ADAPTIVE LEARNING ENVIRONMENTS: Informal learning contexts

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Alyssa Alcorn / (aalcorn@ed.ac.uk)
Plan for today:

• Activity 1: Museum vs. classroom
• Activity 2: Features of classrooms versus informal environments
  • What can we assume about the contexts?
  • How does this affect our goals, designs?
• Goals for informal environments (focus on informal science learning)
• Examples from projects (Coach Mike, Future Worlds. See also readings on CHESS)
With respect to designing ALES, what are features of classrooms vs. informal environments?
Designing for classrooms

We can assume that:

• Domain content learning will be important
• We will know who our user group is (age, maybe more)
• Users are a captive audience: they can’t leave, even if they are bored, don’t like material, etc.
• We may have other domain resources available
  • Help from teacher (while using ALE)
  • Class activities/lectures
  • Textbooks
Classrooms continued

• We know approximately how much time we have (per session, and across sessions). Sometimes, this is many hours of time.
  • Have enough user-system interaction to build meaningful models, use them for pedagogy
  • Time to give detailed instructions
  • Time to repair misunderstandings (on part of student OR system)
  • OK if it takes some time to learn the system
• Know context of use: individual, collaborative, only for homework...
Classrooms continued

• Likely there is **dedicated time** to use the ALE
  • It is not “competing” with other activities
  • ...only with student inattention, tiredness, etc.
• May assume that classroom is a **reasonably quiet, consistent environment** for learning
• Many options for **evaluation**. Need pre- and-post tests? No problem, we do tests anyway.
• Learners may expect the ALE to be “like work”, and may have an **incentive to persevere** (e.g. final exam grades)
Informal learning environments

• Not an “exact” definition of informal learning, but today usually talking about the following type of contexts:
  • Museums, especially science museums
  • Zoos
  • Visitor centres at natural or historical sites
  • Other contexts in that general vein
• Learning at home “for enrichment” could be considered informal, but not discussing that today.
Imagine an anti-classroom

We, as designers, do not know any of the following things when designing for an informal learning environment:

• User characteristics, even age
• How many users may be at the system at once
  • One older child, alone?
  • A parent with two arguing children?
  • Group of students on a field trip, with teacher?
• How much time users will spend (other than “not very much”)
Informal, continued

• We may have **no staff members available** to troubleshoot, answer questions, or help people get started
• May have loud, confusing, busy environment
• Our system is **one option among many things** to do and look at—must attract users in first place!

→ **No captive audience. The users have VETO POWER.** They can walk away as soon as they are confused, bored, system not working...
Informal, continued

So, we could say the following things about adaptive learning in an informal context:

• We need to attract users and then retain their attention, because they have veto power.
• Should design for range of user ages, interaction types (e.g. individual, family, school class).
• Content needs to be limited, targeted because we have very little time (probably < 5 min!)
• Our possible ALE strategies (e.g. modelling) are limited, due to lack of use time, user information.
• May have limited or no human support.
So, does it even make sense to make ALEs for “informal” use?
A qualified “yes”

- Some of what we have learned may not be of much use here due to the context, such as:
  - Constructing very long, complex tutorial dialogues
  - Modelling overall domain knowledge by examining performance on many individual problems

- Other things we have learned are more clearly applicable, for example:
  - How pedagogical agents can increase engagement, positive affect, invoke useful social schemata
  - What kinds of feedback we should give, and how quickly, and how often.
Content is not king!

- Informal learning is where the “touchy-feely stuff” often treated as a peripheral or secondary benefit of a system now becomes much more important than pure content learning.
- So, Using some parts of ALE technology makes sense for certain goals.

→ Suggestions from the class about the type of goals we may target in a museum, visitor centre, historical site, zoo, or other informal context?
Many goals more about affect, engagement, reflection than about “learning”
No one wants to memorize stuff at the zoo

OVERALL, goals for visitors at an informal context like a zoo might be things like:

• Being able to understand important concepts and terms (ex. “deforestation” or what it means for animal to be endangered)

• Engagement with, or investment in, the topic(s) (ex. “I love the endangered tigers! How can I help them?”)

• Connect the experience to the self, to rest of world (ex. my actions impact environment, and those cute animals)

• Have fun!!! (don’t forget this one, it is key!)
Six general goals for informal science learning

1. “Spark” interest, excitement in science
2. Enable understanding, generation, retention, and use of science concepts
3. Encourage testing, observation, exploration, questioning of natural and physical world
4. Foster reflection on scientific process
5. Create opportunities to participate in scientific activities
6. Encourage learners to think of selves as scientists

See Rowe, Lobene, Mott, & Lester (2014), p. 2
Also, no one wants to take a test at the zoo

- Very different challenges with evaluation!
- How to measure gains when no baseline info?
- May need to evaluate in a more traditional way with small groups (e.g. Follow-up surveys and/or interviews after exhibit use), use this to extrapolate to the rest
- May use observations, but this often runs into ethical issues

→ Remember also that will have different evaluation goals, to go with different teaching goals
Programming at Robot Park (Boston MoS)

- Museum volunteers usually helped visitors
- Very labour-intensive—could we have a virtual “coach”?
- Develop pedagogical agent (Coach Mike) to do things that volunteers did
  - Help “orient” people to exhibit
  - Encourage engagement
  - Offer help
  - Set programming challenges
From Lane et al., (2013) see reading list.

Visitors use tangible interface.

Camera

Robot
“Coach Mike” pedagogical agent here

Puzzle pieces have fiducial markers (camera reads from above)

From Lane et al., (2013) see reading list
Coach Mike at Robot Park

Fig. 2. Mike is a 3D cartoon-style pedagogical agent designed to be approachable, supportive, and understanding (among others). These stills are from animations for thinking, giving positive feedback, and displaying a block (magically).

From Lane et al., (2011) see reading list
Coach Mike: effective?

Please see the following papers for details of how different versions of Coach Mike have been evaluated, and the types of goals that the authors and museum were trying to achieve.


This paper provides an "update" to the 2011 paper
Hot off the press: Future Worlds project

• Very recent project from Rowe, Lobene, Mott, & Lester (2014). *The Crystal Island people!*

• Goal: Users investigate paths of environmental sustainability

• Use research on narrative learning, strategy games, collaborative investigation

Figure 1. Early artist rendering of FUTURE WORLDS multi-display exhibit
Design principles from museum partners, review of exhibits

1. Low barrier to entry (immediately useable)
2. Exploration and curiosity
3. Immediate and dramatic feedback (“use fireworks”)
4. Inviting visual aesthetics with broad appeal (Authors note that “high-quality visual presentations are the norm, not the exception in museum-based learning.” p. 3)
5. Novel hardware platforms (to attract learners’ attention, offer exciting experiences not available at home)
• Environment starts out looking dead to indicate its “unhealthiness” and lack of sustainability.
• User can seek in-game info and make choices about energy, waste management, water, etc.
• Colour, animations are “dramatic” feedback about how user choices affect the environment over time.
• Many possible “solutions” to challenges, with various trade-offs
Figure 3. FUTURE WORLDS paper prototype

From “Play in the Museum...” Rowe, Lobene, Mott, & Lester (2014)
Museum pilot test with a reduced-functionality prototype

From “Play in the Museum...” Rowe, Lobene, Mott, & Lester (2014)

Figure 4. Learners interact with the FUTURE WORLDS exhibit
Please see the paper for more information on design, piloting


This is an excellent, hot-off-the-press read with lots of concrete details and examples. I say that as someone who reads lots of papers! –A