Family Home and Social Sciences
Science, Technology, Engineering, Arts, and Mathematics (STEAM) in K-12 Education

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Areas of Interest:
STEAM, Research-Practice Partnerships, K-12 Education, Curriculum Adaptations, Design-Based Implementation Research, Professional Learning
The Problem

What problems and challenges do teachers in K12 settings face?

- Teaching is a complex system
- Teachers face challenges in their practice
- Teachers need support for curriculum adaptations
- Teachers need support for rich implementation
- Teachers need meaningful learning opportunities
Possible Solutions

• Integrate Arts into STEM to make STEAM
• Design-Based Implementation Research (DBIR)
  • Joint focus for project
  • Organizing design process
  • Doing research
  • Continuous improvement
• Research-Practice Partnerships (RPP)
  • Focus on problems of practice
  • Long-term commitment
  • Mutualistic relationships
  • Generate original analyses
Previous Research

• Math Task Adaptations
  • Teachers enjoy adapting math tasks for their classrooms
  • Teacher maintained cognitive demand with tasks at implementation
  • Design matters and teacher expertise in the design process crucial for creating something that can be integrated into their workflow

• Science Curriculum Writing
  • With co-designed technology and participatory design, we can support teacher’s as designers and improve their planning and implementation practices
  • Technology is not always the solution
Collaborators and Project

- Science
- Technology
- Engineering
- Arts
- Mathematics
- Interested in RPPs, DBIR, school districts, curriculum, teachers, and students
- NSF DR-K12 grant (due in November)
Closing the Research to Practice Gap: Designing Feedback Systems to Facilitate the Implementation of Empirically-Supported Practices

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Areas of Interest:  
Implementation science, Multi-Tiered System of Supports, Prevention, Multi-disciplinary collaboration, Communities of Practice
“We know how to build better schools”

...the advances which have recently been made in our control of the learning process suggest a thorough revision of classroom practices and, fortunately, they tell us how the revision can be brought about.

Academic Achievement
(Language Arts Proficiency)
The Conditions for Learning Account for a Greater Portion of Unique Variance in Academic Achievement than Does SES

- Conditions for Learning (28%)
- Socioeconomic Status (7%)
- Shared (39%)
- Unexplained (26%)
“I never teach my pupils. I only attempt to provide the conditions in which they can learn.”

– Albert Einstein
“We know how to build better schools”

...The modern classroom does not, however, offer much evidence that research in the field of learning has been respected or used.

Web of Causation for Academic Achievement

Instruction

Academic Achievement

Web of Causation for Implementation

Find it (EBP)

Do It
The authors note that “Despite the apparent complexity of this diagram, it is undoubtedly an oversimplification and will certainly be modified by further study.” (p. 5).
Where do we start?

**Figure 2**
Interrelationships Between Producers and Consumers

1. **Influence Producers**
   - Educational Professional Organizations
   - Teachers Unions
   - Businesses
   - Advocates

2. **Knowledge Producers**
   - Researchers
   - Effective Practitioners

3. **Regulation Producers**
   - Legislatures
   - Boards

4. **Knowledge Consumers**
   - Publishers and Developers
   - Practitioners

- Improved Fidelity Measures
- School Climate (Principals)
- Student Feedback (Teachers)
- Research-informed Cost Benefit Analyses
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Derin Cobia, PhD
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Areas of Interest:
- Neuropsychology, Neuroscience, Psychosis, Dementia
- Utilizing neuroimaging to study how changes in brain structure and function influence cognition and behavior
Neuropsychology

Scientific study of brain — behavior relationships
Neuropsychology

- IQ
- Attention/Concentration
- Processing Speed
- Language
- Visuospatial
- Memory
- Reasoning
Neuroimaging
Mesh ("Finite Element")

- Vertex = point of 6 triangles
- XYZ at each vertex
- Triangles/Faces ~ 150,000
- Area, Distance
- Curvature, Thickness
- Moveable
Questions

• What kinds of brain changes happen as a result of brain disease or injury?
  • Where?
• How do these brain differences relate to their cognitive, emotional or behavioral state?
Cobia et al. (2011), *Schiz Research*
Neurodegenerative Disorders

Primary Progressive Aphasia

- Language-based Dementia Syndrome

Mesulam et al. (2009), Arch Neurol
Interests

What I can offer:

