH312: PROBABILITY AND STATISTICS (Fall Only) (3)	_____	_____
MATH401: REAL ANALYSIS I (Fall Only) (3)	_____	_____
MATHXXX: Elective 102, 107, 112 or above (3)	_____	_____

<b>B. PROFESSIONAL EDUCATION COURSES*</b> (29 s.h.)		
PSYC103: ADOLESCENT DEVELOPMENT (3)	_____	_____
EDTF101: SOCIAL FOUNDATIONS OF EDUCATION (2)	_____	_____
<u>BLOCK 1:</u> (Spring Only, usually taken the sophomore year)		
MATH200: METHODS OF TEACHING MATH 1 (3)	_____	_____
PSYC201: EDUCATIONAL PSYCHOLOGY (3)	_____	_____
<u>BLOCK 2:</u> (Fall Only, usually taken the semester before student-teaching)		
MATH316: METHODS OF TEACHING MATH 2 (4)	_____	_____
EDUC312: CLASSROOM MANAGEMENT FOR SEC. ED. (2)	_____	_____
Students will take one of the new SPED courses at this time	_____	_____
MATH493 & 494: STUDENT TEACHING AND PRACTICUM (6 each)	_____	_____

Within Major Q.P.A (From categories A AND B): Credit Hours \_\_\_\_\_ Quality Points \_\_\_\_\_ Q.P.A.

<b>C. GENERAL EDUCATION &amp; ELECTIVES</b> (52 additional credits)		
WELLNESS (3)	_____	_____
	_____	_____
	_____	_____
ART/MUSIC/THEATRE (6)	_____	_____
	_____	_____
COMPOSITION (3)	_____	_____
LITERATURE (3)	_____	_____
PHILOSOPHY (3)	_____	_____
SPEECH (3)	_____	_____
WORLD HISTORY (3)	_____	_____
GOVERNMENT OR ECONOMICS (3)	_____	_____
SOCIOLOGY OR ANTHROPOLOGY (3)	_____	_____
LABORATORY SCIENCE (6)	_____	_____
	_____	_____
ELECTIVES (16)		
	<u>SPED204: Cognitive Development of Diverse Learners (3)</u>	_____
	<u>SPED202: Cultural/Linguistic Diversity in Education (3)</u>	_____
	<u>SPED345: Literacy Instruction for Students with Disabilities (3)</u>	_____
	<u>SPED309: Effective Instructional Strategies for Students with Disabilities (3)</u>	_____
	_____	_____
	_____	_____
	_____	_____

\*Must earn a C or better in each course.

TOTAL CREDITS EARNED

OVERALL Q.P.A.

## FREQUENCY OF COURSE OFFERINGS

As you progress through the program, you will find that some courses are not offered every semester, and some are offered only once every several years. Careful advanced planning is recommended to assure that you will get the courses you want.

What follows is a rough guideline of how courses are currently offered. Certainly do not expect courses to be offered any more frequently than in the following guide. Check with your faculty advisor to keep abreast of any changes, as changes in the curriculum may warrant changes in these offerings. The point of this section is that not every math course at LHUP is offered every semester. This means that if you fail a course, you may not be able to simply retake it the next semester. In addition to this, getting off of a suggested plan of study may lead to conflicts in the times of some courses.

### Courses offered only in the fall

MATH225: History of Mathematics  
 MATH302: Number Theory  
 MATH307: Foundations of Geometry  
 MATH312: Probability and Statistics  
 MATH401: Real Analysis  
 BLOCK 2

### Courses offered only in the spring

MATH205: Foundations of Math  
 MATH310: Modern Algebra  
 MATH311: Elements of Lin. Alg.  
 BLOCK 1

NOTE: Other MATH courses that a student may choose to take as an elective may be offered only during a specific semester or “on demand.”

**SAMPLE FOUR-YEAR PLAN OF STUDY**  
**Beginning with MATH141, Calculus 1**  
**(Ideal)**

**FIRST SEMESTER**

MATH141 Calculus 1	3
PSYC103 Adol. Psych.	3
ENGL100 Composition	3
World History Elective	3
Art/Music/Theatre	3
MATH119 FY Seminar	<u>1</u>
	16

**SECOND SEMESTER**

MATH142 Calculus 2	3
MATH205 Found. of Math	3
ENGL110 Intro. to Lit.	3
EDUC101 Soc. Fnd. of Ed.	2
Sociology/Anthropology	<u>3</u>
	14

**THIRD SEMESTER**

MATH243 Calculus 3	3
MATH225 Hist. of Math	3
COMP160 Programming I	3
Lab Science (physics)	3
Speech	3
SPED204 Cog. Dev.	<u>3</u>
	18

**FOURTH SEMESTER**

MATH200 Meth. of Math 1	3
PSYC201 Ed. Psych.	3
MATH311 Linear Algebra	3
Wellness	3
Art/Music/Theatre	<u>3</u>
	15

**FIFTH SEMESTER**

MATH307 Found. of Geom.	3
MATH302 Number Theory	3
Government/Economics	3
Philosophy	3
SPED202 Cult./Ling. Div	<u>3</u>
	15

**SIXTH SEMESTER**

MATH310 Modern Alg. 1	3
MATH elective	3
SPED345 Lit. Inst. for Disab.	3
Elective	3
Lab. Science	<u>3</u>
	15

**SEVENTH SEMESTER**

MATH316 Meth. of Math 2	4
EDUC312 Classroom Man.	2
SPED309 Eff. Inst. Strat.	3
MATH312 Prob. & Stats.	3
MATH401 Real Analysis	<u>3</u>
	15

**EIGHTH SEMESTER**

MATH493 Stud. Teach. 1	6
MATH494 Stud. Teach. 2	<u>6</u>
	12

**Total Credits = 120**

**SAMPLE FOUR-YEAR PLAN OF STUDY**  
**Beginning with MATH141, Calculus 1**  
**(Typical)**

**FIRST SEMESTER**

MATH141 Calculus 1	3
PSYC103 Adol. Psych.	3
ENGL100 Composition	3
World History Elective	3
Art/Music/Theatre	3
MATH119 FY Seminar	<u>1</u>
	16

**SECOND SEMESTER**

MATH142 Calculus 2	3
Elective	3
ENGL110 Intro. to Lit.	3
EDUC101 Soc. Fnd. of Ed.	2
Sociology/Anthropology	<u>3</u>
	14

**THIRD SEMESTER**

MATH243 Calculus 3	3
MATH225 Hist. of Math	3
COMP160 Programming I	3
Lab Science (physics)	3
Speech	3
SPED204 Cog. Dev.	<u>3</u>
	18

**FOURTH SEMESTER**

MATH200 Meth. of Math I	3
PSYC201 Ed. Psych.	3
MATH205 Found. of Math	3
MATH Elective	3
Art/Music/Theatre	<u>3</u>
	15

**FIFTH SEMESTER**

MATH307 Found. of Geom.	3
MATH302 Number Theory	3
Government/Economics	3
Philosophy	3
SPED202 Cult./Ling. Div.	<u>3</u>
	15

**SIXTH SEMESTER**

MATH310 Modern Alg. 1	3
MATH311 Linear Algebra	3
SPED345 Lit. Inst. for Disab.	3
Wellness	3
Lab. Science	<u>3</u>
	15

**SEVENTH SEMESTER**

MATH316 Meth. of Math 2	4
EDUC312 Classroom Man.	2
SPED09 Eff. Inst. Strat.	3
MATH312 Prob. & Stats.	3
MATH401 Real Analysis	<u>3</u>
	15

**EIGHTH SEMESTER**

MATH415 Stud. Teach. 1	6
MATH416 Stud. Teach. 2	<u>6</u>
	12

**Total Credits = 120**

**SAMPLE FOUR-YEAR PLAN OF STUDY**  
**Beginning with MATH113, Precalculus**  
**(also typical)**

**FIRST SEMESTER**

MATH113 Precalculus	3	
PSYC103 Adol. Psych.	3	
ENGL100 Composition	3	
World History Elective	3	
Art/Music/Theatre	3	
MATH119 FY Seminar	<u>1</u>	
	16	

