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Research Article

Epistemic and Nonepistemic Design in Textbooks in Social Studies for Lower Secondary School: Do the Textbooks Facilitate Knowledge Building and In-Depth Learning?

Erik Bratland and Mohamed El Ghami

Faculty of Education and Arts, Nord University, Nesna 8700, Norway

Correspondence should be addressed to Mohamed El Ghami; mohamed.el-ghami@nord.no

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The subject renewal, the new Norwegian curriculum for the school, is part of an international trend with a shift towards more knowledge-based curricula, to bring knowledge and in-depth learning back to the school. Against this background, this study examines new Norwegian textbooks in social studies for schools. The analysis is based on a social realist framework, which combines semantics and content analysis and reveals major differences in the design of the textbooks. A distinction is made between epistemic and nonepistemic design, and this study shows that the absence of an epistemic structure is a problem that haunts new textbooks in social studies. When textbooks lack a design that connects subject concepts, content, and competencies, students will not get access to epistemic knowledge, something which creates barriers to in-depth learning and cumulative knowledge building in the subject.

1. Introduction

This study examines new textbooks in social studies. These textbooks are based on the latest Norwegian curriculum reform, and the aims of this study were to examine how the new textbooks relate to this reform and how this is expressed in the design of the textbooks.

The new Norwegian curriculum reform for the school, subject renewal[1], can be referred to as a knowledge-based curriculum reform. This reform is part of an international trend, with curricula that place more emphasis on knowledge-based approaches as discussed in [2–6]. This trend, with knowledge-based curricula, can be seen as a reaction to the recent decades' one-sided focus on skills and competence, referred to as 21st-century learning [7–9]. The Norwegian reform is characterized by a stronger emphasis on subjects and subject concepts, where the concept of in-depth learning is central. However, in the Norwegian reform, this concept is understood in an ambiguous way [10], where there is a tension between pedagogical approaches, which emphasize learning and development of overarching competencies [11], and on the other hand, approaches emphasizing theories and concepts of the subjects [12]. In the same way as it appears in the international discourse on in-depth learning [13], the term in-depth learning encompasses several definitions and meanings and raises questions that have not been answered in the Norwegian reform subject renewal. In the reform, in-depth learning is understood as something that is partly linked to skills and competencies, as a source of development and understanding, but it is not clear how these skills and new forms of competencies relate to the subjects' concepts and theories. In other words, the reform does not provide answers to how skills and competencies can be related to the subject area's "epistemic structure" [14]. It does not indicate what we can understand the relationship between the various elements in the subject area's epistemic structure, understood as the relationship between subject concepts, content knowledge, skills, and competencies. At the same time, the reform includes elements that emphasize the development of generic "in-depth

learning skills," such as "critical thinking" and "creativity." In this study, we will argue that in-depth learning, understood as students' intellectual development and progression, cannot be decoupled from the subject area's epistemic structure.

In-depth learning, as this term is expressed in the Norwegian reform, can be interpreted in different ways, which raises challenges for teachers, but also the design of new textbooks for schools. Textbooks for schools are part of what Bernstein has described in [15] as the field of reproduction and are the result of complex processes in the interpretation of the authorities' curriculum, with a selection of the subject areas' concepts, content knowledge, skills, and competencies. The design or profile of the textbooks gives us a picture of how publishers and textbook authors interpret the Norwegian reform subject renewal, and in this study, we will in this study focus on selected new textbooks in the social studies. In this study, we will use Rata's curriculum design coherence model [14, 16] and Maton's legitimation code theory [17] to examine the design and semantic profile of textbooks, their interconnection of the various elements, and their underlying organizational principles. In this study, we ask the following research questions:

RQ_1: How do the textbooks relate to the new Norwegian curriculum reform?

RQ_2: What kind of design characterizes the selected textbooks?

RQ_3: Do the textbooks facilitate in-depth learning and cumulative knowledge building?

2. Literature Review and Theoretical Framework

2.1. In-Depth Learning in the Norwegian Reform and the Subject's Epistemic Structure? In-depth learning is a concept with a long history [18], but the concept has gained renewed relevance in the recent international reform wave, with the introduction of knowledge-based curricula in schools [2–5]. These reforms can be seen as a reaction against outcome-based curricula, also referred to as neoliberal education reforms or 21st-century learning [7–9, 19–22], which place crucial emphasis on generic skills and competencies. However, the research literature shows that the transition from 21st-century learning to knowledge-based curriculum reform is accompanied by several unresolved issues, including questions about what we can understand with knowledge in education and how skills and competence can be linked to knowledge, but also in the form of unintended results of new variants of "teaching to test," with reproduction of specified content knowledge [23].

