What do we learn from docutainment? Processing hybrid television documentaries

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ABSTRACT

This study examined how hybrid documentary formats, which embed educational contents into narratives, are cognitively processed. Based on existing research and theories, two reception modes were identified: processing with a focus on the narrative plotline and processing with a focus on the thematic structure. In two experiments, two markers of narrative processing could be found for hybrid television documentaries: the experience of transportation and the narrative distance effect. In the first experiment, it could be shown that re-enactments and personal variables enhance the experience of transportation. The second experiment confirmed the narrative distance effect, which occurs independently of reception goals. This means that educational facts which are closely tied to the narrative plotline were learned better than distant facts, regardless of whether the recipients watched the documentary for information or entertainment purposes. The study supplements prior theories on hybrid processing and provides conditions under which narratives are appropriate for learning.

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1. Introduction

Once one’s formal education has been completed, new knowledge is acquired mostly in informal contexts, be it by reading popular science magazines, visiting museums, or watching television documentaries. In such informal learning settings, it is very important to motivate the recipients to engage themselves with the educational contents presented. Television programs with an educational mandate, for instance, try to do so by embedding educational contents into entertaining narratives. This combination of educational contents with a surrounding narrative is called a hybrid media presentation. Numerous hybrid media presentations can be found in the field of docutainment. The film March of the penguins (Darondeau, Lioud, Priou, Jacquet, & Fessler, 2005), for example, embeds information about the emperor penguins of Antarctica into a dramatic story about their journey from the ocean to their inland breeding grounds. Another example is the German documentary series TerraX in which information about archaeological topics or historical episodes is embedded into a suspenseful detective story.

However, do hybrid media presentations meet these expectations with regard to knowledge acquisition? At present, only few studies have empirically addressed the question of how educational contents embedded into a narrative are cognitively processed and what is learned and remembered from them. To shed more light on this issue, two studies were conducted examining the processing of hybrid television documentaries that embed archaeological and historical contents into a narrative.

1.1. Processing hybrid media presentations: the narrative distance effect and transportation

The status of narrative formats for information presentation has been discussed controversially in educational psychology. On the one hand, several researchers have presented evidence that argues against the use of narrative embedding and narrative anecdotes in learning situations. For example, Garner, Gillingham, and White (1989), Harp and Maslich (2005), and Harp and Mayer (1998) added narrative anecdotes to learning material and compared this to learning material without these anecdotes. They concluded that the entertaining and seductive quality of the narrative anecdotes distracts learners’ attention from the facts to be learned. In contrast, others have argued in favor of the use of narratives when communicating science to the non-scientific community (e.g., Millar & Osborne, 1998; Norris, Guilbert, Smith, Hakimelahi, & Phillips, 2005). They postulated various advantages of narratives, including their potential to connect single scientific facts better (Folino, 2001; Martin & Miller, 1988; Wolfe & Mienko, 2007) and their potential...
to tie scientific facts better to prior knowledge and experience (Martin & Brouwer, 1991; Wilson, 2002), both potentials relating to the episodic structure of narratives. In line with this notion, the Jasper Project (The Cognitive and Technology Group at Vanderbilt, 1997) embedded problem solving tasks from different areas into narratives that were presented on video. Classes using the Jasper materials performed better in problem solving than classes that did not use the videos (Hickey, Moore, & Pellegrino, 2001). In addition, learners using the Jasper narratives were better able to distinguish between relevant and irrelevant information and were better at formulating the problem of a different video-based problem task than learners who were not presented with these narratives (Van Haneghan, Barron, Young, Williams, Vye, 1992).

While the Jasper videos were embedded into a curricular context with predefined learning goals, teacher guidance, and testing (for a similar approach see Michel, Roebers, & Schneider, 2007), few other researchers have discussed the use of hybrid media presentations for knowledge acquisition in informal settings without these typical characteristics of school learning. While students are required to process curriculum-based material with a focus on its educational contents, recipients in informal contexts are free to choose between two modes of reception: processing with a focus on the educational contents or processing with a focus on the surrounding narrative. In his Capacity Model of Children's Comprehension of Educational Content on Television, which has been developed with pre-school television programs such as Cro (Richardson, 1993) or Sesame Street in mind, Fisch (2000) assumes that both parts of the hybrid media presentation, the narrative and the educational contents, have to be processed simultaneously, and hence, compete for limited working memory resources. Fisch (2000) postulates that under these conditions, more resources will be allocated to the processing of the narrative than to the processing of the educational contents.

The narrative which surrounds the educational contents in hybrid media presentations is structured in an episodic manner, describing a series of events or activities that belong “to the same chronology from beginning to end and share the involvement of at least one [group of] character[s]” (Abbott, 2008, p. 14). Thus, in order to understand the narrative, recipients focus selectively on those story elements that are crucial to the development of the story (Cowen, 1988; Trabasso & Sperry, 1985). They extract information with regard to space, time, protagonists, causality, and intentionality (Zwaan, Langston, & Graesser, 1995) in order to create a mental model of the narrative, thereby making inferences on the basis of prior knowledge about narratives (e.g., their structure), general world knowledge (e.g., characteristics of typical settings or character’s intentions and goals), and media-specific forms of presentation (Ohler, 1994).

However, while processing the narrative of a hybrid media presentation, recipients are assumed to pay less attention to other information that is less relevant to the development of the narrative (Fisch, 2000). Hence, educational contents which are closely linked to the narrative plotline should be learned better than educational contents that are distant to the narrative plotline, a phenomenon that Fisch (2000) terms the narrative distance effect. This idea seems to be intuitively plausible. However, to the best of our knowledge, the narrative distance effect has not yet been validated empirically. Furthermore, Fisch (2000) discusses the narrative distance effect in the context of television series with preschoolers as the target audience. It remains, however, an open question whether this effect can be found in adult viewers.

