Towards a didactic model for multidisciplinary teaching - a didactic analysis of multidisciplinary cases in Finnish primary schools

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ABSTRACT
This article investigates multidisciplinary teaching practices through models of General Didactics. Multidisciplinary education is gaining interest on international and national levels through policy reforms. Research on multidisciplinary teaching practices is often descriptive and there is a lack of theories to support teachers. General Didactics on the other hand builds on a long tradition of models and concepts (e.g., content, aims, and methods) relevant for the autonomous teacher who reflects on how to structure and execute the teaching practice. The didactic models of Wolfgang Klafki and Wolfgang Schulz were used when analysing two cases of multidisciplinary teaching in two Finnish primary schools. The question addressed is in what ways General Didactic principles, as defined by Klafki and Schulz, can be identified in the multidisciplinary teaching practices. The method of study is comparative, thematic analysis. The article suggests a theoretically and empirically informed didactic model for multidisciplinary teaching. Identified framing factors (school culture, collaboration, curricula) and shaping factors (subjects, competences, values and aims of education, student needs and interests, contemporary issues, methods) are included in the model for multidisciplinary teaching. The model may support teachers in planning and reflecting on multidisciplinary teaching. To strengthen its validity, the model needs to be empirically tested in different educational contexts.

KEYWORDS
Multidisciplinary teaching; general didactics; Didaktik; Finnish primary education; curriculum reform

Introduction
Multidisciplinary teaching is not a new concept in education. Yet, it has re-emerged in the international discourse of twenty-first century education that emphasizes multidisciplinary, competence-based, and collaborative activities (McPhail, 2018). Fast technological and societal developments are generating new modes of and needs for knowledge. The abundance of information and the complex problems of the global world call for changes in educational practices. Schools are challenged to educate citizens with a broad set of knowledge, including both disciplinary and multidisciplinary knowledge and skills, by which they can face an unpredictable world (Klausen, 2011; Tynjälä & Gijbels, 2012).

The call for multidisciplinary education in policy reforms challenges schools and pedagogies to reconsider educational objectives, teaching methods, and teachers’ roles (Lonka & Westling, 2018). Multidisciplinary education relies on the idea of combining knowledge, theories, and methods from different subjects to meaningful wholes (Klausen, 2014). Unlike subject teaching, the...
multidisciplinary teaching approach lacks a developed pedagogical framework. The subject-based and mono-disciplinary structures of schools and teacher education do not necessarily provide support for teachers who implement multidisciplinary teaching (Niemelä & Tirri, 2018). Previous research has reported on local variations and ambiguity in multidisciplinary teaching practices due to the lack of theoretical underpinning (Braskén et al., 2020; Lam et al., 2013; Rénnie et al., 2012).

This article investigates the potential of General Didactics as a frame of reference for planning, executing, and reflecting on multidisciplinary education. General Didactics introduces concepts relevant for any teaching practice, such as content, aims, and methods (Hopmann, 2007). It is useful for teachers reflecting on what the content and aims are, who the learner is, and what the appropriate methods are. Didaktik assumes an autonomous teacher who reflects on different dimensions of the teaching practice in relation to the curriculum and other framing factors (Jank & Meyer, 2006). General Didactics and the two classic didactic models of Wolfgang Klaflki and Wolfgang Schulz inform the article’s theoretical framework. The context for the study is two multidisciplinary cases in two Finnish primary schools. The question addressed is: In what ways can General Didactic principles, as defined by Klaflki and Schulz, be identified in the multidisciplinary teaching practices? The method of study is comparative, thematic analysis. Based on the analysis, we aim to suggest a theoretically and empirically informed didactic model for multidisciplinary teaching.

The article continues with a concept clarification of the multidisciplinary approach to teaching and learning, followed by an overview of multidisciplinary education in Finland as the study context. Afterwards, the theoretical framework of General Didactics is outlined before the two cases are presented and analysed. The article ends with a discussion on the implications for multidisciplinary teaching and the didactic model suggested based on this study.

**A multidisciplinary approach to teaching and learning**

Multidisciplinary education has gained a lot of interest in recent years. Yet, the concepts used to define it are diverse. Research literature employs concepts such as multidisciplinary or interdisci-

nary education, curriculum integration, integrated teaching, and cross-curricular education. In this article, *multidisciplinary education* is used when referring to all forms of education in which two or more subjects are connected. The concept of multidisciplinarity refers to an understanding of disciplinary perspectives as cornerstones in any integrated teaching practice (cf. Juuti et al., 2015; McPhail, 2018).

Despite the definition diversity, Nollmeyer et al. (2016) identify two fundamental principles in all forms of multidisciplinary approaches to teaching and learning: Firstly, *connections between disciplinary content and skills* are addressed, and secondly, *meaningful and student-centred collaborative experiences* are encouraged. The principle of connection is central also to Klausen (2014) as he concludes that the multidisciplinary approach connects elements which otherwise would have remained unconnected. Disciplines, knowledge, methods, goals, people, and backgrounds are brought together through the multidisciplinary collaboration.

