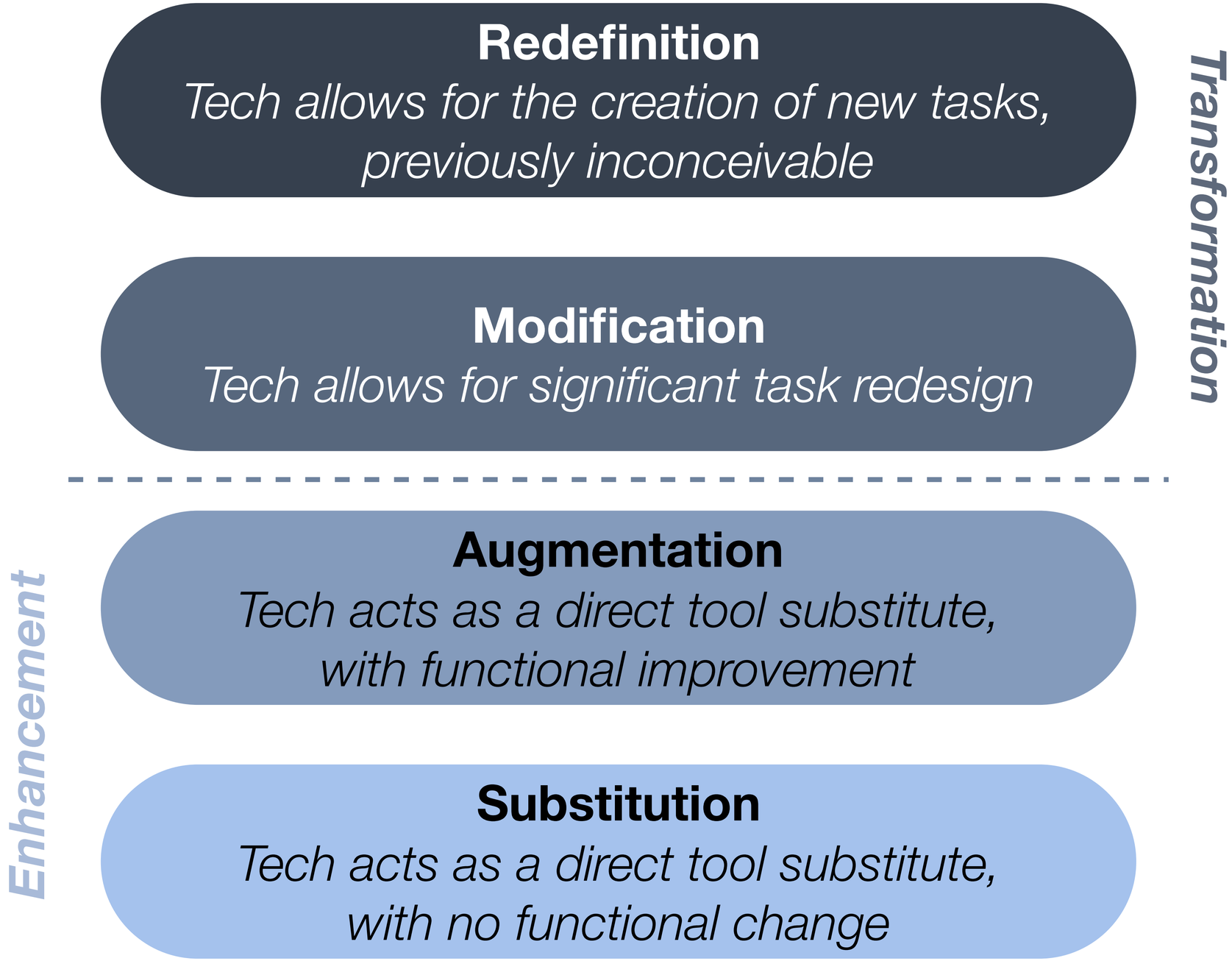
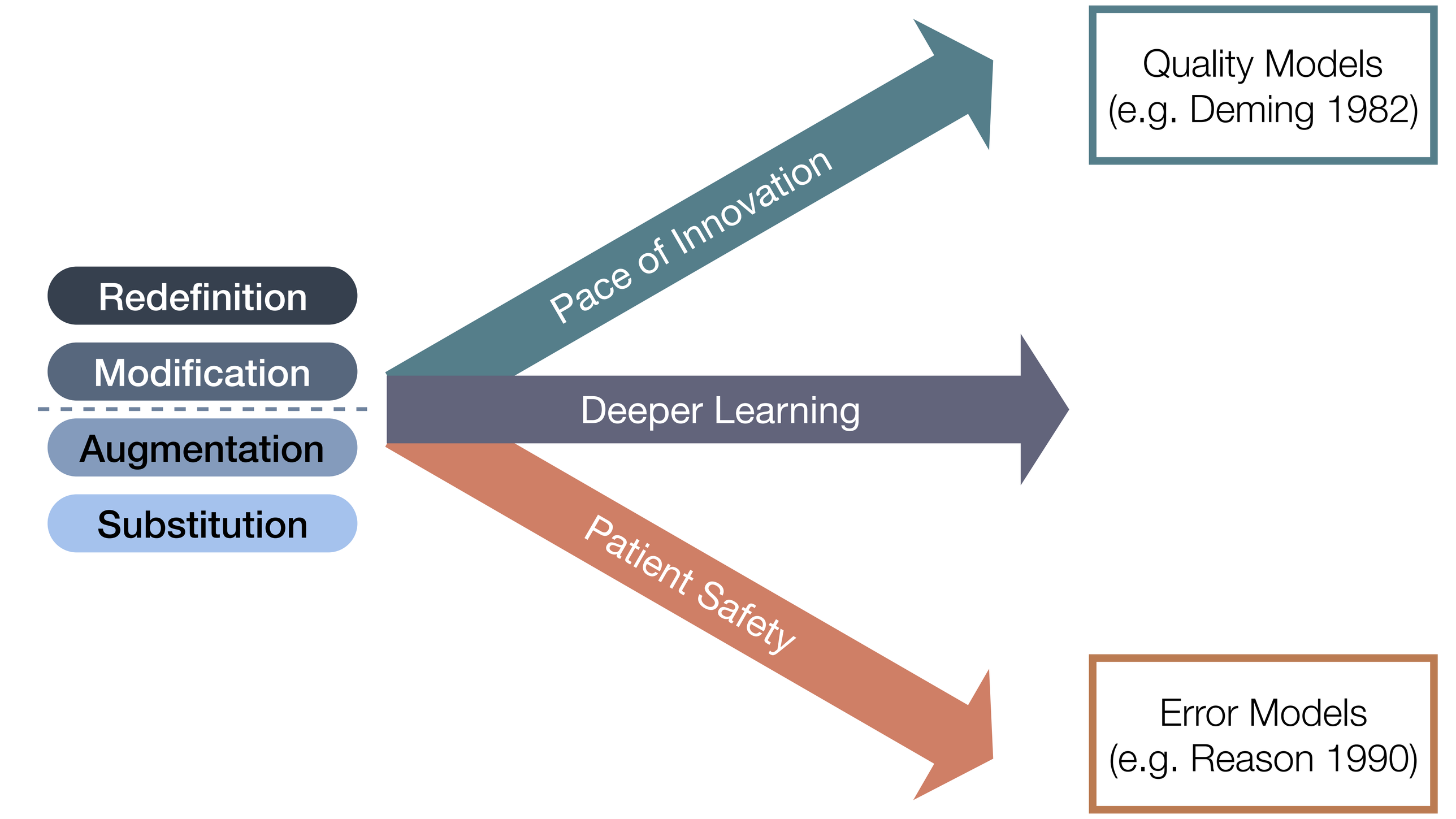
SAMR and the EdTech Quintet: The Context for Technical Education

