

How Students Learn



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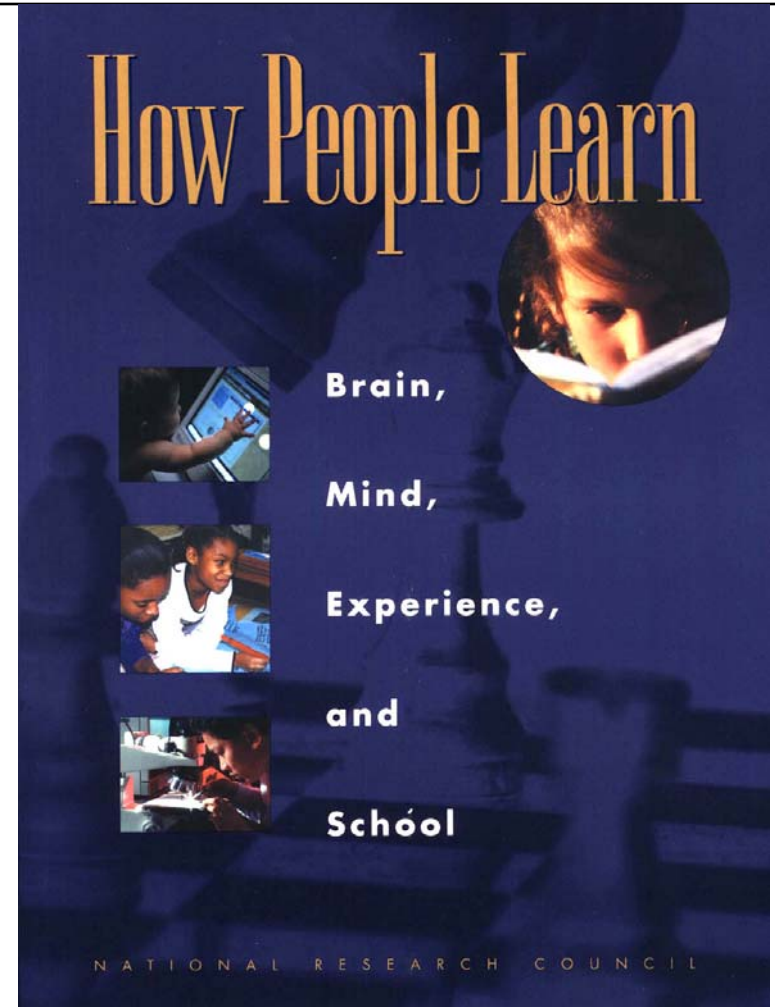


Ground Rules for Collaborative Work

- ❑ She/he who works and participates, *learns*
- ❑ Challenge ideas
- ❑ Everyone has expertise
- ❑ Share “talk time”
- ❑ Take time to listen
- ❑ Take care of your own needs, physically and intellectually
- ❑ There are no silly questions; If you’re thinking it, others probably are
- ❑ Honor times
- ❑ Phrase questions for the benefit of everyone

Guiding Questions

1. Why do we need to know about how students learn?
2. How do students learn?
3. How can we be more effective in the classroom?





University of Puerto Rico at Mayagüez Mission

Within the philosophical framework established by the University of Puerto Rico Act, the Mayagüez campus directs its efforts towards the development of educated, cultured citizens, capable of critical thinking, and professionally qualified in the fields of agricultural, social and natural sciences, engineering, humanities and business administration. They should be able to contribute in an efficient manner to the cultural, social, and economic development of the Puerto Rican and international communities. This process is aimed at endowing our alumni with a strong technical and professional background and instill a strong commitment to Puerto Rico and our hemisphere.

Our alumni should have the necessary skills and knowledge to participate effectively in the search of solutions to the problems facing us, to promote the enrichment of the arts and culture, the development and transfer of technology as well to uphold the essential attitudes and values of a democratic society.



Student Evaluation questions (sample)

- 17. Promueve la participación de los estudiantes.
- 21. Verifica el nivel de entendimiento de los/as estudiantes mediante preguntas u otras actividades.
- 38. Facilita el aprendizaje mediante el uso de métodos de enseñanza tales como conferencia, trabajos en grupos, grupos colaborativos, debates, simulaciones, representaciones de roles, uso de la tecnología, otros.

http://www.uprm.edu/omca/steering_team/COE/cuestionario.pdf

Interesting College Factoids



- Read the College Factoids that were distributed
- Choose the one that seems most significant to you and prepare to discuss why it is important with your colleagues.
 - Why do you think your factoid is important?
 - In your opinion, what are the principal causes?
 - What can you do in your classes to improve the situation?



