

## **Zachary Tyler Grimes, Ph.D.**

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### **EDUCATION & ASSOCIATED ACADEMIC AWARDS**

#### **Ph.D., Mathematics and Science Education**

May 2021

Concentration: Science Education/Biology Education

Middle Tennessee State University,

Murfreesboro, TN

Dissertation Title: *A Mixed Method Evaluation of Anxiety Related to Biology Content in EC-16 Educators*

Major Professor and Dissertation Chair: Dr. G. E. Gardner

Dissertation Committee: Dr. S. Bleiler-Baxter, Dr. R. Seipelt-Thiemann, Dr. K. Mangione, Dr. S. Lampley

#### **M.Sc., Biology**

August 2017

Project Concentration: Genetics and Bioinformatics

Middle Tennessee State University,

Murfreesboro, TN

Thesis Title: *Developing a Model of AFP Transcriptional Regulation by Afr2, a Gene Implicated in Liver Cancer*

Major Professor and Thesis Chair: Dr. R. L. Seipelt-Thiemann

Thesis Committee: Dr. E. McClelland, Dr. J. Jessen

- J.J. Fletcher Endowed Research Award

#### **B. Sc., Biology**

August 2015

Concentration: Genetics and Biotechnology

Middle Tennessee State University,

Murfreesboro, TN

- Eugene F. Strobel Scholarship

- The Homer Fund Scholarship

- Mary C. Dunn Freshman Biology Scholarship

- Undergraduate Research and Creative Activity (URECA) Grant

### **GRADUATE CREDIT HOURS**

Does not include Thesis or Dissertation credit hours.

Syllabi and/or course descriptions available, for confirmation, upon request.

Biology: 34cr (M.Sc.), 14cr (Ph.D.)

Education: 15cr (SPSE rubric, Ph.D.), 10cr (MSE rubric, Ph.D.)

-SPSE: School Personnel and Service Education

-MSE: Mathematics and Science Education

## LICENSES AND CERTIFICATIONS

Arkansas Educator License 10185058 – Biology/Life Science 7-12 – Exp. 12/31/2027

## POSITIONS HELD

### Assistant Professor of Biology

Crowley's Ridge College – F2021-present

### Interim Chair of General Education [renamed Arts and Sciences in Sp2022]

Crowley's Ridge College – Sp2022

### Graduate Teaching Assistant in Biology

Middle Tennessee State University – F2015-Sp2019; Sp2020-Sp2021

### Graduate Teaching Assistant in Education

Middle Tennessee State University – F2018-F2019

### Adjunct Instructor of Biology

Southeast Arkansas College – F2022-present

Volunteer State Community College – F2020-Sp2022

Cumberland University – Sp2021

Lipscomb University – F2019-Sp2020

Middle Tennessee State University – Su2015

## TEACHING EXPERIENCE

Course Descriptions and Syllabi available upon request, where available.

### Tertiary Experience

*\*Crowley's Ridge College – Division of Arts and Sciences*

BIO 121/123 – Biological Science and Lab

BIO 231/233 – Human Anatomy and Physiology I and Lab

BIO 241/243 – Human Anatomy and Physiology II and Lab

BIO 251/253 – Microbiology and Lab

BIO XXX – Pathophysiology

BIO/CHM XXX – Biochemistry

MTH 053 – Beginning Algebra

^MTH 063 – Intermediate Algebra

^PHY 121/123 – Physical Science and Lab

PSY 112 – Introduction to College

SEM 333 – Seminar in Scientific Studies

- Introduction and Field Experience in Wildlife and Conservation Management
- Science and Society

(^) indicates online asynchronous course (≥1 iteration)  
 (+) indicates online synchronous course (≥1 iteration)  
 (\*) indicates curriculum design or redesign  
 (~) indicates field-based courses

