The Best Job in the World

The Good, the Bad, and the Ugly

“We want your research to be limited only by your skills and imagination.” – Herb Simon (1975)

“How can you stand being in your office all day, just reading and writing?” – David Siegler (1975)

“No issue is too trivial for endless discussion.” – Robert Siegler (1975-2016, describing faculty meetings)
So Why Is It the Best Job?

1) Pursuing your own interests
2) Being your own boss
3) Varying your activities – avoiding boredom
4) Collaborating with smart, motivated, nice people
5) Helping others: students, colleagues, public
6) Honing one’s intellect through thinking and writing
7) Traveling and seeing the world
8) Outstanding job security, better pay than we let on
9) Reaping what you sow
10) The thrill of insight

Working With People From Around the World

**Canada:** Norman Brown, Hugo Lortie-Forgues, Jamie Campbell

**Chile:** Roberto Araya

**China:** Zhe Chen, Jing Tian, Xiaodong Lin-Siegler, Yan Mu, Yunqi Wang, Ruizhe Liu

**Colombia:** Elida Laski

**France:** Patrick Lemaire, Pierre Barrouillet, Valerie Camos

**Germany:** Michael Schneider, Elsbeth Stern
Great Britain: Hugo-Lortie-Forgues, Emma Flynn
Italy: Gianmarco Altoe
Israel: Dana Ganor-Stern
Slovenia: Matija Svetina
Switzerland: Elsbeth Stern, Pierre Barrouillet, Valerie Camos

Siegler Lab Members Span the Globe!
My Goals in Working With Students

1) Teach them to identify what children are doing at the micro level and understand the implications at the macro level.

2) Teach them to write and think clearly about what interests them.

3) Focus on big effects

4) Set up each student in his or her own small business

Three Epochs of Students, Topics, and Signature Articles

I. Theoretical studies of cognitive development, culminating in overlapping waves theory

<table>
<thead>
<tr>
<th>Student</th>
<th>Main Focus</th>
<th>Signature Article</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diane Briars</td>
<td>Counting</td>
<td>Briars &amp; Siegler (1984)</td>
</tr>
<tr>
<td>Zhe Chen</td>
<td>Infants’ Tool Use: Choice &amp; Change</td>
<td>Chen &amp; Siegler (2000)</td>
</tr>
<tr>
<td>Matija Svetina</td>
<td>Cross Sectional/ Microgenetic Method</td>
<td>Siegler &amp; Svetina (2002)</td>
</tr>
</tbody>
</table>
Three Epochs of Students, Topics, and Signature Articles, cont’d.

II. Educational Applications to Whole Number Mathematics and Science

<table>
<thead>
<tr>
<th>Student</th>
<th>Main Focus</th>
<th>Signature Article</th>
</tr>
</thead>
<tbody>
<tr>
<td>Julie Booth</td>
<td>Magnitude Knowledge &amp; Arithmetic Learning</td>
<td>Booth &amp; Siegler (2008)</td>
</tr>
<tr>
<td>Geetha Ramani</td>
<td>The Great Race</td>
<td>Ramani &amp; Siegler (2008)</td>
</tr>
<tr>
<td>Elida Laski</td>
<td>Improving Chutes &amp; Ladders</td>
<td>Laski &amp; Siegler (2014)</td>
</tr>
<tr>
<td>Xiaodong Lin-Siegler</td>
<td>Ideal Student Motivation</td>
<td>Lin-Siegler et al. (2010)</td>
</tr>
</tbody>
</table>

Three Epochs of Students, Topics, and Signature Articles, cont’d.

III. Development of Rational Numbers (and Educational Applications?)

<table>
<thead>
<tr>
<th>Student</th>
<th>Main Focus</th>
<th>Signature Article</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michael Schneider</td>
<td>Fractions Development</td>
<td>Schneider &amp; Siegler (2010)</td>
</tr>
<tr>
<td>Lisa Fazio</td>
<td>Fractions Development</td>
<td>Fazio, et al. (2016)</td>
</tr>
<tr>
<td>Jing Tian</td>
<td>Choosing Among Rational Number Formats</td>
<td>Tian &amp; Siegler (2017)</td>
</tr>
</tbody>
</table>
**Diane Briars**

*Notable Contributions:* First postdoctoral student, stimulated my interest in studying math, greatest real world impact of any of my students, first and last fix-up

*Serendipity:* SRCD mix-up, reviewing Gelman & Gallistel (1978)

