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Improving Elementary School Students' Understanding of Historical Time: Effects of Teaching With "Timewise"

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Abstract: The teaching of historical time is an important aspect in elementary school curricula. This study focuses on the effects of a curriculum intervention with "Timewise," a teaching approach developed to improve students' understanding of historical time using timelines as a basis with which students can develop their understanding of historical phenomena and periods. The study, in which 16 teachers from grade 2 (ages 7–8) and from grade 5 (ages 10–11) participated, represents the first curriculum intervention on the understanding of historical time in elementary schools in the Netherlands. The effects were measured in a quasi-experimental pre-/post-test design. Mixed model linear analyses showed that for both grade 2 and grade 5, students in the experimental condition ($N = 396$) scored significantly higher on the post-test than students in the control condition ($N = 392$), with a medium effect size. Implications for the teaching of historical time in elementary school and in teacher training are discussed.

Keywords: elementary school, history, teaching approach, timeline, understanding historical time

Time is an extremely complex and abstract phenomenon that has been debated by philosophers, physicists, psychologists, and, to a lesser extent, by

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historians, even though time is "the heart" (Jordanova, 2000, p.105) or "the distinctive marker" (Stow & Haydn, 2000, p.85) of history. Through an understanding of historical time, students learn to understand the past, to relate the past to the present, and to develop historical consciousness (Grever, 2009; Rüsen, 2012; Seixas, 2006; Wilschut, 2012).

Teachers play an important role in the development of their students' understanding of historical time. However, evaluations and research show that the understanding of historical time is an area that is not always well implemented in the elementary school curriculum (De Groot-Reuvekamp, Van Boxtel, Ros, & Harnett, 2014; Ofsted, 2011; Wagenaar, Van der Schoot, & Hemker, 2010). In elementary schools in many countries, history lessons are based on a chronological sequence of historical eras. For example, this approach applies to elementary history education in Australia, Canada, Ireland, and England. However, just teaching periods in chronological order does not guarantee that students develop an understanding of historical time (De Groot-Reuvekamp et al., 2014). Moreover, history lessons often concentrate on one single era for a longer time without paying attention to the chronological overview and anchor points that can be visualized on a timeline. Many publications on classroom practice about the teaching of historical time recommend that timelines are important to promote students' understanding of historical time (Alleman & Brophy, 2003; Chapman, 1993; Cooper, 2012; Dawson, 2004; Hodkinson, 2003; Hoodless, 1996; Newton, 2001; Wood, 1995). However, only limited empirical evidence supports this contention.

In this study, we investigate to what extent the understanding of historical time of elementary school students can be improved by teaching with timelines. We conducted a curriculum intervention with Timewise, a new teaching approach in which teachers consistently refer to the timeline in every lesson and systematically engage their students in learning activities that focus on the objectives of historical time (De Groot-Reuvekamp, Ros, Van Boxtel, & Oort, 2017). For 5 months, 16 teachers taught their students in grade 2 (ages 7–8) and grade 5 (ages 10–11) following the Timewise approach. The effects of this intervention were measured in a quasi-experimental pre-test/post-test design. The hypothesis in this study is that teaching with Timewise leads to improved student learning outcomes on the understanding of historical time.

THEORETICAL FRAMEWORK

Our conceptualization of the understanding of historical time is based on history education literature. Knowledge and skills that are related to the understanding of historical time are knowledge of chronology (e.g., vocabulary of time, dates, periodization); knowledge of characteristic aspects of historical eras; the ability to place objects, situations, events, and people in the correct historical periods; and the ability to identify aspects of change and continuity

(Barton & Levstik, 1996; Dawson, 2004; Hodkinson, 2003; Hoodless, 2002; Stow & Haydn, 2000; Wilschut, 2012). Thus, understanding historical time is more than knowing dates and names of historical events or eras. Students also need to develop a "sense of period" (Dawson, 2004), which means that they can distinguish one period from another based on knowledge of the characteristics of historical periods, which enables them to imagine how people lived and how things looked. Thinking in terms of change and continuity is regarded as a core concept of historical thinking (Lévesque, 2008; Seixas & Morton, 2013) and of historical consciousness (Grever, 2009).

Children's Development in the Understanding of Historical Time

Although time is an important concept in the teaching and learning of history, there are only a limited number of studies that focus on the development of the understanding of historical time during childhood. The first studies on children's understanding of historical time appeared in the early 20th century with theories from psychologists that emphasized age-related maturation in children's development, which indicated that children can only start to understand and learn about historical time from the age of about 11 (Bradley, 1947; Jahoda, 1963; Oakden & Sturt, 1922; Piaget, 1969). In their review study, Thornton and Vukelich (1988) were among the first critics of the Piagetian developmental stage theory for the concept of historical time. In the last decades of the 20th century, various British and American empirical studies provided evidence that young children from the age of 5 already have some understanding of historical time and are able to distinguish concrete changes through time in pictures and stories (Barton & Levstik, 1996; Brophy, VanSledright, & Bredin, 1993; Harnett, 1993; Hodkinson, 2003; Hoge & Foster, 2002; Hoodless, 2002; Levstik & Pappas, 1987; Stow & Haydn, 2000; Vella, 2001; West, 1981a). The empirical studies from the last few decades generally suggest that the development of understanding historical time in children can be stimulated by learning and instruction, which is in line with Vygotsky's (1978) theory that mastering new concepts is not dependent on a spontaneous process of development and can be helped by education that offers experiences within the zone of proximal development. According to Friedman (1982, p. 173), three components are important in the cognitive processes that underlie children's learning of the abstract concept of time: "verbal lists" of time sets; "associative networks" to remember characteristic features, for instance, of an era in history; and "image coding" as representations of events that can be placed in time. In a previous study, we developed a model that more precisely describes the (hypothesized) development of the understanding of historical time (De Groot-Reuvekamp et al., 2017; see Table 1) and that can support teachers in elementary schools. This model was based on empirical studies with elementary students between the ages of 5 and 12 (Barton & Levstik, 1996; Harnett, 1993; Hoge & Foster,

Table 1. Developmental Model for Students' Understanding of Historical Time (De Groot-Reuvekamp et al., 2017)

Objectives	Stage A—Emergent understanding	Stage B—Initial understanding	Stage C—Continued understanding
A. Vocabulary Apply the vocabulary relating to time and historical periods.	Apply relative terms relating to time, such as: most long ago, a very long time ago, a long time ago, not so long ago, our times.[a]	Apply the names of historical eras that are most recent and most long ago and terms like the Eras of: *Television and Computer, the World Wars, Steam Engines, Roman Times,* and *Middle Ages.* Recognize dates AD.	Apply the names of the historical periods and terms like Prehistory, *Middle Ages,* and *Golden Age.* Apply dates AD and BC and the relation between dates and centuries.
B. Sequence Sequence historical periods and objects, situations, events, and people of different periods of time in chronological order.	Sequence pictures of objects and situations concerning everyday life, such as lifestyle, clothing, architecture, and transport.	Sequence some historical periods (objective 1) and pictures of well-known people and tangible events, e.g., inventions.	Sequence events, people, and historical periods
C. Timeline Place objects, situations, events, and people on a timeline.	Use a simple timeline that portrays the course of time from (very) long ago until now.	Use a timeline with names of historical eras (objective 1).	Use a timeline with dates AD and BC.
D. Characteristic Features Use/identify characteristic features in texts and images to place objects, situations, events, and people in the correct periods of time.	Use /identify everyday characteristic features of past periods (lifestyle, clothing, architecture, and transport).	Use /identify social and cultural characteristic features of some historical eras (objective 1).	Identify social, cultural, economic, and political characteristic features of the ten historical eras in national, European, and world history.
E. Compare and contrast Compare and contrast different historical periods to identify changes, differences, and similarities in the way people lived within and across periods.	Identify differences in everyday life of people in the past and the present in tangible examples through history and related to generations of parents and grandparents.	Identify changes, differences, and similarities in the way people lived *across* historical periods.	Identify changes, differences, and similarities in the way people lived *within and across* historical periods.