Another important characteristic of processing a narrative besides the narrative distance effect is that it typically evokes a specific type of experience that has not been observed with other types of information presentations, namely, the feeling of being transported into and taking part in the narrative world – an experience which has been termed transportation (Gerrig, 1993; Green & Brock, 2002). It is defined as “a convergent process, where all of the person’s mental systems and capacities become focused on the events occurring in the narrative” (Green & Brock, 2002). Thereby, the recipients “lose track of time, fail to notice events going on around them, and experience vivid mental images of settings and characters” (Green, Kass, Carrey, Herzig, Feeney, & Sabini, 2008, p. 513). Busselle and Bilandzic (2008) postulated that the feeling of transportation is closely related to the extent to which a recipient becomes absorbed in the activity of constructing a mental model of the narrative. The more fluently and easily this mental model is created, the greater the transportation recipients will experience. It is also more likely to occur with information presentations that are organized narratively because transportation presupposes the description of a situation and an unfolding chain of events in spatiotemporal terms. Therefore, in the case of hybrid media presentations, which can be processed either in a narrative mode or with a focus on educational contents independent of the narrative, reports of transportation can be considered a second indicator for narrative processing of hybrid media presentations.

1.2. Factors that influence narrative processing of hybrid media presentations: reception goals and re-enactments

Both the narrative distance effect and transportation imply that narrative processing of hybrid media presentations is not a dichotomous “all-or-nothing” mode of reception, but should rather be conceived as a continuum that allows for “more or less” narrative processing. Therefore, the extent to which a given hybrid media presentation is processed narratively should be influenced by a number of factors, including both characteristics of the medium and of the recipients. The present study thereby focuses especially on re-enactments of past cultures in archaeological television documentaries and on the recipients’ reception goals they have when confronted with such hybrid media presentations.

First, narrative and educational contents in hybrid media presentations can be presented either verbally, or the verbal presentation can be accompanied by a visualization. In the case of history or archaeology, an accompanying visualization is often implemented by re-enactment, that is, a quasi-authentic staging of past events by professional actors at historical locations and with historical costumes. In comparison to a purely auditive presentation, in which recipients would have to imagine the past cultures on their own, re-enactments provide the viewers with ready-made images of past events, thereby relieving the viewers of the resource-demanding process of generating mental images on their own. This relief should facilitate narrative processing because the reduced cognitive load (Leutner, Leopold, & Sumfleth, 2009) should allow for a more fluent processing, which in turn, should lead to an enhanced experience of transportation (Busselle & Bilandzic, 2008).

The extent to which transportation is experienced during narrative processing of hybrid media presentations is also influenced by characteristics of the recipients. For instance, visual imagery ability, trait absorption, and prior involvement in the topic of the film have been postulated in the literature to enhance transportation. Although research (Sheehan, 1967; Sheehan & McConkey, 1982) suggests that even persons with low imagery propensity may experience images in response to an especially vivid description in a narrative, it is nevertheless assumed that visual imagery ability produces some variance in transportation (Green & Brock, 2002). Similarly, trait absorption, defined as a “disposition for having episodes of ‘total’ attention that fully engage one’s representational (i.e., perceptual, enactive, imaginative, and ideational) resources”
and interests perceived relevance of the object based on inherent needs, values, and interests” (Zaichkowsky, 1985, p. 342), may also predispose the viewer to be transported into the world presented by the narrative. All these recipients’ characteristics must be considered when examining transportation as an indicator of narrative processing.

Second, with regard to the reception goals of the recipients, Fisch (2000) asserts that the predominance of narrative processing can be overcome if viewers watch a program for the purpose of learning or if there is any other factor that makes the educational content more salient to the viewer. Under these conditions, a greater proportion of working memory resources should be allocated voluntarily to the educational contents. During elaboration of the educational contents, inferences may then be drawn based on prior knowledge about the thematic aspects of the contents. The more prior knowledge the recipient has about the narrative, the better the transportation. The different processing with a learning purpose as postulated by Fisch (2000) is in line with research about the influence of different reception goals on the processing of learning material (Narvaez, van den Broek, & Ruiz, 1984). Narvaez et al. (1999) showed that recipients involve prior knowledge structures more strongly under the condition of having a learning purpose compared to having an entertainment purpose.

Salomon and Leigh (1984) were able to show in their second study, that the recipients’ amount of invested mental effort (AIME = Amount of Invested Mental Effort) is greater under the condition of having a learning purpose compared to having an entertainment purpose. However, neither study was able to show that this also improves knowledge acquisition. Hence, for successful learning, motivation, and mental effort alone are not sufficient. In fact, mental effort must be invested into appropriate processing strategies. However, the relationship between processing strategies, reception goals, AIME, and knowledge acquisition is not yet clear and has not been assessed empirically with hybrid media formats either.

1.3. Hypotheses

We hypothesized that (H1) hybrid archaeological television documentaries, in which educational contents are embedded into a curiosity- and suspense-evoking narrative, will be processed predominantly in a narrative manner. This narrative mode of processing should reveal itself by a subjective feeling of transportation during the reception of the documentary, reaching at least a moderate level (H1a, Experiment 1 & 2), and by a narrative distance effect, that is, a better memory for educational facts which are closely linked to the narrative plotline than for distant facts (H1b, Experiment 2).

Furthermore, it was hypothesized that narrative processing should be influenced by several factors. In particular, we expected that narrative processing as indicated by transportation should be greater for documentaries with a large amount of ready-made images of the past period in the form of re-enactments (H2, Experiment 1). It was also expected that narrative processing (indicated by the narrative distance effect and by transportation) will be reduced under an explicit learning instruction (H3a, Experiment 2), while the amount of invested mental effort (AIME) will be increased (H3b, Experiment 2).

