Questioning the past: student questioning and historical reasoning

Logtenberg, A.

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Chapter 4

STUDENTS’ THINKING AND SPONTANEOUS QUESTIONING WHEN READING AN INTRODUCTORY TEXT IN HISTORY: THE ROLE OF HISTORICAL REASONING, PRIOR KNOWLEDGE AND AFFECT

This study is aimed at deeper insight into processes underlying student questions in History. A process study was carried out to investigate the characteristics of students’ thinking when reading a historical introductory text. Furthermore, the questions students spontaneously asked while reading were described. Thirty-three secondary school students were instructed to read the text and underline striking text segments. At the point of underlining, students were asked to verbalize their thoughts. In our protocol analysis we focused on the questions students spontaneously asked while verbalizing their thoughts and on the verbalization of domain-specific reasoning, prior knowledge and affect. It appeared that in half of the 251 analysed fragments (episodes) students verbalized historical reasoning and expressed affective thoughts. Associations were most frequently used to verbalize prior knowledge. Questions were mostly asked in cases where students expressed a knowledge deficit. Other questions were asked in episodes with historical reasoning and in episodes with affect. Implications of the role of affect and domain-specific reasoning in the onset of questions for research and practice are discussed.

1. INTRODUCTION

History is not only a matter of providing answers. The answers that are provided by history should be questioned. Questions in history can be triggered by present-day developments. For example, present globalization and the fast economic growth in Asia revive old questions about industrialization, still a very important topic of historical debates. Why did only Europe industrialize? Was it because Europeans were more curious about science and other cultures between the 16th and 19th centuries than, for example, the Chinese were? Or was it more important that England possessed cheaper energy sources? (Allen, 2009) Why were the Europeans more inquisitive? Every answer gives rise to other (critical) questions, based on curiosity about,

interest in and knowledge of the past. This study investigates the historical questions students in secondary education ask when reading an introductory history text, especially how spontaneously-asked questions originate.

Current research in history learning focuses on students’ thinking and reasoning about the past (e.g., VanSledright & Limón, 2006). Although several scholars consider the asking of historical questions to be an important component of historical thinking or reasoning (e.g., Schreiber et al., 2006; Van Drie & Van Boxtel, 2008), there is not much explicit knowledge about historical questioning, not even among expert historians. Voss and Wiley (2006) state in their summary of characteristics of expertise in history: “…an aspect of the historian’s task that is virtually never studied (…) is the ability of the expert to be adroit in selecting and defining the issue to be studied. Problem finding is the critical first step in problem solving, and expert historians must have skill at posing interesting yet researchable questions” (p. 573). Our goal is to study and conceptualize this skill of question asking in the domain of history from a student’s perspective.

The objective of this study is to gain more insight into the questions students ask while reading a history text and the (potential) onset of questions. To what extent are students’ spontaneous questions related to historical reasoning, or do they originate in other processes? Particularly knowledge of students’ thinking while reading a historical introductory text could be helpful in designing history education that supports students in reasoning historically, with the asking of historical questions as part of it. In the history classroom, introductory texts are used as lesson starters and can also be used to generate questions that can guide knowledge construction and historical reasoning. Moreover, introductory texts can be constructed to provoke students’ interest and questioning (Logtenberg, Van Boxtel & Van Hout-Wolters, 2011). Although literature on historical thinking and reasoning conceptualizes the asking of historical questions as an important ability that students need to develop in History (e.g., when reading historical sources), there is hardly any empirical research on the underlying processes of questions that students ask when they are engaged with the past when reading a historical text. We therefore mainly built our study on insights from questioning research in other domains. In our view, a focus on the underlying processes of questions is essential to describe and promote students’ ability to formulate questions.

Research on student questioning mostly conceptualizes questioning in terms of a strategy that is important for (text) comprehension and deep meaningful learning (see for reviews Chin & Osborne, 2008; Janssen, 2002; Rosenshine, Meister, & Chapman, 1996). Questioning can support students in articulating their interest and activating their prior knowledge. Questions are asked when students experience a knowledge deficit or conflict (Graesser & Olde, 2003). The model of questioning developed by Dillon (1990) and further elaborated on by Van der Meij (1994) describes the state of puzzlement, surprise or confusion that occurs before formulating a question with the ‘perplexity’ construct. In line with this research, we depart from the idea that questions can arise from a state of perplexity triggered by a cognitive disequilibrium (Graesser & Olde, 2003). However, working within the domain of history, we not only focus on the role of prior knowledge and cognitive processes, but also aim at clarifying the affective and historical reasoning processes that may
underlie the generation of questions. In this perspective, student questions are able to inform us about their thinking (Chin & Osborne, 2008).

First we describe general models of questioning. Second, we discuss questioning from the perspective of learning history and – using that perspective – reflect on the more general models of questioning, resulting in our research questions. Third, we present the design and results of our empirical study.

1.1 General models of questioning

Research on student questioning (Rosenshine et al., 1996) has mainly focused on domain-exceeding skills, which has resulted in general models of questioning. Two general models support the description of the underlying processes of questioning: the model of Dillon (1990) and the model of Graesser and McMahen (1993).

Van der Meij (1994) presents a componential analysis of questioning, based on Dillon’s (1990) theory of the mechanism of questioning. Three stages characterize the process of questioning: (1) the onset of questioning (perplexity), (2) the development of a question (asking) and (3) the search for and processing of an answer (answering). Van der Meij also emphasizes individual and personal factors of questioning, but still little is known about how students’ questioning skills originate. In the first stage the onset of questioning is characterized by perplexity that can be triggered internally or externally. Internal cues cause uncertainty related to one’s prior knowledge, while external cues trigger curiosity by surprising events or facts (Van der Meij, 1994). Before formulating a question (stage 2), a question is determined by presuppositions and presumptions (stage 1). Every question contains a presupposition based on prior knowledge; for example, the question ‘Who was the leader of the Industrial Revolution?’ contains the (not valid) presupposition that this development had one leading person. Presumptions are related to personal motives and beliefs; for example, believing that the presupposition (‘the Industrial Revolution had one leading person’) is valid or true. In this view, presuppositions are related to (prior) knowledge and presumptions to affect, personal characteristics and attitudes (Dillon, 1990; Van der Meij, 1994).

Research on questioning particularly lacks knowledge about presumptions, which may be characterized by affect. It is also unclear whether and how students formulate questions after experiencing perplexity. In other words, what type of perplexity do students experience and do they take the opportunity to formulate a question?

Graesser and McMahen (1993) propose a general model of questioning including three components: anomaly detection, question articulation and social editing. Their focus is mainly on the cognitive triggers of questioning, also known as the cognitive disequilibrium hypothesis. Otero and Graesser (2001) describe several ‘production rules’ (e.g., text characteristics) that trigger cognitive disequilibrium such as contradiction, discrepancies, salient contrasts and expectation violations.

In comparing the two models, the role of cognitive disequilibrium is prominent. When students read a history text, the experience of disequilibrium may result in spontaneously asking questions. The characteristics of students’ disequilibrium may be specified by domain-specific production rules (Otero & Graesser, 2001). The
disequilibrium that students experience when reading a text about history could reflect their historical reasoning competency and could be grounded in both cognitive and affective processes. In the following sections we elaborate on questioning as a component of historical reasoning and the potential role of both prior knowledge and affective processes.

