

Interdisciplinary approaches for deep learning

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ABSTRACT

The Norwegian national curricula for primary and secondary education are currently undergoing reforms, which will be implemented from 2020. The underlying documents regarding the reform are studied in this article, and conclude that learners should be provided with beneficial conditions to develop values and knowledge to manage their lives well. An essential notion is ‘deep learning’ whose implication seems to be acquisition of more in-depth knowledge and understanding of subject areas. The present article argues that learning is about making connections, whether it be noticing connections between isolated subject areas, or, perhaps, between theoretical concepts and practical tasks. Further, the article argues that interdisciplinary approaches extend knowledge as they typically work across subject areas and support learners in discovering disciplinary connections. Claims are made that interdisciplinary strategies have the capacities to facilitate various learning styles, motivation and variation. Such facilitations are required in education that is democratic and which targets all learners. Hence, the article argues that interdisciplinarity and deep learning are concepts that work together, and in which critical thinking and creativity are core elements. The argumentation is based on the four official documents NOU 2014:7, NOU 2015:8, Report to the Storting 28, The Standing Committee on Education, Research and Church Affairs’ recommendation to the Storting 19 S, as well as, data findings discussed in a master study which discusses teachers’ perceptions of interdisciplinarity and learning.

1. INTRODUCTION

Over the latest five years in Norway, increased attention has been given to school and education. In 2013, The Ludvigsen Committee was appointed by the Norwegian Government “to assess primary and secondary education subjects in terms of the competence society and working life will need in the future” (Haug 2016, p. 64), and, consequently, what changes need to be made to the national curriculum. The committee has produced the Norwegian Official Reports (NOU) NOU 2014:7 and NOU 2015:8 (Kunnskapsdepartementet 2014; 2015). Subsequently, The National Curriculum for Knowledge Promotion in Primary and Secondary Education and Training (KPR) (i.e. the education reform introduced in 2006 in primary, lower secondary and upper secondary education and training) is currently undergoing reforms scheduled for implementation from 2020. Central to the reform process are NOU 2014:7 (Kunnskapsdepartementet, 2014), NOU 2015:8 (Kunnskapsdepartementet, 2015), Report to the Storting 28 (Kunnskapsdepartementet, 2016), the Standing Committee on Education, Research and Church Affairs’ recommendation to the Storting 19 S (The Standing Committee on Education, Research and Church Affairs, 2016) (hereafter: Recommendation 19 S).

Recommendation 19 S states that learners should be given constructive conditions to develop values and knowledge to manage their lives well. Schools, then, should provide students with learning opportunities that facilitate a desire to learn and develop. However, considering, for example, the still high number of dropouts from secondary education (which may have various explanations), it might be that Norwegian schools have not been able to make learning possible for all (see, for example, Holmbukt & Larsen, 2016, who discuss the integration of English and programme subjects in media studies). This could be seen as conflicting with the ideas of democracy and equality, as basic knowledge is necessary in order to participate fully as fellow citizens in a democratic society (Kunnskapsdepartementet, 2016). Haug (2016) advocates the democratic idea of education for all, and Bernstein (1974) argues that “the foundation for

a democratic social development is that all students are given similar opportunities for success and for being heard” (cited in Holmbukt & Larsen, 2016, p. 69).

Education is thus seen as a cornerstone for creating a democratic society where each individual is given opportunities to develop skills and prepare for the complexities of work life and social life. More than ten years have passed since the implementation of the KPR. However, despite the fact that the KPR has raised awareness about learners’ learning outcomes and basic skills, we currently face considerable challenges in education with respect to e.g. the quality of learning outcomes, and with the effect, according to Report to the Storting 28 (Kunnskapsdepartementet, 2016), that too many students do not finish their secondary education. On these grounds, The Norwegian Government wants to reform the KPR to give more attention to students’ learning in the various subjects. Teaching and learning, however, are deeply embedded not only in subject learning goals, but also in the core curriculum and in the objects clause of the Education Act (see Report to the Storting 28 (Kunnskapsdepartementet, 2016)), which, in principle, provide the framework to schools’ design of their practices and set of values. The Government aims at reforming all parts of the national curriculum, including the core curriculum and the various subject curricula. The intention is that the fundamental values the Norwegian school system is based on, such as equality, solidarity and democracy, should become more visibly integrated in school practices. Teachers should not only teach subjects, but also become more aware of the school’s wider commitment, which is to teach within a framework of these fundamental values (Kunnskapsdepartementet, 2016).