These assumptions were examined in two experiments. The first one focused on transportation as an indicator of narrative processing of hybrid documentaries and how it is influenced by the occurrence of re-enactments in the film. The second experiment focused on both transportation and on the narrative distance effect as a second indicator of narrative processing, and further, how both are influenced by reception goals. In both experiments, we also took into account several individual predispositions that may enhance transportation: visual imagery ability, trait absorption, and prior involvement in the documentary content.

2. Experiment 1

In Experiment 1, three different archaeological documentaries were presented to groups of viewers in two different versions: one with and one without re-enactments. It was predicted that the participants experience at least a moderate level of transportation (H1a: transportation at least moderate) and that documentaries with re-enactments lead to higher transportation than documentaries without re-enactments (H2: re-enactments enhance transportation). In addition, the recipients’ visual imagery ability, trait absorption, and prior involvement in the film topics were considered as control variables in the analysis.

2.1. Method

2.1.1. Participants and design

Of the 234 students from various disciplines who participated in the experiment, data from n = 212 participants, 63 (29.7%) males and 149 (70.3%) females, aged between 18 and 45 (M = 24.40, SD = 4.25), were analyzed. The 22 participants who were excluded from analysis were students of archaeology, history, or cultural anthropology (7 participants), knew some or all of the material from television (6 participants), or had already visited the archaeological excavations presented in the material (9 participants). All participants were German native speakers. There was a 2 × 3 between-subject design with re-enactment (with vs. without) and film content (Hattusa vs. Piramesse vs. Tucume) as variables, resulting in six different conditions.

2.1.2. Material

A pool of 90 hybrid archaeological television documentaries containing re-enactments was collected from German television channels and scanned for the following selection criteria: typicality of format, archaeological and historical topics that are neither part of the German school curriculum nor common in archaeological documentaries, significant number of re-enactments, and quality of re-enactments. Thus, three typical television documentaries that had been broadcasted on the German public television in 2007 were selected. All of them were from the same documentary series named ZDF-Expedition – Versunkene Metropolen (ZDF Expedition – Lost Metropolises). Hence, the films were similar with regard to production style and thematic scope, which was about lost cities and their cultures: Hattusa, the capital of the Hittites (Wilson, Moroni, & Lippert, 2007); Piramesse, the city of Ramses II (Everest, Lippert, & Moroni, 2007); and Tucume, a pyramid site in Peru that had been temporally governed by the Incas (Laverty, Moroni, & Lippert, 2007). Each documentary told the story about the rise and fall of one past city and its culture, evidenced by archaeological facts and written historical accounts.

Scenes from the excavation areas, archaeological objects, computer-generated or animated maps, experts at work, and expert interviews alternated with re-enactments, the latter comprising about 30–40% of a total of 30–35 min. Re-enactments were highly similar across the documentaries. They were staged...
plays in which the behavior of the actors was scripted. They presented people from past periods in certain situations such that the viewers could observe their characteristics, their visual appearance, and their conditions of living; the actors also presented activities of these people and events with causes and consequences, thus telling the story visually. The re-enactments were acted out without using speech and played by non-professional actors. Computer-generated images were used to recreate parts of the most important buildings as a setting for the re-enactments. An off-screen narrator guided the recipients through the documentaries, which focused on the cities and their cultures rather than on particular persons.

For the control condition, the re-enactment scenes were cut out from the original video track and replaced with other appropriate material from the same documentary, such as scenes of the excavation area or archaeological objects. From the audio track, only sounds associated with the re-enactments (e.g., the clashing of swords) were deleted. However, accompanying audio information, provided by an off-screen narrator, was not altered. To ensure that the resulting control versions were of equal filmic quality as the original versions, three independent expert raters judged the documentaries with regard to six production aspects and five content aspects of filmic quality on a bipolar scale. Production aspects of filmic quality were, e.g., the vividness of imagery, repetition of pictures, aesthetics, text picture discrepancies, informational content of pictures, and support of narration by pictures. Content aspects of filmic quality were objectivity, authenticity, emotionalinity, density of information, and conveyance of insights into the past period. For each of the three films, raters were in agreement on more than 93% of all eleven aspects that there was no difference between the experimental condition and the control condition.

2.1.3. Measures

2.1.3.1. Transportation. This construct is typically assessed by questionnaires because it is defined as the subjective experience of being situated in the story world. The Transportation Scale by Green and Brock (2000) is the most common instrument and has been used in a number of studies (e.g., Green, 2004; Green & Brock, 2000; Vaughn, Hesse, Petkova, & Trudeau, 2009). Green and Brock (2000) reported sufficient reliability (Cronbach’s α = .76) for the full scale, assessed with a sample of n = 274 undergraduates. For the present purpose, an altered version of the German adaptation of the scale on film reception (Appel, 2006) was used. The scale consisted of 15 items, for example: I could picture myself in the historical period presented in the film, I was mentally involved in the historical period presented while watching the film or The historical period presented in the film affected me emotionally (Items of all questionnaires used in the present work were given to participants in German). Answers were given on a 7-point Likert scale, ranging from does not apply to me at all (1) to absolutely apply to me (7). Sums were calculated for all items, ranging from 15 to 105 points.

2.1.3.2. Visual imagery ability. To measure visual imagery ability, the Vividness of Visual Imagery Questionnaire (VVIQ; Marks, 1973) was translated into German. Participants were asked to imagine four scenes, for example: Think of a rising sun, Consider carefully the picture that comes before your mind’s eye, including four details, respectively, thus resulting in a total of 16 items, for example: The sun is rising above the horizon into a hazy sky. For each item, participants were asked to mark one out of five answers representing different degrees of vividness of imagery they had experienced during their task, ranging from no image at all, you only “know” that you are thinking of the object (1) to perfectly clear and as vivid as normal vision (5). Mean scores were calculated, ranging from 1 to 5 points.

