Information Scaffolding Methods for Technical Animation

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ABSTRACT - *This paper outlines several heuristic methods used in the Information Scaffolding audience-centered approach to information design. The methods described include: a topical concept inventory, an audience assessment & integration, and 7 technical animation specific design principles. This paper is the follow up to the Comprehension Scaffolding in Advanced Engineering Graphics Communication paper presented in 2005 (Newman, 2005) and concludes with a 3-pronged framework for evaluating the audience-centeredness of a technical animation.*

I. Introduction

Information Scaffolding is a user-centered approach to information design; a 3-phase method to aid everyday authors in information composition. For the past 3 years this approach has been applied to the construction of technical animations.

The primary aim of Information Scaffolding is motivating authors to re-frame the authoring process, asking them to view the communication exercise not as a simple documenting process (author-centered) but instead as an active process of informing (audience-centered).

Placing a premium on audience-centered documents by emphasizing the information needs and motivations of a document's intended audience, Information Scaffolding looks to strengthen the quality of a document's impact on the individual. The objective is to allow the audience's understanding to closely parallel the authors intended message goals and the document's information takeaways to be salient for future use.

Formally, Information Scaffolding structures information to facilitate comprehension by a range of interested users (an audience); with conscience consideration given to the user's information and instructional needs, abilities and values; as well as to the affordances of the medium (i.e. video, paper, or website) and subject matter. The scaffolding of information should:

-Keep the big picture central and in focus
-Organize and support the comprehension process
-Place a premium on clarity, clear direction and minimizing confusion.

*(adapted from McKenzie, 1999)

Three aspects characterize the Information Scaffolding process; each necessary from a user-centered perspective and all complementing and informing the facets throughout the process. The facets of Information Scaffolding are:

1. A simple framework of how the mind works and how people learn, including key cognitive and pedagogical terminology such as *information processing and cognitive overload.*

2. An ability to assess the information needs and motivations of the document audience. Tools include a concept inventory and audience assessment.

3. A set of simple design principles/suggestions from education, design & information science for the scaffolding and composition of information including, *information density & complementing media.*

Information Scaffolding has implications for all forms of documents, but particularly those requiring cross-disciplinary communication, where some portion knowledge translation is inherent. The initial application of Information Scaffolding approach was in the area of engineering design, specifically in the construction of technical animations. The animation-specific methods developed during a three-year study, are outlined in the remainder of this paper.

II. Information Scaffolding Research Case

In 2006, 2007 & 2008, the Information Scaffolding method was included in the E128, Advanced Engineering Graphical Communications course at the University of California, Berkeley. This is an undergraduate course designed to teach technical animation techniques to undergraduate engineering students. The addition of the Information Scaffolding approach was added to support the students (authors) in the design and construction of the course project. This project requires teams of 2-3 people to create 5-10 minutes technical animations using solids-modeling and surface-modeling software.

Each spring, the engineering students create a short animation of *the assembly and operation of a moderately complex mechanical device, composed of several mechanical parts, and rendered using varying material finishes*. Additionally, the completed animation projects are to illustrate the *aspects of the device's operation that are difficult to visualize or understand conceptually (airflow, magnetic field, fluid flow, microscopic material properties, etc)*. Each project receives a final grade based on the use of purposeful creativity and the effective use of:

- Solid and surface modeling.
- Rendering techniques to emphasize depth and dimension.
- Colors and surface properties to represent materials and surface qualities.
- Lighting to present the device and to highlight key features.
- Animation to present the assembly and operation of the device.
- Effective presentation of visually and conceptually difficult aspects of the device.
- Camera motion to view the device from different viewpoints.
- Sounds and accompanying music.

(Lieu, 2004)

Before the introduction of the Information Scaffolding Methodology, the finished projects successfully meet all of the technical grading requirements (listed above), but each year many of the groups failed to produce a cogent and compelling animation that successfully provided consistent information takeaway and transferable learning, to viewer's outside of the course.

Recent research efforts in engineering/human-centered design, education and information science, have helped to identify some of the challenges in communicating with technical animation. This paper outlines the key Information Scaffolding methods used to support technical animation construction.

