



Illuminating historical causal reasoning: Designing a theory-informed cognition model for assessment purposes

Uddhava Das Rozendal
Carla van Boxtel

*Research Institute of Child Development and Education,
University of Amsterdam, The Netherlands*

ABSTRACT

This study presents a theory-informed cognition model of causal reasoning in history as a foundation for assessment tasks. This model details the levels of achievement of individuals' causal reasoning in history and the underlying beliefs and knowledge types that should be mastered to become proficient in this form of reasoning. The model was developed following a design approach. First, a literature study was conducted on the nature of causation in history. This study led to the creation of an initial model that was submitted to two mixed expert panels comprising experts from various backgrounds who critiqued the model. Based on their feedback, the model was further refined. This process resulted in a description of levels of achievement for three dimensions: an epistemic dimension, a second-order knowledge dimension and a first-order knowledge dimension. For each dimension, we identified concrete behaviour and underlying knowledge and beliefs. This cognition model can form the foundation for developing assessment tasks that can help improve students' causal reasoning in history.

KEYWORDS

Causal reasoning in history, Cognition model, Historical thinking, Historical reasoning, Assessment

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Introduction

Research has shown that assessment can be a powerful tool for teachers to enhance student achievement in secondary education (Black & Williams 1998; Van der Kleij et al., 2015). According to Pellegrino et al. (2001), good assessment design should follow the principles of the assessment triangle: Tasks should be derived from '1) a *cognition* model of student learning in a given domain; 2) a set of beliefs about the kinds of *observations* that can be used as evidence for student learning and 3) the means to *interpret* this evidence' (p. 45). However, Brown and Wilson (2011) have noted that cognition models are often missing or 'backgrounded' (p. 224) in the development of assessment tasks and have emphasized that 'having a model of how students represent knowledge and develop competence strongly benefits curriculum, instruction and evaluation' (p. 225).

In recent decades, the focus of history education has shifted from rote learning and memorizing facts about the past to using this knowledge and developing an understanding of the nature of history to think and reason historically (Van Drie & Van Boxtel, 2008; Lévèsque, 2008). However, several scholars have pointed out that in secondary school, assessment is often aimed at factual recall instead of historical thinking abilities (Ercikan & Seixas, 2015; VanSledright, 2014). The definition of cognition models is an essential step in bridging the gap between the intended and actual goals of history curricula (Ercikan & Seixas, 2015). In this study, we report on the design of such a cognition model of causal reasoning in history. The following questions guided our investigation:

What constitutes causal reasoning in history, and how can we describe the incremental development of student proficiency in this ability?

Designing a cognition model

Both educational researchers (e.g., Voss & Wiley, 2006; Seixas & Morton, 2012) and many historians (e.g., Carr, 1961; Gaddis, 2002; Hewitson, 2014) consider causal reasoning an important aspect of historical study and expertise. Consequently, it features in most theories and frameworks on historical thinking (e.g., Seixas & Morton, 2012; Wineburg, 2001) and historical reasoning (Author, 2008; Van Boxtel & Van Drie, 2018). While research into historical causation has provided many insights into the challenges that students face and has led to strategies for teachers to overcome such challenges, a cognition model specifically aimed at assessment does not yet exist.

We adopted a design approach consisting of an exploration stage, a construction stage, and an evaluation stage (McKenny & Reeves, 2012). In the first stage, we explored historical causation through a study of relevant literature. Discussion about causation, its practice and its nature can be found in both history education research and in publications on the philosophy and theory of history. We chose to incorporate the literature from both perspectives to better understand causal reasoning in history. However, it is important to note that causation is not a subject without disagreement. Among historians and theorists, there is much discussion about the 'what' and the 'how' of causation and its importance within the discipline (Hewitson, 2014). Tosh (2015), citing famed British historian A.J.P. Taylor (1969), explains that some historians question whether seeking causes should even be the purpose of historical enquiry. The philosopher of history Paul (2014) distinguishes four explanatory models regarding causation that cover the various positions within the discipline: the intentionalist model, which focuses on actions by agents; the covering law model, which leans into causal laws similar to the natural sciences; the comparative model, which determines causes through comparison; and the probabilistic model, which substitutes laws for rules that make the occurrence of an event more or less likely. While this paper is not aimed at resolving this discussion, we do feel that it further underlines why it is important to focus on causation specifically and that, to create a valid cognition model, this discussion needs to be explored, which we will do below in the section on second order knowledge.

