

Live Interactive Planetarium Symposium (LIPS)
9th-11th August 2011

LIPS grew out of full dome frustration.

Tuesday, 9th August 2011

Susan Button: Interactive Techniques Under the Dome

What do students notice when they first come into a planetarium? What LIPS members noticed: one circle of chairs, the seams of the dome, a low horizon, the AC, table in the centre with lots of stuff, acoustics, lights. It's a special room!

Where is the Earth? Students can be confused about where the Earth is.

What does "live, interactive" mean? Our answers: Every program is different; it's tailored based on questions; it's mostly (but not always) guided by the audience; the audience is given an opportunity to express their curiosity; they can have input to the show, and have a stake in the output; the audience participates; it's a group experience; it's beyond exciting; they're engaged (and not passive); they have more questions going out than coming in.

Storytelling is a form of interaction – it's engaging, you're predicting the outcome, and you're responding to the teller.

The motion of the Sun (as an example): get the students to hold place markers to show the different locations where it rises; use worksheets to record observations; ask them to put together a sentence to describe the motion; decompress after a show (why do we care about what we've just seen? Give them something to do after the show, e.g., 25 reasons why we care about the seasons)

Kamal, an Arabic celestial navigation/timekeeping tool: it's a square piece of wood on the end of a string. The string was placed between the teeth and let out until the lower side of the square was against the horizon while the upper side was against Polaris, then a knot was tied in the string. With it, you could measure latitude or the keep time.

Moon and its phases: students do not know the properties of light on a sphere, so first introduce that. Have them draw what they can see while experimenting with a sphere (e.g., dylite polystyrene sphere on a stick) and a light – perhaps putting dots on the sphere. You could also have "stations" around the dome, where you draw what you see of a central sphere/light at each station. Also, ask them what they think the people opposite are seeing. Don't ask why for younger audiences, just tell them what's going on (it's too hard to ask why). Also for younger audiences, could use finger puppets for the five different shapes of the Moon (new, crescent, half, gibbous, full). Or an activity where you have to put the phases in order.

"Universe at Your Fingertips" book was recommended.

Karl von Ahnen: Interaction in Larger Domes

Ask questions (e.g., who can find Ursa Major/Big Dipper, who can tell the difference between a star and a planet, which direction is west?)

Repeat after me (after doing this they might not always remember, but they should at least be more familiar with the material next time they encounter it)

Solicit questions, have question and answer session at the end, let them know you're available to answer more questions as people leave

Put the audience to work! Either verbally direct the planetarian's laser pointer, or hand out two different -coloured pointers at a time. With the latter, explain pointer etiquette, ask their name and announce it (especially good for children, so that if they misbehave the adults know who is

responsible and can call them on it), race to e.g., the brightest star or a certain planet – and sterilize after use.

“Think-pair-share” activities, e.g., individually and silently try to find a certain constellation, share it with your elbow partners, and then eventually with the whole group.

Julia Plummer: Evidence for the importance of interactive planetarium programs: Research on kinesthetic strategies with elementary students (grades 1-3)

(Presentation available at <http://www.juliaplummer.com/papers/>)

Two literature reviews mentioned: Brazel and Espinoza (2009; AER, meta-analysis of 19 studies) and Croft (2008; The Planetarian)

We shouldn't think classroom vs. planetarium, but rather that the planetarium experience is complimentary to what students are doing in the classroom. A 45-minute show followed by 6 weeks of classroom activities (for the explanations) seems best for student learning.

Q: How do you measure the success of a planetarium?

A's: Learning vs. making money? The awe factor. Do they come back? Attendance. Are students motivated to learn more? If students get a positive experience, then they next time they encounter it they are not frightened of it. Getting grants.