2.1.3.3. Trait absorption. Trait absorption as a “disposition for having episodes of ‘total’ attention that fully engage one’s representational (i.e., perceptual, entitative, imaginative, and ideational) resources” (Tellegen & Atkinson, 1974, p. 268) was assessed with the German adaptation of the Tellegen Absorption Scale (TABS; Tellegen & Atkinson, 1974) by Ritz, Maß, and Dahme (1993a, 1993b). The scale contains 34 items, for example: If I wish, I can imagine that my body is so heavy that I could not move it if I wanted to or The sound of a voice can be so fascinating to me that I can just go on listening to it. Items are answered on a five-point Likert scale, ranging from does not apply to me (0) to absolutely apply to me (4). Sum scores were calculated, ranging from 0 to 136 points.

2.1.3.4. Prior involvement. In the present experiment, involvement was understood as “a person’s perceived relevance of the object based on inherent needs, values, and interests.” (Zaichkowski, 1985, p. 342). Therefore, involvement was assessed with the revised Personal Involvement Inventory (PII) by Zaichkowski (1994), which had been translated into German. The Hittites, Egyptians, or Incas were evaluated on ten 7-point bipolar dimensions, for example: important — unimportant, boring — interesting or means nothing to me — means a lot to me. Sum scores were calculated, ranging from 10 to 70 points.

2.1.4. Procedure

The experiment took place in a local cinema. With the highly immersive cinema, we attempted to minimize the demand characteristics of a laboratory setting and to create an informal leisure setting in order to enhance ecological validity. Participants were randomly assigned to 12 groups of approximately 20 people. Each of the six conditions was conducted twice. The 12 groups were invited to the cinema, 12 mornings in succession, when the cinema was closed to the public. The participants took a seat in the middle rows and filled out the first questionnaire measuring visual imagery ability, trait absorption, and prior involvement in the topic of the film they were going to see. Then, participants watched one of the six films, depending on the condition they had been assigned to. After watching the film, participants answered the second questionnaire containing measures of transportation, assessment of the exclusion criteria explained above, and demographic variables (age, sex, and course of studies). The whole procedure took approximately one hour.

2.2. Results

A 2 × 3 analysis of variance (ANCOVA) was calculated with re-enactment (with vs. without) and film content (Hattusa vs. Piramesse vs. Tucume) as between-subject factors and visual imagery ability, trait absorption, and prior involvement in the film topic as covariates. Nine of the 212 participants had to be excluded from the analysis because they had not answered all of the questionnaires assessing the variables entered into the analysis. Transportation was normally distributed within the six conditions. The two experimental conditions (without vs. with re-enactment) did not differ significantly with regard to participants’ visual imagery ability (r²(201) = 1.51, ns), trait absorption (r²(201) = −.05, ns), and prior involvement in the film topic (r²(201) = 1.96, ns). Visual imagery ability (F(1, 203) = 11.63, p < .001, ηp² = .057), trait absorption (F(1, 203) = 5.80, p < .05, ηp² = .029), and prior involvement in the topic of the film (F(1, 203) = 20.48, p < .001, ηp² = .095) were significant covariates. As assumed, all three variables were associated with transportation. Correlations were as follows: visual imagery ability and trait absorption r = −.37 (p < .001); visual imagery ability and prior involvement in the film topic r = .22 (p < .001); trait absorption and prior involvement in the film topic r = .16 (p < .05).
Transportation across all participants ($M = 56.63, SD = 13.86$) was significantly higher than the lower third of the scale which is under 45 points ($t(208) = 12.13, p < .001$ overall; $t(101) = 6.52, p < .001$ without re-enactment; $t(106) = 11.11, p < .001$ with re-enactment), indicating that transportation was at least moderate. Individual values of transportation ranged from 26 to 90 points. Results further showed a significant main effect of re-enactments on transportation, independent of the influence of the covariates, $F(1, 203) = 13.17, p < .001, \eta_p^2 = .064$. Participants showed higher transportation levels when watching documentaries with re-enactments ($M = 58.77, SD = 12.73$) than when watching the documentaries without re-enactments ($M = 54.42, SD = 14.64$). There was no significant main effect of film content and no significant interaction between film content and re-enactments on transportation. Internal consistency (Cronbach’s Alpha) of the transportation scale was $\alpha = .86$. The present results therefore confirm Hypothesis H1a (transportation at least moderate) and Hypothesis H2 (re-enactments enhance transportation).

2.3. Discussion

The results showed that during the processing of hybrid archaeological television documentaries, viewers experience at least moderate mean levels of transportation of $M = 56.63$. This sum score corresponds to a mean score of $M = 3.78$. In comparison, studies examining pure narratives have reported slightly higher levels of transportation. Green (2004), for instance, reported a mean value of transportation of $M = 4.21$ for participants who had no personal experience with the narrative topic. In this study, she measured transportation into a pure fictional narrative presented as text. Thus, not surprisingly, hybrid documentaries, which combine narratives and educational contents and which are announced as serious programs, do not reach the levels of transportation reported for purely narrative literature or maybe also feature films. Taking into account the midpoint (60 points) of the transportation scale, the slightly better narrative quality of Green’s (2004) material, along with the fact that the individual transportation values in the present study covered nearly the entire possible range of the scale, the present mean transportation value of $M = 56.63$ can be interpreted as medium in size. Hence, the results show that despite their status as serious documentaries, hybrid media presentations as used in the present study are processed in a narrative manner, at least to a certain extent. In line with H1a (transportation at least moderate) and Fisch (2000), and to the best of our knowledge, Experiment 1 provides the first empirical evidence that the reception of hybrid documentaries involves narrative processing.