**SECOND SEMESTER**

MATH141 Calculus 1	3	
ENGL110 Intro. to Lit.	3	
EDUC101 Soc. Fnd. of Ed.	2	
Art/Music/Theatre	3	
Sociology/Anthropology	<u>3</u>	
	14	

**THIRD SEMESTER**

MATH142 Calculus 2	3	
MATH225 Hist. of Math	3	
COMP160 Programming I	3	
Lab Science (physics)	3	
Speech	3	
SPED204 Cog. Dev.	<u>3</u>	
	18	

**FOURTH SEMESTER**

MATH200 Meth. of Math I	3	
PSYC201 Ed. Psych.	3	
Wellness	3	
MATH243 Calculus 3	3	
MATH205 Found. of Math	<u>3</u>	
	15	

**FIFTH SEMESTER**

MATH307 Found. of Geom.	3	
MATH302 Number Theory	3	
Government/Economics	3	
Philosophy	3	
SPED202 Cult./Ling. Div.	<u>3</u>	
	15	

**SIXTH SEMESTER**

MATH310 Modern Alg. 1	3	
MATH311 Linear Algebra	3	
SPED345 Lit. Inst. for Disab.	3	
Elective	3	
Lab. Science	<u>3</u>	
	15	

**SEVENTH SEMESTER**

MATH316 Meth. of Math 2	4	
EDUC312 Classroom Man.	2	
SPED309 Eff. Inst. Strat.	3	
MATH312 Prob. & Stats.	3	
MATH401 Real Analysis	<u>3</u>	
	15	

**EIGHTH SEMESTER**

MATH415 Stud. Teach. 1	6	
MATH416 Stud. Teach. 2	<u>6</u>	
	12	

**Total Credits = 120**

## **LOCK HAVEN UNIVERSITY'S DEGREE STRUCTURE**

In recent years, there has been much discussion as to the name of the degree that students will receive from Lock Haven University's Secondary Mathematics Education Program. Even though the program is housed within the Department of Mathematics, which is in the College of Arts and Science, you will receive a Bachelor of Science (B.S.) degree in Education. Your major is Secondary Education, with a Mathematics Concentration.

It is informative to know that this degree differs from Lock Haven's Bachelor of Arts (B.A.) degree in Mathematics by one core course (Calculus 4) and two elective mathematics courses in a Discipline of choice, either Pure or Applied Mathematics, along with courses in Foreign Language and Seminars. However, these Mathematics credits for the Secondary Mathematics Education major are earned within your concentration area of Professional Mathematics Education.

With that said, the student in the Secondary Education Certification Track should be aware that if they later choose to earn a graduate degree in Pure or Applied mathematics, it is possible that the university of choice may require that an undergraduate course or two be taken prior to admittance into their program. However, if the student in the Education Certification Track chooses to earn a graduate degree in Mathematics Education, they will be well-prepared for any program at any university.

## **RECOMMENDATIONS FOR GRADUATE SCHOOL IN MATHEMATICS**

If the student who is seeking the degree of B.S. in Education, Secondary Education Mathematics is considering earning a graduate degree in an area of Pure or Applied Mathematics, it would be wise for that student to take the Calculus 4 course, MATH244. In addition to this, it is suggested that students with this desire take Differential Equations, MATH301. Taking these courses will allow this student a greater opportunity for success in graduate school training in mathematics.

## **ADVISEMENT**

While every student is assigned a faculty advisor, the student is ultimately responsible for academic decisions. The advisor can provide information and guidance to help the student make an informed decision or direct the student to someone who else who can be of assistance. It is strongly recommended that students meet with his/her assigned advisor at least once a semester to discuss academic progress and review requirements. In fact, Lock Haven University has made it necessary to meet with your advisor in order to be cleared to register for the subsequent semester.

All students in the Secondary Mathematics Education Program are advised by mathematics faculty. This does not mean that a student may not obtain advisement from another faculty member with whom he/she has made a connection, as long as that person is aware of the requirements of the degree structure. However, students still must be cleared by their official Advisor. In addition to this, the Office of Teacher Education may be consulted with questions concerning certification requirements.

Please be familiar with the LHUP Student and Advising Handbooks.

## **TECHNOLOGY**

While the Secondary Mathematics Education Program at Lock Haven University maintains and employs up-to-date technological resources for its courses, at the time of this writing there is no requirement for a specific type of graphing calculator that is used across the Program. However, it is recommended that students obtain a TI-83 Plus or a TI-84 Plus. This is the graphing calculator that is currently the most commonly used in the secondary classroom.

The faculty in the Department of Mathematics relies on up-to-date technology and software to teach courses. The students will be introduced to such software as The Geometer's Sketchpad, Mathematica, Fathom, Minitab, and LaTeX, as well as technological devices such as SmartBoards, Calculator-based Laboratories, and Calculator-based Rangers. These devices and programs will not only help the student develop a better conceptual understanding of topics being presented, but will also help the student become a better teacher of mathematics themselves.

## **GRADE-POINT-AVERAGE REQUIREMENTS AND ADVISEMENT OUT OF THE MAJOR**

The Pennsylvania Department of Education has strict guidelines concerning the GPA of students who wish to become teachers. All students desiring to become certified in the state of Pennsylvania must maintain an overall grade-point-average of 3.000.

Keep in mind that a student is not officially admitted into the Program until certain requirements are met, which are explained in another section of this guidebook. In order to be admitted into the Program, the student must obtain a 3.000 as described above and maintain this grade-point-average until graduation. The state of Pennsylvania will not certify anyone who does not have an overall grade-point-average of at least 3.000.

Furthermore, due to the fact that is very difficult to bring up a GPA of less than 3.000 in only a few credits, once you have earned over 90 credits, you must already have a 3.000 in order to enroll in the Professional Semester (the semester before student-teaching). **No student will be permitted to enroll in Block 2 or Student-Teaching without having a 3.000 GPA.**

Finally, due to these strict requirements, it is possible that a student may be advised to change majors if it becomes increasingly difficult to obtain a 3.000 in a timely manner; however, the ultimate decision whether to change majors or continue to try to earn the 3.000 is the students'.

NOTE: You may hear from others on campus that their major requires them to have a 3.000 in their major courses, as well as an overall 3.000. This IS NOT the case for math majors. You only have to earn a 3.000 OVERALL gpa.

## PRAXIS EXAMS

The state of Pennsylvania requires its teachers to take and pass state licensure exams before being certified to teach. Lock Haven University follows these guidelines and does not require any standard above that which the state of Pennsylvania requires. These tests are given by the Educational Testing Service (ETS, [www.ets.org](http://www.ets.org)). Information packets may be obtained online or in the Office of Teacher Education on the sixth floor of Robinson Learning Center.

There are two rounds of testing that occurs. The PRAXIS I, Academic Skills Assessment, is a test designed to be taken early in a student's career to measure reading (Test #10710), writing (Test #20720), and mathematics (Test #10730) skills. A student should plan to take this test during either the freshman year or the first semester of the sophomore year. **This is a pre-requisite for Block 1 and for achieving Candidacy.**

The PRAXIS II, Subject Assessment (Test #0061 for Secondary Mathematics Certification), measures a candidate's knowledge of the subject they will teach, as well as general and subject-specific pedagogical skills and knowledge. A student should plan to take this test during the semester prior to their student-teaching semester. **This test must be either taken or registered for before student-teaching.**

You can pass the Praxis I exams in two ways. You can earn scores of 172, 173, and 173 on the reading, writing, and math tests, respectively. Alternatively, you can earn a composite score of 521, with minimum scores of 169, 170, and 170 on the respective tests.

In order to pass the Praxis II exam, you must earn a 136 on the test.