We used two different strategies to gather literature. First, we sought relevant peer-reviewed articles about causal reasoning in history in the ERIC (Educational Resources Information

Center) and Google Scholar databases with terms such as ‘historical causation’ and ‘historical causal reasoning’. Second, we asked experts on history education and the philosophy of history for seminal studies in this field, and then, through a ‘snowballing’ process, we gathered more literature to broaden our understanding of causation in history. In the construction stage, we used our findings to create a preliminary cognition model, which, in the subsequent evaluation stage, was submitted to two expert panels who critiqued the model. This feedback was used to refine the model.

At the outset, we formulated five principles that steered the design process. First, the model should describe causal reasoning in history in a manner that disciplinary practitioners expect. Second, assessment ‘cannot offer a direct window into a student’s mind’ (Radinsky et al., 2015, p. 133), so to ‘know what students know’, this knowledge should be transformed into observable behaviour that can serve as evidence of that knowledge. Therefore, the observable behaviour that students undertake when they construct a causal explanation and the underlying knowledge and beliefs that enable or impede them from doing so should be separated. Third, Alexander (2003) notes that traditional models of expertise tend to portray progression in dual terms but that such novice-expert trajectories mask actual progression. Thus, our model should be multileveled instead of dichotomous. Fourth, the description of the various levels of achievement should be both clear and comprehensive as well as logical and consistent. Fifth and finally, the model should support teachers and teacher educators in the construction and use of assessment tasks.

This report is organized around the phases of the design process, exploration, construction and evaluation as outlined above. After discussing the evaluation stage, we briefly discuss two examples of how the model could be used. Finally, in the conclusion and discussion, we reflect on the model and on our design approach.

Exploration and construction stage

Causal reasoning in history forms part of several models of historical reasoning or thinking (e.g., Seixas & Morton, 2012; Stoel, et al., 2015, Van Drie & Van Boxtel, 2008). In their model, Van Boxtel & Van Drie (2018) define historical reasoning as reaching justifiable conclusions about processes of continuity and change, causes and consequences, and differences and similarities between historical phenomena or periods. They conceptualize historical reasoning in terms of student behaviour and activities such as identifying causes, contextualizing causes, differentiating among types of causes, and the necessary cognitive resources for reasoning: first-order knowledge, second-order knowledge and epistemological beliefs. First-order knowledge refers to the dates, names, facts and phenomena that make up our knowledge of the past. Second-order knowledge refers to meta-concepts in history such as evidence, change and causation. Epistemological beliefs refer to the validity and justification of first-order knowledge (VanSledright & Limón, 2006).

In answer to the first part of our research question, we have defined causal reasoning in history as *the ability to construct or evaluate a historical causal explanation by relating the actions of historical actors, historical conditions and context to the phenomenon, event or development that needs to be explained while considering the relevant disciplinary criteria for constructing such an explanation.*

The three dimensions that constitute causal reasoning in history formed the framework within which we conducted our literature study to answer the second part of our research question: *How can we describe the incremental proficiency of students?* In the following sections, we will discuss each dimension in relation to this question.

Second-order knowledge

Since much research on history education has been devoted to second-order knowledge, we began our enquiry here. Both historians and educators in history education have written extensively on causation. Historians tend to approach the subject from a more abstract point of view and ask questions about the nature of causation and what constitutes a 'cause' (e.g., Carr, 1961; Hewitson, 2014; Paul, 2014). Various studies performed in the 1990s by educational researchers focused on second-order knowledge and examined students' understanding of historical causation from a cognition perspective (e.g., Carretero et al., 1997; Halldén, 1997; 1998; Lee et al., 1998; Voss et al., 1994). This research charted the difficulties that students encounter when engaging in historical causal reasoning and provided some understanding of the difference between 'naïve' and 'disciplinary' causal reasoning. More recent studies have focused on possible teacher strategies for improving reasoning (Chapman, 2003; Reisman, 2009; Seixas & Morton, 2012; Stoel et al., 2015).

For the purpose of this literature study, the work by Seixas and Morton (2012) and Lee, Dickinson and Ashby (1998) is of particular interest. The former distinguish between naïve and expert causal reasoning and offer concrete examples of desired student behaviour in causal reasoning in history. The latter conducted a large-scale study, project CHATA (Concepts of History and Teaching Approaches, 7 to 14), in Great Britain, in which students completed various tasks and were interviewed about their understanding of second-order knowledge of history, such as causation, evidence and change. The resulting data led to the creation of, among other things, a progression model of historical explanation or causal reasoning (Lee et al., 2001; Lee & Shemilt, 2009).

