Suspenseful Design

Engaging Emotionally with Complex Applications through Compelling Narratives

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***Abstract* — Although story is a critical component of many games, stories and storytelling techniques are rarely used in other kinds of applications. In this paper, we introduce a framework for constructing suspenseful, narrative-based software applications. While many interface designs aim to reduce confusion and complexity, we introduce an alternative for inherently complex software by engaging people through narrative. We describe a framework for incorporating suspenseful elements into an interface and apply it to a proto-type of a suspenseful tutorial. We conducted a controlled experiment that compared this suspenseful tutorial to two more traditional tutorial designs. Participants who used the narrative-based tutorial reported greater feelings of hopeful suspense, which previous studies have found to be correlated with enjoyment and interest.**

Keywords — gamification; narrative; suspense; engagement

I. Introduction

For as long as there have been people there have been stories, from earliest oral histories to books, movies, and video games. Great speakers and writers rely heavily on stories to connect with their audiences; game designers, novelists, and screenwriters enthrall us with their tales; in this paper, we suggest that interface designers could use similar techniques to make software applications more engaging.

Video games have long used story to structure and give meaning to raw game mechanics. Suspenseful narratives full of mystery and adventure tend to be especially effective at holding a player's attention and keeping them playing late into the night to better understand the game world and to find out what will happen next.

In our work, we explore the use of suspense in non-game applications. Suspense may be generated by incorporating suspenseful fictional elements into the software or by making the structure of the application itself more suspenseful. Just as suspenseful design may motivate players to keep playing a difficult or lengthy game, so to may it make other kinds of arduous or tedious tasks more tolerable and motivate continued engagement over long periods of time. Complex software applications that require sustained attention and effort to master may benefit from the inclusion of suspenseful elements that maintain interest and motivate continued learning and exploration.

This paper makes three contributions to the study of suspense and human-computer interaction. First, we describe a theoretical framework for creating suspenseful interactions. Second, we describe the design, development, and implementation of a tutorial built around a suspenseful, fictional narrative using this framework. Finally, we present the results of a controlled study in which the suspenseful tutorial was compared to two more traditional tutorial designs, and was shown to provide more hopeful suspense.

II. Related Work

Our work is an extension of existing research on gamification, tutorials, and suspense.

A. Gamification

Our work, like much work in the field of gamification, is about adapting game design elements to non-game contexts. In particular, we have attempted to adapt the game design element of suspense to the non-game context of a tutorial.

Many existing gamified systems and serious games make use of narrative [27] and much has been written about the relationship between narrative, theme, and gameplay [6,13]. Furthermore, several gamified tutorial and educational systems have been created that use game mechanics to motivate learners to strive for mastery [7,18,19].

However, adaptation of narrative elements in gamified systems has been largely ad hoc and intuitive in nature, with the narrative often being more decorative than motivational. In contrast, our research foregrounds the role of narrative and suspense, and seeks to understand the practical and motivational value of suspense-building techniques.

B. Tutorials

Prior research on tutorials has largely focused on developing improved methods for generating and presenting tutorial content. Many systems are able to automatically generate tutorials from user demonstrations [4,10,20], computer-aided design (CAD) drawings, and crowd-sourced instructions [15]. Other research has focused on developing novel ways of presenting tutorial content include Fernquist et al.'s tutorial system that helps with sketching as well as tool use [9], and Grossman et al.'s ToolClips [11] which provides contextual video assistance within an application. Bergman's DocWizards [1] guides users through a tutorial by highlighting controls in the actual application interface. Kelleher and Pausch's stencil-based tutorials [12] keeps users from accidentally performing incorrect actions, and tutorial-based