As mentioned, the Norwegian reform subject renewal, which was implemented in 2020, indicates at least two different approaches to in-depth learning, understood as something that contrasts with surface learning. On the one hand, the reform provides support for key elements in 21st-century learning [8, 9], with an emphasis on generic competencies and skills. In-depth learning in this version will be something that can be realized with a set of overarching emotional and social competencies, embodied in specific competence areas [11] (p. 36). Interdisciplinarity is given special emphasis, and it is assumed that in-depth learning can arise by focusing on "real-world" problems and with the use of student-active and inquiry-based pedagogy. In this version, it is assumed that in-depth learning can be developed independently of the subject areas' concepts. On the other hand, the reform includes a stronger emphasis on the knowledge of the subject areas, where in-depth learning is linked to the subjects' concepts and theories, which is justified by contributions from constructivism and the cognitive research literature [18]. The cognitive literature links development to mental development, with cognitive schemas emphasizing development from concrete to abstract concepts, as a condition for in-depth learning. This type of development is put in context with the learning of content that exists within the subject area, and in-depth learning is defined as [12] follows.

"In-depth learning means that students gradually and over time develop their understanding of concepts and contexts within a subject. Pupils' learning outcomes increase when, through in-depth learning, they develop a holistic understanding of the subject and see the connection between subjects, as well as manage to apply what they have learned to solve problems and tasks in new contexts" (p. 14—authors translation).

In the white paper [12], the cognitive approach is continued and partially reformulated [10], where in-depth learning will occur within the subject area, with the use of pedagogical methods that can contribute to promoting in-depth learning, and where the concepts of the subjects should be applied in new contexts. The Norwegian reform consists of elements that point in different directions, and although the turn towards the subjects' concepts and concepts is an important step, the Norwegian curriculum reform includes tensions between different approaches with different definitions of in-depth learning [10]. Although the cognitive literature includes significant contributions, there is a need for a different approach to the knowledge of the subjects, which recognizes that knowledge is not just a mental state and that the concepts and theories' concepts represent an objective form of knowledge in different subject areas. Social realism is such an approach [24–27], which argues that all students should have access to epistemic knowledge in education, a knowledge that Young and Muller [28] have referred to as "powerful knowledge." The social-realistic approach recognizes that the knowledge of the subject area is an epistemic form of knowledge, which is not only a result of thought processes. Although both dimensions are recognized, this direction places emphasis on a socio-epistemic approach as discussed in [29], where theories and subject concepts are defined as objectified knowledge that represents attempts to explain the world [24, 26], where subject concepts give "epistemic access" [30] or "epistemic ascent" [31] related to an epistemic structure of concepts [16], where subject concepts are objects with a generalizable character, which exist independently of the persons who have developed them in [32], and where these concepts have effects on, among other things, knowledge

building in the classroom [33, 34]. Because this approach recognizes that the subject areas' knowledge has an epistemic structure, this perspective opens opportunities for a more adequate approach to in-depth learning, which can separate the different units, referred to as subject concepts, content knowledge, competencies, and skills, but at the same time place them within the same model. Following [13], we define in-depth learning as "the ability to see the relationships between epistemic parts and wholes of a subject. The outcome of deep learning is the ability to think abstractly and to apply conceptual thinking to a range of contexts including the socio-cultural world" (p.124).

The connection between the subjects' epistemic structure and in-depth learning is complex, but in-depth learning cannot be realized without a clear understanding of the relationship between the elements that are part of the subject's epistemic structure. To address this challenge, Elizabeth Rata and her colleagues have developed a "curriculum design coherence (CDC) model" [14, 16, 35], which describes the subject area's epistemic structure, in a way that connects different forms of knowledge with each other, referred to as "knowledge that" and "know-how to" knowledge [13, 14, 36, 37]. With this juxtaposition, the model combines an epistemic conceptual structure with cognitive development, a contradiction that has haunted the field of education for a long time. The model thus solves some problems that are attached to knowledge-based curricula, such as the Norwegian reform subject renewal, and the model is well suited to analyze how in-depth learning, understood as a capacity to provide "epidemic access" [30], "conceptual progression" [38], and "cumulative knowledge building" [34], is handled in new Norwegian textbooks for the school.

2.2. Theoretical Framework. The theoretical framework for the project will combine the mentioned "curriculum design coherence" model [14, 16, 35], with Maton's "legitimation code theory" (LCT). Rata's CDC model has already been discussed above, and in this study, we will use a more simplified and adapted version of this model, with a special focus on the connections between subject concepts, content, skills, and competencies. This approach will provide an opportunity to uncover the design of the chapters, as they are expressed in the selected new textbooks in social studies for schools. This section will briefly address Maton's theory [33, 34].

Maton's theory, like Rata's model, is based on a social realist framework and aims to make various forms of knowledge visible in education. Maton's theory includes several dimensions [33, 34], and in this project, we will use the semantic dimension. Semantics is a dimension that conceptualizes the principles that underlie various forms of knowledge and can reveal how these forms of knowledge are woven together in Norwegian textbooks for schools. Semantics is suitable for analyzing discourses and practices and their underlying organizational principles, which are given by the strength of semantic gravity and semantic density. In [34], the author defines these concepts as follows: "Semantic gravity refers to the degree to which meaning relates to its context. The stronger the semantic (SG+), the more meaning is dependent on its context; the weaker semantic gravity (SG−), the less meaning is dependent on its context" (p. 15). Similarly, semantic density is defined as "Semantic density refers to the degree condensation of meaning within practices. The stronger semantic density (SD+), the more meaning is condensed within practices; the weaker semantic density, the fewer meanings are condensed." (p. 15).