The model is built around three different themes. First, it addresses several common misconceptions students hold about causation and which strategies experts use when reasoning with causation. For instance, students tend to place more emphasis on human action, while experts also consider the conditions within which individuals operate. These strategies can also be found in the work by Seixas and Morton (2012). The second theme concerns how causal explanations about the past are created, for instance, by basing them on historical evidence. As a result, such explanations are constructed by the historian and are not immanent in events. Third, the model strives to show that the past is not determined, i.e., that events were not necessary results from their antecedents. Progression is set along six stages in which students achieve a deeper understanding about both the nature and practice of causation in history. Although the progression model is comprehensive, there is no clear separation between second-order knowledge and epistemological beliefs. Additionally, the role of first-order knowledge in reasoning remains unclear.

The strategies that experts use as described in the model correspond loosely with the explanatory models that historians use when explaining the past. Paul (2014) distinguishes three explanatory models. The *intentionalist* model of explanation argues that it is primarily the intention of historical agents that explains why events occur. Intentionalist historians focus on the particular and emphasize empathizing with people in the past to understand their motives. Conversely, the *covering law* model, and its less deterministic cousin the *probabilistic* model, focus on the conditions that drive human action. The covering law model is rooted in positivist science whereby events are connected to antecedent conditions through general laws, i.e., laws that *cover* every instance of such an event. Discovering covering laws is problematic because the past, unlike natural science, is not observable. The probabilistic model attempts to solve this problem by referring to rules instead of laws that make the occurrence of an event more *probable*. Both of these models refer to conditions and structures that govern the occurrence of events. Finally, the *comparative* model of explanation contrasts the occurrence of past events with other similar or counterfactual events to determine its causes (Paul, 2014).

The models described above reflect different approaches to historical explanation as they developed over time. Thus, these models may seem mutually exclusive, as they correspond with different disciplinary practices of the past and present. Bevir (2007), for instance, argues for an

agentive approach and against positivist social science techniques such as laws. However, according to Paul (2014), these models are often intermingled in practice. Likewise, Chapman (2017) distinguishes between ‘agency and structure’ (p. 3) but states that ‘they interact in practice’ (p. 3). Similarly, Hewitson (2014) argues in his study on causation that causes are ‘intersecting sets of actions’ (p. 217), that are determined by social and cultural circumstances, i.e., conditions and context. These sets of actions may refer to singular and individual actions or constitute broader conditions that produce or enable change. Therefore, the difference among causes, actions and conditions ‘is one of degree’ (Hewitson, 2014, p. 217), and intentions, structures and comparisons should be used cumulatively rather than independently. In our view, this cumulative approach fits best with the strategies expounded by Lee et al. (2001). We agree with Bevir (2007) that laws in historical study are problematic and thus advocate the probabilistic model as set out above. Conditions then should not be seen as laws that determine behaviour but rather make certain actions more *probable* than others, considering the context and conditions in which they took place.

We used the three explanatory models described by Paul (2014) and the model of Lee and Shemilt (2009), complemented by the work by Seixas and Morton (2012), to describe students’ understanding of historical causation and the corresponding observable activities students undertake, resulting in four separate levels of achievement (see Figure 1). The middle two columns show the development of second-order knowledge and associated student behaviour. Students with a descriptive view of causation tend to give no explanation but merely describe events. Students who have learned that events happen for a reason move to an intentionalist view of causation whereby events are presented as the result of the will of great individuals. Insofar as conditions are considered, they are personified. When realization occurs, historical agents act within certain conditions, and the next stage is reached, in which intentionalism is complemented by structuralism. Causal explanations become less sequential, and historical conditions are considered, corresponding to a probabilistic view of historical causation. In the last stage, students become aware of the constructed nature of historical explanations and that conditions and actions must be placed within a historical context.

Epistemological beliefs

Epistemology is the philosophical branch that questions the nature and justification of knowledge (Hofer, 2002). Kuhn and Park (2005) explicitly link epistemological beliefs to the need for critical thinking. In their model, they distinguish four different epistemological stances. In the first two conceptions, realist and absolutist, the external reality is normative, meaning that knowledge is the result of objective external sources. Knowledge is therefore authoritative and true, and mistakes are the result of human error. In the latter stances, the realization occurs that knowledge is achieved by human thought and actively constructed. This understanding can lead to relativism, the relativist stance, in which ‘knowledge’ devolves into an opinion and one person’s claim is no better than another. This approach changes in the final (evaluative) stance, where it is recognized that not all knowledge is constructed equally. The creation of knowledge needs to adhere to scientific criteria, and as such, the justification of knowledge can be evaluated.