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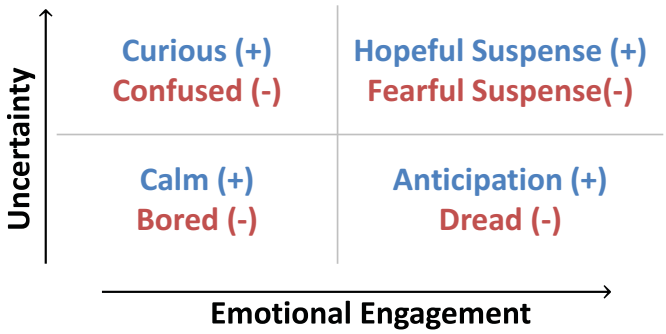

Figure 1. Interaction of uncertainty (y-axis), emotional engagement (x-axis), and valence (+/-).

interfaces by Laput et al. [17] blur the lines between image editing and tutorial.

A common goal in tutorial design in HCI is to reduce complexity and confusion. Our work instead attempts to harness the inherent uncertainty of learning to create tutorials that are motivating because they are suspenseful rather than simple.

C. *Suspense*

Suspense is a fundamental part of storytelling. In fact, Brewer and Lichtenstein found that a suspenseful structure is what distinguishes a story from a mere sequence of events [3]. When presented with artificially constructed texts, study participants ranked those that had a suspenseful or mysterious form as more story-like than those that did not.

Suspense has also been shown to be very enjoyable. For example, Zillman et al. [28] found that audiences rated suspenseful television programs as more enjoyable than similar programs that did not include suspenseful elements. Even suspenseful programs with no resolution were liked more than control texts without a suspenseful initiating event. Similarly, Brewer and Ohtsuka [3] found that overall suspense rating correlated more strongly with the likeability of a story than any other factor they tested.

One method of measuring suspense, used in our study, was developed by Moulard [21] to measure suspense in consumer experiences. We make use of her validated scale for measuring suspense, which breaks suspense down into two component emotions: hope and fear. Hope is felt when someone believes that there is a chance of a positive outcome. Fear results from the belief that a negative outcome is possible. Hope and fear are often intense emotions which shape our attitudes towards an uncertain future: however, little research has been done examining the effect that suspense has on motivation, or how the experience of suspense might be leveraged to pique people's curiosity and keep them engaged with a lengthy, tedious, or difficult task.

III. Design Framework

In this section, we present a general framework for designing with suspense. This framework synthesizes existing work in suspense, and extends that work into the realm of human-computer interaction.

Our framework involves three dimensions of suspense: *uncertainty*, *emotional engagement*, and *valence* (Figure 1). When uncertainty and emotional engagement are both high, one experiences suspense, which can be either hopeful (positive valence) or fearful (negative valence) [21]. High uncertainty but low emotional engagement, does not result in suspense, but rather curiosity (positive) or confusion (negative). Similarly, if a person's emotional engagement is high, but they feel certain that they know how the situation will resolve, instead of suspense they will feel anticipation (if they expect a positive outcome) or dread (if they expect a negative outcome). When a person experiences neither uncertainty nor emotional engagement, they may be either calm (positive) or bored (negative).

A. *Techniques for Incorporating Suspense*

In addition to uncertainty, emotional engagement, and valence, there are several characteristics that distinguish one kind of suspenseful situation from another, which can be considered as parameters for suspenseful design. These parameters are not binary, but rather spectrums along which a suspenseful scenario might be placed. When designing for suspense, some of these parameters may be specific to the application and some may be manipulated. Keeping these parameters in mind can help designers to consider and evaluate a wider variety of possible design options or narrative structures.

1) Incorporating Uncertainty. When incorporating uncertainty into an application or story, a designer should consider:

Temporal Locus—the uncertainty at the core of a suspenseful scenario may revolve around an event that occurred in the past (as in a murder mystery) or an event that will occur in the future (as in an adventure story).

Number of Potential Outcomes—the suspenseful situation may concern a situation in which only a small set of outcomes are possible (as in a sporting event where a team can only win or lose) or the range of possible outcomes may be unimaginably vast and uncertain (as in some surreal or paranormal stories).