1.2 Questioning as a component of historical reasoning

Although researchers in history education state that questioning plays an important role in historical thinking and reasoning (Ciardiello & Cicchelli, 1994; Schreiber et al., 2006; Wineburg, 1991), we are not familiar with empirical studies that focus on questioning processes in History. Van Drie and Van Boxtel (2008) developed a framework for studying historical reasoning. According to these authors, historical reasoning is constructing or evaluating a description of processes of change and continuity, an explanation of a historical phenomenon or a comparison of historical phenomena or periods. Their framework consists of six components: asking historical questions, using sources, contextualization, argumentation, using substantive concepts, and using meta-concepts of history.

In this framework questioning takes a central position, as it is seen as an ‘engine’ of historical reasoning. Interpreting a historical phenomenon implies a search for explanations (e.g., Why did it happen?), differences and communalities (e.g., What changed?) and historical context (e.g., Was it common in that time?). From this domain-specific perspective students ask questions when they try to interpret historical phenomena and when they are engaged in historical reasoning.

In a previous study we analysed the type of questions secondary school students asked after reading a text about the Industrial Revolution which was meant to trigger situational interest (Logtenberg et al., 2011). After reading, students were instructed to formulate questions. We found that students were able to formulate higher-order questions about the historical context, processes of change and continuity, and causes and consequences. For example, questions were formulated about the causes of the Industrial Revolution. By analyzing the questions we experienced that a question itself does not reveal much about the underlying processes that take place while formulating questions. Yang (2006) remarks that much research on questioning incorrectly assumes that “the cognitive process type needed by each question is fixed in itself” (p.198). As a result, most research on questioning disregards the mechanisms of questioning, the underlying processes and the domain-specific characteristics. Both a higher-order and a lower-order question may be the result of a historical reasoning process. In our previous study it sometimes seemed that the higher-order questions asked by the students were in fact the result of reproducing the type of questions asked during the history lessons (in their textbook or by their teacher). More precisely, these higher-order questions could not be authentic in the sense that they were triggered by students’ own thoughts while reading. This raises questions about the type and extent of historical reasoning that occurs while reading a history text. Additionally, we would like to know whether historical reasoning gives rise to student questions. In order to examine these issues we need to focus on the underly-
ing processes that give rise to student questions, the domain-specific characteristics and the questions students spontaneously ask.

1.3 The onset of questioning while reading a historical introductory text

Students, when confronted with historical content, especially controversial issues, tend to judge historical agents and situations from a present-oriented perspective or use stereotypes to describe and explain historical actions or events (Hartmann & Hasselhorn, 2008). They experience difficulty in seeing persons, events and developments in the past in their own historical context (Barton & Levstik, 2004; Barton & McCully, 2007; Wineburg, 2001). Students may be perplexed when they experience disequilibrium between the information that is given about the past and what they know from their experience and present-day standards. This experience may also be characterized by emotions, such as interest or indignation. Strong emotions may be triggered by (inter)nationally sensitive topics such as genocide or long-lasting historical conflicts within and between countries. But less strong, more general affective student reactions (interest, engagement, joy) can also play a role in learning (Demetriou & Wilson, 2009; Silvia, 2006). In history learning, affective reactions can be influenced by interest in a certain topic or in the domain (Grever, Pelzer, & Haydn, 2011; Haydn & Harris, 2010) or by present-oriented thinking or during the reading of historical narratives and texts (Ben-david Kolikant & Pollack, 2009).

Indignation or astonishment about the past caused by the ‘otherness’ of the past can be a powerful emotion that may trigger a question that reflects this emotion or that reflects the aim to contextualize. When students experience a disequilibrium in the sense of seeing the past as ‘strange’ they can use different ways of reasoning that can result in different types of questions. First, students may try to empathize with past persons, actions or events, especially while reading historical narratives. Mar and colleagues (2011) describe feelings of sympathy, identification, empathy and relived and remembered emotions as playing an important role while reading narratives. This may result in questions that are grounded in interest and in the attempt to imagine past situations. Second, students can use a present-day perspective. This may result in questions that reflect emotion or a judgment based on present-day standards. Third, students can (or try to) contextualize past actions or events by describing or explaining in order to make sense of them. While doing this they may activate prior knowledge about the historical phenomenon or period in the text. This may result in questions that are grounded in an attempt to more deeply understand a historical event or situation.

In the previously mentioned study (Logtenberg et al., 2011) we found that questions contained presumptions that may be the result of taking a present-oriented perspective and reflect emotions such as indignation. Examples of these questions asked about 19th century working conditions are: ‘If it paid so badly, why didn’t they protest?’ or ‘Why did they do what they did? Who would have been that crazy?’ Our study also showed that some students asked higher-order questions about the historical context, processes of change and continuity and causes and consequences. These questions suggested that students used important components of
historical reasoning. For example, students tried to understand the topic by asking an explanatory question such as ‘Why did people in the factories work such long hours?’ This raises the question of the extent to which present-oriented perspectives (expressed with emotions) and historical reasoning, such as explaining and contextualization, characterize the processes students experience when reading a text about history.

Summarizing, students’ questions may be triggered by different elements. These elements cause disequilibrium and may lead to spontaneous questions. In this study we want to describe the onset of questions experienced by students in higher secondary education, and to characterize this onset in terms of the verbalization of historical reasoning, (a lack of) prior knowledge and affect. Furthermore, we are interested in the type of spontaneous questions that students ask while they are reading.

1.3.1 Research questions

The research questions that we address in this study are:

- In what processes of historical reasoning, prior knowledge and affect are students engaged while reading a historical introductory text?
- What type of questions do students spontaneously ask?
- Which processes characterize the onset of spontaneous questions?

2. METHOD

2.1 Selection of participants

Thirty-three students in higher secondary education (mean age = 15.6, 10 boys, 23 girls) from 8 different classes from 6 different schools participated in this study. Three schools are from a rural area in the Netherlands and three are located in a large city. Students at this educational level are preparing for higher vocational education. In the Dutch educational system this group represents the middle-level group of students in secondary education. Some of the students come from a lower level (vocational education), so in many classrooms there is a variety in age, interest and ability. Students at this level start with History (an optional subject) at a more analytical level after having had History as a compulsory subject in the first three years of secondary education. The Dutch history curriculum is structured according to 10 eras and 49 aspects (Van Boxtel & Grever, 2011; Van Drie et al., 2009). Students in the 11th grade discuss these 10 eras at a deeper level and prepare for the national examination. In general, these students do not have very much experience in asking questions themselves.

Because of the relatively large variety of students at this educational level, we followed a thorough selection procedure to be sure not to select only high or low-performing students. Thirty-three students were recruited from a sample of 174 in order to reach a maximum variation between them (Patton, 1990). This means that participants were selected in order to compose an equally divided sample concerning the prior knowledge and interest in History variables. To increase generalizability and the heterogeneity of the sample, students were selected from groups of low in-
role of historical reasoning, prior knowledge and affect

Interest/prior knowledge, medium interest/prior knowledge and high interest/prior knowledge, divided over different classes and schools (11 students per group). The groups were mainly created for selection purposes and group sizes are too small to investigate whether there are significant differences between the three groups. Moreover, the aim of this study is to provide a theoretical and empirical foundation for further research on questioning mechanisms that occur when students are engaged in History.