Additionally, the data show that documentaries including ready-made images in the form of re-enactments lead to higher transportation, compared to those without such visualizations. These re-enactments may have relieved the recipients from the resource-demanding process of imagining the past periods on their own, thus contributing to a more fluent generation of mental models of the narrative and therefore to an enhanced experience of transportation. This result is in line with H2 (re-enactments enhance transportation) and with Busselle and Bilandzic (2008), who postulate that the fluent generation of the mental model of the narrative is associated with transportation. The present findings are also in line with the notion that transportation is a process varying gradually in intensity, depending on characteristics of the media presentation. However, characteristics of the media presentation are not the only factor affecting transportation. The results also show that certain personal characteristics are significantly correlated with transportation. In particular, participants with higher visual imagery ability, greater trait absorption, and higher prior involvement in the topic of the film were more fully transported into the past period. These results are in line with previous assumptions (Green, 2004; Green & Brock, 2000; Green & Brock, 2002; Green as cited in Green & Brock, 2002, Sheehan, 1967; Sheehan & McConkey, 1982; Tan, 1996). Notably, the positive correlation between visual imagery ability and transportation stresses the general importance of the imagery component of transportation as well as the importance of visual imagery ability for transportation with audiovisual material.

3. Experiment 2

Experiment 2 was designed to validate and extend the findings of Experiment 1. Therefore, the hypothesis that participants experience at least a moderate level of transportation (H1a: transportation at least moderate) was tested again. While the experience of transportation is certainly indicative of narrative processing, it is solely based on self-reports. For this reason, Experiment 2 included an objective measure as a second marker of narrative processing, namely, differences in the acquisition of educational contents which were either close or distant to the narrative plotline. That is, if a hybrid documentary is processed in a narrative manner, educational contents close to the narrative plotline should be remembered better in a knowledge test than distant educational contents (H1b: narrative distance effect).

As in Experiment 1, we expected narrative processing to vary according to an additional factor. In line with Fisch (2000), narrative processing was expected to be more pronounced for recipients having an entertainment goal compared to recipients having an information goal, both in terms of narrative distance and transportation (H3a: information goal reduces narrative processing). Additionally, we expected viewers with an information goal to invest higher amounts of mental effort than viewers watching the documentaries with the purpose of being entertained (H3b: information goal enhances AIME).

For the present experiment, two of the three documentaries from the first experiment (Hattusa and Tucume) were used. The single historical educational facts included in the documentaries were structured thematically and at the same time related to the narrative plotline to a different degree, thus allowing for testing of the narrative distance effect. Each of the documentaries was presented to two groups of viewers who were instructed with different reception goals. One group was instructed to watch the documentary for entertainment purposes and the other group was instructed to watch it in order to inform themselves about the ancient period. One week later, viewers’ knowledge of the film content was tested.

3.1. Method

3.1.1. Participants and design

Of the 82 students from various disciplines who participated in the present experiment, data from $n = 70$ participants, 24 (34.3%) males and 46 (65.7%) females, aged between 19 and 37 years ($M = 24.17, SD = 3.37$), were analyzed. The 12 participants who were excluded from analysis had either misunderstood the entertainment instruction (which was controlled for by a manipulation check at the end of the experiment; 9 participants), or knew some or all of the material from television (2 participants), or had already visited the archaeological excavations presented in the material (1 subject). As in the first experiment, all participants were German native speakers and were not studying archaeology, history, or cultural anthropology. Analyses were based on a $2 \times 2 \times 2$ design with narrative distance (close vs. distant) as within-subject variable.
and with instruction (entertainment vs. information) and film content (Hattusa vs. Tucume) as between-subject variables.

3.1.2. Material

3.1.2.1. Documentaries. Two of the archaeological television documentaries used in the first experiment, namely, the documentary about Hattusa and Tucume were presented in their original form, including re-enactment scenes. Each documentary told the dramatic story about the rise and fall of one past city and its culture (= narrative plotline). Within this narrative structure, archaeological and historical facts were presented, addressing topics such as religion or the military system of the past culture (= thematically structured educational contents). Hence, the single archaeological and historical facts presented are not only (more or less strongly) linked to the narrative plotline, but are also thematically structured.

3.1.2.2. Instructions. Two different written instructions were administered prior to viewing the films. In the entertainment instruction, participants were requested to watch the following film for entertainment. In the information instruction, participants were asked to watch the subsequent film in order to inform themselves about the historical period depicted. Participants were unaware that, one week later, a knowledge acquisition test would follow as a second part of the experiment.

3.1.3. Measures

3.1.3.1. Knowledge acquisition test. Based on the educational facts both documentaries contained, a pool of items was generated for the films about Hattusa and Tucume, respectively. Next, for each film, the narrative plotline in terms of “those events that have causes and consequences leading from the opening to the closing” (Trabasso & van den Broek, 1985) was determined. In both films, this was the rise and fall of the particular metropolis. This analysis provided the basis for classifying the knowledge test items into two sets, namely, those about facts which were close versus those distant to the narrative plotline. From these sets, an equal number of items about close and distant facts were selected by the authors. Facts presented in the re-enactment parts of the film and in the parts without re-enactments were represented by an equal number of items. As a result, 12 items for each film, six of them asking for close facts (3 with and 3 without re-enactments) and six items asking for distant facts (3 with and 3 without re-enactments) were formulated.

The items, Which constructional characteristic made the wall around Hattusa more stable? and For what purpose did the Hittites drill holes into the bedrock?, for instance, are similar in topic and degree of detail. However, they differ with regard to their distance to the narrative plotline. The narrative plotline was defined as the causes and consequences leading to the rise and fall of the metropolis. The item, Which constructional characteristic made the wall around Hattusa more stable?, was classified as being about a close fact. It was presented at the beginning of the documentary, when an off-screen narrator talked about the reasons why Hattusa became such a powerful metropolis. The fact that chambers in the wall around Hattusa contributed causally to the fact that the city could not be taken and therefore to its rise indicates that this item contains a fact which is close to the narrative plotline about the rise and fall of Hattusa. It is relevant to the understanding of how Hattusa became such a powerful metropolis. The item, For what purpose did the Hittites drill holes into the bedrock?, was classified as being about a distant fact. The fact that the Hittites drilled holes into the bedrock to stick in logs in order to facilitate the transportation of building material into remote areas was addressed in the documentary a few sentences before the fact explained above.