The principle of student-centeredness in multidisciplinary education has its roots in the constructivist and socio-cultural theories of learning (Tynjälä & Gijbels, 2012), asking what needs and interests of the learner that should be in focus of educational activities. As contemporary societal changes are said to require citizens with broad knowledge and multiple competences, multidisciplinary education is proposed to educate citizens with comprehensive knowledge, transversal competences, and abilities to collaborate and engage in the communal knowledge-building (Lonka & Westling, 2018; Lähdemäki, 2018; cf. OECD, 2020; Willbergh, 2015). To support such (multidisciplinary) learning, Tynjälä and Gijbels (2012) suggest that educational activities should pay attention to the learner’s background of previous knowledge, conceptions, and metacognitive and self-regulated skills. Multiple representations of knowledge and various forms of collaborative learning should facilitate the learning process, and it should be characterized by problem solving and active knowledge processing rather than knowledge reproducing (cf. Selander, 2017).
In this article, multidisciplinary teaching is distinguished from the wider approach of multidisciplinary education that includes the dimension of students’ learning. Through a didactic frame, the article zooms in on how teachers plan and implement multidisciplinary teaching in their practices. The empirical data supports the teacher-focused theme as the data were collected through teacher interviews and observations of the teachers’ practices in the two cases. Multidisciplinary teaching, as outlined above, sets challenges for teachers schooled in mono-disciplinary educational structures (Niemelä & Tirri, 2018). To support multidisciplinary learning processes, teachers need a broad pedagogical knowledge. For example, Niemelä and Tirri (2018) mention comprehensive curriculum knowledge, as important to identify relevant intersections of different subjects, and knowledge of the purposes and values of multidisciplinary education, to support teachers in planning goal-directed multidisciplinary activities (cf. Wallace et al., 2007). Studies have further reported on the importance of supportive structures, including organizational arrangements of flexible timetable, planning time, dedicated teaching space, and teaching resources, as well as inspired leadership to enable effective multidisciplinary teaching practices (Applebee et al., 2007; Braskén et al., 2020; Percival, 2014; Wallace et al., 2007).

**Finnish multidisciplinary education—a dialogue between national and local curricula**

Education in Finland has developed in relation to the German Didaktik tradition and the ideas of autonomous teachers and individual identity building among students. Curricular thinking has been guided by respect for disciplinary knowledge (Vitikka et al., 2016). During the last decades, there has been a shift towards more normative and regulative educational policies, of which the latest national curriculum of 2014 is one example (Haapaniemi et al., 2020). The Finnish curriculum reform of 2014 introduced mandatory competence-based and multidisciplinary teaching in basic education. The students should be prepared to apply their knowledge and to engage in the communal building of knowledge through participatory explorative learning that links different fields of knowledge (Lähdemäki, 2018).

The national curriculum of 2014 rests on a dual structure of subject-based and multidisciplinary education. The curriculum obliges schools to provide at least one multidisciplinary learning module every school year for all students. Additionally, seven transversal competence areas are defined in the curriculum that are related to the subject-based and the multidisciplinary practices. The competence areas are: (1) thinking and learning to learn; (2) cultural competence, interaction, and expression; (3) managing daily life; (4) multiliteracy; (5) ICT competence; (6) working life and entrepreneurial competence; and (7) participation, influence, and building a sustainable future (Finnish National Agency for Education, 2014).

The Finnish curriculum system rests on strong local autonomy for municipalities and schools. The national curriculum includes objectives and values of education, and core contents of all school subjects. It determines basic guidelines and a common structure that serve as a base for the local curriculum work (Vitikka et al., 2016). Regarding multidisciplinary education, the national curriculum allows schools to implement it locally as they develop their local curriculum. The national curriculum is open to schools employing a partial or entire multidisciplinary school curriculum if the objectives of all subjects are met. Two different approaches to school curricula are found in the two cases of this article (see more in the analysis). In a recent study by Haapaniemi et al. (2020), Finnish lower secondary teachers perceived that the local curriculum development work and multidisciplinary teaching strengthened their teacher autonomy. The sense of autonomy was consolidated by the teacher collaboration, which enabled professional development and collaborative reflections.

**General Didactics as a comprehensive framework for teachers**

Didaktik falls back on a long tradition of developing theories about teaching and learning in Europe. The monk Hugh of Saint Victor (around 1120) identified three core principles for formal teaching or
Didaktik: (1) orderly knowledge, (2) orderly teaching, and (3) the precondition of the students’ orderly approach to learning (Hopmann, 2007). Among others, J.A. Comenius (1592–1670), Wolfgang Klafki (1927–2016), and Wolfgang Schulz (1929–1993) developed the ideas further. The abovementioned principles are still present in the general didactic triangle that includes interactions between the teacher, the student, and the content. The principles assume an autonomous teacher who reflects on what content is appropriate depending on the background and previous knowledge of the students. The students meet the content and reflect on it. This leads to individual processes of Bildung, where the students understand the content and thereby can make ethical judgements and act on behalf of the common good. Bildung is generally considered a moral process of self-cultivation in relation to a specific culture although many different understandings of the concept exist (Horlacher, 2016). In the Didaktik tradition, curriculum guidelines are suggestions that help teachers to identify general content, while more detailed or specific decisions about the content are up to the teacher. For these reasons, it is difficult or impossible to identify general competences or other measurable factors since each process is defined by the diverse interactions between the teacher, the student, and the content (Hopmann, 2007).