In the first step of selection we calculated sample quartiles (see below) and found that from the original sample \((N = 174)\) a total sample of 82 students appeared to belong to three sub-groups with combinations of low interest/prior knowledge \((n = 20)\), medium interest/prior knowledge \((n = 38)\) and high interest/prior knowledge \((n = 24)\). Groups with combinations such as low interest/high prior knowledge \((n = 5)\) or high interest/low prior knowledge \((n = 2)\) were not used for further selection. These combinations were exceptions in the whole sample. Furthermore, the fact that we found a connection between corresponding levels of interest and prior knowledge corresponds with the theoretical assumption that a higher or lower interest is connected to higher or lower levels of domain knowledge (Hidi & Renninger, 2006).

As a second step we took into account the different classrooms (8 from 6 different schools) and gender (25 boys and 57 girls) while selecting 11 students from each of the three different sub-groups. Finally, after receiving parental permission, a total of 33 students were invited for an individual interview with the researcher which took place in a separate room at their own school. All interviews were audio recorded and transcribed.

2.2 Instruments

2.2.1 Prior knowledge test and interest in History questionnaire

Since prior knowledge and interest play an important role in questioning, we measured these variables before selecting the participants. Prior knowledge on the topic of the text - the Industrial Revolution - was measured with a paper-and-pencil test. Students had to answer 8 open subordinate questions in answering the main question: ‘What do you know about the Industrial Revolution?’ Examples of subordinate questions are: ‘What does the term Industrial Revolution make you think of?, What was daily life like during the Industrial Revolution?’ and ‘Name as many causes of the Industrial Revolution as possible’. Answers were scored according to a template of correct and acceptable answers supplied by the first two authors, both of whom have a Master’s degree in history. For example, for the question regarding causes, a maximum of 4 points could be scored for giving at least two explanations for industrialization, such as inventions, mechanization or urbanization. Only giving a single term without explanation was credited with one point. The inter-rater reliability on 40 randomly-chosen tests from different classes reached from .67 to 1 (Cohen’s kappa). Two questions (about causes and effects) were scored by two raters who discussed the answers until agreement was reached, because the kappas were below .65. The mean test score on a scale from 0 to 23 was 9.3 \((N = 174; SD = 5.6)\).
Cronbach’s alpha for the whole test (eight items) was .74. Three groups were made for the selection of participants: low prior knowledge (scores < 4.00), high prior knowledge (scores > 13.00) and medium prior knowledge groups (scores between 4 and 13).

Interest was measured with a school-subject-interest questionnaire developed by the Dutch National Institute for Educational Measurement (Cito, 1987). The original questionnaire (Attitude Scale towards Mathematics) was validated in a study by Martinot et al. (1988) regarding psychometric quality, reliability, and internal structure and validity. This questionnaire for the school subject of Mathematics was adjusted for History and consists of 32 items with both negative and positive statements about this school subject. Examples of items are ‘I think History is a nice school subject’, ‘I think that History is useless’ and ‘Our history lessons are interesting’. Students answered on a 5-point Likert scale with 1 = ‘don’t agree at all’ to 5 = ‘completely agree’. Cronbach’s alpha for this questionnaire was .92. \( N = 174 \). The mean score on interest in history is 3.1 \( (N = 174; SD = 0.58) \). Three groups were made in order to select participants: low interest in history (scores < 2.66), high interest (scores > 3.59) and a medium interest in history groups (scores between 2.66 and 3.59). Students with a higher score on interest also scored higher on prior knowledge. A correlation analysis between scores on the prior knowledge test and interest in history resulted in a significant correlation between both scores \( r = .413; p < .001 \).

2.2.2 Introductory text

A historical introductory text was composed (770 words, see Appendix A, p. 113). The function of the text is to introduce a new topic in the history curriculum (lesson-starter) and to trigger text-based interest and questions. Text-based interest is an ‘emotional state aroused by specific text features’ (Schiefele & Krapp, 1996). These text features can trigger situational interest that can give rise to questions (Hidi & Renninger, 2006). Texts containing an unexpected element, incongruence or an appeal to one’s imagination can stimulate situational interest (Brantmeier, 2006; Schraw, Bruning & Svoboda, 1995). We aimed at constructing a text that triggers situational interest and questions. The text contains narrative and problematizing characteristics that we considered important for triggering situational interest (engagement and emotions such as indignation), cognitive disequilibrium, and different types of questions. Elements are a vivid description of a nineteenth century factory in Manchester visited by Friedrich Engels, the son of a German factory owner, who is an eyewitness of the poor conditions. Then the text describes a contemporary (problematizing) comparison with the industrialization process of modern-day China and finishes with a concluding paragraph about the positive and negative consequences of the Industrial Revolution. Important historical information such as dates and context are left out in order to trigger knowledge deficits and historical questions.

Text themes are connected to the Dutch history curriculum. The topic of industrialization is covered by two parts of the examination programme: ‘the process of industrialization and the development of an industrial society’ and ‘the social ques-
tion that caused a discussion about the task of the government in a welfare state’. Teachers in the Netherlands can choose from a variety of teaching methods and history textbooks to work with. The text used in this study contains typical examples of introducing the topic to students in secondary education. To check ecological validity, we asked several history teachers and teacher educators whether they could use the text to introduce the topic of the Industrial Revolution. Teachers considered the text suitable for classroom use. The whole text (translated from Dutch) can be found in Appendix A (p.113).

2.2.3 Task and procedure

Participants were asked to read the text and to underline text segments that were striking, (un)familiar or (un)clear to them. At each underlined text element, participants were instructed to verbalize (thinking-aloud) what they thought regarding this element, why they underlined it and to explain their thoughts. The instruction was written down for students and verbally repeated by the researcher. The students received the following instruction:

On the next page you will find a text about a topic in History. Read this text carefully. Mark the text segments where you notice striking things, something funny, strange or interesting. It is also possible that you may recognize something, do not understand something or want to know more about something.

In short, mark everything in this text that attracts your attention. Underline everything in the text that makes you think ‘this is remarkable, this is interesting, I do not understand this, this feels strange, this is fun, or I want to know more about this.’

Underline anything you want to. Read the underlined text-segment aloud and say what you think, what you feel and why you underlined this segment. You can say anything you want to; I want to hear what this text means to you, what attracts you. Anything you say is fine with me.

When you underline something I will ask you to explain why you underlined it.

To ensure that students understood this instruction they were asked to repeat it in their own words. At every underlined segment the researcher followed a protocol by using prompts such as ‘what do you think?’ to stimulate the student to think aloud and explain their thoughts. The text was read silently.