Ruben R. Puentedura, Ph.D.



Ruben R. Puentedura, *As We May Teach: Educational Technology, From Theory Into Practice*. (2009)


Redefinition
Modification
Augmentation
Substitution
Pace of Innovation
Deeper Learning
Patient Safety
Quality Models
(e.g. Deming 1982)
Error Models
(e.g. Reason 1990)

Redefinition

Tech allows for the creation of new tasks, previously inconceivable

Modification

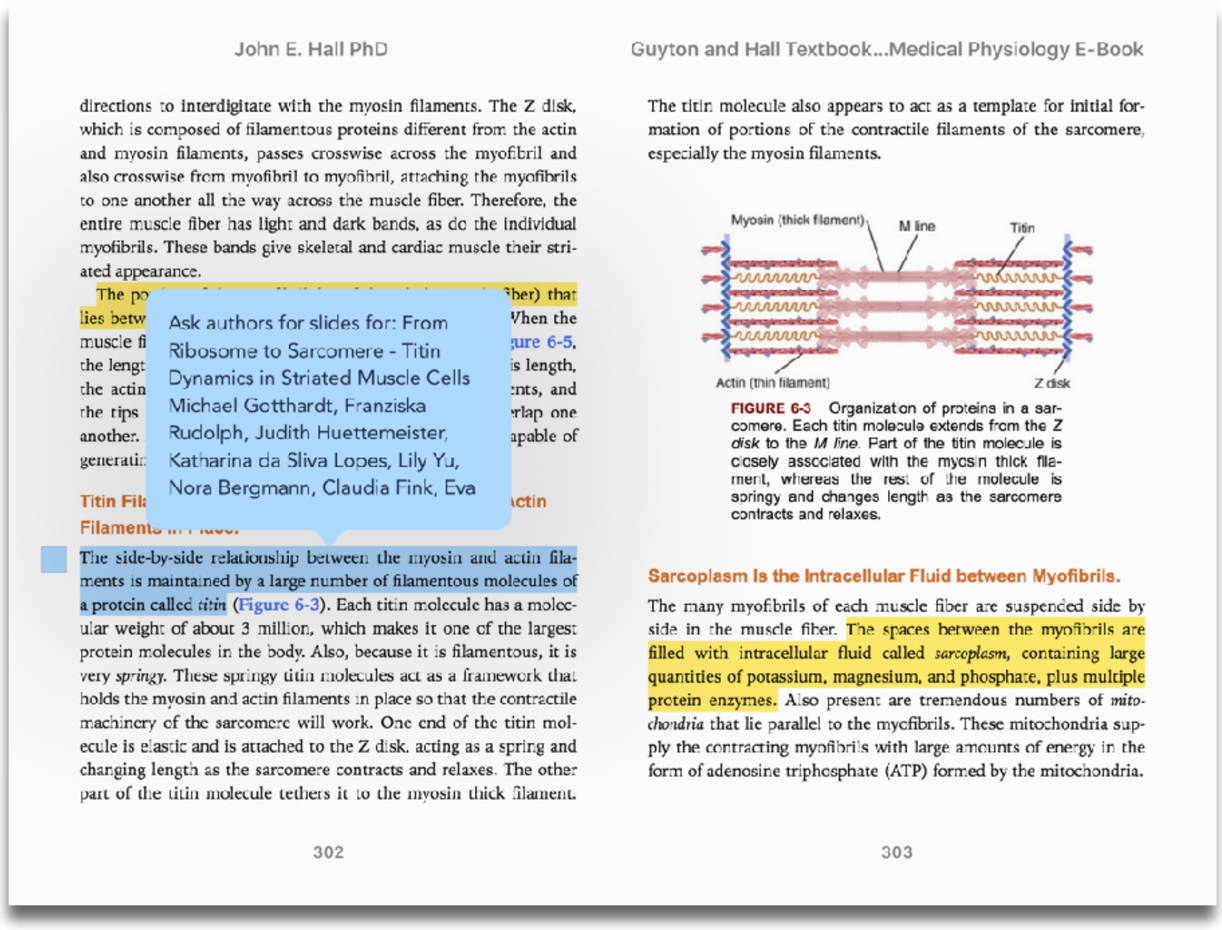
Tech allows for significant task redesign

Augmentation

Tech acts as a direct tool substitute, with functional improvement

Substitution

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



John E. Hall PhD

directions to interdigitate with the myosin filaments. The Z disk, which is composed of filamentous proteins different from the actin and myosin filaments, passes crosswise across the myofibril and also crosswise from myofibril to myofibril, attaching the myofibrils to one another all the way across the muscle fiber. Therefore, the entire muscle fiber has light and dark bands, as do the individual myofibrils. These bands give skeletal and cardiac muscle their striated appearance.

The po… …ber) that lies betw… …When the muscle fi… …ure 6-5, the lengt… …is length, the actin… …nts, and the tips … …rlap one another. … …apable of generatin…

Titin Fil… …ctin Filaments in Place.