Report to the Storting 28 (Kunnskapsdepartementet, 2016) and Recommendation 19 S (The Standing Committee on Education, Research and Church Affairs, 2016) draw several interesting lines of thought with respect to future education, such as focus on improved understanding, collaboration, variation in teaching methods, motivation, democracy and critical thinking. However, amid what seems to be new to the curriculum, and which is particularly emphasised in these documents, is the notion ‘deep

learning’¹. ‘Deep learning’ combined with flexibility in methods, may contribute to successful education for more students (Haug, 2016). The renewed focus on students’ learning, creativity and critical thinking as integral parts, sparks an interest in examining the governmental signals about the future school in Norway.

These new signals about education are in concordance with a master study (Holmbukt, 2007), which sheds light on interdisciplinary² approaches. The study claims the existence of close links between interdisciplinarity and deep learning, and suggests a potential for deep learning outcomes through interdisciplinary schemes. ‘Deep learning’ is thus the key notion that connects Holmbukt (2007) to the groundwork documents for the renewal of Norwegian primary and secondary education. Hence, the present article discusses to what extent interdisciplinarity constitutes strategies or own qualities that affect deep learning in English and other subjects alike.

2. THEORETICAL BACKGROUND

2.1. Interdisciplinarity and problem-based learning

In the present context, interdisciplinarity means teaching and learning across the curriculum, and may be defined as “any form of dialogue or interaction between two or more disciplines” (Moran 2002, p. 16). Epistemologically, then, interdisciplinarity may be seen as a different way of ordering knowledge, not into separate categories, or traditional disciplines, but rather as non-compartmentalising units of knowledge, which allow new perspectives to emerge (Gire Dahl, 2002; Dimmock, 2000; Kaufman, Moss and Osborn, 2003; Moran, 2002; Glenn, 2003; Brough, 2012; Hopkins, 2014; Carlisle, 2011; Pate & Nesin, 2011). This shift in thinking implies that “students are encouraged to build their own knowledge, to create a synthesis of competence based on their own interests and ideas” (Holmbukt, 2007, p. 15). Thus, interdisciplinarity is constructive in nature as it “forces thinking above the fact base” (Erickson, 1998, p. 65). It compares to

¹ Learning for enhanced understanding, see Section 2.2.

² by which is meant teaching and learning across the curriculum, see Section 2.1

metacognitive studies, which are cognitively more challenging than memorization of information about a topic. Metacognition is, according to Biggs (1988) “being aware of our own cognitive processes and exerting control over them” (p. 127), and such qualities may to a larger extent facilitate deep learning (Biggs, 1988; Erickson, 1998; Moran, 2002; McNamara, 2011).

Cross-curricular approaches to learning involve teachers acting more as facilitators and scaffolders than instructors. This implies a student-centred, power-sharing pedagogy (Brough, 2012) where students’ own interests and motivation are central. According to Dewey (1916), it is a democratic enterprise in which knowledge is seen as seamless and holistic, and which may also entail the incorporation of practical skills (Dewey, 1916; Brough, 2012; Holmbukt, 2007). Such a perspective for preparing students for adulthood could enable methods such as problem-based learning (PBL). What characterises PBL are the following features (Bridges & Hallinger, 1992 in Dimmock, 2000):

- (1) a problem is the starting point for learning;
- (2) the best problems conform to the real world;
- (3) knowledge is organized around problems rather than disciplines;
- (4) students, individually and collectively, assume more responsibility for their own instruction and learning; and
- (5) learning takes place in small groups rather than through direct teaching (p. 149).³

Thus, the over-arching principles of PBL are similar to the ones of interdisciplinarity, such as the student-centred approach, critical (or higher order) thinking⁴ and the holistic view of knowledge. Therefore, it is likely to suggest that a PBL approach is interdisciplinary in nature (Savery, 2006; Holmbukt, 2007). PBL and interdisciplinarity may thus be mutually complementary as they both operate across subject areas and connect subject fields according to the question under study.

³ See also Savery (2006).

⁴ Learning situations often require higher-order thinking, for example, in cognitive processes involving analysis and synthesis, i.e., thinking beyond the fact base (Anderson & Krathwohl 2001).

