NC STATE UNIVERSITY | COLLEGE of EDUCATION

Deeply Digital Curriculum

The Changing Landscape of Teaching and Learning

The Classroom (and beyond) Context

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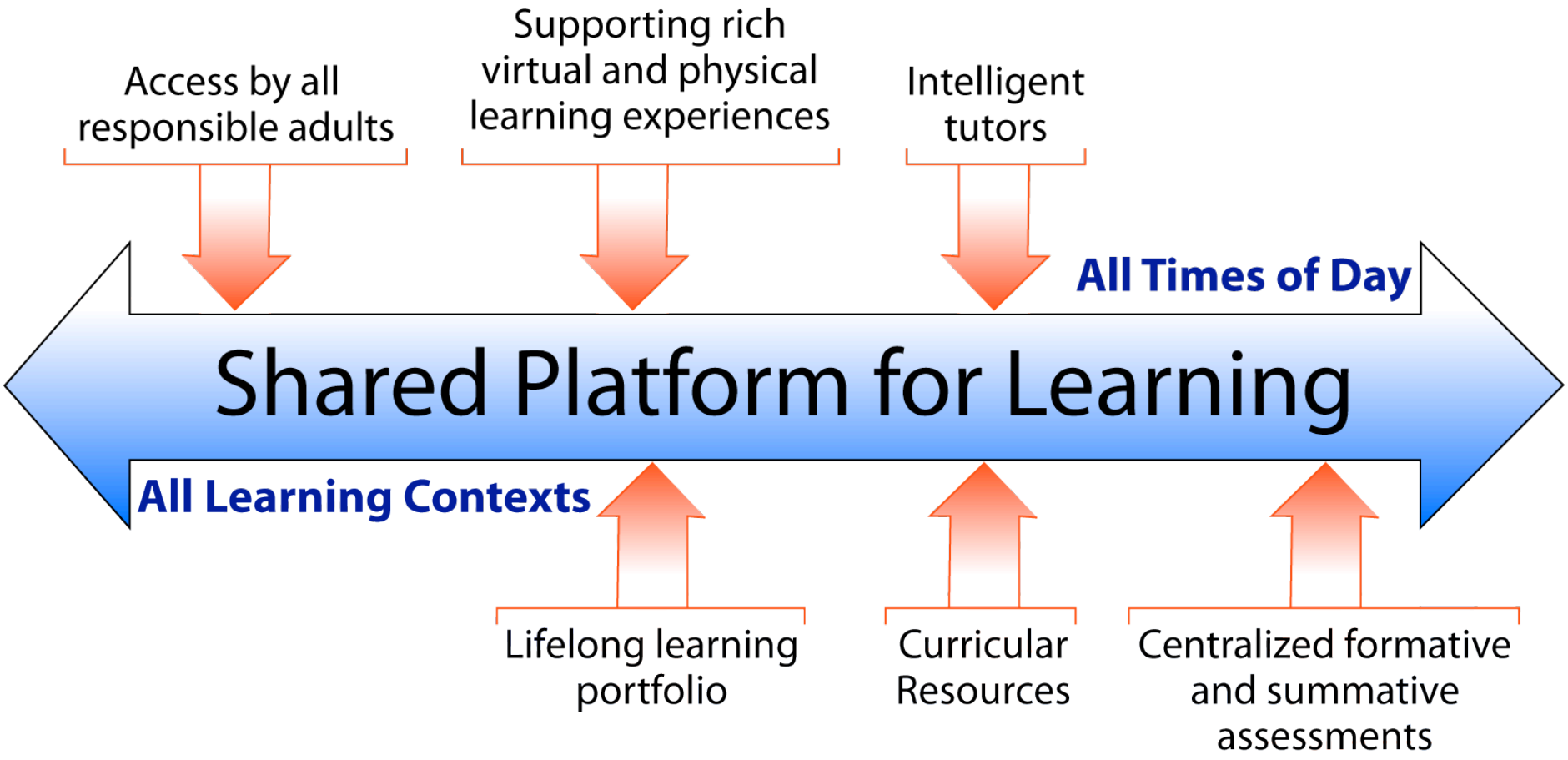
NSF

DRL # 0733217

THE WILLIAM & IDA FRIDAY INSTITUTE FOR EDUCATIONAL INNOVATION

Guiding Principles

- Learning design, not instructional design
- Creating rich learning experiences
- Bring together tools and resources that support this
- Different roles for teachers; expanded roles for other responsible adults
- 4x4x4 model of learning
- Shared platform for learning