The side-by-side relationship between the myosin and actin filaments is maintained by a large number of filamentous molecules of a protein called *titin* (Figure 6-3). Each titin molecule has a molecular weight of about 3 million, which makes it one of the largest protein molecules in the body. Also, because it is filamentous, it is very *springy*. These springy titin molecules act as a framework that holds the myosin and actin filaments in place so that the contractile machinery of the sarcomere will work. One end of the titin molecule is elastic and is attached to the Z disk, acting as a spring and changing length as the sarcomere contracts and relaxes. The other part of the titin molecule tethers it to the myosin thick filament.

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Ask authors for slides for: From Ribosome to Sarcomere - Titin Dynamics in Striated Muscle Cells Michael Gotthardt, Franziska Rudolph, Judith Huettemeister, Katharina da Sliva Lopes, Lily Yu, Nora Bergmann, Claudia Fink, Eva

Guyton and Hall Textbook...Medical Physiology E-Book

The titin molecule also appears to act as a template for initial formation of portions of the contractile filaments of the sarcomere, especially the myosin filaments.

FIGURE 6-3 Organization of proteins in a sarcomere. Each titin molecule extends from the Z *disk* to the *M line*. Part of the titin molecule is closely associated with the myosin thick filament, whereas the rest of the molecule is springy and changes length as the sarcomere contracts and relaxes.

Sarcoplasm Is the Intracellular Fluid between Myofibrils.

The many myofibrils of each muscle fiber are suspended side by side in the muscle fiber. The spaces between the myofibrils are filled with intracellular fluid called *sarcoplasm*, containing large quantities of potassium, magnesium, and phosphate, plus multiple protein enzymes. Also present are tremendous numbers of *mitochondria* that lie parallel to the myofibrils. These mitochondria supply the contracting myofibrils with large amounts of energy in the form of adenosine triphosphate (ATP) formed by the mitochondria.

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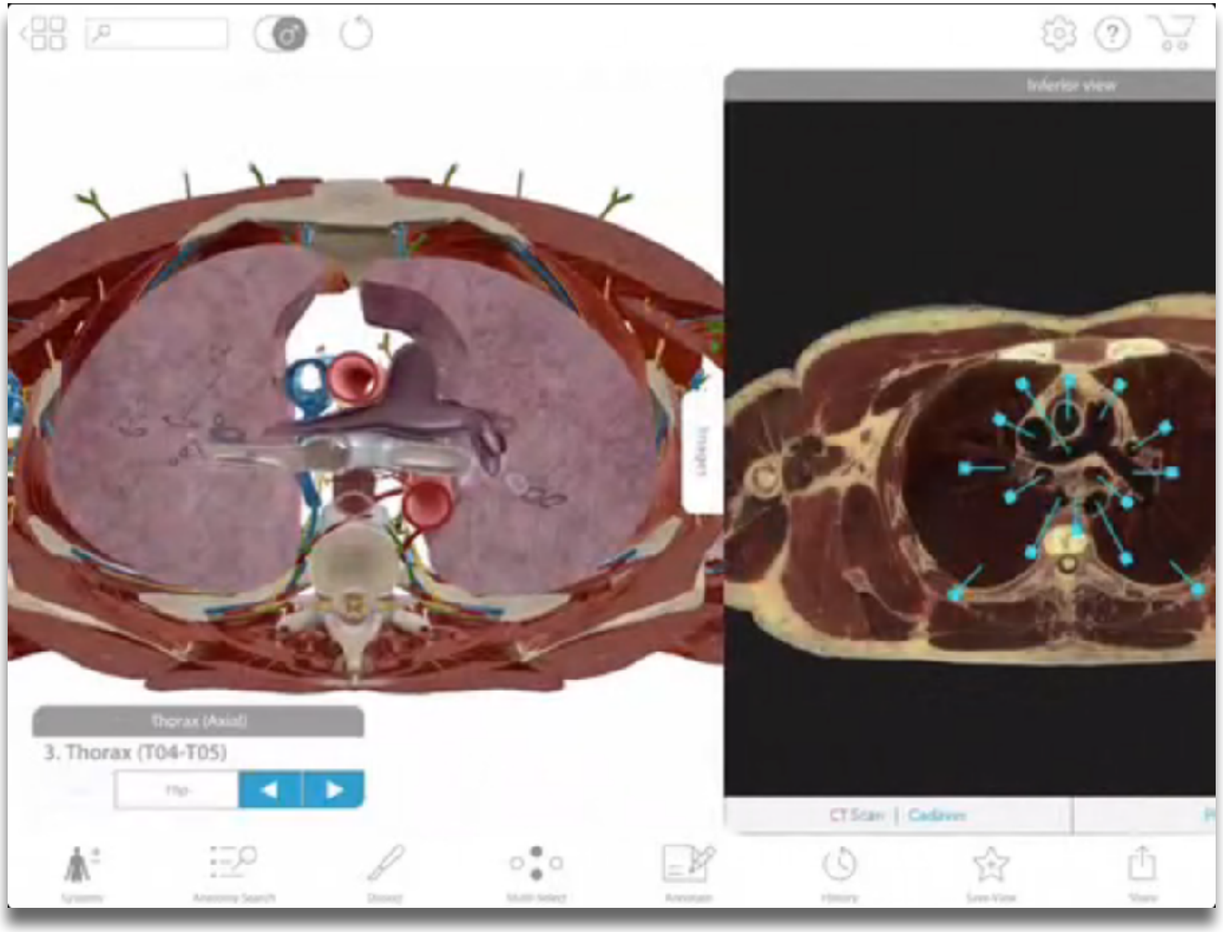

