Designing a Job Aid to Prepare an On-Location Immersive Virtual Expedition (on-LIVE)

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Designing a Job Aid to Prepare an On-Location Immersive Virtual Expedition (on-LIVE)

Sandy Powell

Design Project Review

Summer 2017

IP&T 687R
Project Background

Brigham Young University (BYU) Division of Continuing Education (DCE) completed the proof-of-concept phase of an innovation proposal to create On-Location Immersive Virtual Expeditions (on-LIVE) for the BYU Online Geology 101 course. On-LIVE uses 360-degree video to give students a front-row experience at locations of educational interest. Using Articulate Storyline, this 360-degree view allows viewers to look in all directions and interact with specific parts of the location. The Geology 101 course for BYU Online is a highly visual course using seven geographic regions to show the formation of the Earth. The format of on-LIVE meets Dr Ron Harris’s goal for students to learn to think as scientists, exploring and experimenting as they learn to find clues, build and verify or discard hypotheses, and follow facts to reach defensible conclusions.

The on-LIVE proof-of-concept takes place at Rock Canyon, Utah, and begins with a Google Earth video to orient participants to where in the world they are. Then, a 360-degree drone video brings them in closer, and an on-ground 360-degree video with the professor introduces the location and presents important areas to explore. When the instructor video ends, a panorama of the location is displayed and includes clickable interactions to provide deeper understanding and more information (see Figure 1). The interaction instructs students to record observations in a paper notebook, drawing and coloring a stratigraphic column showing the layers of almost one billion years of sedimentary history found in Rock Canyon, as geologists in the field would. Through the interactive activities, students follow the scientific process of asking questions, experimenting, recording data, interpreting the data, and making conclusions. When participants are ready, they take a location quiz which tests understanding of essential concepts, with
successful completion bringing them to another on-ground 360-degree video where the professor explains critical concepts they should have learned and encourages further exploration at other sites which are available both sequentially and from a map of the canyon.

*Figure 1. Location 3 of Rock Canyon Proof of Concept for on-LIVE*

For her culminating master’s project, Melissa Burton created the first three of ten sites for the on-LIVE based in Rock Canyon, Utah County, Utah, for the proof-of-concept interaction using Articulate Storyline. The current project used the completion of the remaining Rock Canyon locations to create a job aid for designers and course authors to use when creating similar interactions for other courses.
Project Description

As the proof-of-concept phase was wrapping up, further implementation of on-LIVE in other courses required an easy and cost-effective way for designers and authors to determine when on-LIVE is appropriate for a course and to create similar interactives that meet course objectives. Multiple instructional designers for BYU Continuing Education have expressed interest in using on-LIVE in future courses. Language courses could take students on a trip through a foreign country, religion courses could allow students to visit sites of religious significance, history courses might immerse students in critical battles, construction management will walk students through buildings at various stages of completion, landscape design may provide a virtual walk-through of various ornamental gardens. The possibilities are limited only by the imagination of the authors and designers.

During the original meeting proposing on-LIVE to the deans of Continuing Education, one major selling point, and a point which Associate Dean John Taylor came back to repeatedly in the discussion, was the plan to create a template for future use along with instructions for designers to effectively use that template. The ability to re-use substantial portions of the original interaction was critical to the success of the proof-of-concept of this technology innovation.

The completed Geology 101 on-LIVE will be shared with BYU faculty as part of the BYU Online Open House in conjunction with the 2018 University Conference. Faculty will be encouraged to participate in the virtual expedition, and those interested in including a similar interaction in an online course will walk through the Decision Tree with a designer. If the outcome is favorable for including an on-LIVE in the course, the appropriate instructional designer will be provided with the complete job aid.
Front-end Analysis

Because on-LIVE will not be included in all courses and the timing of first use will vary by designer, a training solution is not appropriate. Through discussions with several designers for BYU DCE, it was determined that a job aid document with step-by-step instructions and videos would be the preferred solution.

Based on Associate Dean Taylor’s request that on-LIVE be reusable and the designer’s desire for an on-demand guide, this project created a digital job aid document for BYU DCE. Instructional designers over both high school and university courses will access the document when considering the addition of on-LIVE for a course. Designers will use the job aid to help them easily step through the process of using the Articulate Storyline template to create an appropriate on-LIVE based on course objectives.

The creation of the template and job aid required an analysis of the needed steps, creation of images and screen capture videos, development of each part of the job aid, user experience (UX) testing of each component, and revisions based on the results of the UX testing.

Constraints

This project faced several constraints, including the time frame for creating the project, the requirement that the solution be a job aid rather than training, a request to follow a format similar to a previously created instructions for embedding content created with Articulate Storyline into the Canvas learning management system (LMS) which will ensure the product is usable by DCE instructional designers, and the need for approval by the media team of portions of the project that relate to working with that team.
Dependent on successful completion of the first on-LIVE project, training videos could not be completed without a template, and the template could not be completed without a successfully working on-LIVE. The first on-LIVE was completed in April 2018 and was used as a final project for BYU Online Geology 101 Winter semester 2018. Some parts of the job aid were completed prior to troubleshooting and final approval of the on-LIVE, but many parts were delayed due to the complexity of the on-LIVE project.

As discussed previously, a training solution would not meet the needs of the DCE instructional designers, so a job aid was chosen. Instructions I created previously were used as a template for portions of this project, based on recommendations from other designers and usability requirements for the completed job aid.

Specific portions of the project required approval from the media team, which required collaboration with that team and input was sought throughout the preparation of those sections.

The constraints of time, type of solution, and media team input strengthened the final product and ensured that the job aid will be usable by DCE instructional designers creating an on-LIVE for future courses.

Learner Characteristics

Experienced instructional designers working for BYU DCE will be the primary users of the job aid created for this project. University professors and other subject matter experts (SMEs) who are course authors, and BYU students working as instructional design assistants (IDAs) will be secondary users.

Instructional designers for BYU DCE have between 3 and 18 years experience as designers, and are responsible for specific portfolios of courses. Currently there are three main design
teams, the high school team, the university Independent Study team, and the university BYU Online team. The high school team of eight designers is responsible for all high school courses which are delivered as both individual independent study courses and as part of a suite of courses available to educational institutions as a package of online content. The university Independent Study team has four designers who are responsible for over 200 courses in all content areas which are available to students worldwide. The university BYU Online team has a managing designer and four experienced designers who work with 60+ courses delivered on each semester to BYU matriculated students. These designers will use the Decision Tree portion of the job aid to determine if an on-LIVE is appropriate and feasible for a new course or one in the revision process. When an on-LIVE is selected by the author and designer and approved by the DCE Product Team, the rest of the job aid will be used to streamline the design and production of an on-LIVE for the course.