*\*Crowley's Ridge College – Division of Teacher Education*

EFD 303 – Educational Psychology

*^ Southeastern Arkansas College – Department of Mathematics & Science*

BIOL 1461/1463 – Principles of Biology and Lab

BIOL 2451/2453 – Human Anatomy & Physiology I and Lab

*Volunteer State Community College – Division of Mathematics & Science*

^BIOL 1010/L– Introduction to Biology and Lab

+BIOL 2010/L – Human Anatomy & Physiology I and Lab

*Cumberland University – Biology Department*

BIOL 213L – Human Anatomy & Physiology I Lab

+BIOL 214N – Human Anatomy & Physiology II

*Lipscomb University – Biology Department*

^BY 1144 – Principles of Biology: Diversity and Ecology

*Middle Tennessee State University – Biology Department*

BIOL 1110 – General Biology I

BIOL 1111 – General Biology I Lab

BIOL 1121 – General Biology II Lab

BIOL 2231 - Microbiology Lab

^\*BIOL 3000 – Life Science for Elementary Teachers

\*BIOL 3251/3251H – Genetics Lab

BIOL 4461 – Human Genetics Lab

BIOL 4280 – Undergraduate Research in Biology

*~ Middle Tennessee State University – MTeach Program*

MSE 2010 – Step 2: Inquiry Lesson Design

\*YOED 3520 – Knowing and Learning in Mathematics and Science

YOED 4040 – Residency I MTeach (7-12)

YOED 4050 – Project-Based Instruction in Mathematics and Science

Secondary Experience (Student Teaching)

*Blackman Middle School, Murfreesboro TN*

7<sup>th</sup> Grade SPED Inclusion Science

*Riverdale High School, Murfreesboro TN*

Freshman Honors Biology I

Elementary Experience (Student and Substitute Teaching)

*Ezell-Harding Christian School, Antioch TN*

Substitute for Kindergarten through 4<sup>th</sup> Grade

*The Discovery School, Murfreesboro TN*

3<sup>rd</sup> Grade Math and Science

## RESEARCH EXPERIENCE AND SUPPORTING ACTIVITIES

### > ISU NSF Grant Team – Mentoring Network and Case Study Development

Role: Grant Development Team (F2022), Professional Development Specialist- Assessment, Curriculum, Socioscientific Issues; Group Mentor

Title: RCN:UBE Case-Based Active Science Education (CASE) Mentoring Network; NSF

Submission #2316317

Funding Proposal: \$460,000.00

### Projected Responsibilities

- Training Mentees in Case Study Writing and Assessment
- Professional Development related to Assessment, Curriculum Design, and Socioscientific Issues

### > Dissertation Research – STEM Anxiety, Teacher Education, Biology Anxiety, Biology Education

Role: Graduate Dissertation Student/Primary Investigator (F2019-Sp2021)

Supervisor/Dissertation Chair: Dr. Grant Gardner

MTSU IRB Protocol: 21-20097v

### Responsibilities and Methods:

- Survey design and dissemination via Qualtrics.
- Quantitative statistical analysis, qualitative analytical methods, and data management and visualization using R.

### Supporting Activities

**Grimes, Z.T., & Gardner, G.E.** (under review). Conceptions of Disciplinary Anxiety across Science, Technology, Engineering, and Mathematics (STEM) Contexts: A Critical and Theoretical Synthesis. *Journal of Research in Science, Mathematics, and Technology Education*.

**Grimes, Z.T.** (2021). *A Mixed-Method Evaluation of Anxiety Antecedents Related to Biology Content Among K-16 Educators*. (Doctoral Dissertation, Middle Tennessee State University).

**Grimes, Z. T. , Reid, J.W., & Smith-Walters, C.** (4, January 2019). *Personification as a Reflective Tool to Examine Pre-Service Teachers' Attitudes Towards and Conceptions of Biology*. Presentation at the International Association for Science Teacher Education in Savannah, GA.

