

Narrative Elements in Expository Texts: A Corpus Study of Educational Textbooks

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Abstract

While the use of narrative elements in educational texts seems to be an adequate means to enhance students' engagement and comprehension, we know little about how and to what extent these elements are used in the present-day educational practice. In this quantitative corpus-based analysis, we chart how and when narrative elements are used in current Dutch educational texts ($N=999$). While educational texts have traditionally been considered prime exemplars of expository texts, we show that the distinction between the expository and narrative genre is not that strict in the educational domain: prototypical narrative elements – particularized events, experiencing characters, and landscapes of consciousness – occur in 45% of the corpus' texts. Their distribution varies between school subjects: while specific events, specific people, and their experiences are often at the heart of the to-be-learned information in history texts, narrativity is less present in the educational content of biology and geography texts. Instead publishers employ narrative-like strategies to make these texts more concrete and imaginable, such as the addition of fictitious characters and representative entities.

Keywords: narrativity, educational texts, concreteness, imaginability, quantitative corpus-based analysis

1 Introduction

In our daily lives, we come across all kinds of genres: we skim through newspapers, laugh about our friends' jokes, write grocery lists, listen to the latest pop songs, send e-mails to our colleagues, consult recipes for dinner, and watch the newest tv-series. 'Genre' denotes a classification system to distinguish between different types of spoken and written text. In the linguistic literature, many

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different genres have been categorized and described (for example, Biber & Conrad, 2009; Martin & Rose, 2008). However, broad theoretical consensus about the definition of specific genres is often lacking (Chandler, 1997). This is partly caused by the many different approaches to the study of genre. For instance, while some researchers define genres primarily on the basis of conventions (for example, themes or settings) and/or forms (for example, structure and style), others also consider the situational and social context in which texts are formulated (for a discussion on different approaches, see Chandler, 1997; Lee, 2001). In addition, the definition of a certain genre may vary across domains, cultures, and historical periods of time (cf. Biber & Conrad, 2009). Finally, the boundaries between genres tend to be ‘fuzzy’, as supergenres may be divided into subgenres in multiple ways (for example, “tv-series” into “crimes” or “drama”), and two or more genres may be merged into hybrid forms (for example, “romantic comedy”) (cf. Chandler, 1997; Santini, 2006). Therefore, for any study into genres, it is essential to clearly spell out its focus.

The current study focuses on the expository and narrative genre in the domain of Dutch educational texts. Traditionally, educational texts have been seen as prime exemplars of the expository genre, because they often introduce and explain new, subject-specific terms and/or concepts, such as the process of erosion in the geography text in (1).¹

- (1) Under the influence of plant roots and the weather, rocks crumble all year. This is called erosion. During the winter, the process of erosion often proceeds faster. The water in the cracks and crevices of the mountain freezes and as a result pieces of rock are released. They bounce down the slope and break into smaller pieces. In their fall they take other stones with them. And all those rocks roll into the valley.

(Meander, physical geography grade 5, p. 12)

However, not all Dutch educational texts prove to be fully expository (Sangers, Evers-Vermeul, Sanders & Hoeken, 2020). For example, the text in (2) presents a narrative about a prehistoric man named Iugas. This text, which is placed at the beginning of a new chapter in a history textbook, is used as an introduction to to-be-learned information about the Stone Age and Iceman Ötzi, who lived in this time period. The fictional character Iugas shows many similarities to Ötzi.

- (2) The mountain towers high above Iugas. Heavy clouds gather around the top. Just a little while and then the snow will fall. Too early, it is too early. He has to go further. Once he is over the mountain pass, he will be safe. A twinge of pain passes over his face. His chest hurts at the place where an arrowhead is stuck between his ribs. His shoulder hurts, also from an arrow. He was able to pull it out, but the wound still hurts. Iugas has nothing to take care of the wound. He gathers all his strength. Maybe he is still able to get over the mountain. As long as he keeps walking.

(Speurtocht, history grade 5, p. 8)

In addition, Dutch educational textbooks include hybrid texts, combining characteristics from both the expository and narrative genre. For instance, in the biology text in (3), to-be-learned information about the pollination of flowers is told by a forester, named Jan, who can be considered a narrative character.

- (3) An entomophilous flower needs insects for its pollination. A windflower uses the wind. “Windflowers don’t need to be noticeable to insects. That’s why they look different”, says forester Jan. “They have long stamens and large pistils. Those hang down from

¹ Throughout the paper, we represent excerpts from Dutch educational textbooks by their English translations.

the flowers. As long as the wind can get to them, that's the most important thing.”
(Argus Clou Natuur & Techniek, biology grade 5, p. 49)

Narrative elements such as characters seem to be included in educational texts as a strategy to make these texts more engaging and better comprehensible, considering that many Dutch students find their educational texts too boring to read and/or too difficult to understand (Dood, Gubbels & Segers, 2020; Gubbels, Netten & Verhoeven, 2017; Gubbels, van Langen, Maassen & Meelissen, 2019; Inspectorate of Education, 2017, 2020, 2021; Sangers et al., 2020). While the use of narrative elements seems to be an adequate means to solve these readability issues (cf. Norris, Guilbert, Smith, Hakimelahi & Phillips, 2005; Sangers et al., 2020), we know little about how and to what extent these elements are used in present-day educational texts, and whether their distribution depends, for instance, on the school subject. Therefore, in this quantitative corpus-based study, we aim at gaining insight into the use and distribution of narrative elements in educational texts, focusing on the current Dutch educational practice.

An added benefit of charting the use of narrative elements in current educational texts is that it will enable future empirical research to reflect actual practices. Previous empirical studies into narrative elements in educational texts have been found to show conflicting results: while some studies indicate that narrative elements contribute positively to the comprehensibility of the to-be-learned information (for example, Eng, 2002; Romero, Paris & Brem, 2005), other studies report negative outcomes (for example, Cervetti et al., 2009; van Silfhout, 2014). These conflicting results are partly explained by the way in which narrativity has been operationalized in the experimental texts of these studies, as the number and kinds of narrative elements used in these studies vary considerably (cf. Sangers, Evers-Vermeul, Sanders & Hoeken, 2019). This suggests that the narrative genre has not yet been clearly defined within the boundaries of the educational domain. By basing future empirical research on actual practices, incomparability of empirical results due to too much divergence in narrative manipulations could be prevented. Hence, the following question guided our research:

How and when are narrative elements currently being used in Dutch educational texts?

Before we explain how the use of narrative elements may vary between educational texts for different school subjects (Section 3), we discuss how we define narrativity within the educational domain (Section 2).

2 Narrativity in the educational domain

Over time, many definitions of the concept of narrative have been formulated in the literature. Some definitions have charted the linguistic features found in narrative texts, such as the combination of past tense verbs, third person pronouns, and adverbials of time and place (cf. Biber & Conrad, 2009; Fleischman, 1990), while other definitions were greatly inspired by the work of Labov (1972) and Labov and Waletzky (1967), who define narrative texts as consisting of six elements: abstract, orientation, complicating action, result, evaluation, and coda. For instance, work in Systemic Functional Linguistics builds upon Labov and Waletzky's structural approach, using schematic structures to define recurrent local patterns within and variation between genres – which are argued to enact the social practices of a given culture (cf. Christie & Martin, 2000; Martin & Rose, 2008).

While previous studies have often focused on specific linguistic features of certain genres, our focus is on the text's content. A recurrent element in content-based narratological definitions is the representation of events, although scholars have disagreed about whether a single event suffices for a narrative (Abbott, 2008; Genette, 1982), whether at least two events, ordered in time, are needed (Labov, 1972; Prince, 2003; Rimmon-Kenan, 2002), or whether the events of a narrative should be connected in a non-random way, including relations of causality (Bal, 1997; Onega & Landa, 1996;

Richardson, 1997; Sanford & Emmott, 2012). Another frequently mentioned narrative element is a need for the involvement of human or quasi-human entities in the events described (Fludernik, 2009; Herman, 2009; Norris et al., 2005; Ryan, 2007). Toolan (2001) has combined these elements into his definition of narrative, adding that readers should be able to ‘learn’ something from the agonist’s experiences:

“A narrative is a perceived sequence of non-randomly connected events, typically involving, as the experiencing agonist, humans or quasi-humans, or other sentient beings, from whose experience we humans can ‘learn’” (Toolan, 2001, p. 8).

In a previous study, we have shown that Toolan’s (2001) definition is well-applicable in the domain of Dutch educational texts, and that a narrative educational text can be characterized as exhibiting the following three narrative elements: 1) a sequence of non-randomly connected particularized events, that are 2) experienced by a specific character, of whom 3) readers gain insight into the inner world (Sangers et al., 2020).

A more detailed definition of these elements is as follows. First, narrative educational texts represent two or more events that are connected in a logical way, for instance by means of causal or temporal relations. These events are particularized rather than generic: they take place only once, at one point in time and at one location, as opposed to recurrent phenomena (compare “Yesterday, Lisa went to the University Hall in Utrecht. After a short speech from her supervisor, she received her diploma for the bachelor Communication and Information Studies” versus “Many students graduate from university each year”). Particularization is strengthened by references to the specific time and place at which these events take place. Increasing the degree of detail for these aspects makes a text more concrete, and prompts sensory imagery of the text’s content.

