A Taxonomy for Data Capture in VR and AR

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JCA Solutions
A Taxonomy for Data Capture in VR and AR

By Dottie Lindsey
“I'd rather talk about dogs than about me.”

–Donald McCaig
All the shorthand

• VR - Virtual Reality
• AR - Augmented Reality
• xAPI - Experience Application Programming Interface
Overview

• Why does any of this matter?
• What is xAPI?
• Why does xAPI matter for Virtual and Augmented Reality?
• What does a taxonomy for xAPI look like?
• How is an xAPI taxonomy utilized?
• What comes next?
According to Brandon Hall Group’s research:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
<th>Cost</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing an eLearning course</td>
<td>106 hours</td>
<td>$184/hour</td>
<td>More than $2,000/program</td>
</tr>
<tr>
<td>Produce a simulation</td>
<td>96 hours</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Compliance training methods used by organizations

Image courtesy of Brandon Hall Group’s 2017 Compliance Training Survey

<table>
<thead>
<tr>
<th>Method</th>
<th>Large</th>
<th>Mid-Size</th>
<th>Small</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simulations</td>
<td>10%</td>
<td>17%</td>
<td>12%</td>
<td>27%</td>
</tr>
<tr>
<td>Collaborative</td>
<td>17%</td>
<td>17%</td>
<td>12%</td>
<td>22%</td>
</tr>
<tr>
<td>Games</td>
<td>11%</td>
<td>10%</td>
<td>7%</td>
<td>18%</td>
</tr>
<tr>
<td>Podcasts</td>
<td>10%</td>
<td>12%</td>
<td>2%</td>
<td>18%</td>
</tr>
<tr>
<td>Augmented Reality</td>
<td>0%</td>
<td>7%</td>
<td>7%</td>
<td>16%</td>
</tr>
<tr>
<td>Virtual Reality</td>
<td>8%</td>
<td>6%</td>
<td>2%</td>
<td>10%</td>
</tr>
</tbody>
</table>
What is xAPI?

- A standard designed to be simple and flexible
- Consists of statements
- Statements are required to have an actor, verb, and object
- Utilizes profiles for definitions
A student actor passed the "How to pet a dog" training.
Data Flow in xAPI
What Is A Taxonomy?

The outline before the blueprint
Why do we need one?

• Clarifies a project specification
• Instructs the design of a project
• Helps identify existing xAPI profiles that may be of use
• Ensures that the need for a new profile has been vetted
• Enables the creation of a new profile where appropriate
• Gives an overview of what reporting can be done
The Beginning of Our Taxonomy
What are some questions you should be asking?

- What are the specific goals of your training?
- Is the training new or is it a conversion?
- What data do you need to pull now versus in the future?
- What are your edge cases?
- Why are you using AR/VR?
- What equipment do you need?
- What does your taxonomy look like?
- How much of this data can be captured by xAPI statements?
- Can we use existing xAPI profiles?
Dog Interaction Training Example

Ask, Greet, Pet
What data do we need?

- Whether or not the student has successfully completed tasks in the correct order
- How nervous the student was
- Which dogs the student asks to pet
- Which dogs the student pets
- Which steps are missed most often
- Where the student is looking
What data might we need in the future?

- How long the student spends petting a dog
- What types of dogs the student chooses not to greet
- Whether or not the student recognizes aggressive behavior
- Whether or not the student recognizes nervous behavior
What are some edge cases?

- A student never approaches a single dog
- A student spends way too long petting a dog
- A student never gets to the step that marks the training as complete
- A student does not figure out the correct hand gesture
Why use AR or VR?
What equipment do we need?

• Laptop
• Headset
• Motion Sensors
• Controllers
• Heart rate monitor
Our new taxonomy

Environment
- Heart Rate Monitor
- Camera View
- Controllers
- Audio
- Laptop
- Headset
- Motion Sensors
- Physical Location

Measurables
- Visual Location
- Time Taken
- Motion
- Biometrics
- Eye Focus
- Task Completion
- Score

Wastebin
- Voice Recognition
- Test Mode
- Incomplete Tasks
- Powered Glove
- Documentation

Participants
- Testers
- Students
- Administrator
- Instructor
- JCA SOLUTIONS
Filter student data through the taxonomy

- Student
- Uses Controllers
- Greets A Dog
- Score
- Heart Rate Monitor
- Biometrics

- Environment
  - Heart Rate Monitor
  - Camera View
  - Controllers
  - Audio
  - Laptop
  - Headset
  - Motion Sensors
  - Physical Location

- Measurables
  - Visual Location
  - Time Taken
  - Motion
  - Biometrics
  - Eye Focus
  - Task Completion
  - Score

- Participants
  - Testers
  - Students
  - Administrator
  - Instructor
How much of this data can be captured by xAPI?

The flexibility of xAPI allows almost all data to be captured. Restrictions come from data points that are hard to measure and funding.
Can we use existing xAPI profiles?

Yes!

<table>
<thead>
<tr>
<th>Verb</th>
<th>SCORM</th>
<th>ADL Vocabulary</th>
<th>Serious Games</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Lesson</td>
<td>Simulation</td>
<td>Non-Player-Character</td>
</tr>
</tbody>
</table>
A student actor passed the “How to pet a dog” training
A student gained access to a dog (NPC) and the student’s resulting heart rate was measured.

Example xAPI Statement

```
{
    "actor": {
        "objectType": "Agent",
        "name": "Student",
        "mbox": "mailto:student@jcasolutions.com"
    },
    "verb": {
        "id": "https://w3id.org/xapi/seriousgames/verbs/accessed",
        "display": {
            "en-US": "accessed"
        }
    },
    "object": {
        "id": "http://myexample.com/training/HowToPetADog/NPC/Dog1",
        "definition": {
            "type": "https://w3id.org/xapi/seriousgames/activity-types/non-player-character"
        }
    },
    "result": {
        "extensions": {
            "http://myexample.com/training/HowToPetADog/ext/heart-rate/value": 110
        }
    }
}
```
Summary

Virtual and augmented reality are growing fields in training. As a standard, xAPI helps capture data without restrictions while avoiding miscommunication. Creating a taxonomy allows us to identify which data points are important, design effective reporting, and decide which, if any, xAPI profiles can be implemented.
Resources

- xAPI Vocabulary & Profile Publishing Server  
  http://xapi.vocab.pub/

- Brandon Hall Group  
  http://www.brandonhall.com/

- xAPI-Spec  
  https://github.com/adlnet/xAPI-Spec

- The Impact and Potential of Virtual Reality Training in High-Consequence Industries  

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