III. Multimedia Research: Implications for Technical Animation

The amount of information shown using multimedia dynamic representations (an example being technical animations) can easily overshadow the author's primary message goals, simply because the amount of information to be processed is abundant and densely presented.

Schnotz asserts and as many may know from experience, "learners often underestimate the information content of pictures… thinking short looks or glances are enough to extract the relevant information" (Schnotz, 2001). In the technical arena it is rarely the case that graphs, diagrams and now animations can be understood with short glances. In fact they often contain a wealth of information, embedded at many levels.

It is believed that animations can be extremely helpful for engineering comprehension and abstract thinking because they can dynamically illustrate, for example the movements of mechanical devices or the nature of chemical reactions or fluid flow. On the other hand, "animations can hinder knowledge acquisition because they sometimes reduce the demands on the learner's cognitive processing in an unwelcome way" (Schnotz, 2001)

In 2006, Dwyer's animation study results showed that, "when all levels of learning [facts, concepts, rules, procedures, and higher order comprehension] are expected to occur at the same time, information overload occurs as a result of viewing and interacting with the animation, and the animated sequences and enhancement strategies become ineffective." (Dwyer, 2006)

The highly regarded instructional designers, Levie & Fleming warn that, "learning is more correctly attributable to well-orchestrated design strategy than to the inherent superiority of various media." (Fleming, 1993). **If animations are to be used as learning objects, it is imperative that the learning needs and style of the audience be addressed**. Duke & Pearson (2002) emphasize an additional portion of the communication challenge which happens in parallel with the rudimentary transactional cognitive information processing component. From moment to moment, audience members are subconsciously making judgments (i.e. value, quality, etc) about information; bringing their unique prior knowledge, and individual learning techniques to the experience. This makes the design of information all the more important.

IV. Scaffolding Methods: Concept Inventory, Audience Demography & Heuristic Design Principles

-.*CONCEPT INVENTORY*

Traditionally, a concept inventory is, *a multiple choice test designed to evaluate whether a person has an accurate and working knowledge of a specific set of concepts* (Evans 2001). Typically, concept inventories are built in a multiple choice format and are the subject of extensive research designed to determine both the range of responses and commonly held misconceptions. The most famous Concept Inventory is the Physics Concept Inventory developed by Prof. Hestenes over the course of 15 years. Over this period of time it was improved and refined significantly.

However, concept inventories do not exist for the majority of subjects for two reasons; First, they are extremely well vetted by expert teachers in the field, requiring considerable time and effort. Second, unlike in physics most document topics are comprised of more than a single subject and do not attempt to represent a single topic in it's entirety.

Information Scaffolding leverages the approach of the concept inventory to help authors bring shape to the unique concept they are attempting to articulate and communicate, in its designated form, within the given context and for identified intended audience.

The goal of the author-constructed concept inventory (or concept survey) is to establish a list of items that, in the opinion of the author, bounds or brings shape the unique subject of the document.

The purpose of an information scaffolding concept inventory is to articulate a set of individual concepts which together describe the knowledge and information to be "contained" in the document you will construct. A concept inventory is a list of items including but not limited to; key information, related learning principles, topical background, cultural relevance, and common misconceptions. The purpose of the concept inventory exercise is to develop an understanding both of the necessary knowledge contained within and in support of your message goals. Your concept inventory will not be complete in the sense that will cover everything, instead will be a brief synopsis of the concept, as you understand it. A good rule of thumb is to begin with 15 items in a first concept inventory.

Table 1. Compound Bow Concept Inventory

Concept Inventory: Compound Bow	Y	N
1. general bow construction		
2. cams and limbs construction		
3. sight construction		
4. arrow rest construction		
5. stabilizer construction		
6. cam instruction		
7. release instruction		
8. cam and release working together		
9. sight instruction		
10. stabilizer instruction		

This concept inventory was supplied by the Compound Bow Project (2008). Items 1-5 indicate that the major sub-assemblies of the Compound Bow necessary for the operation of the device, including the sight construction and the stabilizer construction. Items 6-10 indicate the need to understand how some of the subassemblies work alone and in conjunction with one another.