Didaktik always includes the intentions of the teacher (cf. orderly teaching). It is normative as certain values and contents are included while others are excluded. For example, to Comenius education was closely related to the values of his time and context of the sixteenth century, namely Christian values and living a good Christian life. In a modern view, education is an open process in which students learn how to live well and function in a society without predetermined goals like the ones Comenius represented in his Didaktik (Pikkarainen, 2012). Thus, Didaktik identifies the importance of teachers reflecting on the values they (unintentionally) implement during teaching. This reflective practice leaves room for doubt when the consequences of the teaching practice are made obvious through analyses of the relation between theory and practice. Didaktik is signified by a causal tension between theory and practice. This causality means that the intentions of the teacher always are deeply entwined with, for example, the content, the aims, and methods of teaching as well as the interactions with and within the class. Potential results of the teaching practice are dependent on above-mentioned factors (Bengtsen & Qvortrup, 2013).

Bildung-centred /Critical-constructive Didaktik—the work of Wolfgang Klafki

Wolfgang Klafki (1927–2016) is considered a leading representative of German pedagogy and the tradition of Bildung-oriented Didaktik, which has its roots in the Human Science Theory of Education. A central element in the tradition is the principle of twofold autonomy in education, meaning that teachers should find a balance between passing on the cultural tradition of Bildung and encouraging the right to self-determination and self-development of the future generation (Arnold & Koch-Priewe, 2011).

Based on this theory, Klafki designed a model for lesson planning. The model implies that all teachers should be able to justify the selection of instructional content. To support teaching preparation, Klafki (2000) defined five questions of a ‘didactic analysis’: (1) Exemplary value: What wider or general sense of reality is exemplified and revealed to the learner by the contents? What basic phenomenon or principle can be grasped by dealing with these contents as an example? (2) Contemporary meaning: What significance does the content in question or experience, knowledge, ability, or skill to be acquired through this topic already have in the minds of the children in my class? (3) Future meaning: What constitutes the content’s significance for the children’s future? (4) Content structure: How are the contents structured? (5) Pedagogical representation of the ideas: What cases, phenomena, situations, experiments, people, events can be used to make the content interesting, worth asking questions about, and comprehensible for the children at their level and grade? Through the didactic analysis, the teacher critically analyses curriculum content and transforms it into meaningful content for the students.
The Bildung-centred Didaktik tradition has been criticized for not taking into consideration other components of teaching besides content and potentials of instruction (Jank & Meyer, 2006). The close relation to Bildung was another reason for critique; it was deemed too abstract and disconnected from practice, as it was not empirically evaluated. Bildung was perceived as a bourgeois ideal that did not empower societal change. The critique encouraged Klafki (1997) to develop his model into the critical-constructive didactics known today. The critical position comes from the main goals Klafki suggests for education: self-determination, co-determination, and solidarity. These goals are poorly accomplished in society, and the approach is thereby constructive. The constructive position proposes an educational praxis of utopia, striving for a more democratic and human school. The Didaktik tradition should design and test possible ways of teaching- and learning processes that support such education. The critical-constructive model supports teachers to identify contemporary issues (key problems) that are important for humankind and to take them as a starting point for the teaching practice, while including the interests of the students to support them in becoming democratic citizens (Klafki, 1997).

Learning-centred/Teaching-centred Didaktik—the work of Wolfgang Schulz

The initiator of the learning-centred approach was Paul Heimann (1901–1967). Heimann wanted to develop a new Didaktik model that was based on empirical research on teaching and learning, not Bildung or ideologies (Keiding, 2013). Wolfgang Schulz (1929–1993) continued the work further. Central to the model is teaching planning through a structural analysis, consisting of four fields of decision-making: (1) intentions, (2) themes or topics, (3) methods, and (4) media. Teachers should also consider the (5) socio-cultural and (6) individual conditions of their class. The six factors are suggested as formal constants in every teaching situation. Teaching cannot take place without the teacher considering her/his intentions of teaching, the theme and topics of the lesson, and methods and media that will be used. These four fields are deemed decisional factors. The teacher is also bound to certain conditions such as socio-cultural and individual conditions, labelled as conditional factors that should be acknowledged and clarified by the teacher (Jank & Meyer, 2006).

The structural analysis is complemented with a factor analysis, including reflections on different factors relating to the teaching practice. Teaching practices are imbued with normative factors like values and traditions, as well as political, religious, and philosophical interests. Teaching practices are also framed by factors of funding, political guidelines, and organizational issues. Furthermore, teachers need to reflect on effective teaching strategies and their own teaching style in relation to personal experiences and relevant research. The factor analysis is an important addition to any didactic analysis as the teacher is never a neutral conveyer of knowledge but always a conditional factor (Keiding, 2013).

The variability and controllability of lesson planning are central elements in Schulz’s revised teaching-centred model, meaning that teachers need to clarify what students are supposed to do during a lesson and how the effect of teaching can be assessed. This implies an analysis of differences between the teaching plan and the delivered teaching. Schulz also included a notion of three levels of teaching planning into his revised teaching-centred model: (1) strategic planning, whole term or year planning, (2) outline planning or sequence planning, (3) process or lesson planning. To support the democratization of schools and the emancipatory relevance of education, students should be involved in the planning of teaching. Moreover, Schulz suggests that students and parents should be equal partners in teaching planning. He presents a utopia for ‘students’ school’, emphasizing that education could become more exciting and human if the frameworks of school would be altered (Arnold & Koch-Priewe, 2011; Jank & Meyer, 2006).

