“Science of Sport”
Exhibit Observation and Learning Design Analysis

Museum Observation Project
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Abstract

On February 8, 2002, The Tech Museum of Innovation in San Jose opened the “Science of Sport” temporary exhibit. The exhibit was originally developed by the Science Museum of London. Described as ”an interactive exhibit for the entire body”, its modest goals were to stimulate the body and mind. Being the Tech museum we assume its focus was the interface of technology and sports. As we observed children and adults engaged in the exhibits, it was clear that many were enjoying the ”body-on” experience. However, was the exhibit living up to its billing? Were the visitors “learning” science? Our study led us to the conclusion that the exhibit has failed in this goal. We present redesign recommendations that we believe would help the museum attain its stated goals.
Introduction

"What does it take to become a world class athlete? How has technology affected athletic training and equipment? The Tech’s newest temporary exhibit, Science of Sport, examines the influence that science and technology has on sporting, and encourages visitors of all ages to become part of the action. Test your skills on some of the most advanced, large scale, body-on interactive exhibits, from the traditionally popular, to the new wave of extreme sports. Explore the extraordinary physical demands athletes make on their bodies, and how natural skills are developed, perfected and maintained. Play virtual volley ball [sic], take a penalty kick and traverse a vertical surface on our rock wall. In this exhibit, you are truly the champion!"

Promotional material from the Tech Museum

The Tech’s “See What’s New for 2002!” flyer and colored postcard proclaim that the Science of Sport exhibit “examines the influence that science and technology has on sports…”, and of course invites the young visitors to try out their skills. The timing of this exhibit coincides with the Winter Olympics in Salt Lake City. In the never-ending marketing process of luring new and repeat visitors to a museum, we assume that the Tech believes that the Olympics will spark interest in visiting this temporary exhibit and the whole museum.

The Science of Sport exhibit at the Tech museum sets out to realize three laudable goals. We see the goals as holding equal importance. First, the museum wants the exhibit to be a participatory experience. Next, the exhibit must stimulate the mind as well as the body. Finally, as the promotional vision statement states, the impact of technology on sports training and equipment should be demonstrated.

The exhibit is in one large space that contains all the activities. Each activity has in its proximity a set of laminated three-ring binder type books that the participants could browse through. There are no television displays or interactive multimedia accompaniments. The center of attention and also the noisiest exhibit is the running track. Most exhibits present the participants with a numeric description or calculation of their efforts with no attempt to explain the meaning behind this. For example the running track includes a digital clock that tracks the time it takes participants to run a 12 meter length.

Methodology

The design of the study is that of a qualitative observational analysis. We spent one and one half hours on the exhibit floor on an early Friday afternoon, February 23, 2002. The exhibit was moderately attended. The later it got, the more groups of people, particularly school-aged children arrived. We three observers first spent time wandering around all the sports exhibits in order to get a good idea about the grand
scheme and how the different part of the exhibit contributed to the above stated goals.

Next each observer monitored one section of the exhibit, for example the running track. Here we observed people interacting with the exhibits, each other and the museum staff supervising the exhibit (particularly the physical activities). For approximately 15 minutes, we each shadowed a specific visitor group to study how they progressed through the space, how much time they spent at various stations and by eavesdropping onto their conversations, whether we could determine that any learning was taking place as revealed in their discourse. Then we attempted to qualitatively and semi-quantitatively rate the level of participation, perceived learning, and instances where technology was made explicit. The observers reconvened and compared notes, after which any points of contention were re-examined by the group and discrepancies were resolved.

During the observation period, we also took digital photos and occasionally interacted with children who were engaged with exhibits. Additionally, we broached a few questions about visitors and learning to a museum volunteer.

**General Observations**

All of the exhibits provide an activity for the visitor, with accompanying text that described some aspects of the exhibit. However, we noticed that the children were rarely (one child in 60 minutes) seen reading ANY of the materials. Likewise, we did not observe adults reading the materials to children. We did observe many adults reading the materials to themselves.

Being a "Science" exhibit, we expected to see more explicit mention of the science principles involved in the activities. There was in fact very little explicit mention of scientific principles. Furthermore, though the flyer promised that the exhibit examines the influence of technology on sports, the technology in the exhibit was hidden, used for measurement and feedback.

Because this is a temporary exhibit, the physical space at the Tech cannot be customized to a large degree to accommodate it. This shortcoming impacts the learning experience. For example, the lighting of the exhibit was inconsistent. One corner of the exhibit that contains a really highly engaging physical exhibit involving quick reflexes and an accompanying stand with companion materials is so dark most people probably find it by accident.

We observed that visitors spend an average of 10-15 minutes in the Science of Sport exhibit, which is typical for museum exhibits. And, many are attracted first to the running track, which is located at the entry point to the exhibit, but then wander through the space. The exhibit is laid out non-sequentially for open-ended experiences and traveling.
One of the more popular exhibits is a sprinting track, where two runners run alongside the flashing image of a famous track star. Their times are displayed overhead after each trial. That is the extent of the activity.

Next to the track, along the railing, are four flip-books (multi-page laminated descriptive information) that cover a range of topics such as the use of starting blocks, and drug abuse with colorful easily accessed graphic layouts.

Conspicuously absent is any discussion about the science of running, or the body mechanics or training needed to run quickly. Not surprisingly, no children were seen reading the nicely bound information.