Table 2. Transfer Case Concept Inventory

Concept Inventory: Transfer Case	Y	N
1. allows for four wheel drive (multiplying power to front and rear axles)		
2. can multiply power for greater control		
3. chains transfer rotary motion		
4. gears can provide rotary inversion		
5. unequal gear size produces speed/torque differential		
6. disengagement of gears allows for adjustability of power		
7. a mechanical differential forces same rotary direction of motion with potentially different speeds.		
8. universal joints allow flexibility in many directions while transferring axial velocity		
9. planetary gears allow for multidirectional rotation		
10. ribs conserve material and increase strength		
11. ball and needle bearings eliminate kinetic friction and thus prolong parts (material wear) and reduce heat (reduce chance of creep)		
12. finely finished surfaces reduce friction (gear)		
13. springs are used to assist in complex processes		
14. material selection allows for broad range of function		
15. four wheel drive means greater grip/ climbing ability. four wheel drive necessary for snow/sand/forest rescue.		

what principles of operation will be illustrated?

The animation demonstrates how power gets transferred from the engine to the front and rear axles of a four wheel drive vehicle. we intend to show the shifting mechanism and its ability to change from ‘high’ to ‘low’ gear ratios in order to illustrate the possible multiplication of power for varying purposes. this entails putting the gears into a ‘neutral’ state where the gears are disengaged in order to smoothly change rations.

The Transfer Case concept inventory provides a detailed description of the animation aims. It is also clear in the transition from the 15 item inventory to the principles of operation, that the authors consciously tried to par down the complexity of the device to a manageable amount of information.

-.*AUDIENCE ASSESSMENT*

Research has shown that learning is improved when the intended audience is targeted and the information needs and motivations understood (Jensen, 2005).

The purpose of an audience assessment is to list a portion of the characteristics that describe your audience in regard to the subject matter. Please note: "targeting your audience" does not mean emphasizing the information most interesting (or entertaining) to your audience. Instead the purpose is to focus on how the intended message goals are best expressed to your chosen audience.

An audience assessment differs from a user-centered analysis in that an audience assessment identifies key attributes important for the document's success but then must synthesize the differing needs of individual users in order to make key design decisions based on these discoveries. For example, when considering the prior knowledge of an expected audience, where the audience is comprised on intelligent non-experts but where the prior knowledge varies from user to user, clever consideration by the authors must inform the design of the document so that gaps in knowledge are covered without boring those audience members already in the know.

A simple method of audience assessment is to conduct an audience demography. In order to build a sketch of the intended audience, the audience demography asks authors to consider addressing the following questions to inform the design of the content's presentation.

Audience Demography

- *Generally, how can the intended audience be described in terms of:*
    - *background education (field of study)?*
    - *prior knowledge (topic specific)?*
    - *professional experience (field of work)?*
    - *relevant cultural experience (discipline specific terminology, methods, learning approaches, modes of communication)?*
- *Please describe some of the variations within the intended audience with regard to these questions.*

- *To what degree do you want/hope/expect your audience to learn from your information?*

- *Why is the audience interested in your information? What are their goals?*

- *What do you suspect the audience already knows (prior knowledge of the presented content).*

- *What does the audience expect to walk away with and with how much detail? Give an example of how they will use this information in a new situation.*

- *Are they familiar with the presentation style and format?*

- *Where and when will the audience have access to your information? Will they be able or wish to revisit the document?*

- *Initially and over time how many people will take in your information in this form?*

Synthesis of Concept Inventory & Audience Assessment

The synthesis of the concept inventory and the audience assessment is designed to ease the authoring process by identifying the choice bits for use during the design and construction of the technical animations.

To incorporate the results from the audience assessment into the author defined concept inventory, authors are asked to revisit each item of the concept inventory and to determine or to make an explicit educated guess as to whether or not the intended audience is well acquainted with that aspect of the subjects content. This step should help to refine, inform and prioritize the document message goals.

