



Assessing Free-Choice Learning in Science Centres

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Advance Organizer

- What is it we are assessing? (hint: learning)
- Where do science centres fit within the public's science learning world?
- How should we define our audience?
- What kind of learning should we be measuring?
- When should we measure learning?



What is learning?

Learning is CHANGE; change in how we view the world, think about the world, act upon world and/or feel about the world.

- All science centre visitors learn.
- Not everyone learns the same things.
- Some visitors learn more than others.



What is the nature of LEARNING?

- Learning begins with the individual.
- Learning involves others.
- Learning takes place somewhere.
- Learning occurs over time.



Where do we learn?

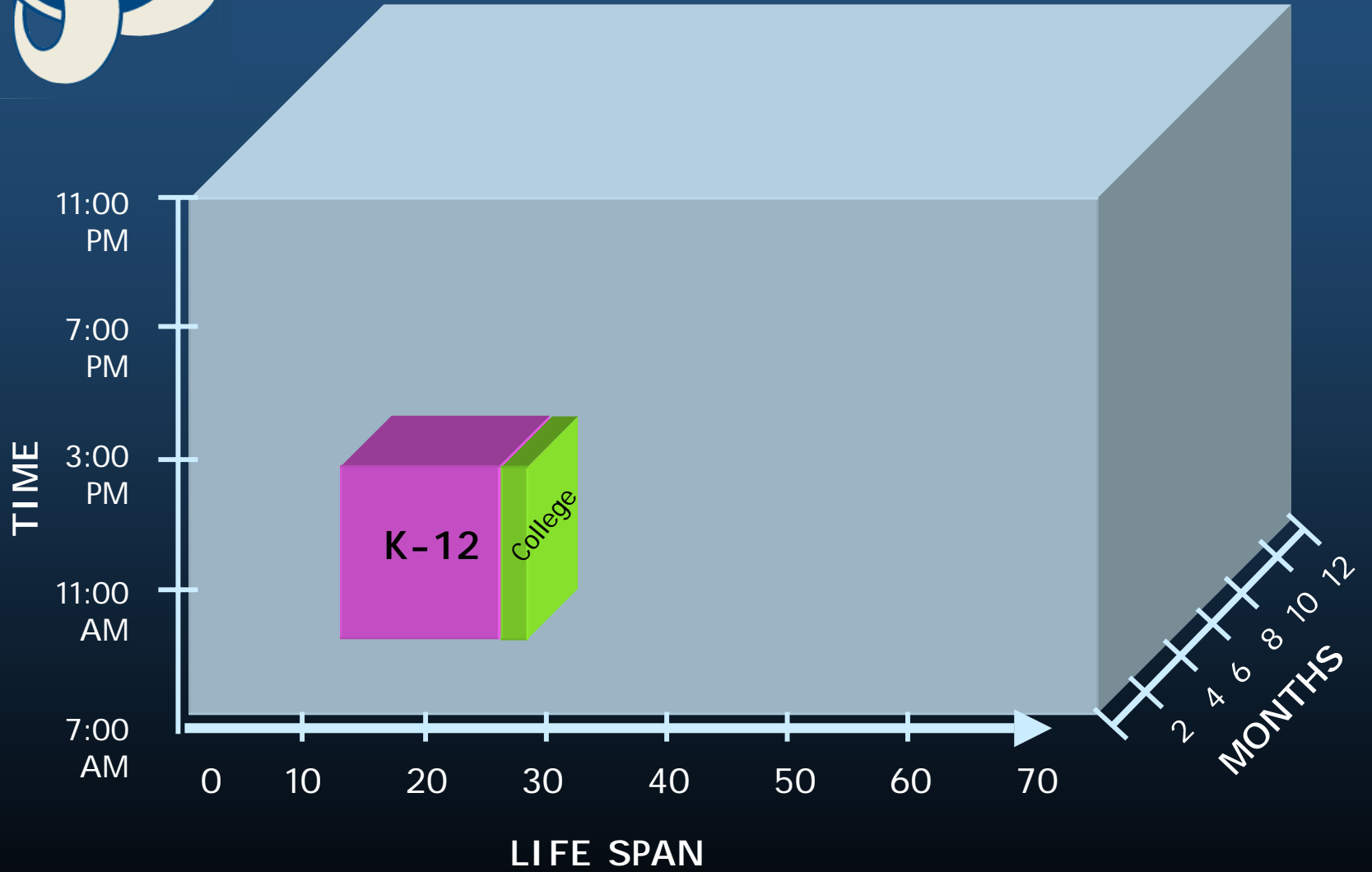
- Children spend 85% of their waking hours outside of school.
- Less than 3% of our lives are spent participating in formal instruction.
- Most of what we learn, we learn through free-choice learning.