Authors work with individual instructional designers to outline course structure, design student activities, and provide content for specific courses. Authors for university courses are professors assigned by department chairs to create a specific course. The authors will work through the Decision Tree with the designer to determine feasibility of creating an on-LIVE for the course. When an on-LIVE is approved, designers will work through the job aid, collaborating with the authors as needed.

Instructional design assistants (IDAs) are competent BYU students hired by DCE and trained in HTML, Articulate Storyline, and the learning management system. When an on-LIVE is approved, IDAs, under the direction of instructional designers, will use the job aid to prepare the
on-LIVE. It is anticipated that IDAs will work most closely with the Working in Articulate Storyline portion of the job aid.

Throughout the process of creating a new on-LIVE, the instructional designer will delegate portions of the job aid to the author and IDAs as appropriate. The author will have final say about the content of the on-LIVE, and the designer will have the ultimate responsibility for the quality of the on-LIVE.

**Current Resources and Training**

Since on-LIVE is a new option for courses created by BYU DCE, there is no current training to create an on-LIVE. Designers and IDAs have access to training in Articulate Storyline, and prior to beginning work on a new on-LIVE it is expected that instructional designers and IDAs will become familiar with Articulate Storyline basic features. The media team includes full time and student employees who have been trained in the Adobe Suite of products, including Premiere Pro, Illustrator, and Photoshop.

The job aid is designed with the assumption that users will have basic familiarity with Articulate Storyline and the appropriate Adobe Suite products. No training on the use of these software products is included beyond the specific uses related to creating an on-LIVE.

**Competing Products**

Since on-LIVE is a new addition to the instructional design toolbox for DCE, there is no competing product for this project. At present there is no training nor job aid available to help designers implement on-LIVE in future courses.
The competitive landscape for the on-LIVE product includes many different modes of providing content to online students, however, considering amount of interactivity and effectiveness in transfer of content knowledge to the learner, on-LIVE is significantly more impactful than most other options, except virtual reality (see Figure 2). Production costs for virtual reality, lack of DCE personnel trained to create effective virtual reality experiences, and the prohibitive cost of hardware required to run virtual reality experiences for individual online students, makes on-LIVE a better option for DCE at the present time.

![Figure 2. Competitive Landscape for on-LIVE](image)

**Budget and Timeline**

Funding for this project came from BYU DCE and the student completing the project. Materials, media, and equipment were provided by DCE and labor was provided by both the division and myself (see Table 1). The original budget was maintained even though the project was delayed since subscriptions to Articulate 360 and Brightcove which were extended would have been extended regardless of progress on this project, and the total labor costs did not
change. The project was initially projected to be completed in August of 2017, however, due to delays in production of the original on-LIVE for Geology 101, the project was completed a year later, in August of 2018 (see Table 2).

Table 1 - Budget

<table>
<thead>
<tr>
<th>Item Required</th>
<th>Cost</th>
<th>Funding Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articulate 360 Subscription</td>
<td>$550/yr - paid for</td>
<td>BYU DCE</td>
</tr>
<tr>
<td>Videos and Images</td>
<td>$3000 - paid for</td>
<td>BYU DCE</td>
</tr>
<tr>
<td>Brightcove Subscription (to store videos)</td>
<td>$499/mo - paid for</td>
<td>BYU DCE</td>
</tr>
<tr>
<td>Student Design Time</td>
<td>172 hr @ $35/hr</td>
<td>BYU DCE/self</td>
</tr>
<tr>
<td>Designer Time for UX Testing</td>
<td>40 hr @ $35/hr</td>
<td>BYU DCE</td>
</tr>
</tbody>
</table>

The majority of this project was funded by BYU DCE through the creation of the original on-LIVE for Geology 101, with a portion of design time funded by the student completing the project. Time available for working with other instructional designers as well as the media team was limited due to both availability and budgeted time which meant that the user experience testing and collaboration sessions with the media team needed to be well planned and streamlined.

Table 2 - Timeline

<table>
<thead>
<tr>
<th>Proposed Schedule</th>
<th>Actual Schedule</th>
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<tbody>
<tr>
<td>Week</td>
<td>Date</td>
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<tr>
<td>1</td>
<td>June 26-30</td>
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<td>Week</td>
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<tr>
<td>2</td>
<td>July 3-7</td>
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<td>3</td>
<td>July 10-14</td>
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<td>4</td>
<td>July 17-21</td>
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<td>5</td>
<td>July 24-28</td>
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<tr>
<td>6</td>
<td>July 31-Aug 4</td>
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</tbody>
</table>
Completion of this project was delayed due to technical issues in completing the original on-LIVE for Geology 101. Since the template, preparation section, and screen capture videos had to be created after a working version of on-LIVE was completed, these portions of the job aid were delayed. The complete on-LIVE was finished in late April 2018. Due to other pressing priorities, continued work on the job aid was not resumed until mid-July 2018. The job aid was completed in August 2018.

**Theory**

Educational virtual experiences at the university level have been the subject of research in many different content areas, including chemistry (Merchant, et al., 2012, Merchant, et al., 2013), materials science (Liou, Bhagat, & Chang, 2016), political science (Park, 2012), geography (Stainfield, Fisher, Ford, & Solem, 2000, Treves, Viterbo, & Haklay, 2015), Zoology (Spicer & Stratford, 2001), medicine (Keskitalo, 2012, Huang, Liaw, & Lai, 2016), creativity (Lau & Lee, 2015, Kwok, Cheng, Ip, & Kong, 2011), and learning sciences (Bailenson, et al. 2008). Benefits of experiences such as virtual field trips include lower costs and the ability of more students to participate (Lei, 2015). Students with limited funds and with disabilities can successfully participate in virtual field trips (Stainfield, et al., 2000). Virtual experiences allow students to experience locations that would be unsafe to visit in person (Spicer & Stratford, 2001,
This project draws upon these benefits to make available to students of BYU Independent Study and BYU Online courses innovative virtual experiences that also ameliorate many of the drawbacks of previous activities.

