Neuromyths: Awareness, Predictors, and Using Mind-Brain-Education (MBE) Science To Design and Teach for Student Success

Dr. Kristen Betts, Dr. Michelle Miller & Brian Delaney
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Dr. Kristen Betts

**Professional Background**
- **Public, Private & For-Profit Institutions**
- **20+ years**: Senior Administration; Program Director; Faculty; Trustee
- **Drexel University**: Clinical Professor; Sr. Director eLearning; Director: MS & EdD Programs
- **Forbes Education**: Chief Academic Officer
- **Armstrong State University**, University System of Georgia: Director, Online & Blended Learning
- Fulbright Specialist, Hong Kong Grants Council Reviewer

**Research Focus:**
- Program/Course Design, Faculty Development, Accreditation
- Student/Faculty Recruitment, Engagement, Retention
- Online & Blended Education, Technology-Enhanced Learning
- Mind, Brain & Education Science, Neuropedagogy, Brain Targeted Teaching
### Dr. Michelle Miller

**Professional Background**
- **Northern Arizona University:**
  Professor, Psychological Sciences; Founding Co-Director, First Year Learning Initiative; President’s Distinguished Teaching Fellow
- **National Center for Academic Transformation:** Redesign Scholar
- **Professional and Organizational Development** in higher education
- **Active:** Course Redesign, Online Program Development, Faculty Development

**Research and Development Focus:**
- Cognitive Psychology – with a focus on memory, attention, and language
- Promoting Academic Success – for diverse student populations
- Supporting Faculty – in promoting student success and persistence
- Educational Technology – choosing and creatively using technology in ways that align with evidence-based pedagogy and how the mind works

### Brian Delaney, PhD Candidate

**Professional Background**
- **Journalist** of 15 years across newspaper, radio, digital
- **Former Instructor** at Roy H. Park School of Communications, Ithaca College
- **Drexel University:**
  PhD Candidate, Educational Leadership and Learning Technologies
  Instructor, Teacher Education program
- **Founding Co-Editor,** Emerging Voices in Education journal
- **Co-Founder,** Education, Learning, and Brain Sciences Research Collaborative

**Research Focus**
- Journalism pedagogy
- Cognitive Apprenticeship models in online journalism education
- Cognitive processes of critical thinking in journalism contexts
- Mind, Brain, and Education science
Research Team

8 Universities
3 Countries
7 Faculty/Researchers
2 PhD Students

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Taft, California, USA
Sanne Dekker, Ph.D.
Radboud University,
Science Education Hub
Nijmegen, Netherlands
Problem

Limited research:
• Beliefs and conceptualization of knowledge within higher education
• Prevalence of neuromyths in higher education and across education modalities

K-12 Education:
• Teachers & Pre-Service Teachers, extensive research
• High prevalence and belief in neuromyths

Purpose

Examine:
• Awareness of neuromyths in higher education related to neuroscience, psychology, and Mind, Brain, and Education science

Identify:
• Predictors for awareness of neuromyths in higher education
Research Questions

• RQ1. Are there differences among (a) professional roles (instructor, instructional designer, professional development administrator), (b) instructional or course development formats (on-campus, hybrid/blended, online), (c) demographic categories and awareness of neuromyths in higher education?

• RQ2. Does reading journals related to neuroscience, psychology, and MBE science increase awareness of neuromyths?

• RQ3. Is professional development a predictor of awareness of neuromyths?

• RQ4. Is there an interest among instructors, instructional designers, and administrators in scientific knowledge about the brain and its influence on learning?

Population & Sample

Online Learning Consortium: Listserv & Snowball Sampling

Survey

929 Respondents

• Neuromyths, 23 questions (2012 & 2017, 32 questions)
• Professional Development & Demographics
929 Respondents

- **USA:** 88% (48 States)
- **International:** 12% (45 Countries)
- **Female:** 69%
- **Male:** 27%
- **Non-Binary:** 1%
- **Chose Not to Respond:** 3%

![Figure 1. Breakdown by Primary Role](image)

929 Respondents

- **4-Year Institution:** 68%
- **2-Year Institution:** 18%
- **Other:** 14%
- **Public:** 61%
- **Private:** 28%
- **For-Profit:** 7%
- **Other:** 4%

![Figure 2. Breakdown by Institutional Level](image)

![Figure 3. Breakdown by Type of Institution](image)
Self-Assessment: Correct, Incorrect or Don’t Know

1. Individuals learn better when they receive information in their preferred learning styles (e.g., auditory, visual, kinesthetic).

2. Some of us are “left-brained” and some are “right-brained” due to hemispheric dominance and this helps explain differences in how we learn.

