Frameworks for Educational Technology: SAMR and the EdTech Quintet

Ruben R. Puente, Ph.D.
Redefinition
Tech allows for the creation of new tasks, previously inconceivable

Modification
Tech allows for significant task redesign

Augmentation
Tech acts as a direct tool substitute, with functional improvement

Substitution
Tech acts as a direct tool substitute, with no functional change

Ruben R. Puentedura, As We May Teach: Educational Technology, From Theory Into Practice. (2009)
Step 1
The teacher provides a description, explanation, or example of the new term

Step 2
Students restate the explanation of the new term in their own words

Step 3
Students create a nonlinguistic representation of the term

Step 4
Students do activities that help them add to their knowledge of vocabulary terms

Step 5
Students are asked to discuss the terms with one another

Step 6
Students are involved in games that allow them to play with the terms
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Enhancement
Transformation

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<thead>
<tr>
<th>Study</th>
<th>SAMR Level</th>
<th>Description</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ligas (2002)</td>
<td>S</td>
<td>CAI system used to support direct instruction approach for at-risk students.</td>
<td>0.029</td>
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<tr>
<td>Xin &amp; Reith (2001)</td>
<td>A</td>
<td>Multimedia resources provided to contextualize learning of word meanings and concepts.</td>
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<td>Higgins &amp; Raskind (2005)</td>
<td>M</td>
<td>Software/hardware used for text-to-speech, definitions, pronunciation guide for children with reading disabilities.</td>
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<td>Salomon, Globerson &amp; Guterman (1989)</td>
<td>R</td>
<td>Software presents students with reading principles and metacognitive questions as part of the reading process.</td>
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<tr>
<td>Algebra I</td>
<td>S to A</td>
<td>S: Computerized algebra drills, some tied to real-world scenarios</td>
<td>≈ 0.2</td>
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<tr>
<td>Effectiveness of Cognitive Tutor Algebra I at Scale,</td>
<td></td>
<td>A: Tools for basic visualization; adaptive response to student progress</td>
<td>50th perc. → 58th perc.</td>
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<tr>
<td>by John F. Pane, Beth Ann Griffin, Daniel F. McCaffrey, Rita Karam</td>
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<tr>
<td>Earth Science</td>
<td>A to M</td>
<td>A: Interactive tools for concept exploration and visualization</td>
<td>≈ 0.6</td>
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<tr>
<td>Using Laptops to Facilitate Middle School Science Learning: The</td>
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<td>M: Narrated animation as final project</td>
<td>50th perc. → 73rd perc.</td>
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<tr>
<td>Results of Hard Fun, by Alexis M. Berry, Sarah E. Wintle</td>
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<td></td>
<td>(≈ 1.4 a month later)</td>
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<td></td>
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<td></td>
<td>(50th perc. → 92nd perc.)</td>
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![Image of human skulls and artifacts representing different time periods.](image)
Learning Environments

- Contextual Search
- Augmented Reality
- Cloud Resources
- Mobile Tools
- Sensors
- Recorders
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[Image of archaeological finds representing different time periods]
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Formal Definition of **Game** (Salen & Zimmerman)

“A game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome.”
Core Values

- Self-Awareness
- Self-Management
- Civic Literacy, Global Awareness and Cross-cultural Skills
- Communication, Collaboration and Information Skills
- Responsible Decision-Making
- Social Awareness
- Relationship Management
- Concerned Citizen
- Active Contributor
- Confident Person
- Self-directed Learner

Source: Singapore Ministry of Education - 21st Century Competencies
Students will
- Articulate learning gaps
- Set learning goals and identify learning tasks to achieve the goals

Conditions for Students’ Self-management and Monitoring of their Learning

Teachers will
- Broaden and deepen students’ learning
- Challenge students to reach a new level of thinking

Experiences for Extension of Students’ Learning

Student-Teacher Learning Partnership

Teachers will
- Scaffold self-directed learning processes to shift responsibility for learning from teacher to students, i.e. facilitate:
  - Self-management of learning through analysis, inquiry, expression of differing and conflicting views and decision making in an emotionally safe environment
  - Self-monitor and reflect on their own thinking and learning processes

Ownership of Learning

Students will
- Explore alternatives and make sound decisions
- Formulate questions and generate own inquiries
- Plan and manage workload and time effectively and efficiently
- Reflect on their learning and use feedback to improve their schoolwork

Management and Monitoring of Own Learning

Extension of Own Learning

Students will
- Apply learning in new contexts
- Learn beyond the curriculum

Self-Directed Learning
Scholarly Primitives: What Methods Do Humanities Researchers Have in Common and How Might Our Tools Reflect This?