## **FIELD EXPERIENCES**

The Teacher Education Unit and Secondary Mathematics Education Program at Lock Haven University have created several requirements for its candidates concerning Field Experiences. Research has made it well known that Field Experiences are an integral part of any successful teacher education program; and accrediting agencies have expected and required it to be a part of any accredited program. Lock Haven University's Secondary Mathematics Education Program has some unique field experience opportunities and requirements for its candidates. The following paragraphs outline the requirements for students.

During the Block 1 semester (traditionally the second semester of the sophomore year, described in a different section of this guidebook), as part of their coursework, students are required to spend approximately six full days (36 hours) with a cooperating teacher, arranged by the University. The expectations for this early field experience are to observe and assist an experienced teacher in a real classroom setting. A student will not be allowed to student-teach if they have not met this requirement. In addition to this, Block I offers a 10-hour Field Experience in an urban setting.

During one of the student's traditional junior year semesters (earlier if desired, and in extreme cases during the Block 2 semester, although this is very difficult to do), he/she is required to obtain additional field experience hours. The ideal opportunities are as a tutor in one of our partnership tutoring programs in a local middle or high school. However, service with a campus or outside agency in an approved mentoring capacity may be accepted, as may hours attached to a Special Education course. The purpose of these opportunities is twofold: first, the student must obtain 10 additional hours of field experience in a diverse setting; second, the student must obtain another 10 additional hours of field experience in any setting. Therefore, in addition to the hours already obtained during the Block 1 semester, the student needs to obtain two additional 10 hours of field experience: one in a diverse setting and one in any setting (although, by doing 20 hours in a diverse setting, both requirements can be met). These opportunities will be posted and students' service will be recorded. It is the student's responsibility to be sure they meet these requirements. A student will not be allowed to student-teach if they have not met this requirement.

During the Block 2 semester (traditionally the semester before student-teaching, described in a different section of this guidebook), as part of their coursework, students are required to spend approximately six full days (36 hours) with a cooperating teacher, arranged by the University. The expectations for this field experience are to observe, assist, and teach a series of lessons in a real classroom setting with an experienced teacher. A student will not be allowed to student-teach if they have not met this requirement.

During the student-teaching semester (traditionally the final semester), the student is placed with two different cooperating teachers for the entire semester. This is a 14-week placement divided, usually, into experiences in both a middle-school and high-school settings. The expectations of this Field Experience are to engage in the regular teacher's day for one entire semester.

## FIELD EXPERIENCE TABLE

The following table should be used to keep track of your field experiences and to include in your portfolios.

NAME \_\_\_\_\_

Semester	School	Grades/ Subjects	# of Hours	Attached Course?	Duties

## **DIVERSITY**

The Secondary Mathematics Education Program at Lock Haven University is committed to giving its students the opportunity to work with diverse faculty, peers, and students. As a rural institute that is quite far (3+ hours) from any major city, this is sometimes a challenge; however, not only has the program found ways to arrange required diverse experiences, it has also provided several other volunteer opportunities for experience in diverse settings.

A student's diverse experiences are initiated when the freshmen student completes a Diversity Profile Plan describing their personal background and experiences with others of a diverse nature. The student is then required to spend a total of 20 hours in diverse placements.

Block I has a 10-hour diverse placement in an urban setting; therefore, students have met 10 hours in this course. Students can easily fulfill the other 10 hours by volunteering to tutor at Roosevelt Middle School in Williamsport during their traditional junior year of study when no Block courses are taken. Other opportunities to obtain these 10 hours exist by taking a special education course or volunteering for several other on-campus or off-campus opportunities.

In addition to these diverse experiences, the student will be placed in a diverse setting during either the Block 2 field experience or one of the student-teaching experiences. Finally, there are opportunities to student-teach in the Philadelphia area, as well as several locations in other countries.

The faculty in the Department of Mathematics is culturally diverse. At the time of this writing, over twenty-five percent of the instructors are from a culturally diverse background. In addition to this, Lock Haven University has gone to great measures to recruit students of a diverse background. While the university is the third smallest in the State System (14 schools), it has the second highest number of international students.

## **LHUP TEACHER EDUCATION DEFINITION OF DIVERSITY EXPERIENCE**

A potentially life-transforming exercise that immerses individuals as participant observers in diverse environments, which differ from their own. An experience that makes students deeply value other cultures and instills in them greater sensitivity to issues of diversity such as race and ethnicity, religion, socioeconomic status, language, and exceptionality that affects teaching and student learning. An experience that awakens in the student an awareness of his or her own value systems and assumptions about life.

## DISPOSITIONS

Lock Haven University believes that all candidates in teacher education programs should demonstrate values, commitments, and professional ethics that are consistent with the expectations of our area school districts and surrounding communities. The following list of nine dispositions and identifying observable behaviors are desirable in all Lock Haven University faculty, cooperating teachers and preservice teacher candidates. Some of these dispositions have been derived from the dispositions identified by the INTASC Principles.

1. The effective practitioner demonstrates *oral communication skills* that include: An absence of distracting mannerisms, an absence of repetitious words, an ability to speak at appropriate pace, correct grammar usage, an ability to enunciate words correctly, an ability to project his/her voice, and organization of thought.
2. The effective practitioner demonstrates *written communication skills* that include: Organization of thought, correct grammar usage, clear and concise writing, and correct mechanics.
3. The effective practitioner demonstrates *collaboration skills* that include: Acceptance of constructive criticism, an ability to seek feedback, acceptance of equality of the workload, and maintaining responsible behavior with borrowed materials.
4. The effective practitioner demonstrates *reflective skills* that include: An ability to self-evaluate, a willingness to make changes based on self-evaluation, and a willingness to formulate measures for self-improvement.
5. The effective practitioner demonstrates *preparedness* by exhibiting behaviors that include: Arriving at class on time/ leaving class at scheduled time, preparing for class, and preparing all needed materials for class.
6. The effective practitioner demonstrates *professional commitment* by exhibiting behaviors that include: Prompt notification of absences, a willingness to make-up work missed due to absence, and a willingness to give extra “out of class” time to school-related activities.
7. The effective practitioner demonstrates *a positive attitude* by exhibiting behaviors that include: Enthusiasm; such as smiling, use of animated language, actively engaging students, a willingness to receive other’s ideas and suggestions, using nonconfrontational body language, using body language that suggests active listening, and using a nonrebuking tone of voice.
8. The effective practitioner demonstrates *ethical behaviors* that include: Non-bias treatment of peers, maintenance of appropriate student-faculty relationship, maintenance of personal integrity, and respecting laws within the community.
9. The effective practitioner demonstrates *a level of independence* by exhibiting behaviors that include: Developing own ideas, initiative in completing classroom tasks, and a limited need for reassurance.

## **“BLOCKS”**

The Secondary Mathematics Education Program at Lock Haven University uses the term “block” to refer to a set of cohesive classes taken during the same semester, within a block of time, in which there are required Field Experience opportunities. There are two such blocks in this program.

Block I is offered only during the spring semester and is typically taken during a traditional student’s second semester of the sophomore year. This set of courses consists of a three-credit Methods of Teaching Mathematics course and a three-credit Educational Psychology course. In addition to these courses, there is included within this block a Field Experience component as described in an earlier section of this guidebook.

Block II is offered only during the fall semester and is typically taken during a traditional student’s semester before student-teaching (fall of the senior year). This set of courses consists of a four-credit Methods of Teaching Mathematics course and a two-credit Classroom Management course. In addition to these courses, there is included within this block a Field Experience component as described in an earlier section of this guidebook.

These blocks are designed to afford the student an opportunity to closely examine a set of related professional topics and to experience a time in the field. A professional mindset is assumed and needed in order to be successful during this time period.

## **PORTFOLIOS**

A student in the Secondary Mathematics Education Program at Lock Haven University is required to develop and submit two portfolios at two different points in time during their educational career. The first is a Developing Portfolio and is to be submitted and presented the semester before a student can enroll in the Professional Semester (the Block II semester). The second is a Senior Portfolio and is to be submitted and presented at the end of the student-teaching semester before graduation. The detailed directions for both of these portfolios can be obtained from the Office of Teacher Education or will be given to the student by the Program Coordinator.