At this point in the documentary, the narrative also dealt with the reasons why Hattusa became such a powerful metropolis. Drilling holes into the bedrock and sticking logs into it is causally relevant to understanding how the Hittites could build their city on a clifffy place but is not causally related to the narrative with respect to the rise and fall of Hattusa at this particular point.

Inter-rater reliability (Krippendorff’s Alpha) between an independent rater and the authors’ prior classification of close and distant facts was $\alpha = .75$ across both films. To ensure that the dimension of narrative distance is not confounded with the importance of the facts to the thematic structure of the educational contents, an additional classification of the items with respect to their importance for various topics, such as religion or military system, was done showing that the authors classified all items to be important for the related topics. An independent rater confirmed this classification with an agreement of 91.7%. Therefore, it can be concluded that the distance of the facts to the narrative plotline was not confounded with their importance to the thematic structure of the educational contents.

The items, formulated as open questions, were presented in random order in the knowledge acquisition tests. Answers ranged from one to five partial solutions per item, which were weighted depending on the maximum number of possible partial solutions for a particular item. The maximum score for each item was therefore 1 point. Mean scores for all items about close facts and for all items about distant facts were calculated. This means that the knowledge tests about Hattusa and Tucume were comparable.

A control study was conducted to check for absence of any prior differences between the items independent of structural aspects of the documentaries. The scenes of the documentaries that corresponded to the items of the knowledge acquisition test were cut out of the documentaries and presented randomly in two blocks (one block per film) to a group of 20 participants. The participants were similar to the subjects in Experiment 2 in terms of exclusion criteria and demographic variables. This scrambling procedure abolished the connection of the educational facts to the narrative plotline and to the thematical aspects. Thus, the contents could be elaborated independent of narrative distance and of their importance to the thematical aspects. After watching these scrambled parts of the films, participants answered the items of the knowledge acquisition test. Paired t-tests were calculated, using an alpha level of .20 because the null hypothesis was being tested. Results showed no significant differences in difficulty between items asking for close (M = .65; SD = .23) and distant facts (M = .63; SD = .18) across both films (p = .61), between the close (M = .64; SD = .24) and distant (M = .62; SD = .21) items about the Hattusa film (p = .68), and between the close (M = .65; SD = .23) and distant (M = .63; SD = .20) items about the Tucume film (p = .60). All items collapsed across both films had a mean score of M = .60 (SD = .20) and can therefore be considered to be of medium difficulty.

The knowledge acquisition tests were analyzed by two raters. The tests from one third of the participants in each condition were analyzed by both raters separately and an inter-rater reliability coefficient (Krippendorff’s Alpha between the results of the two raters) was calculated. With $\alpha = .98$, inter-rater reliability was deemed good.

3.1.3.2. Amount of invested mental effort (AIME). AIME was assessed with a questionnaire containing four items which were formulated on the basis of the NASA-TLX (Hart & Staveland, 1988) and various other studies (Cennamo, Savenye, & Smith, 1991; Salomon, 1984; Salomon & Leigh, 1984). The items were: 1. How hard did you try to understand the film? 2. How much did you concentrate during the film? 3. How attentive were you in following the film? 4. How much cognitive effort did you invest during the film? All items were answered on a 5-point Likert scale ranging from not at all (1) to very
much (5). Mean scores were calculated, ranging from 1 to 5 points. An item analysis of the four-item AIME questionnaire was performed, yielding an acceptable internal consistency of \( \alpha = .74 \). Discriminatory power for the single items ranged from \( r_{it} = .71 \) to \( r_{it} = .82 \).

3.1.3.3. Transportation and control variables. We assessed transportation, visual imagery ability, trait absorption, and prior involvement with the same instruments as in Experiment 1.

3.1.4. Procedure

Participants were randomly assigned to the four conditions, each group including approximately 15–20 people representing the four conditions. The procedure was the same as in Experiment 1 apart from the following exceptions: After answering the first questionnaire, participants read one of the two instructions described above (information or entertainment) and then watched one of the two films (Hattusa or Tucume). After the film, participants were asked to answer the second questionnaire containing additionally a measure of AIME.

One week later, participants came to a laboratory at the authors’ research institute to answer a questionnaire about the film they had watched in the cinema. The knowledge acquisition test had not been announced in the first part of the experiment. Participants who had received the entertainment instruction on the first day of the experiment had to answer an additional manipulation check question. They were reminded of the entertainment introduction from the first part of the experiment. After rereading the entertainment instruction, participants were informed that this introduction could be understood in different ways because the German word for to entertain oneself (sich unterhalten) can take on two meanings, namely, to enjoy the film or to talk about the film. They were asked how they had understood the introduction in the first part of the experiment. Participants could mark one of three answers: (1) watch the film for entertainment, (2) watch the film to talk with someone about it afterwards, and (3) other. When the participants marked the second answer or wrote for number three anything different from answer number one, they were excluded from the analysis. This procedure was necessary because during the first part of the experiment it became clear that a few participants had misunderstood the instruction; these participants were then excluded from the analyses.