Semantics examines the semantic structures of practices, which are given by the strength of semantic gravity and semantic density, a strength that will vary (+, −). Semantic gravity refers to the degree to which meaning relates to its context. All meanings relate to a context of some kind, and semantic gravity can reveal how much the meanings depend on the context to make sense. Semantic gravity can be stronger (+) or weaker (−), depending on the degree to which meanings are dependent on the context. Strong semantic gravity (SG +) refers to meanings that largely depend on the context (e.g., a specific event, concrete cases, and experiences), while weak semantic gravity refers to more context-independent meanings (e.g., subject concepts and theoretical explanations). Semantic density refers to the degree of condensation of the meaning of a concept, and the strength can be related to the semantic structure in which it is located. The stronger the semantic density (SD +), the more meanings are condensed within practices; the weaker the semantic density (SD−), the fewer meanings are condensed. A concept that condenses many meanings will have a relatively strong semantic density (SD +, e.g., democracy), while a concept such as creativity will include fewer meanings and therefore have a weaker density (SD−).

3. Methods

In this study, we analyze the new Norwegian textbooks from level 8 in social studies. These books are based on the new Norwegian reform subject renewal, and the selected textbooks in social studies include topics that have a central place in this reform. The three selected textbooks are Relevans 8 [39], Samfunnsfag 8 [40], and Arena 8 [41]. These books are the most frequently used books in social studies in Norwegian schools. The three books are published by the most important textbook publishers in Norway: Aschehoug, Cappelen Damm, and Gyldendal. These publishers have a long tradition of producing textbooks for the school and choosing a book from each of these publishers will provide a representative selection.

This study consists of two parts: the first part comprises a quantitative analysis of all the chapters in the three textbooks. The second part provides a qualitative in-depth study, with three examples that illustrate the three design categories in the textbooks: coherence design, noncoherence design, and generic design. The chapters of the textbooks are divided into different elements, where the main text is surrounded by paratexts [42] and student assignments. The analysis of the chapters will focus on the main text and be based on an assessment of what can be considered the main text. All

quotations from the textbooks have been translated from Norwegian to English by the authors. Chapters without a topic, which are intended to be an aid to the students, are not a part of this study.

The analysis will combine a semantic text analysis [43], based on the concepts of semantic gravity and semantic density, with content analysis. The content analysis provides opportunities for quantitative and qualitative analyses of textbooks [44]. Based on a form, referred to as a translation device, an analysis was carried out of all chapters in the three books. In line with Rata's CDC model, this study will have a special focus on the epistemic structure of the chapters, that is, the connection between subject concepts, and whether connections have been established between concepts, content, skills, and competencies in the main text.

3.1. Data Analysis. The concepts of semantic gravity (SG) and semantic density (SD) provide an opportunity to analyze the knowledge practices that are expressed in new Norwegian textbooks. The concepts of semantic gravity and semantic density can conceptualize how practices, as expressed in textbooks, are part of the processes of strengthening and weakening SG and SD over time [34]. For example, the practices of presenting a particular topic in chapters in textbooks can move from more context-dependent, abstract, and general (SG−, SD+) to more concrete and context-dependent (SG+, SD−), and back again. This dynamic approach provides opportunities to research and presents the semantic profiles of practices, as they unfold in chapter textbooks over time. Textbooks can have different semantic profiles with different semantic ranges. As Maton has shown, these profiles and their semantic range come in many forms [33, 34], where a distinction can be made between escalators and semantic waves [34, 45], which provides an opportunity to compare different semantic profiles in textbooks for schools. Semantic waves can involve a semantic interweaving of different types of knowledge, with opportunities to establish connections between "knowledge that" and "know-how to" knowledge. As mentioned in this project, we combine Maton's semantic dimension [34], with Rata's CDC model [14, 16]. To translate between theory and data, the following form was developed.

Table 1 combines the semantic scale of the strengths of semantic gravity and semantic density with Rata's CDC model. This combination is suitable for highlighting different forms of knowledge in textbooks and for providing a presentation of what kind of knowledge is emphasized and whether and in what way a connection is established between subject concepts, content knowledge, competencies, and skills [14, 16]. The semantic profile will be able to provide an in-depth analysis of the design of the chapters and say something about the further effects, especially related to opportunities for cumulative knowledge building and in-depth learning. Subject concepts are relatively context-independent and include complex meanings (SG−, SD+). For example, democracy is a term that denotes a strong SD (condenses many and different ideas), where the meaning is relatively independent of the context, by stating a general principle that can be abstracted beyond a particular case. Content knowledge is characterized by subject concepts being linked to one or more cases, for example, a discussion of various aspects of Norwegian democracy. Compared with subject concepts, content knowledge is characterized by a weaker degree of condensation of meanings and a stronger degree of context dependence. Competencies and skills are characterized by relatively simple meanings, which denote weak SD, with meanings that are less condensed. Competencies and skills will have a generic character when disconnected from the epistemic structure of the subject area, but when competencies and skills are linked to content knowledge and subject concepts, competencies and skills will have a stronger SG and be dependent on a context to make sense. In textbooks, for example, a student task in democracy may be linked to assessing certain aspects of Norwegian democracy. To answer such a task, the student must, in addition to conceptual and content knowledge, have different types of "know-how" knowledge [14] (p. 468), where a distinction is made between performance competency and judgment competency. Simply put, to answer the student task or assessment, the student must have skills (writing, math, etc.), and the student should understand the subject concepts that are applied to be able to reason in a subject-specific way, to solve practical or theoretical problems.