Note. [a]Our times is the time after the Second Word War.

2002; Levstik & Pappas, 1987), an analysis of the history curriculum for primary education in the Netherlands and the United Kingdom (De Groot-Reuvekamp et al., 2014), and the components described by Friedman (1982). The model consists of three developmental stages: emergent, initial, and continued understanding of historical time, which grow in complexity. For example, applying time vocabulary develops from broad terms, such as "long ago," to the use of names of historical periods and dates, and the identification of characteristic features of historical periods develops from concrete characteristics, such as clothing and transport, to more abstract characteristics, such as the rise of trade and crafts in medieval cities and citizens striving for political influence in the French revolution.

For each stage, the five objectives were operationalized in terms of student behavior, starting with the first objective on the knowledge of chronology: Apply the vocabulary of time. The other objectives refer to a "sense of period," with student behavior focusing on sequencing events, people, and historical eras in chronological order; using the timeline to place events and people in time; identifying characteristic features of different historical periods; and comparing and contrasting historical periods (De Groot-Reuvekamp et al., 2017). These activities aim at applying knowledge about characteristic features of eras and developing historical thinking through the concept of change and continuity.

The Teaching of Historical Time

For the teaching and learning of historical time, timelines are often recommended because they help with the visualization of temporal relations (Hoodless, 1996) and support students' thinking about time (Stow & Haydn, 2000). The timeline in its modern form is a relatively new invention that started in 1769 with Joseph Priestley's *New Chart of History* (Rosenberg & Grafton, 2010). Timelines impose a linear representation of the past, which is a reason that they are also criticized. Timelines give an impression of a linear historical narrative of progression through time, making it look from today's perspective as if history could not have developed differently. Furthermore, timelines display a structure of historical eras, while changes over time in history are more complex than century turning points suggest (Grever, 2009; Stearns, 2009). Wilschut (2012) suggested that, in education, no priority should be given to dates and timelines. Rather, children should "build associative contexts first, which then later can be mutually arranged through dates and timelines" (pp. 137–138). On the other hand, the importance of learning about dates and chronology were emphasized by Dawson (2004) and Blow, Lee, and Shemilt (2012) as a basis upon which students can develop an understanding of historical concepts, such as a medieval castle or the Second World War, and a "sense of period." Also, Hodkinson (2003) and

Barton (2011) advised teachers to use timelines with historical periods and dates as points of reference to build up students' knowledge of time.

Few empirical studies confirm the effect of timelines on students' understanding of historical time. Both West (1981a) and Hodkinson (2003) used special curricula in which they applied time charts and timelines. West (1981a) worked with more than 1,250 children in 30 elementary schools on developing children's skills in recognizing and interpreting evidence from the past. He reported a remarkable improvement in students' linguistic abilities and in their ability to sequence narrative pictures from different historical eras, but temporal concepts did not appear to follow the same pattern, in spite of the use of classroom time charts (West, 1981a, 1981b). The effect of timelines on students' understanding of time was specifically studied by Hodkinson (2003) by collecting data from five groups of students, aged 8–10, of which one group worked for three terms with a special teaching approach that used timelines consistently in every lesson. The conclusions were that the treatment group developed greater chronological understanding than the control groups and that "large class time lines which orientate the past on the left and have centuries highlighted … were a more useful teaching resource than are the spiral, zigzag or helix forms of this resource" (p. 271). Further, in a study by Masterman and Rogers (2002), an interactive roadmap in the form of a winding timeline was used in a multimedia design with a small sample of children aged 5–7. The evaluation showed that the program facilitated children's ability to reason about sequence, recurrence, and similarities and differences between past and present, which corresponds to the objectives of the understanding of historical time on sequencing and on comparing and contrasting different historical eras (De Groot-Reuvekamp et al., 2017).

Along with timelines, historical pictures seem to be effective materials for the teaching of historical time. Prangsma, Van Boxtel, and Kanselaar (2008) investigated the effect of visual representations with lower secondary school students aged 12–13. They found that students working with visual–textual representations integrated in a timeline outperformed students who worked in the textual representation condition on a post-test of historical knowledge. An experiment by Foreman, Boyd-Davis, Moar, Korallo, and Chappell (2008) compared the sequencing of historical pictures in a Virtual Environment (VE) with sequencing paper sheets. They found that students aged 7–9 who worked with paper sheets learned more about historical sequence than the students who worked in the VE. The authors presumed that this result was due to the possibly overstimulating effect of the VE as an exciting medium. In a number of experimental studies, researchers have used historical pictures to find out how students of different ages used the vocabulary of time and reasoned about chronological sequence and characteristic features of historical eras (Barton & Levstik, 1996; Harnett, 1993; Hoge & Foster, 2002; C. van Boxtel & Van Drie, 2012), while others have used stories (Hoodless, 2002; Levstik & Pappas, 1987). These studies give a good insight into how historical pictures and stories can trigger students to compare and

contrast between the past and the present and between different historical periods using time vocabulary, dates, and the characteristics of historical eras (De Groot-Reuvekamp et al., 2017).

From the review of the literature, it can be concluded that there still exists little empirical evidence for the effect of teaching with timelines, and that which exists is mostly small scale. Further, curriculum intervention studies in history education for elementary school students, like those of West (1981a) and Hodkinson (2003), are rare. There are no examples of recent curriculum intervention studies in elementary school history, in contrast to secondary school, where these kinds of studies are more common, for instance, curriculum interventions on reading and writing with regard to historical thinking (Monte-Sano, De La Paz, & Felton, 2014; Reisman, 2012).

In the present study, we undertake a curriculum intervention on teaching with timelines, in combination with pictures and stories, in order to engage students in the type of activities we consider important for the understanding of historical time (see Table 1). The main design principles of Timewise were:

• To systematically teach according to the objectives of the understanding of historical time, with learning activities as described in the developmental model in Table 1,
• To use the timeline consistently in every lesson related to these activities, and
• To use stories and pictures to foster students' development of a "sense of period."

Timewise: A Teaching Approach to Improve Students' Understanding of Historical Time

The Timewise approach is a curriculum intervention of 5 months that was developed for grade 2 (ages 7–8) and grade 5 (ages 10–11) and was based on the developmental model in Table 1 (De Groot-Reuvekamp et al., 2017), with lesson formats that match the core objectives of the Dutch curriculum, which are about the vocabulary of time, the characteristic aspects of ten eras, and important historical persons and events from Dutch history (Dutch Ministry of Education, Culture and Sciences, 2006).[1] In Dutch schools, hardly any history is taught in grade 2, whereas in grade 5, teachers spend, on average, 60 min a week on history lessons that are mostly textbook based. About 20% of the schools integrate history within a thematic approach for social studies (Dutch Inspectorate of Education, 2015a; Wagenaar et al., 2010). Therefore, the lesson formats that were developed for Timewise can be used either independently or integrated with regular lessons in history or social studies. Only the first three introductory lessons, with an introduction of the timeline and the eras, were prescriptive with a fixed format. These introductory lessons were followed by weekly lessons of about 30 min, with a flexible format that teachers could adapt to their classroom needs (examples

of lesson formats are included in Appendix A). The flexible formats were based on stories and video clips, as the literature indicates that visual representations and stories can stimulate students' learning about time (Barton & Levstik, 1996; Foreman et al., 2008; Harnett, 1993; Hoodless, 2002; Levstik & Pappas, 1987; Prangsma et al., 2008). These stories and video clips were selected from a book with historical stories for young children (Van Dam & De Wolf, 2013) and from educational websites. They were related to topics in the Dutch history curriculum from prehistoric until modern times (e.g., the first farmers, the end of Roman rule in the Low Countries, Charlemagne, child labor in the 19th century, and Anne Frank). These materials were carefully selected with a focus on original sources combined with an attempt to avoid stereotypes that could support notions of presentism. The stories and video clips were the starting point for learning activities based on the model in Table 1, starting with a whole-class discussion on characteristics of an era in which the timeline and the vocabulary of time were used, followed by learning activities on identifying and recognizing characteristic features and on comparing these features with characteristics of previous eras and with the present.