3.2. Results

3.2.1. Influence of instruction on knowledge acquisition for close and distant facts

A \( 2 \times 2 \times 2 \) analysis of variance, with instruction (information vs. entertainment) and film (Hattusa vs. Tucume) as between-subject variables, and narrative distance (close vs. distant) as within-subject variable, was calculated across all 70 participants. Knowledge acquisition of close and distant facts as well as knowledge acquisition across all types of facts (close and distant together) was normally distributed within all conditions. Results showed a significant main effect of narrative distance on knowledge acquisition, \( F(1, 66) = 46.40, p < .001, \eta_p^2 = .413 \). Participants recalled significantly more close facts (\( M = 46, SD = .22 \)) than distant facts (\( M = 31, SD = .17 \)). Additionally, there was a significant main effect of film on knowledge acquisition, \( F(1, 66) = 10.91, p < .01, \eta_p^2 = .142 \). Participants recalled significantly more facts from the film about Hattusa (\( M = 45, SD = .21 \)) than from the film about Tucume (\( M = 32, SD = .17 \)). There were no other significant main effects and no significant interactions in this analysis, in particular, no effect of instruction. That is, the narrative distance effect occurred as expected (H1b: narrative distance effect), but was not influenced by reception goals (H3a: information goal reduces narrative processing).

3.2.2. Influence of instruction on AIME

A \( 2 \times 2 \) analysis of variance was calculated with instruction (information vs. entertainment) and film (Hattusa vs. Tucume) as between-subject variables across all 70 participants. AIME was normally distributed within the four conditions. Results showed a significant main effect of instruction on AIME, \( F(1, 66) = 4.85, p < .05, \eta_p^2 = .068 \). Participants who watched the films for information (\( M = 4.06, SD = .48 \)) showed significantly higher AIME than participants who watched the films for entertainment purposes (\( M = 3.77, SD = .60 \)). There was no significant main effect of film and no significant interaction between film and instruction on AIME. Therefore, the results confirmed the expected influence of instruction on AIME (H3b: information goal enhances AIME).

3.2.3. Influence of instruction on transportation

A \( 2 \times 2 \) analysis of variance (ANCOVA) was calculated across 68 of the 70 participants, with instruction (information vs. entertainment) and film (Hattusa vs. Tucume) as between-subject variables and visual imagery ability, trait absorption, and prior involvement in the film topic as covariates. Two participants were excluded from the analysis because they did not answer all the questionnaires assessing the variables included in the analysis. Transportation was normally distributed within the four conditions. Furthermore, the participants did not differ significantly between the two experimental conditions (information vs. entertainment) with regard to visual imagery ability (\( t(66) = 1.12, ns \)), trait absorption (\( t(66) = .65, ns \)), or prior involvement in the film topic (\( t(66) = -.08, ns \)).

Results showed that visual imagery ability (\( p < .01 \)) and prior involvement in the film topic (\( p < .05 \)) influenced transportation significantly, while trait absorption did not. As assumed, visual imagery ability and prior involvement enhanced transportation. The correlations among the recipients’ characteristics were as follows: visual imagery ability and absorption \( r = .38 (p < .001) \), visual imagery ability and prior involvement in the film topic \( r = .04 (p > .05) \), trait absorption and prior involvement in the film topic \( r = .32 (p < .01) \).

Transportation across all participants (\( M = 56.06; SD = 13.78 \)) was significantly higher than the lower third of the scale which under 45 points (\( t(69) = 6.44, p < .001 \) overall; \( t(33) = 4.89, p < .001 \) with entertainment instruction; \( t(35) = 4.18, p < .001 \) with information instruction), indicating that transportation was at least moderate. Individual values of transportation ranged from 28 to 90 points. Furthermore, results showed neither a significant main effect of instruction, nor a significant main effect of film, nor any significant interaction independent of the influence of the covariates. Transportation was significantly correlated with knowledge acquisition of close, \( r = .26 (p < .05) \), and distant facts, \( r = .25 (p < .05) \). Hence, transportation occurred as expected (H1a: transportation at least moderate), but was not influenced by reception goals (H3a: information goal reduces narrative processing).

3.3. Discussion

We assumed that hybrid documentaries are processed in a narrative manner. Hence, it was hypothesized that facts close to the narrative plotline should be remembered better than facts distant to the narrative plotline (H1b: narrative distance effect). This hypothesis was confirmed in the present study: Participants scored higher for close facts than for distant facts in a knowledge acquisition test administered one week later. As in Experiment 1, participants revealed at least moderate mean levels of transportation, additionally indicating narrative processing of the documentaries (H1a:
transportation at least moderate). The feeling of transportation was positively related to knowledge acquisition. Taken together, these findings indicate that the majority of the viewers watched hybrid documentaries in a narrative processing mode.

It was further assumed that an information goal, that is, to watch the documentary in order to inform oneself about the ancient period, would reduce the narrative distance effect, because such a learning goal should activate a different processing mode in which cognitive resources are allocated voluntarily to the processing of the thematically structured educational contents (H3a: information goal reduces narrative processing). This change in allocation of resources should reduce the narrative distance effect in favor of a non-narrative and thematically focused reception mode. However, no differences were found between the reception goals with regard to the narrative distance effect. In both groups, knowledge acquisition of close facts was significantly better than knowledge acquisition of distant facts, indicating that both groups processed the film in a narrative mode, irrespective of instruction. The finding that instruction also failed to influence transportation as a second indicator of narrative processing supports the interpretation that narrative processing occurred irrespectively of reception goals. Furthermore, although reception goals did not influence knowledge acquisition, participants with an information goal invested a greater mental effort than participants with an entertainment goal (H3b: information goal enhances AIME). These results echo some findings by Salomon and Leigh (1984), who also found that despite the greater mental effort invested by participants with an information goal (compared to an entertainment goal), they did not have an advantage in terms of knowledge acquisition.

Finally, the findings from Experiment 1 that certain individual characteristics of the recipients are associated with transportation could be partly replicated. In particular, both visual imagery ability and prior involvement in the topic of the film led to increased feelings of transportation. In contrast to Experiment 1, trait absorption did not have an influence on transportation. The latter was unexpected, because only slight alterations had been made compared to the first experiment.