Professors involved in the Meso-american Network of Biotic Resources (REDMESO), a research network of twenty-five public universities in eight Meso-american nations, use Fieldtrip to share research and provide virtual experiences for students. One weakness of Fieldtrip is the implementation by professors of virtual experiences for students without sufficient regard for course learning outcomes (Patron, Ellis, & Barrett, 2009). In contrast, by implementing this project’s job aid, which provides specific steps for implementing appropriate pedagogy and is designed to ensure student learning of course outcomes, the impact of on-LIVE will be enhanced.

Xu and Ke (2016) found that usability and consideration of different users is essential when planning educational virtual learning environments. By designing a template that balances system directions and freedom to explore, on-LIVE meets the needs of both active explorers and students who prefer more guidance (Xu & Ke, 2016). The job aid will help ensure that the features built into the template are preserved in all iterations of on-LIVE in BYU courses.

On-LIVE uses 360-degree videos which allow students to look in all directions and see clearly. Kolivras, Leubbering, & Resler (2012) evaluated the use of webcams as a replacement or supplement to live field trips. They found the limited static view and low detail of the webcam prevented students from feeling immersed in the experience. Although the landscape interpretation was often statistically equivalent between virtual and live experiences, the
in-person experience was more satisfying to the learner when compared to webcams. In contrast, on-LIVE uses high resolution 360-degree images along with built-in interactions to provide a closer look at specific, educationally critical information. The job aid ensures designers and authors plan for the capture of images essential to student understanding of course objectives.

Bailensen, et al. (2008) found that students in a virtual learning environment perform better when they are in a preferred location near the instructor, and when they perceive that learning is taking place in a one-on-one tutoring situation. On-LIVE gives every student a virtual front-and-center location, where they learn one-on-one from the instructor on location.

By highlighting the benefits of virtual interactions and working to ameliorate drawbacks, on-LIVE is designed with student learning in mind. The job aid provides assurance to administrators that there will be a consistent and research-based implementation of on-LIVE in future courses.

**Design**

The product is a set of documents (See Appendix A) including a decision tree to determine if an on-LIVE is valuable for a course, step-by-step instructions for designing the interaction, planning and preparing for the 360-degree video shoot, participating in the video shoot, preparing to create the interaction, working with the media team for creating the 360-degree videos and panoramas, and working in Articulate Storyline to build the interactions. Design is based on a similar document created for the transition to Canvas, a new learning management system, which has been well received by designers and is used frequently. Another product is the
Articulate Storyline skeleton template to be used as the basis for building on-LIVE for future courses.

**Design Model**

The “Preparing an On-Location Immersive Virtual Expedition (on-LIVE)” job aid was created based on Wiggin’s Backwards Design (1998). The success criteria requires that designers are able to use this job aid to guide development of a course-appropriate on-LIVE. The Backwards Design model was chosen for consistency in meeting stated course goals. By designing with the end goal of successful implementation of on-LIVE by different designers in a variety of courses, the decision tree and step-by-step instructions were created, tested, and refined to provide consistent results.

**Design Specifications**

The format of the job aid follows the outline below, which was designed based on the processes used to create the Geology 101 on-LIVE.

**Job Aid Sections.**

*Decision Tree.* Helps designers and authors determine if on-LIVE is appropriate for the course. Budget considerations are included in the decision tree.

*Designing the Interaction.* Helps designers and authors determine the course objective to be met with on-LIVE and identifies activities within the interaction for students to complete to meet the objective.

*Planning and Preparation for the 360-degree Shoot Checklist.* Helps ensure that all needed images and videos are listed and both author and designer are ready for the shoot.
**Video Shoot Checklist.** Helps ensure a successful video shoot that captures all needed images.

**Working with Media Team Checklist.** Gives tips, suggestions, and requirements for making sure the media team has everything needed to successfully complete media components of the product.

**Preparing to Create the Interaction.** Steps designer through the preparation process from selecting appropriate icons to creating the panoramic images. This also includes creating transcripts from the videos, determining content to be included in interactions, gathering quiz questions, and finding or creating all needed images.

**Working in Articulate Storyline.** Steps the designer through the process of adding content to the template, copying template items, creating the on-LIVE, testing, and revising.

This format ensures that all on-LIVE interactions created using this job aid will be complete, pedagogically sound, and well-designed.

**Development**

For each piece of the job aid, I first sketched out a rough draft of the component, then transferred it to digital format in Microsoft Word or Presentation. After reviewing and revising, I printed a copy for review by fellow instructional designers. Based on feedback received, I modified the document.

For example, the decision tree started with a brainstorm list, was modified to include branches and options, became a digital document and ended with a final version (see Figure 3). Between the first digital draft and the final draft, I completed user experience testing of the decision tree with two instructional designers for BYU DCE, one is a female with responsibility
for university life science courses, the other a male with responsibility for high school math and science courses. The high school designer helped me recognize that budget considerations for high school courses are different from university courses, so the course enrollment projection numbers were changed to have a two-part explanation. Based on feedback from the university designer, the decision tree was revised to begin at the upper left corner instead of in the top middle, and “Start Here” was added. Full size images of the progression are found in Appendix C, and complete project documents are available at goo.gl/6aCF78.

Once all pieces of the job aid were complete, an IDA who had not seen any part of the job aid previously, but had seen the Geology on-LIVE, looked at all of the parts together and gave feedback for improvement. Based on his feedback, an introductory page was created to provide instructions for using the job aid documents.

**Evaluation**

During development of the job aid, user experience (UX) testing was conducted using interested designers from BYU DCE. At the conclusion of the project, the job aid was evaluated for clarity and ease of use by three designers and two instructional design assistants (IDAs). All
three instructional designers are female, with 17, 12, and three years experience as designers at BYU. All three designers have worked with both high school and university courses. The designer with 12 years experience has helped with user testing of the project throughout the process, but the other two designers had not seen any portion of the job aid previously. Both of the IDAs are male, one has 3 months experience and the other has over 2 years experience working for BYU Academic Services in course quality control and as an IDA. Neither IDA had previous experience with the job aid.

The job aid evaluation was a three-item questionnaire with a seven-point Likert scale (see Appendix B). The three items rated clarity, ease of use, and completeness of the job aid. A successful project needed to receive an average rating of 6 or better on each of the three items, with no ratings falling below 4. As shown in Table 3, average ratings were 6.2, 6.4, and 7, with no single rating below a 5.