Within the flexible lesson formats, teachers could choose if they used stories or/and video clips. Further, they could use additional pictures from the instruction manual on the interactive whiteboard (IWB) and digital timelines, on which pictures could be sequenced. The pictures derived from educational and museum websites. Examples of pictures included photos of Neolithic hand axes, a model of a Roman fortress, a painting of a medieval market place, a map of the Hanseatic towns, an engraving of Nova Zembla, a replica of the first Dutch steam train, the airplane of the Wright brothers, and Neil Armstrong on the moon. The lesson format suggested that at the end of each lesson, the students could choose a picture from the instruction manual for the classroom timeline through a whole-class discussion in which they had to give arguments for why the picture suited the era.

Both for grade 2 and for grade 5, large classroom timelines were developed (Figure 1), representing six eras for the stage of *initial* and ten eras for the stage of *continued* understanding of historical time. The timelines were on scale and had color-coding and symbols for the different eras.

For grade 2, the timeline consisted of the eras that are most recent and most long ago, all with dates AD, as mentioned in Table 1, with the relative terms that belong to stage A (*emergent* understanding) underneath: "a very long time ago," "a long time ago," "not so long ago," and "our times". For grade 5, the timeline showed all ten eras with dates BC and AD. As this timeline was constantly visible, it could also be referred to during lessons on other subjects. For example, in a math lesson on Roman numerals or a reading lesson on a historical person, teachers could refer to the timeline and discuss with students in what era these numbers were used or when this person lived, using the vocabulary of time.
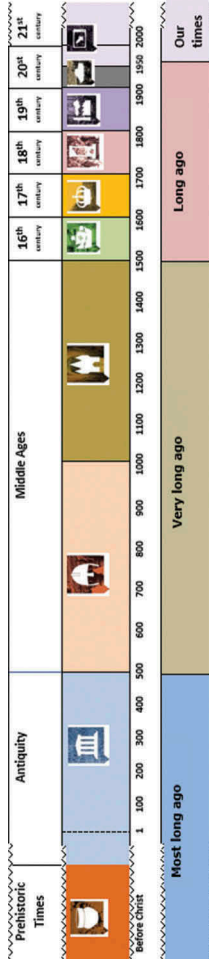
Figure 1. Timeline for Timewise in Grade 5. *Note.* Periodization and icons are according to the Dutch curriculum standards.

Aim of the Present Study

In this study, we aimed to test if the Timewise approach led to better results on the understanding of historical time for students in grade 2 (ages 7–8) and grade 5 (ages 10–11). We chose these grades because we wanted to test Timewise with younger as well as upper elementary students. The regular grade 2 curriculum does not feature history because 7–8-year-old students are regarded as not being able to understand historical time. We wanted to find out if the Timewise approach worked for these young students and measured the effect on their understanding of time compared to the development of this understanding for students who received no history education.

For grade 2, the hypothesis was that students who were exposed to a Timewise curriculum would make more progress in their understanding of historical time than students in the control condition, who received no history education. For grade 5, the hypothesis was that students who were exposed to a Timewise curriculum would improve their understanding of historical time and make more progress than students who received regular history or social studies lessons. Further, we expected that students' characteristics, such as age, gender, reading levels, and parental educational levels would also have an effect on students' results, in addition to the time that teachers spent on Timewise and history lessons.

METHODOLOGY

To test our hypotheses, we carried out a curriculum intervention with Timewise with teachers and students from grades 2 and 5 who applied this teaching approach from February–June, 2015. The effects of Timewise were tested in a quasi-experimental design with an experimental and a control condition in ten Dutch elementary schools. A test with multiple-choice questions on the understanding of historical time (De Groot-Reuvekamp et al., 2017) was used as the pre- and post-test in all grades.

Participants

Through emails and telephone calls, principals of 48 schools were asked to participate in this study, along with their teachers and students from grades 2 and 5. These schools all belong to a partnership with the university for teacher training where the first author works. Eight schools reacted positively to the request to take part with experimental and control classes (Table 2).

We aimed for experimental as well as control classes within all participating schools. However, in some schools, this approach was not possible.

Table 2. Overview of the Number of Classes and Students in the Experimental and Control Conditions ($N = 788$)

| School | Grade 2 (ages 7–8) | | | | Grade 5 (ages 10–11) | | | |
| | Experimental condition | | Control condition | | Experimental condition | | Control condition | |
	Classes	Students	Classes	Students	Classes	Students	Classes	Students
1.	1	21	—	—	1	30	—	—
2.	1	24	—	—	1	28	—	—
3.	1	25	1	24	—	—	2	56
4.	1	24	2	40	2	55	1	27
5.	1	41	—	—	1	22	—	—
6.	2	42	—	—	1	27	2	52
7.	1	12	—	—	—	—	—	—
8.	—	—	1	29	2	45	—	—
9.	—	—	2	55	—	—	3	78
10.	—	—	1	16	—	—	1	15
Total	8	189	7	164	8	207	9	228

Therefore, we approached two extra schools to participate with only control classes. All schools were situated in the southeastern region of the Netherlands in both smaller and larger cities. The 16 teachers in the experimental group had between 2 and 40 years of experience ($M = 17.13$, $SD = 14.44$). Fourteen were female, and 2 were male. The 16 teachers in the control group had between 1 and 39 years of experience ($M = 17.31$, $SD = 13.04$). Eleven were female, and 5 were male. These ratios correspond to the Dutch situation, in which most elementary school teachers are female.

Table 3 shows descriptive statistics for student characteristics: age, gender, reading levels, and the educational levels of parents. In total, 396 girls and 392 boys participated, with slightly more girls in the experimental than in the control condition. All schools in the Netherlands register the educational level of students' parents. Depending on the percentages of lower-educated parents, which is a reliable predictor for pupils' achievement (Ledoux et al., 2015), schools receive more government funding. Parents have a low education level if they both have only elementary school, or if one of the parents has the level of lower vocational education. Table 3 shows that, in our sample, the mean percentages of students with parents with a low education level were below the national average of 10.9% (Dutch Inspectorate of Education, 2015a).

All participating schools took standardized national tests to monitor students' reading levels, which consist of five levels from A–E. The means for each grade and condition are presented in Table 3. In our sample, the reading levels largely corresponded to the national average (Keuning, Hilte, & Weekers, 2014). Only the percentages of high-level readers in both conditions were somewhat higher. A *t*-test indicated that the differences in reading levels between the conditions were not significant.

Students of grade 2 in the experimental condition were on average 7.76 years old ($SD = 1.71$), and in the control condition, 8.21 ($SD = .45$). In grade 5, the ages were 11.25 ($SD = .45$) in the experimental and 11.25 ($SD = .48$) in the control condition.

Table 3. Descriptive Statistics for the Experimental and the Control Condition ($N = 788$)

	Grade 2 (ages 7–8)		Grade 5 (ages 10–11)	
	Experimental ($N = 189$)	Control ($N = 164$)	Experimental ($N = 207$)	Control ($N = 228$)
Girls	52.9%	47.6%	53.6%	46.9%
Low parental education	6.9%	1.8%	2.4%	5.3%
Reading levels[a]	2.43 (1.28)	2.37 (1.21)	2.09 (1.33)	1.86 (1.20)

Note. [a]There are 5 reading levels, of which 1 is the highest level. Standard deviation between brackets.

Instruments

To measure students' performances in both the experimental and control condition before and after the intervention with Timewise, we used a test that was developed in a previous study (De Groot-Reuvekamp et al., 2017), with multiple-choice questions on the five objectives of understanding historical time in Table 1. This same test was used in the pre-test as well as in the post-test. For grade 2, the test consisted of 26 items on emerging and initial understanding. For grade 5, the tests contained 32 items on initial and continued understanding, and there were 14 questions that were common to both tests. There were items in which students had to choose the correct sequence of pictures of buildings and vehicles (grade 2) or events and well-known people (grade 5) from different historical eras. Other questions contained timelines on which students could choose the correct era based on identifying characteristic features in a picture or a little story, for instance, a story of children working long days in factories (grade 2 and 5). Further, there were questions in which students were supposed to identify change or continuity in stories or pictures, for instance, a text on people hoping that life would change after the French invasion in the Netherlands in 1795 (grade 5) required students to choose which changes people were hoping for. In grade 2, the questions were read aloud by the teachers, whereas in grade 5, students read and answered the questions themselves (Appendix B includes some examples of test items).