(individual 4 minutes)

Interesting College Facts - discussion

- Each person at the table will have **two** minutes to talk about his or her significant fact.
- Choose a facilitator
 - Make sure everybody at the table gets a chance to ask questions and make comments
 - Ask for questions or comments from people who have not talked
- Choose a timekeeper
 - Let people know when their time is up





What's the matter with today's students?

After all, we learned by listening to lectures, reading the text, doing the homework.

Why doesn't that work for our students?

Why should we do anything different for them?

What's their problem?



What's the matter with today's students?

Think about classmates who didn't make it.

Were you smarter than all of them?

Did you work harder than all of them?

Were you better prepared?

Did you have more ambition to learn than all the others?

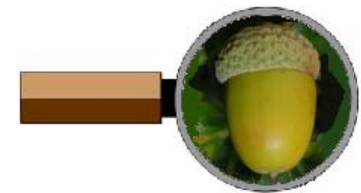
Why did you make it, while others didn't?

How do Students Learn Misconceptions

A big oak tree grows from a tiny seed. The huge oak tree shown here grew from a little seed planted in the earth. Where did **most of the material** in that big tree come from?



CO_2

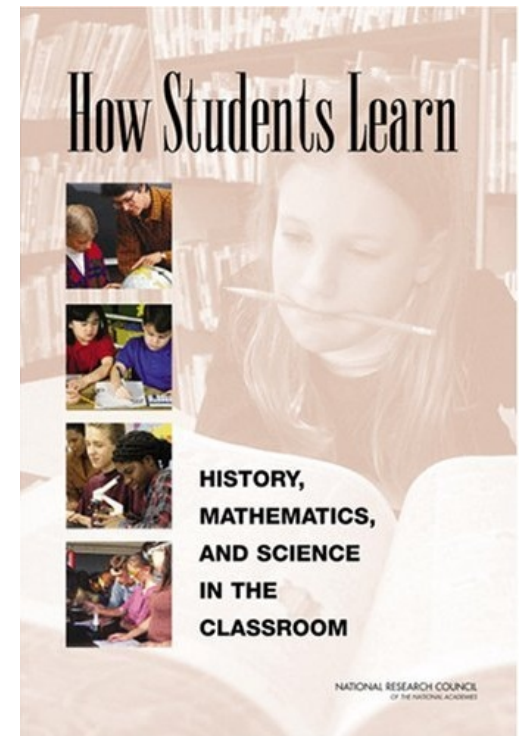


Basic Science Concept:
Photosynthesis

The roots of learning problems

The professor covering the material and explaining it well is NOT the same as the student learning it.

Just how do students learn?



How Students Learn - three principles (“Jigsaw”)

1. Count off from 1 to 3 around the table
2. Read carefully the principle that corresponds to your number
(5 minutes)
3. Prepare to explain the reading to colleagues who are reading other parts (5 minutes)



#1 – pages 9-11, 13, 19 *How People Learn*

#2 – pages 9, 11-12, 13-14, 19 *How People Learn*

#3 – pages 9, 12-13, 14-15, 19 *How People Learn*

How Students Learn - three principles (“Jigsaw”)

Go back to your original table

There will be three minutes to explain the principle that you read to your colleagues and they will have one minute to ask questions and make comments

In each group choose a moderator

- If more than one person in the group read the same principle, be sure that both have “talk time”
- Make sure that each person at the table has an opportunity to ask a question or make a comment
- Ask people who have not spoken to ask a question or make a comment





How People Learn Principle 1: Preconceptions and previous knowledge

1. Students come to the classroom with preconceptions about how the world works. If their initial understanding is not engaged, they may fail to grasp the new concepts and information that are taught, or they may learn them for purposes of a test but revert to their preconceptions outside the classroom.



How People Learn Principle 1: Preconception and previous knowledge

- New knowledge is built on a foundation of existing knowledge and experience.
- Everyday conceptions are resilient.
- Student preconceptions must be actively engaged to support learning with understanding.




Can you understand this?

Aoccdrnig to a rscheearch at Cmabrigde Uinervtisy,
it deosn't mttar in waht oredr the ltteers in a wrod
are, the olny iprmoatnt tihng is taht the frist and lsat
ltteer be at the rghit pclae. The rset can be a taotl
msee and you can slitl raed it wouthit a porbelm.
Tihs is bcuseae the huamn mnid deos not raed ervey
lteter by istlef, but the wrod as a wlohe. Amzanig
huh?

Has anyone here practiced reading scrambled words?

So, how is that we could all read and understand this?