Combining the models of Klafki and Schulz

The critical-constructive model and the teaching-centred model became more alike over time. In the revised teaching-centred model, Schulz included a political-emancipatory Bildung-oriented
programme that rejected the value-neutral aspirations of Heimann. Solidarity, citizenship, and autonomy were presented as central aims of education. Furthermore, the idea that education needs to be negotiated by teachers and students through dialogue is a didactic implication of a *Bildung*-oriented theory (Jank & Meyer, 2006; Keiding, 2013; see also Bengtsen & Qvortrup, 2013).

Arnold and Koch-Priewe (2011) as a fruitful way of capturing the central concepts of General Didactics have combined the works of Klafki and Schulz to a theoretical framework. The authors have designed a model consisting of six central categories that combine the two models (Arnold & Koch-Priewe, 2011). The six categories are: (1) lesson planning as the analysis of the individual and socio-cultural conditions of students and the teacher, (2) planning as relating the actual lesson to the unit and the unit to the yearly plan, (3) discussing and establishing general aims and intentions, and critically analysing curriculum requirements, (4) thematic analysis and decision-making, (5) choosing teaching methods, and (6) choosing media (for an extended model description, see Table 1). The analysis of the two empirical cases will follow the structure of the categories.

### The empirical cases

The multidisciplinary cases were conducted in two Finnish primary schools in spring 2018. The data collection followed a qualitative case study design with teacher interviews and classroom observations as main data collection instruments. The interviews were audio recorded and the observations were documented through field notes. The cases are separately analysed through subject didactic lenses in Mård (2020a) and Mård (2020b), in which extended case descriptions and data collection procedures are reported. In this article, the cases are compared as a multiple case study (Hamilton & Corbett-Whittier, 2013) through a General Didactic lens. Mård has been the responsible and executive researcher for data collection and previous analyses of the cases, while Hilli has contributed to the analysis of the present study.

### Case Entrepreneurship

Case Entrepreneurship was a week-long multidisciplinary module on the theme of entrepreneurship, conducted by five primary teachers and 68 students (aged 12–13) in grade 6. The school setting is a large urban public primary school. Knowledge and/or skills from social studies, visual arts, Swedish (L1) and literature, home economics, and mathematics were integrated in the module. The teachers reported that their planning process started with the selection of the theme, after which they
reflected on and decided what content and skills related to entrepreneurship that their students would need. As a last step of preparation, they noted which subjects that were included. All teachers had 15–27 years of teaching experience.

A main goal of the module was to foster students' entrepreneurial competence through theoretical and practical studies. The module included theoretical lessons, practical lessons, workshops, and business visits. The theoretical lessons consisted of teacher-led lectures and student activities (mostly group discussions) on the themes of entrepreneurship and enterprise. In the practical lessons, students analysed local business logos, produced advertisements, and prepared a school café, which was realized in the last two days of the project. The workshops included lectures and student activities on the lifecycle of a business, Finnish salary and tax systems, job applications and curriculum vitaea, and creative advertisement. Representatives from four local business organizations visited the school and presented their business and the life of enterprise. In the theoretical and practical lessons, students worked in their ordinary class groups, while they worked in mixed groups in the workshops and business visits. The module was evaluated through daily student reflections and an electronic student evaluation form in the end.

**Case Renaissance**

Case Renaissance was an 8-week-long multidisciplinary module on the theme of Renaissance, conducted by one primary teacher, with 15 years of teaching experience, and her class of 18 students (aged 12–13) in grade 6. The module included history, religious education, visual arts, and Swedish (L1) and literature. The students worked with seven subunits in non-chronological order: (1) Renaissance people, (2) Renaissance artwork, (3) Shakespeare’s Hamlet, (4) Martin Luther and the Reformation, (5) Mikael Agricola, (6) Finland’s incorporation into Sweden, and (7) Gustav Vasa and the Great Power Period of Sweden. Work processes followed a common structure of a teacher-led initial review of important facts on the theme of the subunit. Afterwards, students read factual texts and processed their reading by answering questions on worksheets or making mind-maps. Additional assignments were film synopsis writing of Shakespeare’s Hamlet, research on central Renaissance people, and Renaissance-related art assignments. Alongside a formative evaluation in the end, students’ learning outcomes were assessed through Kahoot! quiz games, with questions about the content.

The setting of case Renaissance differs from most Finnish schools. The school is a rural public primary school that follows a multidisciplinary school curriculum. This means that the schoolwork is divided into multidisciplinary modules lasting six to eight weeks. In the modules, curricular content from all subjects (except languages, gymnastics, and mathematics) are merged into larger themes. Despite the multidisciplinary educational structure, the students get subject-specific grades according to Finnish legislation. The school acknowledges subject matter knowledge as cornerstones in education but uses multidisciplinary education to make learning more meaningful for both students and teachers, as they come to work together and experience phenomena through different disciplinary lenses. The multidisciplinary school curriculum was first adopted in fall 2017 as a way of reforming the school (see more in the analysis and Mård, 2020b).