Drawing on the work by Kuhn and Park (2005) and others, Maggioni et al. (2009) created a framework focused on historical evidence that distinguishes three different stances. In the first stance, a conflation of the aforementioned realist and absolutist stances, sources are considered hard evidence that provide true information about the past. History, as a written account, is a copy or an exact representation of past reality. Maggioni et al. (2009) coined this the copier stance. In the borrower stance, students become aware that access to the past is more complex. Sources are not objective copies but subjective accounts by contemporaries that can conflict and contradict. Generating history means piecing together the parts that fit best by borrowing from the sources what is necessary, but decisions about what to include and what to exclude seem ungrounded. History is now a matter of opinion, especially when no evidence is available to resolve biased and contradictory sources. Finally, in the criterialist stance, students become aware of the strategies

and criteria that historians use for their enquiries into the past. Sources are not merely biased accounts that need to be mined for information that ‘fits’ but can be used as evidence through comparison with other sources and by asking the right questions.

Our initial conception of epistemological beliefs was largely informed by the two models outlined above, the former being more general, while the latter is more specific to the use of evidence in historical accounts. In our initial model, at the first level, causal explanations are seen as copies based on certain knowledge of the past contained in external sources. Consequently, causal explanations are accepted without criticism. At the second level, causal explanations are seen as facts that can be either right or wrong. These explanations are certain and based on sources; however, the distance of the past may result in mistakes. This approach means that one causal explanation, the correct one, is accepted as all the others must be wrong. In line with Maggioni et al. (2009), we decided later in the design to combine these two stances. At the third level, causal explanations are seen as opinions and are the result of interpretations of sources. Knowledge is therefore the product of human endeavours, not transmitted through objective, albeit sometimes erroneous, sources. Consequently, multiple explanations may be accepted, but no judgement can be made regarding their truth value. At the fourth level, causal explanations are seen as judgments based on the interpretation of sources that are bound by criteria. This approach means that although multiple explanations can be accepted, they can be evaluated based on these criteria. After consultation with experts, we added an extra level, in line with more postmodern approaches to history, the reasoning for which we will explain below.

First-order knowledge

According to Jin et al. (2019), inquiry and content are inseparable. Content knowledge, or first-order knowledge, is a prerequisite to becoming proficient in inquiry in a domain. This requirement applies to school history as well. The importance of first-order knowledge when explaining historical events has been recognized by many scholars (Chapman, 2021; Seixas et al., 2015; Stoel et al., 2017; Van Boxtel & Van Drie, 2018). According to a review by Alexander and Judy (1988), domain-specific or first-order knowledge is a prerequisite for the use of strategies within a domain, such as causal reasoning, whereas inaccurate knowledge may impede learning. However, not only the quantity of knowledge but also its quality matters. Experts tend to have deep, well-structured and automated domain-specific knowledge that is often both pictorial and verbal. Conversely, novices tend to have superficial, unorganized, nonautomated and more general knowledge that relies on verbal instead of pictorial representations (De Jong and Ferguson-Hessler, 1996). The quality of knowledge then refers to its organization, but how can historical knowledge be organized?

First, facts, events, historical actors, and historical phenomena are often encapsulated in historical *concepts* such as ‘the Enlightenment’ and ‘the feudal system’. Such concepts are abstract references to an idea, a class, category or relationship within a body of knowledge. They give meaning to facts by designating them as, for example, a political system, economic activity, mode of thought or other category. Colligatory concepts encompass within a single construct a large range of events and ideas that are connected to them (Halldén, 1997). Such concepts share a certain theme or development that binds events within a period together by colligation. Historians use these concepts as explanatory tools, for instance, by referring to the Renaissance and its associated ideals and thoughts to explain the increase in critiques of the Catholic Church (Lévêque, 2008). A historical concept thus carries an intrinsic difficulty and level of abstractness depending on its degree of colligation, that is, the degree to which other events, phenomena and concepts are connected to it. A further layer exists whereby one becomes aware that colligatory concepts do not have a fixed meaning. Their definitions change over time as historians refine or question existing standards or as concepts acquire new meaning (Limón, 2002). Research has suggested that the ability to understand such concepts is connected to more general conceptual thinking, moving from more concrete attributes to more abstract ones (Carretero & Lee, 2014).

Second, historical knowledge is organized in *time*. Periodization and chronologies allow historical facts and events to be organized in a sequence. As causality is intrinsically chronological, such knowledge is imperative. Chronological knowledge of historical periods can range from broad to specific dating and from concrete (e.g., knowledge of clothing, transport, or architecture) to more abstract (e.g., on political and religious structures) knowledge (DE Groot-Reuvenkamp et al., 2014) and knowledge of turning points such as ‘the fall of Constantinople in 1453’ or ‘the French Revolution’. Like concepts, periodizations and historical narratives are constructs that are changeable rather than fixed, depending on new insights and meanings attributed to the past (Green, 1992).