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Access by all responsible adults

Supporting rich virtual and physical learning experiences

Intelligent tutors

All Times of Day

Shared Platform for Learning

All Learning Contexts

Lifelong learning portfolio

Curricular Resources

Centralized formative and summative assessments

·2

·Translating Information into Action: Information Transfer from DNA to Protein

From the experiments of Griffith, Av
clear that DNA was the biomolecule
work, scientists deduced that DNA c
For many years prior to the determin
that characteristics ran in families; th
and animals for desirable traits, such
production in cows. Exactly how this

When scientists began to examine sp
coat on the surface of the virulent str
unravel the mystery. They identified
were able to deduce its chemical stru
information encoded in the DNA, an
exactly was the relationship among D

Scientists felt that somehow the infor
DNA. However, how could a mere fe
Earth? In this learning experience, you will first examine the concept of a code, and then
investigate the processes that translate the information encoded in DNA into proteins—the actio
ingredients of the cell.

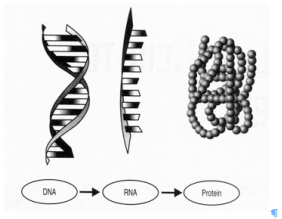

Figure 2.4: The central dogma: Information flows from DNA to RNA to protein.

Investigate

CHALLENGE: How would you explain to Frederick Griffith how information stored in the genetic material (DNA) results in the trait of a polysaccharide coat on bacteria?
A great deal of knowledge about DNA and its relationship to characteristics of organisms was

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Experience 1 provid
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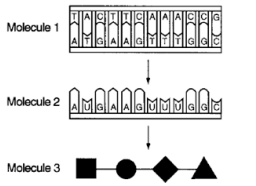
After Watson and Crick created their model of the structure of DNA, their next big question was how did these four bases encode all the information needed by every organism on Earth? In addition to recognizing that the base-paired model provides a mechanism for DNA to produce an exact copy of itself, Crick also saw the possibility of a code:

Review

- All the information required by organisms to maintain life is encodec nucleotides in their DNA.
- Information encoded in DNA is translated into proteins. These protei carrying out essential life processes of an organism.
- The information in DNA is carried in a triplet codon sequence. Speci the information for specific amino acids.
- Different nucleic acids (DNA, mRNA, tRNA) perform different func information from DNA to protein.
- The process of transcription transfers the information encoded in DN
- Translation is the mechanism by which the information carried by m proteins. In this process, amino acids are linked together to form poly
- A single change in the DNA sequence can alter the function of a prot symptoms of disease.