Second, narrative educational texts contain at least one individual who experiences the events described in the text, either by taking active part in these events or by passively experiencing them. This character can be human as well as human-like (for example, an animal). Human or human-like groups are not considered specific characters (compare “Lisa went to the University Hall in Utrecht” versus “All undergraduates went to the University Hall in Utrecht”).

The third narrative element involves the representation of an inner world, the so-called “landscape of consciousness”, through the expression of thoughts, feelings and/or sensory perceptions (Bruner, 1986). This landscape of consciousness is complementary to the text’s “landscape of action”, which is the relationship between the actions of a character and their consequences. The landscape of consciousness is usually linked to a specific character (“Lisa was happy to receive her diploma”), but can also give insight into the inner world of a group (“All undergraduates were happy to receive their diplomas”). If a landscape of consciousness is not explicitly elaborated upon in a text, readers can infer this inner world themselves (cf. Sangers et al., 2020).

The three narrative elements are, for instance, combined in the history text about prehistoric Iugas in (2). This text contains several logically related particularized events (for example, “He was able to pull it out”, “He gathers all his strength”), that are experienced by a fictitious individual named Iugas, of whom readers gain insight into his inner world by the expression of his thoughts (for example, “Too early, it is too early”) and sensory perceptions (for example, “A twinge of pain passes over his face”).

While many traditional definitions present a binary interpretation of narrative, Ryan (2007) proposes a scalar interpretation that focuses on the question “is text 1 more narrative than text 2?” rather than “is text 1 a narrative?” According to Ryan (2007, p. 28), narratives should be viewed as “a fuzzy set allowing variable degrees of membership, but centered on prototypical cases that everybody recognizes as stories”. Based on such a scalar interpretation, a text is most narrative if it contains all narrative elements that are considered prototypical in a certain domain. If a text contains some but not all prototypical narrative elements, this text is merely less pronounced

narrative than the narrative prototype, showing pronounced signs of narrativity. This indicates that all texts categorized as ‘narrative’ are related to a greater or lesser extent to the narrative prototype, without losing the ‘narrative’ label. Taking such an interpretation within the educational domain allows for the inclusion of educational texts that combine expository and narrative features, such as the hybrid text in (3), in which forester Jan tells about the pollination of flowers.

In a prior study, we have qualitatively illustrated that hybrid forms of narrativity can be found in the educational domain, incorporating the three narrative elements mentioned earlier, which can be considered prototypical in the educational domain, in varying combinations (Sangers et al., 2020). This variation can be visualized in the form of a Venn diagram, in which each circle represents one of the three narrative elements (see Figure 1). The intersections represent the different combinations of narrative elements, such as that of particularized events and an experiencing character on the left-hand side of the diagram. As Figure 1 shows, the less-pronounced narrative texts evolve around prototypical ‘full’ narratives such as (2), which are classified in the center of the diagram.

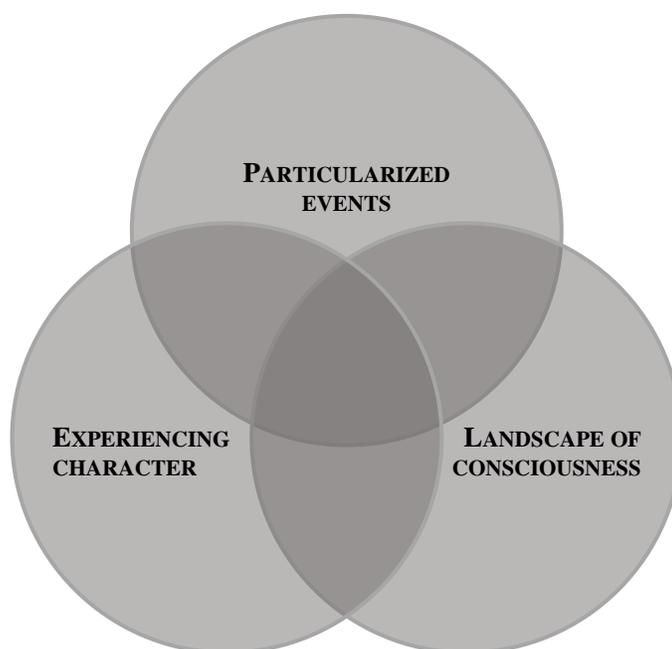


Figure 1. Different combinations of prototypical narrative elements in the educational domain.

While we have previously shown that most areas of Figure 1 can be identified in Dutch educational texts (see Sangers et al., 2020), the frequency with which the various combinations of prototypical narrative elements occur in Dutch educational materials is still unknown. Therefore, the model in Figure 1 guided our first sub-question:

RQ1 How frequently do the different combinations of prototypical narrative elements occur in Dutch educational texts?

In Section 3, we discuss why the frequency of the various combinations of narrative elements may vary across school subjects.

3 The role of narrative elements in different school subjects

In the literature, it has been argued that concrete and imaginable information has a processing advantage over abstract information, being easier to comprehend and more interesting to read

(Nisbett & Ross, 1980; Sadoski & Paivio, 1994; Sadoski, Paivio & Goetz, 1991). An explanation for this ‘concreteness effect’ is given by the Dual Coding Theory (DCT, Paivio, 1971, 1986; Sadoski & Paivio, 1994), which distinguishes between a verbal system – specialized in language processing – to represent information and a mental imagery system, which concerns the processing of world knowledge about events and objects. According to the DCT, abstract information is stored only verbally, because it evokes less mental imagery, while concrete information is stored via both the verbal system and the mental imagery system. The activation of both cognitive systems elicits mental images that make concrete information more engaging, better comprehensible, and more easily retrievable from memory (Sadoski, 1999, 2001). Given the substantial empirical evidence supporting the claims about concreteness (for an overview, see Sadoski, 2001), making educational texts more concrete and imaginable seems an adequate strategy to enhance their comprehensibility and attractiveness.

One way of attaining more concreteness and imaginability seems to be the incorporation of narrative elements in educational texts: the more detailed information a text provides about specific events, specific characters, and the context, the more concrete and imagery-provoking this text is (Nisbett & Ross, 1980). The extent to which educational publishers make use of narrative elements in their texts, however, may be influenced by the nature of the to-be-learned information, which differs from school subject to school subject. That is, while specific events, specific people, and their experiences are often at the core of history texts, texts for biology and geography focus on recurrent natural phenomena and/or general processes, without human involvement or with humans being only passively involved (for example, in explanations about processes in the human body). For instance, the history text in (4) introduces the well-known historical figure John F. Kennedy as a specific character who experiences the specific events that led to his unfortunate death in 1963. By contrast, the geography text in (5) discusses the origin of coal from the Carboniferous marshes, describing events that are generic rather than specific, and including no human agents.

- (4) In the United States, a young, handsome president came to power in 1960: John F. Kennedy. He had big plans for his country. The world was shocked when Kennedy was murdered in 1963. He was shot dead while driving through the city of Dallas in his open top car. The images of the murder were shown on television.
(*Eigentijds*, history grade 5, p. 50)

- (5) Coal originated from the Carboniferous marshes. This is how it happened. Dead plants started to rot. The remains of these plants formed a layer of peat. Water washed a layer of sand over it. On top of this layer, plants started to grow again. A new layer of peat was formed. During millions of years, those layers of peat were pressed together. A solid material, that we call coal, was formed. Coal can be used as fuel.
(*Grenzeloos*, physical geography grade 5, pp. 8-9)

While no narrative elements are included in (5), the narrative elements in (4) are at the heart of this text’s educational content and, therefore, cannot be disregarded. Presuming a stronger connection between narrativity and the educational content of history texts, we expect to find the three prototypical narrative elements, and combinations thereof, more frequently in these texts than in texts for biology and geography.

We should, however, acknowledge that the educational content of geography does not only cover natural phenomena, such as the origin of coal in (5), but also includes human-related topics, such as migration in (6). Hence, it seems likely that the educational content of texts about human geography (GH texts) more frequently involves people than that in texts about physical geography (GP texts), offering more options to include narrative elements. However, the extent to which narrative elements occur in GH texts may still differ from that of history texts, as the educational content in GH texts tends to be less specific than that in history texts, focusing on general tendencies

rather than specific events, and on groups rather than specific characters. Therefore, GH texts may occupy an intermediate position between history texts on the one hand, and biology and GP texts on the other hand.

- (6) Migration can also cross borders. In case of emigration, people move to another place of residence in another country. In case of immigration, someone arrives at a country to settle there. In recent years, for instance, many Polish people have come to the Netherlands. Initially they only came to the Netherlands to work, but nowadays many of them settle here with their family.

(De wereld van, GH grade 5, p. 29)

Following our line of reasoning that biology, GP, and GH texts are less often about specific events, specific characters, and specific contexts, we believe these texts will also tend to be more abstract and less imagery-provoking than their history counterparts. Therefore, these texts might significantly benefit from narrative-like strategies to make them more concrete and imaginable.

One such strategy could be the addition of a specific character to the text. In history texts, publishers can – and often have to – draw on real, well-known historical figures. The educational content of biology, GP, and GH texts, however, might often not contain such authentic characters. To add specific characters to texts for these school subjects, publishers would generally have to invent their own characters. For instance, in the biology text in (7), information about food chains is conveyed by two fictitious characters, Eva and the guide, thereby making the to-be-learned information more concrete and imaginable.