Drawing on these insights, we designed four levels similar to the other two dimensions (the rightmost columns in Figure 1). In the first stage, a severe lack of organization of historical knowledge impedes causal reasoning, and no explanation is given. In the second stage, historical knowledge is mostly concrete, and its organization is still rather limited. Concrete concepts and simple periodizations can be used when reasoning. In the third stage, knowledge becomes more abstract and better organized, resulting in an increased and better use of periodizations and colligatory concepts when reasoning. In the final stage, concepts and periodizations are used reflectively. The underlying knowledge is thorough and well organized, and, more importantly, there is an awareness that concepts and periodizations are constructs that can change over time and are bound by culture, time and space.

Evaluation stage

Validation of the model through expert panels

We submitted our preliminary model to two groups of experts consisting of history teachers, educational researchers in the field of history and historians. The composition of these panels was deliberately mixed because experts on content, i.e., historical knowledge, often have insufficient knowledge of pedagogy; thus, including educational specialists and history teachers from secondary education contributed to the content validity of the model (Brown and Wilson, 2011). Moreover, as the model is aimed at secondary school practice, the input of both educational researchers and teachers was essential.

Using formal and informal networks, invitations were sent to schools and institutions across the Netherlands. According to Clayton (1997), a heterogeneous group should consist of 5-10 participants, so the two panels each consisted of seven participants: two secondary school history teachers, three teacher educators from teacher education programs, and two historians, of which one at least had a specific background in historical theory. Prior to the meeting, each participant received the preliminary model and a written explanation. Each meeting on the model was introduced by the researchers, followed by two feedback rounds. The first round consisted of four questions posed to the panel based on the design principles discussed earlier: 1) Is the model clear and comprehensibly organized? 2) Are the descriptions of the various levels logical and consistent? 3) Does the model accurately represent the ability of historical causal reasoning, both from a historical-theoretical point of view and from a pedagogical point of view? 4) Is the model usable in an educational context? In the second round, participants could offer commentary unrelated to these questions.

Results of expert meetings

Overall, the reception of our model was positive. Experts believed that the model gave a good indication of the steps that students need to master to become better at causal reasoning. Experts viewed the inclusion of first-order knowledge in the model positively. In general, the descriptions in the model, barring some exceptions, were considered clear and consistent. Finally, experts found the theoretical operationalization of the model accurate, although there was debate among experts about whether the epistemological dimension sufficiently reflected the practices of the

historical community. Table 1 shows condensed descriptions of the critical feedback in each category. In the following, we will elaborate on this feedback and how it influenced our revision of the cognition model.

Critical feedback	Action taken
General	
Language aspect of reasoning is absent. Layout seemed confusing.	<i>No language dimension was added. Layout adjusted.</i>
Q1 and 2: Clarity and consistency	
No connection made to specific schooling tracks. Large transition between level 2 and 3 (second-order knowledge dimension). Distinction between concrete and abstract concepts is difficult from an assessment perspective. Wording of certain descriptions in the model.	<i>No further connection made due to lack of theoretical and empirical evidence. Transition maintained due to lack of theoretical and empirical evidence. Distinction maintained based on theory, descriptions refined and clarified. Descriptions re-evaluated and reworded where necessary.</i>
Q3: Historical and educational validity	
Focus on a specific type (positivist) of explanation neglecting other approaches.	<i>Revision of epistemological dimension based on a re-evaluation of the literature</i>
Q4: Usability in classroom practice	
Activities and standards are beyond secondary school curricula. Complex jargon and language makes the model less accessible for teachers.	<i>The highest level was maintained. Descriptions re-evaluated but overall language maintained to ensure accuracy.</i>

Table 1: Condensed descriptions of critical feedback from the two expert panels and the resulting implemented changes.

General feedback

Feedback in this section focused on the wording of some categories, the general layout of the model and the absence of a language dimension. We carefully reread and adjusted the descriptions in certain areas of the model. We agreed with experts that the original layout of the model was confusing, as it was not immediately apparent that it was a cognition model. Thus, we redesigned the model to be more in line with similar models in science education (for example, Wilson, 2011). The final point concerned the absence of a language dimension. Research has shown that language is of vital importance to historical reasoning (Monte-Sano & De La Paz, 2012) and is often, unwittingly, the focus of assessment instead of the reasoning itself (Reisman, 2015). However, we refrained from devoting an entire dimension to language because language skills, particularly writing skills, are vital for educational achievement in general and as such should be a focus within every discipline, not only history. Moreover, when and if students master certain levels within our model, such achievement implies mastery of the accompanying language.