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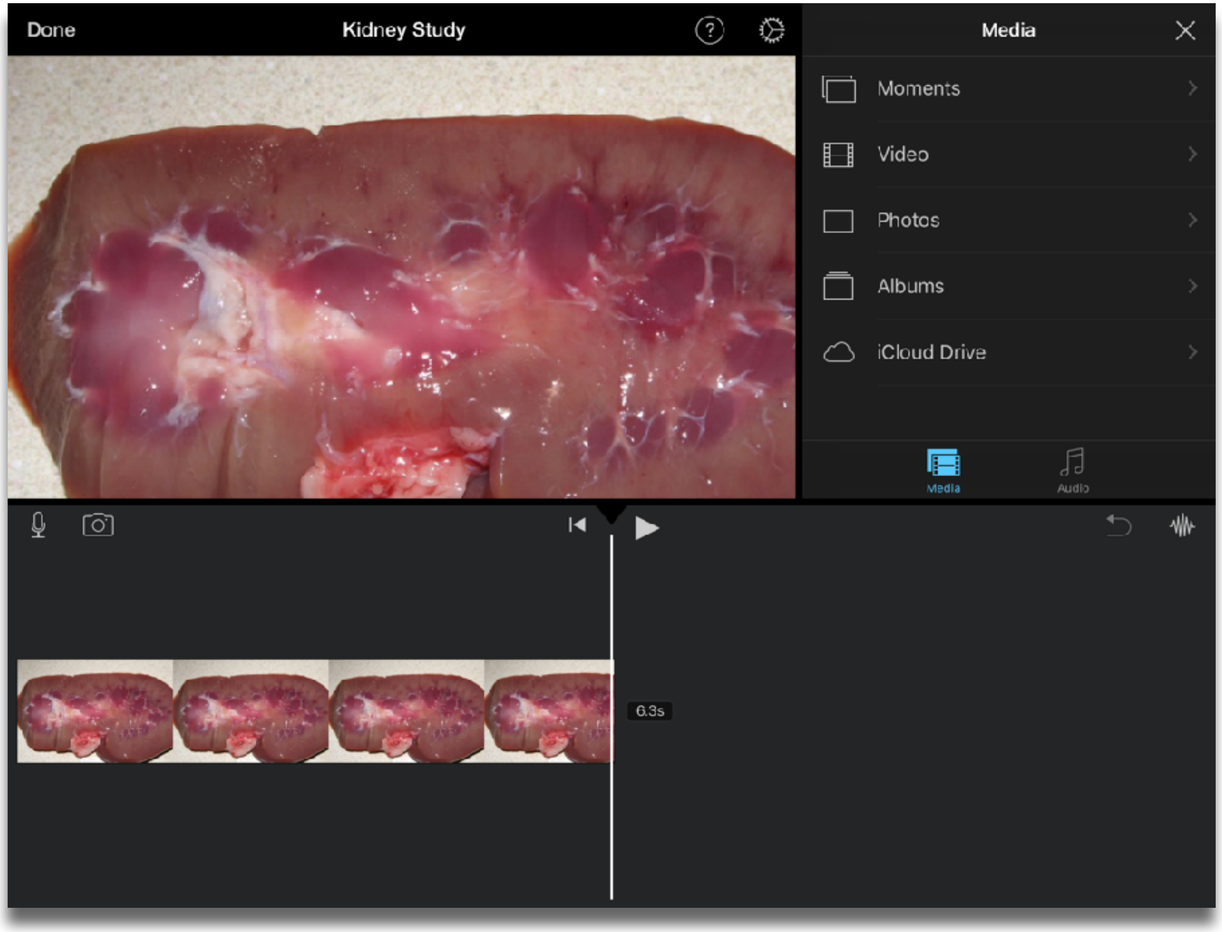