### > MTSU/ISU NSF Grant Team – Concept Inventory Development in Genetics

Role: Graduate Research Assistant (F2017-Su2018), Team Member (F2018-Sp2019)

Title: Tools for Assessment in Genetics (TAG); NSF Award #1710277

Principle Investigators: Dr. Rebecca Seipelt-Thiemann (MTSU) & Dr. Nancy Boury (ISU)

### Responsibilities and Methods

- Manuscript Preparation
- Conducting cognitive interviews with participants
- Lexical analysis of interviews

### Supporting Activities

- Grimes, Z.T.**, Boury, N.M., Wasendorf, C., McCombs, A.L., Reid, J.W., Couch, B., James, O., Armstrong, P.I., & Seipelt-Thiemann, R.L. An Assessment to Investigate Student Conceptions of Pedigree Analysis. (2022). *The American Biology Teacher*, 84(9), 535-544. <https://doi.org/10.1525/abt.2022.84.9.535>
- Wasendorf, C., Reid, J.W., Seipelt-Thiemann, R., **Grimes, Z.T.**, Couch, B., Peters, N.T., Sewall, J.M., McCombs, A.L., Armstrong, P.I., & Boury, N. (2022). The Development and Validation of the Mutation Criterion Referenced Assessment (MuCRA). *Journal of Biological Education*, ahead-of-print, 1-15. doi:10.1080/00219266.2022.2100451
- Grimes, Z. T.**, & Reid, J. W. (23, November 2019). Common student misconceptions in genetics. Workshop presented at the annual Tennessee Science Teachers Association Meeting, Murfreesboro, TN.
- James, O., Boury, N., **Grimes, Z. T.**, Reid, J. W., Wasendorf, C., Armstrong, P., Couch, B., & Seipelt-Thiemann, R. (7, April 2019). *Investigating Undergraduate Student Misconceptions Regarding Pedigree Analysis*. Poster Presented at the American Society for Biochemistry and Molecular Biology (ASBMB) 2019 national meeting in Orlando, FL.
- Grimes, Z. T.**, Boury, N., Reid, J., Wasendorf, C., Armstrong, P., Couch, B., James, O., & Seipelt-Thiemann, R. (7, April 2019). *Development of an Assessment Tool for Evaluating Undergraduate Student Understanding of Pedigree Analysis*. Poster Presented at the American Society for Biochemistry and Molecular Biology (ASBMB) 2019 national meeting in Orlando, FL.
- Couch, B. Seipelt-Thiemann, R., Reid, J., Wasendorf, C., Armstrong, P., **Grimes, Z.T.**, James, O., Peters, N., & Boury, N. (7, April 2019). *Do Students' Misconceptions About Mutations Persist Throughout College Education?* Poster Presented at the American Society for Biochemistry and Molecular Biology (ASBMB) 2019 national meeting in Orlando, FL.
- Seipelt-Thiemann, R., Reid, J., **Grimes, Z. T.**, Wasendorf, C., Couch, B., James, O., Armstrong, P., Peters, N., & Boury, N. (7, April 2019). *Undergraduate Students' (Mis)Understandings of Mutation*. Poster Presented at the American Society for Biochemistry and Molecular Biology (ASBMB) 2019 national meeting in Orlando, FL.
- Seipelt-Thiemann, R., Reid, J., & **Grimes, Z.T.** (24, January 2019). *Undergraduate Students' (Mis)Understandings of Mutations*. Invited talk presented as part of the Spring 2019 Mathematics and Science Education PhD Program Seminar Series.
- Grimes, Z. T.**, Reid, J. W., Boury, N. K., and Seipelt-Thiemann, R. L. (2018). Misconceptions of Mutations and Pedigree Analysis Reveal Lack of Depth in and Reliance on Misplaced Intuition on Understanding. Poster presented at the MTSU Scholar's Week College of Basic and Applied Sciences Event and the University Wide Scholar's Week Event.
- Reid, J.W., **Grimes, Z.T.**, Seipelt-Thiemann, R.L., & Boury, N. (February 2, 2018). *Undergraduate biology students' misconceptions about mutations*. Presentation at the TN STEM Education Research Conference, Murfreesboro, TN.

**Grimes, Z.T.**, Reid, J. W., Seipelt-Thiemann, R.L., & Boury, N. (February 1, 2018). *Undergraduate biology students' misconceptions about pedigrees*. Presentation at the TN STEM Education Research Conference, Murfreesboro, TN.