3.2. Categorization of Chapter Design in Textbooks. To carry out the quantitative content analysis [44], it is necessary to categorize the design and structure of the chapters (RQ_2). After a process, in which various proposals have been put forward and tested, we ended up with a two-step categorization (see Figure 1).

This categorization is based on Rata's CDC model [14, 35] and examines at code level 1 the structure of the main text in the individual chapters, where a distinction is made between epistemic structure and nonepistemic structures. At code level 2, the model differentiates between coherence design, noncoherence design, and generic design, which open possibilities for an in-depth analysis of the design of the various chapters.

4. Results

In this section, we present the results of our study of three Norwegian textbooks in social studies. In this part, we will present the results of the quantitative content analysis of all the chapters included in the selected textbooks, previously referred to as the two-step categorization of chapters in three textbooks in social studies. Figure 2 shows all chapters, which are parts of the three textbooks mentioned, distributed on the categories of epistemic structure and nonepistemic structure.

This diagram provides an overview of the total distribution of the chapters included in this study and shows that most of the chapters have an epistemic structure, but at the same time, there are large differences between the textbooks. Of the three textbooks, only one has a consistent epistemic

Table 1: Translation device.

Semantic scale	Epistemic structure	Description of coded content
SG−/SD+	Subjects' concepts	The textbook connects the chapter topic to selected key concepts, establishes a relationship between these concepts, and shows how these concepts are included in complex systems of meaning, which create the epistemic structure
SG+/SD−	Content knowledge	The textbook describes the chapter topic by connecting subject concepts with selected content, by providing some explanations or interpretations, with references to various sources, such as cases, events, facts, or data
	Competencies/ skills	The textbook describes the chapter topic by making links to student's life words, familiar situations, or experiences and by providing tasks that require the use of competencies and skills

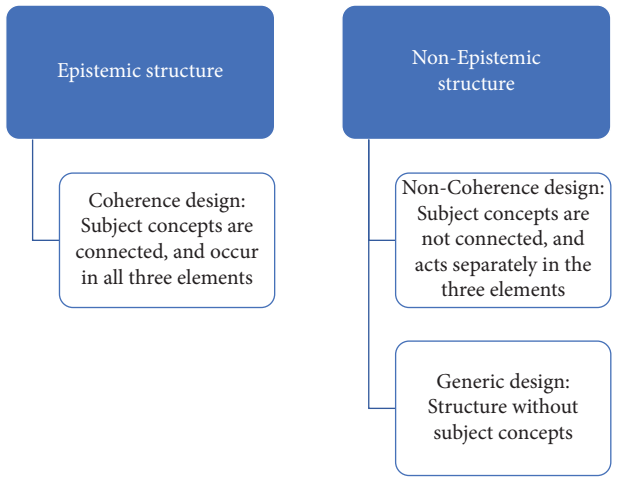

Figure 1: Content analysis of chapters in textbooks: categorization of two levels.

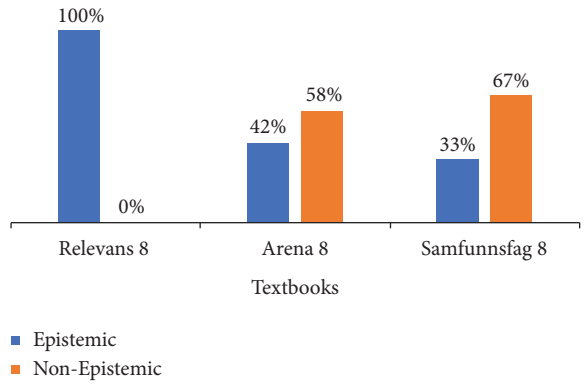

Figure 2: Distribution of epistemic structure and nonepistemic structure in chapters in the three textbooks.

structure [39], while two of the textbooks are characterized by a nonepistemic structure [40, 41]. Most of the chapters in these books do not create an epistemic structure, which means that the subject concepts that are used have a free-flowing character, a generic character, or a lack of connection between the various elements that form part of the chapter's design. It is noteworthy that one of the textbooks has a consistent epistemic structure (100%). The Norwegian reform subject renewal is not based on an explicit theory of knowledge in education, but on cognitive theories of learning. The chapters with an epistemic structure include such elements, but the textbook authors draw directly and indirectly on another form of epistemic knowledge, which is rooted in the disciplines of the social sciences.