Uncertainty may be increased by including a countdown or deadline, a competition, or variable / randomized rewards. Suspense can also be generated by removing resources on which the user relies, causing the apparent uncertainty of the situation to fluctuate, or by foreshadowing a dangerous or otherwise uncertain future. Vague hints about unlockable features, advanced modes of operation, and upcoming content can also be suspenseful.

2) Incorporating Emotional Engagement. Parameters of emotional engagement include:

Valence—suspense may be primarily hopeful (e.g., if one is hoping to win the lottery) or primarily fearful (e.g., if one fears being diagnosed with a deadly disease).

Vicariousness—suspense may revolve around events in one's own life or events in the life of fictional characters.

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Emotional engagement may be increased by including sympathetic characters, by giving the user a team with which to identify. Raising the stakes by presenting users with bigger potential reward and/or loss and strongly communicating the importance of the outcome are also ways of boosting emotional engagement.

3) Parameters of Suspense Resolution. In incorporating suspense into a narrative, it is also important for the designer to consider how that suspense is resolved:

Interactivity—a suspenseful situation may be resolved by working to achieve some task (as in a video game) or simply by waiting and watching (as in a movie).

Timeframe—a suspenseful situation may be resolved very quickly (as with a slot machine) or may be spun out over months or years (as in a series of epic fantasy novels).

In addition, chaining multiple suspenseful interactions together to create an extended narrative or experience may increase or decrease overall suspense. If, in a fictional narrative, the outcome of each smaller suspenseful situation proves to be consistently surprising but logical, the creator both builds trust and makes the story feel more unpredictable. Without trust that a meaningful resolution is coming, the audience's emotional involvement may wither. Without surprise, uncertainty may be reduced to nothing. Creating a series of resolutions that are both surprising and logical is a difficult task, and likely part of the reason why writing a good suspense story is so challenging.

Though these are some of the most common techniques for raising suspense, in fiction and in real life, there are doubtless many other ways in which emotional engagement and uncertainty can be further enhanced.

IV. A Suspenseful Tutorial

While our framework is applicable a wide variety of applications and online experiences, we began our exploration of the concept by creating a tutorial built around a simple, suspenseful narrative.

Lengthy or complicated tutorials often make people feel uncertain and confused. This can lead to frustration and demotivation. To make the experience of working through a difficult tutorial more bearable, tutorial designers typically try to reduce the experience of uncertainty as much as possible by providing significant guidance and clear structure.

However, while reducing uncertainty should reduce confusion and lead to greater calm when interacting with the tutorial, it is an approach that may also risk making the tutorial boring (Figure 1). This is not a problem if a person has a strong, immediate motivation to work through a tutorial, for example if they are using the tutorial to help complete a task that they already care about. However, if the tutorial is being used to proactively expand one's skills or to experience an expert's workflow [16], they may come to the tutorial with less determination to complete it and no clear goal to motivate them. In these cases, structuring the tutorial to provide additional motivation may be very helpful.

We attempted to use suspense to generate that motivation. Instead of trying to minimize uncertainty, we instead increased emotional engagement in an attempt to transform simple uncertainty and irritating confusion into motivating, enjoyable, captivating suspense. This is in accordance with our theoretical model of suspense (Figure 1). If suspense is a combination of uncertainty and emotional engagement, then by applying and possibly adapting known techniques from narrative and media design, it may be possible to turn a merely uncertain situation into a suspenseful one by increasing emotional engagement.

To accomplish this in the tutorial, we presented the tutorial's instructional content in the context of a simple, suspenseful narrative, building on the somewhat story-like structure of a typical tutorial: a difficult challenge is presented, and the protagonist must increase their skills to overcome the challenge, ultimately achieving a decisive victory through cleverness and hard work.

A. Tutorial Task

The tutorial we created teaches participants how to make a 3D animation of a bouncing ball in Blender[1], an open source 3D modeling application . This task was chosen to be challenging but accessible to novices, an assessment which was confirmed in our pilot studies. It was a task that could be completed in less than an hour, but nevertheless one that we expected most participants to struggle with to some extent. Also, 3D animation is difficult and labor intensive, but (like any animation) it lends itself to storytelling.