The test was validated through consultation with experts, think-aloud interviews with students, and a pilot in one elementary school with 135 students. The final version consisted of two tests: Test I for ages 6–8, with items on emergent and initial understanding, and Test II for ages of 9–12, with items on initial and continued understanding. This version was tested with 1,457 students aged 6–12 from seven elementary schools. These tests rendered alphas of .67 for Test I and .77 for Test II, which was sufficient for the purpose of this study. Results showed that students in higher grades consistently outperformed students in lower grades on all objectives of the understanding of historical time and that in each grade there was room for improvement (De Groot-Reuvekamp et al., 2017).

In the present study, grade 2 students took Test I, whereas grade 5 students took Test II. A reliability analysis with the samples of for the pre- and the post-test resulted in a Cronbach's alpha of .64 and .72 for grade 2 ($n =$ 337/346) and .60 and .67 for grade 5 ($n =$ 421/427). Attempts to raise the modest alphas through different versions and pilots remained unsuccessful, which might be explained by the different item formats (e.g., pictures, texts, and timelines), which required different kinds of knowledge and skills. Since the validity of the items was based on construction according to the objectives on the understanding of time, we decided to accept that the reliability was not particularly robust.

Teacher Training

Eight teachers from grade 2 and eight teachers from grade 5 were trained to teach with Timewise. The training was conducted by the first author and took place on two afternoons in January, 2015, followed by an intervention of 5 months. In the first session, the importance of teaching the understanding of historical time was stressed, and examples were given on how students develop their understanding of historical time according to the developmental model (De Groot-Reuvekamp et al., 2017). The teachers received the instruction manuals with prescriptions on how to implement Timewise in their classrooms by systematically paying attention to the objectives and consistently using the timeline in every Timewise lesson. The lesson formats were introduced and highlighted so that teachers could engage students in activities on using the vocabulary of time; sequencing events, objects, persons, and eras; attaching pictures to the timeline; identifying characteristic features in stories and pictures; and comparing different eras. The teachers discussed the feasibility of these activities in small groups.

The focus of the second meeting, 1 week after the first session, was on strategies on how to use the stories, videos, and pictures to introduce and discuss historical eras. Examples of the materials of Timewise were shown: PowerPoints, pictures, links to educational videos, and digital timelines. The materials were made available for teachers through a website. All teachers also received a storybook and a classroom timeline. In small groups, the teachers exchanged ideas on how they could integrate Timewise lessons of about 30 min in their own curricula instead of or alongside regular history or social studies lessons, preferably at a fixed time in the week.

The meeting was concluded with an evaluation of the training. In a questionnaire, all teachers answered that the prescriptions and strategies on how to implement Timewise were clear and that they were satisfied with the provided materials. Finally, the teachers were urged not to share any information with their colleagues from control classes within their schools.

Procedure

After the training sessions, the teachers of the experimental condition carried out 13–15 weekly Timewise lessons. The implementation of Timewise was monitored by means of a questionnaire and logs in which the teachers reported the topics covered and the duration of the lessons, the objectives they strove to reach, and the use of the timeline. Furthermore, each teacher was observed at least once during a Timewise lesson by the first author. All observations were videotaped with consent from the teachers and the students' parents.

In the week between the two training sessions, the pre-test was conducted in all classes of the experimental and the control condition, 1 week

before the experimental condition started with the Timewise lessons. The post-test took place in all classes in the last week of June, 2015, 1 week after the experimental condition had finished the Timewise lessons.

Treatment Fidelity

Treatment fidelity was determined through observations and questionnaires which indicated that teachers' instructional behavior in the experimental condition was according to the prescriptions. For the observations of a Timewise lesson, the frequency in which the teacher focused on the objectives of the understanding of historical time was rated (1 = not or only once; 2 = repeatedly). We observed, for instance, a lesson in grade 2 about the era of Television and Computer, in which the teacher at different moments engaged the students in using vocabulary of time, such as "long ago," "our times," "the time of the World Wars," "the time of television and computer," and "1945". For this lesson, the objective of using the vocabulary of time was rated with 2. In another lesson about the era of Discoverers and Reformers in grade 5, the teacher started the lesson by referring to the timeline and asking the students: "When was that time, and which eras were before and after?" For this lesson, the objective of using timelines was rated with 1, because in the rest of the lesson, the timeline was not used. Sixteen observations were rated by the first author, and subsequently, a teacher trainer from another faculty rated four videotapes according to the same protocol. Cohen's kappa was $\kappa = .77$.

The analyses of the observations indicated that the teachers in the experimental condition in grade 2 and 5 strove to reach all five objectives on the understanding historical time in most of their Timewise lessons. The objective of chronological sequence was observed least. The other objectives were repeatedly observed, with percentages of 75–100% (Table 4).

Teachers of both the experimental and the control condition completed a questionnaire about the teaching of historical time, in which they indicated the time they spent on the teaching of Timewise and/or history lessons as well as their use of textbooks and timelines. The results from this questionnaire

Table 4. The Percentages of Teachers Who Repeatedly Focused on the Objectives on the Understanding of Historical Time in the Observed Lesson

Objectives	Grade 2 (N = 8)	Grade 5 (N = 8)
Vocabulary of time	88	100
Chronological sequence	38	38
Timeline	75	75
Characteristic features	88	100
Compare and contrast	88	88

showed that the 16 teachers in the experimental condition, on average, spent more than the advised 30 min on the Timewise lessons. Grade 2 teachers spent about 34 min per week (SD = 6.94) on Timewise. Grade 5 teachers spent on average 40 min (SD = 7.91) per week on Timewise, compared to an average of 23 min (SD = 18.50) on regular weekly history lessons with textbooks or on social studies. In these textbook lessons, as well as in the social studies themes, the teachers used the Timewise timeline, and they made references to the Timewise lessons. Two teachers in grade 5 replaced the textbook history lessons with activities and materials suggested by Timewise.

For the control condition, the questionnaires showed that in grade 2, history did not feature in the curriculum. Grade 5 teachers in the control condition spent, on average, 39 min per week (SD = 14.70) on history using history textbooks or within social studies themes. The teachers in grade 2 and grade 5 in the control condition did not use large classroom timelines.

Data Analysis

From students' mean scores on the pre- and post-test on the understanding of historical time, descriptive statistics were calculated. Baseline differences between the experimental and control condition were examined using independent t-tests. Subsequently, linear mixed model analyses were conducted in SPSS to take into account the hierarchical structure of the data. Measurement occasions for the pre-test and the post-test (level 1) were nested within students (level 2), who were in turn nested in classes (level 3) (Field, 2013; Snijders & Bosker, 2012). Separate analyses were conducted for grade 2 and for grade 5, with the standardized score on students' understanding of historical time as the dependent variable. In the first step of the analysis, a three-level null model (model 0) was estimated without explanatory variables. This baseline model was used to determine the variance within and between classes before taking into account the differences between conditions in both measurements.

In the second step of the analysis, we included explanatory variables. Model 1 was a standard 3-level mixed effects model with fixed effects for time, condition, and their interaction: $Y_{tic} = y_0 + y_1 d_{tic} + y_2 CON_{tic} + y_3 d_{tic} CON_{tic} + U_{tic} + V_{t0c}$ (Notation: t = time point; i = student; c = class; d = dummy variable for pre-test (0) and post-test (1); CON = dummy variable for control (0) and experimental (1) condition). The last two terms were the random effects. U_{tic} are the level-2 residuals, separately estimated for time points 1 and 2, indicating the amount of variance in scores between students within in the same class. V_{t0c} were the level-3 residuals, separately estimated for time points 1 and 2, indicating the amount of variance in scores between classes. The covariance matrixes for U_{tic} and V_{t0c} were unconstrained. This model included a random intercept that represented the mean score on the pre-test for the control condition. We examined the increase in score from pre- to post-test for the control condition (effect of time). Further, we examined the

differences between the experimental and the control condition on the pre-test score (effect of condition). An interaction effect (time × condition) was included to investigate the differential growth of students in the experimental condition from the pre-test to the post-test contrasted against the control group.