- Broader understanding on how the brain responds to particular condition or situation
- Can probe both brain structure and function

Ongoing interests:

- Heterogeneity in disease
- Protective vs. Susceptibility factors
- Leverage for treatment or modify developmental trajectory
Media effects on children

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Areas of Interest:
Media effects on children and families; body image; gender; aggression
Princess and superhero culture
Music and body image

YOU SHOULD KNOW YOU'RE BEAUTIFUL JUST THE WAY YOU ARE / AND YOU DON'T HAVE TO CHANGE A THING; THE WORLD COULD CHANGE ITS HEART.

ALESSIA CARA

TAKE YOUR MAKEUP OFF
TAKE A BREATH
LOOK INTO THE
MIRROR
AT YOURSELF,
DON'T YOU LIKE YOU?
'CAUSE
I LIKE YOU

COLBIE CAILLAT
IANIMATE: EXPLORING THE USE OF ANIMATION AND AUGMENTED REALITY IN EDUCATIONAL SETTINGS

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Areas of Interest:
Augmented Reality, Video-based Instruction, Human-Computer Interactions, Animation, Autism, Special Education, Educational Psychology
**AUGMENTED REALITY (AR)**

- AR is a technology that allows the blending of the physical world with the digital.
- AR superimposes digital information (i.e. video, picture) on a user’s view of the real world.
- AR allows you to scan anything with your phone’s camera which triggers a pre-determined video to start playing
  - Think about being at a museum and scanning a painting which then plays a short video about the painter’s life.
WHY AR?

- AR has the potential to provide ON DEMAND instruction for any population in any setting.
- Useful for educators because it allows students to access additional instruction as needed.
- Widely available, under utilized
  - 77% of population have smartphones with AR capability
- Assists with environmental awareness
  - Travelers can be informed of a buildings history
  - Football coaches can analyze plays in real-time
AUGMENTED REALITY AND ANIMATION

• Some individuals struggle with social relationships and human interaction. Animation and AR can be used to help some individuals overcome this barrier.

• Animation allows you to model behaviors in a controlled environment
  • Low-risk, High Interest (use their favorite cartoon as the model)

• I have software and equipment that allows me to interact with individuals via animation in real time.
  • Avatars can express emotions, move, talk
CURRENT PROJECTS

• Using live animation to teach individuals with autism social skills
  • Potential for huge implications in the field of autism.

• Using AR in real-world environments for self-instruction
  • Example: Moving your phone over of a box of mac & cheese in your kitchen and it automatically pulls up a video on how to cook it.

• Using AR to teach individuals math skills to individuals with/without disabilities
  • Reduces the instructional load on teachers
  • Allows students of diverse abilities to share a classroom
<table>
<thead>
<tr>
<th>WHAT DO I BRING</th>
<th>WHAT CAN YOU BRING</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Research space: lab with observation both and cameras</td>
<td>• Additional expertise</td>
</tr>
<tr>
<td>• Equipment: iPads, live animation software</td>
<td>• Human computer interactions, eye tracking</td>
</tr>
<tr>
<td>• Participants: access to local schools; members of the community</td>
<td>• Geography</td>
</tr>
<tr>
<td>• Established research relationships with other universities</td>
<td>• Animation</td>
</tr>
<tr>
<td>• Research assistants</td>
<td>• Math education</td>
</tr>
<tr>
<td>• Familiarity with the field</td>
<td>• Autism</td>
</tr>
<tr>
<td></td>
<td>• Psychology of learning</td>
</tr>
<tr>
<td></td>
<td>• Ideas for additional research</td>
</tr>
<tr>
<td></td>
<td>• Students (grad/undergrad) looking for research experience</td>
</tr>
<tr>
<td></td>
<td>• Statistical/measurement knowledge</td>
</tr>
</tbody>
</table>
Counseling and Psychological Services

“...the best collaborative experience, bar none.”
-anonymous
PAST PROJECTS
WEATHER

- Collaboration between CAPS, Physics, and Statistics
- Do weather and pollution affect mental health distress of CAPS clients?
  - $n=16,452$
- Looked at 20 weather and pollution variables:
  - sun time (the time between sunrise and sunset), sunrise, sunset, lunar phase, rainfall, wind speed, wind direction, wind chill, temperature, humidity, atmospheric pressure, absolute pressure, irradiance, dew point, O3, CO, PM10, PM2.5, and NO2
- Suntime!
  - As sun time decreased, overall symptom distress increased, as measured by the OQ-45 total score.
- No other weather or pollution variables were significant predictors of mental well-being after we accounted for sun time
Awarded $100,000 to study response of BYU students receiving services at CAPS to spiritually integrative psychotherapy interventions (use of scripture, prayer, discussion of religious issues).
AUTISM SPECTRUM DISORDER
Do group clinicians predict outcomes better?