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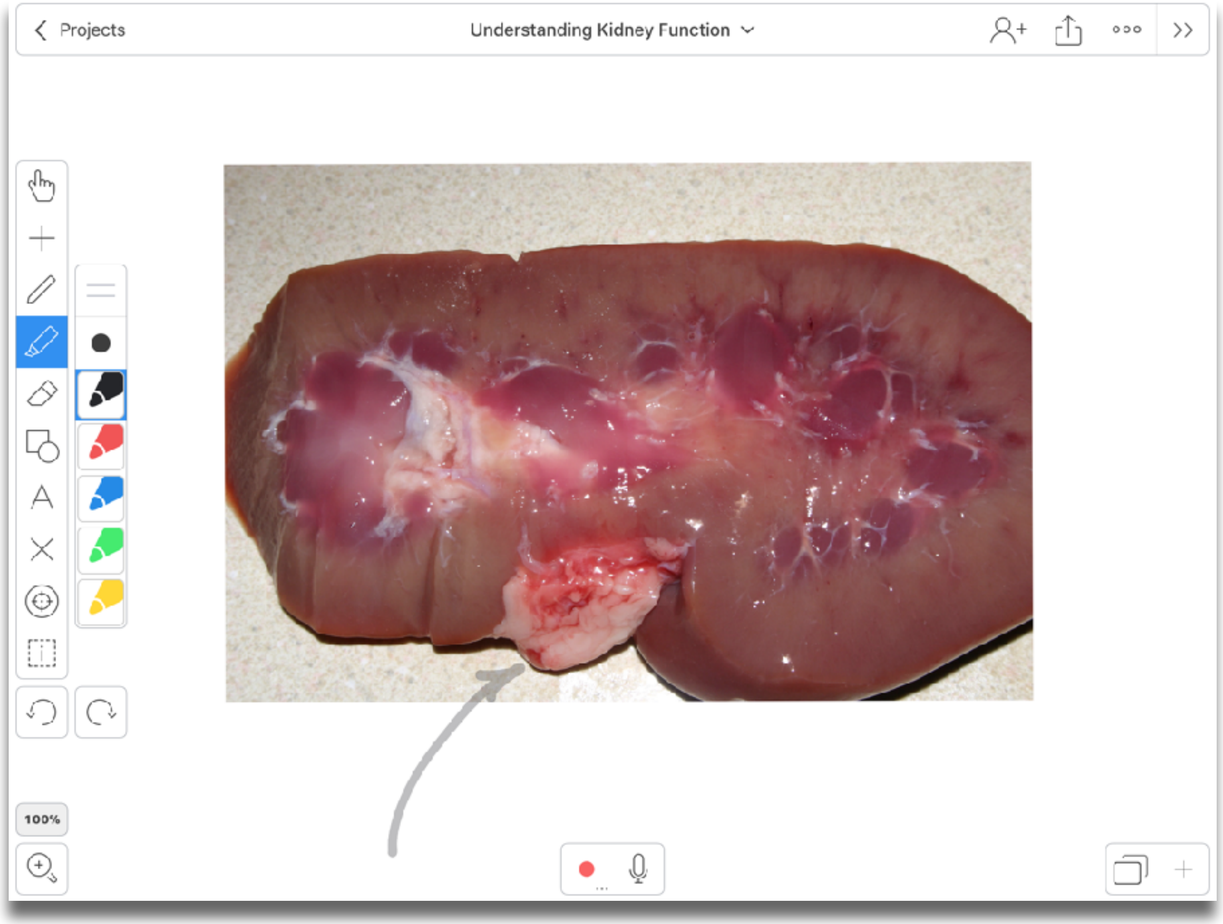

Social	Mobility	Visualization	Storytelling	Gaming
200,000 years	70,000 years	40,000 years	17,000 years	8,000 years

Ruben R. Puentedura, “Technology In Education: The First 200,000 Years” *The NMC Perspective Series: Ideas that Matter*. NMC Summer Conference, 2012.

