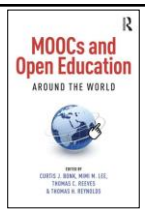
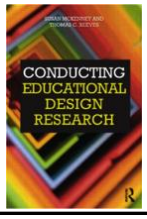
Design-Based Research (DBR) on MOOCs and Open Education

Agenda

- MOOCs and Open Educational Resources
- Rationale for Design Based Research (DBR)
- DBR Case Studies
- DBR Planning Exercise and Review
- Discussion and Questions





IRRODL THE INTERNATIONAL REVIEW OF RESEARCH IN OPEN AND DISTRIBUTED LEARNING

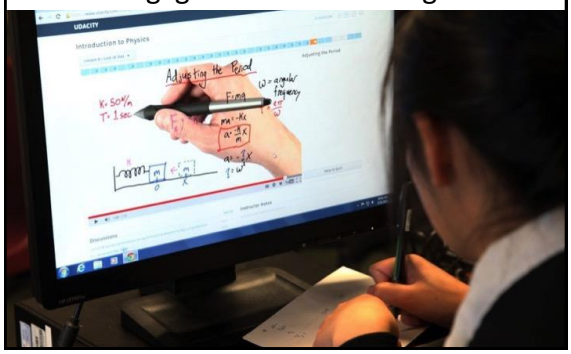
Where is Research on Massive Open Online Courses Headed? A Data Analysis of the MOOC Research Initiative

Dragan Gašević[1], Vitomir **Kovanović**[2,1], **Srećko Joksimović**[2,1], and George Siemens[3]
[1]Athabasca University, Canada, [2]Simon Fraser University, Canada, [3]University of Texas at Arlington, USA

Major MOOC Research Themes

1. student engagement and learning success,
2. MOOC design and curriculum,
3. self-regulated and social learning,
4. social network analysis and networked learning,
5. motivation, attitude and success criteria

Generate a research question related to student engagement and learning success



Design-based research is driven by a desire for IMPACT

Too Much Research on Things

- MOOCs and OERs
- Mobile Learning
- Online Learning
- 3D Printing
- Games and Gamification
- Wearable Technology
- The Internet of Things
- Machine Learning
- Virtual Assistants
- Immersive Learning

Too Little Research on Problems

- Ineffective education
- Increasing poverty
- Child abuse
- Crime
- Lack of literacy
- Poor motivation
- Hopelessness
- Lack of engagement
- Racism, Sexism

Title	Treatment	Method	Results
Learning to take the tablet: How pre-service teachers use iPads to facilitate their learning	Apple iPad	Case Study of 8 preservice teachers	Helped teachers: - develop understanding of content and pedagogy - stay connected and get more organized
Interactivity with the interactive whiteboard in traditional and innovative primary schools: An exploratory study	Interactive whiteboard	Qualitative analysis of 6 video recorded lessons (3 each from traditional and innovative schools)	Expected innovative schools to have more student or shared use of interactive whiteboard, but this was not found
Evaluating types of students' interactions in a wiki-based collaborative learning project	Wiki	Content analysis of wiki pages and qualitative analysis of 10 interviews	No strong evidence of learning; more cooperation than collaboration; instructor role is critical
Collaboration and competition on a wiki: The praxis of online social learning to improve academic writing and research in under-graduate students	Wiki	Content analysis of wiki screen captures and analysis of 22 surveys	Some evidence of student learning from the task, i.e., analysis of a cultural artifact related to public health
Effects of experiential-based videos in multi-disciplinary learning	Digital videos	Mixed method quasi-experimental design with quantitative and qualitative analysis	No significant differences

Goal 1: Eradicate extreme poverty and hunger
Goal 2: Achieve universal primary education
Goal 3: Promote gender equality & empower women
Goal 4: Reduce child mortality
Goal 5: Improve maternal health
Goal 6: Combat HIV/AIDS, malaria and other diseases
Goal 7: Ensure environmental sustainability
Goal 8: Develop a Global Partnership for Development

Most educational research in the USA is conducted by faculty and students in schools and colleges of education.

