Radical Visible Pedagogy and Cumulative Knowledge-Building in Education

Erik Bratland[1] & Mohamed El Ghami[1]

[1] Faculty of Education and Arts, Nord University, Norway

Correspondence: Faculty of Education and Arts, Nord University, 8700 Nesna, Norway. Tel: 47-7505-7931. E-mail: mohamed.el-ghami@nord.no

Abstract

Twenty-first century learning revolves around a pedagogical discourse based on simplistic dichotomies, favoring a student-centered approach. This direction claims that such a learning model will lead to in-depth learning in education. This paper refutes this claim and argues that curricula based on twenty-first century learning promotes a social and context-dependent form of knowledge. To examine the problem of 21st century learning, and to develop an alternative, this paper introduces Bernstein's pedagogical modalities, which are investigated using the terms "semantic gravity" and "semantic density." These concepts are used to analyze teachers' pedagogical practices in three different subjects, considering the further effects of these practices on learning and knowledge-building, as expressed in submitted student papers. The analysis suggests that practices that create long semantic waves, where knowledge is transformed between decontextualized meanings and contextualized meanings, are a condition for in-depth learning and cumulative knowledge-building. The paper argues that this form of knowledge-building is a result of a radical visible pedagogy, which includes practices that are based on different forms of knowledge, making visible how these forms of knowledge can be connected and transformed in education.

Keywords: social realism, cumulative knowledge-building, semantic gravity, semantic density, radical visible pedagogy

1. Introduction

In recent decades, the idea of learning in education has undergone a transformation from "instructionism" to student-centered forms of learning in education (Sawyer, 2006). Student-centered forms of learning have become a mantra in contemporary schools and teacher education, based on a new learning model for the future school that has been driven forward by the twenty-first century learning movement (Scott, 2015). Here, it is assumed that education should cover the need for new competences in the twenty-first century, which can be realized with the help of new learning models, characterized by a de-centered teacher role, focus on interdisciplinary and "real-world" problems, and project-based enquiry learning (Bolstad et al., 2012; Fullan et al., 2018; Organization for Economic Cooperation and Development [OECD], 2018). Curricula based on twenty-first century learning, which has become an international norm (Choo et al., 2017; Lourie, 2020; McPhail & Rata, 2016), place a decisive emphasis on competences and skills and emphasize a student-centered approach, with the teacher as supervisor and where the students are required to develop competence and knowledge themselves. It is assumed that deep learning will occur when students are engaged in overarching themes and when they explore solutions to "real-world" problems (Fullan et al., 2018). In the new age, there is allegedly no need for "instructionism" (Sawyer, 2006), described as a traditional type of classroom practice in which the student is introduced to established factual knowledge without a connection to the students' everyday knowledge. This context, with curricula that are based on twenty-first century learning, has created a pedagogical discourse characterized by simplifications that restrict pedagogical practices, thereby creating an insurmountable divide between student-centered approaches and teacher-centered instructions, where the latter is allegedly an obstacle to in-depth learning.

This paper is based on Bernstein (1977, 1990, 2000) and social realism (Barrett & Rata, 2014; Barrett et al., 2018; Maton & Moore, 2010; McPhail, 2020; Wheelahan 2010; Young, 2008a; Young & Muller, 2013). Arguing in favor of twenty-first century learning has created a one-dimensional pedagogy, based on an either–or logic and without clear connections to the subjects' specialized forms of knowledge, which leads to context-dependent and segmental forms of learning and knowledge-building in education (Maton, 2013, 2014). In line with the social realism research program, referred to in Youngs' book (2008a) as "Bringing knowledge back in," this paper argues