The EdTech Quintet – Associated Practices	
Social	Communication, Collaboration, Sharing
Mobility	Anytime, Anyplace Learning and Creation
Visualization	Making Abstract Concepts Tangible
Storytelling	Knowledge Integration and Transmission
Gaming	Feedback Loops and Formative Assessment

Dimensions of Computational Thinking

Computational Concepts	Computational Practices	Computational Perspectives
Sequences	Being Incremental and Iterative	Expressing
Loops	Testing and Debugging	Connecting
Events	Reusing and Remixing	Questioning
Parallelism	Abstracting and Modularizing	
Conditionals		
Operators		
Data		

Brennan, Karen, and Mitchel Resnick. "New frameworks for studying and assessing the development of computational thinking." *Proceedings of the 2012 annual meeting of the American Educational Research Association, Vancouver, Canada*. 2012.

Computational Thinking in Math and Science

Data Practices	Modeling & Simulation Practices	Computational Problem Solving Practices	System Thinking Practices
Collecting Data	Using Computational Models to Understand a Concept	Preparing Problems for Computational Solutions	Investigating a Complex System as a Whole
Creating Data	Using Computational Models to Find and Test Solutions	Programming	Understanding the Relationships within a System
Manipulating Data	Assessing Computational Models	Choosing Effective Computational Tools	Thinking in Levels
Analyzing Data	Designing Computational Models	Assessing Different Approaches/ Solutions to a Problem	Communicating Information about a System
Visualizing Data	Constructing Computational Models	Developing Modular Computational Solutions	Defining Systems and Managing Complexity
		Creating Computational Abstractions	
		Troubleshooting and Debugging	

Weintrop, David, et al. "Defining computational thinking for mathematics and science classrooms." *Journal of Science Education and Technology* 25.1 (2016): 127-147.

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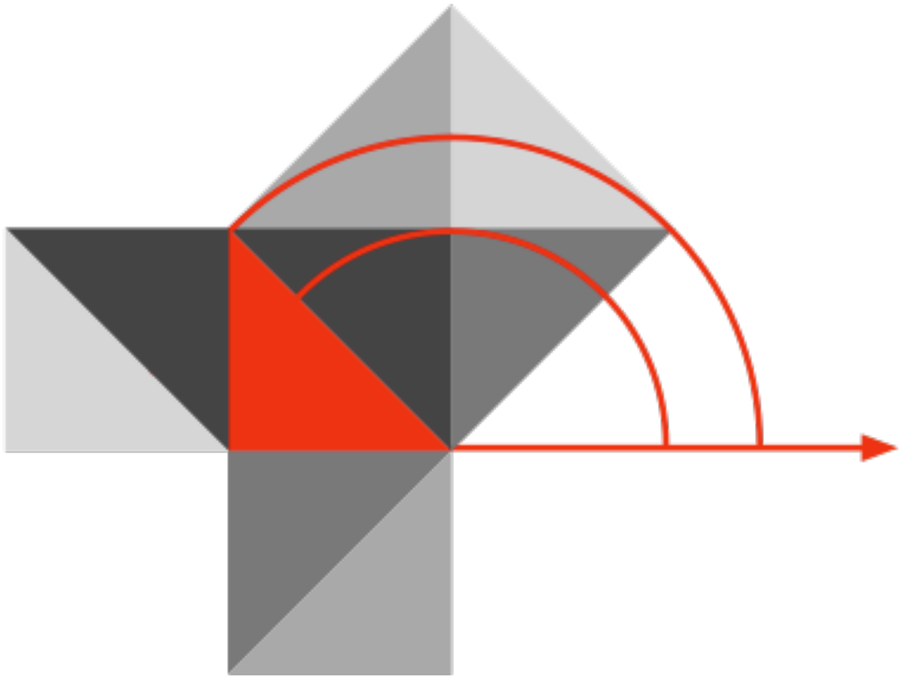

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