2.2. Deep learning

The governmental documents do not clearly explain what is meant by ‘deep learning’. However, the meaning may be inferred from the contexts, for example, page 1 in Recommendation 19 S (The Standing Committee on Education, Research and Church Affairs, 2016) says: “aiming at more deep learning and improved understanding”, and page 12 says: “the depth competence connected to creativity and entrepreneurship”⁵. Further, NOU 2015:8 (Kunnskapsdepartementet, 2015) greatly emphasises the importance of strengthening students’ competence and skills to explore and create, and to connect this to innovation, problem-solving and critical thinking. Beattie, Collins and McInnes (1997, p. 3) characterise ‘deep learning’ as the following:

The deep approach, which implies that students learn for understanding, is characterized by students who (1) seek to understand the issues and interact critically with the contents of particular teaching materials, (2) relate ideas to previous knowledge and experience and (3) examine the logic of the arguments and relate the evidence presented to the conclusions.

The implications of ‘deep learning’ may be intuitive to educators, however, in the present context, it may be defined as learning beyond the fact base for enhanced understanding of the complexities of a problem (Erickson, 1998; Beattie, Collins & McInnes, 1997; Smith & Colby, 2007; Haug, 2016).

The concepts ‘deep’ and ‘surface’ learning, which developed in the 1970s and 1980s, are well established in education discourse today (Beattie, Collins & McInnes, 1997; Smith & Colby, 2007). However, it is argued that this dichotomy is a simplification, and that a more comprehensive understanding of the concepts and their interconnections with the overall teaching-learning situation is required (Beattie, Collins & McInnes, 1997). According to Richardson (2015), Marton and Säljö (1976) are often

⁵ Author’s translations

inappropriately credited as “the source of the distinction between deep and surface approaches to learning” (Richardson, 2015, p. 239). Marton and Säljö’s conclusion is drawn on findings “in experiments in which students read and recalled academic texts. They did not discuss whether levels of processing had any counterparts in students’ everyday studies” (Richardson, 2015, p. 239). Thus, Richardson (2015) claims that Marton and Säljö’s experiment does not account for the students’ approaches to learning in their daily studies (p. 263). What could be inferred from Richardson’s discussion, on a general basis, is that the foundation on which education discourse is based is undoubtedly critical. Hence, the future pedagogical and didactic framework for the Norwegian school has to be shaped on solid ground. This presupposes that educators have a common understanding both of the terminologies used, and of their implications. Regarding the concepts ‘deep learning’ and ‘surface learning’, there is a practical side to continuing using the terms already established.

It might be productive to view surface and deep learning as parts of a learning process as illustrated in Smith and Colby (2007). They discuss the taxonomy SOLO, which stands for “the structure of the observed learning outcome” (p. 206). The framework is structured into hierarchical levels which reflect the continuum of learning, from surface to deep learning. It is a tool educators can use in assessing the quality and complexity of students’ work, and to “understand and examine the depth of ... learning ... of a particular episode or task” (Smith & Colby, 2007, p. 206). Likewise, Anderson and Krathwohl’s (2001) revision of Bloom’s Taxonomy also charts different levels of knowledge and cognitive processes (Anderson & Krathwohl, 2001).

As already stated, Report to the Storting 28 (Kunnskapsdepartementet, 2016) and Recommendation 19 S (The Standing Committee on Education, Research and Church Affairs, 2016) emphasise deep learning as an important future learning orientation. NOU 2014:7, NOU 2015:8 (Kunnskapsdepartementet, 2014, 2015) and Report to the Storting 28 (Kunnskapsdepartementet, 2016) clearly argue that deep learning and seeing subjects as part of a whole are central principles in curricula reforms and future practices in schools (see also Sawyer, 2006; Pellegrino & Hilton, 2012). Deep learning is seen as

beneficial to students' development in single subjects as well as to their acquisition of knowledge across subjects. Altogether, then, it might be suggested that deep learning and interdisciplinary approaches mutually keep each other alive; the one entailing the other (see Sawyer, 2006; Pellegrino & Hilton, 2012; Holmbukt & Larsen, 2016; The Standing Committee on Education, Research and Church Affairs, 2016).