for a pedagogy that engages students with academic knowledge. This alternative combine teacher-centered instructions with student-active learning, where different forms of knowledge can be woven together, something that with Bernstein (1990) can be describes as a "radical visible pedagogy." This term has been discussed in several contributions (Barrett & McPhail, 2023; Bourne, 2004; Hoadley, 2006; Muller & Gamble, 2010), related to the concepts classification and framing. In this paper, we will emphasize how this term opens up for a new type of design and new pedagogical approaches in education. Radical visible pedagogy is a modality that assumes that knowledge affects and shapes practices in education (Bratland & El Ghami, 2021; Bratland et al., 2022; Bratland & El Ghami, 2023). This is a pedagogy, based on a coherent design (Rata, 2021), which connects different forms of knowledge, and opens a space for a diversity of practices, where knowledge can be transformed from context-dependent simple meanings to context-transcending meanings. When the curriculum emphasizes subjects and subject concepts—for example, as is expressed in the new Norwegian curriculum reform "Subject Renewal" (Bratland & El Ghami, 2022)—it is the task of teachers to equip students with subject concepts, which in turn enable them to solve tasks and develop competences. Subject concepts are a generalized and epistemic form of knowledge and represent a break from students' everyday knowledge (Rata, 2016; Rata, 2020; Rata et al. 2019). These concepts equip students with cognitive tools suitable for solving tasks in a specific subject and are a context-independent form of knowledge. One of the aims of radical visible pedagogy is to make these concepts visible in teaching. The purpose is not only to introduce subject concepts and content knowledge to enable students to reproduce these but, rather, this modality can be described as radical in a dual sense: it is progressive in that it makes subject concepts and content visible to students, where the "rules" for academic success are made available and explicit to all students, which is crucial for promoting social and educational justice for all students in education (Wheelahan, 2010); it is radical in that the goal is not primarily reproduction but interruption (Moore, 2013), where the active use of subject concepts opens up a space for change and development, where deep learning can occur and new insights can be created. Pedagogy deals with how the teaching of knowledge in the subject can take place, and Bernstein distinguishes three pedagogical modalities (Barrett & McPhail, 2023; Moore, 2013). In the first part of the authorship, the terms "invisible pedagogies" and "visible pedagogies" are introduced (Bernstein, 1977, 1990), while the term "radical visible pedagogy," which is a further development of visible pedagogy, is described as "a radical realization of an apparently conservative practice" (Bernstein, 1990, p. 72). The mentioned terms, which are part of Bernstein's code theory, refer to pedagogical modalities that are expressed in pedagogical practices in education. While this theory connects the three modalities to the students' social background, this article will emphasize the pedagogical aspects of these terms, the forms of principles that lies under, and further effects in terms of learning and knowledge building in education. Invisible pedagogy can be associated with practices that are based on constructivism and twenty-first century learning, which places a decisive emphasis on students and their experiences (Frodeman, 2014; Scott, 2015). According to Bernstein (1977), the underlying principle of this modality appears as invisible, particularly for students from lower socioeconomic classes. Visible pedagogy is the opposite of invisible pedagogy. This pedagogical modality is characterized by a teacher-centered pedagogy, with selection, sequencing, and pacing of the curriculum's content in which the principles underlying the pedagogical practices are visible. The traditional version of visible pedagogy has been accused of being conservative, with a focus on reproduction of a specified content, often with an emphasis on factual knowledge, something which creates passive and disengaged students. As mentioned earlier, the radically visible pedagogy represents an attempt to overcome this problem through practices that may include instructions and active student learning and where knowledge is transformed between context-dependent and context-independent meanings, and where the principles underlying these practices are made visible for the students. The three pedagogical modalities have distinct characteristics, are based on different forms of knowledge, and have different effects on the students' learning and knowledge-building. Based on an empirical investigation, this paper aims to uncover these forms of knowledge that underlie Bernstein's three modalities and examine their further effects on learning and knowledge-building. With this starting point, this paper attempts to answer the following research questions:

1) What forms of knowledge underlie Bernstein's pedagogical modalities?

2) What effects do these pedagogical modalities have on students' learning and knowledge-building?

2. Theoretical Framework

In recent decades, social realism has further developed and transformed Bernstein's theory, focusing on the differentiation of knowledge types and forms, with implications for pedagogy (Barrett & Rata, 2014; Maton & Moore, 2010; McPhail, 2020). This development is based on Bernstein (1990, 2000), who makes two distinctions: First, a distinction is established between everyday knowledge and theoretical knowledge, as this is expressed in the disciplines. Then, a distinction is established between curriculum and pedagogy, where the curriculum determines content, while pedagogy deals with questions of how to teach with a commitment to knowledge. From