When asked to predict the final outcome status of 40 group members' leaders performed similar to their individual therapy counterparts.
RESOURCES
DATA

CCMH DATASET
OQ-45 DATASET
RESEARCHERS
FUTURE PROJECTS
Conflict is associated with both work-to-family spillover and family-to-work spillover; however, work-to-family spillover tends to be more distressing to women.


Young women’s multiple role plans and strategies tend to be inappropriate for the type of conflict they anticipate and ineffective in reducing work-family tension.


Sexual Minority BYU Students

Sexual minorities: **twice as likely** to have a suicidal attempt in the past year

Male sexual minorities: **four times as likely** to attempt suicide (lifetime)


“[S]tudents who identified as Mormon…were more likely to report incongruence between their sexual orientation and religious faith than all of the other groups. …**Mormon students and college environments appear to be unique.**”


“The overwhelming majority of participants in this study reported **rejecting their LDS identity**”

Sexual Minority BYU Students

Study goals:

- Examine overall mental health of non-clinical BYU undergraduates
- Examine mental health of sexual minority BYU students
- Examine impact of Mormon religious belief on mental illness
- Present a methodologically sound perspective on LDS sexual minorities

Instruments:

- Counseling Center Assessment of Psychological Symptoms-34 (*Mental Health*)
- Duke University Religion Index (*Intrinsic/Extrinsic religiosity*)
- Flanagan Quality of Life Scale
- LGB Identity Scale (*Identity Development*)
Physiological Arousal in Therapy

● Therapy is a very interpersonal experience.

● Individuals with ASD struggle with interpersonal situations.

● How could we UNOBTRUSIVELY measure their physiological arousal while in therapy sessions and match that with process and outcome?

● Possible collaborative departments: Physiology? Engineering?
Long-run Consequences of Occupation Destruction

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Areas of Interest:
Family structure; Marriage; Labor markets; Discrimination; Economic history
Economic research + Family history

• Economists study: (1) economic and geographic mobility, (2) long-run determinants of income.

• Requires linking people/families across decades:
  • Ex. Longitudinal, Intergenerational Family Electronic Micor-data (LIFEM). U. Michigan. $2.1M, NSF. Use machine learning to link together entire population of 5 states. 20 BYU RAs.

• The Family Tree at FamilySearch provides another great way to link together families and records.
  • Individuals with multiple sources attached provide training sets.
  • Traditional family history tools can help with groups that have lower match rates from machine learning (women, immigrants, etc.)

• My lab partners with academics to conduct record linking projects that contribute to the coverage and quality of the Family Tree.
### Consequences of occupation destruction

#### Effect of Industry on Lifespan

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1) lifespan</th>
<th>(2) lifespan</th>
<th>(3) lifespan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horse Industry</td>
<td>-4.505*</td>
<td>-4.670**</td>
<td>-4.854**</td>
</tr>
<tr>
<td></td>
<td>(2.300)</td>
<td>(2.269)</td>
<td>(2.249)</td>
</tr>
<tr>
<td>Birth Year</td>
<td>-0.357*</td>
<td>-0.274</td>
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</tr>
<tr>
<td></td>
<td>(0.193)</td>
<td>(0.197)</td>
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<tr>
<td>Married in 1900</td>
<td></td>
<td>7.106</td>
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<tr>
<td></td>
<td></td>
<td>(4.336)</td>
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<tr>
<td>Constant</td>
<td>73.08***</td>
<td>73.21***</td>
<td>67.54***</td>
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<tr>
<td></td>
<td>(1.361)</td>
<td>(1.343)</td>
<td>(3.704)</td>
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<table>
<thead>
<tr>
<th>Observations</th>
<th>133</th>
<th>133</th>
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<tbody>
<tr>
<td>R-squared</td>
<td>0.366</td>
<td>0.391</td>
<td>0.411</td>
</tr>
</tbody>
</table>

Sibling fixed effects. Standard errors in parentheses.