Feedback on clarity, consistency, and usability in classroom practice

Two considerations were offered with regard to clarity and consistency. First, experts found the gap between stage 2 and stage 3 of the second-order knowledge dimension quite large. Second, there is a lack of a connection between the levels in the model and specific schooling tracks, a feature of the Dutch secondary education system. We left the model unchanged on both counts because of a lack of empirical or theoretical evidence to present it otherwise. The researchers from Project CHATA found no evidence that the development of second-order concepts is linked to specific age groups or grades (Lee & Ashby, 2000). To date, no further large-scale testing has been performed that focuses on differences in performance across age or track groups (Körber and Meyer-Hamme, 2015).

Experts further expressed concern about the high standards the model seemed to impose, the complicated behaviour and understanding that was expected of students in the highest achievement levels, and the extensive use of complex jargon in some of its descriptions. While we

agree that the language of the model is complicated, accuracy in the descriptions is vital; thus, in our view, the use of complex language is not always avoidable.

Concerning the high standards, two considerations should be made. First, the model portrays no arbitrary ceiling for the kind of reasoning that can be expected of students because evidence of such a ceiling is lacking. Second, some of the insights expected of students in history in secondary education correspond with the highest levels of achievement in our model. For instance, in the Netherlands, students must be aware that historical narratives are an interpretation (College of Examination, 2014). Similarly, in Great Britain, students need to 'analyse and evaluate the causes and consequences of historical events and situations' (DfE, 2014, p. 14 as cited in Chapman, 2016, p. 2).

Validity

Concerning the validity of the model, some experts felt that the model leaned towards a positivist view of causation and neglected other forms of historical explanation, specifically postmodern history. However, not all experts agreed, as some felt that the focus on contextualization in the second-order knowledge dimension implied other methods. The disagreement among experts showed that our model was still unclear. Therefore, we revisited and re-evaluated the literature to gain a better understanding of postmodern traditions within the historical discipline.

Postmodern scholars of history, or deconstructionists, dispute the claim that the past is a knowable entity through the use of empirical methods. Language, it is argued, is a meaning-making device employed to construct narratives that do not originate in the past itself but are imposed on historical facts by historians. While singular facts may hold truth, the historical accounts through which these facts are moulded are inherently subjective interpretations and reflect a particular purpose of the historian, for instance, the shaping of a national identity or the promotion of an ideology. Such narratives hold no basis in reality and only serve to maintain or attempt to change power struggles between groups within society (Donnelly & Norton, 2011).

Seixas (2000) has posed the question of whether this postmodern approach should be taught in schools. Such an approach could bring attention to the purpose of the historian to create a certain narrative, such as the narratives in school history books. Furthermore, Seixas (2000) emphasizes that postmodern scholars have justifiably called into question some of the disciplinary methods that historians employ to reconstruct the past and subsequently concludes that it is important to be conscious of the time-bound nature of disciplinary criteria. This observation is echoed by Paul (2011), who contends that 'disciplinary standards' are variable and bound by different disciplinary practices. Donnelly and Norton (2011) point out how historians tend to focus on different methodologies to arrive at explanations of the past, such as a focus on economic factors or class-based explanations. In other words, the various paradigms can influence historians' interpretations.

Because we wanted the model to reflect historical practice as accurately as possible, we decided to add a *reflexive* level of achievement to the epistemological dimension. This level represents how individuals should reflect on the changing and time-bound nature of the different methodological criteria that govern the creation of historical knowledge, for instance, the focus on different types of (analysis of) sources, or a preference for certain types of interpretations based on class-struggle or political or economic factors. Finally, such reflection should focus on the purposes of historical narratives, such as nation-building.

Application

While this report focuses on the model itself, it makes sense to discuss briefly the ways in which the model could be applied. Its purpose is twofold. One is to inform teachers on the design of tasks, and the other is to support teachers in the assessment and monitoring of students' progress in causal historical reasoning. The design of assessment tasks requires a clear idea of the progression

that is the goal. Such tasks could focus on a complete dimension or on one or more levels within a dimension. For instance, a task could focus on the epistemic dimension. Students could be presented with conflicting causal explanations regarding a historical event, for example, the outbreak of World War I, and asked to explain why these explanations differ. Student answers could then be assessed through the descriptions in the epistemic dimension to gain insight into their beliefs. If a teacher would rather focus on a particular element of the model, say, counterfactual thinking, students could be presented with a prediction task in which they are given various scenarios and asked how they would play out to determine whether students grasp the nature of such thinking. In this case, the teacher could design an assessment rubric based on the criteria at that level. The actual design of such tasks is a logical next step in our research.

Conclusion: A theory-informed cognition model of historical causal reasoning

We started this report with the following question: *‘What constitutes causal reasoning in history, and how can we describe the incremental development of student proficiency in this ability?’* Having defined causal reasoning in history, we then set out to create a model that describes student proficiency. Having explained how we revised the model, we present here our adapted cognition model for historical causal reasoning, as shown in Figure 1.