## **LIVETEXT**

The Council on Teacher Education (COTE) at Lock Haven University has adopted the use of an online educational service of web-based tools to assist its students in the development of standards-based lesson plans, unit plans, and portfolios. This service also assists the University with developing, managing, and assessing its programs for accreditation purposes (explained in a different section in this guidebook).

Students are required to purchase a username and password from either the website ([www.livetext.com](http://www.livetext.com)) or from the campus bookstore. Currently, the cost of this service is approximately \$100 but is good for a five year time period. This web-tool is used to submit lesson plans, unit plans, and to develop your portfolios described in an earlier section of this guidebook. Currently, a student must purchase a LiveText account when applying for admission into the Teacher Education Program (explained in a later section) or while enrolling in Block I courses. LiveText is used during the Block I semester.

## **TUBERCULOSIS (TB) TEST**

Evidence of negative results from a tuberculosis test is required before students may enter any school for field placements or student teaching. Students should obtain a TB clearance before enrolling in their Block I courses (explained in another section). This test can be obtained at the Glennon Infirmary and is valid for two years. Be sure to obtain another test before student-teaching, if the first test will expire before student-teacher is completed. This test is completed in two parts. The student is first pricked and then must return a few days later to obtain the results. Therefore, it is imperative that the student plan ahead to be available both days.

## **FBI, PA CRIMINAL RECORD CHECK (ACT 34) AND CHILD ABUSE HISTORY CLEARANCE (ACT 33/151) REPORTS**

All teacher candidates must possess a current FBI, PA Criminal Record Check (Act 34) and a Child Abuse History Clearance (Act 33/151) in order to participate in any Field Experience and to be certified to teach. The forms for these reports can be obtained from the Teacher Education Office on the sixth floor of Robinson and should be submitted to that office when completed. Some of these reports may be obtained online in the event that lack of planning warrants a rush delivery. The FBI clearance is valid for the entire time that you are continuously enrolled at LHUP, while the other reports are valid for one year. These should initially be completed during the sophomore year.

## **LIABILITY INSURANCE**

Students are required to obtain liability insurance for Block 2 Field Experience, as described in a previous section. This insurance will protect you from any lawsuits that may occur while you are in the Field. Such insurance may be obtained by joining one of several professional educator associations or by securing a rider policy to a homeowner's policy. A policy of \$500,000 to \$1,000,000 should suffice. At this writing, a policy of \$1,000,000 comes with a \$25 membership to the Student Pennsylvania State Education Association (SPSEA) on campus. However, some students find that their personal convictions are in conflict with this organization. In such cases, that student should seek liability insurance from another source. Membership in the National Council of Teachers of Mathematics (NCTM) does NOT come with liability insurance.

## **PROFESSIONAL CLUBS AND ORGANIZATIONS**

It is highly recommended that students get as involved as possible in professional organizations as soon as possible in their careers. The Secondary Mathematics Education Program at Lock Haven University has made it easy to satisfy this recommendation.

The Math Club on campus is the Student Chapter of the Mathematics Association of America (MAA), one of the premier professional organizations for mathematicians. This organization meets regularly on campus and has several activities planned each semester.

During your Block semesters, you will be encouraged to join the National Council of Teachers of Mathematics (NCTM) and the Pennsylvania Council of Teachers of Mathematics (PCTM) at a greatly reduced student rate. The NCTM is the premier organization for secondary mathematics teachers in the nation.

The University maintains clubs that are a part of the Pennsylvania State Education Association (PSEA). These clubs are the Student-PSEA (SPSEA) and the Secondary Education Student-PSEA (SESPSEA). All students are strongly encouraged to join these organizations.

## **ACCEPTANCE INTO THE TEACHER CERTIFICATION PROGRAM (Also known as “Achieving Candidacy” or “Stage I” Requirements)**

When a student declares a major of Secondary Education, Mathematics Certification, this DOES NOT signify being admitted into the actual Teacher Certification Program. The Pennsylvania Department of Education has set strict guidelines for being officially admitted into a Teacher Certification Program. Lock Haven University requires that students complete a few additional requirements.

The following guidelines represent what is required for a student to gain admittance into LHU’s Teacher Certification Program. These are also known as Stage I Requirements.

1. Completion of 45 semester credit hours
2. An overall GPA of 3.0
3. Obtain a C- or better in English Composition, English Literature
4. Obtain a C or better in MATH and Professional courses.
5. Complete a Self-Evaluation Disposition Competency Form in LiveText
6. Complete a Diversity Profile Plan
7. Obtain FBI, Act 33/151, and Act 34 Clearances
8. Obtain a negative TB test result
9. Complete a Technology Self-Assessment Form in LiveText

The student may choose to apply for Candidacy at any time they can meet these requirements. However, a student may not enroll in any 300 or 400 level Professional courses until achieving Candidacy. Please keep in mind that achieving candidacy is NOT a requirement of enrolling in Block I courses. The requirements for enrolling in Block I courses are described next. It is strongly suggested that students apply for Candidacy as soon as they are eligible.

## **ELIBILITY TO ENROLL IN “BLOCK I” COURSES**

In order to enroll in Block 1 courses, the Department of Mathematics has set several requirements to ensure that the students in this course are seriously pursuing a career in secondary mathematics education and are prepared to represent Lock Haven University and the Department of Mathematics in local school districts. The following criteria must be met in order to enroll in Block I courses:

1. Have passed (C or better) or be presently enrolled in MATH142, Calculus 2
2. Have passed (C or better) or be presently enrolled in MATH205, Foundations of Mathematics
3. Have passed (C or better) or be presently enrolled in EDUC101, Social Foundations of Education
4. Have passed (C or better) or be presently enrolled in PSYC103, Adolescent Psychology
5. Have passed all Praxis I exams

**NOTE:** Block I is NOT a Secondary Mathematics Education major’s “Professional Semester.” The “Professional Semester” is the semester before the student student-teaches and consists of Block II courses.

While maintaining Clearances, TB tests, etc. are not required to “enroll” in Block I courses, these will be required to participate in mandatory Field Experiences during this semester. Therefore, it is strongly suggested that the student obtain these tests and clearances prior to enrolling in Block I and maintain them throughout the Program.

While earning Candidacy is not a requirement of enrolling in Block I, students are expected to be eligible to become a Candidate at the end of the Block I semester. If a student is not eligible for Candidacy and his/her records indicate that Candidacy may not be able to be earned at the end of the Block I semester, he/she may be advised out of enrolling in Block I and into a course of action that will allow them to become eligible to achieve Candidacy.

**COMPLETING AND PRESENTING THE DEVELOPING PORTFOLIO  
(Also known as “Stage II” Requirements)**

Before a student can enroll in the Professional Semester (Block II courses, the semester before student-teaching), he/she must complete and present a Developing Portfolio. The directions for completing and presenting this Portfolio can be obtained from the Coordinator of Secondary Mathematics Education or the Teacher Education Office. However, the following list outlines the requirements for developing and completing the Developing Portfolio. Note that some of these requirements may have been met while applying for Candidacy.

1. Achieve Candidacy (meeting Stage I Requirements)
2. Overall GPA of 3.0
3. C- or better in Speech, History, Sciences
4. No grade of lower than a C in MATH or Professional courses.
5. 60 hours of Field Experience (these consist of the hours obtained through Block I experiences)
6. 20 hours of Diverse Field Experience (these consist of the hours obtained through Block I experiences and tutoring during your junior year)
7. A Diversity Essay (from one of the Diverse Field Experience above)
8. Portfolio artifacts
9. Portfolio reflections

## **ELIGIBILITY TO ENROLL IN “BLOCK II” COURSES**

Block II is the Secondary Mathematics Education major’s “Professional Semester” before student-teaching and as such must only be taken by those students who have met very strict requirements. The following guidelines must be met in order to enroll in Block II courses.