2.2.4 Coding system and analysis

We transcribed 33 protocols of students verbalizing their thoughts about striking fragments in the text. These data were divided into episodes. An episode is defined as ‘all utterances of the student after underlining a text segment’. We considered the moment of underlining to be a possible indication of reasoning, a cognitive disequilibrium/deficit or some type of affect. We defined 251 episodes (\(M = 7.6\) per student). A coding scheme was developed to code verbalizations found within these episodes. Students indicated the theme of the text, explained their thoughts, and reacted to the prompting of the researcher (e.g., ‘What do you think now?’ and ‘What do you mean by that?’). An episode ends when the student stops verbalizing (or does
not react to the researcher’s prompts) and continues reading. Transcribed episodes vary in length from 2 to 25 sentences.

Coding on the dimensions historical reasoning, prior knowledge and affective processes is used to characterize (potential) onsets of questions. Each episode is coded on these different dimensions. We used the episode, not the student, as a unit of analysis because we wanted to get insight into the onset of questioning processes that occurs when students read a text about history and how spontaneously-asked questions are related to these different processes.

To analyse the protocols we developed a coding scheme in order to label each episode on the following four dimensions: 1) historical reasoning (contextualization, comparing, causal reasoning and argumentation), 2) prior knowledge (experiencing a deficit in, a contradiction or a correspondence with prior knowledge) 3) affective processes (indignation, interest, astonishment, empathy or boredom), and 4) spontaneously-asked question(s) (yes or no). The coding scheme is illustrated in Tables 1 to 4, where we describe each coding dimension. For the categories historical reasoning, prior knowledge and affective processes, inter-rater reliability between two raters on a randomly chosen set of 45 episodes was calculated. Cohen’s kappas reached from .63 to .90. Kappas are reported in each table.

(1) Historical reasoning

Episodes were coded on the appearance of historical reasoning or no historical reasoning (Cohen’s kappa = .73). When a student showed a present-day perspective by using his or her own experience or present-day standards in explaining their thoughts (e.g., only discussing present-day issues) this was coded as ‘no historical reasoning’. But when a present-day issue was explicitly compared with the past or put into a historical context, this was coded as historical reasoning.

Describing the different types of historical reasoning in sub-categories was done by two raters together because in some cases different types of historical reasoning could be detected. In those cases we decided on the main type of historical reasoning present in the episode. Historical reasoning describes the reasoning activities students display while reacting to the content of the text. These reasoning activities are aimed at giving meaning to the historical information in the text. Typical historical reasoning activities are contextualizing, comparing, causal reasoning and argumentation. Table 1 presents the description and examples of these coding categories.
Table 1 Codes, descriptions and examples of historical reasoning (κ = .73)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Example</th>
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<tbody>
<tr>
<td>No historical reasoning</td>
<td>Episode contains no use of a historical reasoning related to the text segment.</td>
<td>Well, that people weren’t treated humanely in those factories. For example, that woman that wanted to comfort her child, or a child, and she immediately gets a fine because she’s not working: I think that’s really harsh.</td>
</tr>
<tr>
<td></td>
<td>Student judges a situation or event in the past from a present-oriented point of view (own experiences/values).</td>
<td>In this case I think of my own situation. I work 5 hours a week and I earn 3.85 an hour or something like that. And then I think ‘they earned so little in the past.’ That’s just not right.</td>
</tr>
<tr>
<td>Historical reasoning</td>
<td>An episode contains use of historical reasoning related to the text segment aimed at giving meaning to a historical situation, event or phenomenon. The described information in the text is extended or made comprehensible by using one or more forms of reasoning: (1) contextualization, (2) comparison, (3) causal reasoning, (4) argumentation.</td>
<td>The period, I think about 1700, 1800, when the steam engine appeared in England, I think. Yes, when things improved technically. That’s what comes to mind.</td>
</tr>
<tr>
<td>Contextualization</td>
<td>Student constructs a historical context for the situation/event that is described in the text in order to make this situation more comprehensible. The episode contains statements about characteristics of a specific time, place or society.</td>
<td>Steam engine. Yes, that was the first invention of the Industrial Revolution (...) And the locomotive is derived from that. Yes, people worked six days a week in factories; streets were dirty and on Sundays they drank a lot.</td>
</tr>
<tr>
<td>Comparison</td>
<td>Student makes a comparison that concerns situations, events and phenomena in the past that are compared with each other or with present-day situations, events and phenomena. (A comparison between present-day situations is not considered historical reasoning; for example the comparison between China 2008 and present-day Europe.)</td>
<td>Well, because my idea about earlier times, for example the Golden Age (17th century A.L.), is that women didn’t work as merchants or anything like that and they didn’t work on ships. They were at home with the children. Men worked, so I think it’s strange that now women and children have to work.</td>
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</table>
Causal reasoning  
Student names causes and/or effects of an event or situation that is described in the text.

Well, we now have faster transportation and people, yes, well, it changes, you know, we were able to move faster and, because of the train, we went to live in other places and we started to build cities. And that’s what I mean with development. Progress, just like the Renaissance, for example.

Argumentation  
Student gives arguments for or against a statement or interpretation, examines different arguments or interpretations.

I agree with the opinion that the existence of common people has improved. Um, well, the train came, so you can get anywhere within 3 hours. I think that’s very important, that you can travel far (…) And what could we do without machines nowadays? Almost nothing. So that’s my opinion. I agree with this.

(2) Prior knowledge
Episodes were coded on the appearance of verbalization of prior knowledge (Cohen’s kappa = .63). The codes, descriptions and examples from the transcripts can be found in Table 2. First we coded the episode on the category ‘knowledge deficit’ because we were interested whether a student experienced a deficit in knowledge (one of the most obvious triggers to formulating a question). Knowledge deficit was coded when a student explicitly stated lack of knowledge about the topic. This lack of knowledge can also be expressed as a spontaneous question. This is not applicable for cases where other aspects of prior knowledge were more prominent and explicit than a knowledge deficit.

When no knowledge deficit appeared in the episode the episode was coded with the codes ‘knowledge conflict’, ‘association’ or ‘no prior knowledge’. A knowledge conflict means that the student explicitly states that the information in the text is in conflict with his or her own knowledge. This can also mean that a student compares this information with other information previously presented in the text. Association is referring to prior knowledge without verbalizing a knowledge deficit or contradiction. An association can be expressed by the student by adding own knowledge, remembering lesson experiences, or information from a previous episode or text segment. An episode was coded as ‘no prior knowledge’ when a student only paraphrased the text or verbalized an affective reaction.
Table 2 Codes, descriptions and examples of prior knowledge (κ = .63)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Example</th>
</tr>
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<tbody>
<tr>
<td>Knowledge deficit</td>
<td>Episode contains statements from the student that express a lack of knowledge, expressed in a question or by using the expression; 'I do not know'.</td>
<td>Well, I don’t know. Apparently England is more developed than Germany. But I don’t know for sure, that’s why I underlined it. I don’t really understand it.</td>
</tr>
<tr>
<td>Knowledge conflict</td>
<td>Episode contains one or more expressions of prior knowledge that does not fit with the information in the text, according to the student. There is a contradiction with; - own knowledge - prior information from the text - own opinion, if supported with own knowledge - knowledge/information from the text.</td>
<td>Well, yes, it says that this Friedrich goes to his father’s factory, a textile factory. But I don’t understand, because it says in this sentence ‘In a large, dark factory hall dozens of people are working: remarkably many women and children’. But I always thought it was the men that worked.</td>
</tr>
<tr>
<td>Association</td>
<td>Episode contains one or more expressions of prior knowledge related to the text segment. This prior knowledge can consist of; - own knowledge - preceding information from the text - lesson experience/recollection - own (life)experience.</td>
<td>Steam engines came; they began to work with steam. Things got more automated. How do you say that? That there was more productivity. That a lot more was produced. Yes, people are sad because they have to work, they can’t do fun stuff and on Sundays they drink to forget.</td>
</tr>
<tr>
<td>No prior knowledge</td>
<td>Episode contains no statements that express prior knowledge related to the text-segment. - Information from text is repeated/paraphrased. - Episode only contains an affective reaction, opinion or judgment.</td>
<td>‘10 to 12 hours’ Um, that’s too long. That, um. Well, I just don’t think it’s right that children had to work 10 to 12 hours a day.</td>
</tr>
</tbody>
</table>