In the last model (model 2), explanatory covariates were added stepwise for the total time that teachers spent on Timewise and history lessons (in minutes), and for students' age (in years and months), gender (1-female, 0 = male), reading levels (1 = high, 5 = low), and parents' educational levels (1 = high, 0 = low).

For models 1 and 2, the residual intra-class correlation coefficients were estimated to explain for the variance between classes compared to the total variance in students' scores on the tests on the understanding of historical time. The 2-Log-likelihood test was used to assess the significance of the deviance between models 1 and 2 without and with covariates, using the table for critical values of the chi-square distribution (Field, 2013). Finally, Pearson's correlations between the fixed predicted values and the Z-scores of the pre- and post-test on the understanding of historical time were used to assess pseudo R-squared for model 1 and 2.

RESULTS

Differences Between Pre-Test and Post-Test on the Understanding of Historical Time

Table 5 contains descriptive statistics for grade 2 and grade 5 students' scores on the pre- and post-test on the understanding of historical time in both conditions. A first analysis through paired samples t-tests (two-tailed) for the sample of pupils that took both tests ($N = 718$) showed that students within grades and conditions scored significantly higher on the post-test compared to the pre-test: grade 2, experimental: $t(177) = 14.99$, $p = .000$; grade 2, control: $t(148) = -6.73$, $p = .000$; grade 5, experimental: $t(178) = 13.60$, $p = .000$; grade 5, control: $t(211) = -6.48$, $p = .000$.

Analyses through independent t-tests (two-tailed) between conditions showed that in the pre-test, students in the experimental condition for both grades scored lower than students of the control condition. However, these differences were not significant (grade 2: $t(325) = -.90$, $p = .370$; grade 5: $t(389) = -.58$, $p = .559$). On the post-test, these analyses showed that students in the experimental condition scored significantly higher than the control condition for grade 2 ($t(325) = 3.44$, $p = .001$) as well as grade 5 ($t(389) = 5.28$, $p = .000$).

Multilevel Analyses

Because of the hierarchical structure of the data and the repeated measures, separate multilevel analyses were conducted for grade 2 and grade 5 to take into account the variance between classes and to avoid overestimating the

Table 5. Mean Scores and Standard Deviations on the Pre- and the Post-Test on the Understanding of Historical Time

| Grade | Condition | Pre-test ($n = 758$) | | | Post-test ($n = 773$) | | |
		N	*Mean score	SD	N	Mean score[a]	SD
2	Experimental	183	13.87	3.58	186	17.80	4.08
2	Control	154	14.19	4.01	160	16.32	3.75
5	Experimental	199	18.78	3.71	201	22.58	3.78
5	Control	222	19.03	4.05	226	20.56	4.01

Note. [a]The test consisted of 26 items for grade 2 and 32 items for grade 5.

significance of the *t*-tests. The random part of model 0 provided justification for the application of multilevel analysis. The interclass correlation coefficients indicated that in this model, the variation between classes accounted for 11% (grade 2) and 12% (grade 5) of the total variance in students' test scores. The variation within classes accounted for 42% (grade 2) and 41% (grade 5) of the total variance.

Model 1 (see Table 6) is a standard 3-level mixed effects model with fixed effects for time and condition. The estimates for the variable time indicated a significant increase in scores from pre- to post-test for the control condition. The estimates for condition indicated that on the pre-test, the control condition scored higher than the experimental condition, but not significantly. The interaction between time and condition showed that Timewise had a significant extra effect on the post-test scores of students in the experimental condition compared to the control condition and compared to the pre-test: *ES* = .44 for grade 2, and *ES* = .54 for grade 5. These effect sizes can be interpreted as medium (Cohen, 1988). For model 1, residual interclass correlation coefficients (ICCs) indicated that the variation between classes on students' understanding of historical time for grade 2 accounted for 11% (pre-test) and 14% (post-test) of the total variance in students' achievements. For grade 5, these ICCs were 15% (pre-test) and 10% (post-test).

To explain for the variance between and within classes, covariates were included as fixed effects in model 2: the total time that teachers spent on Timewise and regular history lessons and the students' characteristics (age, gender, reading levels, and parents' education). We included these covariates stepwise, and with every step, the log likelihood went down. However, for reasons of simplicity, we only present the full model. When these covariates were taken into account, the effects that we found in model 2 remained significant. Further, we found small effects for all covariates except for parents' education. The effect of the total time that teachers spent on Timewise and history lessons on students' understanding of time was significant at the .05 level in grade 2 and at the .001 level in grade 5. With regard to age, older students performed better than younger students in grade 2, whereas in grade 5, the scores of older students were lower than those of younger students ($p < .05$). In both grades, girls performed significantly lower than boys. The effects of reading levels were significant on the .001 level for grade 2 and the .05 level for grade 5. For model 2, the residual ICCs were lower than in model 1. The variation between classes in grade 2 accounted for 6% of the total variance in scores on the pre-test and 5% on the post-test. In grade 5, the ICC for the pre-test was 8%, and for the post-test, 4%. These lower ICCs indicated that the added covariates largely explained the variance between classes.

The pseudo *R*-squared was the same for models 1 and 2: .109 for grade 2 and .127 for grade 5. Finally, a −2 log likelihood test proved that model 2 provided the best fit to the data. The differences between models 1 and 2 were significant for grade 2 as well as for grade 5 ($p < .01$, $df = 5$).

Table 6. Estimates for Students' Performance on the Understanding of Historical Time Test Using Linear Mixed Model Analyses

| Effect | Grade 2(Students N = 353; Classes N = 15) | | | | Grade 5(Students N = 435; Classes N = 17) | | | |
| | Model 1 | | Model 2 | | Model 1 | | Model 2 | |
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Fixed effects								
– Random intercept	−0.30*	0.13	−1.38***	0.38	−0.32*	0.13	0.85	0.96
– Time	0.50***	0.10	0.51***	0.10	0.39**	0.11	0.38**	0.11
– Condition	−0.12	0.18	−1.07*	0.40	−0.27	0.20	−0.38*	0.17
– Time × Condition	0.44**	1.36	0.44**	0.14	0.54**	0.16	0.54**	0.16
Random effects								
– Variance within classes pre-test	0.72***	0.06	0.69***	0.05	0.75***	0.05	0.71***	0.05
– Variance within classes post-test	0.76***	06	0.73***	0.06	0.79***	0.06	0.74***	0.05
– Variance between classes pre-test	0.09	0.05	0.04*	0.03	0.13*	0.06	0.07*	0.03
– Variance between classes post-test	0.12*	0.06	0.04*	0.03	0.9*	0.04	0.03	0.02
Covariates								
– Time for Timewise + history			0.03*	0.01			0.02***	0.00
– Students' age			0.09*	0.04			−0.17*	0.08
– Gender (girl vs boy)			−0.22**	0.08			−0.33***	0.07
– Reading levels			0.13***	0.03			0.07*	0.03
– Parents' education (high vs low)			−0.07	0.20			0.16	0.19
– 2*log likelihood	1670,19		1640.423*		2094.39		2052.92*	

Note. $*p < .05$, $** p < .01$, $***p < .001$.