Table 3. Vacuum Cleaner Concept Inventory

Concept Inventory: Vacuum Cleaner	Y	N
1. demonstration of the suction mechanism	X	
2. dust trap mechanism	X	
3. dual motors- one powering brush, one for suction	X	
4. flow of the air in the vacuum	X	
5. example of domestic use of vacuum	X	
6. types of material/objects that can be vacuumed	X	
7. misconception that brush motor does most of the vacuuming	X	
8. aesthetic design of vacuum	X	
9. demonstration of how the motor powers the brush	X	
10. motion of the visor and how it is used	X	
11. emptying the dust shell where dirt is trapped	X	
12. power source of the unit		X
13. use of hose attachments (crevice tool)		X
14. electrical aspects of motor		X
15. electrical aspects of switch		X

Example: Vacuum Cleaner Technical Animation Project authors used the above concept inventory and decided to focus the intended project message goals on the: cleaning of the dust trap, motion of the brush picking up the dirt, the operation of the visor, the mechanism behind the power switch.

Finally, the audience assessment process is an iterative one and may make subtle changes as more information is gathered and feedback from intended audience members is received.

-. *7 INFORMATION SCAFFOLDING HEURISTIC DESIGN PRINCIPLES*

Principle 1.

— *Information Metaphor* —

The Information Metaphor principle is the animation backbone, the logic that takes the viewer from beginning to end, making the necessary key points in between.

Betrancourt, Bisseret and Faure (2000), found evidence that display strategy was heavily dependent on the "intrinsic properties of the object or situation being displayed" and that this display strategy in turn strongly influenced the information mapping structure to a person's memory. Betrancourt, Bisseret and Faure (2000) also suggest, "that these findings can be used to adapt the display strategy to the type of cognitive process or representation that the information system is supposed to teach". (Bétrancourt, 2000).

The researchers Levie & Fleming also hope that the structure of information and its impact on learning will be taken into account, "A message's structure determines how chunks are formed by the viewer and how memory for the message is organized. Logically organized information will "facilitate flow between short and long term memory" (Fleming, 1993)

Dwyer found in her 2006 study that the level of required comprehension (from an audience) should potential influence the structure of information. Dwyer's stratification was such: higher levels of understanding were difficult for those with low prior knowledge because the nature of animation did not allow time to grasp the necessary underlying factual and conceptual understanding (Dwyer, 2006). Should the audience require an understanding of principles, rules or other types of facts or concepts the type of learning is much different and the design of the information structure should reflect this.

In the early 1900's, Lev Kuleshov, an early Russian filmmaker believed that juxtaposing two unrelated images could convey a separate meaning. In the Kuleshov experiment he filmed 5 shots - a famous Russian actor, a bowl of soup, a girl, a teddy bear, and a child's coffin. He then cut the shot of the actor into the other shot; each time it was the same shot of the actor. Viewers felt that the shots of the actor conveyed different emotions and a different storyline suggested by the order in which the shots were presented (Kuleshov, 1974).

What should be taken from this? The order that information is presented in as a technical animation matters. The order should have a rational, which even if proved unsuccessful can be consciously modified during future iterations.

Example: The structure of the technical animation will be a function of the subject matter, the message goals and the authors' creativity. Some examples of how technical animations have been organized include:

- The device's assembly first and then the device's operation
- A total disassembly of the device and then the device reassembled to show operation
- Assembly of subassemblies, showing operation after each subassemblies

Principle 2.

— *Conceptual Chunking/Information Density* —

The Conceptual Chunking/Information Density Principle describes the breaking up of information appropriately based on audience need, optimizing the cognitive load and then relating 'chunks' to each other and to the larger document.