1. Maintain Candidacy (i.e. an overall GPA of 3.0)
2. Be eligible to student-teach the following semester (or in certain cases within the next two semesters)
3. Completed and presented the Developing Portfolio (Stage II Requirements) during the semester before this Professional Semester
4. Completed all course requirements that will allow student-teaching to occur the following semester (or in certain cases within the next two semesters)

**NOTE:** The student should register to take the Praxis II exam while enrolled in Block II courses, if not before, as this test must be passed before certification can be recommended by the University. All students must either have attempted the Praxis II exam, or have proof that they are registered to take it, before the Student-Teaching Semester, but must have it passed before the state will certify them.

## **ELIBILITY FOR STUDENT-TEACHING SEMESTER**

In order to student-teach, the student must have completed the Professional Semester and maintained the overall 3.000 GPA requirements. In addition to this, the student must attend a Student-Teaching Meeting, announced by the Director of Student-Teaching, and submit a Student-Teaching Application to the Teacher Education Office on the 6<sup>th</sup> floor of Robinson. Finally, the student is reminded that Clearances, TB tests, and Liability Insurance are required for student-teaching and may not expire during the experience. The Praxis II exam must be attempted or be scheduled to be attempted before student-teaching.

**NOTE:** Some school districts in which students may be placed require that a potential student-teacher develop a small portfolio of documents prior to student-teaching. The Director of Student Teaching and Field Experience has required that all student-teachers create this small portfolio. The Coordinator of Secondary Mathematics will guide you through the creation of this portfolio. Also note that some districts even require the potential student-teacher to attend an interview prior to student-teaching.

## **SENIOR PORTFOLIO**

### **Also known as “Stage III Requirements”**

During the student-teaching semester and prior to graduation, each student will develop a Senior Portfolio. The directions for this portfolio can be obtained from the Coordinator of Secondary Mathematics or from the Teacher Education Office and is explained by your student-teaching Supervisor.

**Lock Haven University Secondary Mathematics Education Program  
Certification Requirement Checklist/Timeline**

Year	Fall	Spring
<b>1</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Meet your advisor</li> <li><input type="checkbox"/> Enroll in the appropriate freshmen seminar</li> <li><input type="checkbox"/> Study hard...maintain a 3.0 overall G.P.A.</li> <li><input type="checkbox"/> Complete Diversity Profile Plan (not "required" until applying for Candidacy)</li> </ul> <p>NOTE: You must complete 6 credits of both English and Math before becoming a Candidate. You must complete or be enrolled in EDUC101, PSYC103, MATH142, and MATH205, and pass Praxis I, prior to enrollment in Block 1. So plan wisely.</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Study hard...maintain a 3.0 overall G.P.A.</li> <li><input type="checkbox"/> Meet with your advisor</li> </ul> <p>NOTE: You must complete 6 credits of both English and Math before becoming a Candidate. You must complete or be enrolled in EDUC101, PSYC103, MATH142, and MATH205, and pass Praxis I, prior to enrollment in Block 1. So plan wisely.</p>
<b>2</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Study hard...maintain a 3.0 overall G.P.A.</li> <li><input type="checkbox"/> Meet with your advisor</li> <li><input type="checkbox"/> Register and take the PRAXIS I 10710 PPST Reading (Passing Score: 172) 20720 PPST Writing (Passing Score: 173) 10730 PPST Math (Passing Score: 173) (composite 521, with 169, 170, 170)</li> <li><input type="checkbox"/> Get FBI, Act 34, and Act 33/151 clearances (must reapply for 34 and 33/151 yearly)</li> <li><input type="checkbox"/> Get TB test (valid for 2 years)</li> <li><input type="checkbox"/> Get liability insurance (must reapply yearly)</li> <li><input type="checkbox"/> Enroll in Block I for the spring semester</li> </ul> <p>NOTE: You must complete 6 credits of both English and Math before becoming a Candidate. You must complete or be enrolled in EDUC101, PSYC103, MATH142, and MATH205, and pass Praxis I, prior to enrollment in Block 1. So plan wisely.</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Study hard...maintain a 3.0 overall G.P.A.</li> <li><input type="checkbox"/> Meet with your advisor</li> <li><input type="checkbox"/> Successfully complete all Block I courses</li> <li><input type="checkbox"/> Begin construction of Developing Portfolio in LiveText</li> <li><input type="checkbox"/> <b>You may apply for candidacy if you meet requirements</b></li> </ul>
<b>3</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Study hard...maintain a 3.0 overall G.P.A.</li> <li><input type="checkbox"/> Meet with your advisor</li> <li><input type="checkbox"/> <b>Apply for candidacy (you must be a candidate before you can present your Developing Portfolio)</b></li> <li><input type="checkbox"/> Update clearances, TB tests, liability insurance as needed</li> <li><input type="checkbox"/> Complete tutoring requirement as outlined by your program coordinator during fall or spring semester</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Study hard...maintain a 3.0 overall G.P.A.</li> <li><input type="checkbox"/> Meet with your advisor</li> <li><input type="checkbox"/> <b>Complete Developing Portfolio in LiveText</b></li> <li><input type="checkbox"/> Schedule and make Developing Portfolio Presentation with the Program Coordinator for your program by Feb.15<sup>th</sup></li> <li><input type="checkbox"/> Complete tutoring requirement as outlined by your program coordinator during fall or spring semester</li> <li><input type="checkbox"/> Enroll in Block II for the fall semester</li> </ul> <p>NOTE: Students will not be permitted to enroll in Block 2 courses without Candidacy, completing all Developing Portfolio Requirements, and having a 3.0 overall G.P.A..</p>
<b>4</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Study hard... maintain a 3.0 overall G.P.A.</li> <li><input type="checkbox"/> Meet with your advisor</li> <li><input type="checkbox"/> Update clearances, TB tests, liability insurance as needed</li> <li><input type="checkbox"/> Register and take the PRAXIS II (this needs to be taken before student-teaching and passed before you can graduate)</li> <li><input type="checkbox"/> Attend student teaching meeting and apply for student teaching</li> <li><input type="checkbox"/> Successfully complete all Block 2 courses</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Student Teach</li> <li><input type="checkbox"/> Meet with your advisor</li> <li><input type="checkbox"/> Complete Student Teaching Portfolio and Presentation</li> <li><input type="checkbox"/> Apply for PA certification</li> <li><input type="checkbox"/> Apply for LHUP graduation</li> <li><input type="checkbox"/> Maintain a 3.0 overall G.P.A.</li> </ul>

\* Prior to achieving candidacy status, you have not been formerly accepted into a teacher certification program. This is a Pennsylvania Department of Education (PDE) stipulation.

## STANDARDS

The time in which we live is being directed by standards. Simply put, standards are guidelines to ensure that organizations are doing what is expected of them. It would be difficult to find an organization that is not governed by some set of standards in this day and age. Some standards are created by the organization itself, while some standards are created by outside agencies that help govern the organization under consideration. Throughout the Secondary Mathematics Education Program at Lock Haven University, you will hear mention of many different types of standards. It is important for the student to be knowledgeable of all standards of interest.

The Field of education is a leader in this standards movement. In fact, there are several agencies that help educational institutions ensure that students are receiving a high-quality education. One of the consequences of having standards is the fact that it is the responsibility of the educational institution to “prove” that its students meet the standards that have been set forth by other agencies. Therefore, the educational institution needs to require that students “prove” to the institution that they are meeting these standards. It is through this mechanism that the University shows the outside agencies that they are providing students with a high-quality education.

Lock Haven University is certainly no exception. Proudly, the Secondary Mathematics Program has been accredited by its governing body (NCTM) and the entire Educational Program at Lock Haven University has been accredited by its governing body (NCATE).