(3) Affect
First we coded each episode on appearance of ‘no affect’ or ‘affect’ (Cohen’s kappa = .90). Next, we coded the episodes that contained verbalizations of affect with the sub-categories interest, indignation, astonishment, empathy and boredom (Cohen’s kappa = .79). These types of affect were inductively generated based on student utterances including words or expressions that refer to affective characteristics (e.g., like, fun, awful, etc.). Descriptions of the codes and examples from the transcripts are presented in Table 3.
Table 3 Codes, descriptions and examples of affect (κ = .90) and different types of affect (κ = .79)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Affect</td>
<td>Episode contains no statement from the student that expresses emotion or interest.</td>
<td>Yes, children had to work too instead of going to school. So here you see again that they didn’t have much choice. They had to work to survive.</td>
</tr>
<tr>
<td>Affect</td>
<td>Episode contains one or more statements from the student that expresses emotion or interest.</td>
<td>Um, yes, I think that’s because it interests me. I am curious about working conditions. Well, um, I think things like child labour, for example, are topics that I find fascinating. How do I explain that?</td>
</tr>
<tr>
<td>Interest</td>
<td>Episode contains one or more statements from the student that express interest. The student uses words like interesting, fascination or curious.</td>
<td>The student uses expressions like ‘not normal’, ‘shocking’ or ‘awful’. Well, a child should be comforted when she, well, you have to comfort people when they aren’t feeling good. And in this case it’s not allowed. That’s shocking.</td>
</tr>
<tr>
<td>Indignation</td>
<td>Episode contains one or more statements from student that express indignation. The student uses expressions like ‘unbelievable’, ‘strange’ or ‘surprising’.</td>
<td>I think that people at that time had to work very long hours. It’s hard for me to believe that it was so bad at that time…and also because it concerns children, of course. That always really surprises me.</td>
</tr>
<tr>
<td>Astonishment</td>
<td>Episode contains one or more statements from the student that express astonishment. The student uses expressions like ‘unbelievable’, ‘strange’ or ‘surprising’.</td>
<td>I think that people really lived like that! I hate to think that I’d ever have to live like that. It’s a bit like you are him and you’re looking out the window and you see what he sees.</td>
</tr>
<tr>
<td>Empathy</td>
<td>Episode contains one or more statements from the student that express empathy. The student can imagine herself/himself in the situation that is described in the text segment.</td>
<td>That people really lived like that! I hate to think that I’d ever have to live like that. It’s a bit like you are him and you’re looking out the window and you see what he sees.</td>
</tr>
<tr>
<td>Boredom</td>
<td>Episode contains one or more statements that express boredom. The student uses expressions like ‘boring’, ‘annoying’ or ‘not interesting’.</td>
<td>Well, yes, I just said that I don’t think the subject we have now is a nice one. Because, well…it’s probably important but I prefer to talk about things like World War II.</td>
</tr>
</tbody>
</table>

(4) Spontaneous questions

Spontaneous questions were divided into content questions (descriptive, comparative, explanatory, evaluative) and non-content (procedural) questions. We used a coding system from an earlier study (Logtenberg et al., 2011). Table 4 presents descriptions and examples of these different types of questions. Procedural questions, which fall into a new category in our coding system, function to understand the task and are mostly directed at the interviewer. The inter-rater reliability for the coding of spontaneously-asked questions was calculated on a randomly chosen sample of 50 questions (Cohen’s kappa = .76).

Summarizing, all episodes were coded on historical reasoning, prior knowledge, affect, and spontaneous questions. In Table 5, two complete episodes are presented with all codes as an example.
Table 4 Codes, descriptions and examples of spontaneous questions (κ = .76)

<table>
<thead>
<tr>
<th>Category</th>
<th>Code</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Descriptive</td>
<td>What, when, who, how questions that can support building a historical context or describing processes of change and continuity.</td>
<td>Manchester is in England, isn’t it? What is this transition?</td>
</tr>
<tr>
<td>Comparative</td>
<td>Questions that ask for differences and similarities in order to determine the uniqueness of historical phenomena.</td>
<td>What do we have now that they didn’t have?</td>
<td></td>
</tr>
<tr>
<td>Explanative</td>
<td>Questions that ask for explanations of historical phenomena, why questions, what were (short-term and long-term) causes and/or effects?</td>
<td>I would like to know why many women and children worked.</td>
<td></td>
</tr>
<tr>
<td>Evaluative</td>
<td>Questions that discuss the significance of historical phenomena that foster discussion about the topic by asking for a judgment/opinion.</td>
<td>What was wrong with the people themselves during the Industrial Revolution?</td>
<td></td>
</tr>
<tr>
<td>Non-content</td>
<td>Procedural</td>
<td>Questions about the task or procedure directed at the interviewer or that support the thinking process.</td>
<td>How do I explain? Do I have to underline this? What do I think about this?</td>
</tr>
</tbody>
</table>

Table 5 Two examples of coded episodes, with and without spontaneous questions

Example 1

Underlined text: ‘Impressive’, Friedrich thinks, ‘A lot more modern than our Essen station in Germany.’

Episode: Well, that suddenly a German is standing at an English (Manchester) train station. I think that’s unusual. Um, well it is in the time of the Industrial Revolution, but I didn’t know that foreigners were already going to England, especially Germans. Um, well, I don’t know exactly, I just thought ‘unusual, I don’t know. Well, I didn’t exactly know that, say, Germans, other people, went to England. I thought it was America. Well, America was the new world. So, I think ‘If they wanted a better life’ or something, then they’d go to America, not to England.

Example 2

Underlined text: Essen in Germany

Episode: Yes, I don’t understand this, the ‘Essen in Germany’. Well, I think something like: ‘What does this have to do with the rest of the text?’ Here it says ‘a modern station’. And then someone says ‘it is more modern than our Essen station in Germany’. So, this man comes from Germany. That attracted my attention. Well, I’m reading this and someone suddenly says this and then I think, ‘were they linked in some way? And I think: ‘Was there something special about Germany even then? Were they in conflict or something? Yes, I mean at war.

Well, um, because the World Wars were about this time. And this is the end of the 18th century? How do you say that? This is the 19th century, is it?

