21st Century Literacies: 
A Look Through a Technology Lens 

Ruben R. Puentejura, Ph.D.
<table>
<thead>
<tr>
<th>Social</th>
<th>Mobility</th>
<th>Visualization</th>
<th>Storytelling</th>
<th>Gaming</th>
</tr>
</thead>
<tbody>
<tr>
<td>200,000 years</td>
<td>70,000 years</td>
<td>40,000 years</td>
<td>17,000 years</td>
<td>8,000 years</td>
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</tbody>
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![Image of various artifacts and visualizations](image-url)

- **Social**: The evolution of social structures over 200,000 years.
- **Mobility**: Changes in mobility patterns over 70,000 years.
- **Visualization**: Advances in visualization techniques over 40,000 years.
- **Storytelling**: Development of storytelling over 17,000 years.
- **Gaming**: Emergence of gaming culture over 8,000 years.
Information Literacy and Social Structures
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: categorizing, providing commentary, analyzing
- Comparing: finding differences, similarities and creating 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
**Community Types**

- **Communities of Practice**: A group of people with a common interest or practice who share information and/or network.

- **Teams**: Communities working on a shared goal for a particular project or function.

- **Technical Support Groups**: Provide technical support for a particular software or hardware tool.

- **IdeaLabs**: Communities in which members brainstorm around a set of questions or issues for a limited period of time, usually one to three days long.

- **Recreation**: Communities devoted to recreational activities unrelated to work.

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A Basic Social Toolkit

• Bookmarks: Delicious, Diigo

• RSS Feeds: Reeder

• Discussions: Edmodo

• Microblogging: Twitter

• Blogging: WordPress

• Wikis: MediaWiki

• Telepresence: Google+ Hangouts
Design From Expectations

21st Century Learning

Foundational Knowledge

Core Content Knowledge

Cross-Disciplinary Knowledge/Synthesis

Information Literacy

Meta Knowledge

Humanistic Knowledge

Communication & Collaboration

Life & Job Skills

Ethical & Emotional Awareness

Problem Solving & Critical Thinking

Creativity & Innovation

Cultural Competence
Seymour Papert: Four Expectations

- **Expectation 1:** the scholastically unsuccessful group among the students will advance by several grade levels on standard achievement tests in mathematics and language. We shall, of course, confirm the significance of any such observation by comparison with a control group matched on a series of variables set up before the outset of the experiment.

- **Expectation 2:** observers will agree that the student in the experiment not only learned more than in a traditional class, but learned it in a more articulate, richer, more integrated way.

- **Expectation 3:** students will develop, or adapt concepts and metaphors derived from computers and use them not only as intellectual tools in the construction of models of such things as "number" and "theory" but also in elaborating models of their own cognitive processes. This will in turn have an impact on their styles of learning and problem-solving.

- **Expectation 4:** the use of computer metaphors by children will have effects beyond what is normally classed as "cognitive skill". We expect it will influence their language, imagery, games, social interactions, relationships, etc…
Measuring the Four Expectations

• **Expectation 1:** suitably designed formative/summative assessment rubrics will show improvement when compared to traditional instruction.

• **Expectation 2:** students will show more instances of work at progressively higher levels of Bloom’s Taxonomy.

• **Expectation 3:** student work will demonstrate more – and more varied – critical thinking cognitive skills, particularly in areas related to the examination of their own thinking processes.

• **Expectation 4:** student daily life will reflect the introduction of the technology. This includes (but is not limited to) directly observable aspects such as reduction in student attrition, increase in engagement with civic processes in their community, and engagement with communities beyond their own.
“Practice in a classroom is formative to the extent that evidence about student achievement is elicited, interpreted, and used by teachers, learners, or their peers, to make decisions about the next steps in instruction that are likely to be better, or better founded, than the decisions they would have taken in the absence of the evidence that was elicited.”