Learning Changes the Brain and the Brain Imposes Patterns

Learning specific tasks brings about localized changes in the areas of the brain appropriate to the task...learning imposes new patterns of organization on the brain.

Particularly important is the finding that the mind imposes structure on the information available...neuroscience research confirms the important role that experience plays in building the structure of the mind by modifying the structures of the brain...there is a similar relationship between the amount of experience in a complex environment and the amount of structural change. (HPL Chap. 5)



How People Learn Principle 1: Preconceptions and previous knowledge

A car travels from point **A** to point **B**. If the average velocity from **A** to **B** was 50 kilometers per hour, at what velocity should the car go returning from **B** to **A** to get an average velocity of 100 kilometers per hour for the round trip?



How People Learn Principle 1: Preconceptions and previous knowledge

Imagine that the distance from point **A** to point **B** is 50 kilometers. It would take exactly one hour to go from **A** to **B** (going) at 50 km/h.

In this case, the round trip would be 100 kilometers. So, to average 100 km/h, the round trip would have to be made in one hour.

But going from **A** to **B** already took one hour.

No matter what the distance, the return would have to be instantaneous in order to double the average velocity from 50 km/h to 100 km/h.

Principle #1: New knowledge must be grounded in prior understanding

Implications for teaching

Reflect

How can we provoke effective connections with prior understanding?



What are the common naïve conceptions (misconceptions) that students bring to the classroom?

How can we lead them to confront these naïve conceptions in order to eliminate them?

Principle #1: New knowledge must be grounded in prior understanding

- Even though prior understanding can be a powerful aid for learning, it can also lead to developing misconceptions that act as learning barriers.
 - Ex: Small children will say the world is round, but interpret that to be round like a pancake
- Naïve conceptions (misconceptions) are often difficult for professors to remove because they seem to work well enough in the day to day world.
- If misconceptions are not confronted directly, they don't go away completely. Students memorize the “right answers” for the exam, but later they go back to their original misconception.



How People Learn Principle 2:

Organize knowledge in the context of conceptual frameworks

2. To develop competence in an area of inquiry, students must: (a) have a deep foundation of factual knowledge, (b) understand facts and ideas in the context of a conceptual framework, and (c) organize knowledge in ways that facilitate retrieval and application.




How People Learn Principle 2:

Organize knowledge in the context of conceptual frameworks

Learning for understanding requires:

- A deep foundation of factual knowledge.
- Understanding facts and ideas in the context of a conceptual framework.
- Organized knowledge for effective retrieval.



How People Learn Principle 2: Organize knowledge in the context of conceptual frameworks

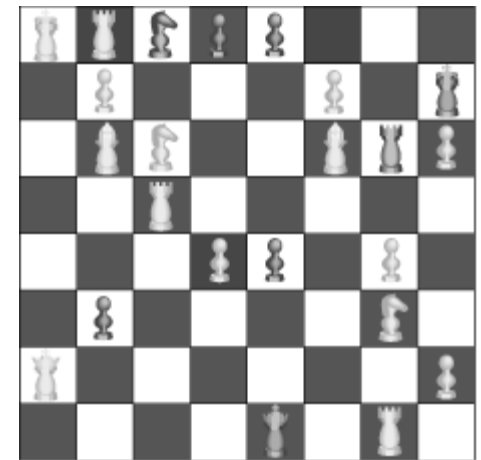
Geography can be used to illustrate the manner in which expertise is organized around principles that support understanding. A student can learn to fill in a map by memorizing states, cities, countries, etc., and can complete the task with a high level of accuracy. But if the boundaries are removed, the problem becomes much more difficult. There are no concepts supporting the student's information. An expert who understands that borders often developed because natural phenomena (like mountains or water bodies) separated people, and that large cities often arose in locations that allowed for trade (along rivers, large lakes, and at coastal ports) will easily outperform the novice. The more developed the conceptual understanding of the needs of cities and the resource base that drew people to them, the more meaningful the map becomes. Students can become more expert if the geographical information they are taught is placed in the appropriate conceptual framework.

How People Learn Principle 2: Organize knowledge in the context of conceptual frameworks



Experiment: If each has 5 seconds to look at a chessboard in the middle of a game, who do you think remembers more, a chessmaster or a “good” player?


Experiment: If each has 5 seconds to look at a chessboard with the pieces placed randomly, who remembers more, a chessmaster or a “good” player?



How People Learn Principle 2: Organize knowledge in the context of conceptual frameworks

Petals around the Rose:

The ^{Sol} game has petals that are arranged in a unique pattern. out how many petals there are. You can find out the correct answer to try to discover the pattern.




