



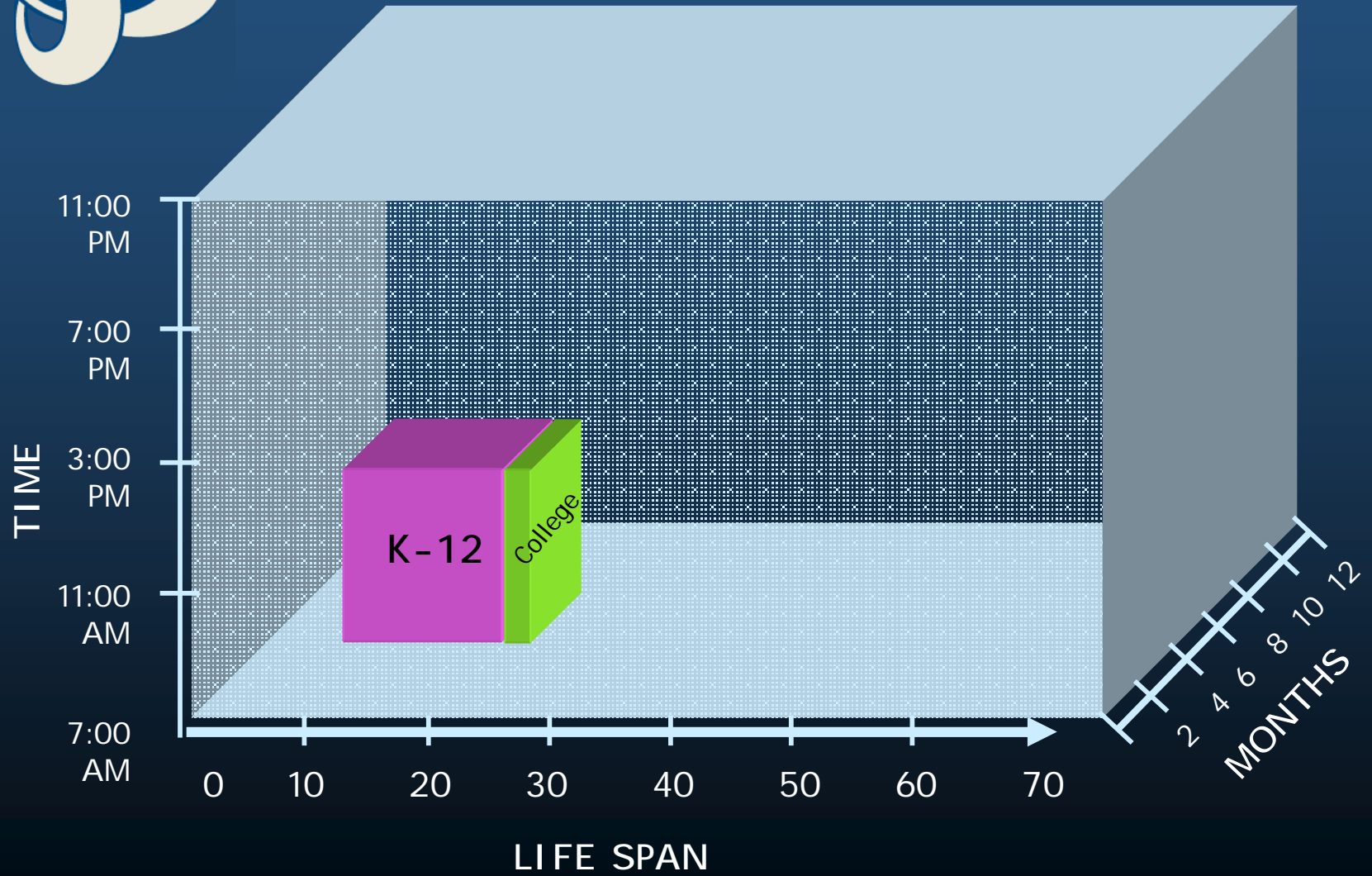
Where's the Field?:
Conceptualizing &
Investigating Lifelong,
Life-Wide STEM
Learning