- (7) Eva listens to the guide. He describes how wild animals are constantly trying to survive. “A herd of zebras is grazing, over there. They do nothing but graze. And of course they pay attention. But at the moment they have a rest, because: do you see those lions there? They just caught a young zebra. Now they are eating him.” “How sad for that little zebra,” Eva says. “That’s how you see it,” the guide says, “but without those zebras, the lions would die. Tell me: do you ever eat a sausage or a hamburger?” Eva nods. “Then you eat an animal, don’t you?” the guide says. “People eat meat as well. We keep cows and pigs to eat!”

(Wijzer! N&T, biology grade 5, p. 52)

In addition, publishers can apply a “pars pro toto” strategy to support generic educational content. In this case, in addition to or instead of giving a summary description of a certain concept, a prototypical instance of this concept is highlighted. For example, the text in (1), which gives a generic description about the process of erosion, is preceded by the paragraph in (8), in which a specific instance of erosion is described. This paragraph presents a series of chronologically related events that focus on individualized natural entities (*one* cleft, *one* seed, and *one* tree) instead of the entire group of entities. As such, the generic to-be-learned information in (1) is introduced in a more concrete and imaginable way. Similarly, in the biology text in (9), educational content about the maturation of babies is conveyed by focusing on the developmental process of *one* baby. The baby in (9), who cannot be linked one-on-one to a specific person in the real – or fictitious – world and, therefore, does not qualify as a character, is considered a “representative” of the entire group of babies. Although focusing on a representative entity (*a* baby) instead of giving a summary description of all entities (*all* babies) makes an educational text more concrete and imaginable, this strategy is more conceptual than the description of a real or fictitious character who can be considered a typical example of the group of entities. For instance, the author of (9) could also have chosen to highlight a specific baby as an example case (for example, *baby Thomas*). Such an exemplar baby is more concrete than a representative baby, because it maps one-on-one to an individual in the real or fictitious world. Rather than representing the entire group of entities, an

exemplar can be used for the categorization of new potential group members by way of comparison (cf. exemplar vs. prototype theory; Murphy, 2016). From less to more concrete/imaginable, the above three ways to frame educational content about babies are schematically related to each other as follows: ‘*all babies*’ (group) → ‘*a/the baby*’ (representative) → ‘*baby Thomas*’ (exemplar).

- (8) It started with a small crack in the rock. Moisture started to grow in it and at some point some seeds. A tree grew from one of those seeds. The roots of that tree penetrated further and further into the crack. And so the crack became wider and deeper. Snow and ice made the crack a little wider every year, because water expands when it freezes. And then one day, this huge piece of rock broke loose and popped down...
(*Meander*, GP grade 5, p. 12)

- (9) After seven weeks, a baby looks more like a tadpole than a human. But all kinds of things are coming into existence in that body. For instance, brains and a heart that pumps real blood. After twelve weeks, the baby has arms, legs, hands, and feet that move. This is how he exercises his muscles.
(*Binnenstebuiten*, biology grade 5, pp. 42-43)

Taken together, we expect 1) narrative elements to be more frequent in history texts than in texts for biology, GP, and GH, while hypothesizing that 2) strategies to make educational texts more concrete, such as the addition of fictitious characters and representative entities, are more frequent in the latter subjects. This motivated our second sub-question:

- RQ2 To what extent are narrative elements applied differently in texts for biology, physical geography, human geography, and history?

In Section 4, we clarify the method of our quantitative corpus-based analysis. Subsequently, in Section 5, we describe the results of our analysis. Finally, in Section 6, we turn to our discussion and conclusion.

4 Method

In this section, we describe the material selection (Section 4.1), method of analysis (Section 4.2), inter-annotator agreement (Section 4.3), and method of statistical analysis (Section 4.4).

4.1 Material selection

To find out whether differences in the distribution of narrative elements over texts for biology, GP, GH, and history are generalizable over grade levels, our corpus-based analysis focused on texts for grade 5 and for grade 8 of pre-university education.² While grade 5 students have acquired the basic reading skills required for a deep understanding of texts, grade 8 students need to be able to read more challenging texts, particularly in pre-university education.

4.1.1 Textbook selection

We selected educational texts from textbooks published by five well-known Dutch educational publishers. For grade 5, one textbook was selected per subject per publisher, leading to a total of

² The Dutch system for secondary education is divided into three educational levels, ranging from theoretical to vocational training: pre-university education (Dutch *vwo*), senior general education (Dutch *havo*), and pre-vocational education (Dutch *vmb*). Within pre-university education, we focused on texts for grade 8 (year 2 of Dutch secondary education), because eighth graders are able to read texts on a more advanced level than seventh graders, who have only mastered a basic reading level (Committee Meijerink, 2009), and because eighth graders are still taking classes in all school subjects under investigation.

fifteen textbooks.³ For grade 8, only three out of five publishers also distributed textbooks on a pre-university level. All three did so for geography and history, while only two of them also published a biology textbook, leading to a total of eight textbooks. See Appendix A for a list of all twenty-three textbooks.

4.1.2 Chapter selection

For history and biology, we selected one chapter per textbook. Per geography textbook, two chapters were selected: one for GP and one for GH. This resulted in a selection of thirty-one chapters. We strived for thematic overlap per subject, both within and between grade levels. This was done to counter potential narrative distribution biases caused by topic selection as much as possible. Thematic overlap was established on the basis of a comparison of keywords.

For biology, the reproduction of humans, animals, and plants was chosen as the overlapping theme. For one grade 5 textbook including no information on reproduction, we selected a chapter on eating habits of animals and plants.

For history, we selected chapters that discussed the time period of stadtholder William of Orange, who led the Dutch Revolt against Spain during the start of the Eighty Years' war (1568-1648). For one grade 5 textbook including only events after 1900, we selected a chapter on the Cold War.

For geography, chapters were matched within grade level only, since it turned out to be unfeasible to select thematically overlapping chapters between grade levels. For GP, the grade 5 chapters were matched by their discussion of different sorts of landscapes, and the grade 8 chapters based on their focus on characteristics of the earth. For GH, the grade 5 chapters concentrated on the European Union, while the grade 8 chapters focused on demographic notions such as 'birth rate' and 'immigration'. Even though the distinction between GP and GH chapters was generally straightforward, one grade 5 textbook paid equal attention to both sub-domains in all of its chapters. For this textbook, we selected a chapter on the climates and landscapes of Eastern Europe (GP) and a chapter on Europe that included discussions on the European Union (GH).

4.1.3 Text selection

Within the chosen chapters, we selected texts that included educational content and/or background information. A text was taken to be a unit of at least three sentences that belonged to a marked text box, and/or was grouped under a subheading (blank lines did not mark the beginning of a new text). In those few cases in which these rules did not suffice, we looked at font characteristics in order to make a final decision. Table 1 shows the number of texts per school subject and grade level. In total, the corpus consisted of 999 texts.

Subject	Grade 5	Grade 8	Total
Biology	147	84	231
GP	125	106	231
GH	124	118	242
History	137	158	295
Total	533	466	999

Table 1. Number of texts per school subject and grade level.

4.2 Method of analysis

While previous analyses of the narrative genre have often focused on narrative structure and/or specific linguistic features (for example, Biber & Conrad, 2009; Fleischman, 1990; Labov & Waletzky, 1967), our focus is on the text's content, namely the three prototypical narrative elements

³ Per publisher, texts for GH and GP were selected from the same geography textbook.

in the Venn diagram in Figure 1. For each text, excluding its heading, we manually coded whether these three elements were present or not. To expedite the coding process, we first analyzed whether a text contained **one particularized event**, describing a happening that took place only once, at one point in time and at one location. Subsequently, we scored whether texts with one particularized event contained a second particularized event that was chronologically related to the first, forming a **sequence of particularized events**. For instance, the history text in (4), repeated here as (10), begins with the particularized event stating that John F. Kennedy became president of the United States. This event is followed by that of his murder in 1963.

- (10) In the United States, a young, handsome president came to power in 1960: John F. Kennedy. He had big plans for his country. The world was shocked when Kennedy was murdered in 1963. He was shot dead while driving through the city of Dallas in his open top car. The images of the murder were shown on television.
(*Eigentijds*, history grade 5, p. 50)

In addition, a text contained an **experiencing character** if an individual was represented who was either taking active part in an event (“In the United States, a young, handsome president came to power in 1960: John F. Kennedy”) or passively experiencing it (“He was shot dead”). This character could be human as well as human-like. Groups and “*tota pro partibus*” (wholes for a part, for example, ‘the world’, indicating the world’s citizens) were not considered specific characters. In line with our discussion of narrative-like strategies that publishers may employ to make texts more concrete and imaginable, we also scored whether 1) a specific character was **fictitious** (vs. real), and 2) a **representative entity** was present in texts without a specific character, either being an individualized natural object, as in (8), or a human and/or an animal, as in (9).