Where is the impact of our research on problems that really matter?

Research Paradigm Arguments Persist

Paradigm

The assumptions underlying any approach to research.

Positivist Paradigm

- There are facts with an objective reality that exist regardless of our beliefs.
- The goal of research is to detect the causes of changes in phenomena through measurement and quantitative analysis.
- Experimental designs are best because they reduce "error" hiding "the truth."
- Detachment is the ideal state.

Interpretivist Paradigm

- Reality is socially constructed through collective definitions of phenomena.
- The goal of research is to interpret phenomena from multiple perspectives.
- Ethnographic methods such as observation and interviews are best because they provide the basis for shared interpretations.
- Immersion is the ideal state.

Critical Paradigm

- Reality is individually constructed based upon experience, gender, culture, etc.
- The goal of research is to improve the status of the under-privileged.
- Critical theory deconstructing phenomena is best when it reveals the hidden power agendas in many educational technology interventions.
- Political engagement is the ideal state.

Heuristic Paradigm

- Reality is complex and social phenomena are unpredictable.
- The goal of research is to provide education practitioners with the information they need to make better decisions.
- Methods and tools should be selected on the basis of their potential for enhancing the quality of decision-making.
- Skepticism is the ideal state.

Design Paradigm

- Educational phenomena are exceedingly complex.
- The goal of research is to have a positive impact on teaching and learning practice and to contribute to theory.
- Creative design efforts combined with rigorous evaluation using multiple methods are recommended.
- Commitment is the ideal state.

Where would you invest 100 million in educational research?


Positivist

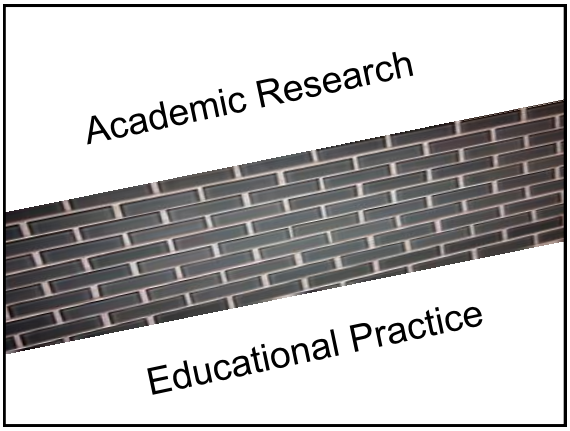

Interpretivist

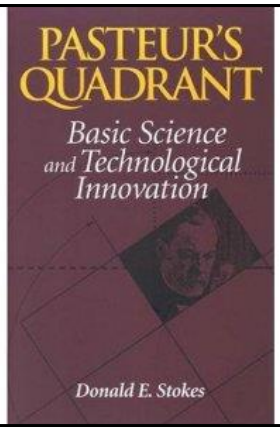

Critical


Heuristic


Design

Using Post-It Notes, invest 100 million dollars in grant funds in one or more of the paradigms.

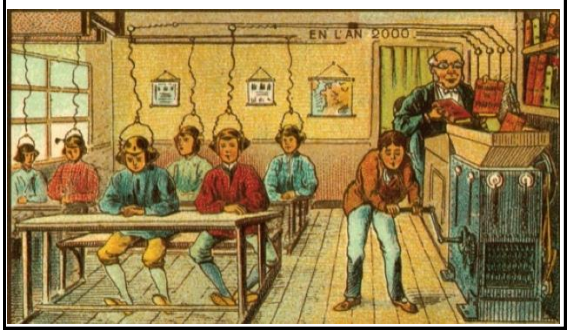




"Pasteur's Quadrant" (Stokes, 1997).