DISCUSSION

In this study, two hypotheses were tested for the effect of Timewise on students' understanding of historical time in grade 2 (ages 7–8) and 5 (ages 10–11). In grade 2, history usually does not feature in the curriculum because, based on older Piagetian theories (Jahoda, 1963; Piaget, 1969), most teachers believe that students aged 7 or 8 are not able to understand historical time. The Timewise intervention, however, shows that teaching history at these ages is not only possible, but it also leads to more progression in students' understanding of historical time than a curriculum without history lessons. The fact that these grade 2 students showed increased gains in historical knowledge seems to further contradict the Piagetian stage theory and the limitations of early grade cognition, which confirms findings from previous research (Barton & Levstik, 1996; Harnett, 1993; Hoodless, 2002; Stow & Haydn, 2000).The finding that grade 2 classes without history lessons also made progress indicates that maturation could also be a factor in the development of the understanding of historical time, which is consistent with findings in the study by De Groot-Reuvekamp et al. (2017), which also showed progress on the understanding of historical time for students aged 6–8. The significant higher learning gains for grade 2 students who were taught with Timewise show that the teaching of history could start earlier than the age of 9 or 10, which is typical in most countries.

In grade 5, as well, students who were taught with Timewise scored significantly higher on the post-test compared to the pre-test and the control condition. In contrast to Timewise, traditional textbook-based history lessons largely consist of reading texts and answering questions on worksheets, with a focus on one era for a longer time, without specific focus on using the vocabulary of time and on placing events, persons, or objects in time with reference to the larger framework of historical eras (De Groot-Reuvekamp et al., 2014). Questionnaires of teachers in the control condition showed that these teachers did not use classroom timelines. In the grade 5 classes that were taught with Timewise, six participating teachers spent on average 24 min weekly extra on history, since they gave regular textbook lessons along with the Timewise lessons. These teachers did not want, or did not dare, to skip the textbook lessons, since teachers in the Netherlands rely heavily on textbooks (Wagenaar et al., 2010). Two grade 5 teachers, however, did not use history textbooks at all. They only worked with the materials and suggestions that were provided with Timewise, and their student learning gains were well above the average. It would be interesting to investigate on a larger scale if increasing learning gains on the understanding of historical time can be reached by adopting the Timewise approach without adding textbook lessons.

Building on earlier studies (Hodkinson, 2003; Masterman & Rogers, 2002; West, 1981a), Timewise focuses on the use of timelines as a means to improve students' understanding of historical time. Other approaches could also be possible, such as building associative contexts through stories first and adding dates and the timeline later, as suggested by Wilschut (2012). We have not

chosen this approach, since we believe that learning about dates and chronology with support of the structure of a timeline can help students from the very start as a visual scaffold to place events and persons in time (Barton, 2011; Blow et al., 2012; Dawson, 2004; Hoodless, 1996; Stow & Haydn, 2000). However, we also realize that timelines can be criticized because of their linear representation (Grever, 2009; Stearns, 2009). Putting so much emphasis on this linear representation might enhance a deterministic view of history (that history could not have unfolded differently). Periodizations are always interpretations that depend on the (limited) perspective that is taken, leaving out world history, for example. When working with timelines is introduced in primary education, issues of periodization and contingency in the course of history need to be addressed in secondary education. Further, teachers must keep these drawbacks in mind when constructing or selecting a timeline to use in the classroom.

We found significant effects on the test scores for the student characteristics of age, gender, and reading levels. The finding that in grade 2, older students performed better than younger students might be explained by maturation, which could play a role for these young students. In grade 5, it seems that maturation is no longer important, since older students did not perform as well. This finding might be explained by the fact that older students in grade 5 were repeaters (students who are in the same grade for the second year, mostly because of lower performances), whereas in grade 2, there were fewer repeaters. The significant effect of reading levels in both grades might be explained by the fact that most questions in the test required reading skills. Although for grade 2 students the test was read aloud by the teachers, students still had to understand the question, and this process probably was easier for students with higher reading levels. The significantly lower performance of girls compared to boys is consistent with findings from Dutch national tests on the social sciences (Wagenaar et al., 2010) and findings of De Groot-Reuvekamp et al. (2017). Although several studies report this phenomenon (Dutch Inspectorate of Education, 2015b; H. van Boxtel, Engelen, & de Wijs, 2011), no adequate explanation has yet been offered. On the other hand, Hodkinson (2009) found that gender played no role in primary school pupils' development of temporal cognition and the retention of historical knowledge. Contrary to findings in both aforementioned studies, parents' education had no effect. The only explanation that we can suggest here is that the effect diminishes because of the effect of reading levels that are often higher for students of higher-educated parents. Further, in our sample, the percentage of students with parents with a lower level of education was rather small compared to the national average (Dutch Inspectorate of Education, 2015a).

We end this section with several limitations in the study that need to be discussed, firstly in relation to the sample. Because neither students nor teachers were randomly assigned to the classroom, teacher background and characteristics might be associated with student achievement, although the multilevel analyses took differences between classes (and teachers) into account. It might be interesting for future research to investigate how teachers

differed in the implementation of Timewise. On the other hand, the fact that most schools, as far as possible with regard to the school size, participated with experimental as well as control groups enhanced the comparability. A second limitation relates to the data collection, in which the reporting on history lessons in the control condition was only based on questionnaires. Observations of history lessons in the control condition could have added more information on how these teachers taught differently from the teachers in the experimental condition. Thirdly, there are some limitations with regard to the pre- and post-test. Since these were the same tests, the effect of regression to the mean could have influenced the results on the post-test. Although there were 5 months in between the pre- and the post-test, there could have been a learning effect. Further, a multiple-choice test cannot reveal how students think and reason about historical time as a key second order concept of history. Timewise contributes to an understanding of historical eras; the ability to situate historical persons, events, and objects in time; and the ability to make comparisons between historical eras, but it does not enhance students' understanding of the nature of time (i.e., how time is perceived and experienced). In further research, interviews with students could give more insight into how an intervention like Timewise affects students' understanding of the metahistorical concept of time.

CONCLUSION

The present study aimed to add empirical evidence for the assumption that students' understanding of historical time can be enhanced by engaging students in activities on the application of vocabulary related to time; placing and sequencing objects, situations, events and persons in historical eras; and comparing and contrasting historical eras through a consistent use of timelines (Hodkinson, 2003; Masterman & Rogers, 2002; West, 1981a). The results show that systematic teaching according to the objectives of historical time, using the activities mentioned above with a consistent use of timelines, results in higher learning outcomes on students' understanding of historical time. These findings have some important implications for the teaching of historical time in elementary school and for teacher education.

The intervention with Timewise made teachers more aware of the objectives of the understanding of historical time, which in teaching through textbooks often remain implicit. Timewise offered teachers a lot of readymade materials, such as a classroom timeline, a storybook, lesson formats, and links to pictures and video clips, which made it easier for them to integrate the timeline in their curriculum and classroom practice. In this respect, the Timewise approach could offer examples of how history textbooks could be improved, by more explicitly including learning activities that focus on the objectives of historical time and the use of timelines. It would be interesting to

explore if the Timewise approach, in providing teachers with high quality materials, could be translated to other areas of historical thinking. For instance, the study by Reisman (2012) showed how a curriculum intervention with classroom-ready materials in high school had a positive effect on students' historical thinking. Further research could investigate to what extent high-quality, authentic, ready-made curricular materials could contribute to the improvement of primary school students' historical thinking.

Further, the positive effects of the use of Timewise in grade 2 show that, contrary to beliefs of many teachers in the Netherlands who still follow the Piagetian stage theory, teaching history to young students is possible and leads to increased gains in their understanding of historical time. Further longitudinal research would be needed to investigate to what extent an earlier start in learning about historical time remains advantageous in later years compared to starting with history lessons at the age or 9 or 10, which is typical in most countries.

The findings from the present study could contribute to preservice and in-service teacher training, as (prospective) teachers should be aware of children's development of the understanding of historical time and how to teach it to students in elementary school. Further research could explore how the findings of the present study could help improve teacher training and teacher professional learning in schools through developing their knowledge and skills, and changing their beliefs, with respect to their teaching of historical time.

NOTE

[1] These ten eras, with rounded dates, are Hunters and Farmers (until 3000 BC); Greeks and Romans (3000 BC–500 AD); Monks and Knights (500–1000); Cities and States (1000–1500); Discoverers and Reformers (1500–1600); Regents and Princes (1600–1700); Wigs and Revolutions (1700–1800); Citizens and Steam Engines (1800–1900); the World Wars and the Holocaust (1900–1950); and Television and Computer (1950–now).