Code level 2 provides opportunities for an in-depth analysis of the chapters included in the textbooks discussed. At code level 2, a distinction is made between coherence design, noncoherence design, and generic design. The figure below gives an overview of how the chapters are distributed in these categories.

Figure 3 shows how the chapters in the three textbooks are distributed in the category's coherence design, noncoherence design, and generic design. Relevans 8 [39] is consistently characterized by coherence design (100%), while the other two textbooks, Arena 8 [41] and Samfunnsfag 8 [40], are characterized by other forms of design, referred to as noncoherence design (50%, 22%) and generic design (8%, 44%), respectively. Coherence design means that the chapter creates a connection between the topic, subject concepts, content, and competencies. Chapters without such an epistemic structure have a different design, referred to as noncoherence design and generic design. Noncoherence design typically has a design where the main text presents several subject concepts, but without a clear connection being established between these concepts. The subject concepts in this design have a free-flowing character, accompanied by a single structure, which appears separately. Chapters without an epistemic structure can also have a generic design, characterized by a structure without subject concepts, but where content, skills, and competencies are focused. This does not mean that concepts are absent, but terms and concepts are linked to a given content and competencies and lack a connection to subject concepts as a part of social science theory. It is reasonable to relate these results with textbooks with very different designs, to the Norwegian reform subject renewal as presented in [46] (RQ_1). The emphasis on subjects and subject concepts indicates that the reform must be understood as a type of knowledge-based curriculum, but how this should be interpreted is left to the producers of textbooks for the school. The analysis shows a curriculum that provides a wide open space for interpretation and leads to textbooks with quite different designs, which are based on different frameworks for interpretation. The large gaps in interpretations are a consequence of the confusion and uncertainty that arises when the curriculum's emphasis on subjects and

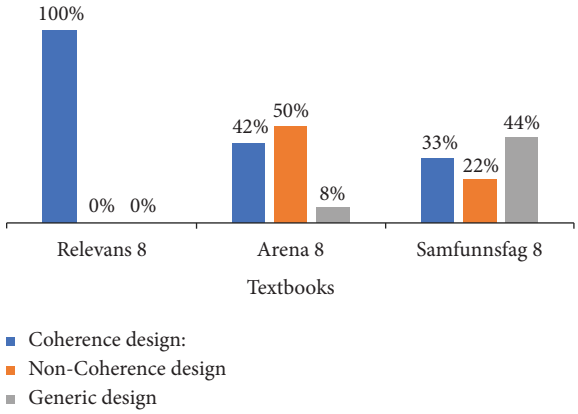

Figure 3: Distribution of coherence design, noncoherence design, and generic design in chapters in the three textbooks.

subject concepts is rooted in cognitive theory. The results, expressed by different designs, can be related to a larger societal context, with different trends in international curriculum reform [8, 9, 22, 26]. Chapters with a generic design seem to be an interpretation following skills and outcome-based reforms, in line with the 21st-century learning, which places crucial emphasis on skills and competencies. Chapters with noncoherence design have provided a different framework, which represents a shift away from outcome-based reforms and seems to be in line with a trend described in the research literature as "knowledge-engaged" [5]. Knowledge-engaged curricula are characterized by conceptual knowledge and "big ideas" [5, 14], but are characterized by an organization, which can lead to free-flowing concepts, with the absence of a coherent epistemic structure. The last category, with chapters with a coherence design, seems to coincide with a trend that can be broadly referred to as knowledge-based curriculum reforms, also referred to by Rata in [16] as "knowledge-rich curriculum." Chapters with coherence design are presented in all three textbooks and provide access to epistemically structured knowledge in social studies. The significant presence of coherence design in new textbooks in Norwegian schools is relatively good news, not least because textbooks still play an important role in students' learning of school subjects [47]. However, in two of the textbooks, this design is overshadowed by other forms of design with a nonepistemic structure.

5. A Semantic Analysis of Three Chapters: Semantic Waves and Dawn Escalators

This section will provide examples of semantic profiles in chapters in new textbooks in social studies. The three examples in this section are the result of a selection process, with sampling choices, where the purpose is to provide a deeper understanding of the three design categories included in the three textbooks (see Figure 3). The three examples have been chosen because they in a clear and distinct way illuminate the three design categories—coherence design, noncoherence design, and generic design—that are expressed in the textbooks included in this study. The analysis includes the following selected chapters: Chapter 4 in Relevans 8 [39] has a coherence design, Chapter 3 in Samfunnsfag 8 [40] has a noncoherence design, and Chapter 1 in Arena 8 [41] has a generic design.

To deal with the third research question (RQ_3), we will provide an in-depth sematic analysis of the selected chapters [34, 43, 45]. The semantic analysis distinguishes between semantic waves and dawn escalators and will focus on whether the semantic provides an exhaustive analysis of chapters with profile creates an epistemic structure. Following Rata [14, 35], the selected chapters are analyzed based on whether the chapter establishes a coherent connection between the elements (topic, subject concepts, content, and competencies), which can create an epistemic structure. The section provides examples of chapters, referred to as coherence design, noncoherence design, and generic design, which are characterized by different semantic profiles, with practices that can create different structures and forms of knowledge building.