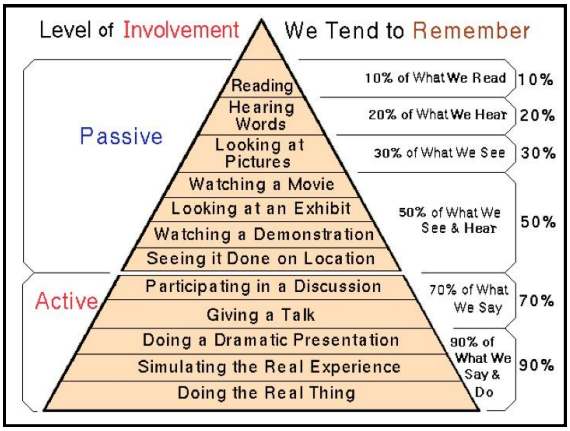
Research is inspired by:	Considerations of use? No	Considerations of use? Yes
Quest for fundamental understanding? Yes	Bohr 	Pasteur 
No		Edison 

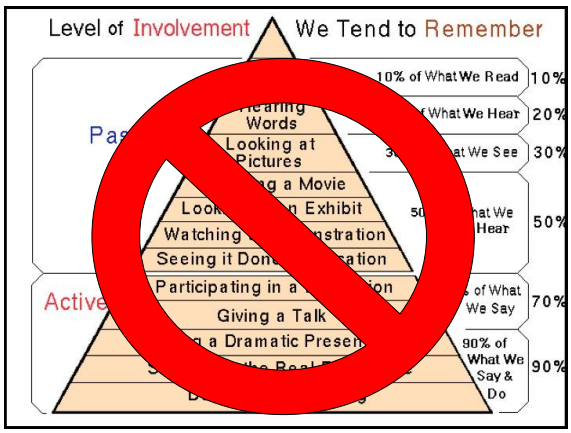
Educational Technology Research



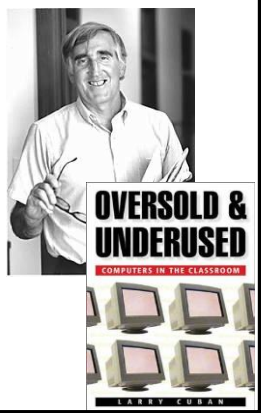
Technology Lies

- Technology lets you replace the teacher with the machine.
- Technology makes learning easy and automatic.
- Changing the medium alone enhances learning.



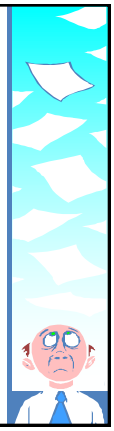


- Abundant technology has not led to extensive use of computers for "tradition-altering classroom instruction."
- The small percentage of computer-using instructors only use it to maintain existing classroom practices.



Educational Research Reality

- Isolated researchers conduct individual studies rarely linked to a research agenda or concerned with any relationship to practice.
- Studies are presented at conferences attended by other researchers and published in journals few people read.
- Occasional literature reviews and meta-analyses are published.

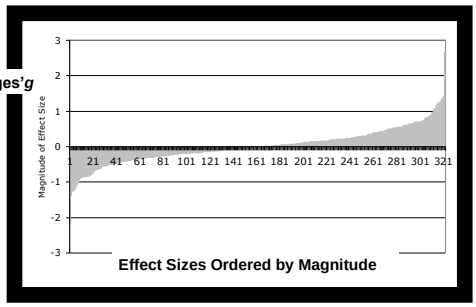


Literature reviews of educational technology consistently show results that amount to "**no significant differences**."

Bernard et al. 2004 - "How Does Distance Education Compare to Classroom Instruction?"

- very small mean effect size for interactive distance education over traditional classroom instruction on achievement
- small negative effect for retention

Distribution of Effect Sizes



325 independent outcomes (achievement)
Hedges' *g* = +0.0122, *p* < .001

Tallent-Runnels et al. 2006 - "Teaching Courses Online: A Review of the Research

Major conclusion: "… overwhelming evidence has shown that learning in an online environment can be as effective as that in traditional classrooms."