a social realist perspective, the task of pedagogy is to engage students with disciplinary knowledge in a manner that enables students to distinguish between different forms of knowledge, which can enable them to use subject concepts and content to achieve a deeper understanding, something McPhail (2020) has referred to as deep learning. This type of pedagogy aims to engage students with academic knowledge in a manner that creates connections to the students' everyday lives, but without reducing the academic requirements, which research has referred to as a central pedagogical challenge (Barrett et al, 2018; Rata et al., 2019; Wheelahan, 2010). In his studies, Young (2008a, 20008b, 2010) contributed by clarifying Bernstein's distinction between everyday knowledge and theoretical knowledge. Young argues that Bernstein's differentiation between forms of knowledge is based on a distinction between context-dependent and context-independent knowledge, where everyday knowledge is a particular and context-dependent form of knowledge; in contrast, theoretical knowledge, referred to as disciplinary knowledge and subject concepts, is a generalized form of knowledge that is context-transcending (Rata et al., 2019; Young, 2010). Maton's (2014, 2016) legitimation code theory (LCT) has further developed this semantics dimension by introducing the terms semantic gravity (SG) and semantic density (SD). Barrett and McPhail (2023) argue that these are terms that are well suited for examining the forms of knowledge that underlie a radical visible pedagogy. We agree, but we assume that SG and SD are suitable for examining all forms of practices that underlie the mentioned pedagogical modalities. These terms provide insight into the forms of knowledge underlying all forms of practices in education and are suitable for overcoming simplified dichotomies, such as that between teacher-centered and student-centered learning, by indicating that all forms of practices can have different semantic strength. According to Maton (2016, p. 15), SG refers to the degree of context-dependent meaning—the stronger the SG (SG+), the more the practice depends on the context to obtain meaning, and vice versa—the weaker the SG (SG-), the less the practices depend on context to obtain meaning. Similarly, SD refers to the extent of condensation of meaning within practices—the stronger the SD (SD+), the more meanings are condensed in a symbol or practices, the weaker the SD (SD-), the less the meanings are condensed. As mentioned above, SG and SD are suitable terms for studying all forms of practices and can reveal the semantic strength and variations of the practices. These terms open up the possibility of describing the gradual changes in practices over time, with gradations in semantic strength. The practices create changes, with variations in the context-dependence of the meanings, which provide the basis for an analytical method that is referred to by Maton (2016, p. 17) as "profiling." This method can track the strength of SG and SD over time in all types of educational practices. The semantic profiles, referred to as semantic flat lines and semantic waves, can reveal the character of the practices that unfold and reveal their semantic range; this is understood as the span between their highest and lowest strength. The semantic profiles reveal the context-dependence and context-independence of the meanings as well as how different forms of knowledge interact and are included in the practices. Further, these profiles indicate the effects of the practice and provide insight into various forms of knowledge-building. Maton (2014, 2016) distinguishes between segmental knowledge-building and cumulative knowledge-building, both of which are concepts that refer to the degree of context-dependence of meanings and the further effects of this for learning and knowledge-building. While segmental forms of knowledge-building are characterized by meanings and knowledge that are relatively context-dependent, cumulative knowledge-building has a context-transcending character, with practices that weave together different forms of knowledge. Against this background, we argue that both SG and SD provide a theoretical basis for examining practices in education, which can reveal the forms of knowledge that underlie Bernstein's pedagogical modalities, referred to as invisible pedagogy, visible pedagogy, and radical visible pedagogy. The terms also make it possible to study the effects of pedagogical practices, whether they lead to progression and include opportunities to transcend the given context or they lead to a form of knowledge-building and learning that is only meaningful within a particular context.

As mentioned above, the terms SG and SD are well suited for studying the principles underlying the three pedagogical modalities given by Bernstein (1977, 1990). These modalities include specific practices, and SG and SD can reveal the forms of knowledge that underlie these practices to shed light on the practices that characterize the respective pedagogical modalities and to study their further effects. In the next section, we analyze selected examples taken from a previous research project, conducted in 2016–2018.

3. Method and Data Analysis

The data collection in the study was conducted in three different classes in teacher education and included video recordings and interviews with teachers (T_h, T_g, T_p). The study conducted in 2016–2018 was conducted in three different subjects—history, geography, and pedagogy, at the level of a bachelor's degree, and encompassed the analyses of submitted student papers in the same subjects.

Student papers in history and geography were handed in as group assignments, while student papers in pedagogy were individual assignments. The results of the study provide content for the mentioned modalities and show how these practices are part of a continuum, which includes different forms of knowledge.

3.1 Examples from the Research

The examples in this section can be divided into two parts: The first part analyzes teachers' pedagogical practices in three different subjects, which provides content for the various pedagogical modalities, as described above. The second part comprises a semantic analysis of students' practices, as they are expressed in 24 submitted student papers in the same three subjects (see Table 3).

3.1.1 Teachers' Pedagogical Practices

The pedagogical practices in this study are characterized by different pedagogical modalities; they are categorized as radical visible pedagogy, visible pedagogy, and invisible pedagogy. These pedagogical modalities include various practices, which are expressed in academic preparations, guidelines, and interviews with teachers.

Table 1. Categorization of the Teachers' Pedagogical Practices

Categories	Academic preparation	Guidelines for student papers	Example quotes from data
Radical visible pedagogy	History: Lecture and group work. Information regarding student papers.	Students discuss sustainable development and the historical background of the planet's ecological condition.	"In general, I would say that there must be some theory in the paper, and there should also be some details." (T_h) "Students like to draw on their own experiences. It should be remunerated if it can illuminate the theories." (T_h) "As a student, you must have something overarching to show, otherwise it will only be speculation or your own assessments and experiences." (T_h) "Cause and effect relationships should have a place in a historical paper." (T_h) "The students discuss the UN's findings, and the national allocations that exist. In addition to this thinking globally and acting locally, how they can break it down at a local level." (T_h)
Visible pedagogy	Geography: Lectures and group work. Information regarding student paper.	Students explore the persecution of certain minorities in Norway before and after World War II.	"I would say that a good paper is when the students have gained new insight." (T_g) "I'm glad that they have gained new insight, especially in relation to.... the authorities' treatment of the Gypsies." (T_g) "It is good that they refer to current research. Many students use several sources and spend time and energy getting this into the paper." (T_g) "It's a pretty ugly story. A lot of the systematic persecutions, forced sterilization, and lobotomization have happened after the Second World War." (T_g)
Invisible pedagogy	Pedagogy: Students participate in the project "outdoor classroom." Information about student paper.	Students write papers about classroom management based on their own experiences with the "outdoor classroom."	"A good paper in my subject is that the students get to reflect on their own thinking, that it is inspired, and that they can make a professional articulation of something they have been involved in themselves." (T_p) "I am quite concerned that they should, to the greatest possible extent, reflect on the topic that they are concerned with in connection with the local learning project." (T_p) "if I have some kind of order, which builds up, then I'm afraid that the arsenal won't be taken out." (T_p) "I'm afraid that feeding them with a certain theory, which I believe in, will be at the expense of their independent thinking." (T_p)