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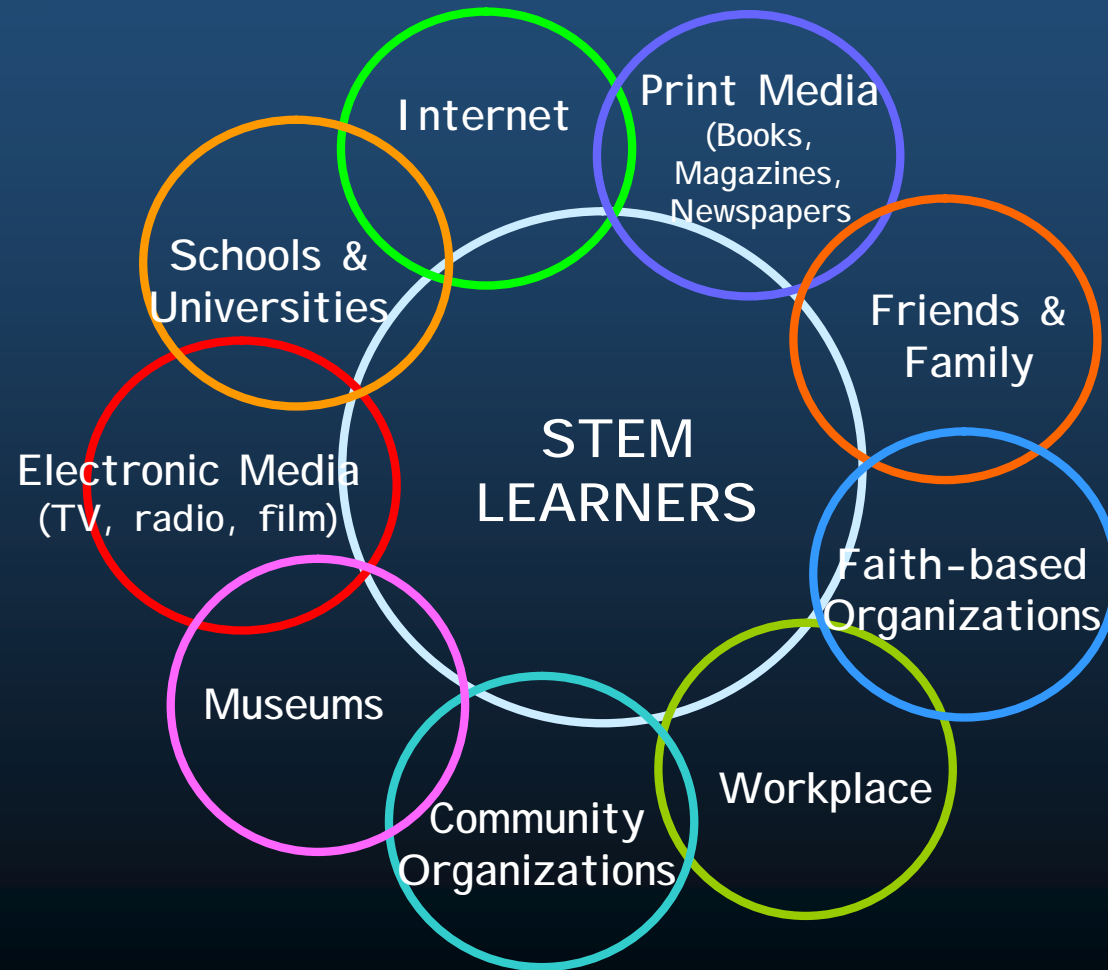
Overview of Talk

- What assumptions have been made in these studies?
- What outcomes have been investigated?
- What evidence is there of cumulative effects of free-choice science learning and its connections to other science learning?





Science Learning Infrastructure





Assumptions about Learning

- Self-motivated, voluntary, & guided by needs & interests; role of motivation, choice & control, interest & expectations critical
- Physical setting is extremely important; needs to be investigated in authentic contexts.
- Learning is both a process & product; need to investigate processes of learning, as well as products.



Assumptions about Learning (cont.)

- Strongly mediated socially/culturally; essential to explore social/cultural factors including role of discourse, social learning networks, cultural dimensions & use of groups, as well as individuals, as unit of analysis.



Assumptions about Learning (cont.)

- Learning cumulative; lifelong & life-wide. Need to investigate all dimensions of learning & connections in variety of settings across span of time; How are experiences used & connected to previous & subsequent experiences?