Internet-Based Learning in the Health Professions: A Meta-Analysis Cook et al. (2008)

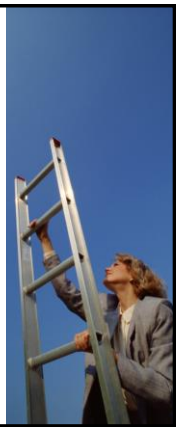
Internet-based learning compared with non-Internet instructional methods show effectiveness similar to traditional methods.

Is "just as good" good enough?

Educational researchers often fail to distinguish between research goals and methods.

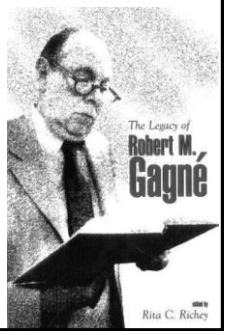
Six research goals:

- Theoretical
- Predictive
- Interpretivist
- Postmodern
- Design/Development
- Action/Evaluation



Theoretical Goals

- Focus on explaining phenomena through logical analysis and synthesis of principles and results from other studies
- EXAMPLE: Gagne's theory of the conditions of learning



Predictive Goals

- Focus on determining how education works by testing hypotheses related to theories of learning, teaching, performance, etc.
- EXAMPLE: cooperative learning and control studies by Hooper, Temiyakarn, and Williams

Simon Hooper

Interpretivist Goals

Focus on determining how education works by describing and interpreting phenomena related to learning, teaching, performance, etc.

EXAMPLE: Delia Neuman's observations of disabled children using commercial software

Delia Neuman

Postmodern Goals

- Focus on examining the assumptions underlying educational programs with the goal of revealing hidden agendas and empowering disenfranchised minorities
- EXAMPLE: Ann DeVaney's analysis of IT in relation to race, gender, and power

Anne DeVaney

Design/Development Goals

- Focus on dual objectives of developing creative approaches to solving problems and constructing reusable design principles
- EXAMPLE: Sasha Barab's "Quest Atlantis" project and "Learning Engagement Theory"

Action/Evaluation Goals

- Focus on describing, improving, or estimating the effectiveness and worth of a particular program
- EXAMPLE: Hill and Reeves four-year evaluation of ubiquitous computing initiative.

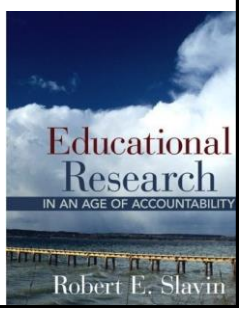
Janette Hill

Tom Reeves

Methods should not be selected until goals & research questions are clear:

- Quantitative experiment
- Qualitative observation
- Critical deconstruction
- Historical analysis
- Literature Review
- Mixed-methods

- Is there a control group?
- Are the control and experimental groups assigned randomly?
- If a matched study, are the groups extremely similar?
- Is the sample size large enough?
- Are the results statistically significant?

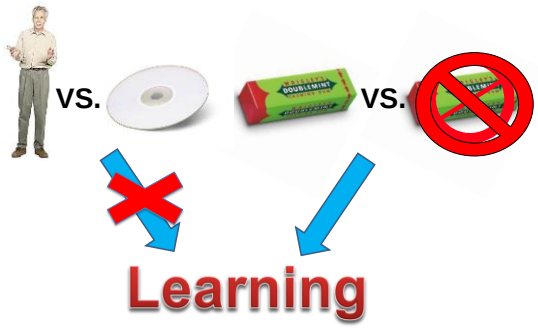


Problems with Medical Research Model

- Double blind experiments impossible in education.
- Implementation variance reduces treatment differences.
- Causal agents are under-specified in education.
- Goals, beliefs, and intentions of students and teachers affect implementation of treatments.

David R. Olson

Allen K, Galvis D, Katz R. Evaluation of CDs and Chewing Gum in Teaching Dental Anatomy. *Journal of Dental Research* 2004;83(Special Issue A),Abstract#1399.