Discussion

The final cognition model that we present in this study is based on a broad range of literature on causation and the feedback of two groups of experts from various disciplines, both practical (i.e., teachers) and theoretical (i.e., historians and history educators). In this section, we reflect on our approach, the practical applications of this model and possible further research.

We chose the format of expert panels as a way to ensure that our operationalization of historical causation met the standards we set ourselves at the outset of our endeavour. The use of these panels had several benefits that positively influenced the creation of our model. First, the inclusion of different experts helped deepen our insight into historical causation, not only through their comments but also through expert debate. Second, because the groups were heterogeneous, we received a broad array of feedback. Third, the use of two different panels helped prioritize feedback through repetition: Issues raised in both groups could be considered more valid than issues raised only sporadically or by only a few experts. Fourth, experts were keen on not only supplying criticism but also considering solutions. Conversely, the use of panels also posed a drawback. Foremost, the diversity of opinions, while fruitful, also created tension. Central to this was the mediation between the scientific community and the community of practitioners, i.e., between historians and history teachers. This finding brings us to the results of the expert panels, in which we will elaborate on the latter.

We started out with five principles that directed the design of the model: 1) The model should accurately model historical causal reasoning; 2) second, the model should describe both behaviour and underlying knowledge; 3) the model should be multileveled; 4) the model should be clear, consistent, logical and comprehensive; and finally, 5) the model should support teachers in assessment. We applied the second and third principles in the construction of the model itself. Each dimension consists of four levels, and each level describes both knowledge and behaviour. The other principles were transformed into questions posed to the expert panel. The model yielded mostly practical concerns, such as the wording, layout, the apparent large gap between certain levels and the lack of a connection between levels and schooling tracks. As discussed, the wording and layout were adapted and clarified. Due to of a lack of evidence for either action, we did not attempt to assign levels to different schooling tracks, nor did we change the gap in levels. The questions regarding whether the model accurately represents the ability to perform historical causal reasoning, both from a historical-theoretical point of view and from a pedagogical point of view, and whether the model is usable in an educational context yielded more pressing matters

and illustrated the tension between historians and teachers, as mentioned above. The historians were generally critical of our operationalization of epistemology in history, referring to a 'positivist bias' that did not resonate with the practice of actual historians and also pointing to a discrepancy between how history is conceptualized for education versus historiographical development of the discipline. The teachers pointed to the high intellectual standards set by the model and the use of complex jargon, which threatened the usability of the model as a basis for the creation of assessment tasks. In essence, the principle of validity competed with the principle of usability. Ultimately, validity proved decisive in adapting our model, as we explained earlier.

The principal application of our model is as a reference tool for teachers in the development of tasks, including assessment rubrics or marking schemes specifically tailored to those individual tasks. Through this focus, this model aims to alleviate the difficulty of ensuring that a task assesses the desired construct as described by Ercikan and Seixas (2015).

Although the model could serve many purposes, it also has limitations. First, its empirical foundations are weak. The model is rooted strongly in relevant literature on causation in history; however, evidence for how the various dimensions progress remains scarce. Furthermore, as became apparent from the expert meetings, teachers found the model theoretically challenging and at first difficult to comprehend, in particular the epistemic dimension, thus lowering its immediate usability in the classroom. Implementing teacher training aimed at applying the model and developing examples of how the model can be used to design assessment tasks is a first step to neutralizing this problem. More specifically, teacher training about epistemology in history could further alleviate this problem.

Other limitations concern the measurability of certain levels or behaviour within levels and the relatively narrow scope of the model, as it focuses only on causal reasoning within history, whereas different forms of reasoning, for example, causal reasoning, reasoning about aspects of change and continuity, and reasoning about differences and similarities are often strongly interrelated (Van Boxtel & Van Drie, 2018). Similarly, measuring epistemological beliefs has proven to be a difficult process. Maggioni et al. (2009) found, in their study on epistemological beliefs of elementary school teachers, that epistemological beliefs are not necessarily stable but may be context dependent, a result recently echoed by Wansink et al. (2017) in their study of epistemological beliefs of prospective Dutch history teachers. Regarding the latter, while we acknowledge this limitation, causal reasoning, as explained earlier, is an important skill within historical reasoning in school history and essentially different from other such concepts, such as sourcing. Therefore, we believe such an in-depth focus is warranted. When teachers use tasks that require a more holistic approach, relevant parts of this model can be used where appropriate, perhaps in tandem with models that describe other second-order concepts.