With that said, it is important for the student to know the outside agencies to which Lock Haven University answers and the standards set forth by each. The following is a list of the agencies, an explanation of their missions, and their standards, where appropriate, whether in brief or full.

### **NCTM: National Council of Teachers of Mathematics**

The NCTM is the main organization that governs the teaching of mathematics at the secondary level. This is the principal organization to which Lock Haven University’s Secondary Mathematics Education Program must answer. The Program has created an Assessment Plan that is aligned with the NCTM standards. This Assessment Plan will be outlined later in this document. The NCTM sets standards to ensure that math teachers properly know the mathematics they will teach, can apply appropriate mathematical pedagogy, and have had relevant and ample experiences throughout their program. While there are several positions and standards that you will closely examine as a student in this program, the following is a list of the standards that the University is expected to help each student meet.

#### **Standard 1: Knowledge of Mathematical Problem Solving**

Candidates know, understand, and apply the process of mathematical problem solving.

*Indicators*

- 1.1 Apply and adapt a variety of appropriate strategies to solve problems.
- 1.2 Solve problems that arise in mathematics and those involving mathematics in other contexts.
- 1.3 Build new mathematical knowledge through problem solving.
- 1.4 Monitor and reflect on the process of mathematical problem solving.

**Standard 2: Knowledge of Reasoning and Proof**

Candidates reason, construct, and evaluate mathematical arguments and develop an appreciation for mathematical rigor and inquiry.

*Indicators*

- 2.1 Recognize reasoning and proof as fundamental aspects of mathematics.
- 2.2 Make and investigate mathematical conjectures.
- 2.3 Develop and evaluate mathematical arguments and proofs.
- 2.4 Select and use various types of reasoning and methods of proof.

**Standard 3: Knowledge of Mathematical Communication**

Candidates communicate their mathematical thinking orally and in writing to peers, faculty, and others.

*Indicators*

- 3.1 Communicate their mathematical thinking coherently and clearly to peers, faculty, and others.
- 3.2 Use the language of mathematics to express ideas precisely.
- 3.3 Organize mathematical thinking through communication.
- 3.4 Analyze and evaluate the mathematical thinking and strategies of others.

**Standard 4: Knowledge of Mathematical Connections**

Candidates recognize, use, and make connections between and among mathematical ideas and in contexts outside mathematics to build mathematical understanding.

*Indicators*

- 4.1 Recognize and use connections among mathematical ideas.
- 4.2 Recognize and apply mathematics in contexts outside of mathematics.
- 4.3 Demonstrate how mathematical ideas interconnect and build on one another to produce a coherent whole.

**Standard 5: Knowledge of Mathematical Representation**

Candidates use varied representations of mathematical ideas to support and deepen students' mathematical understanding.

*Indicators*

- 5.1 Use representations to model and interpret physical, social, and mathematical phenomena.
- 5.2 Create and use representations to organize, record, and communicate mathematical ideas.
- 5.3 Select, apply, and translate among mathematical representations to solve problems.

**Standard 6: Knowledge of Technology**

Candidates embrace technology as an essential tool for teaching and learning mathematics.

*Indicator*

6.1 Use knowledge of mathematics to select and use appropriate technological tools, such as but not limited to, spreadsheets, dynamic graphing tools, computer algebra systems, dynamic statistical packages, graphing calculators, data-collection devices, and presentation software.

**Standard 7: Dispositions**

Candidates support a positive disposition toward mathematical processes and mathematical learning.

*Indicators*

- 7.1 Attention to equity
- 7.2 Use of stimulating curricula
- 7.3 Effective teaching
- 7.4 Commitment to learning with understanding
- 7.5 Use of various assessments
- 7.6 Use of various teaching tools including technology

**Standard 8: Knowledge of Mathematics Pedagogy**

Candidates possess a deep understanding of how students learn mathematics and of the pedagogical knowledge specific to mathematics teaching and learning.

*Indicators*

- 8.1 Selects, uses, and determines suitability of the wide variety of available mathematics curricula and teaching materials for all students including those with special needs such as the gifted, challenged and speakers of other languages.
- 8.2 Selects and uses appropriate concrete materials for learning mathematics.
- 8.3 Uses multiple strategies, including listening to and understanding the ways students think about mathematics, to assess students' mathematical knowledge.
- 8.4 Plans lessons, units and courses that address appropriate learning goals, including those that address local, state, and national mathematics standards and legislative mandates.
- 8.5 Participates in professional mathematics organizations and uses their print and on-line resources.
- 8.6 Demonstrates knowledge of research results in the teaching and learning of mathematics.
- 8.7 Uses knowledge of different types of instructional strategies in planning mathematics lessons.
- 8.8 Demonstrates the ability to lead classes in mathematical problem solving and in developing in-depth conceptual understanding, and to help students develop and test generalizations.
- 8.9 Develop lessons that use technology's potential for building understanding of mathematical concepts and developing important mathematical ideas.

**Standard 9: Knowledge of Number and Operation**

Candidates demonstrate computational proficiency, including a conceptual understanding of numbers, ways of representing number, relationships among number and number systems, and meanings of operations.

*Indicators*

- 9.1 Analyze and explain the mathematics that underlies the procedures used for operations involving integers, rational, real, and complex numbers.
- 9.2 Use properties involving number and operations, mental computation, and computational estimation.
- 9.3 Provide equivalent representations of fractions, decimals, and percents.
- 9.4 Create, solve, and apply proportions.
- 9.5 Apply the fundamental ideas of number theory.
- 9.6 Make sense of large and small numbers and use scientific notation.
- 9.7 Compare and contrast properties of numbers and number systems.
- 9.8 Represent, use, and apply complex numbers.
- 9.9 Recognize matrices and vectors as systems that have some of the properties of the real number system.
- 9.10 Demonstrate knowledge of the historical development of number and number systems including contributions from diverse cultures.

**Standard 10: Knowledge of Different Perspectives on Algebra**

Candidates emphasize relationships among quantities including functions, ways of representing mathematical relationships, and the analysis of change.

*Indicators*

- 10.1 Analyze patterns, relations, and functions of one and two variables.
- 10.2 Apply fundamental ideas of linear algebra.
- 10.3 Apply the major concepts of abstract algebra to justify algebraic operations and formally analyze algebraic structures.
- 10.4 Use mathematical models to represent and understand quantitative relationships.
- 10.5 Use technological tools to explore algebraic ideas and representations of information and in solving problems.
- 10.6 Demonstrate knowledge of the historical development of algebra including contributions from diverse cultures.

**Standard 11: Knowledge of Geometries**

Candidates use spatial visualization and geometric modeling to explore and analyze geometric shapes, structures, and their properties.

*Indicators*

- 11.1 Demonstrate knowledge of core concepts and principles of Euclidean and non-Euclidean geometries in two and three dimensions from both formal and informal perspectives.
- 11.2 Exhibit knowledge of the role of axiomatic systems and proofs in geometry.
- 11.3 Analyze characteristics and relationships of geometric shapes and structures.
- 11.4 Build and manipulate representations of two- and three- dimensional objects and visualize objects from different perspectives.

- 11.5 Specify locations and describe spatial relationships using coordinate geometry, vectors, and other representational systems.
- 11.6 Apply transformations and use symmetry, similarity, and congruence to analyze mathematical situations.
- 11.7 Use concrete models, drawings, and dynamic geometric software to explore geometric ideas and their applications in real-world contexts.
- 11.8 Demonstrate knowledge of the historical development of Euclidean and non-Euclidean geometries including contributions from diverse cultures.

**Standard 12: Knowledge of Calculus**

Candidates demonstrate a conceptual understanding of limit, continuity, differentiation, and integration and a thorough background in the techniques and application of the calculus.

*Indicators*

- 12.1 Demonstrate a conceptual understanding of and procedural facility with basic calculus concepts.
- 12.2 Apply concepts of function, geometry, and trigonometry in solving problems involving calculus.
- 12.3 Use the concepts of calculus and mathematical modeling to represent and solve problems taken from real-world contexts.
- 12.4 Use technological tools to explore and represent fundamental concepts of calculus.
- 12.5 Demonstrate knowledge of the historical development of calculus including contributions from diverse cultures.