Assessment

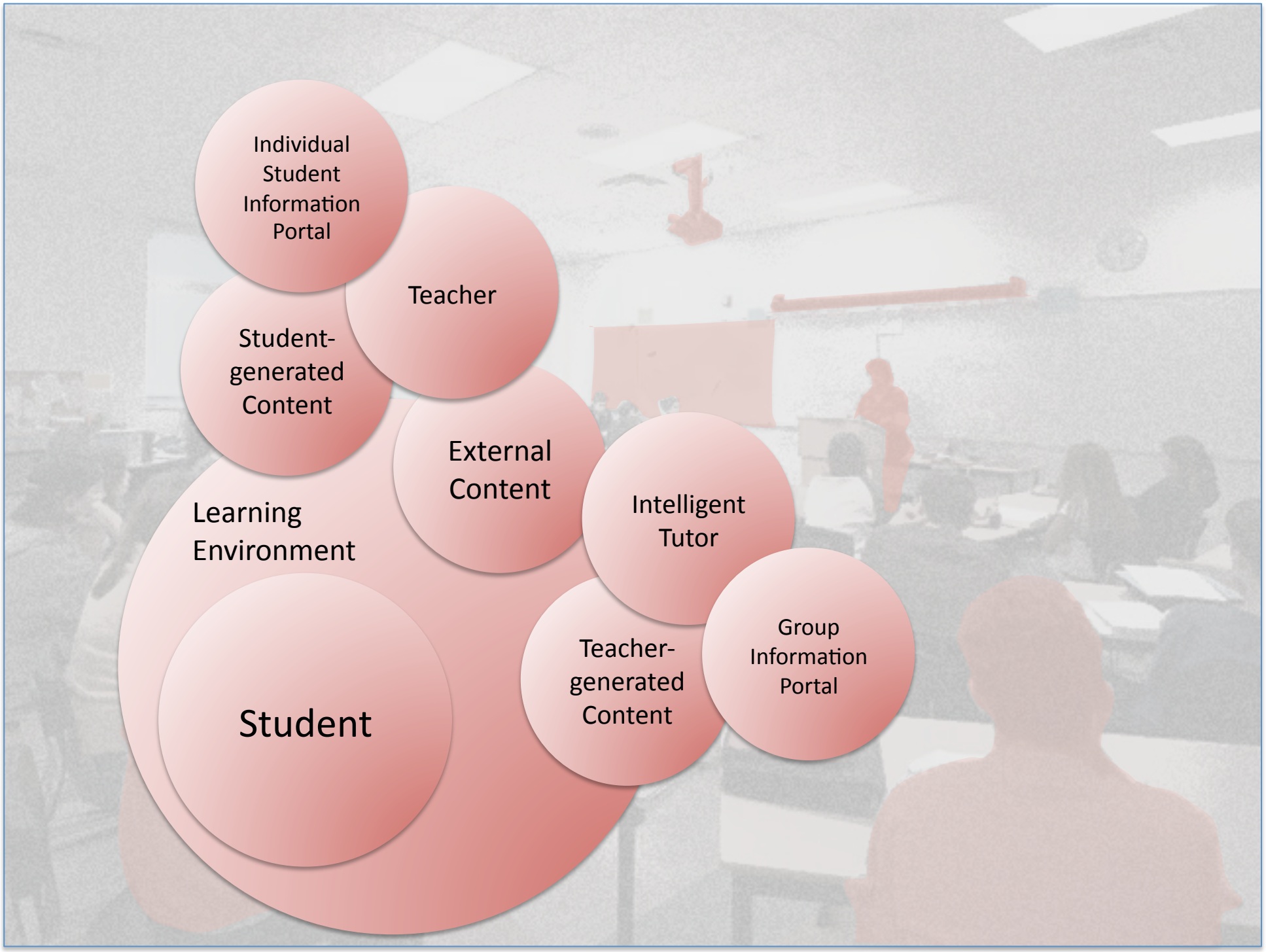
Base your answers to questions 1 through 3 on the diagram below and on your knowledge of biology. The diagram represents molecules involved in protein synthesis.