Table 1 presents teachers' pedagogical practices, which are based on the three different pedagogical modalities. These modalities—radical visible pedagogy, visible pedagogy, and invisible pedagogy—are based on practices that are governed by underlying principles, which include different forms of knowledge. Maton's (2014, 2016) terms, referred to as SG and SD, are dynamic concepts that can highlight these principles. SG and SD reveal how these practices form part of a continuum with a greater or lesser degree of dynamism and with varying possibilities for weaving different forms of knowledge together. The mentioned pedagogical modalities, which are expressed in Table 1, include different practices, and are based on different forms of knowledge with different semantic range and strength. Radical visible pedagogy is expressed in several elements in this study. First, this is done via a presentation in a lecture on the topic, which makes visible the connection between concepts and content and is then related to local environmental issues that the students are aware of. The same aspects are emphasized in the

teacher's guidelines for the student papers. For the teacher, this connection among subject concepts, content, and assessments is crucial to making progress in the subject: "Students... like to draw on their own experiences. It must be remunerated if it can shed light on the theories" (T_h). This is a modality that combines context proximity (SG+) with highly condensed meanings (SD+). Simultaneously, the practices within this modality can vary, with different degrees of context-dependence and condensation of meaning. For example, the statement "Cause and effect must have a place in a historical paper" (T_h) is less dependent on the context (SG-), which refers to explanations and concepts with condensed meanings (SD+). According to the teacher, it is crucial that the students' own experiences and assessments (SG+) are related to subject concepts (SG-): "As a student, you must have something overarching to show, otherwise it will only be speculation or your own assessments and experiences" (T_h). The teacher's practices indicate variations within the radical visible pedagogy, where different forms of knowledge are woven together and where emphasis on the subject's concepts is placed in the context of the students' experiences and assessments.

In this study, visible pedagogy is expressed through the teacher's pedagogical practices, which focus on established knowledge of the authorities' persecution of Sami, Kvens, and Gypsies in Norway before and after the Second World War. These are terms that refer to certain content that has relatively simple meanings (SD-). However, these terms also represent a type of factual knowledge that may be cross-contextual (SG-), with meanings that come to be expressed in popularized representations as well as in Wikipedia and similar Norwegian online sources. The visible pedagogy, which is expressed in the teacher's practices, places decisive emphasis on content knowledge; first presented via a lecture that intends to form the basis of student papers. The strong emphasis on content knowledge is repeated in the teacher's guidelines for student papers. In the interview, the teacher emphasizes how the students, through their own exploratory activities have gained new insight: "I am glad that they have gained new insight, especially in relation to.... the authorities' treatment of the Gypsies" (T_g). According to the teacher, the students can achieve a deeper understanding by becoming aware of factual knowledge that the students were previously unaware of. This modality deals with reproduction, but with a further exploration of the topic through which the students find new facts related to these cases.

Invisible pedagogy assumes that the students themselves should construct their own knowledge based on their own experiences and assessments. In this case, the experiences with the "outdoor classroom" (SG+) form the basis of the students' reflections, as these are expressed in the student papers. The teacher does not give any instructions with the presentation of relevant subject concepts and theory; according to the teacher, this may be a barrier and prevent students from "reflecting on their own thinking" and "making a professional articulation of something they have been involved in themselves" (T_p). The teacher justifies this pedagogical practice in the following manner: "I am afraid of feeding them with a certain theory, which I believe in, will be at the expense of their independent thinking" (T_p). This last formulation refers to the assumed development potential of this modality, where it is presumed that the students' reflections on their own experiences can be developed into more abstract forms of knowledge (SD+). This modality places the students' experiences at the center of their learning and knowledge-building, but it does so without clarifying the underlying principles, where the purpose of the project appears diffuse and unclear.

3.1.2 Semantic Analysis of Students' Practices

Based on the concept of SG, an external language was developed, referred to as a "translation device," which allows the coding of data in student papers (Bratland, 2018).

Table 2. An external language of the description of semantic gravity (SG) (description of coding)

Semantic Gravity	Coding categories	Description of coded content
Weaker (SG-)	Read (R)	Students describe a theory, concept, or principle in a general manner, without reference to experiences, social conditions, or own assessments.
	Green (G)	Students describe the subject by referencing various sources, but without explicit references to relevant academic theories or explanations.
Stronger (SG+)	Yellow (Y)	Students describe the subject by referring to their own experiences, views, or perceptions of social conditions.