The choice of the 3D modeling application Blender was deliberate, as it exemplifies many of the strengths and weaknesses of complex applications. It is extremely powerful and efficient for experts, but for novices it can be extremely intimidating [2]. Our intention was to introduce suspenseful narrative elements that give the extra motivation necessary to push past initial frustration and intimidation, in order to ultimately succeed with learning the tool.

B. The Story

Perhaps the most challenging part of building a suspenseful tutorial was creating a story that people would find emotionally engaging. We wanted the motivating story to be simple enough to be conveyed quickly, without slowing the study participants down too much.We arrived at our final story through an iterative process of creating stories, mapping those stories to the tutorial's educational goals, assessing the effectiveness of both story and instructional content, and revising as necessary. Ultimately, we pared the story down to a simple, suspenseful narrative about a cute, innocent character—a sleeping red ball—being shot at by an unknown assailant. Arrows whiz through the air, striking left, striking right, just barely missing the defenseless ball. Just as another, perfectly aimed arrow is about to hit the unfortunate ball in its face, time freezes, and the study participant is given the chance to save the ball, by making it jump out of the way of the oncoming arrow. But to do that, they must learn to master some of Blender's basic animation tools.

[1] Blender. http://www.blender.org/

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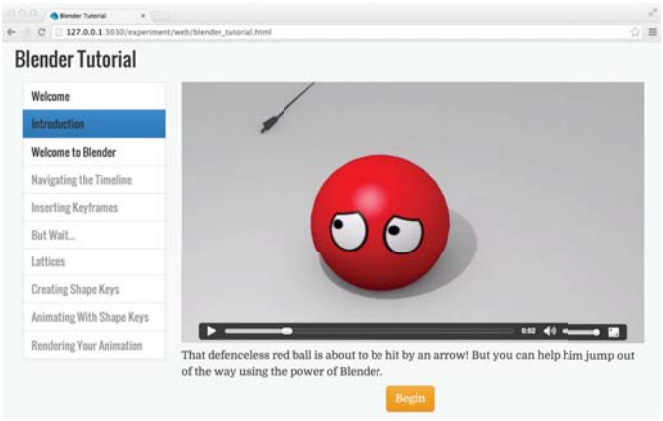

Figure 2. In the Story condition, the tutorial begins with a video of the personified ball about to be shot.

This story has the format of a suspenseful story. Emotional engagement is heightened through three of the suspenseful design techniques mentioned previously. Concern for a sympathetic character is created through the character of the innocent, cute, and goofy red ball. The stakes are raised by putting the ball in mortal peril. The learner's success will be the ball's salvation, their failure will be the ball's doom. Finally, the introductory video communicates importance directly by telling the learner "Only you can save [the ball]". Uncertainty arises naturally from the tutorial format, and by putting the ball's fate in the learner's hands.

The story was primarily communicated through a brief movie that preceded the main text of the tutorial (Figure 2), while the tutorial text was presented in a more traditional manner using excerpts from the Wikibook "Blender 3D: Noob to Pro"[2] and a related online tutorial . The text was minimalist and factual, with numbered steps illustrated with screenshots from Blender. However, the narrative frame was still reinforced in small ways through task phrasing. For example, in the story-based tutorial included the following text:

> *You can use Blender's animation tools to move the red ball out of the path of the oncoming arrow. However, before you begin animating, you need to learn about how 3D animation works, starting with the concept of frames and keyframes.*

While in the control conditions the equivalent text read:

> *Before you begin animating, you'll need to learn about how 3D animation works, starting with the concept of frames and keyframes.*

The tutorial starts out using basic keyframe animation to move the sphere straight up and down, and gets more complicated as it goes along, introducing lattices, object deformation, and squash and stretch animation.

