Research-Based Design & Design-Based Research: Affordances, Limitations & Synergies

Invited session at Elearn, the World Conference on E-Learning Association for the Advancement of Computing in Education
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A little background

• Former pre-school teacher

• Researcher, developer, consultant & teacher
  • Curriculum development
  • Teacher professional development
  • Technology integration
  • Educational design (research)

• In service of educational practice
E-Learn—World Conference on E-Learning is an international conference organized by the Association for the Advancement of Computing in Education (AACE) and co-sponsored by the International Journal on E-Learning.

This annual conference serves as a multi-disciplinary forum for the exchange of information on research, development, and applications of all topics related to e-Learning in the Corporate, Government, Healthcare, and Higher Education sectors.
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Who designs Elearning?
Who designs Elearning?
Who designs Elearning?
Who designs Elearning?
Designs for Elearning: More than technology
What are designs for Elearning?
What are designs for Elearning?
What are designs for Elearning?
What are designs for Elearning?
How are Elearning designs created?
How are Elearning designs created?

Two robust, well-informed approaches:

- **RBD**: Research-based design
- **DBR**: Design-based research
How are Elearning designs created?

Two robust, well-informed approaches:

- **RBD**: Research-based design
- **DBR**: Design-based research

What do they involve?

- Same core phases
- Different outputs
- Different relationships with research
RBD

iterative development of solutions to practical and complex educational problems.
RBD & DBR

“Design research is a genre of research in which the iterative development of solutions to practical and complex educational problems also provides the context for empirical investigation, which yields theoretical understanding that can inform the work of others.”

- McKenney & Reeves, 2012
RBD & DBR outputs

- Programs
- Processes
- Products
- Policies
RBD & DBR outputs

- Describe
- Explain
- Predict
- Prescribe

- Programs
- Processes
- Products
- Policies
Robust, well-informed design

• Features: Research ⇔ Development (R&D) interaction

• Is often: Driven by either research or development, rarely both together

• Is easier said than done: Elearning designs often fail due to
  • Lack of R&D alignment, e.g.
    • Denial: “This can still work – the research results are just faulty”
    • Omission: “There is no time or budget for a full pilot”
  • Lack of R&D integration, e.g.
    • Front end analysis shoddy or ignored
    • Evaluation data too late due to aggressive production schedules
Sound Elearning design requires R\(\leftrightarrow\)D interaction

In RBD & DBR, what might be:

- Powering the initiative (horse)?
- Carrying precious cargo to the destination (cart)?
- Similarities and differences?
- Affordances, limitations & synergies?
Which is horse and which is cart?

It’s all in the eye of the beholder...

• Researchers usually: View research as the horse, powering a theoretically-driven initiative that can also bring an intervention to practice

• Practitioners/developers usually: View intervention as the horse, powering a need-driven initiative that can also bring new insights to others

Consequences of these views?
H/C Mindset: Strategic consequences

<table>
<thead>
<tr>
<th>Developers</th>
<th>Researchers</th>
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<tbody>
<tr>
<td><img src="seeds_of_science.png" alt="Seeds of Science" /></td>
<td><img src="jasper.png" alt="The Adventures of Jasper Woodbury" /></td>
</tr>
<tr>
<td><img src="roots_of_reading.png" alt="Roots of Reading" /></td>
<td><img src="jump_in.png" alt="JUMP iN" /></td>
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### Research funds

<table>
<thead>
<tr>
<th>Metric</th>
<th>Seed/Root ELL Students (n=60)</th>
<th>Business as Usual ELL Students (n=55)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading Comprehension</td>
<td>22.5%</td>
<td>24.5%</td>
<td>+2.0%</td>
</tr>
<tr>
<td>Science Vocabulary</td>
<td>43.8%</td>
<td>45.6%</td>
<td>+1.8%</td>
</tr>
<tr>
<td>Science Content Knowledge</td>
<td>68.1%</td>
<td>74.0%</td>
<td>+5.9%</td>
</tr>
</tbody>
</table>

### Practice funds

<table>
<thead>
<tr>
<th>Mathematics Assessment Project</th>
<th>3D and 2D Views</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="3d_view.png" alt="3D View" /></td>
<td>Top view – surface of water:</td>
</tr>
</tbody>
</table>

![Text](text.png)
H/C Mindset: Process consequences

- Ejersbo et al, 2008
H/C Mindset: Outcomes consequences

• Tensions between research & development goals
  • Important contrasts tend to bring vigor and headaches simultaneously

• Different reward systems, timelines, habits of mind, e.g.
  • Researcher reward systems value methodical, detailed work
  • Developer reward systems value production
  • Varying expectations for documentation
Conclusion

• Horse/cart mindset
  • May be a strategic necessity in the short term
  • Bears risks in the long term
    • Separated processes can be informative, but are insufficient for building theory or robust interventions
    • Focus on separate goals risks exacerbating existing tensions

• Integrated R&D yields greater benefits
Potential benefits of well-integrated R&D?