Books mentioned (available as free PDFs):

- 1) How People Learn,
- 2) How Students Learn (build on prior knowledge to learn and transfer; deep conceptual learning needed in an organized way to facilitate retrieval; meta-cognitive approach),
- 3) Learning Science in an Informal Environment (people-centred, place-centred, culture-centred)

Activity for apparent celestial motion: students follow the motion of the Sun/Moon/stars by pointing as object goes across the dome. Popular with kids and teachers, and study showed improvement in learning (but someone raised the question: did the pre-test influence their learning by showing them what to focus on?)

“Dual-coding theory” (Clark and Paivio, 1991) – learning together by, for example, seeing *and* hearing.

Questions still remaining for future research:

- 1) How do you get a good (and time-efficient) assessment in planetarium shows?
- 2) How do you go from Earth-based observations to the actual celestial motion?

John Kaufmann: Keynote presentation: Interactive performance philosophy/practice and the idea of connecting stories (traditional and "invented") to the mechanics of the sky.

Turning around the mode of “blaming the audience” for a bad show.

Create the right environment:

- 1) A welcoming environment. Creating it is important; their first steps into it are crucial
- 2) Failure. A wrong answer is celebrated towards getting the right answer. Take away the stigma of failure!
- 3) Rule and objectives (accountability): as a facilitator, rather than an instructor with knowledge and power. Deal with this at the beginning. Have a vote, or create a deal for self-discipline. Noise-activated light idea! “Let's see what happens if do (what you suggest)”. “Our show is about planets; does that sound good to you?” A canned/full-dome show is like the mass media; an interactive show is more democratic.

Tools

- 1) Being present. “I notice” game: in pairs, one person begins “I notice (and makes an observation about the other person)”, and the other answers “Thank you for noticing. I notice (an observation about the first person)”, etc...

- 2) Keep things positive. “Left-field questions” activity: speak on an astronomy topic, and have the practice group interrupt you with random questions that are apparently unrelated to your topic, but that you actually weave back into the presentation.
- 3) “Think-share” activity. You relate differently after thinking of your own experience. E.g., before showing your audience the meteor show, ask them to think back to the last time they saw one – where they were, who they were with, what they saw, etc.
- 4) Frozen pictures (can apply to anything, not just astronomy): act out your favourite constellation.
- 5) Student demo for Sun/Earth/stars relationship and why we see different constellations at different times of the year: one student in the middle as the Sun, four (or more) students in a circle with their frozen picture constellations that they associate with that particular season, and a sixth student who orbits the Sun within the constellation students.

In the dome

The Big Bear is facing the direction that it moves over the course of the night. Imagine it’s tethered to Polaris: how long does it take to go around? Greek for bear is arktos (arctic, North)

By having students look at the stars and create their own constellations, they are able to relate to the way the constellations are named (it’s no longer an old and stodgy topic anymore, but alive for them)

Alan Gould: The Question of Questions

POPS = Participatory-Oriented Planetarium Shows

Planetarium educator workshop guide in “Planetarium Activities for Student Success (PASS)”, includes 15 shows on DVD from SkyScan (\$300)

Mirror game (as analogy): only certain students can see the drawing at the front of the classroom. All the other students have their back to the drawing. The students who can see the drawing must explain the pictures to those who can’t so that they can draw it. The students explaining the picture cannot see the drawings of the other students, so they don’t know if what they are describing is being correctly interpreted.

Quantity vs. depth – leave the students wanting more (i.e., don’t cover everything at the expense of opportunities for deep learning)

Question strategies:

“Could you explain that more?”

“Could be. What others?” (even if you get the correct answer when you first ask – this is useful later on when you get an incorrect answer)

“Does everyone agree with that?”

Don’t say “Can anyone (do something)?” because it implies that no one can. Instead ask “Who can show me...?”

Remember to wait about 5 seconds when you ask a question.

How you respond is extremely important (your tone included).

Should you use clickers in shows? It depends on how you use them, just like in teaching – you want to get at deep learning

Leigh Simpson: Storytelling in a Dome

You don’t need to be the scientist on every occasion!

