

Lessons learned from Informal Science learning research: From theory to practice and back again



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- thank you for inviting me
- I especially appreciate receiving this Svend Pedersen award
 - because it is also my goal to translate theory to practice
 - **as Pederson himself did so well**

Like Pedersen who examined

(with [Halldén](#)) in 1994:

- *how students...construct and develop their understanding of animal and plant adaptation to nature, with the help of their biological knowledge as well as by alternative and more intuitive ideas about the function of nature.....*
 - I interpreted such an emphasis on what students already do know, that is, their prior knowledge, as the resources they brought to the learning setting.

Some museums



Why informal learning?

- Studying learning in situ,
 - naturalistic, messy and approximating how people learn out of school,
 - lifelong, mixed ages, apprenticing, active, motivated, etc.
- Families and students have their own learning social patterns, and ways of interacting with each other and with phenomena

“ museums are increasingly seeing themselves as settings of...

“learning theory in action”

Shari Tishman, Harvard Graduate School of Education and Project Zero

Changes

- We are ready now to view museums on their own terms, examine the learning that goes on there, and transfer what we have learned to other settings.
 - For many years learning theory was imported from classrooms to informal settings. Researchers tried to directly map the views of learning seen in classrooms to museums.

Moving away from

- Strictly constructivist theory
- Using individual as unit of analysis
- *Us vs. them* mentality in regards to diversity
- Linearity
- ...

TO

- learning as a social process, based in activities or practices that are shaped by personal, social, cultural, and historical circumstances.
 - *Very sociocultural*
- Learning occurs through active participation
 - *With others and with tools*
- *Knowing* becomes doing things with cultural tools for particular purposes in particular contexts.
 - *Participation*

Two main strands of my research in museums

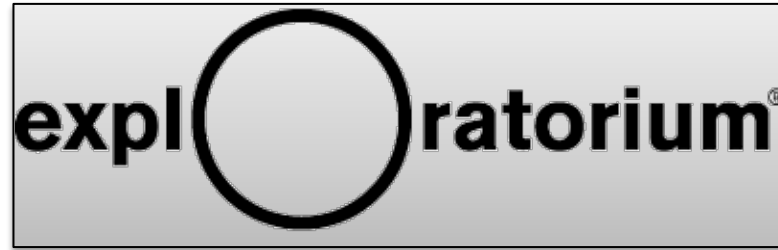
1. Learning occurs —what does it look like?
 - How can it be characterized in more detail, and on its own terms, not only in comparison to classrooms?
2. Informal settings are ideal places for populations typically disenfranchised from science to gain access to it.
 - We can advance an equity agenda

Monterey Bay Aquarium, Splash Zone

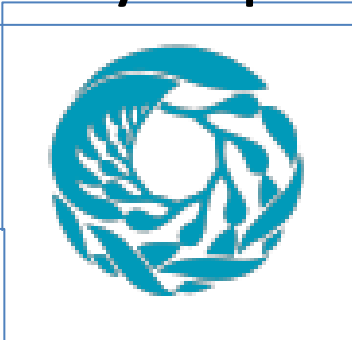


Background

- Professor UCSC,
 - teacher for many years,
MA/credential for secondary science
- Biologist
- Researcher
 - Science learning and teaching
 - In classrooms and informal learning settings
 - Equity and access to science
 - Urban and Latino populations
 - New research methodologies to capture and analyze complex. messy data sets.



Monterey Bay Aquarium



The message simply said:

- Informal learning research is increasingly appreciated for what it reveals about learning.
- We will look at some characteristics of learning in museums that inform theory
 - Not just cognitive, as many other aspects are involved
 - Not unitary but discontinuous, but also thematic
 - Mixing agendas

Changing Theories, Practices, and Ideologies

Learning is a large, messy topic, which has been primarily been studied in classrooms

- Classroom is a only part of this huge topic

We are at the **early** stages of research in places like museums

- The field is young and open to new ways of doing things
- We constantly cross borders, and feel shifting sands beneath our feet

1—From past to present

- Evaluation studies for many years were large grained and concentrated on time on task, pointing and gesturing concepts and counting such things as questions
 - Over the past 15 or so years, more researchers have taken a more fine grained look at learning, often by doing microanalysis

2—Whose agenda??