• Strategic value
  • Helps demonstrate added-value
  • To other researchers and to practitioners

• For robust design & research processes
  • Sensitizes researchers to practice realities
  • Inculcates practitioner ownership in recursive, reflective process

• For meaningful results
  • Guards ecological validity
  • Helps increase quality and therefore impact on practice
What might integrated R&D look like?
Integrated R&D

(McKenney & Reeves, 2012)
Integrated R&D
(McKenney & Reeves, 2012)

RBD: Internal users & clients
Integrated R&D

*(McKenney & Reeves, 2012)*

**RBD**: Internal users & clients

**DBR**: Internal users & clients, external researchers and professionals
Integrated R&D

(McKenney & Reeves, 2012)
Integrated R&D

*(McKenney & Reeves, 2012)*

**RBD:** Problem exploration largely informal, limited use of scientific literature
Integrated R&D
(McKenney & Reeves, 2012)

RBD: Problem exploration largely informal, limited use of scientific literature
DBR: Detailed, formal problem exploration, framework rooted in literature
Integrated R&D
(McKenney & Reeves, 2012)
Integrated R&D
(McKenney & Reeves, 2012)

RBD: Largely fed by previous organizational practices, designer expertise
Integrated R&D

(McKenney & Reeves, 2012)

**RBD**: Largely fed by previous organizational practices, designer expertise

**DBR**: Largely fed by own research and research and development elsewhere
Integrated R&D

(McKenney & Reeves, 2012)
Integrated R&D
(McKenney & Reeves, 2012)

RBD: Evaluation tends to be shorter and primarily formative
Integrated R&D

(McKenney & Reeves, 2012)

RBD: Evaluation tends to be shorter and primarily formative

DBR: Rigorous evaluation, both formative and summative
Integrated R&D

(McKenney & Reeves, 2012)
Integrated R&D
(McKenney & Reeves, 2012)

RBD: One main output – an intervention
Integrated R&D
(McKenney & Reeves, 2012)

RBD: One main output – an intervention
DBR: Two main outputs – an intervention & theoretical understanding
What does this look like in the real world?
What does this look like in the real world?

Two examples

• **RBD**: Workplace learning consortium
• **DBR**: Electronic performance support

Briefly examine

• Nature of project
• Core processes
• Main outcomes
RBD: Technology for workplace learning

About the project:
• Improve alignment of workplace learning with tertiary learning
• Teams of workplace and school mentors devise mini-innovations
• Technology-based materials, resources and expertise to support them
RBD: Technology for workplace learning

Analysis & exploration
- Multiple agendas
- Differing reward systems

Design & construction
- D: Ideation-design F2F
- C: F2F, online, offline

Evaluation & reflection
- Ownership by colleagues
- Assessment challenges
RBD: Technology for workplace learning

Outcomes:

• 6 locally-driven, research-informed innovations
• Reusable technology-based materials and resources
DBR: Technology for curriculum developers

About the project:

• Performance support for curriculum developers in Africa

• Iterative development of software, informed by research
DBR: Technology for curriculum developers

Analysis & exploration
- State-of-practice
- Most urgent needs/wants

Design & construction
- User-centered
- Semi-rapid protootyping

Evaluation & reflection
- 510 respondents, 15 countries
- Mixed methods
DBR: Technology for curriculum developers

Outcomes:

• Valid, practical, electronic performance support system (EPSS)
• Multiple publications, EPSS design principles, designer concerns
Affordances, limitations, synergies

• Affordances
  • Meeting goals in sustainable ways, often also yielding unforeseen benefits
  • Collaborations between education, industry and academia
  • New opportunities e.g. agile approaches

• Limitations
  • Tensions among stakeholders, concerning priorities, goals, and tactics
  • Time, money, expertise

• Synergies
  • Development process expertise from RBD=>DBR?
  • Design principles from DBR=>RBD?
How to move RBD & DBR forward?

- Accept that integration is difficult and still seek:
  - Rigorous research methods
  - Processes and products that accommodate real (not ideal) situations
- Examples of integrated Elearning trajectories that FEEEL
  - Foster effective, enjoyable and efficient learning
  - e.g. research unit at the OU: [http://www.ou.nl/web/welten-research/fiegel](http://www.ou.nl/web/welten-research/fiegel)
- Elearn community to voice and (collaboratively) tackle concerns
  - Issues, struggles, victories
  - At least within and perhaps across SIGs
Conclusions
Conclusions

- Separate research and development processes are a risky reality
Conclusions

• Separate research and development processes are a risky reality

• Robust, integrated approaches yield more powerful results
Conclusions

• Separate research and development processes are a risky reality

• Robust, integrated approaches yield more powerful results

• Challenges ahead: Integrating processes without dilution of R or D standards
Design research resources in print

Design research resources online

• Design research communities and information:
  • http://learndbir.org
  • http://dbrxroads.coe.uga.edu/
  • http://www.evaluateitnow.com

• Conducting Educational Design Research book:
  • Amazon discounted: http://goo.gl/AuSJ0c
  • Routledge inspection copy: http://goo.gl/Mh9VUb

• Open access ebook:
  • http://international.slo.nl/edr/
Thank you!
For discussion beyond today…

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