Levie & Fleming tell us, "*Configuration of [information] parts into potentially meaningful units is an important feature of preattentive perceptual organization. The configuration of parts [chunks] into perceptual units takes place when such a configuration permits an 'emergent property' to become evident. [Information] chunking is the organization of conceptually related blocks of information. Effective conceptual chunking reflects the optimal amount of related information that can be presented before working memory is overtaxed. The amount of information that can be presented simultaneously increases as ability, maturity, motivation and related prior knowledge increase"* (Fleming, 1993)

Authors can facilitate the comprehension process by appropriately chunking the information into digestible audience-appropriate concepts and by integrating those pieces into the larger organized document representation. The size and arrangement of these conceptual chunks influences the value of the information. Having a grasp of the needs and motivations of the intended audience should inform the chunking of information appropriately.

For text–based documents, everyday assumptions based on the college-educated non-expert may suffice. For technical animations however, the 'chunking' of information can take on a number of dimensions. A simplified framework of these dimensions might be to considered how -'chunking' can occur; over the course of the animation (temporal), within the animation's frame (spatial), as well along the animation narrative.

Image 1. Disassembled Chainsaw

The disassembled chainsaw pictured above contains over 250 unique parts. The order in which the device presented will make a large difference in the understanding of the assembly and use of a chainsaw. A chainsaw animation could be 'chunked' in many different and effective ways. The actual animation of this device however was not broken up into any subassemblies, nor did the animation at any point show much intermediate function. The result was a lengthy animation which showed an impressive rendering of hundreds of parts, but left the audience with little to no understanding of how a chainsaw works or of it's essential components.

Principle 3.

— Wayfinding & Navigating —

The Wayfinding & Navigating Principle refers to how the author helps the audience negotiate the animation content from beginning to end as well as prevent distraction along the way.

With little use of narration or text, audience members often have a difficult time tracking the 'thesis' of an animation project. The wayfinding & navigation principle advocates the use of strategies to help the audience follow the logic of the animation. For example, recent animation projects have begun to include embedded titles to key mechanical subassemblies.

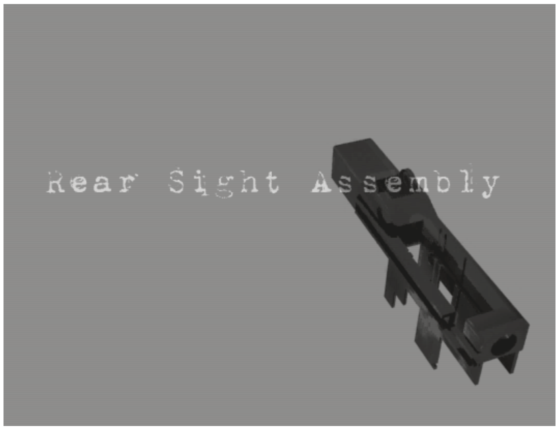
Lowe (2003) identifies three types of *change events* used in animations;

- Transformations, in which the properties of objects such as size, shape and color alter.
- Translations, in which objects move from one location to another.
- Transitions, in which objects disappear or appear.

Learners may focus on obvious perceptual events rather than on those that are of most conceptual interest for example, Lowe found that novices extracting information from a dynamic weather map focused on less important translations rather than the more important but subtle transformations. Effort should be made to guide the audience's attention through the animation, drawing attention to conceptually important points.

Example:

Image 2. Scene Title for M1 Rifle



For the animation of this M1 Rifle the authors introduced each scene by framing the beginning of each subassembly with a title.

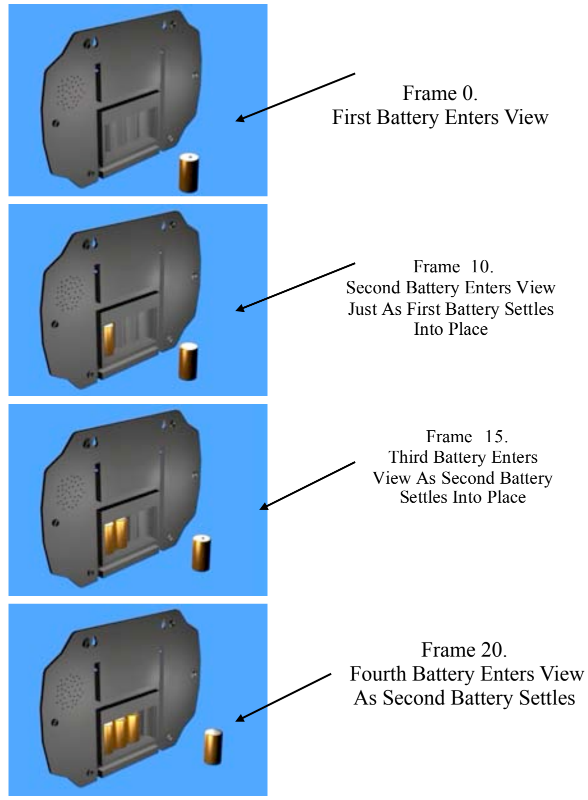
Principle 4.