> Thesis Research - Bioinformatics and Molecular Biology

Role: Graduate Thesis Student (F2015-Su2017)

Thesis Mentor: Dr. Rebecca Seipelt-Thiemann

Bioinformatics Analysis Programs

- Sequence retrieval from databases (Sanger Institute, gEVAL, National Center for Biotechnology Information (NCBI), and Mouse Genome Informatics (MGI)).
- Sequence analysis (ExPASy Translate, Clustal Omega, BOXSHADE, Alggen PROMO, SMART, and InterProScan)
- Interactome analysis (MENTHA, STRING)
- Protein Modeling (PyMOL, Protein DataBank (PDB), Chimera, Quiagen Drug Discovery Workbench)

Laboratory Techniques

- DNA Biotechnology (cloning, gel electrophoresis, transformation, PCR (standard, colony, and gradient), bacterial DNA isolation and precipitation).
- RNA Biotechnology (Reverse Transcription, RNA precipitation)
- Microbiological Methods (media preparation (standard and selective), isolation streaking, preparation of electrocompetent cells).

Supporting Activities

**Grimes, Z. T.**, Spear, BT., Peterson, ML., and Seipelt-Thiemann, R. (2017). *Towards the Molecular Identification of Afr2, a Gene Implicated in Liver Cancer*. Poster Presented at the American Society for Biochemistry and Molecular Biology (ASBMB) 2017 national meeting in Chicago, IL.

**Grimes, Z. T.**, Spear, BT., Peterson, ML., and Seipelt-Thiemann, R. (2017). *Towards the Molecular Identification of Afr2, a Gene Implicated in Liver Cancer*. Poster presented at the MTSU Scholar's Week College of Basic and Applied Sciences Event and the University Wide Scholar's Week Event.

**Grimes, Z. T.**, Spear, BT., Peterson, ML., and Seipelt-Thiemann, R. (2016). *Towards the Molecular Identification of Afr2, a Gene Implicated in Liver Cancer*. Poster presented at the MTSU Scholar's Week College of Basic and Applied Sciences Event and the University Wide Scholar's Week Event.

> Undergraduate Research - Thermal Biology and Evolutionary Ecology

Role: Undergraduate Research Student (Sp2015)

\*supported by MTSU internal Undergraduate Research and Creative Activity (URECA) grant  
Project Mentor: Dr. Robert Fischer, Melissa Pompilius

Responsibilities and Methods

- Culturing, rearing, and isolation of *Daphnia lumholtzi*, an aquatic macroinvertebrate, in different environmental temperature conditions.

- Analysis of life history characters, including measurements of the core body and head and tail spines, number of offspring produced, number of resting eggs present, etc.
- Comparisons of somatic measurements across experimental and control populations

#### Supporting Activities

**Grimes, Z. T.**, Fann, S., Pompilius, M., and Fischer, R. (2015). Effects of Temperature on *Daphnia lumholtzi* Life History Traits. Poster presented at the MTSU Scholar's Week College of Basic and Applied Sciences Event and the University Wide Scholar's Week Event.

### OTHER SCHOLARLY ACTIVITIES

#### Publications

Gardner, G.E., Brown, E., **Grimes, Z.T.**, & Bishara, G. (2021). Exploring Barriers to the Use of Evidence-Based Instructional Practices. *Journal of College Science Teaching* 51(2).

#### Workshops

**Grimes, Z. T.**, & Reed, S. D. (3, November 2018). *One potato, two potato, which weighs more?* Workshop presented at the annual Tennessee Science Teachers Association Meeting, Murfreesboro, TN.

Napoleon-Fanis, V., & **Grimes, Z.T.** (2, November, 2018). *Using games to teach biology.* Workshop presented at the annual Tennessee Science Teachers Association Meeting, Murfreesboro, TN.

Lanfear, A.K., **Grimes, Z.T.**, & Smith-Walters, C. (29, May 2018). *All the Write Stuff: Integrating Science, Literacy, and Technology.* Presented at the annual Rutherford Works TechReady Conference, Smyrna, TN.

Napoleon-Fanis, V., **Grimes, Z. T.**, & Smith-Walters, C. (10, November 2017). *Novel Assessment Ideas: Supporting K-12 Science, Mathematics, and Literacy.* Presented at the annual Tennessee Science Teachers Association Meeting, Murfreesboro, TN.

