Voting systems under the dome : what benefit for education

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BIOGRAPHIES
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ABSTRACT
After one year using voting systems in the refurbished planetarium, Cité de l’espace will present the main results and knowledge in how voting system has enhanced, or not, the planetarium shows attractivity and visitors involvement. The paper will present the case study of a new educational show using storytelling and the voting system for strategic decisions by the students or for testing their knowledge and will report how this new tool has changed or not the relationship between the lecturer and the visitors.

INTRODUCTION
We have all seen the evolution of technology for the last years. Some of them can be useful for planetarium activities, such as voting systems.

There are many ways of using these systems.

Experiences show that students learn better if there are evaluations of their knowledge.

1/ First, we could use the voting box system for a very simple question :

**LIFE** Do you believe in life out of the Solar system ?

There is no good or bad answer, it is just an opinion. But to be useful in pedagogy, the vote must use the knowledge or sense of logic of the audience.

2/ For example : *(question / quiz)*

We are now under the sky that we will see tonight, at 11 o’clock, heading north.

**CONST** We can see some of the most famous constellations : the Big Dipper, the Small Dipper and Cassiopeia.
If we accelerate the time, we notice that every star moves around this one, which remains always at the same place.

What is its name? Please choose among 3 propositions, using the voting box on your right hand.

- The shepherd star?
- The polar star?
- The rock star?

You have 20 seconds to answer, and can change your mind until the end of the vote.

The good answer is the Polar star: it’s immobile because aligned with the rotation axis of the Earth, so the polar axis of the Earth. The shepherd star is not a star but the planet Venus.

By using this type of vote during a presentation, the audience becomes active. The playful approach is a way of keeping the public’s interest by interacting with him. The most important, if we look for an educational interest, is that the question must give the opportunity to the student to express his position. It must not be just a question of hazard, or just his opinion. This time, there is a good answer, the question mobilize knowledge.

The pilot mode is just for fun, for entertainment, leaving the control to the public.

Now you are flying above the rings of Saturn. Please press the buttons as indicated on the dome to control your direction.

As you notice, it is difficult for a group to go in one direction. It is more efficient with one pilot than with 300!... Anyway, it is funny, but the benefit for education is poor.

Let’s come back on Earth, heading South, this time.

With the Decision vote we will now try to give the hand to the audience, so that they do not only see a planetarium show, but decide on the subject. For example:

- Jupiter
- Saturn

This vote does not use knowledge or sense of logic, it is just a choice, so there is no pedagogic interest.

But it can be expanded to decide the content level, depending on the audience.

“What subject do you want to discover:

- The Moon phases?
- The seasons on Earth?
- The birth of stars?
- The fusion reactions inside the Sun?
- The Spectroscopy and detection of exoplanets?"

In this case, the voting system gives the opportunity to customize the show, or to adapt it to the audience: primary school, secondary school…

5/ The first system we saw, the “question vote” can bring something more. For example, we may ask a question at the beginning of the show, and ask the same question at the end, to see if the public has learned something during the presentation.

The best should be to ask the question a first time, then, later a second time, on the same subject, but by a different way. For example:

We give the good answer. But later in the show, we go to Venus:

And ask a new question: “Venus shows different phases.

Venus is:

- A planet?
- A star?

The difference between Venus and the Polar Star was discussed earlier, so twice, but by different ways, which is more efficient.

Here, at the Cité de l’espace, we made a choice slightly different for our next planetarium show. It is divided in 5 parts. At the end of each part, we ask a question which deals with it. We invite the children to talk together, debate the answer.

Now we can see the Moon, in front of us, the Earth, just above, and the Sun on the upper left.

Here is the question: “Without the light of the Sun, what would remain visible?

- Nothing
- The Sun
- The Earth
- The Moon
- The stars”

Here is a short version of 20”. In our show, we let 45 seconds to the audience to debate and share their points of view. If there are not enough good answers (less than 50%, or 70%), instead of giving the answer, we give a clue:

“What makes the light? What is illuminated?”
Then, we make the same vote a second time. During our tests, we noticed that there was more debate between the children after the clue: they use it to explain their choice to their friends. So in this case, the children use their knowledge, they debate and use logic.

Then, as most of the people better remember what they see than what they ear, we **play the answer**, launch a sequence that shows what would really happen.

**SUN OFF**

By visualizing the answer, the audience will easily understand, and remember it. The vote becomes more educational because it gives the opportunity to debate on the answer, and is followed by an animation that shows it.

But during our tests, we had a surprise. We thought that there will be more good answers at the second vote than during the first one, thanks to the clue. But it is not the case half of the time. Thanks to some animators who were among the children to listen to the reactions, we understood that the children were influenced by the color of the results. As every answer appears in red, even those who gave a good answer thought it was wrong, and changed it during the second vote. So the explanations made by the animator, the words he uses, are very important.

**CIEL NORD**

**IPS POLAR + ANIM REPONSE**

You remember the question about the Polar star? It would be helpful to complete it with an animation. This time, the vote launches a journey to Venus, and then another one which shows the rotation axis of the Earth pointing toward the Polar star.

We also could imagine to see Earth, Moon and Sun, and propose to the audience: “place the Moon so that we can see a full moon.”

6/ To summarize:

- Tests of knowledge can be useful
- It is better if it gives the opportunity to discuss and debate
- It is better if using knowledge and sense of logic
- It is possible to un-built the wrong representations of children, then rebuilt the knowledge
- It is useful to ask many questions on the same subject, under different ways.

We are just at the beginning of this voting system in our planetarium. Other ways to use it are probably to be discovered. So the next years will be very exciting for that.

Thank you for your attention.