Set your ground rules before you go into the planetarium.

Ask questions, change up your voice – tempo, volume, different voices for different characters and funny sounds (age appropriate).

Let others contribute, and talk about other cultures.

Karrie Berglund and Greg Anderson: Outreach in portable domes

Stand your ground!

Have a contract/guidelines/check list to go through together.

Get someone there from the place you're visiting to help.

Require a teacher to be present.

Suggest pre-tests for each and every group (check what students should already know, how the class is usually dealt with for discipline)

Check ceiling height.

Ask about circuits, so you don't blow any fuses.

Get evaluations – give out pencils and forms before the show.

Look/listen/learn for eyes/ears/brain.

Three main groups: 1) fun, 2) curriculum, but haven't studied anything, 3) curriculum and have studied

Cover perforations with plastic paint.

Two flashlights: red for questions, and white to say "shut up!"

Compliment the higher level audiences by saying that you're excited to talk to them because you're able to show them more.

For the teachers who are always answering your questions: thank them, and ask if anyone else knows the answer to the next question as the adults already seem to know.

Wednesday, 10th August

Jonathon Fay: Xbox Kinect demo (with MS World-Wide Telescope)

For planetariums of all sizes and also flat screens.

No swimming (arms as pincers to move)

Takes practice to get a smooth motion

Kids might not think much of this magic – they almost expect it

Can select by "eye line" with hand

Take care when "driving" your audience; be slower and smoother for a more immersive experience. The spiritual experience of flying through space needs a good driver – need to say no to some presenters.

Is the audience looking at the presenter or the dome? Or is it complimentary, like with an orchestral conductor where you can choose what you want to focus on? Presenter might be in an alcove.

Where does the interactivity come in? Perhaps have "planetarium as exhibit", where the museum visitors operate a secondary dome.

To keep the "3D effect" (that we're travelling through space), you always need a slow but continual zoom or pan. If the image becomes static then the reality collapses.

Operating and talking at the same time is like driving.

Visualizations initially jumped ahead of controller technology, but now controllers are catching up.

Kevin Scott: Evans and Sutherland Demo

Digistar 4 (for large and small domes, single and multiple projectors)

Can use Astronomy Visual Meta (AVM) data, which has RA,dec embedded in the image, so that images are placed automatically in their correct positions on the dome.

Can build your own GUIs.

Can change the "centre of focus" to be unidirectional/zenith/anywhere you want.

Karrie Berglund: Digitalis Demo

Digitalarium Kappa (resolution – with a dome diameter of 1600 pixels – is a lot better than the Alpha 2 – with 768 pixels!) and Operating Platform 4

Universal Console (UC): no on-dome menu; can call objects/constellations from a list (not seen by audience), although you don't get to follow where the presenter is directing your gaze as with the cursor/remote – so these two controls should be used together.

The UC also allows you to show two images on the dome, overlaying the star field (you could do this without the UC, but would need a script to do it). It's possible to quickly and easily move these images around the dome, or to switch to full dome mode for the image.

Pointed out that the Inca constellations make their shapes out of the dark spaces, not connecting the stars.

Can fly to Solar System objects, although landing is quite abrupt. Can also fly from orbit to orbit.

There are clouds and lights on the rendition of the Earth.

Could use the moon phases of Mimas (to get rid of preconceived notions of our own Moon's phases)

MPEG2 is the best format to currently use (although working on MPEG4). Also working on AVM data.

Arrow pointer: \$75 inc. shipping.

Martin Radcliffe: SkyScan

"Go to" function, with specified time delay (e.g., "go to" nautical twilight in 12 seconds)

Really easy to draw the analemma

Can add new topics (e.g., Dawn's mission to Vista/Ceres)

Can change the "centre of focus" to be unidirectional/zenith/anywhere you want.

Need to be careful how you leave the Earth, so that the audience knows what you are doing.