3. METHOD

The method applied in the present study is textual analysis, and comprises the following documents: NOU 2014:7 (Kunnskapsdepartementet, 2014), NOU 2015:8 (Kunnskapsdepartementet, 2015), Report to the Storting 28, (Kunnskapsdepartementet, 2016), Recommendation to the Storting 19 S (The Standing Committee on Education, Research and Church Affairs, 2016) and Holmbukt's study (2007) on teachers' perceptions of interdisciplinarity and learning. The four official documents are categorized as political since they aim at policy makers of Norwegian education, and are thus fundamental to the curricula reform process. Holmbukt (2007), on the other hand, provides empirical data which supports the argumentation in the official documents.

In the present qualitative textual analysis, the main focus is to examine the content of the documents; what the authors intend to communicate or argue, i.e., the authors' message to the reader (Widén, 2009; Andreassen, 2016). A hermeneutical approach is used. Hermeneutics is a philosophical term referring to the investigation of human behaviour (Gadamer, 2004; Befring, 2015; Bratberg, 2014; Thurén, 2009). Gadamer (2004) claims that knowledge is gained by interpretation and reaching understanding via arguments by other parties, for example, texts. He discusses the notion 'horizon', which implies "the range of vision that includes everything that can be seen from a particular vantage point." (p. 301). He continues: "Applying this to the thinking mind, we speak of narrowness of horizon, of the possible expansion of horizon, of the opening up of new horizons..." (p. 301). The parallel to the present analysis is quite clear, as the reading processes gradually added to the thinking and understanding of the texts, to new horizons. Thus, the documents were initially read to get a general impression of what

ideas they communicate, which was anticipated would also give signals about highly regarded values (Bratberg, 2014) for the Norwegian education in the future. This initial reading revealed a focus on ‘deep learning’ as one main idea in the documents, and established a prior understanding that ‘deep learning’ is an issue which will be prominent in the future curricula. With that perspective in mind, the texts were close read in order to identify underlying, additional ideas that would fill in the picture about the authors’ (the policy makers’) implications of the notion ‘deep learning’. The interaction with the texts modified and extended the understanding and knowledge about the perspectives in the documents, for example, that deep learning would imply accompanying dimensions, such as creativity and critical thinking. The text analysis and the noticing of the authors’ trains of thought with respect to deep learning are of paramount importance, as ‘deep learning’ is the key dimension that connects the official documents to Holmbukt’s study (2007).

Holmbukt’s study⁶ (2007), which discusses teachers’ perceptions of interdisciplinarity and learning, suggests that there is a connection between deep learning, on the one hand, and interdisciplinary approaches, on the other. From that viewpoint, a similar reading and analysis process as described above was carried out, however now in order to identify information to support the argumentation on deep learning in the official documents, and to identify teaching approaches, and qualities thereof, that may foster deep learning. The findings of the analyses processes are discussed in Section 4 below.

4. THE EFFECT OF INTERDISCIPLINARITY ON STUDENTS’ LEARNING

4.1. Introduction

Holmbukt (2007) discusses English and Norwegian teachers’ perceptions of interdisciplinarity and learning, with a particular focus on literacies. ‘Literacy’ in the

⁶ Due to its qualitative and attitudinal nature, the study applied questionnaires and interviews in the collection of data. The research was conducted in one upper secondary school in Norway and three secondary schools in the north of England. The interviewee sample constitutes teachers from different departments, such as arts, health studies and media studies.

singular form implies ‘the ability to read and write’⁷ (Kalantzis & Cope, 2012; New Learning, n.d.), whereas ‘literacies’ in the plural (or ‘multiliteracies’) includes a wider variety of representational modes, such as visual, audio, tactile and spatial (Kalantzis & Cope, 2012). Importantly, however, literacies are not only viewed as modes of communication, i.e., a functional view. They also involve a pedagogy of literacies of which the overall aim is to prepare young people for adulthood, work life and social life, i.e., a bigger vision of their lives. Consequently, “literacies ... are central to all subject areas and all learning” (New Learning, n.d). The pedagogy of (multi)literacies, therefore, also include critical thinking about teaching and learning, and about teaching practices (New Learning, n.d). On these grounds, the present article equals ‘literacies’ with ‘learning’.