Free-Choice Learning

Free-choice learning is learning that is guided by a person's needs and interests.

People engage in free-choice learning throughout their lives to find out more about what they find useful, compelling or just plain interesting.





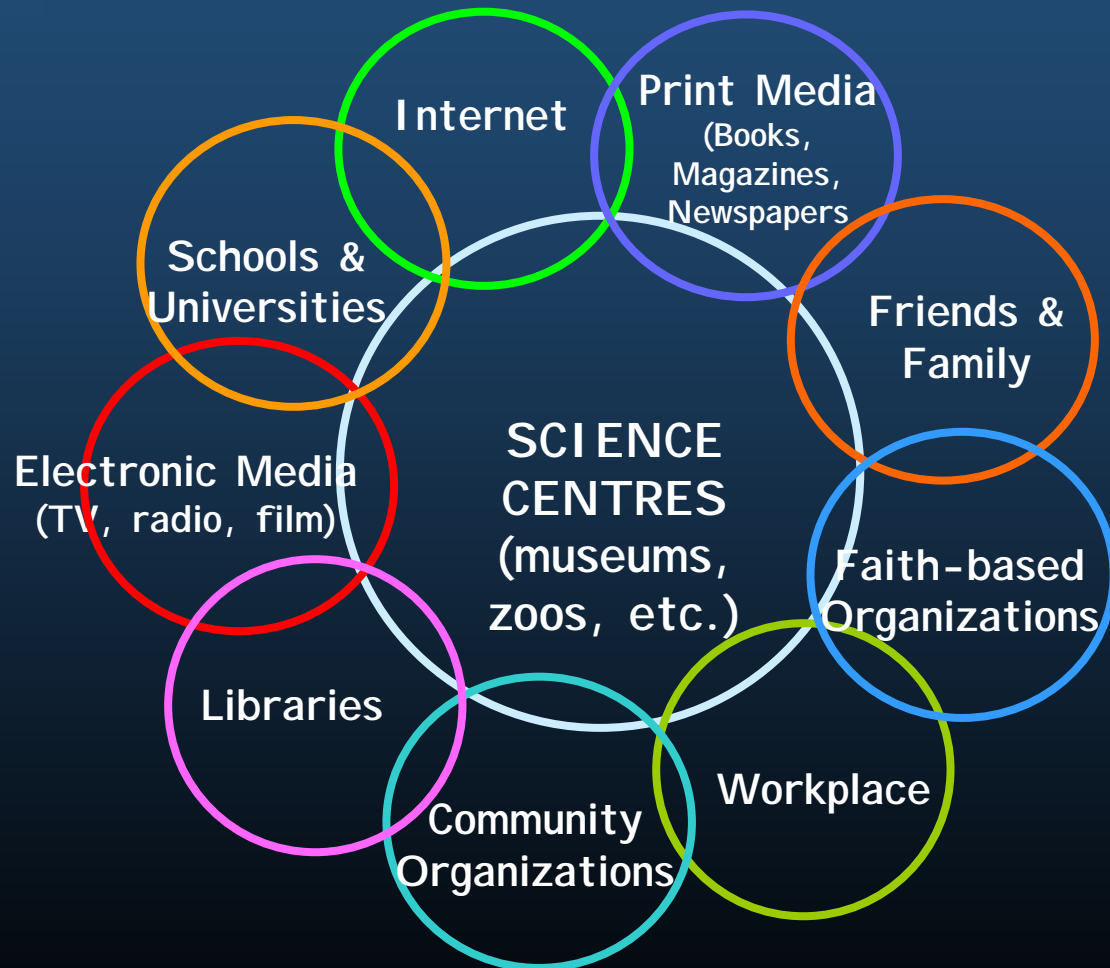
Sources of Information about Science

- 76% Books, magazines, not for school
- 74% Life Experiences
- 74% Television
- 3. 68% School courses
- 4. 65% Science Centres, Natural History Museums, Zoos & Aquariums
- 57% On the job
- 55% Family and Friends
- 31% Radio
- 10% Internet*

* NOTE: data collected in 2000, Internet was 3% in 1997



Science Learning Infrastructure





Science Learning in Science Centres

- We currently know quite a bit about the nature of learning.
- We can use this understanding to measure science learning in science centres.
- We also currently know quite a bit about the factors that significantly contribute to science learning in science centres.
- We are just beginning to understand how these multiple factors individually and collectively interact to determine the course and nature of visitor science learning.