Table 2, which shows variations in the strength of SG (+, -), provides a basis for the coding of the student papers. The semantic strength was coded based on three levels, where red (R) refers to subject concepts and theories, green

(G) refers to content knowledge, and yellow (G) refers to the students' experiences, assessments, and perceptions. The teachers' pedagogical practices have effects; in this study, these effects were made visible through a semantic analysis of the submitted student papers (see Table 3).

This analysis is based on the concept of SG, with the development of an external language, suitable for creating a connection between theory and data. The "translation device" includes three levels—subject concepts, content knowledge, and own assessments—in the span between context-dependence and relative context-independent (SG+, -) meanings. The result of the analysis reveals that these papers, submitted in three different subjects, are characterized by rather different semantic profiles, with practices of different semantic range and strength (see Table 3). The semantic profiles visualize the forms of knowledge that underlie the students' practices as well as the further effects for learning and knowledge-building. The analysis of data revealed significant differences between the student papers in history, geography, and pedagogy.

Table 3. Employment of different strengths of semantic gravity

Level present	Coding present	Student papers in geography		Student papers in history		Student papers in pedagogy	
		number	percentage	number	percentage	number	percentage
Single levels	Green	5	56%	0	0%	0	0%
Two levels	Green/Red	2	44%	1		0	
	Green/Yellow	2		0	25%	8	73%
Three levels	Red/Green/ Yellow	0	0%	3	75%	3	27%
Totals		9	100%	4	100%	11	100%

The analysis revealed that most of the student papers in history comprise three levels (75%). Most student papers in geography (56%) comprise one level, characterized by a strong focus on content knowledge. Further, the student papers in pedagogy are based on the students' personal experiences, acquired through use of the "outdoor classroom," together with students from lower secondary school. The analysis revealed that most of these student papers cover two levels (73%), with practices that weave together the students' experiences (SG+) and their reflections on these experiences (SG).

A comparative analysis of the students' papers in the three different subjects reveals significant differences, with practices that are based on different forms of knowledge. These papers have rather different semantic profiles, where the semantic range varies considerably, with practices producing different semantic movements. Figure 1 provides a heuristic illustration of three semantic profiles that are expressed in student papers in three different subjects.
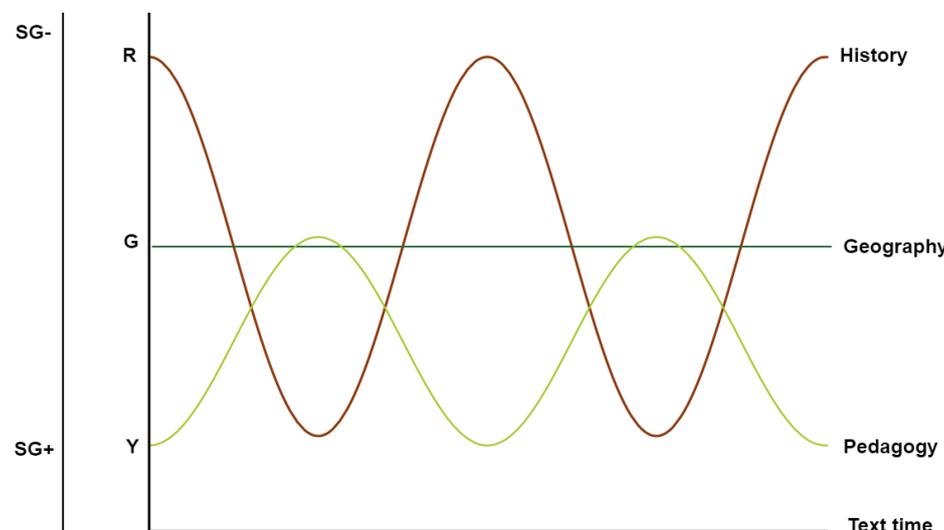

Figure 1. Profiles of semantic gravity (SG) in student papers in three subjects

Figure 1 depicts how the students' practices, expressed in student papers submitted in three different subjects, create three rather different semantic profiles (Maton, 2013, 2016). The semantic profiles reveal how practices, over time, create semantic movements that alternate between context-dependent and relative context-independent meanings. The history students' practices, as expressed in the papers, create semantic waves with great span and range, moving from a position with relatively weak SG to a position with strong SG, and vice versa. In the papers, the students' practices move from the concept of sustainable development—which is linked to UN climate reports—and become the subject of the students' assessment, where they draw upon national and local conditions and conduct a discussion where the concept is applied. These practices, which are based on a radical visible pedagogy, create a distinctive semantic profile, expressed as long semantic waves. Student papers in geography have a rather different profile, referred to as a medium semantic flatline (SG). The papers are shaped by a visible pedagogy, which places a decisive emphasis on content knowledge, where the students provide fact-based presentations of the Norwegian authorities' persecution of the Sami, Kvens, and Gypsies. Student papers in pedagogy, which are based on an invisible pedagogy, produce a semantic profile, with semantic waves of limited range. The students' papers are based on their own experiences (SG+), which provides a basis for the students' reflections in which simple pedagogical terms are used (SG). The students' reflections increase the semantic range, but the strong emphasis on experience provides these papers a context-dependent character. This study reveals that there is a relatively clear connection between the teachers' pedagogical modalities and the students' practices in various subjects, as expressed in the submitted papers. The students' practices lead to different semantic profiles, thereby revealing the limitations of invisible pedagogy, in which the students' reflections on acquired experiences lead to papers with a limited semantic range, characterized by context-dependent forms of knowledge. There are also problems with the visible pedagogy, which in this case places decisive emphasis on content knowledge. This emphasis affects students' practices and leads to fact-driven student papers, without connections to subject concepts, which can explain the authorities' persecution of the national minorities in this period.