**Table 3 - Evaluation Scores**

<table>
<thead>
<tr>
<th>Question</th>
<th>Designer 1</th>
<th>Designer 2</th>
<th>Designer 3</th>
<th>IDA 1</th>
<th>IDA 2</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td>7</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6.2</td>
</tr>
<tr>
<td>Easy to use</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>7</td>
<td>6.4</td>
</tr>
<tr>
<td>Complete</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

Evaluators were also encouraged to provide specific comments and suggestions for improvement. One designer provided very positive feedback, indicated that the separate parts of the job aid would be very helpful, and commented, “The location shoot checklist will be really valuable for designers without a lot of experience working with the media team (and a relief to the media-team members).” The other designers expressed that the job aid will be helpful and
gave suggestions for improvement. Comments from the newest IDA were also positive, indicating that the inclusion of the introduction was helpful. The other IDA suggested changes in color for the panorama instructions to improve contrast. The color change suggestion was implemented for the final product. Complete evaluation comments are included in Appendix B.

The evaluation plan required an average score of 6 or greater on all three items, with no scores less than 4. As the averages were all greater than 6.2, and the lowest score was 5, the project exceeds the evaluation requirement.

**Conclusion**

The completed job aid is available for use by BYU DCE instructional designers. The decision tree will be used by designers and authors interested in implementing an on-LIVE to determine whether an on-LIVE is feasible for a course. When future courses meet the requirements for including an on-LIVE, as outlined in the Decision Tree, the job aid will serve as a resource for the design and development of the interaction. The product has not yet been used in the creation of a second on-LIVE due to the lengthy approval process, which includes budget approval, but through the evaluation process, the job aid is expected to be highly useful to designers in the future.
Appendix A – Completed Product

Creating a Virtual Expedition

Introduction
When considering the inclusion of a virtual expedition in a course, these documents will help the designer, author, and design team

- decide if a virtual expedition is appropriate for the course,
- design the interaction that will serve as the virtual expedition,
- work with the media team to prepare and create the interaction,
- prepare all needed assets, and
- work in Articulate Storyline to complete the interaction.

How to use these documents

<table>
<thead>
<tr>
<th>Document</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>01_DecisionTree.pdf</td>
<td>Follow the decision tree from “Start Here” to determine whether a virtual expedition is appropriate for the course.</td>
</tr>
<tr>
<td>02_Designing the Interaction.docx</td>
<td>Edit throughout the design process to ensure a consistent experience for students with all virtual expeditions created.</td>
</tr>
<tr>
<td>03_Location Shoot Checklists.docx</td>
<td>Plan for and efficiently carry out the collection of video assets for the interaction.</td>
</tr>
<tr>
<td>04_Working with Media Team Checklist.docx</td>
<td>Ensure critical media assets for the interaction are prepared.</td>
</tr>
<tr>
<td>05_Prepaging to Create the Interaction.docx</td>
<td>Prepare for an efficient creation of the interaction.</td>
</tr>
<tr>
<td>06_Working in Articulate Storyline.docx</td>
<td>Put the pieces together using Articulate Storyline to complete the interaction.</td>
</tr>
</tbody>
</table>
Virtual Expedition Decision Tree

Start Here

Does the course contain at least one visually rich\(^1\) location\(^2\)?

Yes

Is the author technologically prepared\(^3\) to create an interaction?

Yes

Is expected course enrollment sufficient\(^4\) to justify the expense?

Yes

How long before the course goes live?

Less than 1 semester

Discuss capacity and design options with the media team.

More than 1 semester

Less than 1 semester

Are both the author and designer committed to adding the interaction to the course after it is live?

Yes

Consider other ways to present the information.

1 visually rich = content relevant items to look at in multiple directions.

2 location = physical place that can be photographed or filmed.

3 technologically prepared =
   - motivated to use technology in innovative ways in the course.
   - comfortable on camera.
   - tolerant of technical issues.
   - OK with imperfection.
   - willing to devote the needed time to this project (30+ hours).

4 sufficient enrollment = 100+ students/year for university courses, 250+ students/year for high school courses.
Designing the Interaction

Note: This is for the preliminary design of the interaction. This document is meant to be edited
throughout the design process.

Overall Design

Objectives
What should students know and be able to do when finished with this activity? Consider how this
activity helps meet course learning outcomes.

List objectives:

1.
2.
3.

Assessments
How will each of these objectives be assessed? (Multiple choice, drag and drop, notebook or journal,
discussion board, other)

List assessment methods for each objective:

1.
2.
3.

Location Considerations
How many distinct areas or stops will be needed to prepare students to meet the objectives?

Which equipment will be used? Discuss the following options with the media team. Highlight needed
equipment.

- Drone—Is a higher perspective valuable?
  - With 360° video—Students need to look in multiple directions.
  - Without 360° video—View in one direction at a time is sufficient.
- 360° video—can be used indoor or outdoor.
  - Students need to look around while watching the video.
  - Can include guided or highlighted movements.
- Matterport—works best indoors.
  - Allows students to move around freely
  - Completely self-guided exploration

Design Each Location (copy and paste from ——— to ——— for each location needed, then complete.)
Location # ___

Objectives
What will students know and be able to do at the end of this location? Consider how this is tied to the activity objectives.

List objectives:

- 
- 

Assessments
How will these objectives be assessed?

- When? (at this location, later in the interaction, or later in the course?)
- Format? (multiple choice, drag and drop, discussion board, journal or notebook entry, other)

Autonomy
Identify the degree of student choice at this location. Click and drag slider.

- [ ] Completely self-guided
- [ ] Prescribed path

Interactions
What will students do here? Mark all that apply. Add additional items as needed.

- [ ] Introduction video
- [ ] Exploration (copy and paste if more than one)
  - Describe each available interaction:
    - Toolbox (list items in toolbox)
    - Content (describe)
    - Other (describe)
- [ ] Content exposure
  - Video (describe type and number)
  - Animation (describe type and number)
  - Text (describe content needed)
  - Images (describe type and number)
  - Other (describe)
- [ ] Assessment (copy and paste if more than one)
  - Description of assessment
  - Required to move on? Y/N
- [ ] (List other activities)
- [ ] Conclusion videos
Overall (Do this AFTER designing the individual locations.)