Boston Museum – working to do both full dome and interactive shows

Martin's talk: "How to use your digital planetarium: New stories about the Universe"

Toshi Komatsu: A Digital PASS

A quick tour through some of the PASS activities (introduced earlier by Alan Gould), a couple of which are free to download.

Constellation Show

Give star maps out, and ask kids to find constellations in groups

Moon Show

Crescent – looks like a smile, banana, fingernail, etc; half – looks like letter D, half pizza, etc.

Moon ball demo with Styrofoam ball.

Galileo Show

Jupiter's moons – one group tracks one moon, and records on a sheet relative to guiding points printed there.

Leads to tour of Solar System and other Moons

Strange Planets (on ESPs)

Transit method video

Students act out transits, and use a light meter

Show some data of light curves

Flying High

Show about space flight for 4-7 year olds

Sun/Stars

Sun rising/setting

Colours from Space

How astronomers gather light

Focus on Betelgeuse, Arcturus and Aldebaran

Show a filament light

Different patterns on red/green/blue stripes in red/green/blue light

Filter wheels passed out to students
Target Earth
Dinosaurs
Role-playing with chemists, astronomers, palaeontologists, geologists

Julia Plummer: AVI

Use full-dome clip(s) that would be short segments within an interactive planetarium show for elementary students (a bit like micro-scripting)
Can skip sections or dwell on sections depending on the level of the students

Jaap Vreeling: Novalab – the Dutch Approach

NOVA: Netherlands Research School for Astronomy
(Prior “outreach” only via press releases, websites, and publishing – no shows or school visits)
Cooperation of five Dutch universities
Supports and supported by amateur associations
Connects amateurs with school groups (e.g., Moon observations at schools with telescopes)
Supplies materials to teachers, and hosts professional development conferences for teachers
Two portable planetariums (note: there are only a handful of fixed domes in the Netherlands)
Shows on ALMA, “Two small pieces of glass”, “Journey to the Chocolate Planet”
Try to incorporate what’s already in the curriculum
Goals:

What do they remember?
If you don’t get feedback, how do you know what they’re learning?
Deep or surface learning?
Need to do something: experience, reflect or use it.

(Someone raised the question: Does it matter as long as it’s exciting? So that the next time they experience astronomy they’re more open to it...)

Questions:

How do you get feedback?
How does one start from their interests? (e.g., ask them some questions before you go in?)
What kind of action does the planetarium show motivate?
How do we control the quality of presentations/interactions? (Get feedback on the training from presenters)

Kaura Kimura: What’s the problem? Learn astronomy education from the elementary school teachers

We began with a survey of relatively simple astronomy-related questions, given to elementary school teachers, and then looked at the compiled results. It was apparent that there were a lot of misconceptions prevalent about the Sun, the Moon, the constellations, the colours of stars, etc., but this is material that the teachers are supposed to be teaching to their students. There is also a problem in that the curriculum states that the students must learn “by observing”; how do teachers do this?

Two aids were discussed:

BaMoon (a small balloon with the Moons surface printed on it):

<http://melos.ted.isas.jaxa.jp/BaMoon/jpn/>

i-CAN (Open, free access to a network on telescopes/cameras to use in the classroom):

<http://melos.ted.isas.jaxa.jp/i-CAN/eng/index.html>

Kevin Scott: Kinect with Digistar

We saw three modes:

- 1) Flying through the rings of Saturn
- 2) Constellations
- 3) ISS

Mark Webb: Intern Annie and Captain Steve go to Mars

At the Adler Planetarium

6-8 overnight events per year (7-12 year olds with parents, 750 people on one evening with four ~30 minute shows between 18:00 and 22:00, very informal)

Another more formal, but still fun show is "What's up?" (a daytime show where it's emphasized that the planetarium is not a movie theatre but a space simulator)

"Zoop" to change position, stamp feet to change speed

Show the spinning Earth while simultaneously show a time-lapse video of somewhere on Earth

Show the Earth orbiting the Sun, and show a time-lapse video through the seasons

An interactive part of one of the shows: the kids can choose 'naked eye', 'telescope', 'space mission' or 'astronauts' for Moon, Mars or Jupiter.