REFERENCES

Alleman, A., & Brophy, J. (2003). History is alive: Teaching young children about changes over time. *The Social Studies*, *94*, 107–110. doi:10.1080/00377990309600191

Barton, K. C. (2011). Enriching young children's understanding of time. *Primary History*, *59*, 16–18.

Barton, K. C., & Levstik, L. S. (1996). 'Back when god was around and everything': The development of children's understanding of historical time. *American Educational Research Journal*, *33*, 419–454. doi:10.3102/00028312033002419

Blow, F., Lee, P., & Shemilt, D. (2012). Time and chronology. Conjoined twins or distant cousins? *Teaching History*, *147*, 26–34.

Bradley, N. (1947). The growth of knowledge of time in young children of school-age. *British Journal of Psychology*, *38*, 67–78.

Brophy, J., VanSledright, B., Bredin, N. (1993). What do entering Fifth Graders know about U.S. history? *Journal of Social Studies Research, 16/17*(1), 2–19.

Chapman, T. (1993). Teaching chronology through timelines. *Teaching History*, *73*, 25–29.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Cooper, H. (2012). *History 5–11*. London, UK: Fulton.

Dawson, I. (2004). Time for chronology? Ideas for developing chronological understanding. *Teaching History*, *117*, 14–24.

De Groot-Reuvekamp, M., Ros, A., Van Boxtel, C., & Oort, F. (2017). Primary school pupils' performances in understanding historical time. *Education 3–13: International Journal of Primary, Elementary and Early Years Education*, *45*, 227–242. doi:10.1080/03004279.2015.1075053

De Groot-Reuvekamp, M. J., Van Boxtel, C., Ros, A., & Harnett, P. (2014). The understanding of historical time in the primary history curriculum in England and the Netherlands. *Journal of Curriculum Studies*, *46*, 487–514. doi:10.1080/00220272.2013.869837

Dutch Inspectorate of Education. (2015a). *De Staat van het Onderwijs. Onderwijsverslag 2013/2014*. [The state of education. Education report 2013/14]. Utrecht, The Netherlands: Inspectie van het Onderwijs.

Dutch Inspectorate of Education. (2015b). *Wereldoriëntatie. De stand van zaken in het basisonderwijs*. [World orientation. The state of affairs in primary education]. Utrecht, The Netherlands: Inspectie van het Onderwijs.

Dutch Ministry of Education, Culture and Sciences. (2006). *Kerndoelen basisonderwijs*. [Core objectives for primary education]. Retrieved from http://www.slo.nl/primair/kerndoelen/Kerndoelenboekje.pdf/

Field, A. (2013). *Discovering statistics using IMB SPSS statistics*. Los Angeles, CA: Sage.

Foreman, N., Boyd-Davis, S., Moar, M., Korallo, L., & Chappell, E. (2008). Can virtual environments enhance the learning of historical chronology? *Instructional Science*, *36*, 155–173. doi:10.1007/s11251-007-9024-7

Friedman, W. J. (1982). Conventional time concepts and children's structuring of time. In W. J. Friedman (Ed.), *The developmental psychology of time* (pp. 171–208). New York, NY: Academic Press.

Grever, M. (2009). Geen identiteit zonder oriëntatie in de tijd. Over de noodzaak van chronologie. [No identity without orientation in time. On the necessity of chronology]. *Bijdragen En Mededelingen Betreffende De Geschiedenis Der Nederlanden*, *124*, 438–451.

Harnett, P. (1993). Identifying progression in children's understanding: The use of visual materials to assess primary school children's learning in history. *Cambridge Journal of Education*, *23*, 137–154. doi:10.1080/0305764930230203

Hodkinson, A. J. (2003). *Children's developing conceptions of historical time: Analysing approaches to teaching, learning and research* (Unpublished doctoral dissertation). University of Lancaster, Edge Hill, UK.

Hodkinson, A. J. (2009). Are boys really better than girls at history? A critical examination of gender-related attainment differentials within the English educational system. *International Journal of Historical Learning, Teaching and Research*, *8*, 51–62.

Hoge, D. J., & Foster, S. J. (2002, April). *It's about time: Students' understanding of chronology, change and development in a century of historical photographs*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.

Hoodless, P. A. (1996). *Time and timelines in the primary school*. London, UK: Historical Association.

Hoodless, P. A. (2002). An investigation into children's developing awareness of time and chronology in story. *Journal of Curriculum Studies*, *34*, 173–200. doi:10.1080/00220270110080962

Jahoda, G. (1963). Children's concepts of time and history. *Educational Review*, *15*, 87–104. doi:10.1080/0013191630150201

Jordanova, L. (2000). *History in practice*. London, UK: Arnold.

Keuning, J., Hilte, M., & Weekers, A. (2014). Begrijpend leesprestaties onderzocht—Een analyse op basis van Cito dataretour. [Reading comprehension achievements examined—An analysis based on Cito data return]. *Tijdschrift Voor Orthopedagogiek*, *53*, 2–13.

Ledoux, G., Roeleveld, J., Veen, A., Karssen, A., van Daalen, M., Blok, H., … Driessen, G. (2015). *Het onderwijsachterstandenbeleid onderzocht. Werkt het zoals bedoeld?* [The education retention policy examined. Does it work as intended?]. Nijmegen, The Netherlands: ITS.

Lévesque, S. (2008). *Thinking historically: Educating students for the twenty-first century*. Toronto, Canada: Toronto University Press.

Levstik, L. S., & Pappas, C. C. (1987). Exploring the development of historical understanding. *Journal of Research and Development in Education*, *21*, 1–15.

Masterman, E., & Rogers, Y. (2002). A framework for designing interactive multimedia to scaffold young children's understanding of historical chronology. *Instructional Science*, *30*, 221–241. doi:10.1023/A:1015133106888

Monte-Sano, C., De La Paz, S., & Felton, M. (2014). Implementing a disciplinary-literacy curriculum for US history: Learning from expert middle school teachers in diverse classrooms. *Journal of Curriculum Studies*, *46*, 540–575. doi:10.1080/00220272.2014.904444

Newton, L. D. (2001). Encouraging historical understanding in the elementary classroom. *Evaluation & Research in Education*, *15*, 182–188. doi:10.1080/09500790108666996

Oakden, E. C., & Sturt, M. (1922). The development of the knowledge of time in children. *British Journal of Psychology*, *12*, 309–355.

Ofsted. (2011). *History for all. History in English schools 2007–2010*. Retrieved from www.ofsted.gov.uk/resources/history-for-all

Piaget, J. (1969). *The child's conception of time*. New York, NY: Basic Books.

Prangsma, M. E., Van Boxtel, C. A. M., & Kanselaar, G. (2008). Developing a 'big picture': Effects of collaborative construction of multimodal representations in history. *Instructional Science*, *36*, 117–136. doi:10.1007/s11251-007-9026-5

Reisman, A. (2012). Reading like a historian: A document-based history curriculum intervention in urban high schools. *Cognition and Instruction*, *30*, 86–112. doi:10.1080/07370008.2011.634081

Rosenberg, D., & Grafton, A. (2010). *Cartographies of time*. New York, NY: Princeton Architectural Press.

Rüsen, J. (2012). Tradition: A principle of historical sense-generation and its logic and effect in historical culture. *History and Theory*, *51*, 45–59. doi:10.1111/hith.2012.51.issue-4

Seixas, D. P., & Morton, T. (2013). *The big six historical thinking concepts*. Toronto, Canada: Nelson Education.

Seixas, P. (Ed.). (2006). *Theorizing historical consciousness*. Toronto, Canada: University of Toronto Press.

Snijders, T. A. B., & Bosker, R. J. (2012). *Multilevel analysis: An introduction to basic and advanced multilevel modeling* (2nd ed.). Los Angeles, CA: Sage.

Stearns, P. N. (2009). Long 19th century? Long 20th? Retooling that last chunk of world history periodization. *The History Teacher*, *42*, 223–228.