Interdisciplinary approaches could be claimed social constructivist since work processes and designs would materialise out of students’ priorities and collaboration. According to constructivist principles, students learn by investigating and solving problems, and building on and extending their knowledge (Vygotsky, 1962; 1978). To work in such student-centred ways, students should be given open, weak-framed tasks (an example from the subject of English is discussed in Holmbukt and Larsen (2016)). Bernstein (1974) explains the notion ‘framing’ as the following: “Strong framing entails reduced options; weak framing entails a range of options. Thus, frame refers to the degree of control teacher and student possess over the selection, organisation, and pacing of the knowledge transmitted and received in a pedagogical relationship” (Bernstein, 1974, p. 205-206). In interdisciplinary approaches, weak framing is favourable as it may facilitate variation and novelty in problem solving (see Holmbukt & Larsen, 2016) and potentially encourage creativity and critical thinking. Consequently, the fundamental values for the future Norwegian school, as discussed in Recommendation 19 S (The Standing Committee on Education, Research and Church Affairs, 2016), such as equality,

⁷ In a Norwegian context, where the subject of English in most cases is a non-native language, ‘literacy’ is still seen as ‘language skills’ or proficiency in communication.

solidarity, creativity, democracy and critical thinking, might be emphasised and supported more explicitly through interdisciplinary or PBL schemes.

The findings presented in Holmbukt's study (2007) indicate that interdisciplinary approaches may have positive effects on students' learning. Thus, Section 4.2. discusses potential higher learning outcome by making curricular connections, Section 4.3. sheds light on how learners benefit from variation and authentic, 'real life' themes. Section 4.4. addresses motivation and the value of interdisciplinary approaches in education, whereas Sections 4.5. and 4.6. briefly illuminate teachers' attitudes and school culture as influential factors in the design of teaching, and, thus, learning outcomes.

4.2. Making connections

The nature of interdisciplinarity is that elements of a given context are connected in some way. With respect to education, this could involve school subjects being integrated, and thus adding to a holistic view of knowledge:

... we did something in our English department with music, drama and history on the theme of war, and we also have done something on community, culminating in an evening's production ... of drama and display of art work and English work. ... Sometimes it's just a matter of making links between things that are artificially divided by discipline labels (informant in Holmbukt, 2007, p. 45).

A holistic view requires a recognition and understanding of the interconnections between disciplines; that the 'whole' of knowledge consists of a variety of smaller parts, i.e., subjects. From a hermeneutic viewpoint, it is about negotiating worldviews to gain understanding of the parts of a whole, and vice versa (Benton & Craib, 2011; Gadamer, 2004). Students develop their understanding of subject matters in a process of merging new information with their 'old' knowledge, a fusing of horizons (Gadamer, 2004). The cognitive process of negotiating information and connecting perspectives requires critical thinking, which, ultimately, may generate higher learning outcomes (Beattie, Collins &

McInnes, 1997; Smith & Colby, 2007; The Standing Committee on Education, Research and Church Affairs, 2016). To consider knowledge as a continuum instead of compartmentalised, single subjects, to allow students to “see a bigger picture and to use their different skills and knowledge in concert rather than separately” (informant in Holmbukt, 2007, p. 48) could benefit student performances:

...looking at new ideas then new words will emerge quite spontaneously, and I think you will get a layer-upon-layer approach, so if you’ve got the musician and the artist working together, then you will have ... quite a rich literary environment, new words perhaps that people have not come across, and new ways of putting ideas together ... and the vocabulary of the children is actually enhanced by that, I’ve actually seen it happen (Holmbukt, 2007, p. 55).

4.3. Variation and authentic learning

It is argued above that learning is about making connections. In primary and secondary education, learners may benefit from connecting practical and theoretical subject areas (see Holmbukt & Larsen, 2016). Such learning situations could involve authentic and practical problem solving that relates to the students’ lives outside school. An example is an interdisciplinary project in a primary school in 2014 (Holmbukt, 2016) where the pupils got assignments integrating English, Norwegian and social science, and practical knowledge about technology was applied and enhanced in making posters and films. The novelty of the tasks combined with use of communication technology presumably also contributed to bridging the gap between school and ‘real life’ (Cope & Kalantzis, 2000).