**The comparative analysis**

The comparative analysis follows the structure of the integrative model by Arnold and Koch-Priewe (2011, see Table 1), which means that the two cases are analysed through the categories presented in the model. The question guiding the analysis is as mentioned: *In what ways can General Didactic principles, as defined by Klafki and Schulz, be identified in the multidisciplinary teaching practices?* Finally, the results are discussed with a presentation of our suggested didactic model for multidisciplinary teaching.
Lesson planning as the analysis of the individual and socio-cultural conditions of the students and the teacher

Case Renaissance exemplifies how the socio-cultural conditions of the class and the school culture affected the multidisciplinary teaching. The school of case Renaissance had suffered from an authoritarian leadership for several years which resulted in both teacher and student exhaustion. To reform the school, an external pedagogical expert was hired to lead the implementation of a new educational school strategy. The intentions of the reform work were twofold, to increase student learning motivation and outcomes, and to improve the social environment of the school. During the first year of the new strategy’s implementation, 2017–2018, the school staff was already experiencing an improvement. The class of study was affected by the school’s previous situation, and consequently, many students lacked study skills and had weak content knowledge of many subjects. In the interview, the teacher saw multidisciplinary education as a way to include a variety of teaching methods. Nevertheless, the individual needs of her students and the socio-cultural conditions of the class directed her teaching, as she wanted to facilitate the students’ current and future studies. Therefore, the module included many reading comprehension exercises and writing assignments. To develop the competence of taking responsibility for the schoolwork, all students were personally responsible for completing all the module assignments as they followed individual study paths.

In case Entrepreneurship, the socio-cultural conditions of the students were not similarly exceptional but still present in the teachers’ agency. The teachers considered the young age of their students when they planned the sequencing of lesson segments. Their intention was to provide a healthy mix of theoretical and practical lessons in the project of entrepreneurship, to facilitate student engagement and avoid a heavy workload of lecturing sessions. The curriculum and its political guidelines as a conditional factor affected how the teachers related to the theme of entrepreneurship. Since the national curriculum favours competence-based education and entrepreneurial citizenship, the teachers designed the module to foster students’ entrepreneurial competences.

Planning as relating the actual lesson to the unit and the unit to the yearly plan

The teachers related their multidisciplinary practices to the yearly plan in relation to the different structures of their schools. The school of case Entrepreneurship employed a subject-based school curriculum, which made the multidisciplinary modules separated from the ordinary education. For one week, all teachers and students in the school worked with multidisciplinary modules. Every grade conducted its own module, meaning that all sixth gradeteachers planned and implemented the shared module of entrepreneurship with their classes. The teachers decided on themes, content, and methods themselves, and there were no obligations of relating the modules to the ordinary year plan. The module of entrepreneurship was not assessed like other teaching activities in the school as the teachers regarded it to be a bonus to the ordinary education.

In the school of case Renaissance, which used a multidisciplinary school curriculum, the multidisciplinary modules were included in the ordinary education. The Renaissance-module was one module of four in the year plan for grade six. The content and subjects of the module were consciously selected in relation to the other modules, as the school’s intention was to cover all curriculum content through the modules.

Discussing and establishing general aims and intentions, critically analysing curriculum requirements

The school culture, socio-cultural conditions, and the curricula had an impact on how the teachers considered the aims and intentions of multidisciplinary education. Interestingly, the ordinary subject-based school culture of case Entrepreneurship did not imply multidisciplinary teaching that relied on
subject-specific objectives or content. Instead, the teachers set only competence-based aims for the multidisciplinary module. They referred to entrepreneurship as one of the seven transversal competences in the Finnish national curriculum and set an overarching aim of developing students' entrepreneurial competences and skills. Although they drew on disciplinary perspectives of social studies, visual arts, Swedish (L1) and literature, mathematics, and home economics, they did not include subject-specific curricular objectives in the module aims. As their everyday teaching was subject-based, the teachers seemed to perceive other strategies as more important during one week of thematic, multidisciplinary teaching.

The multidisciplinary school culture in case Renaissance supported a view of multidisciplinary education to build on subject-specific objectives and content. The aims of the project included curricular objectives of history, religious education, visual arts, and Swedish (L1) and literature. The overarching aim was to enhance students' knowledge of the Renaissance and their awareness of its legacy in present society. According to the teacher, knowledge of the Renaissance is important general knowledge that every citizen should have in order to understand the modern society. Through the multidisciplinary lens, she intended to provide a broad view of the Renaissance era to her students. Besides, the school culture and the socio-cultural conditions forced the teacher to set aims of developing the students' study skills.

Multidisciplinary education as a mandatory element of the national curriculum was positively addressed by the teachers in both cases. They all referred to multidisciplinary education as an approach suitable for modern teaching that stresses holistic and student-centred education. In case Entrepreneurship, the teachers regarded multidisciplinary education to be a natural part of their teaching as primary school teachers. Hence, they found that the curriculum-mandated multidisciplinary teaching did not bring major changes to their already holistic everyday teaching. In case Renaissance, the curricular guidelines had inspired the school leadership to adopt a multidisciplinary school curriculum. The approach was used to reform the school since it was perceived as a student-centred, motivational, and effective way of teaching. According to the teacher of study, the multidisciplinary approach suited her group of students well. As the students followed their individual study paths of completing the module tasks, she could provide support according to every student's personal needs.