Upcoming show: "Teleskype", from the perspective with the dome as the viewscreen of a stranded alien's ship

Someone asked how these ideas come about: It's nothing formal for overnight, but educational "What's Up?" is goals/learning objectives-driven which had a lot more thought and planning put into it.

Side discussion on the ring systems (cancelling vertical motion of particles), versus the oblateness of planets/SS/galaxy disk (flatness due to spinning)

Rob Cockcroft: Repeat Offenders: How to Keep Regulars Coming Back For More

Ideas from brief talk:

(Work well): General/Intro astronomy shows (e.g., "Lighthouses in the Sky" intro to constellations and bright stars, new discoveries, ask an astronomer)

Different perspectives on the same theme (e.g., with planets could talk about moons, exoplanets, space mission, Holst's music, etc., in addition to planets)

Use different cultural/religious perspectives (e.g., ancient Egyptian astronomy, astronomy in the movies, debunking celestial myths)

Themes on destruction (black holes, seven ways life on Earth could end, cosmic collisions)

Combine with events (e.g., IYA, Venus transit, International Observe the Moon Night, 2012, Festive Skies, Halloween)

(Doesn't work so well): Switching between full dome and PowerPoint projectors

Relying too heavily on extra imported images, rather than using the projector's own software

Ideas from group discussion:

Topic suitability to dome

Make teacher comfortable (and somehow engaged if they've heard the talk many times)

Connect with museum/larger institution

Keep up with PR

Align with State standards/curriculum

Leave tools with the students (e.g., starcharts)

Practical approaches (e.g., with spectroscopy)

Question driven shows are good

Keep a balance between full-dome and interactive shows? Live is popular, but can break it up into full-dome chunks, too. Could talk over pre-recorded shows.

Level is important; start with something that they know

Transitions are important; use natural breaks

Arthur Bogart: Pimp Your Dome

Display feedback outside of the planetarium

Lights – cove lights for fixed domes, or rope light attached with Velcro (fuzzy side, not the finger side, on the dome!)

Pre-show room, with updates of current news

Audio sources: gaming soundtracks, musopen, freesound.org (small sound effects), socan (\$100/yr for licence, and cannot use for pre-rendered shows – must be live), “Destiny in Space”

Downward-pointing, reading lights under the cove (go with orange, as red is too dim) – along with clipboards and pencils (could also put lights on your clipboard like Toshi and Alan). The downward-pointing lights work well for drop-in/walk-in shows, too.

Jonathon Fay: World-Wide Telescope

Amazing zoom-ins on Earth or Mars

It’s a tangent-plane projection (that’s why it seems a little distorted around the edges)

Can show the Universe in different wavelengths

Non-profits that charge can use WWT for free

Constellation line colour and opacity can be changed

Need to zoom out (with mouse/X-box controller)

Dome-master movie output in stills

Can do 3D, too (but not yet on full dome)

Arthur Bogard: Using the Hide and Bone

Use the unusual acoustics in the dome to talk about:

Sound and light, and how they are both waves and can reflect

Have a conversation with someone opposite (can easily do), then four people along from you (can’t hear anything) – the Tohoku tsunami was used as an analogy for the bowl-shaped waves being focussed

Use the cove lights to explore colour effects

Can subtract pigments (e.g., from images handed out to audience)

Can reproduce colour blindness

Talk about birds that have 4-colour receptors

Activity cutting four coloured wires (red, green, blue, white) in the different cove lights

Pay attention to the colours and audience’s clothes

Hand out coloured dots and get them to stick in spaces (can do a few times)

Draw a picture with crayons with all the labels taken off

Colour blind people/tetrachromats can see other stuff

Turn down the lights – at what point can you not see colour?