3. We only use 10% of our brain.

4. Dyslexia is reading letters backwards.

5. There are critical periods in human development after which certain skills can no longer be learned.
<table>
<thead>
<tr>
<th>Study Results</th>
<th>Answer Key</th>
<th>Percent Correct Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Instructor</td>
<td>Instructional Designer</td>
</tr>
<tr>
<td>1. A primary indicator of dyslexia is seeing letters backwards.</td>
<td>Incorrect</td>
<td>23%</td>
</tr>
<tr>
<td>2. Individuals learn better when they receive information in their preferred learning styles (e.g., auditory, visual, kinesthetic).</td>
<td>Incorrect</td>
<td>26%</td>
</tr>
<tr>
<td>3. Some of us are “left-brained” and some are “right-brained” due to hemispheric dominance and this helps explain differences in how we learn.</td>
<td>Incorrect</td>
<td>28%</td>
</tr>
<tr>
<td>4. We only use 10% of our brain.</td>
<td>Incorrect</td>
<td>47%</td>
</tr>
<tr>
<td>5. There are critical periods in human development after which certain skills can no longer be learned.</td>
<td>Incorrect</td>
<td>70%</td>
</tr>
</tbody>
</table>

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**Results: Professional Roles & Neuromyth Awareness**

![Graph showing the median percent correct responses for neuromyths by professional role.](image)

- Instructional Designer: 68%
- Instructor: 66%
- Administrator: 65%

*Figure 4. Professional Role: Median Percent Correct to Statements for Neuromyths (Kruskal-Wallis H Test)*

- Only significant post-hoc difference between instructional designers and administrators.
**Results: Reading Journals, Increased Awareness of Neuromyths**

Figure 5. Reading Journals: Median Percent Correct Responses for Neuromyth Statements

Kruskal-Wallis, significant difference (p<0.001)

**Results: Predictors of Neuromyth Awareness**

Three Fields
(1) Neuroscience
(2) Psychology, and
(3) MBE science

Five Types – Professional Development
- Professional training
- Workshops
- Certificate(s) of completion
- Certificate(s) with credit
- MOOC(s)

All professional development across three fields, significant difference <0.001
I am interested in learning more about the brain and its influence on learning. I find scientific knowledge about the brain and its influence on learning interesting. I find scientific knowledge about the brain and its influence on learning valuable for my teaching practice. I find scientific knowledge about the brain and its influence on learning valuable for course development. I find scientific knowledge about the brain and its influence on learning valuable for professional development.

Figure 6. Value and Interest in Scientific Knowledge about the Brain and its Influence on Learning

Results

• Training: Predictor of awareness NM

• Reading Journals (Neuroscience, MBE, Psychology), significant difference in awareness NM

• Very High Interest: Learning more about the brain
**Neuromyths**

Misconceptions, misunderstanding, misquoting, or misreading information about the brain.

(OECD, 2002; Goswami, 2006)

Educators’ conceptualization of knowledge:

- greatly impacts her/his **pedagogy**
- affects learners’ epistemological beliefs

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1. Human brains are as **unique** as human faces.
2. Each individual’s brain is **differently** prepared to learn different tasks.
3. New learning is influenced by **prior experiences**.
4. The brain **changes** constantly with experience.
5. **Neuroplasticity** exists throughout the lifespan.
6. There is no new learning without some form of **attention** and some form of **memory**.
Should principles from cognitive psychology be included when we discuss neuromyths and beliefs about learning?

How do these overlap with the counterproductive beliefs we see among students?

Top Points for Teachers

- Retrieval practice and the positive impacts of testing
- Spacing and distributed practice
- Moving away from the idea of learning styles
- Moving away from simplistic ideas of how the brain works and how learning happens
- Promoting collaboration among faculty and instructional designers
- Many principles relate to choosing and using technologies

The Notable Knowledge of Instructional Designers

Credit: Creative Commons
1. We see with our brains, not with our eyes.

2. The brain seeks novelty and patterns.

3. Repeated practice and rehearsal of learned material or a skill across multiple modalities helps to consolidate it in long-term memory.

4. Frequent, low stakes tests enhance learning.

5. Feedback is an essential element of learning.

6. Spacing of learning is beneficial to long-term memory.

Tracey Tokuhama-Espinosa, 2018
Evaluate Sessions and Win!

- Navigate to specific session to evaluate
- Select “Evaluate Session” on session details screen
- Complete session evaluation*

*Each session evaluation completed (limited to one per session) = one contest entry
Five (5) $25 gift cards will be awarded
Must submit evals using the OLC conference website, beta platform mobile app

Questions

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