Map
What will be used as an overall location guide? (map, blueprint, aerial view, other)

Link Map
Identify links between sites or pages with arrows. Copy and paste to add sites, pages, and arrows. This may be best done in a separate document in Publisher, Google Drawings, or similar program.

Interactions and Icons
What types of interactions are needed at each site? Look for similar or repeated tasks and interactions to combine and choose appropriate icons for each type of interaction. If no icon in the library fits, leave icon column blank; an appropriate icon will need to be created by the artist on your team.

Add more rows and columns as needed.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Interaction</th>
<th>Location 1</th>
<th>Location 2</th>
<th>Location 3</th>
<th>Location 4</th>
<th>Location 5</th>
<th>Location 6</th>
<th>Location 7</th>
<th>Location #</th>
</tr>
</thead>
<tbody>
<tr>
<td>?</td>
<td>Help—Show Help slide, learn how to use the interaction</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>🗺️</td>
<td>Map—Go to overview of activity locations</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>📍</td>
<td>Location—Jump to other locations</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>(Add icon from Icon Library below)</td>
<td>(Write a short description of what will happen when icon is selected.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(add rows as needed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Planning and Preparing for the Location Shoot

Checklist

☐ Create a shot list according to location, if shooting in multiple locations, for the media team (see next page). Make a list of every shot needed at each location. Include 360° video, 360° stills, 2-D video, and 2-D stills. Print three copies—one for the producer, one for the photographer, and one for you.

☐ Work with media team to create a schedule for the shoot according to access, location, best lighting, and so forth.

☐ Work with the author to determine essential content for each video.

☐ Work with the author to make a list of props needed for each shot. Determine who is responsible for bringing each prop.

☐ Determine essential weather considerations—at what point will a scheduled shoot be postponed due to weather?

☐ Identify people needed for the shoot:
  ☐ author
  ☐ designer
  ☐ producer (from media team)
  ☐ photographer
  ☐ drone pilot
  ☐ student assistants (how many?)
  ☐ others

☐ Make sure a contract is in place with the producer, photographer, and drone pilot based on expense, time allowances for projects, reshoot arrangements, and so forth.

☐ Obtain talent release forms if necessary.

☐ Work with media team to obtain site use approvals, release forms, and other required documents.

☐ With media team, plan food and water for the shoot.
Location Shoot

Items to Bring
- copy of the shot list
- printed bullet list of essential content for each video—for the author to review before shooting
- all props on the props list
- first aid kit
- tool kit
- cart, wagon, or dolly to haul props, food, and water
- food and water

At Each Location
- Give the author the printed bullet list of content for that location to review prior to filming.
- Help as needed with props.
- Mark your copy of the shot list as each shot is finished; make sure all shots are completed.
- Help with cleanup.

Other Responsibilities
- Keep the shoot on schedule.
- Watch for signs of fatigue or illness in group members.
- Encourage group members to drink plenty of water.
- Ensure areas are cleaned up.
Sample Shot List

Location 1
360° Videos
  □
  □
  □

360° Stills
  □
  □
  □

2-D Videos
  □
  □
  □

2-D Stills
  □
  □
  □

Location 2
360° Videos
  □
  □
  □

360° Stills
  □
  □
  □

2-D Videos
  □
  □
  □

2-D Stills
  □
  □
  □
Working with the Media Team Checklist

☐ Communicate, communicate, communicate!!!
☐ Animation team
  ○ Make a list of all animations needed based on Designing the Interaction.
  ○ Provide descriptions and thumbnails of all needed animations.
  ○ Collaborate to determine an appropriate timeline for animation creation.
  ○ Respond promptly to requests for input and information.
☐ Art team
  ○ Request four-direction and 24-direction panorama images for each location. See Preparing to Create the Interaction for detailed instructions.
  ○ Make a list of all other images and icons needed based on Designing the Interaction.
  ○ Provide descriptions and thumbnails of all needed images and icons.
  ○ Collaborate to determine an appropriate timeline for image and icon creation.
  ○ Respond promptly to requests for input and information.
☐ Video team
  ○ Make a list of all videos and photographs needed based on Designing the Interaction.
  ○ Use Planning for the Shoot Checklist.
  ○ Use Video Shoot Checklist.
  ○ Request still panorama images for each location for editing by the art team.
  ○ Request audio of all 360° and 2-D videos.
  ○ Get transcripts made as soon as possible.
  ○ Work with the author to create scripts for video edits from the transcripts.
    ▪ Make sure script directions are clear and easy to follow.
    ▪ Include images with the scripts showing where highlights, animations, text, and other after-effects need to be placed in the 360° edited videos. (See sample scripts in Preparing to Create the Interaction.)
  ○ Provide all images, animations, and videos to be inserted into 360° edited video.
Preparing to Create the Interaction

Make sure the completed *Designing the Interaction* document is available.

**Location Files**

Create a folder in the Instructional Designer folder of the appropriate course in the N: drive with a descriptive title that relates to the interaction. Within that folder, create a folder for each location and one for the overall interaction items.

Create a course folder in the I: drive Canvas folder if needed. Create a folder for the specific course, and a folder titled “HTML” within it.

**Icons**

For each empty icon cell in the *Interactions and Icons* table in *Designing the Interaction*, work with the art team to have an appropriate icon created and approved. The icon should:

- have maximum dimension of 96 pixels by 96 pixels,
- be black on white,
- include versions in other needed colors,
- effectively represent the interaction, and
- be saved in the appropriate location file.

Save icons used in multiple locations in the *Overall* folder. Include all new icons in the copyright spreadsheet for the course.

**Interaction Map**

Work with the art team to create an overview map that includes all of the locations for the interaction. The map must be no more than 1200 pixels wide or 900 pixels high, and should include every location included in the interaction. Save the map in the *Overall* folder. Make sure to include the map in the copyright spreadsheet.

**Panorama Images**

Location panoramas are still images that show the location in all directions. Images should be approximately 1200 pixels wide by 900 pixels high. Save each panorama image in the appropriate location folder.
Four Direction Panorama

Four direction panorama images need to overlap about 30% on each side, and should follow the naming format ##_Direction (ex: 03_North, 08_East).

Print a copy of the panorama and identify each of the directions (north, south, east, and west), as shown below.