4. General discussion

In informal learning settings such as television, numerous examples of docuainment programs can be found that combine educational content with narratives to fulfill an educational mission and at the same time make scientific topics more enjoyable and engaging. In this context, the present two experiments addressed the question of how such hybrid media presentations are processed. The results show that recipients tend to process hybrid television documentaries predominantly in a narrative mode of reception. This reception mode is indicated by the finding that in both studies, viewers reported the experience of being transported into the narrative world while watching the films. Additionally, as a further indicator of narrative processing, a narrative distance effect was observed, that is, educational facts that are closely linked to the narrative plotline were remembered better than distant facts.

The present results are in line with the assumptions of Fisch’s (2000) capacity model of comprehension of educational content on television. Basically, the model proposes that in the case of hybrid media presentations, viewers prioritize the allocation of their cognitive resources in such a way that the narrative is processed first, whereas those educational contents which are less important to the narrative plotline are only processed if sufficient cognitive resources are left. The present study extends this model by providing two empirical markers of narrative processing, namely, the experience of being transported and the memory advantage of facts that are closely related to the narrative plotline (narrative distance effect). It also supplements Fisch’s (2000) model by demonstrating that its basic assumptions for younger children can be extended to adult students as well.

The present experiments also shed some light on several factors which could be shown to influence the processing of hybrid media presentations, namely, recipients’ processing goals and design characteristics of the presentation itself. First, contrary to Fisch’s (2000) assumption, no significant effect of reception goals on knowledge acquisition of close and distant facts was found in Experiment 2. Fisch (2000) asserts that the predominance of narrative processing can be overcome if viewers watch a program for the purpose of learning, or if any other factor makes the educational content more salient to the viewer. Under these conditions, a greater proportion of working memory resources should be allocated voluntarily to the contents relevant to the learning goal. However, Experiment 2 showed no differences with respect to the narrative distance effect or transportation between recipients with a learning goal and an entertainment goal, indicating that even the group with the information goal tended to process the films in a narrative mode. Furthermore, no effect of reception goals on knowledge acquisition could be shown, although recipients with a learning goal invested higher amounts of mental effort than recipients with an entertainment goal. This result requires explanation. It is in line with findings reported by Salomon and Leigh (1984), who also failed to observe advantages in terms of knowledge acquisition, despite the greater mental effort invested by participants with an information goal compared to participants with an entertainment goal. In our study, participants possibly invested their mental effort into processing strategies which were inappropriate for knowledge acquisition. Given our participants’ low prior knowledge of the archaeological and historical content, it is well possible that they lacked the prior knowledge necessary to build a knowledge structure from the thematically structured facts. Thus they may have been forced to process the information along the narrative plotline they were more familiar with. This line of reasoning is compatible with a study by Wolfe and Mienko (2007), who compared expository and narrative texts about the human circulatory system with regard to knowledge acquisition, thereby considering mediating influences of prior knowledge about this topic: They showed that for narrative texts, recall did not depend on prior knowledge about the educational content. This result indicates that narrative texts are processed with the concern to create a mental representation of the events described in the narrative, but less with the concern to integrate the educational contents into existing prior knowledge structures about the topic. Processing expository texts, on the other hand, seems to involve attempts to integrate the educational contents into prior knowledge structures, similar to having a learning goal. This interpretation is also consistent with the results by Narvaez et al. (1999), who showed that recipients with a study purpose acknowledged a lack of background knowledge more often than recipients with an entertainment purpose.

In our study, the participants of Experiment 2 had little prior knowledge about the educational contents of the film. It may be possible that the participants who focused on the thematically structured educational contents induced by the learning instruction had difficulty integrating the presented educational facts into their insufficiently established, prior knowledge structures about the educational contents. They then may have switched to the more appropriate narrative processing mode. Thereby, the narrative itself provided a pattern for an episodic mental structure the historical facts could be tied to, independent of prior knowledge structures about the educational contents. Further empirical research based
on a comparison between participants with low and high prior knowledge about the educational contents in question is necessary to test this assumption.

Second, the results also show that narrative processing of hybrid documentaries is influenced by characteristics of the media presentation. In particular, the first experiment demonstrated that re-enactments, which provide ready-made images and thus relieve the viewers from imagining the past periods on their own, facilitated the experience of transportation. This finding is compatible with the notion of Busselle and Bilandzic (2008) that transportation goes along with the fluent processing of a narrative. In terms of cognitive load theory (e.g., Sweller, van Merriënboer, & Paas, 1998), designing content for fluent processing means to reduce extraneous load which, in turn, frees cognitive resources for further elaboration. In the narrative mode of processing, however, such elaboration is mainly applied to those elements that are closely tied to the narrative plotline.

To sum up, hybrid documentary formats entertain their recipients by telling a curiosity- and suspense-evoking narrative and by enabling the enjoyable experience of transportation (Green, Brock, & Kaufman, 2004; Vorderer, Klimmt, & Ritterfeld, 2004), although this may occur to a slightly lesser extent than with full-fledged narrative films or feature films. Furthermore, hybrid documentary formats induce narrative processing, which means there is a selective elaboration of educational contents embedded in the narrative of the documentary. In addition, this kind of processing and selective elaboration seems to be hard to avoid for learners with little prior knowledge about the educational contents, even with explicit learning goals. Nevertheless, especially in learning settings in which recipients have little prior knowledge about the educational contents, as is often the case within informal learning settings, hybrid documentary formats seem to be an appropriate way to enable efficient knowledge acquisition independent of prior knowledge structures about the educational contents. Recipients with little prior knowledge about the educational contents in informal learning settings can be attracted to the media presentation, their attention can be maintained over a longer period of time, and they can be aided in knowledge acquisition by providing them with a curiosity- and suspense-evoking narrative for which they already have narrative-related prior knowledge and therefore can understand the educational contents in the light of the narrative presented.

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