Demonstrate polarized light with LCD screens and polarized lens

Could make big demo from cardboard (with snake shape as light waves, and glasses with slits)

Derek Demeter: Live Theatrical Shows

Show ideas:

Minds in Motion – Newton, Galileo and Kepler

Extraterrestrial Files

Science and Spooks (Halloween show) – e.g., the Ghost Nebula

Who’s Who: Famous Astronomers and their Discoveries

Valentines (Greek myths on romances – decorate with rose petals and tuxedos)
Sidewalk astronomy to advertise the planetarium
Neutral density filter to get true black from LCD projector
Black lights and white board with fluorescent pens
Events that you can take a portable planetarium to:
 Boy Scouts conference
 Malls
 Fairs

Chuck Voordman and Keith Davis: The Digital Visual Theatre at Notre Dame

Uses SkyScan, and encourages not just astronomy (hence not using “planetarium”) but also maths, chemistry, physics and biochemistry.
www.visarray.com

Karrie Berglund: Keeping Open in a Bad Economy

Can cover more people with portables
Curriculum – can cover specific material
Build your network/supports – you don’t want to see your friends close down
Expand curriculum to not just astronomy
Membership/Find sponsorship
Look at buzzwords from the local education program, and include them in your annual report – speak their language
Don’t sit back and relax after opening – continue with PR
Planetarium is ambassador to the larger community
Quantitative data idea: get responses from teachers by doing a prize draw for an ereader (ask them what they want covered; what do they not cover but would like us to cover?)
Have education goals, with the subtext of a business mentality – charge what you’re worth, but don’t overcharge
Summer school program option
Team building corporate events
Invite people to your planetarium!
Coupons on groupon (2-4-1 deal); TV is least effective
Astrophotography contests
Radio stations (live-on-location)
Exit tokens (live shows proved more popular than canned shows)
Ticket sales as a way of pre-judging popularity
Emphasize that live=better quality, more interaction and fun! Perhaps not all the public equates this
Use university’s communication majors to do PR for planetarium (ask the instructors to make it a lesson – could do something similar with history students, or game/simulation design students...)
Display kids’ drawings/statements on postcards/websites
Charge, but if they give feedback or contribute research then they get it free/discounted
Corporate sponsorship: e.g., \$5 for 1 student, \$100 for a whole class, \$500 for a whole year group
Credit for sponsorship on entry slide
Book recommendations:
Dale Smith – Planetarium _____?
George Reed – Who the Hell Needs a Planetarium?

Other random notes

Ideas from Keith Davis for planetariums at universities: invite new faculty/all faculty to the planetarium for professional development, and in addition to showing them astronomy also talk about the possibility of using the dome for non-astronomy material.

Bryen McGuire's idea of getting around the Harry Potter copyright issues: "Astronomy with Wizards", e.g., talking about Draco, Bellatrix, etc. for HP connections

50% discount if you see both planetarium and 3D

For tactile materials:

Noreen Grice (blind work in the planetarium): Noreen@youcandoastronomy.com

David Hurd: dhurd@edinboro.edu

Hubblesite.org

Cove lighting in the Pacific Planetarium:

Power supply (40x20x20cm)

Each LED strip is 3x3lights (the 3 lights being RGB)

Control computer is also needed, with a touch screen (but could use the UC as your touch screen)

Would want to go through Digitalis for this if we were considering cove lights and UC

Check out IPS, and support the "Training/Content" and live/interactive workshops and sessions.

"Choose your own adventure" shows

One-minute energizers:

Rotate with/against the sky

Frozen pics

Stamp your feet to e.g., fast forward

Shake paper for a particular answer

Rain (snap your fingers, clap, slap knees, stomp, slap knees, clap, blow the clouds away... silence)

Songs for younger kids

Calm-downs:

Noise-activated lights

Elderly audiences:

History appeals

Personal recollections on a famous event (where were you when...?) – Powerful before describing any event.