**Thematic analysis and decision-making**

In case Entrepreneurship, the teachers were free to decide on any themes they identified important for the multidisciplinary modules. The theme of entrepreneurship was selected in consensus as a preparation for a later visit to Yrityskylä since the teachers previously had experienced having too little time to prepare the students for the visit. The teachers addressed the value of entrepreneurship as an overarching value and a transversal competence of Finnish education. Through actors like Yrityskylä, external societal stakeholders supported the schools' entrepreneurial education.

The process of selecting multidisciplinary themes in case Renaissance was a shared activity of all teachers in the school. As a first step of implementing the new multidisciplinary school curriculum, they thoroughly reviewed the national curriculum together. Subsequently, they reflected on possible combinations of the different subject content for each grade. Out of the process, the themes and content of all multidisciplinary modules were established. The teacher of each grade planned the detailed content, aims, and methods individually. Thus, the process of thematic decision-making included both collaborative and individual elements.

Despite the different approaches of thematic decision-making, the teachers in both cases, through didactic analyses, related the content to contemporary and future meanings and needs of their students. Entrepreneurship was described as an important competence in students' daily life, which would help them to manage school assignments and take responsibility for schoolwork. Entrepreneurship was concurrently emphasized as a prerequisite for successful participation in future work life. Knowledge of the Renaissance was defined as important knowledge for all citizens, including
sixth-graders. The acquisition of study skills through the content of the Renaissance was related to both current and future studies as fundamental in grasping the study content and managing duties.

**Choosing teaching methods and media**

In both cases, the teachers chose teaching methods and media that would serve the established aims and intentions of the projects. The methods of lecturing, discussions, and practical training were selected in case Entrepreneurship to support the development of students’ entrepreneurial competences through both theory and practice. Through the visits of local entrepreneurs, a dialogue with society and actors outside school was created. In case Renaissance, the teacher based her decision of aims and methods on the needs of her students. As the main aims were to enhance students’ knowledge of the Renaissance and develop their study skills, she designed a module consisting of knowledge acquisition by reading comprehension exercises, writing assignments, and research tasks. Both Klafki and Schulz support the common processes of methodical considerations as the last phase of teaching planning. When the elements of themes, content, and aims are selected, the method- and media-related decisions should follow naturally as they are dependent on the others. This was the case of the teachers in this study.

*Student activity* was a central methodical principle in both cases. Teacher lectures introduced the themes while the emphasis was on students’ own work. In case Entrepreneurship, the practical lessons and workshops were designed for student activity as the students worked individually or in smaller groups with the assignments. In case Renaissance, the students completed all assignments in the sub-units through individual study processes. The two modules resulted in products of collaborative or individual work: in case Entrepreneurship as a school café and in case Renaissance as student portfolios.

Teacher perception on *evaluation* of multidisciplinary teaching varied in the two cases. In case Entrepreneurship, the teachers worked towards competence-based aims and used formative assessment as the only assessment tool. Students were encouraged to reflect daily on their activities and learning gains, either individually, in pairs, or in whole class. The reflections alternated between oral and written formats. Summative assessment of measuring student’s content knowledge was perceived by the Entrepreneurship-teachers as a non-appropriate tool in the multidisciplinary teaching that focused on developing students’ competences, attitudes, and life skills. In case Renaissance, the aim of enhancing students’ content knowledge of the Renaissance resulted in summative assessment through Kahoot! quiz games, with questions about the content. The Renaissance module was also formatively evaluated through a joint teacher and student reflection on the student’s learning process in the end. As a tool for the formative evaluation, the school had designed its own assessment taxonomies.

**Towards a didactic model for multidisciplinary teaching**

The aim of this article was to identify didactic strategies in teachers’ planning and implementation of multidisciplinary cases in primary education. The question addressed in the article was in what ways General Didactic principles, as defined by Klafki and Schulz, can be identified in the multidisciplinary teaching practices. Previous research has stated that multidisciplinary teaching is a complex practice due to its lack of theoretical underpinning (McPhail, 2018; Niemelä & Tirri, 2018). We acknowledge these concerns and suggest General Didactics as a useful tool for planning and implementing multidisciplinary teaching. General Didactics and the empirical cases in two Finnish primary schools presented and analyzed above are the basis for the didactic model for multidisciplinary teaching we suggest below.

According to Schulz, all teaching situations are framed by *conditional factors* that should be acknowledged and clarified in teaching planning (Jank & Meyer, 2006; Keiding, 2013). This study has indicated that the conditional factors of the multidisciplinary teaching practices are of considerable
meaning. The conditional factors of school culture, collaboration, and curricula determine how the multidisciplinary teaching unfolds. In our suggested model, these three conditional factors surround six dimensions (subjects, competences, values and aims of education, student needs and interests, contemporary issues, methods) of multidisciplinary teaching (Figure 1). The model is inspired by a hermeneutic helix, viewed from above, which visualizes the dynamic, open, and reflective processes of multidisciplinary teaching planning and implementation. The hermeneutic character makes the model non-static, meaning that the factors and dimensions are related to one another in complex relationships, and all of them are connected to the center.