Midway through, after successfully moving the ball upwards, there is a brief, interlude that changes the focus of the suspense from dodging the arrow to making a safe squishy landing. This foregrounds the narrative element and motivates the second half of the tutorial, which deals with squashing and stretching objects.

[2] Blender 3D: Noob to Pro. http://en.wikibooks.org/wiki/Blender_3D:_Noob_to_Pro

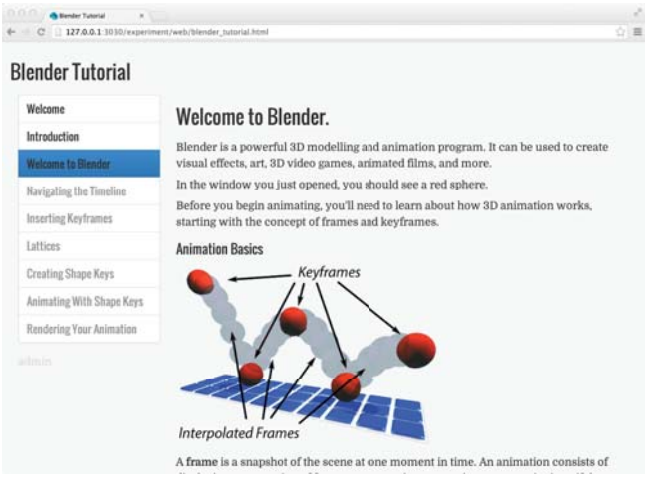

Figure 3. Screenshot of the tutorial instructions.

C. *Implementation*

The tutorial was presented as a series of web pages, created using the Angular Dart web framework . A navigation bar at the left side of the browser window, shown in Figure 3, enabled participants to return to earlier pages for reference, but did not allow them to jump ahead as pages in the navigation bar had to be unlocked in linear order, one-by-one.

V. Study: Suspense in Tutorials

We conducted a laboratory study to evaluate the effectiveness of the suspenseful tutorial. The study focused on the relationship between a dramatic narrative and engagement in the tutorial, but we wanted to separate the effects of suspense from the logical sequence of steps a story naturally provides, we thus included two baseline conditions: one without a story, and one without a story or clear goal.

In the context of video games, Klimmt et al. [14] have previously shown that players derive greater enjoyment from high-suspense vs. low-suspense versions of the same game. While their work shows a link between suspense and enjoyment in a gaming context, our study instead explores the specific use of suspense to increase engagement in tutorials, using validated scales to measure suspense [21], intrinsic motivation [24], and flow [23]. Our intention was to determine whether presenting tutorial instructions in the context of a suspenseful narrative increases participants' interest in and motivation to complete the tutorial.

A. *Participants*

Forty-one participants took part in the study, 14 female and 27 male. Participants' ages ranged from 18–42 years (*Mdn* = 24); 12 (29%) had some prior experience with 3D modeling software, and 13 (32%) had some experience with animation software. One participant had previous experience with Blender, but had only used it to create primitive solids such as cones and spheres for use in a class assignment.

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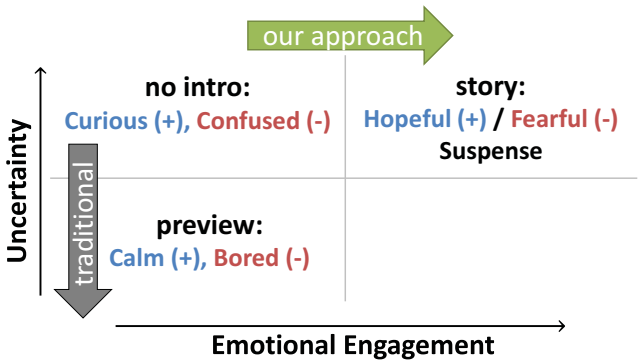

Figure 5. The story-based tutorial was designed to increase emotional engagement rather than decrease uncertainty.