Coding

1. Historical reasoning: contextualizing
2. Prior knowledge: knowledge deficit
3. Affective processes: no affect
4. Spontaneous questions: 1 procedural / 3 content (descriptive) questions (in italics)

3. RESULTS

In this study we want to describe students’ historical reasoning, verbalization of prior knowledge and affect when they read a historical introductory text. Furthermore, we are interested in the kind of spontaneous questions that students ask and in the type of processes in which these questions are embedded.

3.1 In what processes of historical reasoning, prior knowledge and affect are students engaged while reading a historical introductory text?

As we described earlier (coding system and analyses), a total of 251 episodes from 33 students were analysed. Table 6 shows the results of the analysis of the episodes in which students verbalized their thinking after they underlined part of the text. We found that in 120 (48%) of the episodes students verbalized historical reasoning, mainly contextualization ($f = 81$, 32%) and comparison ($f = 26$, 10%). With regard to prior knowledge we observed that prior knowledge in 74% ($f = 186$) of the episodes played a role in students’ thinking and reasoning when they verbalized why they stopped reading. In 23% ($f = 57$) of the episodes students expressed a knowledge deficit and in 8% a knowledge conflict ($f = 21$). 108 (43%) episodes contain an association. In 51% ($f = 128$) of the episodes students showed an affective reaction, mainly indignation ($f = 59$, 24%) and astonishment ($f = 27$, 11%) about the poor working conditions and child labour.
To gain more insight into students’ thinking and reasoning regarding text segments they considered striking, we looked at how expressions of historical reasoning, prior knowledge and affect occurred simultaneously when students explained why they stopped reading. Table 7 shows the frequencies of 16 different combinations found after coding, organized in types of processes with and without historical reasoning and with and without affect.

**Table 7 Frequencies of types of processes in episodes with and without historical reasoning**

<table>
<thead>
<tr>
<th>Types of processes</th>
<th>Historical reasoning</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affect</td>
<td>Prior Knowledge</td>
<td>13 (4.8)</td>
<td>26 (10.4)</td>
<td>39 (15.5)</td>
</tr>
<tr>
<td></td>
<td>Knowledge Deficit</td>
<td>120 (47.8)</td>
<td>131 (52.2)</td>
<td>251 (100)</td>
</tr>
<tr>
<td></td>
<td>Knowledge Conflict</td>
<td>117 (46.6)</td>
<td>127 (49.9)</td>
<td>244 (97)</td>
</tr>
<tr>
<td></td>
<td>Association</td>
<td>6 (2.4)</td>
<td>12 (4.8)</td>
<td>18 (7.2)</td>
</tr>
<tr>
<td></td>
<td>No prior knowledge</td>
<td>120 (47.8)</td>
<td>131 (52.2)</td>
<td>251 (100)</td>
</tr>
<tr>
<td>Affect</td>
<td>Knowledge Deficit</td>
<td>120 (47.8)</td>
<td>131 (52.2)</td>
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<td></td>
<td>No prior knowledge</td>
<td>120 (47.8)</td>
<td>131 (52.2)</td>
<td>251 (100)</td>
</tr>
</tbody>
</table>

*Underlined frequencies of types of processes are elaborated with examples in the text*

Most episodes containing historical reasoning included one or more associations. About half of these episodes also included one or more affective responses. Episodes without historical reasoning mainly included the verbalization of a knowledge
deficit and the verbalization of an affective reaction without verbalizing prior knowledge. Four types occurred most frequently, cover 52.5% of the episodes ($f = 132$,) and are underlined in Table 7. These types are combinations of 1) historical reasoning, association without affect ($f = 39, 16\%$), 2) historical reasoning, association with affect ($f = 34, 14\%$), 3) no historical reasoning, knowledge deficit and no affect ($f = 26, 10\%$); and 4) no historical reasoning, no prior knowledge and affect ($f = 33, 13\%$). These four most frequent types are described below, elaborated with students' utterances. First we provide examples of episodes with historical reasoning and then we provide examples of episodes without historical reasoning.

3.2 Episodes with historical reasoning

Episodes that showed historical reasoning ($f = 120, 48\%$) were mostly episodes that included one or more associations. We found many instances in which a text element triggered association by a student when asked to explain why he or she underlined a part of the text. The student not only verbalized an association, but also used this knowledge to construct a historical reasoning ($f = 39, 16\%$). Most often students used their association to construct a historical context for the situation described. We found this type five times in the episodes of student Roy. When he read the term ‘steam engine’, he reacted by saying that steam engines appeared in the Industrial Revolution. He added that people started to work with steam and their productivity was increased. We find another example with Sophia. She underlined the final part of the text that discusses the significance of the Industrial Revolution. Sophia reasoned about the consequences of the Industrial Revolution using her prior knowledge: ‘this was when life improved, for the people and the working conditions. People were probably treated better and earned a higher hourly wage.’ Furthermore, she tried to understand the statement on different opinions through argumentation: ‘there are different opinions; some think that life improved, others do not. Well, maybe just the rich people got a better life, but not the people in the factories because they didn’t have as many rights. Bosses also worked in factories; they had a better life, for example (...) there were differences between people.’ These examples of episodes show that several text elements triggered processes that were mainly characterized by reasoning and associative reacting to statements in the text, without affect.

Part of the episodes in which students engaged in historical reasoning also include an affective response. These episodes reveal a profile of historical reasoning, association and affect ($f = 34, 14\%$). Students verbalize their associations and construct a historical reasoning, but also show an affective reaction with regard to the text. Like many other students, Jessica, underlined the part in the text about women and children working in a factory. She expressed prior knowledge: ‘many women and children worked because they were less expensive than men, and they were more delicate with their hands. For example, sewing (...) men have bigger hands so they have more trouble with sewing.’ Then she verbalized interest by stating: ‘I think this is funny, because on the one hand this is a sort of emancipation because many women worked. This is striking compared to the years before that when women were not allowed to work. And now even children come into the work picture.’
This student attempts to contextualize, although her reasoning is not fully adequate; women and children were also used to working for the family before the time of industrialization. Prior knowledge was shown and this student showed some interest in the topic by using words like funny and striking. There are 13 episodes in which a student verbalized indignation but also constructed a historical reasoning. Alina, for example, expressed indignation while reading the text fragment about poor working conditions for women and children. She said; ‘Well, actually this is pretty awful.’ But she proceeded with contextualizing the situation by making a comparison, and she concluded that this situation is different from today and that this situation was common for them then: ‘Well, they didn’t know better, they didn’t know that it wasn’t right, working such long hours. Well, ‘right’, I mean, because we, for us, this is not right. For them it was normal.’ Alina was able to make a distinction between our present ideas and experiences and those of people in the past.

We compared the frequencies of episodes with historical reasoning between students with low, medium and high prior knowledge and interest (LL, MM, HH). Because of small group sizes we could not perform statistical analysis. The high prior knowledge/interest group showed more historical reasoning combined with associations ($f = 42, 57\%$) than the low prior knowledge/interest group ($f = 7, 10\%$) and the medium group ($f = 24, 33\%$).