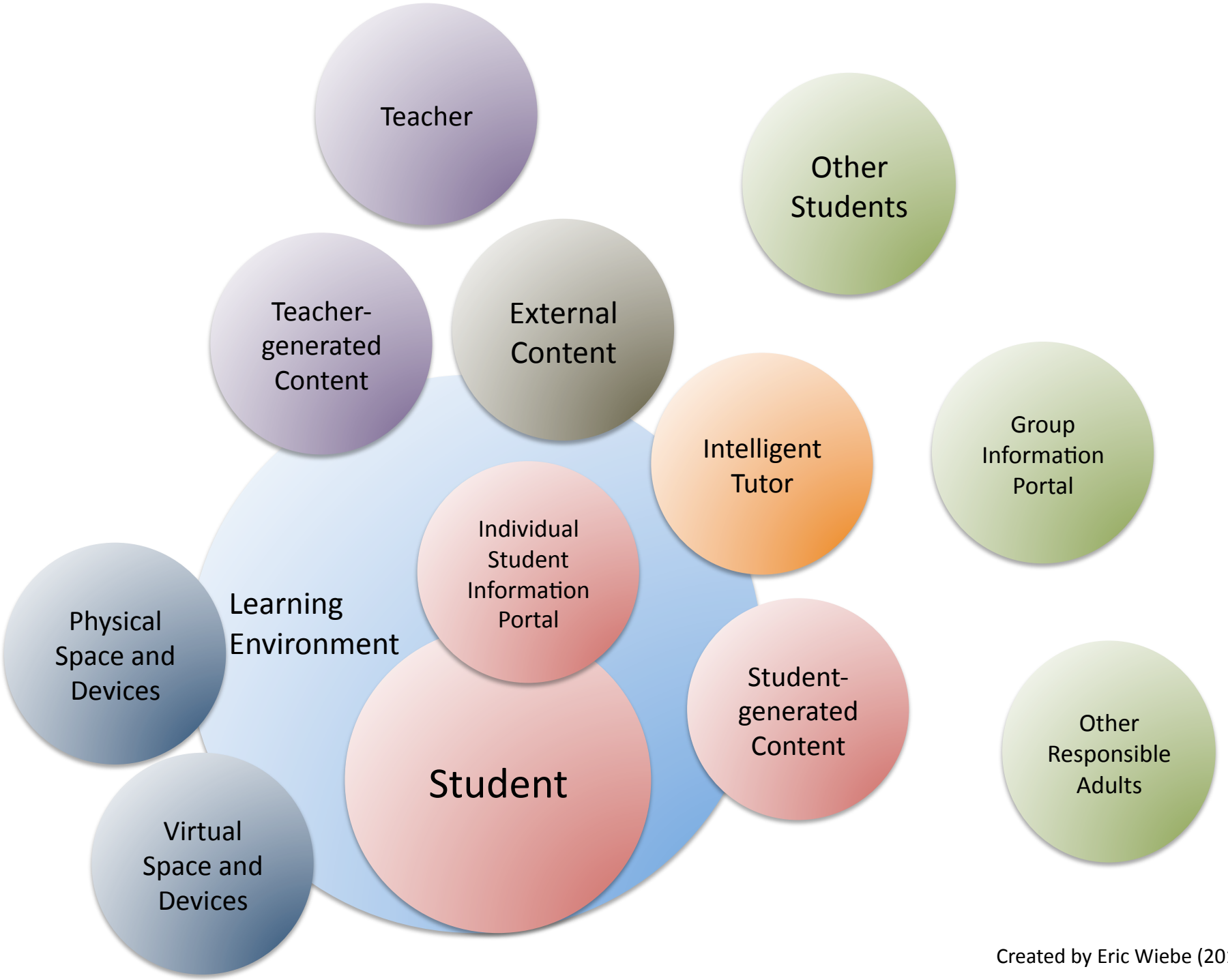


1. In plant cells, molecule 1 is found in the
   A. centriole
   B. nucleus
   C. cell wall
   D. lysosome

2. The building blocks of molecule 3 are known as
   A. amino acids
   B. DNA molecules
   C. fatty acids
   D. RNA molecules

http://www.designshare.com/dbadmin/upload/projects/1/502/General_Classroom_6.jpg


Individual Student Information Portal
Teacher
Student-generated Content
External Content
Intelligent Tutor
Learning Environment
Student
Teacher-generated Content
Group Information Portal



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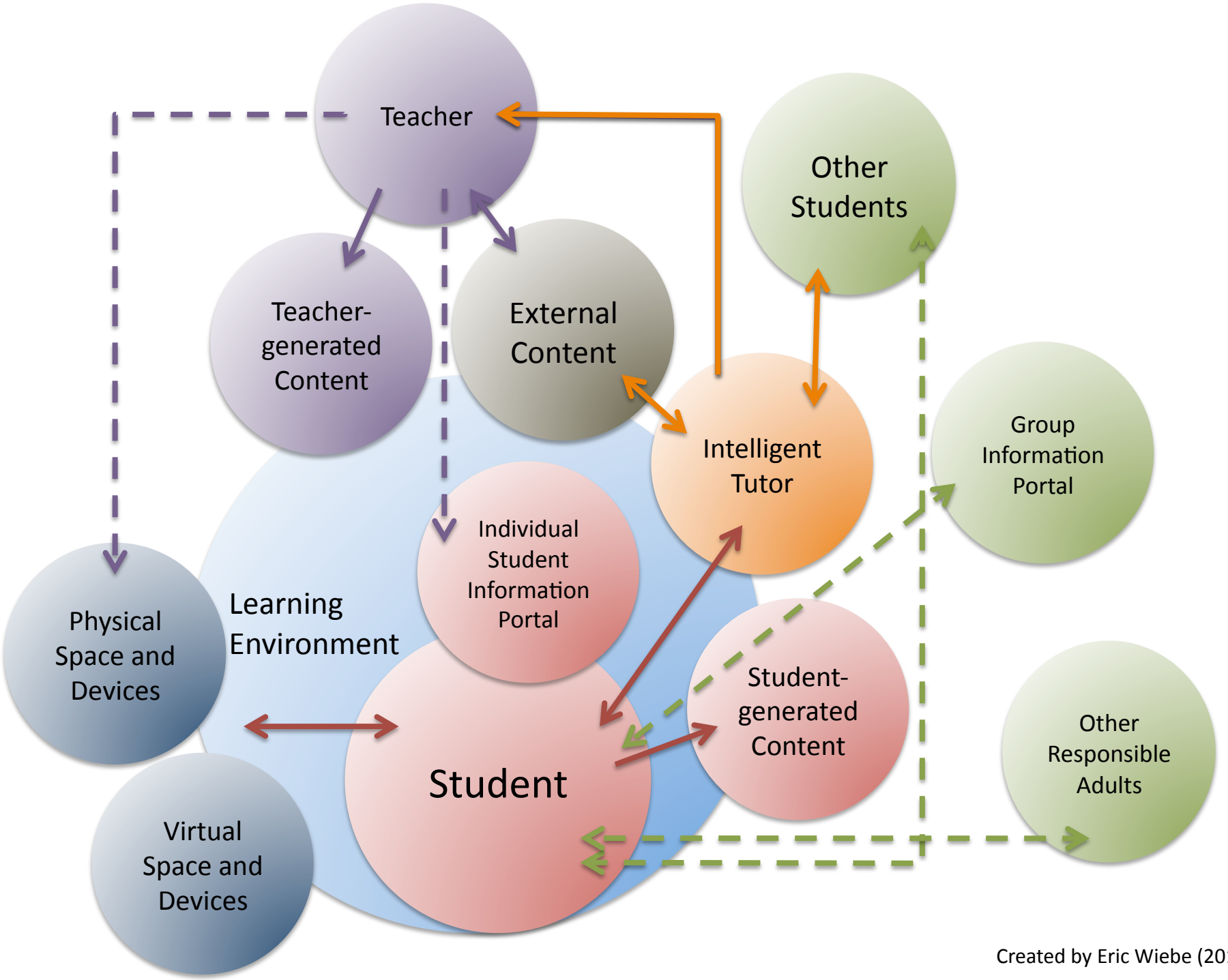