Interdisciplinarity has the potential to facilitate a variety of problem-solving strategies, for example, auditory, visual and kinaesthetic, or, simply address a wider range of media (including textbooks) providing new angles and the novelty students need to maintain interest. If learners’ reading of academic subjects is part of solving practical, authentic assignments, they may recognise the value of the reading. They might come to realise that academic subjects do have relevance to themselves as individuals. Integrating

academic subject areas and practical elements, and facilitating variation in learning approaches are possible not only in cross-curricular schemes, but, owing to the flexibilities of interdisciplinarity, such learning situations might be easier accommodated in integrated schemes. Holmbukt's (2007) informants note that the connection to "practical matters seems to be favourable" (p. 57) because it adds to the expansion of students' skills (see also Holmbukt & Larsen, 2016; Mulder, 2012).

4.4. Motivation and the value of interdisciplinarity

Pace, Homestead and McGinnis (1997) claim that "curriculum integration and motivation go hand in hand" (p. 8), and Glenn (2003) states that "integrated instruction is a worthwhile curricular approach as it motivates students and helps encourage...learning" (p. 148). An English informant in Holmbukt (2007) argues that a cross-curricular approach will extend literacy skills due to higher motivation among students:

... if children have positive experiences that will always lead to improved performances because they're interested and they want to do well, and literacy skills will grow as a consequence of that ..., if they are interested in something they will make the effort to read and write and to explore in whatever medium is appropriate....

When students recognise English and other subjects as in some way or other being necessary parts of the knowledge and competences needed in everyone's lives, it might be a driving force in their learning process (Holmbukt & Larsen, 2016; Pate & Nesin, 2011). Therefore, cross-curricular approaches may be rewarding with respect to discovering disciplinary interconnections, and can have a positive effect on the motivation to learn. Teacher informants in Holmbukt (2007) claim that integration extends motivation when the students realise that the academic subjects (such as English) are purposeful in their chosen programme of study, for example, art and design and media studies. This is a Norwegian informant's (N4) experience with film-making (Holmbukt 2007, p. 61):

An example of a successful task ... is the production of the video ‘Communication’... Here, the interdisciplinary approach was essential. N4 reports that her students were more energetic and motivated for this task, claiming, too, that they learn more by working with exercises where they have to control more disciplines and media.

Several informants (Holmbukt, 2007) claim that bringing together various media, such as art, music and technology, can expand literacy due to its motivating effect. The above discussion demonstrates that teachers believe interdisciplinarity is a valuable strategy in the classroom because it seems to have the potential to uncover and expose the continuum of subjects and feed students’ motivation. (Holmbukt, 2007; Holmbukt & Larsen, 2016; Glenn, 2003; Pate & Nesin, 2011). Interdisciplinarity and PBL orientations are flexible in various ways; for example, regarding combinations of subjects, assignment designs, facilitating diverse learning styles (i.e. learners’ preferred ways of acquiring knowledge), differentiated instruction and student collaboration. Holmbukt and Larsen’s (2016) discussion of integrating English with media studies is just one example addressing flexibility as a major concern. The overall aim in education should be supporting student engagement and making the curriculum more interesting and meaningful to all learners (see also Cope & Kalantzis, 2000, 2012; Hayes, 2010; Brough, 2012).

What this article argues so far, is that interdisciplinarity, due to its qualities of being student-centred and democratic, and supporting weakly framed student assignments, opens up to reflection and higher-order thinking. This may lead to increased learning and understanding (i.e., deep learning) of subjects, such as English, and of the interconnections between them. The study informants (Holmbukt, 2007) believe an integrated curriculum enhances learning as new knowledge and expertise are embedded during joint scheme work processes. All the skills students use in their work “are cross-fertilising each other” (English informant in Holmbukt, 2007, p. 56), for example when teachers combine literacy with science to reinforce and expand both (Holmbukt, 2007).

Glenn (2003, p. 147) confirms this line of thought, arguing that “the brain attempts to seek patterns and make connections between acquired pieces of knowledge”. The brain organises information in holistic schemes, “often in the form of a thematic web that combines... the knowledge gained” (Glenn, 2003, p. 147). These assumptions about the functioning of the brain support the epistemology of interdisciplinarity, i.e. ordering knowledge in ‘wholes’ instead of disconnected units. It might be claimed that integrated curricula are necessary for understanding the ever-increasing complexities of the world.