Stow, W., & Haydn, T. (2000). Issues in the teaching of chronology. In J. Arthur & R. Phillips (Eds.), *Issues in the teaching of history* (pp. 83–97). London, UK: Routledge.

Thornton, S. J., & Vukelich, R. (1988). Effects of children's understanding of time concepts on historical understanding. *Theory & Research in Social Education*, *16*, 69–82. doi:10.1080/00933104.1988.10505556

Van Boxtel, C., & Van Drie, J. (2012). "That's in the time of the Romans": Knowledge and strategies students use to contextualize historical images and documents. *Cognition and Instruction*, *30*, 113–145. doi:10.1080/07370008.2012.661813

Van Boxtel, H., Engelen, E., & De Wijs, A. (2011). Wetenschappelijke verantwoording van de eindtoets basisonderwijs. [Scientific accountability for the final assessment in primary education]. Arnhem, The Netherlands: Stichting Cito Instituut voor Toetsontwikkeling.

Van Dam, A., & De Wolf, A. (2013). *Lang geleden. De geschiedenis van Nederland in vijftig voorleesverhalen* [A long time ago. The history of the Netherlands in fifty stories to read]. Houten, The Netherlands: Unieboek, Het Spectrum.

Vella, Y. (2001). Extending primary children's thinking through the use of artefacts. *International Journal of History Learning, Teaching and Research*, *1*, 99–112.

Vygotsky, L. (1978). International Journal of History Learning, Teaching and Research, In M. Gauvain & M. Cole 1, 99–112.

Wagenaar, H., Van der Schoot, F., & Hemker, B. (2010). *Balans van het geschiedenisonderwijs aan het einde van de basisschool. PPON-reeks nummer 42* [Balance of history teaching at the end of primary school]. Arnhem, The Netherlands: Stichting Cito Instituut voor Toetsontwikkeling.

West, J. (1981a). *Children's awareness of the past* (Unpublished doctoral dissertation). University of Keele, UK.

West, J. (1981b). Primary school children's perceptions of authenticity and time in historical narrative pictures. *Teaching History*, *29*, 8–10.

Wilschut, A. (2012). *Images of time: The role of an historical consciousness of time in learning history.* Charlotte, NC: Information Age.

Wood, S. (1995). Developing an understanding of time-sequencing issues. *Teaching History*, *79*, 11–14.

APPENDIX A

Fixed Format for the Introductory Lessons
Objectives
Introduction to the timeline, from a timeline of students' lives (grade 2) to timelines with ten historical eras (grade 5). Students learn to:

- use the vocabulary of time;
- place objects, situations, events and people on a timeline;
- identify characteristics of the historical eras; and
- compare and contrast different historical periods.

Teaching methods and learning activities
- Students make a timeline of their own lives and learn to use dates.
- Teachers present interactive PowerPoint presentations on the historical eras.
- Students discuss differences and similarities between different eras and the present.
- Students sequence pictures on a digital timeline on the IWB.
- Students attach preselected pictures to the classroom timeline.
- Students participate in a "quiz" to check if they mastered the vocabulary of time.

Flexible format for the weekly Timewise lessons
Objectives
In every lesson, the teacher focuses on five objectives on understanding historical time (Table 1). For every era, these objectives are operationalized in a table (see example below).
Suggested teaching methods and learning activities
- Short review of the era of the previous lesson, in which students attach a picture to the classroom timeline (objective 3).
- The teacher discusses the objectives of the lesson with the students, and the era of the lesson is pointed out on the classroom timeline, using the vocabulary of time (objective 1).
- The teacher reads a story and/or shows a video clip on the IWB, followed by a whole-class discussion about the characteristics of the era—how people lived at that time. Historical concepts are used and can be written on the whiteboard (objective 4).
- Student discussions: How do we know about these times? What sources do we have? What is left/still visible or used in our times (objective 5)?
- Characteristics of the era can be compared with the present and other eras (objective 5).

– Students can sequence pictures on the timeline on the IWB (objectives 2 and 3).
– Students can choose a picture and attach this to the classroom timeline (objective 5).

Example of a flexible lesson format for grade 2
Roman times—The Romans are coming

Objectives to discuss and evaluate with students	We learn about Roman times. These times also belong to the historical period that is most long ago. We learn that: – Roman times came after the time of Hunters and Farmers; – When the Romans came, there were people living in our country that were called Batavians and Frisians; – The Romans came from Rome; – The Romans were good architects (army camps, cities, big buildings); and – We still have /use things from Roman times (e.g., coins, glass, letters and buildings).
Vocabulary of time	Most long ago, our times, Roman times, the start of Roman times in the Netherlands
Historical concepts	Romans, Batavians, Frisians, emperor, Rome, different and the same.
Suggested materials	Story: "The Romans are coming." Timewise timeline for the IWB with pictures; video clip. Printed pictures to attach to the classroom timeline.

APPENDIX B

Examples of items in the grade 2 test, stage of emergent understanding of historical time
Objective 2: Sequencing objects, situations, events, and people/historical periods in chronological order.
Text that the teacher reads aloud: "Here you see buildings from the past till now. What is the right sequence in time, starting from the oldest building? Tick the box before the row that represents the correct order in time."
Explanation: Students were given four rows of four pictures from various buildings in different order:
– a Roman Temple
– a mediaeval castle
– a town hall from the 17th century
– a factory from the 19th century

Objective 4: Use and identify characteristic features in texts and images to place objects, situations, events, and people in the correct periods of time.

Picture Mp3 player	Picture DVD player	Picture Turntable	Picture IPod

☐   ☐   ☐   ☐

Text that the teacher reads aloud: "Niels is a student in grade 2. When his grandfather was a child, he liked to listen to music. Which device was used to listen to music at the time that the grandfather of Niels was a child? Tick the box under the device that the grandfather of Niels used to listen to music."

Examples of items that were used in both tests, stage of initial understanding of historical time.
Objective 1: Vocabulary relating to time and periods of time.
In a family, there are four children: Sander, Elise, Tim, and Julia. Behind each child you see the year they are born. Which child is the oldest?

    A. Sander 2001.
    B. Elise 2003.
    C. Tim 2004.
    D. Julia 2006.

Objective 3: Placing objects, situations, events, and people on a timeline.
Here you see a picture of Anne Frank. In her diary, she writes how she and her family had to hide for 2 years, because they were Jewish.
In which era did Anne Frank write her diary?
Explanation: Students were given a picture of Anne Frank and a timeline that represented the eras most recent and most long ago in different colors (Figure B1).

Examples of items in the grade 5 test, stage of continued understanding of historical time.
Objective 4: Use and identify characteristic features in texts and images to place objects, situations, events, and people in the correct periods of time.
Here you see a map from a history book. To which chapter in the book does the map belong?

    A. The journeys of the Vikings in the 9th century.
    B. The trade routes of the Hanseatic League in the 13th century.
    C. The journeys of the Dutch East India Company in the 17th century.
    D. The slave trade in the 18th century.

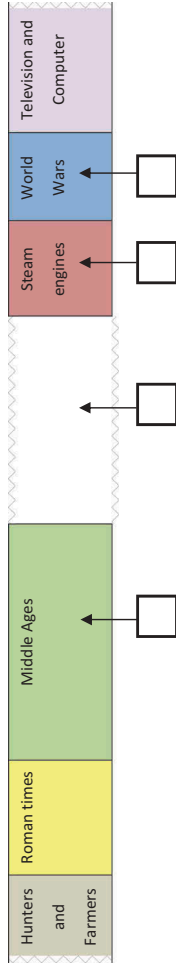*Explanation: Students were given a picture of a world map with arrows representing the triangular trade.*

Figure B1. Timeline for Timewise in Grade 2 (Ages 7–8)

Objective 5: Compare and contrast different historical periods to identify changes, differences, and similarities in the way people lived within and across periods.

On this picture from 1870 you see people at work. What was new at this time?

    A. The machines were very safe.
    B. The machines worked on steam power.
    C. Men and women got the same wages.
    D. On Saturdays the factory was closed.

Explanation: Students were given a picture of people working in a textile factory in 1870.