Even the starting blocks in the exhibit’s track were not being used, as “no one knows how to use them and they just keep falling over, so we just took them out...you can use them if you really want to...” according to the staff people. As a result, the opportunity to compare times with and without starting blocks is not apparent to the children.
Standing Jump

This exhibit is also very popular among the young visitors, as many are attracted to the challenge. They were observed trying over and over to better their results. The instructions require that you first reach up and activate the highest button you can reach without jumping, then you jump up and activate a higher button. The exhibit calculates the height of your jump.

The exhibit does not, however, describe any scientific or physiological principles that would assist you in your understanding of how jumping works or how athletes manage to jump so high.

One young visitor (age 8?) was observed exclaiming to his mom that she jumped higher than he did “...because you’re taller than me”. Clearly he missed the notion that the exhibit was measuring a change in distance, independent of starting height. His mom did not respond to his misconception.
Despite the title of this exhibit, the primary point being made is that divers can control the speed of their rotation by tucking or spreading out. The two wooden figure "dolls" in the exhibit allow the user to feel the difference in rotational inertia of an extended doll versus a doll that is in a tucked position. The extended doll is harder to turn.

One wonders, however, if the children make the jump from “hard to turn” to “they spin slower”. There is also no scientific explanation of the phenomenon, and no animation or video to show the principle in action, as it applies to divers.

The exhibit designers should be credited, however, for the use of two clever features. The dolls can only be twisted by two fingers due to the constraining collar surrounding the rotating pins that control the dolls. This prevents the visitor from applying a different amount of force to one doll or the other.

Another clever feature is that the explanation, albeit non-scientific, is positioned in front of the children, raising the likelihood that they would actually read about the display.

We propose that an animation or even a graphic diagram that shows the movement in progression would aid the learning.
Judge the Distance

This exhibit shows how you need two eyes to judge distance by giving the user a chance to align a center rod with the two adjacent rods, using one eye or the stereoscopic abilities of two eyes.

This boy had inquiries of his own, perhaps “how do the controls work?” With one hand on the control arm, he peered around the machine hoping to see the middle bar moving. Unfortunately, his size and the exhibit’s design did not accommodate his questions.
Conclusions

Motivation and participation should be goals of any interactive museum exhibit. By observing random groups of children and adults as they track through the exhibit, it is clear that the children are actively engaged in the physical aspects of the exhibit. The exhibit’s objectives of motivation and participation are successfully met. In this sense the exhibit is -no different to a sports arena that had a variety of sports.

With respect to learning we believe that the Sport of Science exhibit fails. The learning experience and learning design intention of the exhibits are not at all obvious. The exhibits do not motivate the participants to go to the informational sources. In many cases they are not linked physically or visually to assist the learner. These feel separate to the activities, not at all connected except for the physical proximity. Moreover when there is self-motivation by the participants to access the large laminated binder pages with commentary, there is no connection between the information offered and the activities. For example, with the running track, the activity measures ‘time’ but the interpretive material talks about ‘speed’. They are of course related, but that relationship is not made to the learner. We postulate that the exhibit designer and content developer for this exhibit did not work effectively as a team.

The third aspect studied is the explicit demonstration of technology in sports. In this area the museum also failed. There are numerous opportunities to demonstrate the important part that technology plays in sports that are woefully missed. For example, adjacent to the cylindrical climbing wall structure there are interpretive graphics panels that discuss the latest innovations in clothing fabrics and equipment materials that aid professional climbers in dealing with the natural elements and their physical endeavors. Samples of these materials that could be touched or at least seen up close, would in fact link the concept to the physical activity for the exhibit visitor. And it is technological and engineering advances in breathable fabrics, shoes, rope materials, etc. that enable these product developments to occur. There are popular stations within the exhibit that involve an activity of matching the shoe or helmet or eyewear with its particular sport. Unfortunately, they seem more like a commercial endorsement for Nike shoes or Oakley sunglasses than an educational, experiential exhibit.

The space is utilized well in that it allows the audience to observe the participation of others. However we feel the peripheral, less noisy exhibits deserve more attention. The exhibit also disappoints in its lack of multimedia presentations.

It seems obvious that adopting an exhibit without modification that originally met its objectives in London to meet different objectives in the Tech shows poor design effort. In the following section we will outline a few ideas that would allow the exhibit to meet all its objectives.
Recommendations for redesign

Areas for improvement are outlined below. Presupposing limited resources of time and money, the modest recommendations are easily implemented. These recommendations fall into three categories:

- Provide connections between the displays and the training of actual athletes
- Incorporate additional measurement technologies and scientific discussions regarding measurement
- Encourage science inquiry and dialog

CONNECTIONS  With respect to learning about sports, one recommendation is to provide some scaffolding in the form of simple questions or video displays to model athletes’ learning and training. For example, the ”center of rotation” display could be enhanced with a video of actual divers in slow motion. Additional video footage of divers in training would help the exhibit visitors connect the model to the actual movements and training of divers.

SCIENTIFIC MEASUREMENT AND DISCOURSE  Because technology is a centerpiece of The Tech Museum, it would be quite appropriate to highlight the role of technology in each display. For example, for The Sprint, an explanation of how time was calculated and measured would be very informative. This could be further enhanced by helping the visitors explore how they could use time and distance to calculate velocity and perhaps the energy expended.

SCIENTIFIC INQUIRY AND DISCOURSE  Leveraging the excitement and competitive nature of the participants could provide a springboard for scientific inquiry. Simple prompts, such as, ”Do you want to improve your speed? Here are how your muscles work... Here are tips from athletes... Try it again, only this time...” could be effective at improving the learning that takes place within this interactive exhibit.

In conclusion, while the Science of Sport exhibit contains some engaging physical and interactive activities, our observational analysis finds it to be deficient in the area of learning.