— Prioritization of Key Information —

Prioritization of Key Information calls for authors to consciously consider how much information to show, as well as why and when, rather than giving equal weight to all information at all times. This principle rejects giving equal weight to all aspects of the device and instead recommends prioritizing key information elements.

Historically the technical animation projects have given equal weight to practically every screw and washer. While giving equal time to every part and its role in the larger device may seem democratic, it is unfair to the audience. Technical animation projects can contain 100s of parts, posing an unnecessary cognitive processing burden on audience members, by asking them to determine what within the animation is most important while tracking the movement of each part. Without guidance (implicit or explicit), each audience member will self-determine which aspects of the animation they will attend to.

Image 3. Battery Installation Scene



The device pictured contains 4 batteries. The animation of the batteries is done is such a way that just as one battery is in place the next has already entered the shot. Over the course of a few moments it is clear that the 4 batteries are all the same and that all 4 batteries are necessary for operation. If all of the batteries were to enter at once this information could be potentially glossed over and if equal time were taken adding each battery the viewer may lose patience. The priority of the scene here is that this device is battery operated, and requires 4 batteries to function.

Principle 5.

— Temporal & Spatial Relationships —

The Temporal & Spatial Relations Principle calls for the maintaining of relationships between pieces/ chunks of information over time and space.

During the development of a technical animation a 3-dimensional space is represented. With 100's, sometimes 1000's of parts flying in and out of this 3-D space, it is easy to allow the parts to take on a 'life of their own', to move independently of each other. Animation students and surveyed audience members have commented on how difficult it is to focus on the broader animation goals when the relationships between parts are absent. What animation is good at is illustrating temporal and spatial dynamics and the implicit relationships between them. The Temporal and Spatial Relationship principle asks is that authors explicitly define relationships between parts, subassemblies and the greater whole through use of thematic movement.

Well-defined Temporal & Spatial relationships, used with consistency and leveraged along with animation conventions allow users to differentiate between the relevant and irrelevant information, and prioritize new or novel information [Parkhurst, 1983]. When it comes to the tempo of an animation, "the rate at which sequential information is presented should be slow enough to allow accurate perception, attentive scrutiny, elaboration, and comprehension. It should also be rapid enough to present attention from wandering." [Mayer, 2003]

This conscious consideration will help to direct audience attention and reduce the cognitive burden.

Principle 6.

— Global & Local Perspectives —

The Global & Local Perspectives principle asks authors to be conscious when transitioning from the document's big picture to focus on particular aspects or details of the device and back again.

Typically these devices contain parts in a wide variety of sizes. In order to present very small or detailed mechanism an extreme degree of zoom may be necessary. Unfortunately after even a short duration of time the relationship to the larger device and to the message of the animation maybe lost. In the E128 course some animation groups have begun to embed a larger device view into the animation frame.

Consider the text equivalent of this challenge. In a successful essay when the time has come to focus more on the details of a research study or to explore the musings of a particular literary work, words/sentences are used to transition from one portion to the next while maintaining the larger essay context. The same must hold for technical animation only new construction devices must be employed.

Principle 7.

— Complementary Media —

The complementary media principle asks for the selective use of available animation tools such as sound, camera motion, and lighting to achieve *media coherence*

The availability within any animation program to use lights, motion and sound makes it easy to unnecessarily overuse any one of these tools – resulting in an animation that is overwhelming. The Complementary Media Principle suggests that the use of each of these animation tools be informed by the underlying message goal and the needs of the audience.