Assumptions about Learning (cont.)

- Because of complexity, innovative research designs, methods and analyses are critical (e.g., conversation/discourse analysis, constructivist tools such as concept mapping & personal meaning mapping, social learning network analysis etc.
- Outcomes need to be broadly defined; include understandings, ways of thinking, attitudes, and aesthetic appreciation of STEM
- Need studies at different grain sizes (micro & macro)



Some Evidence: Public Understanding of Science

Working Science Knowledge

- 43% Free-Choice learning
- 34% School
- 23% Work-Related



What Sources Do People Use to Become/Stay Informed?

1. 76% Books, magazines, not for school
2. 74% Life experiences
3. 74% Television
4. 68% School courses
5. 65% Museums, zoos & aquariums
6. 57% On the job
7. 55% Family and friends
8. 31% Radio
9. 10% Internet (NOTE: 3% in 1997)



Family Learning, cont.

- Long-term *family learning* impacts of “new” permanent dinosaur exhibition opened June, 2004 at a children’s museum.
- How was the exhibition, its interpretive programs and additional in-depth family-oriented experiences, used and integrated into the lives of families?
- Were visitors aware of institutional changes to support family learning & to what degree were these goals accomplished?



Family Learning

- In-depth, semi-structured, phone interviews (15-20 minutes)
- n=48 adults (144 total family members); family or child(ren) had visited exhibition &/or participated in one or more program(s) 3 months to year before



Family Learning, cont.

- Hands-on activities & interactives were family learning resources; adults & children interacted & learned together, adults facilitating child's learning and visa versa
- Exhibit-related conversations included reading aloud, describing, directing, explaining, questioning, comparing, & connecting experience to family life.
- Felt programs contributed to family's learning something new or reinforced prior knowledge
- 25% of adults talked about family's or child's increased knowledge of dinosaurs, or reinforcement of prior knowledge; several adults felt personal/social connection with staff interpreter/special guest encouraged continued interest in dinosaurs



Family Learning, cont.

- Family learning was extended beyond exhibition & program through conversations; inventorying what was learned, capturing relevant information to incorporate into families' personal history and identity & creating new shared experiences (take-home activities and souvenirs played an important role in sparking conversation)
- Included other family members, friends, and acquaintances who had not participated in the original experience.



Family Learning, cont.

- Exhibition, interpretation & programming, successfully contributed to people's understanding of dinosaurs, providing an enjoyable, high quality family learning experience.
- Adults in families did not use term "family learning" without prompting, but were able to discuss importance of interactivity, appealing to learners of all ages & backgrounds, and learning by children *and* adults
- Longitudinal research demonstrates how range of pre- and post-visit experiences interact iteratively with exhibition & program experiences, supporting family learning & identity building thus increasing likelihood experiences are integrated & assimilated across time and space.



Long-Term Impacts of In-Depth Youth Programs

Institute has investigated several youth-based programs retrospectively and found evidence for learning across these dimensions at the level of the individual, their peer/family group & community

- Perspective & Awareness
- Social Development
- Interests
- Knowledge & Skills



In-Depth Youth Programs, cont.

INDIVIDUAL

- **Perspective & Awareness**
 - Self-confidence
 - Independence & autonomy
 - Attitudes & perspectives on learning
- **Social Development**
 - Interacting with others
- **Interests**
 - Personal interests
- **Knowledge & Skills**
 - Personal knowledge & skills outside of school



In-Depth Youth Programs, cont.

FAMILY & PEERS

- **Perspective & Awareness**
 - Family roles & perspectives, diversity of peers
- **Social Development**
 - Facilitated communication with family/peers
- **Interests**
 - Family interests, seeking out special interest groups
- **Knowledge & Skills**
 - Influencing family members' learning



In-Depth Youth Programs, cont.

COMMUNITY

- **Perspective & Awareness**
 - Cultural tolerance
 - Civic responsibility
- **Social Development**
 - Community of learners
- **Interests**
 - School & career decisions
- **Knowledge & Skills**
 - Learning connections



On the Horizon...

- Findings from Center for Learning & Teaching (CILS, CISTL)
- L.I.F.E. Center
- Gender Research project
- NSF Academy for Young Scientists grants