B. *Design & Conditions*

The primary factor in our study was *tutorial type*. We created three tutorials for the 3D modeling application, Blender. All three versions of the tutorial guided participants through the process of creating a simple 3D animation. The tutorials were as similar as possible, and presented the same steps in the same order (Figure 4). They differed only in the way the tutorial content was introduced and framed.

No Intro: In this tutorial, participants were provided with a sequence of steps without any narrative frame or any information about what it is that they would be building. This tutorial type was included because it provided a minimalist baseline against which the other conditions could be compared, and corresponds to a condition in which we would expect some confusion to occur (Figure 5).

Preview: This tutorial began by showing participants a video of the animation they would be making, without any narrative frame and then provided them with the same sequence of tutorial steps. This tutorial type was included because it is a very common format for tutorial instruction. In this condition, uncertainty is reduced, with the intention of creating a more calm (or boring) experience (Figure 5).

Story: The story-based tutorial was the one described in the previous section, which incorporated a suspenseful video and minimal changes to text to flow with the story.

We also incorporated the secondary factor of tutorial stage in our design. In each tutorial stage, participants were presented with a new (and increasingly difficult) concept followed by a short questionnaire measuring suspense and flow (Figure 4). We used a mixed design with between-participants factor tutorial type (each participant only experienced one type) and within-participants factor tutorial stage, with stages 1–5 in the same order for all participants.

C. *Apparatus*

The tutorial was carried out on a 15-inch 2880×1800 pixel MacBook Pro laptop connected to an external 15-inch 1920×1080 pixel monitor and a mouse with scroll wheel. Blender was displayed on the external monitor, while the tutorial and questionnaires were displayed on the laptop.

D. *Measures*

After finishing each stage of instruction, we asked participants to fill out a 29-question questionnaire to gauge their experience of suspense, flow, perceived outcome importance, and desire to continue. Specifically, participants were asked to fill out Moulard's suspense scale [21] and the flow short scale [23]. Participants were also asked if they "would be upset if the tutorial ended now". At the end of the session, participants completed the intrinsic motivation inventory [22], and provided subjective feedback on their experiences through open-ended written survey questions.

1) *Moulard's Suspense Scale*

Moulard's suspense scale [21] asks participants to rate their feelings of hopeful suspense, fearful suspense, and valence-neutral suspense using a 7-point Likert scale. Hopeful suspense was probed by the following statements: "I feel eager", "I feel excited", "I feel enthusiastic", and "I am looking forward to what happens next." Fearful suspense was probed by statements such as "I am afraid" and "I am petrified", and valence-neutral suspense was probed by statements such as "This is a tension-filled experience" and "This is a nail-biting experience".

2) *Flow Short Scale*

Flow theory posits that people are intrinsically motivated by flow experiences—states of intense concentration in which the mind is wholly fixed on a particular task to the exclusion of all else. Flow is more likely in situations that involve clear goals, immediate feedback, and challenges just at the limit of a person's abilities [5]. The flow short scale [8] measures fluency of performance, absorption by activity, perceived importance of outcome, and perceived fit of demands and skill. Sample questions include: "I know what I have to do each step of the way" (performance fluency), "I do not notice time

Figure 4. Progression of tutorial in story (orange, top), no intro (blue, middle), and preview (green, bottom). Questionnaires were presented between each major stage (grey, numbered diamonds).

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passing" (activity absorption), "I must not make any mistakes here" (outcome importance), and "Compared to all other activities which I partake in, this one is… Easy – Difficult " (demand/skill fit).

3) Intrinsic Motivation Inventory (IMI)

According to self-determination theory, people are intrinsically motivated by activities that satisfy needs of autonomy, competence, and relatedness to others [24]. To measure motivation, we used the intrinsic motivation inventory [22], a validated scale measuring interest/enjoyment, perceived competence, effort, and tension. Example statements include "I would describe this activity as very interesting" (interest/enjoy¬ment), "I think I am good at this activity" (perceived competence), "I tried very hard on this activity" (effort), and "I was anxious while working on this task" (tension). Note that we replaced the relatedness subscale with the relatedness subscale from the Player Experience and Needs Satisfaction (PENS) survey [25] using "activity" in place of "game", as that made more sense in our study.