Finally, a text contained a **landscape of consciousness** if thoughts, emotions, opinions, and/or wishes were represented explicitly. For instance, the history text in (11) gives insight into emperor Charles V’s doctrinal ambition (“wanted”) and emotional state (“was afraid”). Representations of an inner world that were imaginable but remained implicit in the text were not taken into account. A landscape of consciousness did not have to be linked to a specific character, but could also be expressed by groups or *tota pro partibus*. For instance, in (12), the emotions and thoughts of the common people are represented. Similarly, an inner world did not have to be related to the leading character of the text; it was also scored for minor characters, as for William of Orange’s cousin in (13). Evaluations given by the author of the educational text were not taken into account (see also Sangers, Evers-Vermeul & Hoeken, submitted).

- (11) Charles V wanted all his people to have the same faith. He was afraid of fights about the right faith. The Catholic faith was the only thing that brought together all people in his great empire.
(*Memo Geschiedenis*, history grade 8, p. 14)
- (12) After the last seconds of Thursday October 4th 1582 had passed, it was suddenly October 15th in most parts of Europe. This only happened because many European countries switched from the Julian calendar to the Gregorian calendar, yet it upset many people. Riots broke out in some places because people thought that ten days of their lives had been stolen. It was said that migratory birds would not fly south in time. And the holy days had been shifted. Would the Saints understand what was going on?
(*Geschiedenis Werkplaats*, history grade 5, p. 9)
- (13) William was eleven years old. His father was count of Nassau in Germany. That was what William would also become when he grew up. William had a cousin who was the prince of a tiny area in France. This cousin died. His will stated that he wanted William

to succeed him as Prince of Orange. And so young William suddenly inherited a very important title.

(*Argus Clou Geschiedenis*, history grade 5, p. 44)

4.3 Inter-annotator agreement

For considerations of reliability, 10 percent of the corpus (N=103) was coded by a second, independent annotator (cf. Neuendorf, 2002). This sample was randomly compiled for each school subject and grade level, making use of the ASELECT()-function in Excel. Before the second annotator coded the sample, she engaged in a training phase to make her familiar with the procedure and the elements under investigation. The inter-annotator agreement was substantial to almost perfect (.74<K>1.00) (cf. Landis & Koch, 1977), as is shown in Table 2.

Narrative element	Cohen’s kappa	% agreement
One particularized event	.81	92
Sequence of particularized events	.93	97
Experiencing character	.88	95
Landscape of consciousness	.74	91
Fictitious character	1.00	100
Representative entity	.86	93

Table 2. Inter-annotator agreement (Cohen’s kappa and % agreement) per narrative element.

The annotators discussed and resolved disagreements in their analyses to reach a final dataset. This was achieved without difficulty. The somewhat lower kappa-score for landscape of consciousness, for instance, was caused by the fact that not all thoughts, emotions, opinions, and wishes were easily recognizable. In (14), for example, the ambition of William of Orange to reach freedom of religion was overlooked by one annotator as the representation of a belief/wish.

- (14) A number of southern regions, such as Limburg, Brabant, and Zeeland Flanders, now belonged to the Republic. Many Catholics lived in these regions. The ideal of William of Orange was for everyone to decide for themselves which religion they wanted to embrace. After the war, one could indeed decide on what to believe. In practice, however, it was much harder to be a Catholic than to be a Protestant. Nevertheless, no one could be punished or arrested for his faith. And that is still the case today.

(*Argus Clou Geschiedenis*, history grade 5, p. 59)

4.4 Method of statistical analysis

The final dataset was analyzed using R version 3.6.1 (R Core Team, 2019). The analyses were completed via generalized linear mixed models, using the packages haven (Wickham & Miller, 2019), lme4 (Bates, Mächler, Bolker & Walker, 2015), emmeans (Lenth, 2019), and ggplot2 (Wickham, 2016). We added the fixed factors ‘Subject’, ‘Grade level’, and their interaction to the models in a stepwise manner. Because some publishers did not design materials for all grade levels and/or school subjects under investigation, the statistical analysis did not allow for differentiation between publishers. To account for 1) potential differences in stylistic preferences between textbooks from different publishers and 2) correlations between texts for the two sub-domains of geography (which were selected from the same geography textbook, see also Section 4.1), ‘Textbook’ was modeled as a random factor. Likelihood ratio tests were computed in order to assess which models fitted the data best. In Section 5.2, we present the significant results of the best fitting models. See Appendix B for an overview of all results.

5 Results

Our analyses focused on the distribution of three prototypical narrative elements – particularized events, experiencing characters, and landscapes of consciousness – over Dutch educational texts for different school subjects. We sketch a picture of the overall occurrence of the three narrative elements in our corpus (Section 5.1), before we discuss the statistical analyses with respect to their distribution over biology, GP, GH, and history texts (Section 5.2.1). Subsequently, we consider the distribution of fictitious characters and representative entities (Section 5.2.2), and discuss some qualitative observations regarding these strategies to make educational texts more concrete (Section 5.3).

5.1 Overall occurrence of prototypical narrative elements

A sequence of particularized events was found in 138 texts of the corpus ($N=999$). However, due to singularity issues, the statistical model for this element could not be run without errors. Since we were able to run the model for texts that contain (at least) one particularized event (282 texts), and its raw frequency pattern resembles that of the erroneous model, we report the results for texts with one particularized event here.⁴ We return to the theoretical and practical implications of this decision in the discussion section (Section 6).

Beside 282 texts with a particularized event (28%), 293 texts contain an experiencing character (29%) and 253 texts a landscape of consciousness (25%). In total, 453 texts of the corpus contain one up to three of these narrative elements (45%), as opposed to 546 texts that are fully expository (55%). Figure 2 represents the number of texts found for each combination of prototypical narrative elements, showing that full narratives are best represented (114; 11%), while texts that combine a particularized event and a landscape of consciousness without introducing a specific character are least frequent (21; 2%).

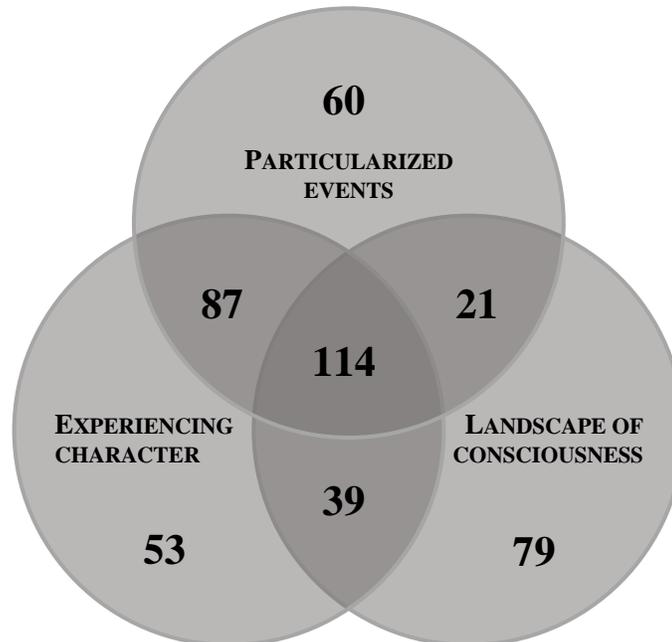


Figure 2. Number of texts per combination of prototypical narrative elements ($N=453$).

⁴ Of the 138 texts with two or more related events, 103 were found for history, 12 for biology, 10 for GP, and 13 for GH. A similar pattern was found for the 282 texts with one particularized event: 176 for history, 31 for biology, 37 for GP, and 39 for GH.

5.2 Statistical analyses

In this section, we first describe the statistical analyses for prototypical narrative elements (Section 5.2.1). Subsequently, we discuss the statistical analyses for fictitious characters and representative entities (Section 5.2.2).

5.2.1 Prototypical narrative elements

We first analyzed whether the distribution of educational texts with one up to three prototypical narrative elements over the corpus was influenced by the fixed factors Subject, Grade level, and/or their interaction. For this analysis, which included all 453 texts categorized in Figure 2, the best fitting model was the model in which only Subject was entered as a fixed factor ($\chi^2(3)=43.56$, $p<.001$). As hypothesized, a post hoc Tukey pairwise comparison test revealed that prototypical narrative elements are more frequent in history texts than in texts for biology, GP, and GH (all p 's<.001).⁵ These results are visualized in Figure 3.

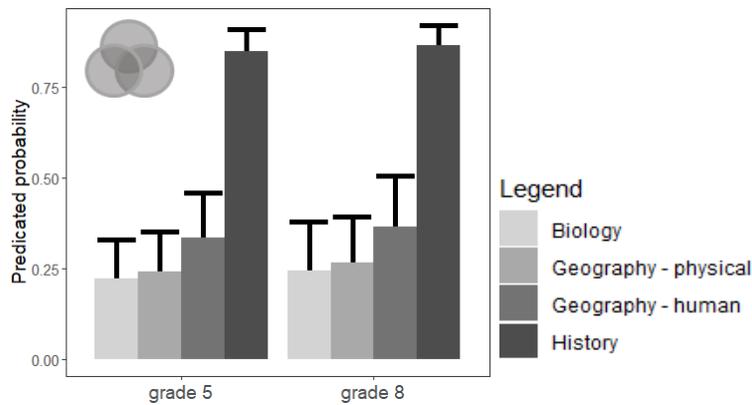


Figure 3. Predicted probability for texts with 1-3 types of narrative elements.