### 3.3 Episodes without historical reasoning

Episodes that did not show historical reasoning mainly contained verbalizations of a knowledge deficit or no verbalization of prior knowledge. Examples of no historical reasoning, a knowledge deficit without affect ($f = 26, 10\%$), were characterized by episodes in which often a spontaneous question was formulated. For example, Daisy read the text fragment from the diary of Friedrich Engels: ‘Workers are not human beings in their eyes (reads), but economic entities. Well, I thought, I didn’t read on, why are workers not human being in their eyes? I was thinking; who are they talking about and why are they not workers? Because they are workers.’ This response is a typical form of puzzlement expressed with one or more questions, but no reasoning, prior knowledge or affective reaction was expressed. This type is determined by the spontaneous questions asked or the explicitly stated knowledge deficit.

Episodes without historical reasoning were often episodes that show an affective reaction to the text ($f = 33, 13\%$) without a verbalization of prior knowledge. A typical example is Sonia who read the text fragment: ‘You get a fine. You should talk in your own time.’ Sonia reacted with: ‘if the woman was comforting a child, this is disgraceful! Well, a working child is crying, a woman wants to comfort it and then she gets a fine because she wants to comfort the child. What do I think about this? Bug off! That’s what I think, but well, you probably couldn’t say that. I think you’d be in even more trouble if you did.’ Although Sonia seemed to understand that it was not really an option to protest or leave the factory in those times, she did not bring in any knowledge about this period to contextualize. In many episodes students reacted with this type of affect (indignation) without using prior knowledge. When expressing their affect, the text elements were paraphrased.
For the episodes without historical reasoning we found that both the low ($f = 17, 45\%$) and medium ($f = 19, 15\%$) prior knowledge/interest groups had more episodes with a knowledge deficit than the high prior knowledge/interest group ($f = 2, 5\%$). When we looked at the occurrence of affective processes in the different student groups, we found that the number of episodes with affective responses was comparable for the three groups with low, medium and high prior knowledge/interest.

Summarizing, the analysis of students’ thinking while reading an introductory text on the Industrial Revolution showed that students’ thinking processes for an important part reflected historical reasoning, the activation of prior knowledge and affective responses. Therefore, historical reasoning, prior knowledge and affect may also play a role in the asking of questions. In the following sections we describe the type of questions that students ask and when questions are asked in episodes.

### 3.4 What type of questions do students spontaneously ask?

A total of 129 questions were spontaneously asked. Ninety-seven questions were content-related and, to a lesser extent, 32 procedural questions were asked (see Table 8).

**Table 8 Type, frequency and percentage of spontaneous questions asked in episodes**

<table>
<thead>
<tr>
<th>Spontaneous questions</th>
<th>$f$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content</strong></td>
<td></td>
</tr>
<tr>
<td>Descriptive</td>
<td>73 (57)</td>
</tr>
<tr>
<td>Comparative</td>
<td>2 (1)</td>
</tr>
<tr>
<td>Explanative</td>
<td>14 (11)</td>
</tr>
<tr>
<td>Evaluative</td>
<td>8 (6)</td>
</tr>
<tr>
<td><strong>No content</strong></td>
<td>97 (75)</td>
</tr>
<tr>
<td><strong>Procedural</strong></td>
<td>32 (25)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>129 (100)</td>
</tr>
</tbody>
</table>

Most content questions were descriptive ($f = 73, 57\%$) and were asked while reading the narrative text that dealt with working conditions. Students hardly ever formulated comparative or evaluative questions. Examples of descriptive questions students spontaneously formulated are ‘This is the nineteenth century, isn’t it?’ or ‘Wait, is this about Friedrich Engels?’. Evaluative questions are ‘Are we living worse now than before, than before the Industrial Revolution, or do we live better now?’ and ‘What went wrong with the people during the Industrial Revolution?’

With regard to the different groups, we found that the medium ($f = 93, 37\%$) and high ($f = 89, 35\%$) prior knowledge/interest groups underlined more text fragments (episodes) compared to the low group ($f = 69, 27\%$). We also found that the medium interest/prior knowledge group asked more content questions ($f = 47, 48\%$) than the low ($f = 29, 30\%$) and high ($f = 21, 22\%$) interest/prior knowledge group. Thus, the medium interest/prior knowledge group underlined more text fragments and in this
group more questions were asked within one episode. There were no notable differences found between groups with regard to topic and type of questions.

3.4.1 When are spontaneous student questions asked?

In 63 episodes (25%) students asked one or more content questions (descriptive, comparative, explanatory or evaluative). With regard to historical reasoning, 44 content questions (42%) were asked in episodes with historical reasoning, mainly descriptive questions in episodes with contextualizing. With regard to prior knowledge most questions ($f = 69, 71\%$) were asked in episodes with a knowledge deficit, 4 questions in episodes with a knowledge conflict and 16 questions in episodes with an association. With regard to affect 42 (42%) of the questions were asked in episodes with affect (mainly interest, indignation and astonishment). Reading about the noise of the steam engines, Sophia asked, where all that noise was coming from. When reading about Friedrich, who remarks that it is not like his hometown of Essen, she asked whether he was on a visit or a holiday. Questions in episodes without historical reasoning are close to the story in the text and are less about the historical phenomena the story is introducing.

Spontaneous questions were also related to affective responses. 42% of the spontaneously asked questions were asked in episodes in which students expressed interest or emotions. Often these questions reflected a moral judgment as a result of taking a present-oriented perspective towards the situation or event described in the text. One of the students, for example, showed indignation about the fact that the woman who comforts a crying child gets a fine and asked ‘Why does she get a fine?’

Although episodes that contained historical reasoning did not often contain one or more spontaneous questions (23% of these episodes contained a question), 42% of spontaneously-asked content questions were found in episodes that contained historical reasoning.

Affect, historical reasoning and the asking of spontaneous questions can go together in different ways. In some cases affective responses, such as indignation or amazement, resulted in a question and then the student tries to contextualize or explain the situation or event. For example, when reading about the working conditions in the factory Carl expressed his indignation with a question: ‘People are allowed to talk, aren’t they?’ After this he contextualized the situation through a more extensive description of the working conditions in those factories: ‘Taken into account the whole text and what we have had in the lesson, people worked in really bad conditions and many died in the factories. Children had to work because they were able to crawl between all those machines.’ In this case the question is the start of a historical reasoning.

There were some examples in which the attempt to contextualize itself gave rise to questions. In one case (see example 2 in Table 5), a disequilibrium was triggered by the sentence in which Friedrich says that it (Manchester) was more modern than Essen (in Germany). Victor verbalized his lack of knowledge and asked: ‘Were these two connected or something?’ and ‘Was there something special about Germany, even then?’ He tried to situate it in the broader context of developments in Germany, and in order to do that he also wanted to know what period it is about. He stated
‘This is at the end of the 18th century’ and asked ‘This is 19th century, isn’t it?’ From a domain-specific perspective, the questions can also be understood as an attempt to build a historical context in order to understand the difference between Germany and England. The questions were aimed at finding information that help Victor place the historical situation in the context of time and place.

A final example of a question as the result of historical reasoning is about the text segment that describes the different statements from historians about the effects of the Industrial Revolution. Victor reacted to this statement with the remark that he needs to know more about the living conditions in the past and present in order to construct his opinion. In this way, Victor experienced a knowledge deficit. His questions were ‘How did they live? How do we live now? What do we have now that they didn’t have then? Is life worse than before, than before the Industrial Revolution, or is life better now?’ In this episode the student asked for more information about working conditions during the period of industrialization in order to make a comparison with present conditions and take a position in the discussion. Actually, the reasoning of this student was not only characterized by contextualization (how people lived in those times), but also by comparison and argumentation, which are also components of historical reasoning.