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Teacher and Student Resources

Teacher

Intelligent Tutor

ACTIVITY: Passing the Message, Interpreting the Code

Part A: Sending the Message

Once a secret message is encoded, there needs to be a way to send it to the recipient. Shortly after discovering the structure of DNA and proposing the idea of a genetic code, Crick also realized that there needed to be some kind of intermediate molecule of information that carried the information from DNA to the site of protein synthesis. This would be something akin to the letter that Bancroft proposed to send with his DNA message dot.

Crick's rationale for proposing an intermediate was the recognition that eukaryotic cells are compartmentalized. The DNA is stored in the nucleus, but the machinery for making proteins, the ribosomes on the endoplasmic reticulum, is found in the cytoplasm. (You may want to review your understanding of cell structure).

Think About It Using a pencil and a full page of your notebook, draw a picture of the cell indicating the nucleus, the DNA, the cytoplasm, the endoplasmic reticulum, and the ribosomes. Be neat and clear, and leave space for other cellular components. You will be adding to this drawing during the next two activities.

In 1960, Crick's prediction was realized with the discovery of **ribonucleic acid** or RNA. Messenger RNA, called **mRNA**, has a structure similar to DNA with three notable exceptions:

- → mRNA is almost always a single strand rather than the double-stranded DNA.
- → The RNA backbone, like DNA, is a sugar-phosphate structure, but the sugar in RNA is a **ribose** rather than the deoxyribose of DA. A ribose contains one extra oxygen, as shown in

mine base found in DNA, as shown in **Figure**

http://www.mnartists.org/work.do?rid=55192

http://www.youtube.com/watch?v=YjWuVrzvZYA

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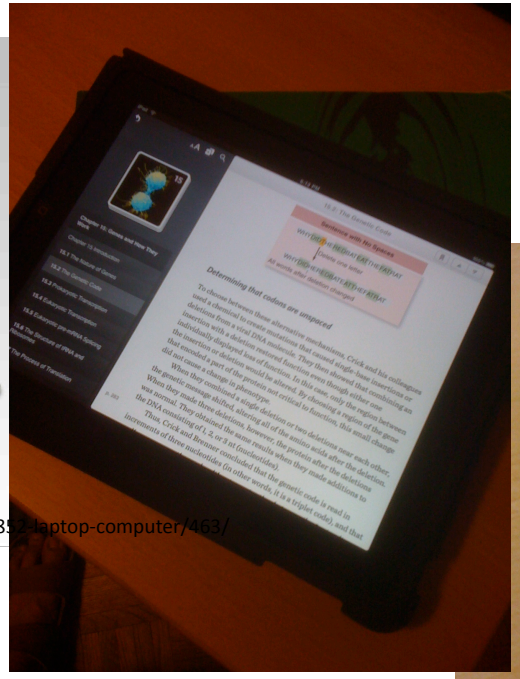