Radical visible pedagogy, which forms the basis for the papers in history, presents a different story. This pedagogical modality influences the students' practices and leads to student papers with a long semantic range and with a profile of long semantic waves, thereby allowing changes in the context-dependence of meanings. These papers comprise three levels. Radical visible pedagogy differs from the other modalities as it combines practices that alternate between context-dependence (SG+), content, and generalized subject concepts (SG-), which have a context-transcending character. This is a pedagogical modality, based on a coherent design (Rata, 2021), which influences the students' practices and leads to student papers with long semantic waves in the span between more and less context-dependent meanings. These papers include practices where knowledge is transformed between decontextualized and context-dependent meanings, which paves the way for in-depth learning and cumulative knowledge-building in the subject.

4. Discussion

This paper takes its point of departure from the prevailing pedagogical discourse—referred to as twenty-first century learning—which focused on a one-dimensional pedagogy and decisively emphasized a student-centered approach, according to where the students themselves should create knowledge. Moreover, according to this direction, it was assumed that the emphasis on a student-centered approach, with a focus on project-based inquiry learning in contrast to "instructionism," will lead to in-depth learning (Bolstad et al., 2012; Fullan et al, 2018, Sawyer, 2006). This study rejected this claim and demonstrated that the problem of segmental knowledge-building is not solved with the mantra of twenty-first century learning. This direction assumes that student-centered approaches, based on the exploration of the "real world," will lead to in-depth learning in education (Bolstad et al., 2012: Fullan et al., 2018). This paper refutes this claim and argues in line with social realism that deep learning— also referred to as cumulative knowledge building (Maton, 2014, 2016)—requires access to specialized knowledge, to generalized subject concepts and content, which McPhail (2020) referred to as epistemically structured knowledge. As an alternative to the prevailing pedagogical discourse, this paper introduced Bernstein's (1977, 1990) three pedagogical modalities, which were analyzed with the concepts SG and SD (Maton, 2014, 2016). These concepts are, as mentioned, suitable for overcoming simplified dichotomies, such as that between teacher-centered and student-centered learning, by highlighting that all forms of practices can have different semantic strength. In this way, the concepts provide opportunities to investigate the forms of knowledge that underlie the pedagogical modalities, and their further effects for learning and knowledge-building. The pedagogical modalities and their further effects are examined based on a research project that deals with the teachers' pedagogical practices in three different subjects, which results in the submission of student papers in these subjects.

The three pedagogical modalities expressed in this study are characterized by different pedagogical practices based on different forms of knowledge, which have different effects on the students' learning and knowledge-building.

The analysis of the students' papers reveals that there is a relatively clear connection between the pedagogical modalities and the students' learning and knowledge-building. Figure 1 presents three semantic profiles based on the students' practices, as expressed in the student papers in three different subjects. Based on this result, we argue that there is a relatively strong connection between the various pedagogical modalities and the students' practices, as they are expressed by the paper's semantic profiles. These profiles are rather different, with practices based on different forms of knowledge, with different semantic strength and range. This result provides a basis for judging the effects of the pedagogical modalities in terms of learning and knowledge-building (Maton, 2013, 2014, 2016). The students' papers in geography and pedagogy are based on practices that lead to segmental forms of knowledge-building. The students' practices create few or limited semantic movements, with meanings that have a relatively context-dependent and segmental character. The papers in history constitute a contrast, where the students' practices create large semantic waves and knowledge is transformed between decontextualized meanings and context-dependent meanings, which provides a basis for cumulative knowledge-building. Based on this analysis, we argue in line with Maton (2013) that practices that create long semantic waves are a key to cumulative knowledge-building. This form of knowledge-building, which overcomes the problem of segmental knowledge-building, is a result of a radical visible pedagogy. Radical visible pedagogy includes practices where knowledge is transformed between decontextualized meanings and contextualized meanings. This is a pedagogical modality that overcomes the simplistic dichotomies that characterize contemporary educational discourse, with practices that combine contextual proximity with more abstract forms of knowledge. These forms of knowledge, which lie under radical visible pedagogy, are revealed using the terms SG and SD. Seen in relation to previous research (Bourne, 2004; Hoadley, 2006), these concepts provide a new approach to the term "radical visible pedagogy", which reveals the principles underlying the forms of knowledge practices included in this pedagogical modality. Radical visible pedagogy is a modality that is based on a design that distinguishes between different forms of knowledge (Bratland & El Ghami, 2022; Rata, 2021), where the teacher reveals for the students how these forms of knowledge can be connected and transformed. Radical visible pedagogy makes knowledge visible to students and equips them with cognitive tools that enable them to engage in practices that can promote in-depth learning and cumulative knowledge-building in education.