## Wiliam: A Framework for Formative Assessment

<table>
<thead>
<tr>
<th>Role</th>
<th>Where the learner is going</th>
<th>Where the learner is right now</th>
<th>How to get there</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher</td>
<td>1 Clarifying learning intentions and criteria for success</td>
<td>2 Engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding</td>
<td>3 Providing feedback that moves learners forward</td>
</tr>
<tr>
<td>Peer</td>
<td>Understanding and sharing learning intentions and criteria for success</td>
<td>4 Activating students as instructional resources for one another</td>
<td></td>
</tr>
<tr>
<td>Learner</td>
<td>Understanding learning intentions and criteria for success</td>
<td>5 Activating students as the owners of their own learning</td>
<td></td>
</tr>
</tbody>
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Dylan Wiliam, *Embedded Formative Assessment*, Solution Tree (2011)
Bloom's Taxonomy: Cognitive Processes

<table>
<thead>
<tr>
<th>Anderson &amp; Krathwohl (2001)</th>
<th>Characteristic Processes</th>
</tr>
</thead>
</table>
| Remember                    | • Recalling memorized knowledge  
                              | • Recognizing correspondences between memorized knowledge and new material |
| Understand                  | • Paraphrasing materials    
                              | • Exemplifying concepts, principles  
                              | • Classifying items               
                              | • Summarizing materials          |
|                             | • Extrapolating principles  
                              | • Comparing items               |
| Apply                       | • Applying a procedure to a familiar task  
                              | • Using a procedure to solve an unfamiliar, but typed task |
| Analyze                     | • Distinguishing relevant/irrelevant or important/unimportant portions of material  
                              | • Integrating heterogeneous elements into a structure  
                              | • Attributing intent in materials |
| Evaluate                    | • Testing for consistency, appropriateness, and effectiveness in principles and procedures  
                              | • Critiquing the consistency, appropriateness, and effectiveness of principles and procedures, basing the critique upon appropriate tests |
| Create                      | • Generating multiple hypotheses based on given criteria  
                              | • Designing a procedure to accomplish an untyped task  
                              | • Inventing a product to accomplish an untyped task |

### Facione: Critical Thinking – Cognitive Skills and Subskills

<table>
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<tr>
<th>Skill</th>
<th>Subskills</th>
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<tbody>
<tr>
<td>Interpretation</td>
<td>Categorization</td>
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<tr>
<td></td>
<td>Decoding Significance</td>
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<tr>
<td></td>
<td>Clarifying Meaning</td>
</tr>
<tr>
<td>Analysis</td>
<td>Examining Ideas</td>
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<tr>
<td></td>
<td>Identifying Arguments</td>
</tr>
<tr>
<td></td>
<td>Analyzing Arguments</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Assessing Claims</td>
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</tr>
<tr>
<td>Inference</td>
<td>Querying Evidence</td>
</tr>
<tr>
<td></td>
<td>Conjecturing Alternatives</td>
</tr>
<tr>
<td></td>
<td>Drawing Conclusions</td>
</tr>
<tr>
<td>Explanation</td>
<td>Stating Results</td>
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<tr>
<td></td>
<td>Justifying Procedures</td>
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<tr>
<td></td>
<td>Presenting Arguments</td>
</tr>
<tr>
<td>Self-Regulation</td>
<td>Self-examination</td>
</tr>
<tr>
<td></td>
<td>Self-correction</td>
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Framing Cross-Disciplinary Work
Three Categories

• **Convergent Design**
  - What is a common underlying feature connecting different activities in different subject areas?
  - Example: how does marketing appear as a common feature to be addressed across vocational areas?

• **Divergent Design**
  - What do different disciplines have to say about one central theme?
  - Example: what do different subject areas contribute to the understanding of the European Union?

• **Challenge Based Learning**
  - How do we go from a big idea, to a challenge, to implementing a solution, to assessing it?
  - Example: what challenge and response could we derive from the idea of sustainability?
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.
**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.

**Big Idea**
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Evaluation
The CBL Process

Collaborative Space
- How will the teams communicate?
- Where will resources be shared?

Introduction
- Why is this idea important to the students?
- Why is this idea important to the community?

Team Formation
- What makes up a productive design team?
- How do we capitalize on everyone’s skills?

Assessment
- How will the process be assessed?
- How will the solution be assessed?

Guiding Questions
- What do we need to know in order to meet the challenge?

Guiding Activities
- What do we need to do to answer our guiding questions?
- What resources are needed?

Solution Development
- How do we meet the challenge?
- Is the solution justified?

Implement and Assess
- How can the solution be tested?
- Did the solution work?

Document/Reflect
- What did we learn?
- What would we do differently?

Publish
- How do we share our results?
- What is the story behind the solution?
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Resources

Hippasus

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