Clark & Mayer's multimedia coherence principle states: People learn better when extraneous words, pictures, and sounds are excluded rather than included. (Clark, 2003). However, while some redundancy is actually very important in communication in order to reduce uncertainty and ambiguity, Ainsworth and VanLabeke write, "When multiple representations complement each other they do so because they differ either in the information each expresses or in the processes each supports. By combining representations that in these ways, it is hoped that learners will benefit from the advantages of each of the individual representations. Multiple representations provide complementary information when a single representation would be insufficient to carry all the information about the domain" (Ainsworth, 2004).

The complementary media principle asks authors to attempt to strike a balance between the minimalist approach advocated by Mayer and the selective redundancy suggested by Ainsworth and VanLabeke, in order to achieve cohesion and concert in the use of the multiple animation attributes.

V. ASSESSMENT

The data collected from the three iterations of the Information Scaffolding intervention and the subsequent interpretation are too lengthy to be presented here, however the three methods of evaluation may prove valuable evaluation approaches for animation authors and instructors.

A. Audience Perceptions & Comprehension. As part of the scaffolding intervention, the project authors were asked to provide 3 project related comprehension question. These questions were to be based on the author defined project message goals with the answers illustrated over the course of the technical animation.

Two surveyed audiences (members of the project's intended audiences and fellow students) were asked for their perceptions of the finished projects and to answer the provided comprehension questions. The survey participants were asked the following perception questions with their answers summarized by project for constructive feedback.

1. *Is the length appropriate?*
2. *Does the presentation approach and style help overall understanding?*
3. *Are there aspects of the animation that are overwhelming, distracting or frustrating?*
4. *Are weight and priority given to the important aspects of the device?*
5. *Does the animation maintain a big picture perspective while providing enough detail?*
6. *Does the animation contain complementing media?*

B. Author Scaffolding Approaches. The scaffolding approaches used by each set of project authors contained the following common elements;

- A clear concept inventory
- Summary of intended-audience assumptions
- A synthesis of the two preceding steps
- Clear and selective message goals
- The design strategies based on the preparatory analysis.

An evaluation of the the authors' approaches looked for innovative uses of the 7 technical animation specific design scaffolding principles to structure and synthesize the information gathered during the first phases of the scaffolding process.

C. *Content Analysis.* The evaluation of the content will vary depending on the need - but a content analysis can also serve as a formative assessment before further iterative improvement. The six facets used for a 2009 technical animation content analysis were;

Intended Concepts: Are the intended concepts present - and to what degree? Could an audience member find the answers to the author provided comprehension questions within the animation project?

Framing: Is the animation purpose evident? The animation purpose will always be obvious to the authors but not necessarily self-evident to the audience. Adult audience members in particular need to know both the purpose of the animation and what they are likely to learn from viewing the project.

Storyline: One of the elemental analysis modes of film critique is to ask if there is a strong, well-structured storyline, not necessarily linear or narrative, but a cogent underlying thread that binds the film's elements together. Knowing that decontextualized information often does not provide the motivation for sustained interest by the viewer and that the reason motion pictures for example are accessible to a range of viewers is in part because they supply their own, self-contained motivation, the need for the animation projects to present well-defined relationships to the animation as a whole becomes important.

Part Relationships: Is the presentation of parts appropriate and is there meaning behind the initial introduction of a collection of related parts?

Registration: Here the evaluators look at tempo of the projects on the local scale. Knowing that it takes a full second to read and register the contents of a road sign, do the authors allow for adequate registration?

Vocabulary: Is the use of vocabulary in the the title, the device and the comprehension questions consistent? Is the vocabulary audience appropriate? Can the intended audience connect with the animation and device given the vocabulary used? For example, the Transfer Case Project, titled *Transfer Case* is self-explanatory for audience members who knew what a transfer case was but for those who did not - a major portion of the animation held no meaning.

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