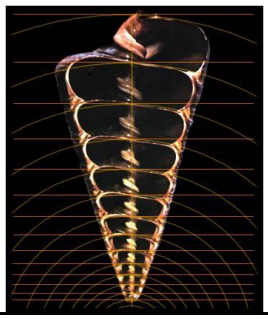
The only defensible rationale for Educational Research is

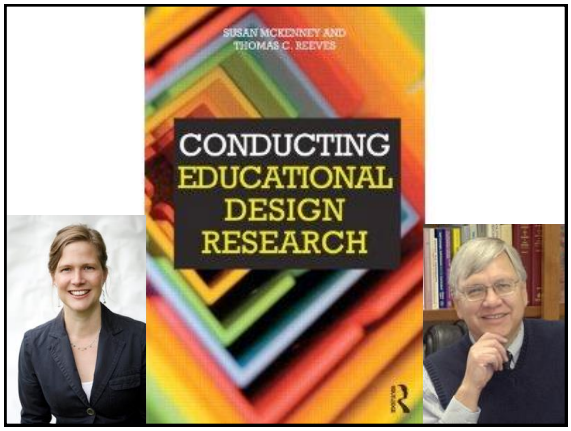
IMPACT

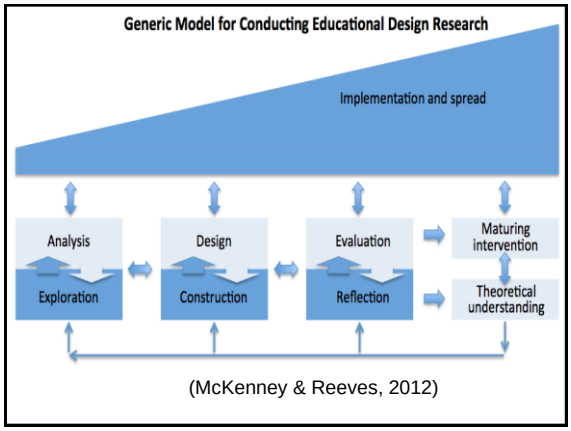
on real world problems!

Key Criteria for Educational Design Research

- Collaborative
- Utility-oriented
- Theory-informed
- Interventionist
- Iterative
- Rigorous
- Relevant







(McKenney & Reeves, 2012)

Case Study 1

Susan McKenney & Harini Raval

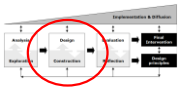
University of Twente, The Netherlands

Raval, H. (2010). *Supporting para-teachers in an Indian NGO: The plan–enact–reflect cycle*. Doctoral dissertation. Enschede, NL: Twente University.

- **Type of Study:** Educational design research study led by doctoral student and her supervisor.
- **Main Research Question:** What kind of professional support can help para-teachers adopt teaching strategies with a learner-centered orientation?
- **Dual Outcomes:**
  - Robust para-teacher professional development program
  - Design heuristics for creating similar programs in other contexts

Para-teacher learning in an Indian NGO

- **Analysis**
  - Literature review
  - Field portrait
  - Classroom observations
  - Teacher interviews
  - Management interviews
- **Exploration**
  - Program inspiration
    - India education weak
    - Long term interest in developing countries
  - SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis to establish options and boundaries for a sustainable professional development program



Para-teacher learning in an Indian NGO

- **Design**
  - Four major factors
    1. the para-teacher
    2. the instructional setting
    3. the organizational setting
    4. policy
  - Conceptual model
    - lesson planning
    - lesson enactment
    - reflection on the lessons
- **Construction**
  - Workshop components
    - tailor-made templates for lesson planning and reflection
    - Opportunities to increase content knowledge
    - Pedagogical guidelines

Para-teacher learning in an Indian NGO

- **Evaluation**
  - Three rounds of testing of professional development workshop
    1. Researcher alone
    2. Local managers with researcher present
    3. Local managers alone
- **Reflection**
  - Enhance PD program
  - Identify reusable design heuristics