Subsequently, we analyzed whether this pattern persisted for each individual prototypical narrative element (that is, the three autonomous circles). For each element, the same pattern was found: the model in which only the fixed factor Subject was entered fitted the data best (particularized event: $\chi^2(3)=23.98$, $p<.001$; experiencing character: $\chi^2(3)=24.63$, $p<.001$; landscape of consciousness: $\chi^2(3)=35.52$, $p<.001$). Post hoc Tukey tests showed that all three prototypical narrative elements are more frequent in history texts than in biology, GP, and GH texts (all p 's<.001), as visualized in Figure 4-6.

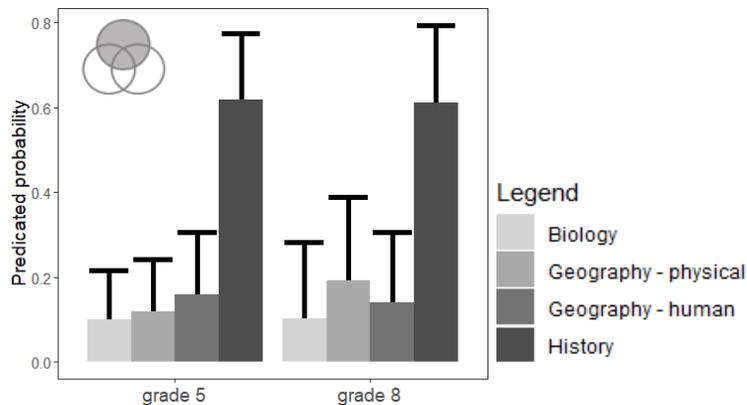


Figure 4. Predicted probability for particularized event.

⁵ For the complete Tukey results, see Appendix B.

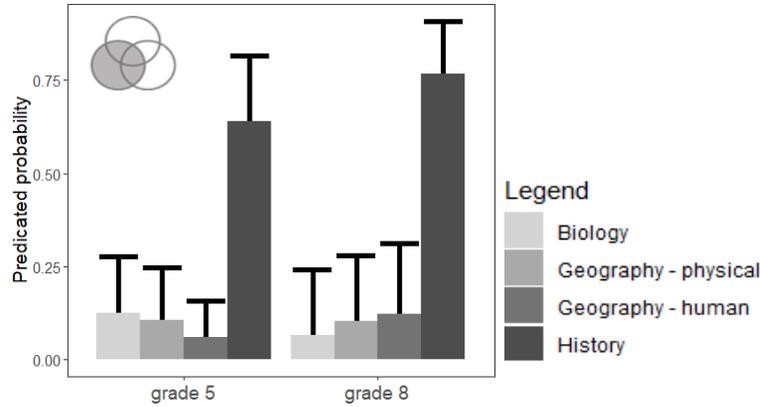


Figure 5. Predicted probability for experiencing character.

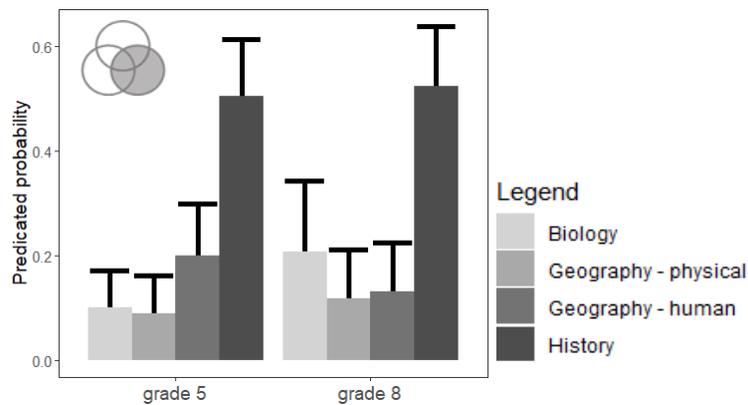


Figure 6. Predicted probability for landscape of consciousness.

Finally, we analyzed whether the pattern persisted in full narratives, combining the three narrative elements. Once again, the model in which Subject was entered as a fixed factor was the best fitting model ($\chi^2(3)=32.05$, $p<.001$). Following the pattern, a post hoc Tukey test showed that full narratives are more frequent in history texts than in texts for biology, GP, and GH (all p 's<.001), as visualized in Figure 7. None of the analyses revealed an effect for Grade level or an interaction effect of Grade level and Subject.

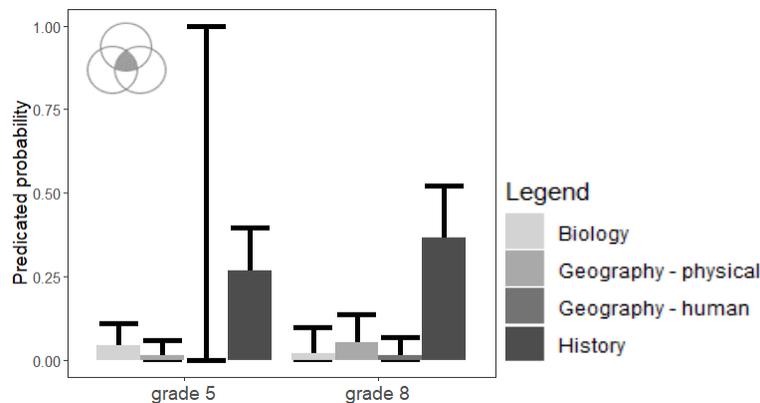


Figure 7. Predicted probability for full narratives.⁶

⁶ The error bar for GH grade 5 texts extends from 0 to 1 because no full narratives were found in this condition.

5.2.2 Fictitious characters and representative entities

Of the 293 texts with an experiencing character, the majority include a character who exists or existed in the real world (228 texts, 78%), while only 65 texts introduce a fictitious character (22%). For texts with a fictitious character, the model in which only Subject was entered as a fixed factor was the best fitting model ($\chi^2(3)=20.38, p<.001$). As hypothesized, the pattern for fictitious characters was opposed to the one found for prototypical narrative elements: a post hoc Tukey test revealed that fictitious characters are less frequent in history texts than in texts for biology ($p=.008$), GP ($p<.001$), and GH ($p<.001$), as visualized in Figure 8. This indicates that if experiencing characters are absent in the educational content – as is often the case in biology, GP, and GH texts –, publishers occasionally add fictitious characters to the text, while they generally do not apply this strategy if specific characters are at the core of the to-be-learned information, as is the case in most history texts.

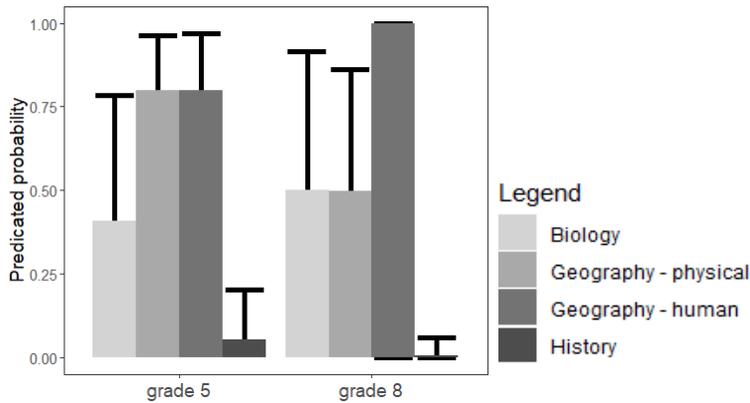


Figure 8. Predicted probability for fictitious experiencing characters.

In addition, for texts with a representative entity (225 texts, 23%), the model with the fixed factors Subject ($\chi^2(3)=51.52, p<.001$), Grade level ($\chi^2(1)=5.91, p=.015$), and their interaction ($\chi^2(3)=13.25, p=.004$) was the best fitting model. A post hoc Tukey test revealed that in both grade 5 and grade 8 texts, representative entities are more frequent in biology texts than in texts for GP, GH, and history (all $p<.001$). In addition, in texts for grade 8 – but not for grade 5 –, representative entities are more frequent in GP texts than in GH ($p<.001$) and history texts ($p=.002$). These results, which are visualized in Figure 9, indicate that while experiencing characters are not so much at the heart of the educational content in biology and GP texts, these texts are occasionally made more specific by the application of representative entities. Furthermore, the post hoc Tukey test showed that for GP texts – but not the other subjects – representative entities are less frequent in grade 5 than in grade 8 ($p=.017$).

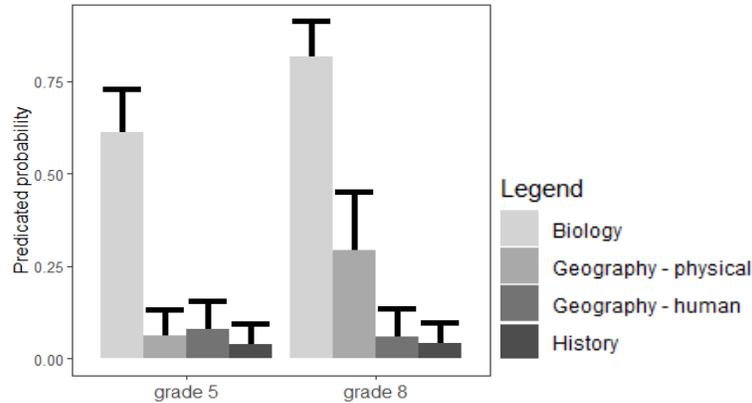


Figure 9. Predicted probability for representative entities.