![Direction Identifiers](image)

Have the art team cut the panorama into four images, similar to what is shown below, cutting off the top and bottom of the panorama to remove parts of the image that are overly warped.

![Cut Panorama](image)

The artist should extend the panorama by copying from one end of the image and pasting to the other end in order to have room to make all four directional images.
Add each panorama image to the copyright spreadsheet.

24 Direction Panorama
Twenty-four direction panorama images should overlap the next image by 50% in each direction. The naming convention for these images is A_height or AB_height, using N, S, E, or W for A and NE, NW, SE, or SW for AB, and top, mid, or low for height (Ex. N_top, SE_mid, W_low).

Print a copy of the panorama and identify each of the directions (north, northeast, east, southeast, south, southwest, west, and northwest). On the same panorama, identify top, mid, and low heights.

Use the following grid as an example for the art team to cut the panorama into 24 overlapping images.

Add all panorama images to the copyright spreadsheet.

Points of Interest
Create Viewing Points from points of interest in the panorama. Select and copy Viewing Points into individual image files as shown in the following video.

Step-by-step video on creating images for viewing points.

Add all Viewing Point images into the copyright spreadsheet.
Transcripts
Designers, request audio files from the media team of all videos made on location as soon as possible and have transcripts made by a scrum team member or editor. These transcripts are critical to creating the video edit script and identifying critical content needed for activities.

Video Edit Script
Designers, provide a copy of the audio transcripts to the author. Work with the author to identify any critical content missing from the video. To determine the best option for including missing critical content, consider the following:

- Create a 2-D video containing the content.
- Use text and images to provide the content.

Identify the most appropriate location in the panorama to provide a link to each part of the content. Modify location details in Designing the Interaction as needed.

On a copy of the location panorama, highlight and number the content parts for highlighting in the panorama slides and corresponding 360-degree video, as in the example below.

Site 5 panorama, green left = Site 6, right = Site 4; yellow = Experiment Zones L-R: Wall, Fold, Sandstone w/scratch + acids; gray = view area, spaghetti; blue = videos L-R Fault Stresses, CrossBeds, Dunes and Currents

Using the transcripts, identify items to highlight in the 360-degree videos, and other special effects, animations, and 2-D videos to be added to the videos in post-production (editing). Identify video transitions and text needed for voice-over audio. (See example script below.)
It may be easier to identify highlight locations after the video clips have been edited together, as shown in the examples below.

4:00 (“on this wall” – highlight the wall as he walks toward it)

4:21 (“you can also see in the distance” – highlight until he says “fractures are oriented like this”)
4:35 ("one that’s like this" – extend straight vertical line from his hand, keep the line with his hand)

4:38 ("and one that’s like that" – extend straight line from other hand, keep both lines on screen, equal width lines – end when he starts walking @ 4:41)

Interaction Content

Text
Make a list of text content needed based on Designing the Interaction. Work with the author to obtain, edit, and proof all needed text. Save in the appropriate folder.

Assessments
For each location and for the overall interactions, obtain all questions, text, and images needed to complete the assessments as described in Designing the Interaction. Save all items in the appropriate folder.
**Needed Images**

Work with the media team and author to find or create all remaining needed images. Save each image in the appropriate location folder.

Document images in the course copyright spreadsheet as appropriate.
Working in Articulate Storyline

Have the *Designing the Interaction* document on hand while completing the interaction in Articulate Storyline.

Preparing the .story File
Open the Interactive_Template.story file from N:\IS\Production\Templates\Articulate Templates. Save the file to the SCORM folder in the N:\IS\Production\Courses\CourseName\CourseVersion\Development folder, renaming as appropriate. Create a SCORM folder if needed.

Introduction
Update the About the Field Trip slide in the interaction as needed. To update the Intro Video link, right-click and select Web Object> Edit. Under Enter a Web Address, update the Brightcove ID or the entire URL as necessary.

Add Location
Copy and paste the Sample Location until you have the correct number of locations based on the Designing the Interaction document.

Interaction Map
From the View tab, open the Master Screen. Change the map image to match the location. Move the location markers to the appropriate location, adding or deleting markers as needed. Link each location marker to the appropriate location panorama, and change the marker name in the Hover state.

Update Locations
For each location, complete the following steps as needed.

Panorama
Select the panorama image then click Edit States. In each state, update the image to the correct location and direction. The Normal state refers to the North direction. Click Done Editing States.

Panorama + Zoom
Select the Panorama+Zoom slide. For the North_NE layer in this slide, click the image and select Edit States. In each state, update the image to the correct location, direction (A = N, AB = NE),
and view height (top, mid, and low). The **Normal** state refers to the main direction of the layer, North, South, East, or West, without a view height. Click **Done Editing States**. Repeat with the remaining layers: **East_SE** (A = E, AB = SE), **South_SW** (A = S, AB = SW), and **West_NW** (A = W, AB = NW).

---

### Delete Unneeded Items

Delete slides for items that are not used at this location. Remove icons in the panorama that were linked to the unused items.

---

### Add Needed Items

Add the needed number of each type of item based on the design document. Modify each item and add an icon to link the item to the panorama for each new item.

- **Experiment Zone**
- **Video Clip**
- **View Location**

#### Journal Activity

Copy the **Journal** slides if needed. Update, add, or delete slides based on the **Designing the Interaction** document. Update the icon placement and link in the location panorama if needed.

- **Reference Material**

#### Quiz

Modify quiz questions, adding or removing question slides as needed. Content for the quizzes should be saved in the location folder in the N: drive.

---

### Check Links and Menus

Publish the interaction.

Upload the interaction folder to the HTML folder for the course in the I: Drive.
RockCanyon_20180427 - Storyline output

Rename the folder to remove “Storyline content.”

Open the interaction folder and double-click the story.html file to open the interaction in a web browser.

Open the interaction using the web address for iscontent based on the I: drive location by replacing file://I:/ with https://iscontent.byu.edu in the web address, similar to https://iscontent.byu.edu/Canvas/CourseName/HTML/InteractionFolder/story_html5.html.

Test all links within the interaction. Make a list of broken or misdirected links.

Identify slides with incorrect menu options.

Troubleshoot
Return to Articulate Storyline and troubleshoot as needed.
Fix Variables
On slides with incorrect menu options, change trigger variables to match the needed function.