### SERVICE

#### > Program and Institutional Service

##### *Crowley's Ridge College*

- Academic Assessment Committee, Member (AY21-22), Chair (F22-present)
- Curriculum Committee, Interim Member (Sp2022)
- Academic Affairs Committee, Interim Member (Sp2022)
- Higher Learning Commission (HLC) Academy Team (F2022-Su2023)

##### *Middle Tennessee State University*

- Mathematics and Science Education Program Student Coordination Committee, Secretary (AY2017-2018)
- Institutional Review Board, Student member (AY2017- 2018)
- University Academic Appeals Committee, College of Basic and Applied Sciences Subcommittee, Student representative (AY2014-2015)

- University Grade Appeals Committee, College of Basic and Applied Sciences Subcommittee (AY2014-2015)
- University Academic Misconduct Committee, Student member (AY2013-2014)

### *Student Organizations Memberships*

- MTSU Biology Education Association (2016-2021)
- MTSU Biology Graduate Student Association (2015-2021)
- National Society of Leadership and Success (2014-present)
- Raiders for Christ Campus Ministry (2011-2015; Student President 2013-2014)

### > Professional Service

#### *Professional Organization Memberships*

- American Society for Biochemistry and Molecular Biology (2016-present)
- Association of Biology Laboratory Educators (2017-present)
- Association for Mathematics Teacher Educators (2018-present)
- Association of Science Teacher Educators (2018-present)
- National Association of Biology Teachers (2017-present)
- National Association for Research in Science Teaching (2017-present)
- National Science Teachers Association (2017-present)

#### *Reviewer Positions*

- Reviewer for The American Biology Teacher
- Proposal Reviewer for the NSTA Regional Conference, National Harbor 2018
- Proposal Reviewer for the ASTE International Conference 2019
- Undergraduate Poster Judge for MTSU University Wide Scholars' Week 2018, 2019

### > Community Service

- 2019 STEAM Festival, "Build a spider" station (volunteer)
- 2018 Expanding Your Horizons Conference for Middle and High School Girls (volunteer)
- 2018 STEAM Festival, "Design a Rocket" station (volunteer)
- Lytle Creek Cleanup with BGSA and the Tennessee Environmental Council (volunteer)

### > Educational Service

- Advanced Placement (AP) Anatomy and Physiology – Sp23-current  
Invited by CollegeBoard to serve on the advisory board for the development of this course
- Science Olympiad – Regional Tournament – Sp2018, Sp2019  
Wrote, proctored, and graded questions for the Fermi Questions event.
- Mentor, Central Magnet High School Senior Thesis – F2017  
Mentored a CMS senior through their senior thesis. The project investigated the antimicrobial effects of essential oils often used for cleaning.
- Cytosis: The Cell Biology Board Game* – Sp2017  
Wrote and edited portions of the "Cell Biology 101" Science Companion for *Cytosis* by GeniusGames.
- Harnessing electricity from microbes!* – Spring 2017  
Co-developed and modified classroom materials and teacher workshop materials based around the MudWatt – a device that uses electricity produced by soil microbes to light a



lightbulb. Materials prepared at MTSU for Dr. Anthony Farone's use in Chilean classrooms and teacher professional development.

-Science Olympiad – Regional Tournament – Sp2017

Assisted Dr. Erin McClelland Division C Microbe Mission and Gram Staining during the Regional Tournament on February 25, 2017.

-*Is the stream polluted? – A Lesson in Ecology* – F2016

Taught to children who were present to help with the Lytle Creek cleanup. Covered how to evaluate stream quality based upon present species of macroinvertebrates. Hosted by the Tennessee Environmental Council.

-*What are germs? – A Lesson in Microbiology* – F2012/Sp2013

Taught to the 3rd graders at both Discovery School at Reeves-Rodgers and Ezell-Harding Christian School. Covered how bacteria and viruses are transmitted through contact and the importance of hygiene. Hosted by Dr. Kristy Mall (DS@RR), and both Mrs. Paula Walters and Ms. Teresa Grimes (EHCS).

-*What is heredity? – A Lesson in Genetics* – Sp2012

Taught to the 3rd graders at Discovery School at Reeves-Rodgers. Covered basics of heredity and inheritance of visible traits. Hosted by Dr. Kristy Mall.