5.3 Making educational texts more concrete: some qualitative observations

Since we were also interested in the ways in which the strategies to make educational texts more concrete are qualitatively elaborated upon in educational texts for different school subjects, we made some additional observations. For instance, we observed that in biology, GP, and GH texts, fictitious characters are placed in a contemporary context, often representing a peer, such as Eva in (7) or the German teenager Matthias in (15), or an individual belonging to a certain professional group, such as gynecologist Loes in (16). By contrast, in history texts, fictitious characters are situated in a historical context, often representing the “common man” experiencing the events of his time, such as prehistoric man Iugas in (2) or merchant Pieter in (17). The three fictitious characters in (15)-(17) introduce themselves, mentioning their name, and share their personal stories, interlaced with to-be-learned information.

- (15) Guten Tag! I am Matthias Sammer. I live in Berlin and I enjoy being your guide while you are exploring my country. Germany is a big country in Europe. The Netherlands fits into it almost nine times and we have five times as many inhabitants.

(*BuiteNLand*, GH grade 8, p.17)

- (16) Hello, my name is Loes. I work as a gynecologist and I am involved in pregnancies and deliveries that are not going well. In the Netherlands, many babies are born at home under the supervision of a midwife. However, giving birth at home can also involve too much risk.

(*Biologie voor jou*, biology grade 8, p. 183)

- (17) I am Pieter Ysenbouts from Antwerp. I buy and sell spices from the East: nutmeg, pepper, cloves, cinnamon... The commercial ships bring me everything. Maybe I will travel on a such a ship myself soon.

(*Tijdzaken*, history grade 5, p. 77)

For educational content about natural phenomena, we observed a similar distinction along the lines of representative entities (*a baby*) versus exemplar characters (*baby Thomas*) to concretize generic to-be-learned information about human or human-like entities (*all babies*). Compare, for instance, the geography texts in (18) and (19), which originate from the same textbook. In (18), the general process of the formation/eruption of stratovolcanoes is explained by the description of a representative instance, focusing on individualized natural entities. However, this instance does not link one-on-one to an actual event in the real world. By contrast, (19) discusses a real exemplar of a stratovolcano eruption, namely that of the Soufrière on Montserrat. As opposed to (18), the time

and place of the volcano eruption are explicated in (19). In addition, while (18) focuses on the technical aspects of the volcano eruption, (19) rather concentrates on its consequences for the human population.

- (18) At a convergent boundary, a heavy earth plate slides beneath a lighter earth plate. The heavy plate disappears deeper and deeper into the mantle, causing the stones to melt. The resulting magma wants to rise again. [...] Eventually the pressure becomes too high and the volcano erupts explosively. The tough lava quickly solidifies. This creates a volcano with steep slopes: a stratovolcano.

(De wereld van, GP grade 8, p. 54-55)

- (19) A dormant volcano can come back to life. This happened not so long ago with the Soufrière volcano on Montserrat, a British island located 150 kilometers from Saba, belonging to the same island arc. Like Mount Scenery, the Soufrière had been quiet for four hundred years. But on July 18, 1995, the volcano erupted.

Because there had been earthquakes since 1992, the volcano was closely monitored. This allowed the population to be brought to safety in time for the eruption. About 7,000 residents were evacuated to surrounding islands and to the United Kingdom. The nineteen deaths on the island were people who had ignored the warnings. The capital of Montserrat was wiped off the map, only the north was still habitable and tourism did completely collapse.

(De wereld van, GP grade 8, p. 49-50)

The two texts evoke a different learning approach: while (18) presents a hypothetical, individualized instance of generic to-be-learned information to which real exemplars could be linked via deduction, (19) provides a real exemplar to which more generic educational content can be associated via induction. As can be inferred from the texts' page numbers, the publishers of the GP textbook have chosen to place the exemplar situation before the representative instance, proceeding from specific to somewhat more generic educational content.

6 Discussion and conclusion

In this quantitative corpus-based study, we charted how and when prototypical narrative elements, namely particularized events, experiencing characters, and landscapes of consciousness, are being used in present-day Dutch educational texts. More specifically, we analyzed 1) the frequency with which various combinations of these narrative elements are used in Dutch educational texts, and 2) the extent to which they are applied differently in texts for the school subjects biology, physical geography, human geography, and history. Our findings are summarized in Table 3.

Narrative elements		Number of texts (N=999)	% of texts corpus	Significant patterns
	One or more types of narrative elements	453	45%	HI>BI=GP=GH
	Particularized event (PE)	282	28%	HI>BI=GP=GH
	Experiencing character (EC)	293	29%	HI>BI=GP=GH
	Landscape of consciousness (LoC)	253	25%	HI>BI=GP=GH
	All three narrative elements	114	11%	HI>BI=GP=GH
	PE + EC	87	9%	
	PE + LoC	21	2%	
	EC + LoC	39	4%	
	Fictitious characters	65	7%	HI<BI=GP=GH
	Representative entities	225	23%	5: BI>GP=GH=HI 8: BI>GP>GH=HI GP: 5<8

Table 3. Summary of the quantitative findings.

Our results demonstrate that even in a domain that has traditionally been considered the prime exemplar of the expository genre, narrative elements are found quite frequently: 45 percent of the educational texts in our corpus are categorized in one of the narrative areas of the model in Figure 1, indicating that only 55 percent of the texts in the corpus are fully expository. Of the three prototypical narrative elements, an experiencing character is most frequently found ($N=293$), closely followed by a particularized event ($N=282$) and a landscape of consciousness ($N=253$). When two narrative elements are combined, the combination of a particularized event and an experiencing character is most common ($N=87$).

In addition, our statistical results show that the occurrence of narrative elements in educational texts depends on the nature of the to-be-learned information. As we hypothesized, particularized events, experiencing characters, and landscapes of consciousness are more frequent in history texts than in biology, GP, and GH texts. This substantiates our reasoning that the educational content of the school subjects under investigation differs in their focus on narrativity – with specific events, specific people, and their experiences often being at the heart of history texts, and a focus on general tendencies in biology, GP, and GH texts. This indicates that narrative elements are less frequently applied in contexts in which they fit less naturally. In fact, when prototypical narrative elements are used in biology, GP, and GH texts, they are generally deliberate interventions.

Following our observation that biology, GP, and GH texts are less often about specific events, specific characters, and specific contexts, we argued that these texts would also tend to be more abstract and less imagery-provoking than history texts. Given the theoretical and empirical

evidence underlining the processing advantage of concrete information over abstract information (cf. Sadoski, 2001), we reasoned that biology, GP, and GH texts would benefit from strategies to make educational texts more concrete, such as the addition of fictitious characters and representative entities. Indeed, the distribution pattern of texts with a fictitious character is opposite to that of texts with prototypical narrative elements: fictitious characters are less frequently added to history texts than to texts for the other school subjects. This shows that while specific characters tend to be real historical people in history texts, those in biology, GP, and GH texts are almost always fictitious inventions. It is, however, important to acknowledge that the deliberate intervention of fictitious characters was not so frequent in itself, being employed in only 7 percent of the texts in the corpus (4% of biology texts, 9% of GP texts, 11% of GH texts, 3% of history texts), compared to the occurrence of real experiencing characters in 23 percent of the texts in the corpus (10% of biology texts, 4% of GP texts, 1% of GH texts, 66% of history texts). The other strategy – the incorporation of representative entities – was applied more frequently, namely in 23 percent of the texts in the corpus (67% of biology texts, 17% of GP texts, 7% of GH texts, 4% of history texts). In line with our hypotheses, the distribution pattern of representative entities differs from that for texts with prototypical narrative elements: while the latter elements are not so much at the heart of the educational content in biology and GP texts, publishers make use of representative entities to make these texts more concrete and imaginable. Interestingly, representative entities were not found more frequently in grade 5 GP texts and in GH texts than in history texts.