4.5. Teachers’ attitudes

Central to this view on integrated curricula is the learner as an autonomous individual whose inner motivation is kept alive by being in environments of varied learning activities (related to ‘real life’). Integrated schemes would fit into this epistemology. However, to succeed in blending interdisciplinarity into existing orientations, attention has to be paid to schools’ systemic levels and teachers’ own attitudes and thinking about teaching and learning (Holmbukt, 2007; Holmbukt & Larsen, 2016; Mulder, 2012; Pate & Nesin, 2011, Hopkins, 2014). To realise interdisciplinary work, schools have to define what interdisciplinary thinking implies (Mulder, 2012). What is needed is a “fundamental reappraisal of the philosophy and the very foundation that underpins the curriculum” (Burden & Williams, 1998, p. 189). If the ecocentre of a curriculum is a philosophy of interdisciplinarity, teaching critical and flexible thinking may be a cornerstone across several subject areas. Teachers’ priorities would be to teach children to think “to be able to face the demands of a rapidly changing world” (Burden and Williams, 1998, p. 189) and schools would organise the curriculum and advance teaching pedagogies to develop such skills (Holmbukt, 2007).

Teachers’ and school managers’ attitudes to subject integration and a problem-based orientation in learning are decisive to its success (Mulder, 2012). Engaged teachers are essential in new paths of learning, hence, it might be that those “who are interested and willing to take risks are vital parts of the pack in school and curriculum design”

(Holmbukt 2007, p. 68) (See also Kaufman, Moss & Osborn, 2003; Mulder, 2012; Pate & Nesin, 2011; Brough, 2012; Hopkins, 2014).

4.6. School culture

However, Holmbukt's (2007) study finds that despite the informants' positive attitudes to interdisciplinary approaches, they are not reflected in their teaching practices⁸. The Norwegian teachers note the absence of a clear policy on integrated curricula, which indicates that such strategies are not commonly used and not part of the culture in the particular school. It is further claimed that the senior management team should act on the issue and initiate such teaching approaches. This is supported by Erickson (1998, p. 156-157. See also Mulder, 2012.):

Principals are critical to the success of any schoolwide innovation or change. Teachers look to their leaders for guidance and support. When we are talking about something as fundamental to the learning process as the structures for curriculum and instruction, then the principal must be knowledgeable.

5. CONCLUSIVE REMARKS

The present article sheds light upon probable changes in the Norwegian national curriculum, which are planned to take effect from 2020. The official documents Norwegian Official Reports NOU 2014:7 and 2015:8 (Kunnskapsdepartementet, 2014, 2015), Report to the Storting 28 (Kunnskapsdepartementet, 2016) and Recommendation to the Storting 19 S (The Standing Committee on Education, Research and Church Affairs, 2016) state that learning conditions should be facilitated for learners to develop the values and knowledge they need for their future. A key notion in this context is 'deep

⁸ It is important to bear in mind that due to the size of the study no conclusions about a whole teacher population can be drawn, but the study might still indicate potential tendencies in a larger sample of schools and teaching professionals.

learning' which implies acquisition of more in-depth knowledge and extended understanding of subject areas. The present article argues that learning is about making connections, whether it be noticing connections between isolated subject areas, or between theoretical concepts and practical tasks. Further, the article argues that interdisciplinarity encourages learning as it typically works across subject areas and supports learners in discovering the disciplinary connections. Interdisciplinary learning orientations offer necessary flexibilities, which are required in education that is democratic, for example, facilitation of learning styles, motivation and variation. Hence, the article argues that interdisciplinarity and deep learning are concepts that work in concert, where the one empowers the other.

Among the central values for education pointed out in the official groundwork documents are collaboration, critical thinking and creativity. It is argued that these values come into play in learning activities with weak framing in both English and other subjects (see Holmbukt & Larsen, 2016). They feed “the desirable aim of teaching children to think” (Holmbukt & Larsen 2016, p. 71), “to analyse situations, to think critically, to solve problems logically and also creatively, and to face life’s revelations with judgement, intelligence and flexibility” (Burden & Williams 1998, p. 189). Along with the official documents, Holmbukt’s (2007) study on interdisciplinarity and learning is central in the present article. Its discussion is based on a limited sample of teachers, yet despite these limitations, it might bring to the fore dimensions of didactics, which may leave educational professionals with a greater awareness about interdisciplinary approaches, and their relative potential for deep learning. By objecting to integration, “instead of encouraging excellence, we may be limiting our students’ intellectual options” (Rush 1981, p. 19) in English as well as in other subjects.

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