- People going to museums have their own social/cultural/linguistic patterns and **agendas** while interacting with the exhibits' agendas and with each other.
 - We must recognize learners' agendas, and then honor them
 - Museums are trying to examine their own social/cultural patterns but this has been difficult

MOSI— the Museum of science and industry in Tampa, Florida





– And museums are increasingly interested in attracting culturally and linguistically diverse populations

– “the new mainstream”

3: Funding

- Museums more recently have been seeing their budgets drop (USA, UK); this impacts the prospects for financial survival
 - Populations are diversifying and many museums have not been keeping up with the times
- They want to look closer at learning in order to attract more culturally diverse audiences and more funding.

4: “Re-norming”

In the past museums were focused primarily on white, European-American, upper middle class, well-educated visitors

that was considered the norm

- Now museums need to provide the vision and the services for the 21st century
 - **This is quite a challenge**

Informal Settings

- Messy data set...
 - Background noise
 - Lots of distraction
 - Typically leaderless or shifting leaders
 - Disciplinary content is sometimes difficult to locate
 - Social, affective realms trump many others

- We are ready now to view museums on their own terms,
- and more closely examine the learning that goes on there

Learning occurs in museums— what does it look like?

Some of the more noticeable things include:

- There is no formal assessment
- It is about more than content; feelings are half the issue
- Not as controlled or linear as in school
- Everybody learns something different
 - This is desired; talk across difference