Para-teacher learning in an Indian NGO

Implementation

- First: Organizational conditions
- Second: Basic teaching and classroom management skills
- Third: Learner-centeredness

- **Diffusion**
  - From start: Eye toward scale and sustainability
  - Program institutionalized (endures and grows without researchers)
  - Multiple publications

Article-Based Dissertation

- Raval, H., McKenney, S., & Pieters, J. (2010). A conceptual model for supporting para-teacher learning in an Indian NGO. *Studies in Continuing Education*, *32*(3), 217–234.
- Raval, H., McKenney, S., & Pieters, J. (2011). Institutionalizing planning, enactment and reflection of daily lessons through appropriate organizational restructuring. *The Asia-Pacific Educational Researcher, 20*(3), 438=455.
- Raval, H., McKenney, S., & Pieters, J. (2012). Contextual Factors that Foster or Inhibit Para-Teacher Professional Development: The Case of an Indian NGO. *International Journal of Training and Development*.
- Raval, H., McKenney, S. & Pieters, J. (2012). Supporting para-teachers by regularizing and strengthening planning, enactment and reflection of daily lessons. *Staff and Educational Development International, 16*(1), 5-21.
- Raval, H., McKenney, S., & Pieters, J. (2014). Remedial teaching in Indian under-resourced communities: Professional development of para-teachers. *International Journal of Educational Development*, *38*, 87-93.

Case Study 2
Enhancing Group Work in an E-learning Evaluation Course

Eunjung Oh, Ph.D.

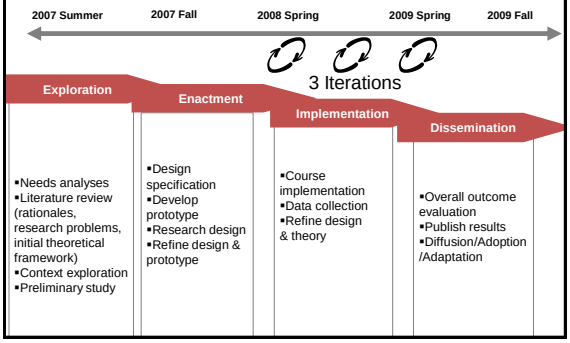
Research Goals

- To optimize collaborative group work (and ultimately learning) in an online learning environment
- To present both a refined model and design principles for online collaborative group work among adult learners in higher education

Practice

Theory

EDR Process

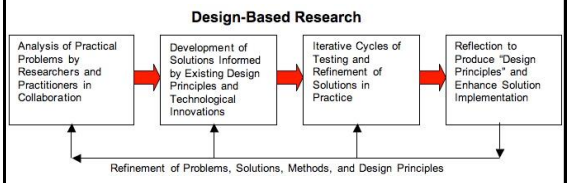



Akker


Gravemeijer

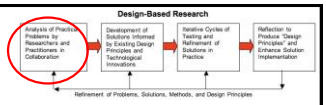

McKenney


Nieveen



Reeves, T. C. (2006). Design research from the technology perspective. In J. V. Akker, K. Gravemeijer, S. McKenney, & N. Nieveen (Eds.), ***Educational design research*** (pp. 86-109). London: Routledge.

Phase 1:



Identification of problem

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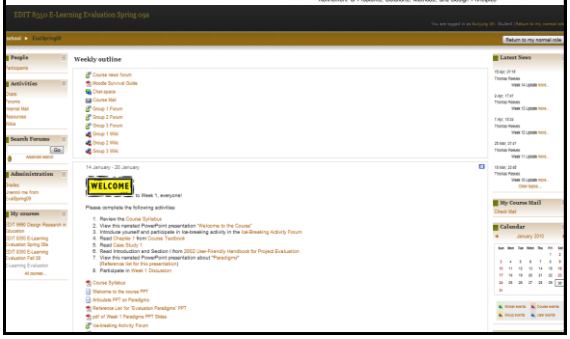
Practitioner Interest

Few online courses optimized for learning. Group work and self-regulation are challenges.