"Norwegian democracy" is the topic in Chapter 4 of Relevans 8 [39]. The chapter begins with a definition of democracy: "In countries with democracy, it is the people who decide and who govern" (p. 102). This definition is followed and linked to the Norwegian context, by a discussion of the Norwegian Constitution, a law that contains basic rules for how the country should be governed: "The Constitution states that it is the people, i.e., everyone with the right to vote must elect representatives to the parliament [Stortinget]" (p.102). The section further discusses the relationship between the various state powers and shows how the constitution is based on the principle of distribution of power: "Power is therefore divided between the parliament, the government, and the courts" (p.102). In the section, the discussion of the principle of distribution of power is taken further and is put in connection with a list of some typical characteristics of democratic countries and nondemocratic countries. Then, this is followed by a student assignment: "What makes Norway a democratic country?" (p. 103). After the task, the chapter introduces the "people's sovereignty principle" (p. 103), which in turn is related to the electoral system in Norway, and how the constitution ensures that all citizens have equal rights in the country. Then, this is followed by a student assignment. Figure 4 provides a heuristic illustration of the chapter's semantic profile, referred to as long semantic waves, and shows practices over time and their semantic reach, understood as the difference between their highest and lowest strengths. The semantic profile shows how the strength of semantic gravity and semantic density unfolds in this text. The text starts with a definition of democracy (SG−, SD−) and links this concept to the Norwegian constitution. The text section ends with a student assignment (SG +, SD−). The semantic profile is characterized by practices that lead to long semantic waves, which move from highly condensed and decontextualized ideas via content, which expands the meaning of the subject concepts and then moves towards simpler and more concrete forms of understanding, in response to the given student assignment. The further upward semantic movement occurs by the introduction of another concept, which is related to the

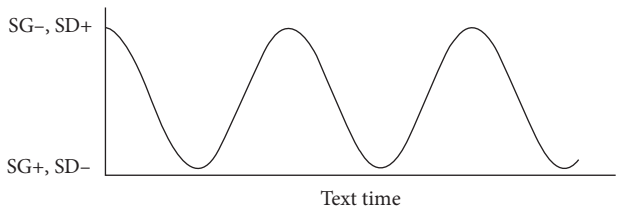

Figure 4: Coherence design: long semantic waves in textbooks.

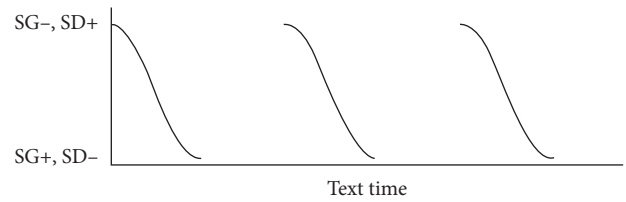

Figure 5: Noncoherence design: a "down escalator" profile in textbooks.

preceding concepts, and the further downward movement follows the same wave pattern. In this way, this text weaves together different forms of knowledge and creates an epistemic structure [14, 16], with a connection between subject concepts, content, and competence. Through this text, students gain access to the social studies' specialized knowledge, which lays the foundation for cumulative knowledge building and in-depth learning, with knowledge that can be transferred to new contexts.

Chapter 3 in the textbook Samfunnsfag 8 [40] asks the question: "What is society?" To answer the question, the chapter introduces several different subject concepts, but without establishing a connection between these concepts. For example, the section dealing with the "laws of society" starts from the concepts "norms and values" (p. 76), relating these concepts to the need for having basic rules in society. Against this background, the following questions are asked: "Why do we need rules and norms in society?" (p.76). This question is related to a Norwegian context where "the population of Norway comes from all corners of the world" (p. 76), which can lead to "disagreements and conflicts." This is followed by a student assignment: "How do you behave when you meet people you disagree with?" (p.76). The next section begins with the question "In what way are we mutually dependent on each other?" and then introduces the concept of "Globalization" (p. 77). This concept is put in the context of a smaller world, which means that "Goods, services, people, and money move quickly and easily across national borders" (p. 76). All this is believed to lead to changes in "Norwegian society." The section ends with a student assignment: "Can you imagine anyways we have become more dependent on each other?" (p.77).

Figure 5 illustrates the semantic profile of this chapter, here referred to as a "down escalator" profile. This profile shows practices that consist of a series of downward semantic shifts, which are repeated over time. This series has a fragmentary character, which ends without connection with the next downward shift. As can be seen from the example above, the series begins with the introduction of subject concepts, which are highly condensed and decontextualized (SG–, SD+), and these concepts are then linked to a context, with a special content, which expands on the meaning of the subject concepts. The last part of the downward movement is expressed in the form of a student assignment (SG+, SD–), which includes a more "everyday language," which is closer to the student's world of life, and which is designed so that the student can actively explore, assess, and build knowledge. However, the serial and fragmentary nature of this semantic profile represents a potential problem for cumulative knowledge building. When the semantic movement stops at the context-specific and is not led back to the subject's specialized knowledge, understood as the social science's discourse on the given topic, it creates problems for cumulative knowledge building, by making it difficult to make connections to those concepts, with highly complex and context-crossed meanings, which constitute the subject's specialized knowledge of society.