While we generally found robust effects for the distribution of narrative elements over school subjects, our distinction between two sub-domains of geography does not seem to be relevant with respect to the distribution of narrative elements. That is, contrary to our line of reasoning, our results indicate that GH texts (human-related, generic) do not occupy an intermediate position between history texts (human-related, specific) and biology and GP texts (non-human-related, generic): they rather side with the latter two subjects. This means that even though GH texts discuss human-related topics – thereby offering more options for the inclusion of narrative elements –, their content remains as generic as that of texts for less human-related subjects. In addition, we did not find differences in the distribution of narrative elements over different grade levels, indicating that our results are generalizable over grade levels. Only one effect of grade level was found, which concerned just one school subject.⁷

The present research has provided insight into the distribution of narrative elements over Dutch educational texts for different school subjects. However, there are some limitations to this study that give rise to theoretical implications as well as new directions for future research. A first limitation to this study is that we were unable to run the statistical model for *a sequence of particularized events*, which is why we decided to report the results on the model for *one particularized event* instead. There is some theoretical basis for this decision. In the narratological literature, there has been a debate on the minimal criteria required for texts to be categorized as ‘narrative’, particularly the criterium whether a single event suffices for a narrative (Abbott, 2008; Genette, 1982), or whether at least two events are needed (Bal, 1997; Labov, 1972; Onega & Landa, 1996; Prince, 2003; Richardson, 1997; Rimmon-Kenan, 2002; Sanford & Emmott, 2012). In our application of narrativity to the educational domain, we adopted the second definition: a narrative educational text is formed by a sequence of two or more non-randomly related events. This strict interpretation excludes educational texts with only one particularized event from a classification as narrative texts. However, following Ryan’s (2007) scalar interpretation of ‘narrative’, and introducing a model that allows for hybrid forms of narrativity – containing only one or two prototypical narrative elements –, we could also imagine a scalar interpretation *within* each prototypical narrative element. Following such an interpretation, educational texts with one

⁷ Exemplars were less frequent in grade 5 GP texts than in grade 8 GP texts.

particularized event would merely be less-pronounced narrative than educational texts that contain a sequence of particularized events – presenting more of a narrative scene to concretize the educational content rather than a complete story. Such a lenient interpretation would allow for nuances within each prototypical narrative element, giving rise to fruitful directions for follow-up research.

In addition, educational publishers might use particularized events not with the purpose of making educational texts more narrative but with the sole aim of making it more concrete and imaginable. This raises the question as to how narrativity and concreteness relate to each other: does a higher degree of narrativity always lead to more concreteness, and vice versa? Following the literature, the answer to the first part of this question seems to be positive: Nisbett and Ross (1980) have argued that the more detailed information a text provides about specific events, specific characters, and the context, the more concrete and imagery-provoking this text is. This suggests that irrespective of a strict or lenient interpretation of the narrativity of events, adding a particularized event to an educational text enhances its concreteness and imaginability. However, it is not clear whether a higher degree of concreteness also brings about more narrativity. On the basis of the strict interpretation, the use of one particularized event instead of a sequence of particularized events would not make an educational text more narrative – the event, however, does make the text more concrete. This suggests that the relationship between narrativity and concreteness might not be one-to-one. If publishers are primarily concerned with making their texts more concrete, it would not be surprising if they added just one particularized event to the educational text. The lenient interpretation, on the other hand, does not preclude a one-to-one relation between the two concepts: the addition of one particularized event would make the educational text more concrete and somewhat – but not fully – narrative. Determining the precise relationship between narrativity and concreteness would be valuable for further theoretical development.

In this respect, it would be worthwhile to discuss our findings with publishers and authors of educational materials. What goals do they pursue with the application of narrative elements in their texts, and how do they see the relation with concreteness? Do publishers distinguish between narrativity and concreteness, or do they consider these concepts as intertwined? What kinds of design principles do they formulate to make their texts more narrative and/or more concrete? Earlier research has shown that interviews can be fruitful in discovering what educational professionals consider important textual elements, and how they adapt their design principles accordingly (Land, Sanders, Lentz & van den Bergh, 2002).

A second limitation to this study is that we only analyzed two narrative-like strategies publishers can employ to increase the concreteness and imaginability of educational texts that are less inherently focused on specific events, characters, and contexts. Of course, other strategies may also be fruitful in conveying relevant content in a comprehensible and interesting way. One strategy, for instance, could be the use of “voice” in educational texts (cf. Beck, McKeown & Worthy, 1995; Sangers et al., submitted), establishing an interaction between the author of the educational text and students to bridge the gap between students and the educational content they need to learn.

Third, in our study, we focused on a specific domain, namely Dutch educational texts. To be able to interpret our quantitative results in a broader context, it would be worthwhile to compare the use of narrative elements in Dutch educational texts to that of texts in other domains. A fruitful domain for comparison could, for instance, be journalism, as news texts also tend to convey new information, while often discussing particularized events and introducing ‘characters’ (for example, eyewitnesses), who may express their feelings and/or thoughts about the happenings described (cf. van Krieken & Sanders, 2016). Furthermore, it would be valuable to broaden the focus of the current research by including texts from other cultures. While most – if not all – cultures define ‘narrative’ as a genre, its exact interpretation within the educational domain (as well as any other domain) may differ from culture to culture (cf. Biber & Conrad, 2009). Therefore, in order to

uncover any cultural differences with respect to narrativity in educational texts, it would be fruitful to compare our results on narrative elements in Dutch educational texts to that of educational texts from other countries.

Fourth, within the domain of Dutch education, we focused on educational texts for a limited set of school subjects, namely biology, geography, and history. In future research, it would be interesting to expand the current research by examining the distribution of narrative elements over additional school subjects. For instance, how and to what extent are narrative elements applied in school subjects that focus on formulas instead of human- or nature-related topics, such as mathematics?

Finally, future research could focus on the presumed rationale behind including narrative elements in educational texts: are narrative educational texts indeed more interesting to read and easier to understand than expository educational texts? Previous experimental research has shown conflicting results in this respect (see also Section 1). However, since these studies have used different operationalizations of the notions “expository” and “narrative”, no firm conclusions can yet be drawn about the relative effectiveness of narrative versus expository educational texts (Sangers et al., 2019). Therefore, future research should pursue a more consistent approach to the manipulation of these genres in experimental texts. We believe that our model in Figure 1 offers valuable guidelines to make a fair distinction between fully expository educational texts, fully narrative educational texts, and hybrid educational texts, combining characteristics of both genres.

Taken together, we have demonstrated that narrative elements are quite common in educational texts – a domain that has traditionally been considered as the prime exemplar of the expository genre. In addition, we have shown that the occurrence of narrative elements in educational texts depends on the nature of the educational content: 1) prototypical narrative elements tend to be at the core of the to-be-learned information in history texts, while 2) strategies to make educational texts more concrete, such as the addition of fictitious characters and representative entities, are more frequently applied in school subjects in which prototypical narrative elements fit less naturally, namely biology and geography texts. This way, the current paper has given insight into the use and distribution of narrative elements in educational texts, and has provided an essential step to investigate the potential of narrative elements in educational texts further – with the ultimate aim of designing optimal texts that present relevant educational content in a comprehensible and attractive way.

Acknowledgements

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Appendix A – Materials

Biology grade 5

- Mart Ottenheim and Rein Tromp (eds.) (2011). *Natuniek: Natuur en Techniek voor het basisonderwijs groep 7 leerlingenboek*. ThiemeMeulenhoff, Amersfoort.
- Ferry Siemensma (2014). *Wijzer! Natuur & Techniek: Leerwerkboek groep 7*. Noordhoff Uitgevers, Groningen/Houten.
- Annet Talsma and Linda Vogelesang (eds.) (n.d.). *Natuurzaken: Werkboek jaargroep 7* (4th ed.). Uitgeverij Zwijsen, Tilburg.
- Maaïke van Riel and Leonoor Soet (eds.) (2012). *Argus Clou professor in alles: Natuur en Techniek groep 7 lesboek*. Malmberg, 's-Hertogenbosch.
- Carla Wiechers (ed.) (2014). *Binnenstebuiten: Natuur en Techniek bronnenboek groep 7*. Blink Educatie, 's-Hertogenbosch.

Biology grade 8

- Trijnie Akkerman (ed.) (2013). *Nectar: 2-3 vwo leerboek* (4th ed.). Noordhoff Uitgevers, Groningen/Houten.
- Arteunis Bos, Onno Kalverda, Ruud Passier, Hans Rawee, Rik Smale, Gerard Smits and Ben Waas (2015). *Biologie voor jou: Handboek 2a vwo/gymnasium* (7th ed.). Malmberg, 's-Hertogenbosch.

Geography grade 5

- Anton Bakker (ed.) (2012). *De blauwe planeet: Aardrijkskunde voor het basisonderwijs*. ThiemeMeulenhoff, Amersfoort.
- Anja Huisman (ed.) (2012). *Argus Clou professor in alles: Aardrijkskunde groep 7 lesboek*. Malmberg, 's-Hertogenbosch.
- Ferry Siemensma (2015). *Wijzer! Aardrijkskunde: Leerwerkboek groep 7*. Noordhoff Uitgevers, Groningen/Houten.
- Annet Talsma (ed.) (2014). *Wereldzaken: Werkboek jaargroep 7* (3rd ed.). Uitgeverij Zwijsen, Tilburg.
- Marijke van Ooijen (ed.) (2014). *Grenzeloos: Aardrijkskunde bronnengroep groep 7*. Blink Educatie, 's-Hertogenbosch.

Geography grade 8

- Daphne Ariaens, Wim B. Brinke, Chris de Jong and Jan H.A. Padmos (eds.) (2016). *De Geo: Aardrijkskunde voor de onderbouw 2 vwo* (9th ed.). ThiemeMeulenhoff, Amersfoort.
- Martin van de Ven (ed.) (2018). *De wereld van: Aardrijkskunde voor de onderbouw leeropdrachtenboek 2VG*. Malmberg, 's-Hertogenbosch.
- Geert van den Berg (ed.) (2014). *BuiteNLand 2 vwo* (3rd ed.). Noordhoff Uitgevers, Groningen/Houten.