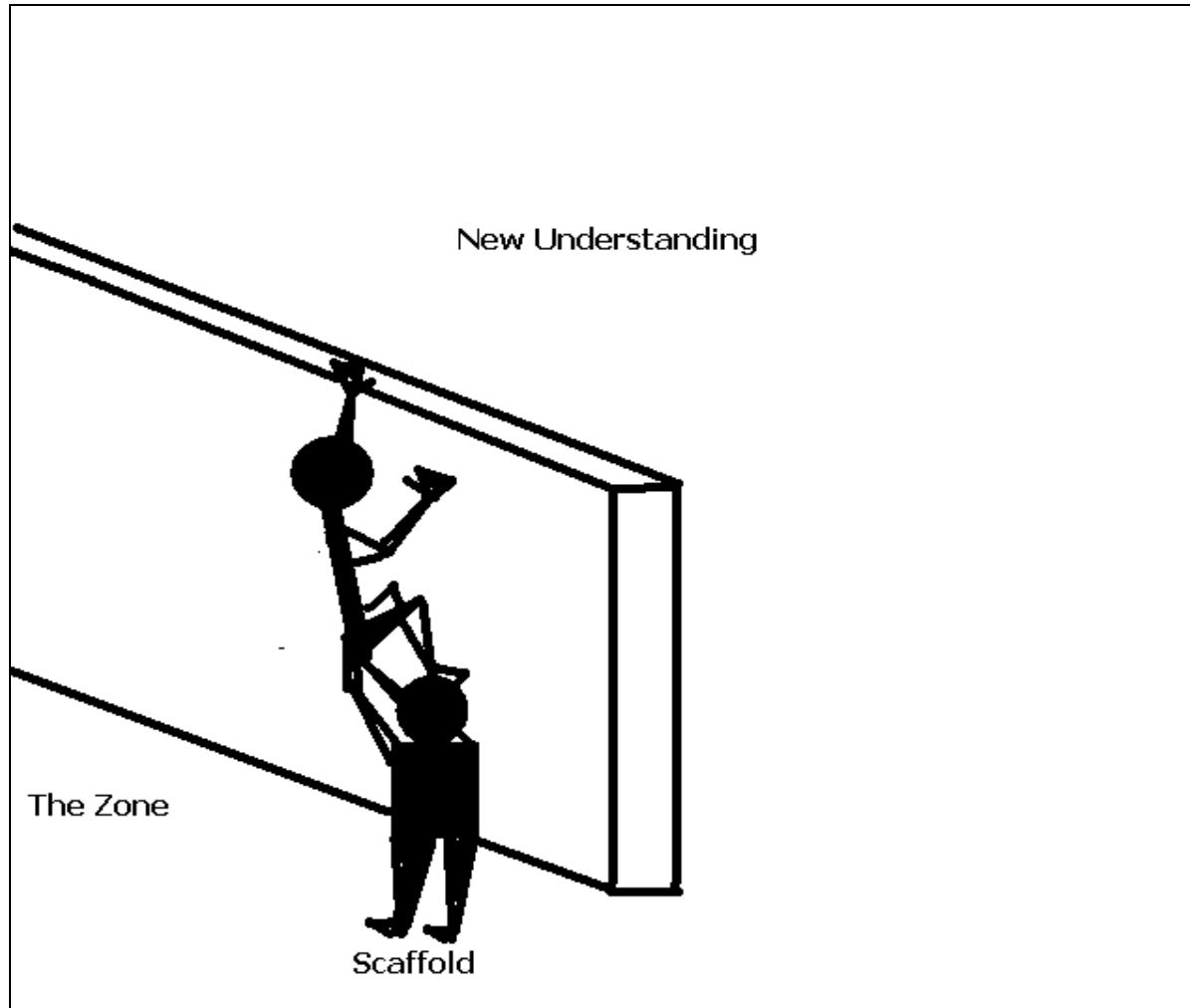


My understanding of sociocultural theory

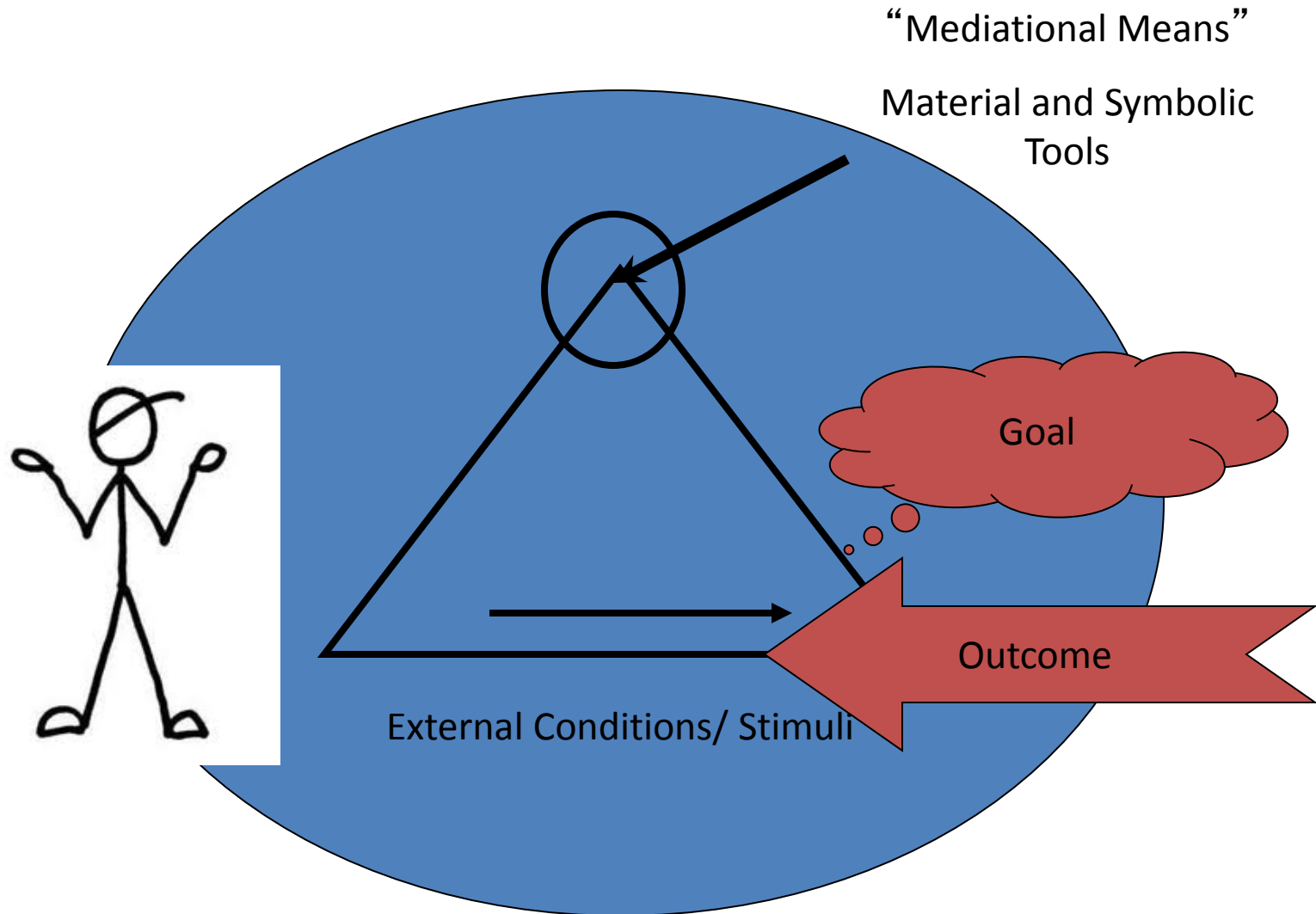
- Designing with zones of proximal development in mind, which applies in both in classrooms and museums
 - Talking across distributed expertise
- Envisioning how families make sense of new objects and ideas, and work with the museum curriculum, as they interpret it and interact with exhibits and each other
 - Promoting a hybrid agenda.
- Community of practice
 - Boundary crossings