E. Hypotheses

Our hypotheses were as follows:

H1. Participants would experience more suspense (hopeful, fearful, and/or neutral) in the *story* condition than either the *preview* or *no intro* conditions.

   a. Participants would experience more uncertainty in *story* and *no intro*, but not in *preview*.

   b. Participants would experience more emotional engagement in *story* than either *preview* or *no intro*.

H2. Participants would be more motivated to continue in the *story* condition than in the other two conditions.

H3. The effects of suspense and motivation would vary over the duration of the tutorial (e.g., as suspense is introduced or resolved across stages 1–5).

We tested H1 using the suspense scale, and separated H1a and H1b using subscales from the *flow short scale* of absorption by activity, perceived importance of outcome and using the interest/enjoyment subscale of the *IMI*. We used the remaining flow and IMI subscales to test H2.

VI. Results and Discussion

Participants' time to completion varied greatly (*Mdn*=40 min, *Min*=22 min, *Max*=66 min). Some participants had a great deal of difficulty following the tutorial, repeatedly skipping or misinterpreting important steps. To reduce statistical noise resulting from the overwhelming confusion and frustration of these participants, 8 participants who took more than 50 minutes (advertised maximum time of study) to complete the tutorial were removed from our analysis.

We analyzed data from the remaining 33 participants using a 3 (tutorial type, between) × 5 (tutorial stage, within) repeated measures analysis of variance (ANOVA) for each measure in the suspense, flow, and IMI scales. Note that each measure is an average of several questions, and it is common to use parametric tests for analysis. For all tests performed, there were only two main effects that were significant (p > .07 for the remaining 28 main effects and 15 interactions), and so we report only significant findings. We used Bonferroni correction in both post-hoc analyses.

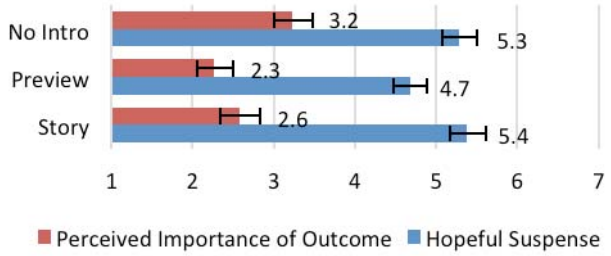

Figure 6. Participants in the story condition reported significantly greater hopeful suspense than those in the preview condition. Participants with no intro reported significantly greater perceived importance than those with a preview. Error bars display standard error (*SE*).

A. Hopeful Suspense (H1)

There was a significant main effect of tutorial type on the 'hope' component of suspense ($F_{2,30}$=3.7, p = .04, Figure 6). Pairwise comparisons showed that the story condition (M= 5.4, SE=0.2) produced marginally higher hopeful suspense than the preview condition (p=.06, M=4.7, SE=0.2), as predicted by H1. The *no intro* condition was not significantly different than either *story* (p>.99), or *preview* (p=.12).

Our findings were limited to hopeful suspense, indicating a positive valence, but it is worth noting that the questions measuring fear were worded quite strongly, so small changes may have gone undetected (e.g., concern for the ball). In addition, some participants spoke English as a second language and may not have fully understood some of the colloquial statements in the questionnaires. In particular, several participants asked for clarification of the phrases: "edge of my seat", "nail-biting experience", and "petrified".

Somewhat surprisingly (H1 is only partially confirmed), the difference in reported hopeful suspense between the story and the no intro conditions was not significant; this may be because participants in the no intro condition were not told what they were meant to be creating, and that uncertainty likely gave rise to a feeling of suspense. Participants might wonder what they are building, how the work they've done will fit into a bigger and more complicated final animation, and how they would recover if they made a mistake.