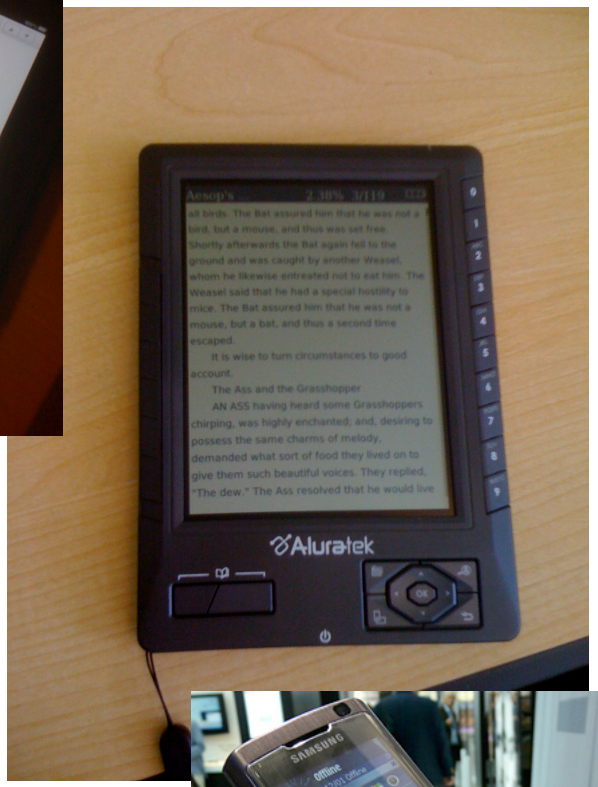

Individual Student Information Portal

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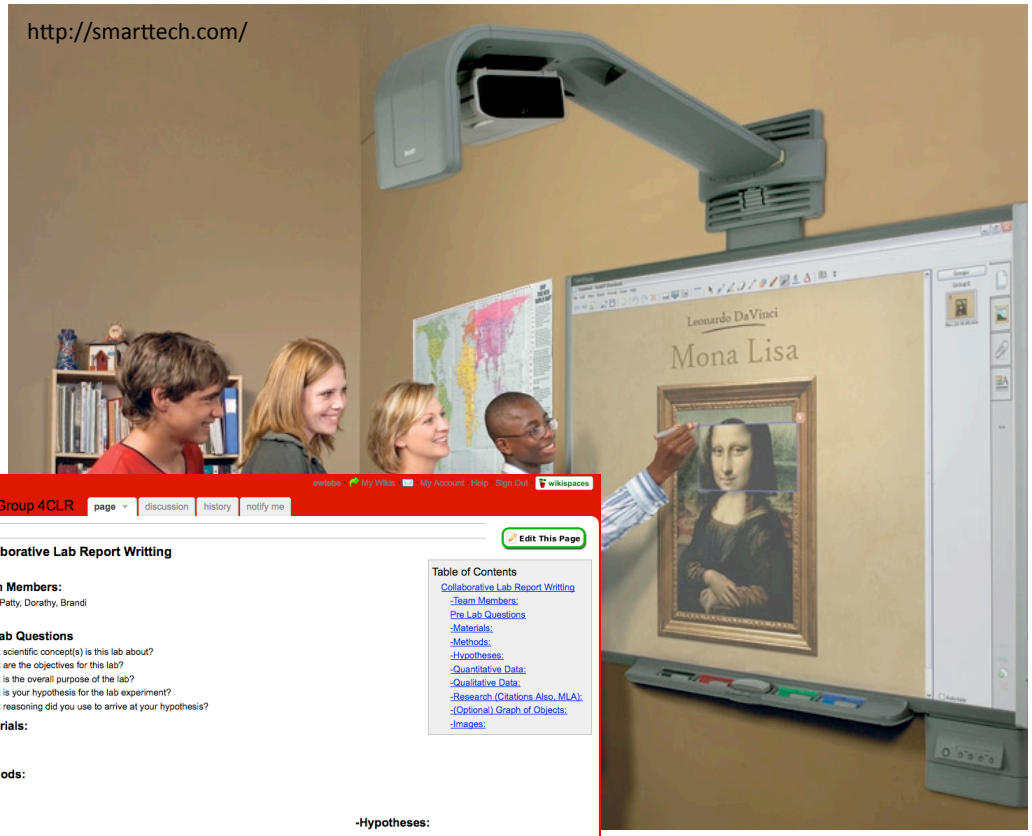
Teacher