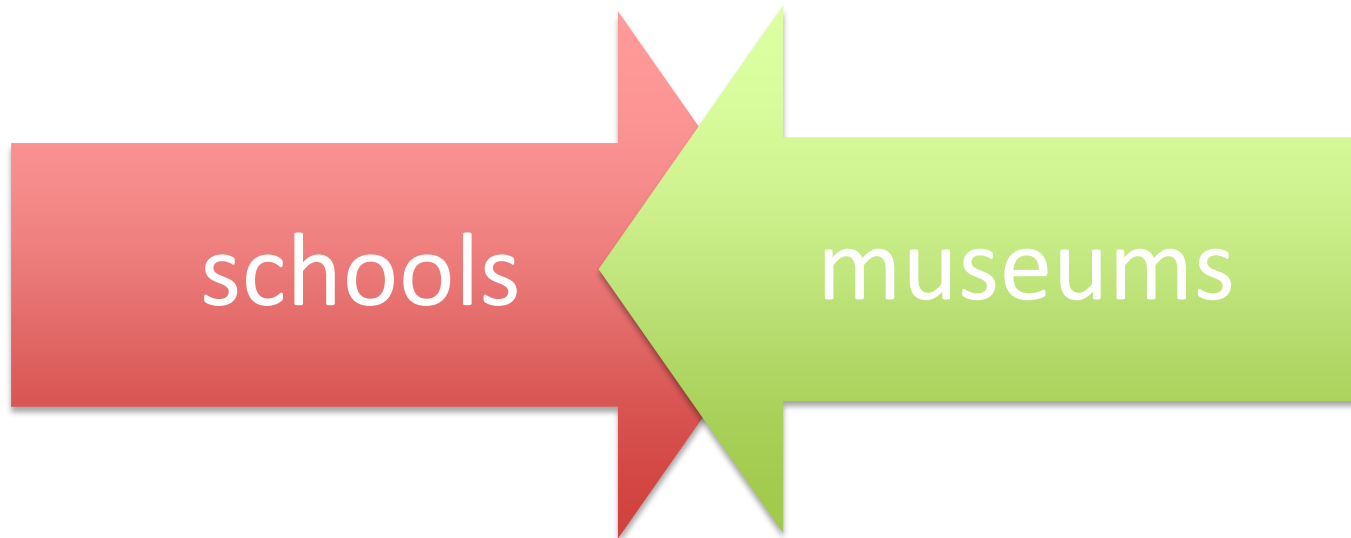
Vygotsky's zpd



Learning activity is Mediated



Overlapping boundaries in communities of practice



Finding 1:

Honor both learner and museum agendas

- Sometimes over-ride
- Sometimes blend

Dental Dad video

Is the agenda merged here?

- The “correct” dialogue would have been about the different kinds of teeth, carnivore, herbivore, and omnivore.
- The father and the family instead move the conversations toward dental hygiene.
- Is the agenda co-opted?
 - **We can't make the mistake that families know little**

Joint productive dialogue with museums

- Is one way culturally, linguistically, and economically diverse families can come to feel welcome and comfortable in museums
 - Reasonably easy to do

Findings 2

Learning is not linear.