The image shows five dice arranged horizontally. Each die has a different pattern of black dots. The first die has two dots (top-right and bottom-left). The second die has six dots (two on each of the three vertical faces). The third die has one dot in the center. The fourth die has three dots in a diagonal line. The fifth die has four dots in a square pattern.

The game only has 3 rules:

- The name of the game is "Petals around the Rose".
- The name is important.
- The answer is always an even number.

<http://weavervsworld.com/docs/think/rose/>



How People Learn Principle 2: Organize knowledge in the context of conceptual frameworks

Implications for teaching

How can we provoke students to organize a solid base of declarative knowledge (data, facts, information) around the key concepts of the discipline?

How can we get to the big ideas and include enough of the details to sustain those ideas at the same time? (The tendency has been to cover a mile in width, but at depth of one inch.)

How can we strike a balance between the rich, factual details that help them make sense of everything and the multiple abstract representations that let them analyze and understand?



How People Learn Principle 3:

Metacognitive approach to instruction

3. A “metacognitive” approach to instruction can help students learn to take control of their own learning by defining learning goals and monitoring their progress in achieving them.



How People Learn Principle 3: Metacognitive approach to instruction

- Metacognitive Strategies help students to learn and to take control of their own learning.
- They can be taught effectively in context of subject matter.

Metacognitive Practices

Exercise

- Look at the object. 15 seconds after erasing it from the screen, I'll ask you what the object was.



What strategy did you use to help yourself remember?



Metacognitive Practices

Exercise

Read the following passage from a literary critic, and pay attention to the strategies you use to comprehend:

If a serious literary critic were to write a favorable, full-length review of *How Could I Tell Mother She Frightened My Boyfriends Away*, Grace Plumbuster's new story, his startled readers would assume that he had gone mad, or that Grace Plumbuster was his editor's wife.

SOURCE: Whimbey and Whimbey (1975, p. 42).

What strategies did you use while reading?



Principle #3: The importance of self-monitoring: (metacognitive knowledge)

The majority of good readers go back and reread parts again in order to understand what the passage means. In contrast, poor readers tend to read the whole paragraph without stopping to see if it makes sense. When they are asked to paraphrase the passage in their own words they can't do it correctly.

We use specific strategies to understand readings and concepts, how can we make ourselves conscious of these techniques to monitor them and then share them with our students?

Principle #3: The importance of self-monitoring: (metacognitive knowledge)

Implications for teaching

Reflection

- It is not enough to tell our students how to monitor their learning to get them to do it, for that we have to provide the setting and actively promote it.

How can you do this in your classroom?

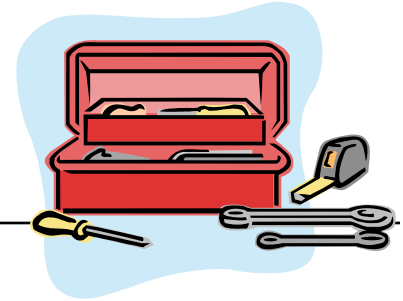




Resources

- ❑ Álvarez Pérez, H.J. 2007. *Los Hallazgos de las Neurociencias y su Aplicabilidad a la Sala de Clases: Teoría y Práctica*. Grupo Santillana.
- ❑ Baer, J.D., Cook, A.L. & Baldi, S. (Eds.). 2006. *The Literacy of American College Students*, American Institute of Research.
- ❑ Bok, D. 2005. *Our Underachieving Colleges: A Candid Look at How Much Students Learn and Why They Should Be Learning More*. Princeton University Press.
- ❑ Bransford, J.D., Brown, A. L., & Cocking, R. R. (Eds.). 2000. *How People Learn: Brain, Mind, Experience, and School: Expanded Edition*. National Academy Press.
- ❑ Donovan, S. & Bransford, J. (Eds.). 2005. *How Students Learn: History, Mathematics, and Science in the Classroom*. National Academy Press.
- ❑ Pellegrino, J.W., Chudowsky, N., Glaser R. (Eds.). 2001. *Knowing What Students Know: The Science and Design of Educational Assessment*. National Academy Press.
- ❑ Wiggins, G.P. & McTighe, J. 2005. *Understanding By Design Expanded 2nd Edition*. ASCD.

Teaching strategies toolbox



- ❑ Rules of collaboration
- ❑ College factoids– to create disequilibrium
confront prior knowledge/beliefs
- ❑ Petals around the Rose – visualize thinking
- ❑ 3 HPL principles – cooperative learning “Jigsaw”
- ❑ Memory – metacognitive activity
- ❑ Resources – additional information
- ❑ Teaching strategies toolbox – metacognitive
activity