Professor desired to move evaluation course online and open it to the world.

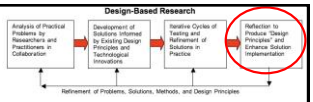
Phase 2:



Phase 3: Iteration 1

- Implemented online course for three semesters
- Intensive observations
- Surveys
- Interviews
- Document analysis
- Redesign iterations

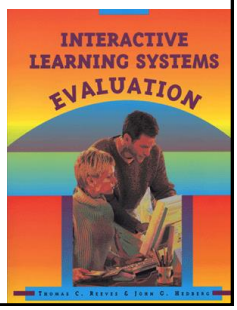
Phase 4:



- Design principles and models related to:
  - Supporting collaborative group work in online learning environments
  - Supporting self-regulated learning in online learning environments

Optimizing Group Work in Online Courses

- Two-year EDR project to design and develop a graduate-level online "E-Learning Evaluation" course to best support adult learners' group work experience
- Evaluation course delivered face-to-face for 20 years.
- Numerous requests to have the course converted to an online version

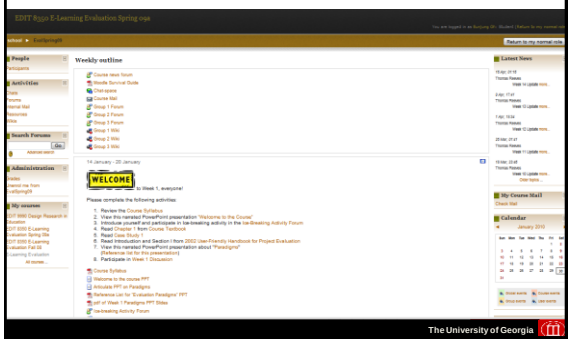


Optimizing Group Work in Online Courses

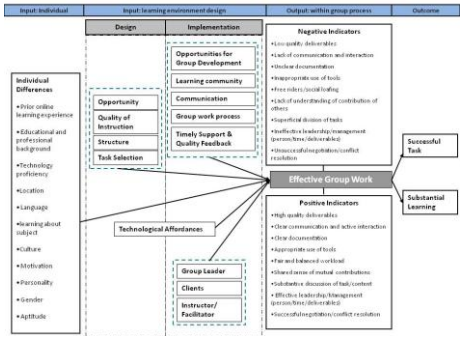
Research Questions

- What challenges do learners encounter when they work in groups in online learning environments?
- What are the attributes of groups working well together and what are the attributes of groups not working well together? What makes them different from each other?
- What supports or scaffolding do learners need during the group work process?

Design Version 3.0 (Spring, 2009)



Conceptual Framework



A model for online collaborative group work for adult learners

Findings 1: challenges encountered

First Iteration	Second Iteration	Third Iteration
Communication related issues ▪ Working in different time zones ▪ Tool affordance and choices ▪ Major events in personal lives ▪ Culture and language Technology related factors Lack of sense of community and belongingness Differences in motivation, expectations and accountability Overly optimistic expectations regarding student self directness and autonomy Lack of leadership or ineffective leadership within groups	Communication Differences in expectations regarding commitment and product quality Insufficient knowledge or opportunity to learn about each other and build relationships as team members Uncontrollable challenges that retarded the work process Ineffective leadership	Delay in project process Time management

Findings 2: attributes of groups

Positive Indicators	Negative Indicators
• High quality deliverables • Clear communication and active interaction • Clear documentation • Appropriate use of tools • Fair and balanced workload • Shared sense of mutual contributions • Substantive discussion of task/content • Effective leadership/management (person, time, and deliverables) • Successful negotiation/ conflict resolution	• Low quality deliverables • Lack of communication and interaction • Unclear documentation • Inappropriate use of tools • Free riders/social loafing • Lack of understanding of contribution of others • Superficial division of tasks • Ineffective leadership/management (person, time, and deliverables) • Unsuccessful negotiation/conflict resolution