- The content (and other aspects) are never linear
 - it is discontinuous, appears, disappears, reappears
 - and is built on the everyday and the scientific/technical

but it is also can be **thematic**

(eg. Marine snow)

We need to tolerate the ambiguity

- Video of marine snow family in Spanish

- an uneven, uncertain process in which the direction and outcome of a learning episode are often variable
- “learning goals or objectives are defined and redefined...distributed, abandoned and revisited”

- learning is gradual, holistic, open-ended, and variable in ways rarely seen in school learning.

Findings 3

Meaning is framed by identity

- “no single learning experience is mutually exclusive of others, rather every life experience is interpreted
-in the light of who we are and our dynamically developing socio-cultural *identity(ies)*”

Findings 4

Learning is not only a cognitive process.

- holistic, multifaceted approach to learning
- cognitive, affective, appreciative, aesthetic, social, moral, and identity, to name a few ...

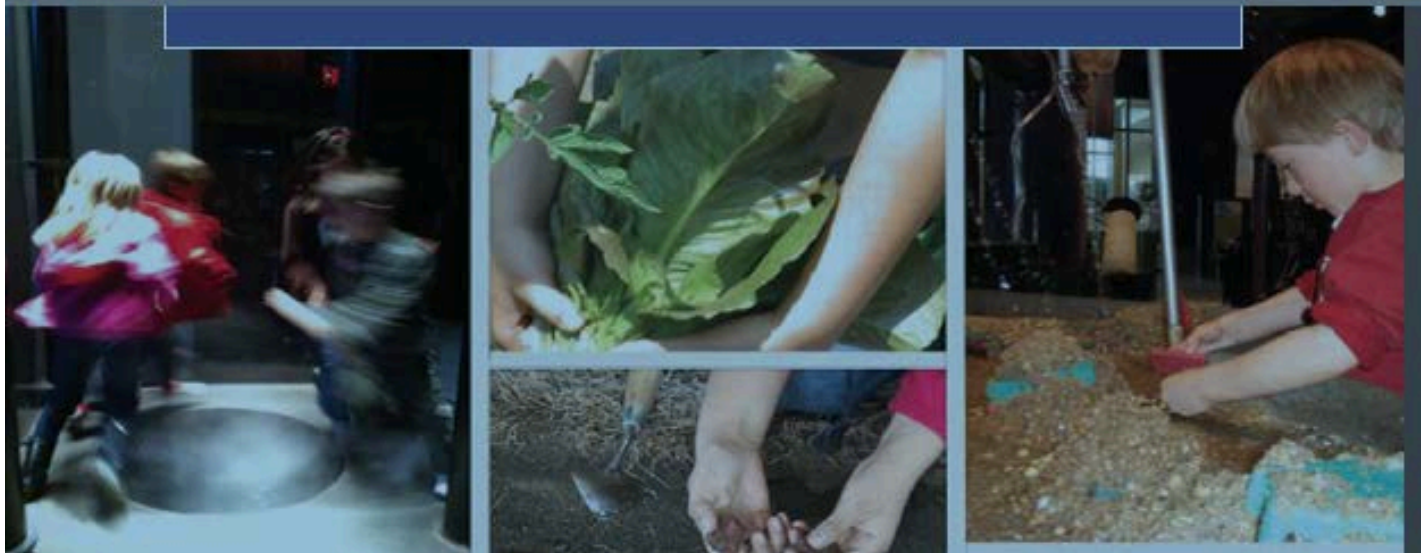
This view of learning sees it as—

- Multidirectional, not linear
- open-ended, discontinuous
- dynamic and ongoing
- spread over time and space,
- encompassing the entire learner (including interests, prior knowledge, and emotions)
- engaged with others in distinct practices situated in specific cultural-historical settings.

Putting Theory into Practice

Tools for Research in Informal Settings

Doris B. Ash, Jrène Rahm and
Leah M. Melber (Eds.)



Tools for research

- Gardens, field trips, zoos, aquarium, museums
- Design experiments, hermeneutics
- Crossing borders from school to museums
- Learning across contexts and boundaries

- Thank you so much for this honor
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