

# PRESENTATION OF RESEARCH ON AND RESEARCH WITH EMERGING TECHNOLOGIES

**By:**  
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Article: Research on and Research with Emerging Technologies

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## → Objectives

- Historical examination of research in computer-assisted learning systems over the past 30 years
- Analyze critically contemporary computer-based instruction research as it relates to issues of effectiveness, design, and individual differences
- Examine and analyze research on emerging computer-based learning systems, and
- Identify problems, issues, and unresolved research questions related to the future of computer-aided learning.

It is important to point out technologies are continuously changing; therefore, research on or with a specific technology is viewed as phases of an ongoing metamorphosis.

## → Historical examination of research in computer-assisted learning systems

- The authors trace the evolution of computer-based instruction to the work of Pascal, and point out that, issues such as cost, size, space barriers, and computer hardware problems marked this evolution.
- They acknowledge the fact that there were limitations in terms of pedagogy and usability to provide good computer-based instruction. As a result, computer-based instructions available in those days were poorly designed.
- The main research in the mid-1960s was the Stanford Arithmetic Project, which provides a scientific study of computer-assisted learning.
- Many research on computer and learning followed using the behaviorism theory, and emphasizing human-computer interactions.
- Large-scale research and development efforts came mainly out of the University of Illinois PLATO project
- In the late 1960s, research started looking out the cognitive perspective of computer and learning
- Contemporary research revolves around user-centered learning, open-ended learning, and hypermedia.

It is important to note that the evolution of computers in learning was possible thanks to the development in psychology, pedagogy, and technology.

→ Effectiveness of emerging technologies

- The effectiveness of emerging technologies is the most critical issue of research done in this IT field.
  - ♣ Cost effectiveness
    - Expensive hardware
    - “Cost –added” models are used to see the marginal gains associated with the developed systems. The costs associated with computer-aided learning were so high that they rarely feasible.
    - Research to compare recurring costs and maintenance were rare
  - ♣ Meta-analyses
    - “It is a statistical process whereby the findings of several studies, focusing on a common problem or topic are pooled in an effort to draw inferences as to the meaning of a collective body of research.”
    - Focus on tutorials, simulations, drills. These researches did not provide answers to the big questions. For i.e. Clark’s famous debate on the lack of media effect on learning.
    - Instead of focusing on “big question, big answer” the focus should normally be on finding ways to effectively utilize computer and technologies to support teaching and learning efforts. This leads us to the identification of methods and strategies to reach that goal.
  - Design of computer-based Instruction
    - Orienting the learner (navigation, advance organizers, interaction)
    - Presenting the lesson (multimodal instruction instead information presented instruction – Use of illustrations, animation, effective screen design and display).
    - Encoding Support (Personalizing Instruction, interaction method)
    - Detecting, Correcting Errors (“help learners recognize inadequacies in their mental models and stimulates deeper understanding”)
    - Lesson sequencing (learner vs. Designer control - two opposing views of learner control, Adapting Instruction, advising learners, hypertext/hypermedia linking)
    - Motivation
    - Applying knowledge and skills (Problem solving, knowledge transfer
    - Contextual factors (situated cognition, cognitive apprenticeships, authentic learning, and anchored instruction)
  - Evolution in perspective
    - “Emerging technologies are altering the design process itself. Research on design indicates that traditional design strategies have

focused on *how and what* to teach rather than *empowering to learn*".

- 'Developing, testing and researching alternative design methods may be among the most daunting of tasks facing future researchers'.

→ Emerging constructs and learning systems

- Need to use contemporary approaches that are rooted in cognitive theories.
  - ♣ Psychological Constructs
    - Learning as the Active Construction of knowledge ('learning is a personal event that results from sustained and meaningful engagement with one's environment')(Bruner)).
  - ♣ Situated Cognition and generative Learning (promising theories for technologically enhanced learning environments)
- Emerging learning systems (examples of STELLA, Logo MicroWorlds, Jasper Woodbury, The voyage of the Mimi, Citizen Kane)
- Reflections on Emerging Learning Systems
  - ♣ Responsibility on learners

→ Into the 21<sup>st</sup> Century

Future research should be conducted in the following areas: New design methods, tools for thinking and learning, classroom applications, and expanded theory and research

- New design Methods (Alternative Design strategies, Rapid Prototyping of Innovative Designs and Strategies, Hybridization of analog technologies into digital formats)
  - Tools for thinking and learning (Tools and resources that aid in the construction of knowledge)
  - Classroom Applications (Innovative classrooms and reinvented schools, optimization of both learner and technological capabilities)
  - Theory and research (integrated views of teaching, learning and technologies, clarification of relationships among teaching, learning, and technology, redefinition of research problems and assessment methods, the study of expertise, evolution of new, integrated theories)

→ Summary and conclusion

A shift from learning *from media* to learning *with media* is required in emerging technology research for the new millennium.