The school culture, including size, traditions, resources, and visions of the school, plays an important part in framing and forming the classroom teaching (cf. Kansanen, 1997). The individual and socio-cultural conditions of teachers and students affect the group dynamics and teaching activities of the school. For example, in case Renaissance the school culture influenced the teacher’s selection of methods to support basic study strategies among the students. The school culture, informed by the school curricula, further determines the structure of multidisciplinary teaching in case it is implemented on daily basis or during specific periods.

Collaboration is a central feature of multidisciplinary education as it relies on communal knowledge building (Klausen, 2014; Lähdemäki, 2018). In this study, we found teacher collaboration to be a requisite conditional factor. In case Entrepreneurship, the five teachers together planned and implemented the module with their students. In case Renaissance, the multidisciplinary themes were selected in a joint teacher operation, while the teacher herself planned the module in detail and implemented it. Teacher collaboration can thus be utilized in various ways, providing opportunities for both shared sense-making and individual reflection (cf. Haapaniemi et al., 2020).

Figure 1. A didactic model for multidisciplinary teaching (Mård & Hilli, 2020).
The national and local curricula form the school culture and frame the teaching. New curricular guidelines may change the teaching practices and affect teacher attitudes. The mandatory element of multidisciplinary education in Finnish curricula was positively regarded by all teachers of this study, although they related their multidisciplinary modules differently to the ordinary education and to disciplinary thinking. In Finland, the mandatory multidisciplinary education challenges teachers to didactic reflections on when and why multidisciplinary education is a relevant approach. Multidisciplinary education is best used when it supports the established aims, and teachers therefore should consider how the content could best be taught, rather than how it could be taught multidisciplinary (cf. Klausen, 2011). Such reflections would be an important part of the factor analysis, recommended by Schulz, as a way of making the implicit explicit in mandatory multidisciplinary education (Jank & Meyer, 2006; Keiding, 2013; cf. Bengtsen & Qvortrup, 2013).

The general didactic triangle illustrates the interactions between teacher, student, and content in teaching practices (Hopmann, 2007). In multidisciplinary teaching, the content is a combination of connected disciplinary content and skills (Klausen, 2014). This leads to dynamic and reflective processes among teachers. Decisions on subjects, competences, aims and values need to be made in relation to the students. According to the Didaktik tradition Klafki represents, deciding the content is the starting point of teaching planning. The teacher reflects on what content that is of current and future meaning to the students in the light of their Bildung processes (Klafki, 2000). In multidisciplinary education, the task of identifying meaningful content is important, as the content for it is not specified in the curriculum. This study found multidisciplinary content to include five dimensions that the teachers considered in relation to one another: subjects, competences, values and aims of education, student needs and interests, and contemporary issues. The multidisciplinary content is implemented in teaching practice through relevant teaching methods.

The content of multidisciplinary teaching includes curricular content and objectives of one or several subjects. Teachers are challenged to navigate and connect aims, content, and methods of the different subjects in focus (Klausen, 2014; Nollmeyer et al., 2016). The subjects can be explicitly addressed as in case Renaissance or implicitly addressed as in case Entrepreneurship. In case Renaissance, curricular objectives of history, religious education, visual arts and Swedish (L1) and literature were combined in the multidisciplinary studies of the Renaissance. In case Entrepreneurship, content and methods of social studies, visual arts, Swedish (L1) and literature, mathematics, and home economics were combined to achieve the multidisciplinary entrepreneurial aims. Despite an explicit or implicit approach, the empirical data supports the view of disciplinary perspectives as cornerstones in any multidisciplinary practice (cf. Juuti et al., 2015; McPhail, 2018). However, the analysis also reveals that teachers in relation to the dual structure of contemporary Finnish education seek various ways of navigating between disciplinary and multidisciplinary knowledge in supporting students’ holistic learning processes.

The Finnish national curriculum presents competence-based learning as a main aim of basic education. Multidisciplinary teaching should include an ambition of developing students’ transversal competences in relation to the theme and content of study (Finnish National Agency for Education, 2014). In case Entrepreneurship, the fostering of students’ entrepreneurial competence was a central aim of the multidisciplinary module. However, the competence was related to the subjects mentioned above, since the competence of entrepreneurship needs to be linked to subject content to move from the abstract to something concrete (cf. Willbergh, 2015). Competence-based education is not only an aim of Finnish education but also an overarching value of contemporary international education (cf. Lähdemäki, 2018; McPhail, 2018; OECD, 2020).

Education and Didaktik are normative because certain values are included and other values are excluded (Bengtsen & Qvortrup, 2013). Values and aims of education are important elements of the multidisciplinary content. Entrepreneurship as a common educational value (cf. Fejes et al., 2018; Finnish National Agency for Education, 2014) was the overarching element of case Entrepreneurship. Besides common educational values, the teacher always brings her or his own values into the teaching situation. This element, addressed by Schulz as an element of the factor analysis (Jank &
Meyer, 2006; Keiding, 2013), was evident in case Renaissance through the teacher’s emphasis of knowledge of the Renaissance as being obligatory common knowledge.