Other Students

Group Information Portal



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http://wayangoutpost.com/

http://www.fi.ncsu.edu/feature/adventure-awaits-in-the-science-classroom

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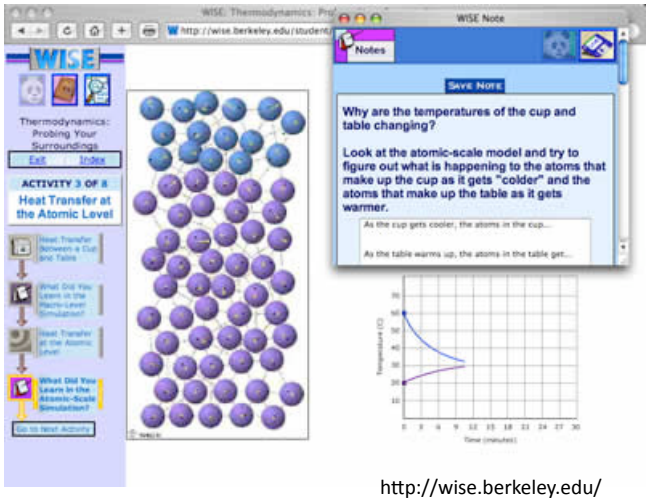

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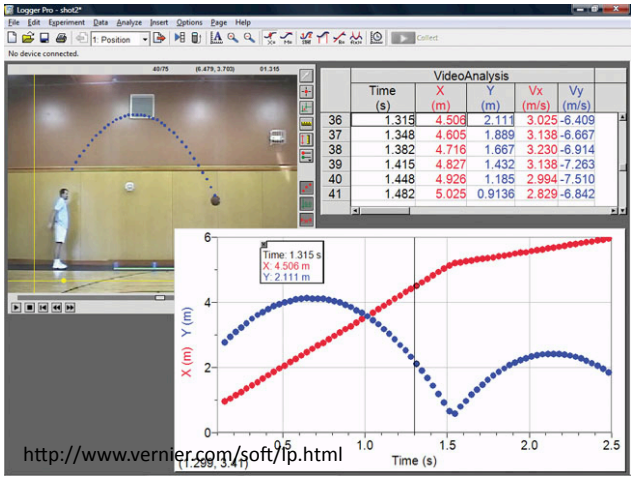
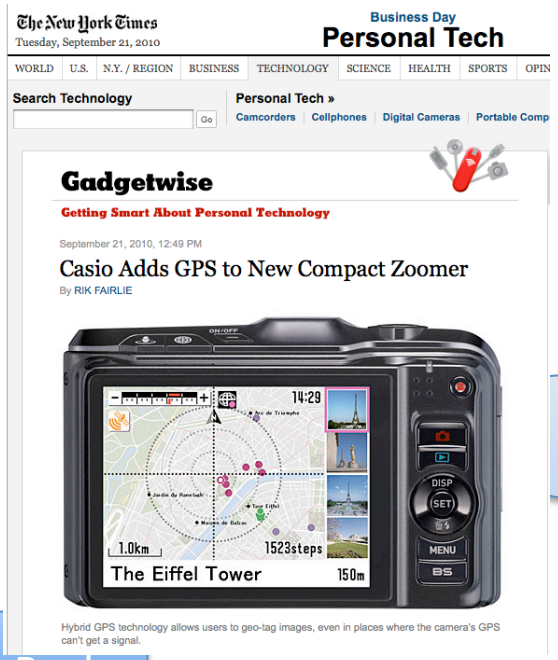


http://www.vernier.com/soft/lp.html

http://www.highschool247.com/jrscience.php

Virtual Augmented Physical



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Summary

- Deeply Digital moves in the next few years will hinge as much on pedagogical as technological strides forward (TPACK)
- Moving traditional print to DD -> doable now but expensive
- Some of the most exciting near-term possibilities are in data mining -> as much policy as technology driven

Acknowledgments

- IBM Faculty Research Fellowship
- NSF Blue Sky Conference Participants
- NSF DRK-12 Project Funding
- Ben Shapiro and Bob Tinker