5. Conclusion

The trend of curricula based on 21st century learning became the international norm from the 1990s (Choo et al., 2017; Lourie, 2020: McPhail & Rata, 2016). This direction has introduced a learning model for future education, based on a pedagogical discourse that includes simplified distinctions, referred to as "teacher-centered" and "student-centered" or "traditional" and "progressive," but provides few answers to how the problem of segmental knowledge-building can be overcome in education (Maton, 2013). To examine this obstacle, this paper introduced Bernstein's (1977, 1990) three modalities, which are analyzed with the concepts SG and SD (Maton, 2014, 2016).

These concepts, which provide insight into the forms of knowledge that underlie the practices that are included in these pedagogical modalities, are applied to examples taken from a previous study. The analysis suggests that the teachers' practices can be categorized into three different pedagogical modalities. These modalities include practices that have different effects on learning and knowledge-building, which is revealed in the analysis of student papers submitted in different subjects (Figure 1). The student practices, as they appear in these papers, create different semantic movements, and are based on different forms of knowledge, which gives the student papers rather different semantic profiles. The different semantic profiles—referred to as long semantic waves, medium semantic flatline, and short semantic waves—provide a clear picture of the effects of the practices in terms of learning and knowledge-building. While the papers in geography and pedagogy are based on practices that create few or limited semantic movements, where knowledge has a context-dependent and segmental character, this is different in the papers on history. The students' practices in these papers create semantic movements with a wide range, where knowledge is transformed between context-dependent and context-independent meanings, which paves the way for in-depth learning and cumulative knowledge-building in the subject. We argue that this result cannot be seen independently of the pedagogical modalities that provide the frameworks for these papers. The pedagogy teacher's invisible pedagogy, which is in line with twenty-first century learning, leads to segmental forms of learning and knowledge-building. This is also the case with the geography teacher's visible pedagogy, a traditional pedagogy in which students are introduced to established factual knowledge. In contrast, radical visible pedagogy, as it is expressed in history, is a modality that is based on a coherent design (Bratland & El Ghami, 2022; Rata 2021), which in this case make the "rules" for successful academic writing visible to the students, something which enables practices that create connections between different forms of knowledge. This is a modality that aims to engage students with academic knowledge in a manner that transcends the distinction between "instructionism" and "student-centered," where students' active use of subject concepts opens a space for

interruption rather than reproduction (Moore, 2013), which can pave way for in-depth learning and cumulative knowledge-building in education.

References

Barrett, B., Hoadley, U., & Morgan, J. (2018). Knowledge, curriculum and equity: Social realist perspectives. Routledge.

Barrett, B., & McPhail, G. (2023). Conceptualizing a radical visible pedagogy. *Journal of education* (Boston, Mass.)*, 203*(3), 726-735. https://doi.org/10.1177/00220574211053576

Barrett, B., & Rata, E. (2014). Knowledge and the future of the curriculum: International studies in social realism (1st ed.). Palgrave Macmillan.

Bernstein, B. (1977). Towards a theory of educational transmissions (vol. 3). Routledge & Kegan Paul.

Bernstein, B. (1990). Class, codes and control: 4. The structuring of pedagogic discourse. Routledge & Kegan Paul.

Bernstein, B. (2000). Pedagogy, symbolic control and identity: Theory, research, critique. Rowman & Littlefield.

Bolstad, R., Gilbert, J., & McDowall, S. (2012). Supporting future-oriented learning & teaching: A New Zealand perspective. Wellington, N.Z.: Ministry of Education.

Bourne, J. (2004). Framing talk: Towards a "radical visible pedagogy." In J. Muller, B.

Davies & A. Morais (Eds.), Reading Bernstein, researching Bernstein (pp. 61-74). RoutledgeFalmer.

Bratland, E. (2018). Technology and education: Why do students still need access to specialized knowledge? In E. Baron-Polańczyk (Ed.), *ICT in educational design* (vol. 12, pp. 37-49). Zialona Gora University Press.