4. DISCUSSION

In this study we described the onset of questioning with students who read a historical introductory text. According to general models of questioning, the onset of questions is characterized by a cognitive conflict or disequilibrium or an experience of a knowledge deficit. In addition to these cognitive components, we were especially curious about the role affective processes and historical reasoning might play in the onset of questions in the domain of history. Questions may arise because of affective factors like interest or astonishment, or because of the attempt to contextualize or explain a historical situation. In this study we examined student verbalizations of domain-specific reasoning, prior knowledge and affect. After that we related these processes to spontaneously-asked questions.

Our first research question aimed at describing historical reasoning, prior knowledge and affect that occur when students are triggered by a fragment in a historical introductory text. Coding the appearance of historical reasoning in students’ explanations of their underlining showed that in half the cases students used historical reasoning, often in the form of constructing a historical context for the situation or event described in the text (contextualization). The two types of episodes that appeared most both include historical reasoning with prior knowledge, sometimes combined with affective reactions and sometimes without affective reactions.

Prior knowledge appeared to be an important dimension in the characterization of processes students engaged in. We found that students often stopped reading when terms or statements in the text triggered prior knowledge. In almost a quarter of all episodes students verbalized a knowledge deficit. However, students hardly ever expressed a knowledge conflict, whereas in general models such conflicts are considered important sources of student questions (Graesser & McMahen, 1993).
With respect to the role of affective dimensions of processes that take place during reading, we can conclude that in explaining their disequilibrium or reason to stop reading, students verbalize emotions and interest. We found affective reactions in about half of the episodes, and two of the types of episodes that occurred most contain affective responses. Indignation and astonishment about the working conditions were particularly triggered by the text. This supports our idea that the disequilibrium students experience is not only cognitive, but also affective. Events or situations described in the text conflict with what students think is correct or normal. In the domain of science, it is well-known that students can experience a cognitive conflict between scientific ideas and ideas based upon everyday experiences, perceptions and physical sensations (e.g., Limón, 2002). However, in the domain of history, conflicts may occur more on the level of values and norms, and emotions can play an important role.

Summarizing, historical reasoning, the activation of prior knowledge, the realization of a knowledge deficit, the verbalization of emotions such as indignation and astonishment are important components of the disequilibrium students experienced when reading the introductory text about the Industrial Revolution. Therefore, these components may also play a role in the evolvement of questions.

The second research question aimed at the type of questions students spontaneously asked. The results showed that 97 spontaneous content questions were asked. This is not in line with results of other studies which show that students are not inclined to ask questions themselves while reading a text or during a whole-class discussion (Dillon, 1988; Good, Slavings, Hobson Harel & Emerson, 1987; Niegemann & Stadler, 2001). On the other hand, students missed many opportunities to formulate a question by phrasing disequilibrium into a question. We found that 25% ($f = 63$) of the episodes contained content-related questions. This may be explained by the fact that in many cases when students stop reading because something in the text makes them think or wonder, they associate and verbalize prior knowledge and there seems to be no real surprise or puzzlement.

Students mainly ask descriptive questions. The text contains comparisons (e.g., between Germany and England and between present-day China and England in the past), but not many comparative questions are formulated. Furthermore, not many explanatory questions are formulated, although students do contextualize.

With regard to the third research question (which processes characterize the onset of spontaneous student questions?), the analysis of episodes with questions shows that questions are especially asked when students experience a need for more information (and thus a knowledge deficit). This need for information is sometimes grounded in the attempt to contextualize, which is an aspect of historical reasoning. 42% of spontaneously-asked questions were asked in episodes with historical reasoning. In some of these episodes questions were the start of a historical reasoning or the result of it. Astonishment and indignation - when combined with the attempt to contextualize - can also develop into a question, although these questions often contain presuppositions reflecting a judgment or a present-oriented perspective. Since indignation and astonishment occurred in a third of all episodes, only in 13% of these episodes students asked questions spontaneously. Thus, often these emotions did not give rise to the asking of questions.
4.1 Limitations

A possible limitation of this study lies in the research methodology. The advantage of the method that let students decide to stop reading and explain their thoughts is that it allowed us to register affective student reactions on specific text segments. Affect, particularly, may be a brief and fleeting phenomenon and would not have been expressed after reading the text. On the other hand, this method may disrupt the reading process and may have caused students to mark fewer elements in the last section of the text because they became tired of explaining their thoughts each time they marked a text segment. It is also possible that students refrained from marking elements of which they knew nothing, being afraid to show that they were unable to discuss these issues.

Furthermore, the prompting after each utterance could have influenced reasoning processes, student thinking and the asking of spontaneous questions. The researcher asked questions for explanation that caused students to be placed in ‘answering mode’, and therefore they did not automatically start asking questions. They were not instructed to formulate questions.

Since we only used an introductory text and a text about one historical topic, further research is needed using a variety of texts (e.g., explanatory texts or primary sources) and topics to support our findings that in the domain of history, prior knowledge, affect and historical reasoning are important components of the processes that students experience when reading a text, and that affect and domain-specific reasoning are also important in the development of questions.

Finally, further research could continue to explore differences and communalities in the ability to ask historical questions between students with different levels of prior knowledge and interest in history. Because of the small sample size in this study we were not able to draw conclusions about these differences. However, it seems that students with more prior knowledge and interest show more associations and historical reasoning, whereas students with low prior knowledge and interest experienced a knowledge deficit more often. Maybe some questions should be answered first in order to trigger more reasoning and formulate other questions. Furthermore, it seems that affect plays an important role in the underlying processes of all groups.

4.2 Practical implications

We think that knowledge of the onset of a question can provide us with more information in determining the quality of a question. In educational practice, the assessment and evaluation of the quality of the questions learners ask is receiving more attention (Dori & Herscovitz, 1999). Determining whether a question is a ‘good’ question can be done by looking at the disequilibrium the questioner experiences and whether the questioner is able to formulate a question out of this experience.

The findings that students do not often formulate a spontaneous question when they experience some form of disequilibrium, and that affect and historical reasoning are important components of students’ onset of questioning, are not only important for research on learning History and on student questioning, but also for educational
practice. In history education, question asking is an important ability. First, in history lessons students could be stimulated to articulate their thoughts about what they consider strange or unjust before being instructed to formulate questions (see also Ciardiello, 2007). When students ask questions that reflect affective responses as a result of taking a present-day perspective, the teacher has the opportunity to transform the taking of a present-day perspective into a more historical perspective, for example by modelling or providing information with which students can investigate why people in the past behaved as they did. Second, students could be stimulated to contextualize what they read in a text. Contextualization seems to be an important activity for formulating descriptive, comparative and explanatory questions about historical phenomena and also for dealing with indignation and astonishment. In this way students can be supported in problem-finding and formulating questions they are interested in or that are functional to them, and these are at the same time important opportunities to construct historical knowledge and enhance historical reasoning.