Findings 3: identified scaffoldings & support

First Iteration	Second Iteration	Third Iteration
Model appropriate communication styles and methods Encourage students autonomy, yet provide sufficient course structure and specific guidelines Enhance the sense of community and belongingness Provide new, enhanced tools and guidelines for technology use for group work Facilitate students' learning about evaluation Assign groups with careful consideration of particular students' heterogeneous characteristics Share instructor's expectations for performance Provide opportunities for discussion of their expectation	Guide communication and organization/management strategies directly Provide guidance on effective leadership Assign groups with careful consideration Reach out to students Establish an atmosphere for more social/personal interaction Provide task-centered scaffolding	Provide more task-centered scaffolding to improve time management

Outcomes

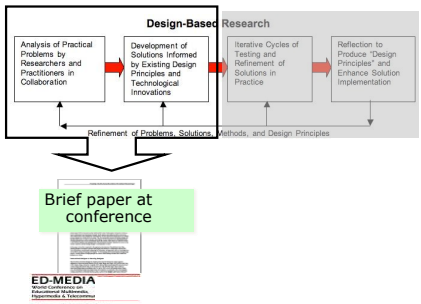
- **7 design principles & 30 associated strategies**
- Research: explore the sustainability, transferability and generalizability of the outcomes
  - Application without the presence of design researchers
  - Application beyond the local setting
- Practice: Application in broader settings
  - Design principles/strategies need adjustment depending on the context
  - High transferability because of familiar/free technology use
  - Online evaluation courses, courses using a semester-long authentic project

7 Design Principles

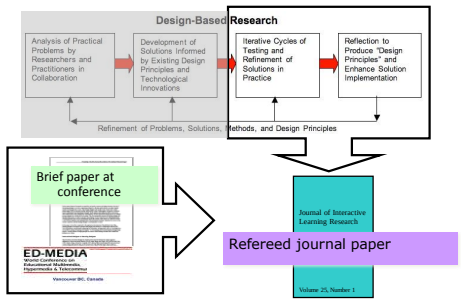
- Facilitate communication
- Establish a strong sense of community and a sense of belongingness to their own groups and the class
- Provide a variety of technology everyone can use
- Maximize the opportunities of collaboration and scaffold the group work process
- Provide opportunities for establishing positive interdependence
- Enhance individual accountability, motivation, and engagement for active participation in group work
- Facilitate individual student learning about evaluation

All my EDR students used research articles format for dissertations.

Publishing Educational Design Research



Publishing Educational Design Research



Educational Design Research:

- Working closely with practitioners, define a pedagogical outcome and create a prototype learning environment informed by theory.
- Emphasize content and pedagogy rather than just technology.
- Give special attention to supporting human interactions.
- Test, refine, and retest learning environments until outcome is reached. Refine theory simultaneously.

Rationales for MOOCs

- Increase access to educational opportunities for those who would otherwise not have them

C+

- Increase the quality and effectiveness of teaching and learning

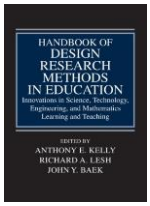
F

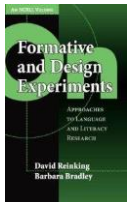
You have 15 minutes to work with another participant to outline a design-based research plan focused on improving the educational quality of MOOCs.

Please describe in brief:

- problem
- collaborators
- initial design principles
- research questions
- data collection methods

EDR Resources





http://dbrxroads.coe.uga.edu/

http://www.international.slo.nl/edr

http://authenticlearning.info/DesignBasedResearch/Design-based_research.html

Education is a design profession like architecture and engineering, and thus educational researchers should pursue design research that integrates the desire to solve problems with the search for knowledge.

"The status of research deemed educational would have to be judged, first in terms of its disciplined quality and secondly in terms of its impact. Poor discipline is no discipline. **And excellent research without impact is not educational.**"

Charles Desforges (2000)

Thank You!

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