"Source criticism" is the topic in Chapter 1 of the textbook Arena 8 [41]. The chapter begins with the following question: "Have you ever been fooled by something that was shared on social media?" (p. 15). In the section, this question is related to the spread of "fake news" on social media, a spread that is associated with users' activities, with "sharing of news items and images in social media" (p. 15). This section ends with a student assignment on sharing news items on social media. The next section spins on the term "fake news" and introduces the term "lie factories," a term related to commercial actors, but also to "people who make fake news deliberately to influence the opinions of people" (p. 15). The section provides two examples of fake news, which has been widely shared on Norwegian social media, about asylum seekers who have allegedly received large sums of money and iPhones from Norwegian society. Then, this is followed by a student assignment: "What do you think maybe the reason why someone has invented these cases?" (p. 13).

Figure 6 represents a semantic profile, referred to as semantic waves. In contrast to the profile with long semantic waves, this profile has shorter waves, with practices that provide less distance between the highest and lowest points. This profile is characterized by an absence of subject concepts and is unrelated to the subject's specialized knowledge. These terms have been replaced by generic terms and concepts (SG–, SD–), which are relatively context-dependent and with simpler meanings (source criticism, social media, fake news, and lie factories). These concepts are related to a context, which we associate with the development and use of digital technology today, a development that includes such trends as discussed in the content section. The semantic downward movement ends with a student assignment (SG+, SG–). Then, the same profiled pattern is repeated, with movement up and back to a generic concept, followed by content and student assignment. The student assignments are designed as assessment tasks, which are intended to stimulate knowledge building in social studies. However, because the semantic weaving in the chapter is

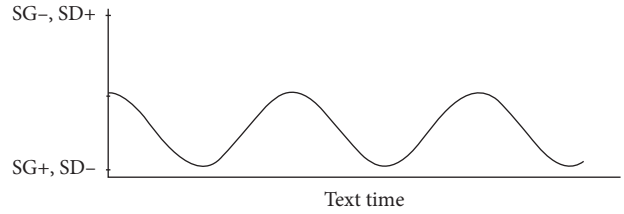

Figure 6: Generic design: semantic waves in textbooks.

limited and unrelated to subject concepts, this provides poor conditions for cumulative knowledge building. To answer the student assignments and build knowledge that has a more general and cross-context character, it is crucial to be connected to relevant subject concepts and the social science discourse related to this topic. Source criticism without such a connection becomes a generic form of knowledge, with less condensed concepts, separated from the epistemic structure of the relevant subject concepts.

6. Discussion

The new international trend in knowledge-based curricula has created new opportunities for emphasizing knowledge in schools as discussed in [2–5]. Nevertheless, as the new Norwegian curriculum subject renewal illustrates, these new knowledge-based curricula are accompanied by tensions and unanswered questions, which limit the teachers' professional development and create similar challenges for the development of knowledge-based textbooks for the school. This context, and in particular the Norwegian curriculum subject renewal [46], forms a backdrop for our study of new textbooks in social studies level 8 for schools (RQ_1). In the Norwegian reform, subject renewal and in-depth learning are a key concept, and this concept is linked to an emphasis on the subjects' concepts and theories. With this provision, the authorities have drawn up a broad framework for how the new knowledge-based reform can be understood. In addition, it can be confusing that the reform continues elements that can be associated with outcome-based curricula, and it provides few clear answers to how the subjects' concepts, content, skills, and competencies should be connected. How subjects and subject concepts should be emphasized and how knowledge should be strengthened in textbooks are interpretations that are left to the publishers and textbook authors. As shown in the analysis, the Norwegian reform subject renewal provides a large space for interpretation and leads to textbooks with quite different designs and profiles, which are based on different frameworks for interpretation. This study, which includes the three most important textbooks in social studies, shows that of the three books, only one book has a consistent epistemic structure with a coherent design Relevans 8 [39], something which is missing in the other two books, Arena 8 [41] and Samfunnsfag 8 [40]. Most of the chapters in these two textbooks have a nonepistemic structure, referred to in the analysis as noncoherence design and generic design. The large gap in interpretation, which leads to textbooks of very different design, is the result of a curriculum that includes tensions between different elements, is based on different curriculum traditions, and lacks a clarification of how the key elements—subject concepts, content, skills, and competencies—can be connected in the textbooks. Although the Norwegian reform subject renewal can be characterized as a kind of knowledge-based reform, these problems create serious limitations and lead to textbooks that create barriers for students to gain access to the epistemic knowledge of the subject area. Of course, several teaching resources can be used in the classroom, but in Norwegian schools, textbooks have a central role [47], because many teachers teach several subjects and have relatively weak subject competence [48].