**Standard 13: Knowledge of Discrete Mathematics**

Candidates apply the fundamental ideas of discrete mathematics in the formulation and solution of problems.

*Indicators*

- 13.1 Demonstrate knowledge of basic elements of discrete mathematics such as graph theory, recurrence relations, finite difference approaches, linear programming, and combinatorics.
- 13.2 Apply the fundamental ideas of discrete mathematics in the formulation and solution of problems arising from real-world situations.
- 13.3 Use technological tools to solve problems involving the use of discrete structures and the application of algorithms.
- 13.4 Demonstrate knowledge of the historical development of discrete mathematics including contributions from diverse cultures.

**Standard 14: Knowledge of Data Analysis, Statistics, and Probability**

Candidates demonstrate an understanding of concepts and practices related to data analysis, statistics, and probability.

*Indicators*

- 14.1 Design investigations, collect data, and use a variety of ways to display data and interpret data representations that may include bivariate data, conditional probability and geometric probability.

14.2 Use appropriate methods such as random sampling or random assignment of treatments to estimate population characteristics, test conjectured relationships among variables, and analyze data.

14.3 Use appropriate statistical methods and technological tools to describe shape and analyze spread and center.

14.4 Use statistical inference to draw conclusions from data.

14.5 Identify misuses of statistics and invalid conclusions from probability.

14.6 Draw conclusions involving uncertainty by using hands-on and computer-based simulation for estimating probabilities and gathering data to make inferences and conclusions.

14.7 Determine and interpret confidence intervals.

14.8 Demonstrate knowledge of the historical development of statistics and probability including contributions from diverse cultures.

### **Standard 15: Knowledge of Measurement**

Candidates apply and use measurement concepts and tools.

#### *Indicators*

15.1 Recognize the common representations and uses of measurement and choose tools and units for measuring.

15.2 Apply appropriate techniques, tools, and formulas to determine measurements and their application in a variety of contexts.

15.3 Complete error analysis through determining the reliability of the numbers obtained from measures.

15.4 Demonstrate knowledge of the historical development of measurement and measurement systems including contributions from diverse cultures.

### **Standard 16: Field-Based Experiences**

Candidates complete field-based experiences in mathematics classrooms.

#### *Indicators*

16.1 Engage in a sequence of planned opportunities prior to student teaching that includes observing and participating in both middle and secondary mathematics classrooms under the supervision of experienced and highly qualified teachers.

16.2 Experience full-time student teaching in secondary mathematics that is supervised by a highly qualified teacher and a university or college supervisor with secondary mathematics teaching experience.

16.3 Demonstrate the ability to increase students' knowledge of mathematics.

## **INTASC: International New Teacher Assessment and Support Consortium**

The Interstate New Teacher Assessment and Support Consortium (INTASC) is a consortium of state education agencies and national educational organizations dedicated

to the reform of the preparation, licensing, and on-going professional development of teachers. Created in 1987, INTASC's primary constituency is state education agencies responsible for teacher licensing, program approval, and professional development. Its work is guided by one basic premise: An effective teacher must be able to integrate content knowledge with the specific strengths and needs of students to assure that *all* students learn and perform at high levels.

Ideally, the INTASC standards and the NCTM standards are aligned with each other. While this is basically true, there are certain aspects of the Program that are aligned with different standards. This can sometimes cause confusion and therefore is a good reason to be familiar with all standards for which the student and University are required to meet. The following list outlines the INTASC Standards, without mention of the knowledge, dispositions, and performances for each, as does the formal documentation concerning INTASC standards.

**Standard 1:**

The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he/she teaches and can create learning experiences that make these aspects of subject matter meaningful for the students.

**Standard 2:**

The teacher understands how children learn and develop, and can provide learning opportunities that support their intellectual, social, and personal development.

**Standard 2:**

The teacher understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to the diverse learner.

**Standard 4:**

The teacher understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.

**Standard 5:**

The teacher uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.

**Standard 6:**

The teacher uses knowledge of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.

**Standard 7:**

The teacher plans instruction based upon knowledge of subject matter, students, the community, and curriculum goals.

**Standard 8:**

The teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social, and physical development of the learner.

**Standard 9:**

The teacher is a reflective practitioner who continually evaluates the effects of his/her choices and actions on others (students, parents, and other professionals in the learning community) and who actively seeks out opportunities to grow professionally.

**Standard 10:**

The teacher fosters relationships with school colleagues, parents, and agencies in the larger community to support students' learning and well-being.

**PDE: Pennsylvania Department of Education**

The Pennsylvania Department of Education produces a set of standards for mathematics that is very similar to that which the NCTM produces. The student is not required to align performances to the PDE Standards, as they are aligned with the NCTM and INTASC standards. Following are the PDE standards for mathematics.

**I. Knowing the Content**

The professional education program provides evidence that Mathematics certification candidates complete a program of Mathematics studies the same as the academic area content courses and required electives of a major in a bachelors' degree. The program shall require the candidates to demonstrate a knowledge of and competence in teaching students Mathematics concepts and processes necessary for a teacher at the secondary level (7-12) including:

I.A. History of mathematics as a tool for life and the workplace, and in contexts as part of a cultural heritage.

I.B. Examination of theories, research and practices related to student learning and achievement in mathematics to increase the quality of mathematics teaching.

I.C. Use of mathematical communication to:

- organize and consolidate mathematical thinking,
- explain mathematical thinking to other,
- analyze and evaluate strategies of others,
- express mathematical ideas precisely

I.D. Concepts of calculus including:

- differential and integral calculus,
- sequences and series,
- methods of integration,
- transcendental functions,
- polar coordinates,
- analytic geometry,
- multivariable derivatives and integrals

I.E. Number theory including:

- numbers, ways of representing numbers, relationships among numbers and number systems,
- meanings of operations and how they relate to one another

I.F. Functions including:

- generalize patterns using explicitly defined and recursively defined functions,
- properties of classes of functions; such as polynomial, rational, algebraic, exponential, logarithmic, and trigonometric functions,
- representing functions numerically, symbolically, graphically, and verbally

I.G. Geometry including:

- fundamental ideas of measurement and spatial visualization,
- nature of axiomatic reasoning,
- transformations, coordinates and vectors,
- trigonometry from a geometric perspective,
- use of technological tools in geometry
- Euclidean and non-Euclidean geometry

I.H. Linear algebra including:

- matrices,
- systems of linear equations,
- vector spaces,
- linear transformations,
- determinants,
- eigenvalues

I.I. Abstract algebra including:

- structures, properties and examples of groups, rings, and fields,
- relevance of algebraic properties in the study of number systems

I.J. Probability and statistics including:

- measures of central tendency and variability,
- axioms of probability,
- properties of discrete and continuous probability,
- discrete and continuous probability distributions,
- statistical inference

I.K. Discrete mathematics including:

- logic, sets, relations and functions,
- mathematical induction,
- elementary graph theory,
- permutations and combinations

I.L. Mathematical modeling of physical, biological, social, psychological or conceptual entities.

I.M. Fundamental concepts and methodologies of analysis, including rigorous definitions and proofs of theorems including:

- make and investigate mathematical conjectures,
- develop and evaluate mathematical arguments

I.N. Enhancement of the learning of mathematical concepts through instructing students in the effective and appropriate use of technology (graphing calculators, computer software etc.), as well as other computational tools.