Contextual Factors that Contribute to Science Centre Learning

Personal Context

- Pre-Visit Expectations and Motivations
- Prior Knowledge and Experience
- Prior Interest
- Perceived Choice and Control

SocioCultural Context

- Interactions Within Own Social Group
- Interactions With Staff & Other Visitors
- Cultural values related to leisure and learning

Physical Context

- Orientation
- Advance Organizers
- Physical Space and Environment
- Design of Exhibit Elements
- Subsequent Reinforcing Experiences



Multi-Year, National Science Foundation-funded Study of Science Learning

- California Science Center
- Focused on World of Life Exhibition
- Random sample of 193 visitors
- Included follow-up interviews 18 -23 months after the visit



Who Learned Short-Term?

- Everybody learned something, but some learned more than others. The greatest change in short-term knowledge was as follows:
 - 1. BELOW AVERAGE knowledge group
 - 2. AVERAGE knowledge group
 - 3. ABOVE AVERAGE knowledge group



What did not affect change in short-term learning?

- Gender
- Age of Visitor
- Social Group
- Educational Attainment
- Prior visits to CSC/World of Life
- Prior visits to science centers
- Where visitors were from (local or not)



What did affect change in short-term learning?

- All of the contextual learning variables we measured significantly affected learning in some visitors.
- None of these variables significantly affected all visitors.
- If we segmented visitors by some of these variables, for example prior knowledge, we could begin to explain a significant percentage of the variance, with different sets of visitors being affected by different sets of variables.



What happened long-term?

- Over time, results changed.
- Subsequent experiences affected visitor learning?
- Different groups of learners showed different learning long- vs. short-term.



Who Learned Long-Term?

Some individuals showed significant long-term change; others showed no significant change in their knowledge.

BELOW AVERAGE interest groups significantly changed

ABOVE AVERAGE interest groups did not



Investigation of the Impact of Science Interactives

- Powerhouse Museum, Sydney & Scitech Science Centre, Perth
- Visitors over 15 years of age
- A total sample of 200 visitors
- Short term, immediate outcomes (on-site interviews and Personal Meaning Maps)
- Long term outcomes (4 - 8 months after the museum experience through telephone interview & PMM; N = 80).



Learning Outcomes

- Perspective & Awareness
- Social Learning
- Knowledge & Skills
- Motivations & Interests



Frequency of SHORT-TERM learning outcomes across interactives

		Knowledge and Skills	Motivation and Interests	Perspective and Awareness	Social Learning
PHM	<i>Fireworks</i>	73%	27%	14%	5%
	<i>Firebrigade</i>	74%	26%	26%	11%
	<i>Gridlock</i>	42%	4%	65%	15%
	<i>Bigfoot</i>	55%	7%	74%	10%
Scitech	<i>Thongophone</i>	78%	17%	17%	11%
	<i>Puzzle</i>	69%	19%	0%	19%
	<i>Spin-Out</i>	59%	24%	0%	18%
	<i>Driving Tired</i>	19%	0%	73%	19%

0% - 33% = Green

34% - 66% = Yellow

67% - 100% = Red



Frequency of LONG-TERM learning outcomes across interactives

		Knowledge and Skills	Motivation and Interests	Perspective and Awareness	Social Learning
PHM	Fireworks	67%	25%	50%	8%
	Firebrigade	58%	8%	42%	17%
	Gridlock	8%	25%	50%	8%
	Bigfoot	29%	5%	100%	5%
Scitech	Thongophone	29%	21%	79%	43%
	Puzzle	80%	10%	40%	60%
	Spin-Out	41%	12%	41%	35%
	Driving Tired	10%	10%	70%	40%

0% - 33% = Green 34% - 66% = Yellow 67% - 100% = Red



Key Findings

- Different visitors derived different outcomes from the same interactive
- Individuals derived multiple outcomes from the same interactive
- Long-term outcomes were not predictable from short-term outcomes
- Over time, perspective and awareness and social learning outcomes became increasingly common and important



Take-Home Messages about Assessing Learning from Science Centres

- We need to think about science centre learning as being just one part of a larger science learning experience.
- When we define our audience we need to go beyond simple demographic categories.
- We need to expect (account for?) a broad range of science learning outcomes.
- We need to think about (assessing?) both short AND long-term learning outcomes.