Further analysis of the chapter's semantic profile provides good insight into the effects that follow from textbooks with an epistemic and nonepistemic structure. The textbook with a coherent design creates an epistemic structure, with chapters that create a connection between subject concepts, and with movements that connect different forms of knowledge with a profile that is characterized by long semantic waves. These movements create a complex pattern, with movements that create changes in context-dependent and condensed meanings over time, which lays the foundation for in-depth learning [13] and cumulative knowledge building in the classroom [45]. Textbooks with a nonepistemic structure are characterized by semantic profiles that produce quite different effects. In this study, a distinction is made between noncoherence design and generic design, with semantic profiles that in various ways create obstacles to in-depth learning and cumulative knowledge building. Textbooks with chapters with noncoherence design have a semantic profile that includes subject concepts, but these are not connected, which gives the text a "down escalator" profile [45], where the treatment of the topic is given a fragmentary and serial character. On the other hand, textbooks with a generic design are characterized by a semantic profile with more limited semantic waves. Chapters with this profile are characterized by an absence of subject concepts, which leads to a form of learning that is decoupled from the subject's specialized knowledge.

The idea of giving students in school access to the subjects and the concepts of the subjects has major implications for education, including the choice of design model for textbooks. This idea, which distinguishes between discipline knowledge and everyday knowledge, aims to bring students beyond their everyday experiences [49]. This idea presupposes a design with a different concept and organization, based on quite different principles than the "21st-century learning" [8, 9], where students are encouraged to start with their own experiences and content knowledge. Giving students access to abstract knowledge, where students can climb an "epistemic ladder," requires textbooks with a coherent design, which connects subject concepts, content, and competencies. Textbooks with epistemic design, with long semantic waves, can provide students with "powerful knowledge" [28], where students gain access to specialized and abstract knowledge through an approach that alternates between highly condensed and context-crossing concepts and more concrete and contextual forms of knowledge [34, 45]. Textbooks with epistemic design have

chapters with an integrated conceptual structure, which weaves together different forms of knowledge, where the acquisition of knowledge can lead to "conceptual progression" [38] or "epistemic ascent" [31]. On the other hand, chapters with noncoherence design and generic design, with a "dawn escalator" profile or short semantic waves, create problems for in-depth learning and knowledge building in the classroom. These chapters give a misleading presentation of the social studies' form of specialized knowledge. Overcoming these problems is not easy, especially not in the Norwegian school, where many teachers lack a solid academic background to teach the subject [48].

As previously indicated, the new textbooks' different designs and profiles are closely linked to unresolved issues in the new Norwegian curriculum subject renewal. Although more emphasis is placed on knowledge, the intention of a more knowledge-based curriculum, which can form a basis for textbooks and knowledge building in schools, is partly unfulfilled. The new Norwegian curriculum thus forms a part of an international trend, where the intention to replace outcome-based education with a movement "back to knowledge" in schools is in danger of remaining unrealized. This problem is illustrated in our study of new textbooks in social studies, where the goal of in-depth learning and cumulative knowledge building is not easily realized.

7. Conclusions

This study starts with a description of the new Norwegian curriculum subject renewal. This reform can be described as a knowledge-based reform, which focuses on subject areas and subject concepts, where the concept of in-depth learning is central. However, the reform provides few answers on how concepts and content in the subjects should lead to in-depth learning, understood as access to the subjects' specialized knowledge. This problem does not only affect the school. As illustrated in this study, the absence of an epistemic structure is a problem that also haunts new textbooks in social studies at the school. Our study, which includes the three most important social studies textbooks, shows that two of these books are dominated by chapters with a nonepistemic structure. In this study, we argue that these problems are rooted in underlying conditions. The large gaps between the textbooks in this study are a consequence of the confusion that arises when the curriculum's emphasis on subjects and subject concepts is rooted in cognitive theory and 21st-century learning [9]. These problems cannot be solved by cognitive theories but require a theory of knowledge in education. Social realism is a theory that emphasizes epistemic knowledge [24], related to disciplines and subject areas, which can provide a basis for cumulative knowledge building and in-depth learning in schools. However, as pointed out by several "powerful knowledge" writers [13, 14, 16, 23, 31, 37], access to epistemic knowledge in schools is a problem, which is not easily solved. To avoid noncoherence design in textbooks and curricula, with elements that are not linked, whether it takes the form of "big ideas," content focus or skill-based approaches, more research is needed. The goal of in-depth learning, where students can achieve a deeper understanding by engaging in the concepts of the subject, presupposes a further development of models of the kind that is involved in this study, which addresses the complex relationship between subject concepts, content, and competencies, with textbooks that weave together different forms of knowledge over time.

This presupposes a knowledge-rich curriculum, emphasizing subjects and subject concepts, based on the theory of knowledge in education, which can provide models and designs for knowledge building in schools, with textbooks helping students to stay focused on the subject's concepts, rather than going directly to content, competencies, and skills. Rata's CDC model is a significant contribution [14, 35], but there is a need for more research on epistemic coherent designs, what kind of design can provide sufficient depth and insight into the subject's specialized knowledge of different topics, and how such models can best contribute to students' cumulative knowledge building in textbooks and school.

Data Availability

All references to the analyzed textbooks are given in the form of a title and references. All English translations are done by the authors.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this study.

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