B. Flow: Perceived Importance of Outcome (H1a)

We found a significant main effect of tutorial type on perceived importance of outcome ($F_{2,30}$ = 4.6, p = .02). Post-hoc analysis revealed that participants in the no intro condition (M = 3.2, SE = 0.2) reported significantly higher (p = .02) perceived outcome importance than those in the preview condition (M = 2.3, SE = 0.2), but no other pairwise difference was significant (p > .05, Figure 6).

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This result partially confirms H1a, as participants in the no intro condition did not know what they were supposed to be building, which we believe increased uncertainty, as supported by the following participant comments: "I think for each step, give the learner an ultimate goal (e.g. what results we will see after finishing this chapter) will help us understand what we are doing", "It is a bit distracting at the beginning of the tutorial since I have no experience with the software at all. I went back a bit since I felt I missed some steps, while I actually didn't", "not enough pics to check if you've done it right."

C. Subjective Feedback

Participants in the story condition demonstrated a wide range of attitudes. Some seemed affected by sympathetic qualities of the ball. For example, when asked what they liked about the tutorial, responses included: "The eyes on the ball's face" and "The purpose of the lesson of saving the poor ball from impending doom". Other participants in the story condition mentioned the aesthetic ("cute") qualities of the animation, perhaps implying a degree of emotional engagement with the ball character. For example: "Cute animation made it more exciting, and the step-by-step instructions were clear" And "It was cute and simple". In addition, the one participant in the study who requested that their completed animation be emailed to him had been assigned to the story condition.

One participant in the story condition liked that tutorial task was grounded in a semi-realistic scenario involving recognizable physical objects that might be relevant in other contexts: "I liked the goal driven part that goes over some common things that you would want to do for a simple animation. Like that of a rubber ball bouncing. There were also flying arrows that I feel I could create myself now."

Not all participants in the story condition found the story elements notable. One participant did not even wait for the introduction video to finish before skipping ahead to the next step. However, participants that were not interested in the story seemed to appreciate other aspects of the experience, such as the experience of creating (e.g., "the new experience I had in 3D modeling and learned about this Blender software") or the clarity of the instructions (e.g., "The tutorial provided clear step-by-step instructions which I found mostly easy to follow.", "It's pretty clear").

Interestingly, one of the participants who did not mention the story elements as a notable positive element suggested that "a game to begin would have set the tone". The short, narrative movie shown prior to the tutorial may have been insufficient to capture this participant's imagination, while a more interactive, game-like presentation of the narrative may have drawn them in more effectively.

D. Remaining Hypotheses (H1b-H3)

Measures of emotional engagement (H1b), heightened motivation (H2), and change across stages (H3) cannot be confirmed. We expect this is in part due to the small size of effects in our study, and perhaps a lack of professional storytelling advice.

VII. Summary of Findings

Our results indicate that even a simple narrative can increase people's experience of hopeful suspense, as characterized by agreement with statements such as "I felt eager", "I feel enthusiastic", and "I am looking forward to what happens next". In past work, this kind of pleasurable anticipation of a positive event is associated with incentive motivation [26] and story enjoyment [3]. In addition, the importance of perceived outcome was found to be significantly higher in the no intro condition, as measured by agreement with statements such as "I am worried about failing", which we attribute to increased uncertainty.

VIII. Conclusion

In this paper, we introduced a theoretical framework for understanding suspense and designing suspenseful applications, by considering both uncertainty and emotional engagement. We presented the design of a tutorial for 3D animation tool, Blender, which incorporated a suspenseful narrative. Finally, we described the results of a study that compared the story based tutorial to two more traditional tutorials, and found that the story provided hopeful suspense when compared to tutorials in which participants to tutorials in which participants were given a preview but no suspenseful story. Overall, the results are suggestive, but future work is needed to determine the full effects of dramatic narrative on engagement and motivation.

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