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Variable Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>ToolboxVariable</td>
<td>0 = disabled (default)</td>
</tr>
<tr>
<td></td>
<td>1 = normal</td>
</tr>
<tr>
<td></td>
<td>2 = selected</td>
</tr>
<tr>
<td>MapVariable</td>
<td>0 = disabled (default)</td>
</tr>
<tr>
<td></td>
<td>1 = normal (default)</td>
</tr>
<tr>
<td></td>
<td>2 = selected</td>
</tr>
<tr>
<td>ReplayVariable</td>
<td>0 = disabled (default)</td>
</tr>
<tr>
<td></td>
<td>1 = normal</td>
</tr>
<tr>
<td></td>
<td>2 = selected</td>
</tr>
<tr>
<td>QuestionVariable</td>
<td>0 = disabled (default)</td>
</tr>
<tr>
<td></td>
<td>1 = normal</td>
</tr>
<tr>
<td></td>
<td>2 = selected</td>
</tr>
<tr>
<td>MicroscopeState</td>
<td>0 = disabled (default)</td>
</tr>
<tr>
<td></td>
<td>1 = normal</td>
</tr>
<tr>
<td></td>
<td>2 = selected</td>
</tr>
<tr>
<td>MagnifyState</td>
<td>0 = disabled (default)</td>
</tr>
<tr>
<td></td>
<td>1 = normal</td>
</tr>
<tr>
<td></td>
<td>2 = selected</td>
</tr>
<tr>
<td>AcidState</td>
<td>0 = disabled (default)</td>
</tr>
<tr>
<td></td>
<td>1 = normal</td>
</tr>
<tr>
<td></td>
<td>2 = selected</td>
</tr>
</tbody>
</table>
Appendix B – Evaluation

Evaluation Instrument

Please rate the “Preparing a Virtual Expedition” job aid.

How clear are the steps in the job aid?
1 2 3 4 5 6 7
Incredibly unclear Completely clear

How easy to use is the job aid?
1 2 3 4 5 6 7
Hard to follow Easy to follow

How complete is the job aid?
1 2 3 4 5 6 7
Missing essential steps Contains all essential steps

Evaluator Comments

Designer 1:
Here are my thoughts:
• The decision tree is very helpful.
• The design template will be very useful. (Icon library—from your icon-design experience!)
• The location shoot checklist will be really valuable for designers without a lot of experience working with the media team (and a relief to the media-team members).
• Ditto for the working-with-media-team checklist.
• Including smart filename and folder discipline in the “Preparing” section is brilliant.
• The marked-up script and examples are very helpful.
• The directions for working in Articulate do presuppose experience with the program, but with a project this complex, it doesn’t make sense to hand the programming to a Storyline
newbie.

Altogether, I think this is a great toolbox for designers! (And a nice plug for working well with the media folks!)

Designer 2:
You’ve done a good job with this. It is highly useful.
For the video clips, consider adding text such as “View video” next to the icon.

Designer 3:
Introduction: This may be a good spot for an example virtual expedition.
Decision Tree: I would put the flow horizontally and put the terms at the bottom. Perhaps some color would be helpful and add to the ability to quickly process.
Planning and Preparing the Shoot: I would move the definition of “shot list” to right after you introduce that phrase.
Working with the Media Team: I would make “Communicate, communicate, communicate” a subheading.
Working in Articulate Storyline: I don’t think the Introduction video is the best.
Consider formatting the documents exactly the same and putting the document that comes before and after.

Instructional Design Assistant 1:
The introduction added clarity. I was able to follow the documents and they made sense.

Instructional Design Assistant 2:
The steps would be more clear if I was actually creating something.
In Design each location (copy + paste from ---- to ----), when I first saw this, I wasn’t sure what to do. Maybe say “repeat/copy all of page 2 for each location needed”?
*When explaining the panoramas, the blue color can be difficult to see.

*Suggestion implemented within job aid. Changed color from dark blue to cyan to improve visibility.
Appendix C – Development Iterations

Decision Tree

Brainstorm

- Visually rich location -
  Outdoors
  Estimated Student count > 100 / yr
  Author - motivated -
  - comfortable on camera
  - tolerance for tech issues

Timing - How soon does the course go live?
Second Rough Draft

Decision Tree

- Visually Rich location?
  - Yes → Is the author...
  - No → Consider other ways to present the course

- Defined - physical place that can be photographed for filming worthwhile way to see in multiple directions

- cost too high

- Not enough time to complete consistently

- Interactive critical to the course going live?
  - Yes → Is the course expected to serve > 100 students/year?
  - No → How long before the course goes live?

- How long before the course goes live?
  - 1 semester → Are both the author and designer committed to interaction added to the course?
  - > 1 semester → Discuss media team
on-LIVE Decision Tree

Consider other ways to present the information.

Does the course contain at least one visually rich location?*

Yes

*visually rich = worthwhile things to look at in multiple directions.
location = physical place that can be photographed or filmed.

No

Is the author technologically prepared** to create an interaction?

Yes

**technologically prepared =
• motivated to use technology in innovative ways in the course
• comfortable on camera
• tolerant of technical issues
• OK with imperfection
• willing to devote the needed time to this project (30+ hours)

No

Is the course expected to serve 100+ students per year?

Yes

No

Are both the author and designer committed to adding the interaction to the course after it is live?

Yes

How long before the course goes live?

More than 1 semester

Discuss capacity and design options with the media team.

Less than 1 semester
Virtual Expedition Decision Tree

Start Here

Does the course contain at least one visually rich location?

Yes

Is the author technologically prepared to create an interaction?

Yes

Is expected course enrollment sufficient to justify the expense?

Yes

How long before the course goes live?

Less than 1 semester

Discuss capacity and design options with the media team.

More than 1 semester

Consider other ways to present the information.

No

Does the course contain at least one location?

Yes

Is the author technologically prepared to create an interaction?

No

Are both the author and designer committed to adding the interaction to the course after it is live?

No

Sufficient enrollment = 100+ students/year for university courses, 250+ students/year for high school courses.

1 visually rich = content relevant items to look at in multiple directions.

2 location = physical place that can be photographed or filmed.

3 technologically prepared =
   - motivated to use technology in innovative ways in the course.
   - comfortable on camera.
   - tolerant of technical issues.
   - OK with imperfection.
   - willing to devote the needed time to this project (30+ hours).