## **II. Performances**

The professional education program provides evidence of the candidates participation in sequential and developmental field experiences and student teaching, under the supervision of college personnel and cooperating teachers who are well trained in mathematics, have interpersonal skills and demonstrated competence in teaching. The program also provides evidence that the criteria and competencies for exit from the Mathematics certification program are assessed in coursework, field experiences and student teaching and require candidates to demonstrate their knowledge and competence in fostering student learning through:

II.A. Managing the instructional environment in order to:

- communicate challenging learning expectations to each student,
- establish and maintain rapport with students and promote mutual respect among students,
- instill in all students a belief that they can succeed in mathematics,
- establish and maintain consistent standards of classroom behavior,
- make the physical environment safe and conducive to learning,
- model school to career attributes and behaviors

II.B. Long-range and short-range planning of instruction, done independently and in collaboration with other educators, based upon:

- mathematics subject matter,
- students and the community,
- Pennsylvania Academic Standards, content analysis with specific objectives,
- instructional methods, including materials and activities,
- results of student assessments

II.C. Selecting, adapting and implementing a variety of instructional strategies ranging from computational exercises to complex problem solving to “essay-style” homework, class assignments, projects, and utilizing traditional tools as well as modern technologies

II.D. Selecting, analyzing, and modifying instructional materials to meet the needs of diverse learners

II.E. Assessing and evaluating student’s conceptual understanding of content through a variety of contextual settings, providing formative feedback to align instructional strategies assist to individual student needs

### **III. Professionalism**

The professional education program provides evidence that each teacher certification candidate demonstrate knowledge and competencies that foster professionalism in school and community settings including:

III.A. Professional organizations, journals, and other resources for professional development.

III.B. Integrity and ethical behavior, professional conduct as stated in Pennsylvania’s Code of Professional Practice and Conduct for Educators; and local, state, and federal laws and regulations.

III.C. Establish collaborative relationships with colleagues of the elementary, secondary and higher education levels to improve student learning.

III.D. Communicate effectively with parents or guardians, other agencies and the community at large to support learning by all students.

### **NCATE: National Council for Accreditation of Teacher Education**

The main organization that accredits Teacher Education Programs in the United States is NCATE. The University works very hard to meet the Standards set forth by this organization, and LHU is very proud of its strides in gaining and maintaining this accreditation. The Secondary Mathematics Education Program and the entire LHU Teacher Preparation Program has created an assessment system based on the standards set forth by NCATE. The following is a list of NCATE’s standards.

#### **Standard 1: *Candidate Knowledge, Skills, and Dispositions***

Candidates preparing to work in schools as teachers or other professional school personnel know and demonstrate the content, pedagogical, and professional knowledge, skills, and dispositions necessary to help all students learn. Assessments indicate that candidates meet professional, state, and institutional standards.

**Standard 2: *Assessment System and Unit Evaluation***

The unit has an assessment system that collects and analyzes data on the applicant qualifications, candidate and graduate performance, and unit operations to evaluate and improve the unit and its programs.

**Standard 3: *Field Experiences and Clinical Practice***

The unit and its school partners design, implement, and evaluate field experiences and clinical practice so that teacher candidates and other school personnel develop and demonstrate the knowledge, skills, and dispositions necessary to help all students learn.

**Standard 4: *Diversity***

The unit designs, implements, and evaluates curriculum and experiences for candidates to acquire and apply the knowledge, skills, and dispositions necessary to help all students learn. These experiences include working with diverse higher education and school faculty, diverse candidates, and diverse students in P–12 schools.

**Standard 5: *Faculty Qualifications, Performance, and Development***

Faculty are qualified and model best professional practices in scholarship, service, and teaching, including the assessment of their own effectiveness as related to candidate performance. They also collaborate with colleagues in the disciplines and schools. The unit systematically evaluates faculty performance and facilitates professional development.

**Standard 6: *Unit Governance and Resources***

The unit has the leadership, authority, budget, personnel, facilities, and resources, including information technology resources, for the preparation of candidates to meet professional, state, and institutional standards.

**ISTE/NETS-T: International Society for Technology in Education/National Education Technology Standards for Teachers**

ISTE is a nonprofit professional organization with a worldwide membership of leaders and potential leaders in educational technology. They are dedicated to providing leadership and service to improve teaching and learning by advancing the effective use of technology in K–12 education and teacher education. They provide their members with information, networking opportunities, and guidance as they face the challenge of incorporating computers, the Internet, and other new technologies into their schools. ISTE has developed Technology Standards for students as well as teachers. The Standards for teachers follow.

**Standard 1:** Technology Operations and Concepts.

*Teachers demonstrate a sound understanding of technology operations and concepts.*

*Teachers:*

- A. demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE National Education Technology Standards for Students)
- B. demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.

**Standard 2:** Planning and Designing Learning Environments and Experiences.

*Teachers plan and design effective learning environments and experiences supported by technology. Teachers:*

- A. design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.
- B. apply current research on teaching and learning with technology when planning learning environments and experiences.
- C. identify and locate technology resources and evaluate them for accuracy and suitability.
- D. plan for the management of technology resources within the context of learning activities.
- E. plan strategies to manage student learning in a technology-enhanced environment.

**Standard 3:** Teaching, Learning, and the Curriculum.

*Teachers implement curriculum plans, that include methods and strategies for applying technology to maximize student learning. Teachers:*

- A. facilitate technology-enhanced experiences that address content standards and student technology standards.
- B. use technology to support learner-centered strategies that address the diverse needs of students.
- C. apply technology to develop students' higher order skills and creativity.
- D. manage student learning activities in a technology-enhanced environment.

**Standard 4:** Assessment and Evaluation

*Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies. Teachers:*

- A. apply technology in assessing student learning of subject matter using a variety of assessment techniques.
- B. use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.

- C. apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.

**Standard 5:** Productivity and Professional Practice

*Teachers use technology to enhance their productivity and professional practice.*

*Teachers:*

- A. use technology resources to engage in ongoing professional development and lifelong learning.
- B. continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning.
- C. apply technology to increase productivity.
- D. use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.

**Standard 6:** Social, Ethical, Legal, and Human Issues

*Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK-12 schools and apply those principles in practice. Teachers:*

- A. model and teach legal and ethical practice related to technology use.
- B. apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.
- C. identify and use technology resources that affirm diversity
- D. promote safe and healthy use of technology resources.
- E. facilitate equitable access to technology resources for all students.

## **ACCREDITATION**

Lock Haven University is proud of its many programs that are accredited by state and national accrediting agencies. Based on the Standards mentioned in an earlier section of this guidebook, the Secondary Mathematics Education Program has been accredited by the Pennsylvania Department of Education (PDE) in 2004 and the National Council of Teachers of Mathematics (NCTM) in 2008. In addition to this, the entire Educational Unit of Teacher Education at Lock Haven University has been accredited by the Pennsylvania Department of Education (PDE) in 2004 and the National Council for Accreditation of Teacher Education (NCATE) in 2009.

It is with great effort that the Secondary Mathematics Education Program and the Educational Unit at Lock Haven University maintains these accreditations, and students should be proud that their program is thus accredited. There are certain requirements for students that are in place for the purpose of accreditation. The University and the Program appreciates student cooperation as they develop and maintain Assessment Systems in order to meet the demands of accreditation status.

## **ASSESSMENT SYSTEM**

The assessment process for students in the Secondary Mathematics Education Program at Lock Haven University has two primary purposes. First, it is intended to ensure that every graduate of the program is adequately prepared. Second, it provides the data needed to improve the program. Both purposes are accomplished in a continuous way.

The accrediting agencies described earlier require that the Program has an Assessment System that assesses students in all Standard areas outlined by the agencies. Therefore, the assessment process is comprehensive. Currently, the Secondary Mathematics Education Assessment Plan consists of the following assessments:

- PRAXIS II Licensure Test
- GPA's in major courses
- Lesson Plans Portfolio
- Student-teaching Competency Form
- Teacher Work Sample during student-teaching
- Field Experience Evaluation Form during Block 1 and Block 2 field experience
- Disposition Form
- Senior Portfolio
- PDE 430 during student-teaching

In addition to these assessments for the Program, the Educational Unit (the entire Teacher Education System at Lock Haven University) may use other types of assessments for its Assessment Plan.

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