Birth Year has been re-centered to 1860

*** p<0.01, ** p<0.05, * p<0.1

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#### Table: Consequences of occupation destruction

<table>
<thead>
<tr>
<th>Occupation</th>
<th>1850-70</th>
<th>1870-80</th>
<th>1880-00</th>
<th>1900-10</th>
<th>1910-20</th>
<th>1920-30</th>
<th>1930-40</th>
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<tbody>
<tr>
<td>All Occupations</td>
<td>129%</td>
<td>40%</td>
<td>66%</td>
<td>32%</td>
<td>12%</td>
<td>20%</td>
<td>12%</td>
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<tr>
<td></td>
<td>4.9M</td>
<td>11.2M</td>
<td>15.7M</td>
<td>26.1M</td>
<td>34.5M</td>
<td>38.6M</td>
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<tr>
<td>Horse Industry</td>
<td>145%</td>
<td>43%</td>
<td>120%</td>
<td>-4%</td>
<td>-22%</td>
<td>-77%</td>
<td>-71%</td>
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<tr>
<td></td>
<td>80K</td>
<td>196K</td>
<td>279K</td>
<td>615K</td>
<td>589K</td>
<td>460K</td>
<td>104K</td>
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</tbody>
</table>

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% Changed to Unmarried

- **Horse Industry**
- **Brothers**

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Observations: 133

R-squared: 0.366, 0.391, 0.411
Interdisciplinary Autism Research

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Counseling Psych and Special Ed (CPSE)
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Areas of Interest:

Autism, Disabilities, ADHD, Interdisciplinary Treatment and Support, Gifted and Talented, Models of Service Delivery
- Babies
- Teens
- School age
- Females
- Low Verbal Ability
- Parents, Siblings
- College Students

We Need People With and Without Autism to Participate in Research - Register Now
Asia, Eastern Europe, United Kingdom, So. America, Africa, Russia

BYU Autism Translational Research Workshop

Jan. 25-26, 2018

“Tough Topics in Autism”

Participation in Research Helps People All Over the World - Your Contribution is Important

autism@byu.edu
Genealogy, Interrelatedness, and Migration

Samuel Otterstrom
Geography
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Areas of Interest:
Historical Geography of the U.S., Population and Settlement Geography, Genealogy and Geography, and Urban Planning
Seeking collaborators Interested in Analyzing Historical Migration Trends at Various Scales Using Genealogy Data
Spatial construct: From a root place of an ancestor their ancestors and descendants spread out in a generally hourglass fashion from generation to generation. This increases the likelihood of finding relatives in far-away cemeteries as generations add up (figure from Otterstrom & Bunker 2013).
Tracking Migration Flows - History in Reverse – Top Half of Migration Hourglass

Mean Center of Generations
Indianapolis Births in 1900 with Multigenerational Statistics

<table>
<thead>
<tr>
<th>Generation</th>
<th>1st Gen</th>
<th>2nd Gen</th>
<th>3rd Gen</th>
<th>4th Gen</th>
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<tbody>
<tr>
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<th>3rd Gen</th>
<th>4th Gen</th>
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</thead>
<tbody>
<tr>
<td>Dates</td>
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<td>340.2051</td>
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<td>624.6046</td>
<td>308.2017</td>
<td>168.4903</td>
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</table>
Top Half of Migration
Hourglass – Indianapolis
1900
Indianapolis 1st Generation Origins, Europe
Bottom half of Migration Hourglass – As seen by Searching Distant Cemeteries

Location of Luther Holtzclaw’s grave in Flint Hill Cemetery, Oakton, VA. Link from FindAGrave.
My wife’s relationship to Luther J Holtzclaw – 4th cousins, twice removed
Luther J Holtzclaw (1863-1925) and Tacie Emma Corder Holtzclaw (1858-1906)

This drawing of the Holtzclaws was placed on FindAGrave by their granddaughter. I contacted her and now I am linked in with my wife’s distant cousin.