According to Klafki (2000), the content of teaching needs to be justified in relation to its current and future meaningfulness of the students. In a didactic perspective, the needs and interests of the students should guide the teacher’s decisions in the teaching planning. Multidisciplinary teaching has been suggested a way of making education more meaningful for the students, as they explore phenomena of the world through a holistic lens and in collaboration with their peers and teachers (Lähdemäki, 2018; Nollmeyer et al., 2016). In line with the democratic ambition of both critical-constructive and teaching-centred Didaktik, the Finnish national curriculum encourages teachers to involve the students in multidisciplinary teaching planning and include their interests and inquiries as objects for multidisciplinary exploration (Finnish National Agency for Education, 2014). While the element of student participation in teaching planning was absent in the multidisciplinary practices of this study, the teachers still reflected on current and future meaning of the multidisciplinary content to their students.

As a way of making education more meaningful Klafki (1997, 2000) encourages teachers to identify contemporary key issues or problems that are relevant to students in their daily life. Such issues are generally multidisciplinary, and different disciplinary perspectives are required to comprehend them. Entrepreneurship, in focus of case Entrepreneurship, could be considered as a contemporary issue. Entrepreneurship as personalized in everyday practice is a common concept and knowledge area of education in the Nordic countries (cf. Fejes et al., 2018). In a society that favours entrepreneurial citizens, who manage to solve a broad spectrum of social problems and are empowered to create a good life (e.g., Blenker et al., 2012; Finnish National Agency for Education, 2014), the entrepreneurial competence is relevant for sixth-graders who gradually are taking a bigger part in society through studies and work life.

The complex process of linking the different content dimensions to a meaningful entity that supports students’ multidisciplinary learning is a challenging task for teachers schooled in a monodisciplinary educational structure (cf. Niemelä & Tirri, 2018). Although primary teachers teach many subjects and are used to navigate between different subject areas, the process of linking the dimensions together in the same teaching process requires reflective consciousness. The multidisciplinary content dimensions need to be implemented in practice through relevant teaching methods. Once the themes, content, and aims are selected, teachers need to utilize methods that enable them and their students to achieve the aims of the multidisciplinary teaching (Wallace et al., 2007). To support meaningful and multidisciplinary learning experiences, the teaching methods should include student activity, multiple representations of knowledge, various forms of collaborative learning, and active knowledge processing (cf. Tynjälä & Gijbels, 2012). Method decisions also include the devising of assessment procedures, which is an important part of teacher reflection on the effect of any teaching practice (cf. Schulz in Arnold & Koch-Priewe, 2011; Jank & Meyer, 2006; Keiding, 2013).

Critical remarks
This study presents the results of a small-scale research project that included data from two case studies. Given the limited empirical data, generalizations are not possible or intended. The empirical cases are thoroughly presented in this study and in previous studies (Mård, 2020a, 2020b) which ensures thick descriptions desirable in case study research (Hamilton & Corbett-Whittier, 2013). To ensure credibility, the results of the limited empirical data are analysed and discussed in relation to the substantial didactic theories of Wolfgang Klafki and Wolfgang Schulz. The suggested didactic model is both empirically and theoretically informed, making it more valid. Nevertheless, the model needs to be empirically tested in different educational practices to strengthen its validity. As primary education was the context of the two empirical cases, secondary education would be an area of further research.
In Finland, curricular guidelines of multidisciplinary and competence-based education are also directing lower and upper secondary education (Finnish National Agency for Education, 2014, 2020).

Through the lens of General Didactics, our intention has been to discuss multidisciplinary education according to Bildung-oriented ideals and teaching as a highly reflective practice (Hopmann, 2007). Finnish education has developed in relation to this tradition, which partly explains the motives of the approach. As we acknowledge the contextual framing of any teaching practice, which emerges in the suggested model, we also note the contextual determination of the model. Concurrently, we identify multidisciplinary education as a contemporary global ideal in policy reforms (Klausen, 2011; McPhail, 2018). To transform the model to different cultural practices, it needs to be examined in the light of other influential educational theories and conditional factors relevant in other contexts.

The first author performed the data collection and main analysis. This is a limitation of the study, although the second author is well acquainted with the empirical data due to her position of supervisor of the doctoral thesis written on the data. The analysis and interpretation of this study are made in consensus.

Conclusion

This article has suggested a model that builds on General Didactic concepts and principles as a framework for multidisciplinary teaching planning and implementation. General Didactics provides a frame of reference for teachers’ planning, implementing, and reflecting on the aim and relevance of multidisciplinary education. In this study we have combined Wolfgang Klafki’s Bildung-centred /critical-constructive Didaktik with Wolfgang Schulz’s learning-centred/teaching-centred Didaktik to explain the importance of questions of content and Bildung (subjects, competences, values and aims of education, student needs and interests, contemporary issues, methods) as well as surrounding factors (school culture, collaboration, curricula) that frame the multidisciplinary teaching practice. We have moved from the concrete to the abstract; from two cases, two Finnish multidisciplinary teaching practices, to an empirically and theoretically founded didactic model, which may support teachers and schools that wish to implement multidisciplinary teaching.

Note

1. Yrityskylä is a Finnish educational innovation that started in 2009. The Yrityskylä learning environment for sixth-graders is a schoolchildren’s society, a miniature city in which students work in a profession and earn money for their work. In addition, the students act as consumers and citizens. Over 75 % of all Finnish sixth-graders participate in Yrityskylä (Yrityskylä, 2020).

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