4 sufficient enrollment = 100+ students/year for university courses, 250+ students/year for high school courses.
Annotated Bibliography


Four studies were conducted using immersive virtual environments (IVEs) of a classroom. Study one found that teachers look at students more if there are frequent cues indicating the amount of time between glances and that students in preferred seats (center) received more frequent teacher gaze. Study two found that students on the peripheral seats did not perform as well as students in the center seat. Study three found that students nearer the teacher performed better than students further away. Study four found that the behavior of virtual classmates impacted student learning and students in a perceived one-on-one environment performed better than students with virtual peers.


Varying elements of an instructional design model provided evidence of the importance of visual clarity, access to support tools, and making available alternative input devices in design of virtual reality-based learning environments. Clear images and legible text are needed, especially when the image and text elements are important to the learning objectives. Support tools such as coaching messages should be available within the virtual environment. Input devices should match the navigational metaphor for the task being performed.


Projected and desktop computer virtual reality (VR) can be used for spatial instruction that improves student learning of body organs. Virtual Body Structures-Auxiliary Teaching System (VBS_ATS), a Web-based 3D VR was used to instruct 230 undergraduate biology students in Taiwan. Six organ systems were covered, nervous, respiratory, digestive, circulatory, urinary, and skeletal systems. Students were able to zoom in and out and rotate the parts of the systems. Class periods included traditional lecture, projected VR and desktop VR. A questionnaire with Likert scale items was used to determine attitudes toward VR learning.

First year medical students have high expectations of virtual reality (VR) and simulation-based learning environment (SBLE) activities. They expect learning and studying to be constructivist and self-directed. Learning in VR and SBLEs should help them understand and learn things that are applicable. Mistakes should not cause students to be ridiculed in SBLEs.


Providing participants in a virtual reality (VR) learning activity with peer feedback using a virtual facilitator and scaffolding through feedback messages enhanced the experience. It is also important to give participants time to explore and become familiar with the VR environment before beginning the learning activity.


Using webcams in place of field trips provides equal value for geography tasks, but the experience is significantly different. Student perception is limited by the static view and low level of detail provided by the webcam. Landscape interpretation was often statistically equivalent between field trip participants and students using webcams to observe the same location from nearly the same view. The in-person experience was more satisfying to the students and more immersive.


Affective learning scenarios based on DeBono’s Six Hats were created for an Information Management General Education course. Students were exposed to 3D projections, emitted fragrances, and interactions based on discussion noise levels, intended to cause specific emotional reactions while discussing creative solutions to problems. The SAMAL (Smart Ambience for Affective Learning) classroom positively influenced the perceived experience and promoted engagement. Participants were more creative while exposed to SAMAL than when not.

Eight university students in Taiwan participated in a creative discussion using ActiveWorld©. Students indicated the virtual experience helped them feel more relaxed and comfortable sharing ideas. A VR environment can enhance a learning experience by motivating students to explore new ideas.


Based on feedback from college science instructors, a list of benefits and drawbacks for virtual field trips is given. Benefits include cost savings, safety, inclusion, flexibility, and temporal and geographic freedom. Drawbacks include technological access issues, incomplete alignment with course objectives, reduced sensory learning issues, and lack of original data collection.


Materials science courses used augmented reality (AR) and virtual reality (VR) to expose students to content before class. Students became active, engaged learners and performed better than the control group on both posttest and delayed posttest scores for three dimensions of learning: knowledge, comprehension, and application.


Three-dimensional (3-D) chemistry modeling review activities in Second Life® (SL) improved student understanding of the 3-D nature of molecules for students with poor initial spatial ability over students reviewing the same content using two-dimensional (2-D) images. No statistically significant results were found for other subgroups. Content was presented using Chemistry Corner in SL which contains three 3-D simulations: the Molecule Game, Chemist as an Artist, and Tower of VSEPR Theory.

Three-dimensional (3-D) virtual reality spatial modeling activities support student learning when the system is easy to use and learners find meaning in the experience. Student ability to control and manipulate the 3-D environment may impact self-efficacy in the subject. Spatial training is encouraged for science subjects that involve three dimensional thinking.


Using Second Life to hold virtual policy debates increases student participation in the discussions, opens conversations, and benefits many students. Teachers need to be aware of students with technology issues, but Second Life can be used in place of face-to-face discussion groups.


Professors participating in the Meso-american Network of Biotic Resources (REDMESO), a research network of 25 public universities in 8 Meso-american nations, use Fieldtrip to share research supporting conservations and ecosystem sustainable management. Professor use of Fieldtrip is determined by their attitudes towards information and communication technologies (ICTs). Suggestions are given to help facilitate more effective use of Fieldtrip and similar technologies by providing specific design supports to guide professors to consider course learning outcomes and student learning.


Students majoring in zoology and using hypermedia activity, Tidepools, found it a beneficial learning experience but did not feel that it could or should replace field experiences. Negative comments about the experience indicated a desire to spend more time exploring and experimenting with the technology experience. Virtual field trips will be very valuable for environments where it is not safe or possible to take students for a variety of reasons.


Integral to geography degrees are field courses, however costs and other disadvantages impact student access to field courses. Virtual field trips (VFTs) are a valuable support and can be designed to meet a variety of purposes, such as preparing students for field work, developing fieldwork skills, decrease costs, empower students with disabilities.

First year geography students at Arizona State University experienced a geographic location (“A” Mount) through a virtual field trip, a live field trip, or both. Post-test scores were statistically indistinguishable both years of the study. Students who went into the field felt more of a connection to the subject, and student participating in both virtual and field study scored best of all groups on a difficult question about alluvium river cobbles.


Student activity in Google Earth can be tracked in four dimensions and visualized in two ways, animated path maps and paint spray maps. The use of analytic to analyze student movement within a virtual field trip (VFT) may lead to the ability to track deep learning.


Describes backwards design or beginning with the final results in mind. Discusses six facets of understanding and explores creating of educational materials and instructional planning that keeps student understanding at the forefront. Assessment planning is an integral part of the process.


One factor that impacts design of educational virtual-reality-based learning environments is usability, which is impacted by the interaction interface and controls. Consideration must be given to different types of users. For active and exploratory uses, provide opportunities for exploration and discovery. For those who prefer instructions and explanations, job aids and scaffolds should be designed. Find a balance between system directions and freedom to explore and minimize negative interactions.