*What we did:* Development of counting (Briars & Siegler, 1984)

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**Briars & Siegler (1984; *Developmental Psychology*)**

Number of Children Thinking Each Feature Essential (Among 10 in Each Age Group)

<table>
<thead>
<tr>
<th>Group</th>
<th>Word/object</th>
<th>Adjacency</th>
<th>Start at an end</th>
<th>Pointing</th>
<th>Standard direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-year-olds</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4-year-olds</td>
<td>9</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>5-year-olds</td>
<td>10</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>
Norman Brown

Notable: Outstanding dry sense of humor, stimulated my interest in estimation, concept of “Sieglerizing”

Serendipity: Meeting Norman while at University of Chicago, first Iraq war

What we did: Real world quantitative estimation (Brown & Siegler, 1993)

Brown & Siegler (1993; Psychological Review)

(Arrows indicate actual population for each country)
### Patrick Lemaire

**Notable Contributions:** Knowledge of math development, interest in and access to seniors, charm, interest in strategic change

**Serendipity:** Shared interests in food, wine, and running

**What we did:** Analytic framework dividing strategy development into four dimensions (Lemaire & Siegler, 1995), choice/no choice method (Siegler & Lemaire, 1997)

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### Siegler & Lemaire (1997; *JEP: General*)

Older Adults’ Speed and Accuracy Under Choice and No-Choice Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Mean RT</th>
<th>% Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiplicand of 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choice</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>No-choice</td>
<td>5.4</td>
<td>1</td>
</tr>
<tr>
<td>No Multiplicand of 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choice</td>
<td>8.5</td>
<td>10</td>
</tr>
<tr>
<td>No-choice</td>
<td>10.5</td>
<td>21</td>
</tr>
</tbody>
</table>

*Note: RT = reaction time.*
Zhe Chen

Notable Contributions: Interest in microgenetic studies, gave up tenured position to do postdoc at CMU, knowledge of infant problem solving

Serendipity: Reviewing his grant proposal years before he came to CMU, NSF grant funding

What we did: Microgenetic studies of infants’ tool use (Chen & Siegler, 2000) and self-explanation (Siegler & Chen, 1998)

Chen & Siegler (2000; SRCD Monographs)

Problem C

- Modeling, 27-35 mo.
- Modeling, 18-26 mo.
- Hint, 27-35 mo.
- Hint, 18-26 mo.
- Control, 27-35 mo.
- Control, 18-26 mo.
Matija Svetina

Notable: Only CMU postdoc from Slovenia, developed microgenetic/cross-sectional design

Serendipity: Development of email, which allowed long distance advising on dissertation

What we did: Microgenetic/cross-sectional studies of logical reasoning (matrix completion and class inclusion (Siegler & Svetina, 2002; 2006)

Siegler & Svetina (2002; Child Development)

Changes over sessions in percentage of correct matrix completion answers among precocious children, learners, and nonlearners.
Julie Booth

Notable Contributions: Efficiency, strong desire to improve math education

Serendipity: Already in Pittsburgh, Mark Strauss recommendation

What we did: Individual difference analyses of log to linear shift (Booth & Siegler, 2006); my first math intervention (Booth & Siegler, 2008)

Booth & Siegler (2006; Developmental Psychology) Progression from Log to Linear Representation — 0-1,000 Range

Second Grade
Lin R² = .85 = Log R² = .91

Fourth Grade
Lin R² = .98 > Log R² = .74
Geetha Ramani

Notable Contributions: Saw potential of Great Race intervention; crafted it to perfection

Serendipity: Took my class and interested in Great Race idea, same home town as Julie

What we did: The Great Race (Ramani & Siegler, 2008; Siegler & Ramani, 2009)

Ramani & Siegler (2008; Child Development)

Performance at pretest, posttest, and follow-up.
Elida Laski

Notable Contributions: Fluent in “educationese,” deep knowledge of classroom math learning, eminently “coachable”

Serendipity: Closing of Boston University Ed.D. Program, pilot test experience

What we did: Demonstrated influence of categorization of numbers on number line estimation (Laski & Siegler, 2007), extended Great Race to 0-100 version and tested encoding hypothesis (Laski & Siegler, 2014)

Laski & Siegler (2007; Child Development)
Michael Schneider

**Notable Contributions:** Excellent knowledge of European as well as U.S. math research, connections to neuroscience, interest in rationals