- Discovering: selecting according to a criterion, showing relationships of items selected to the original set
- Annotating: searching, browsing, accessing, collecting, categorizing, providing commentary, analyzing
- Comparing: find differences, similarities and create meaning from them
- Referring: linking, referencing
- Sampling: searching, browsing, accessing, collecting
- Illustrating: showing an example, highlighting features within an example
- Representing: changing depiction mode, publishing

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**Collaborative Learning**

**Effective Group Processes**
- Students will:
  - Negotiate and set common goals
  - Interactively contribute own ideas clearly and consider other points of view objectively and maturely
  - Ask questions to clarify and offer constructive feedback
  - Reach consensus and take on different roles and tasks responsibly within the group to achieve group goals
  - Reflect on group and individual learning processes

**Individual and Group Accountability of Learning**
- Students will:
  - Work towards completing individual's assigned tasks as well as help group members achieve group goals
  - Rely on each other for success

**Assessment of Individual and Group Learning**
- Teachers will:
  - Use various assessment methods to assess both individuals and group learning and performance
  - Provide feedback on individual learning and group learning and performance

**Structures for Collaboration among Students**
- Teachers will:
  - Develop students' communication skills and interpersonal skills
  - Provide conflict management strategies on resolving diverse or conflicting views

**Structures for Effective Group Processes**
- Teachers will:
  - Develop students' communication skills and interpersonal skills
  - Provide conflict management strategies on resolving diverse or conflicting views

Source: Singapore Ministry of Education - The ICT Connection - Masterplan 3: Understanding the Goals
Location
Position in space

Condition
Mix of natural & artificial features that give meaning to a location

Links
Connections between places

Formal Region
Group of places with similar conditions

Functional Region
Group of places linked together by a flow
Shigeru Ban - The Nomadic Museum – Photo by weird tramp
An authentic connection between academic disciplines and real world experience

A framework and workflow to develop 21st century skills

The purposeful use of technology for researching, analyzing, organizing, collaborating, communicating, publishing and reflecting.

The opportunity for learners to do something important now, rather than waiting until they are finished with their schooling

The documentation and assessment of the learning experience from challenge to solution

An environment for deep reflection on teaching and learning

A process that places students in charge of their learning

These attributes enable Challenge Based Learning to engage all learners, provide them with valuable skills, span the divide between formal and informal learning, and embrace a student's digital life.

Key Components

The Challenge Based Learning process begins with a big idea and cascades to the following: an essential question, a challenge, guiding questions, activities, and resources, a solution, implementation, evaluation, reflection, assessment, and publishing.

The Big Idea:

The big idea is a broad concept that can be explored in multiple ways, is engaging, and has importance to learners, and the larger society. Examples of big ideas are Resilience, Separation, Creativity, Health, Sustainability, and Democracy.

Essential Question:

By design, the big idea allows for the generation of a wide variety of essential questions. Eventually the process narrows to one essential question that reflects the interests of the learners and the needs of their community.

The Challenge:

From the essential question a concise challenge is articulated that asks the learners to create a specific solution that will result in concrete, meaningful action.

Guiding Questions, Activities and Resources:

Generated by the learners, guiding questions represent the knowledge needed to successfully develop a solution and provide a map for the learning process. The learners identify lessons, simulations, activities, and content resources, to answer the guiding questions and set the foundation for them to develop innovative, insightful, and realistic solutions.

Solutions:

Each challenge is stated broadly enough to allow for a variety of solutions. The solution should be thoughtful, concrete, clearly articulated and actionable in the local community.
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Hippasus

Blog: http://hippasus.com/rrpweblog/
Email: rubenrp@hippasus.com
Twitter: @rubenrp

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