History grade 5

- Millicent Kruis (2014). *Wijzer! Geschiedenis: Leerwerkboek Groep 7*. Noordhoff Uitgevers, Groningen.
- Annemarie Können (ed.) (2012). *Argus Clou professor in alles: Geschiedenis groep 7 lesboek*. Malmberg, 's-Hertogenbosch.
- Jouke Nijman and Hans Roest (2011). *Speurtocht 7: Geschiedenis voor het basisonderwijs: Leerlingenboek* (2nd ed.). ThiemeMeulenhoff, Amersfoort.
- Miranda van de Mortel, Marcel van den Oever, Hans Vermeer and Linda Vogelesang (n.d.). *Tijdzaken: Werkboek jaargroep 7* (4th ed.). Uitgeverij Zwijsen, Tilburg.

Carla Wiechers (ed.) (2014). *Eigentijds: Geschiedenis bronnenboek groep 7*. Blink Educatie, 's-Hertogenbosch.

History: grade 8

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Appendix B – statistical results

1. Generalized Linear Mixed Models⁸

Full Venn	-2LL	$\Delta\chi^2$	Δdf	p
Model 0	1112.7			
*Model 1 (+SUBJECT)	1069.1	43.56	3	<.001
Model 2 (+LEVEL)	1068.9	0.21	1	.645
Model 3 (+SUBJECT*LEVEL)	1067.7	1.19	3	.755

Particularized event	-2LL	$\Delta\chi^2$	Δdf	p
Model 0	990.7			
*Model 1 (+SUBJECT)	966.7	23.98	3	<.001
Model 2 (+LEVEL)	966.7	0.04	1	.844
Model 3 (+SUBJECT*LEVEL)	964.6	2.05	3	.561

Experiencing character	-2LL	$\Delta\chi^2$	Δdf	p
Model 0	862.5			
*Model 1 (+SUBJECT)	837.8	24.63	3	<.001
Model 2 (+LEVEL)	837.7	0.17	1	.68
Model 3 (+SUBJECT*LEVEL)	834.5	3.21	3	.36

Landscape of consciousness	-2LL	$\Delta\chi^2$	Δdf	p
Model 0	1014.2			
*Model 1 (+SUBJECT)	978.7	35.52	3	<.001
Model 2 (+LEVEL)	978.2	0.53	1	.468
Model 3 (+SUBJECT*LEVEL)	973.0	5.15	3	.161

Full narrative	-2LL	$\Delta\chi^2$	Δdf	p
Model 0	571.4			
*Model 1 (+SUBJECT)	534.3	32.05	3	<.001
Model 2 (+LEVEL)	536.7	1.63	1	.202
Model 3 (+SUBJECT*LEVEL)	532.1	4.58	3	.205

Fictitious character	-2LL	$\Delta\chi^2$	Δdf	p
Model 0	169.8			
*Model 1 (+SUBJECT)	149.4	20.38	3	<.001
Model 2 (+LEVEL)	148.3	1.10	1	.294
Model 3 (+SUBJECT*LEVEL)	141.2	7.08	3	.069

Representative entity	-2LL	$\Delta\chi^2$	Δdf	p
Model 0	770.2			
Model 1 (+SUBJECT)	718.7	51.52	3	<.001
Model 2 (+LEVEL)	712.7	5.91	1	.015
*Model 3 (+SUBJECT*LEVEL)	699.5	13.25	3	.004

⁸ The Asterisk indicates the model that was proven to be the best fitting model.

2. Predicted probability scores

Full Venn	Probability	SE	LCL	UCL
Biology	0.23	0.05	0.13	0.36
Geography – physical	0.25	0.05	0.15	0.38
Geography – human	0.35	0.05	0.23	0.49
History	0.86	0.03	0.73	0.92



Particularized event	Probability	SE	LCL	UCL
Biology	0.10	0.03	0.04	0.22
Geography – physical	0.15	0.04	0.07	0.29
Geography – human	0.15	0.04	0.07	0.28
History	0.62	0.07	0.44	0.77



Experiencing character	Probability	SE	LCL	UCL
Biology	0.10	0.04	0.04	0.26
Geography – physical	0.10	0.04	0.04	0.24
Geography – human	0.08	0.03	0.03	0.21
History	0.70	0.08	0.47	0.85



Landscape of consciousness	Probability	SE	LCL	UCL
Biology	0.13	0.03	0.08	0.22
Geography – physical	0.10	0.02	0.06	0.18
Geography – human	0.17	0.03	0.10	0.26
History	0.51	0.04	0.40	0.62



Full narrative	Probability	SE	LCL	UCL
Biology	0.03	0.02	0.010	0.10
Geography – physical	0.03	0.01	0.009	0.09
Geography – human	0.01	0.01	0.001	0.04
History	0.31	0.06	0.186	0.47



Fictitious character	Probability	SE	LCL	UCL
Biology	0.46	0.20	0.10	0.86
Geography – physical	0.64	0.18	0.21	0.92
Geography – human	0.91	0.09	0.44	0.99
History	0.02	0.02	0.003	0.13

Representative entity		Probability	SE	LCL	UCL
Grade 5	Biology	0.61	0.07	0.43	0.77
	Geography – physical	0.06	0.02	0.02	0.17
	Geography – human	0.08	0.03	0.03	0.20
	History	0.04	0.02	0.01	0.13
Grade 8	Biology	0.82	0.06	0.58	0.93
	Geography – physical	0.29	0.07	0.14	0.52
	Geography – human	0.06	0.03	0.07	0.18
	History	0.04	0.02	0.01	0.13

3. Post hoc Tukey scores

BI = biology 5 = grade 5
 GP = physical geography 8 = grade 8
 GH = human geography
 HI = history

Full Venn

Contrasts			OR	SE	z	p
BI	/	GP	0.89	0.32	-0.33	.988
BI	/	GH	0.56	0.20	-1.66	.343
BI	/	HI	0.05	0.02	-8.16	<.001
GP	/	GH	0.63	0.13	-2.26	.107
GP	/	HI	0.06	0.02	-8.13	<.001
GH	/	HI	0.09	0.03	-6.94	<.001



Particularized event

Contrasts			OR	SE	z	p
BI	/	GP	0.63	0.31	-0.94	.784
BI	/	GH	0.65	0.32	-0.89	.812
BI	/	HI	0.07	0.03	-5.56	<.001
GP	/	GH	1.03	0.26	0.10	1.00
GP	/	HI	0.11	0.05	-4.99	<.001
GH	/	HI	0.11	0.05	-5.06	<.001



Experiencing character

Contrasts			OR	SE	z	p
BI	/	GP	1.01	0.61	0.02	1.00
BI	/	GH	1.24	0.75	0.36	.984
BI	/	HI	0.05	0.03	-5.15	<.001
GP	/	GH	1.23	0.36	0.72	.891
GP	/	HI	0.05	0.03	-5.34	<.001
GH	/	HI	0.04	0.02	-5.66	<.001



Landscape of consciousness

Contrasts			OR	SE	z	p
BI	/	GP	1.37	0.48	0.91	.799
BI	/	GH	0.78	0.25	-0.77	.870
BI	/	HI	0.15	0.04	-6.34	<.001
GP	/	GH	0.57	0.16	-2.07	.163
GP	/	HI	0.11	0.03	-7.20	<.001
GH	/	HI	0.19	0.05	-5.91	<.001



Full narrative

Contrasts			OR	SE	z	p
BI	/	GP	1.12	0.71	0.81	.998
BI	/	GH	4.99	4.39	1.83	.260
BI	/	HI	0.07	0.04	-4.71	<.001
GP	/	GH	4.45	3.56	1.87	.241
GP	/	HI	0.07	0.04	-5.08	<.001
GH	/	HI	0.01	0.01	-5.15	<.001



Fictitious character

Contrasts			OR	SE	z	p
BI	/	GP	0.47	0.52	-0.68	.906
BI	/	GH	0.09	0.11	-1.89	.232
BI	/	HI	39.48	45.35	3.20	.008
GP	/	GH	0.18	0.17	-1.80	.274
GP	/	HI	84.03	90.09	4.13	<.001
GH	/	HI	461.55	586.07	4.83	<.001

Representative entity

Contrasts			OR	SE	z	p
5BI	/	5GP	23.10	11.63	6.25	<.001
5BI	/	5GH	18.20	8.79	6.00	<.001
5BI	/	5HI	37.40	20.56	6.59	<.001
5GP	/	5GH	0.79	0.37	-0.51	1.00
5GP	/	5HI	1.62	1.01	0.77	.995
5GH	/	5HI	2.06	1.25	1.18	.937
8BI	/	8GP	10.60	5.81	4.30	<.001
8BI	/	8GH	71.10	45.27	6.70	<.001
8BI	/	8HI	103.00	65.55	7.27	<.001
8GP	/	8GH	6.72	2.99	4.28	<.001
8GP	/	8HI	9.71	5.66	3.90	.002
8GH	/	8HI	1.45	0.96	0.55	.999
5BI	/	8BI	0.36	0.18	-2.03	.459
5GP	/	8GP	0.16	0.09	-3.37	.017
5GH	/	8GH	1.39	0.85	0.54	1.00
5HI	/	8HI	0.98	0.65	-0.04	1.00

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