**Serendipity:** Did graduate work with Elsbeth Stern, who did postdoc with me

**What we did:** My first study of fractions (Schneider & Siegler, 2010); integrated theory of numerical development (Siegler, Thompson & Schneider, 2011)

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Siegler, Thompson, & Schneider (2011; *Cognitive Psychology*)

Correlations among fraction magnitude estimates, fraction arithmetic, and achievement test scores: 8th graders

<table>
<thead>
<tr>
<th></th>
<th>Arithmetic accuracy</th>
<th>PSSA math</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number line 0-1 PAE</td>
<td>-.64**</td>
<td>-.63**</td>
</tr>
<tr>
<td>Number line 0-5 PAE</td>
<td>-.70**</td>
<td>-.86**</td>
</tr>
<tr>
<td>Magnitude comparison accuracy</td>
<td>.64**</td>
<td>.62**</td>
</tr>
</tbody>
</table>

* $p < .05$; ** $p < .01$.  

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Lisa Fazio

Notable Contributions: Deep knowledge of adult cognitive psychology, willingness to learn new methods (meta-analysis) to pursue issue

Serendipity: Planned studies on retrieval effects didn’t work

What we did: Meta-analysis of relation of non-symbolic number to math achievement (Fazio, et al, 2014); trial-by-trial analysis of fraction magnitude comparison (Fazio, DeWolf, & Siegler, 2016)
Drew Bailey

Notable Contributions: Great skill in longitudinal analysis, intellectual courage

Serendipity: Grew up in Evanston, carpooled with Greg Duncan’s daughter

What we did: Analysis of longitudinal data linking early whole number magnitude knowledge to later fraction knowledge (Bailey, Siegler, & Geary, 2014)

Bailey, et al. (2014; Developmental Science)

<table>
<thead>
<tr>
<th>Initial Variable</th>
<th>Mediator</th>
<th>Outcome</th>
<th>Proportion via mediation</th>
</tr>
</thead>
<tbody>
<tr>
<td>WN Mag</td>
<td>Frac Mag</td>
<td>Frac Arith</td>
<td>.62</td>
</tr>
<tr>
<td>WN Mag</td>
<td>Frac Arith</td>
<td>Frac Mag</td>
<td>.27</td>
</tr>
</tbody>
</table>
Hugo Lortie-Forgues

Notable Contributions: Creative insights in designing interesting and informative tasks; outstanding intuitions about what will work

Serendipity: Followed interest in math learning rather than logical deduction

What we did: Conceptual understanding of rational number arithmetic; direction of effects task (Lortie-Forgues, Tian, & Siegler, 2015; Siegler & Lortie-Forgues, 2015)

Siegler & Lortie-Forgues (2015; J. Ed. Psych.)

Percent Correct on Assessments of Procedural and Conceptual Knowledge of Fraction Arithmetic: Pre-Service Teachers

<table>
<thead>
<tr>
<th>Operation</th>
<th>Procedural Knowledge</th>
<th>Conceptual Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addition</td>
<td>87</td>
<td>91</td>
</tr>
<tr>
<td>Subtraction</td>
<td>93</td>
<td>89</td>
</tr>
<tr>
<td>Multiplication</td>
<td>87</td>
<td>33</td>
</tr>
<tr>
<td>Division</td>
<td>51</td>
<td>30</td>
</tr>
</tbody>
</table>
Jing Tian

Notable: Outstanding math ability, knowledge of Chinese math education

Contributions: SCIL (Siegler Center for Innovative Learning) and Beijing University both located in Beijing

Serendipity: Mapping of decimals, fractions, and percentages to spatial displays (Tian & Siegler, in prep.)
Pierre Barrouillet & Valerie Camos

*Notable* Applying Piagetian and information processing theories to understanding math cognition

*Serendipity:* Valerie’s reading *Emerging Minds*

David Klahr

Notable Contributions: Collaborated in creating information processing theory of development
Innumerable insightful comments on my work and on field

Serendipity: Bar Mitzvah comment

What we did: Convinced me of value of computer simulation (Klahr & Siegler, 1978)
**Xiadong Lin-Siegler**

**Notable Contributions:** Warmth, humor, creativity, ability to draw on cultural background for scientific research, genius for charming and cajoling people into doing what she wants, patience in putting up with me

**Serendipity:** Dan Schwartz forwarding my email

**What she did:** Ideal student and struggle story research, encouragement of my pursuing educational applications, keeping me amused
Todd Siegler and the Decatur Sieglers

Motivating New Contributions
The Bigger Picture