Bratland, E., & El Ghami, M. (2021). The Janus Face of Professional Knowledge: What Organizational Principles Are behind the Students' Perceptions of Professional Knowledge in New Norwegian Teacher Education? *Education research international*, 2021, 1-10. https://doi.org/10.1155/2021/1253416

Bratland, E., & El Ghami, M. (2022). Recontextualization of knowledge in the new Norwegian curriculum: Epistemic and non‐epistemic design in learning objectives for social studies. *Curriculum Journal, 34*(3), 457-471. https://doi.org/10.1002/curj.197

Bratland, E., Ghami, M. E., & Mediå, M. (2022). Technology and knowledge. In what way are knowledge and teachers' knowledge practices in subject areas crucial for the integration of technology in education? *Nordic Journal of Digital Literacy, 17*(3), 155-169. https://doi.org/10.18261/njdl.17.3.2

Bratland, E., & El Ghami, M. (2023). The Norwegian curriculum and integration of knowledge in textbooks in social studies: A comparative study. *International Educational Research* (IER), Volum 6.(2), 46-55. https://doi.org/10.30560/ier.v6n2p46

Choo, S., Sawch, D., Villanueva, A., & Vinz, R. (2017). Educating for the 21st century: Perspectives, policies, and practices from around the world (1st 2017. ed.). Springer.

Frodeman, R. (2014). Sustainable knowledge: A theory of interdisciplinarity. PalgraveMacmillan.

Fullan, M., McEachen, J., & Quinn, J. (2018). Deep learning: Engage the world, change the world. Corwin.

Hoadley, U. K. (2006). Analysing pedagogy: The problem of framing. *Journal of Education, 40*, 15-34.

Lourie, M. (2020). Recontextualizing twenty-first century learning in New Zealand education policy: The reframing of knowledge, skills, and competencies. *New Zealand Journal of Educational Studies, 55*(1), 113-128. https://doi.org/10.1007/s40841-020-00158-0

Maton, K. (2013). Making semantic waves: A key to cumulative knowledge-building. *Linguistics and Education, 24*(1), 8. https://doi.org/10.1016/j.linged.2012.11.005

Maton, K. (2014). Knowledge and knowers: Towards a realist sociology of education. Routledge.

Maton, K. (2016). Building knowledge about knowledge-building. In K. Maton, S. Hood, & S. Shay (Eds.), Knowledge-building: Educational studies in legitimation code theory (pp. 1-23). Routledge, Taylor & Francis Group.

Maton, K., & Moore, R. (2010). Social realism, knowledge, and the sociology of education: Coalitions of the mind. Continuum.

McPhail, G. (2020). The search for deep learning: A curriculum coherence model. *Journal of Curriculum Studies,*

53(4), 420-434. https://doi.org/10.1080/00220272.2020.1748231

McPhail, G., & Rata, E. (2016). Comparing curriculum types: "Powerful knowledge" and "21st Century Learning." *New Zealand Journal of Educational Studies, 51*(1), 53-68. https://doi.org/10.1007/s40841-015-0025-9

Moore, R. (2013). Basil Bernstein: The thinker and the field. Routledge.

Muller, J., & Gamble, J. (2010). Curriculum and structuralist sociology: the theory of codes and knowledge structures. In P. Peterson, E. Baker & B. McGraw (Eds.), International encyclopedia of education (pp. 505-509). Elsevier.

Organization for Economic Cooperation and Development [OECD]. (2018). Teaching for the future: Effective classroom practices to transform education. OECD.

Rata, E. (2016). A pedagogy of conceptual progression and the case for academic knowledge. *British Educational Research Journal*, 42(1), 168–184. https://doi.org/10.1002/berj.3195

Rata, E. (2020). What is a knowledge-rich curriculum? *New Zealand Annual Review of Education, 26*, 29-35. https://doi.org/10.26686/nzaroe.v26.6855

Rata, E. (2021). The Curriculum Design Coherence Model in the Knowledge‐Rich School Project. *Review of Education (Oxford), 9*(2), 448-495. https://doi.org/10.1002/rev3.3254

Rata, E., McPhail, G., & Barrett, B. (2019). An engaging pedagogy for an academic curriculum. *Curriculum Journal (London, England), 30*(2), 162-180. https://doi.org/10.1080/09585176.2018.1557535

Scott, C. L. (2015). The futures of learning 3: What kinds of pedagogies for the 21st century? Education Research and Foresight Working Paper 15. UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000243126

Sawyer, R. K. (2006). The Cambridge handbook of the learning sciences. Cambridge University Press.

Wheelahan, L. (2010). Why knowledge matters in curriculum: A social realist argument. Routledge.

Young, M., & Muller, J. (2013). On the powers of powerful knowledge. *Review of Education (Oxford), 1*(3), 229-250. https://doi.org/10.1002/rev3.3017

Young, M. F. D. (2008a). Bringing knowledge back in: From social constructivism to social realism in the sociology of education. Routledge, Taylor & Francis Group.

Young, M. (2008b). From constructivism to realism in the sociology of the curriculum. In (5 (2) (Ed.), *Theory and Research in Education* (pp. 1-28).

Young, M. (2010). Why educators must differentiate knowledge from experience. *Pacific Asian Education, 22*, 9-20.

Copyrights