Following the assessment triangle by Pellegrino et al. (2001), the next logical step is to develop assessment instruments, such as the examples we discussed earlier, based on the model presented here. Such instruments should make visible the observable behaviour of students in such a way that they can be used to make valid claims about students' understanding of historical causal reasoning. These instruments could be used not only for classroom assessment but also to further our understanding of the actual progression of knowledge and beliefs, as presented in our model. This understanding includes the relationship between the knowledge and beliefs and the behaviour that students demonstrate when they reason with causes.

Epistemological beliefs (Kuhn & Park, 2005; Maggioni, et al. 2009; Seixas, 2000; O'Donnely & Norton, 2009)		Second-order knowledge (Lee & Shemilt, 2009; Seixas and Morton, 2012; Paul, 2012; Hewitson, 2014)		First-order knowledge	
Understanding	Behaviour	Understanding	Behaviour	Understanding	Behaviour
Reflexive		Possibility thinking		Rich and reflexive	
Assertions about causal explanations are seen as temporal claims that must be justified and historical knowledge as the product of the time-bound purpose of the historian and thus uncertain. The validity of historical knowledge can be assessed through temporal scientific criteria, which reflect change and various practices in the historical discipline.	The student is able to give and/or accept multiple causal explanations and assess their quality while demonstrating awareness of the relative and time-bound nature of both the scientific criteria and different purposes of historians and their explanations within a given time.	The student understands that history is not determined, and alternative explanations are possible. Explanations are constructions dependent on the historical context.	The student constructs an historical explanation supported by historical evidence consisting of actors and conditions that are placed in an appropriate historical context. The student can evaluate the weight of different causes, is able to think counterfactually, is aware of his/her own and others' (historical) context, and uses historical evidence.	The student has substantial and well-organized knowledge of historical facts, concrete and abstract concepts and chronology and understands the constructed nature of historical knowledge.	The student uses historical facts, concrete and abstract concepts and chronology reflectively when explaining events.
Criterialist		Intentionalism and structuralism		Rich	
Assertions about causal explanations are seen as claims that must be justified and historical knowledge as the product of human thoughts and thus uncertain. The validity of historical knowledge can be assessed through scientific criteria.	The student is able to give and/or accept multiple causal explanations and assess their quality based on scientific criteria.	The student understands historical events as the result of a network of related causes and is aware that causes are also effects.	The student constructs a historical explanation consisting of conditions and actors and tries to order these in a sequence or network. The student looks for possible unintended consequences, uses multiple and different types of causes, and pays attention to the role of actors and conditions.	The student has substantial knowledge of historical facts, concrete and abstract concepts and chronology.	The student uses historical facts, concrete and abstract concepts and chronology when explaining events.
Subjectivist		Naïve intentionalism		Limited	
Assertions about causal explanations are seen as opinions and historical knowledge as the product of human thoughts and thus uncertain. The validity of historical knowledge cannot be assessed.	The student is able to give and/or accept multiple causal explanations. However, the student is unable to determine their quality.	The student understands causes as 'things' that act and cause events and can be categorized. Events are considered the result of motives of acting agents.	The student constructs a historical explanation based on the intentions of historical actors. Causes are personified. The student tends to look for a single cause, is able to categorize causes, and tends to look for purposeful consequences caused by active purposeful agents (both individuals and inanimate conditions).	The student has a reasonable amount of knowledge of historical facts, concrete concepts and chronology, but limited knowledge of abstract historical concepts.	The student uses historical facts, concrete concepts and chronology when explaining events.
Copier		Descriptive		Poor	
Assertions about causal explanations are seen as copies of the past and historical knowledge is the product of external sources and is certain. The validity of historical knowledge is either right or wrong because the past is not directly accessible.	The student accepts a causal explanation without criticism. The student is unable to give and/or accept multiple (valid/conflicting) explanations.	The student understands causes as inherent in events.	The student gives a description of events but no historical explanation.	The student has limited, and often inaccurate, knowledge of historical facts, concepts and chronology.	The student gives no historical explanation.

Figure 1: Cognition model for historical causal reasoning: underlying knowledge and beliefs, behaviour, and activities.

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About the authors

Uddhava Rozendal is a history teacher in secondary education, currently working in the Caribbean Netherlands. He was trained as a teacher, historian and educational scientist. He conducts his doctoral studies at the University of Amsterdam in the Netherlands. His interests lie in teaching about, and assessing causation in history.

Email: u.d.rozendal2@uva.nl

Carla van Boxtel is a professor of history education at the Research Institute of Child Development and Education of the University of Amsterdam. She was trained as a historian and educational scientist and explores the learning and teaching of history in and outside schools. Her research focuses on historical thinking and reasoning, social scientific reasoning, critical thinking, inquiry-based learning, collaborative learning, and museum education.

Email: c.a.m.vanboxtel@uva.nl

ORCID: 0000-0002-5119-121X