HUMAN IMPACT ON ECOSYSTEMS:

A CLIL-based material package for integrating upper secondary EFL and biology

Annika Ylituomaala
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Department of language and communication studies
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Tiivistelmä – Abstract

Kielen ja sisällön integrointi (eng. Content and Language Integrated Learning, CLIL) on etenkin eurooppalaisessa kontekstissa laajalti tunnettu ja käytetty kaksikielisen opetuksen tapa, joka nimensä mukaisesti yhdistää kielen ja sisällön opettamisen. CLIL-opetuksessa keskeistä on sekä opittavalle kielelle että sisällölle asetettujen oppimistavoitteiden saavuttaminen.

CLIL-opetuksen suosiosta huolimatta sen käyttöönotto voi olla hyvinkin haasteellista. Yhtenä merkittävimpänä haasteena on CLIL-opetukseen suunniteltujen oppimateriaalien vähyys. Kaupallisia CLIL-materiaaleja tuotetaan hyvin vähän, jos ollenkaan. Tämä tarkoittaa sitä, että opettajien on usein itse tuotettava CLIL-opetukseen soveltuva materiaali. Opettajien laajan työnkuvan vuoksi materiaalien tuottamiseen ei kuitenkaan useinkaan jää ylimääräistä aikaa.

Tässä tutkielmassa kehitellyn materiaalipaketin tavoitteena on yhdistää lukion englannin kielen sekä biologian opettaminen, ja siten tarjota uutta CLIL-materiaalia lukio-opetukseen. Materiaalipaketti pohjautuu kahteen lukion moduuliin, ENA5 (Kestävä tulevaisuus ja tiede) ja BI3 (Ihmisen vaikutukset ekosysteemeihin), joiden sisältöjä ja oppimistavoitteita materiaalipaketissa yhdistetään. Lisäksi materiaalipaketin tehtävissä on huomioitu kolme laaja-alaisen osaamisen osa-aluetta (vuorovaikutusosaaminen, monitieteinen ja luova osaaminen sekä eettisyys ja ympäristöosaaminen), joiden yhteisenä keskeisenä tavoitteena on valmistaa opiskelijoita tulevaisuutta varten kehittämällä muun muassa heidän yleissivistystään sekä toimintakykyään kestävän tulevaisuuden puolesta.

Materiaalipaketti koostuu kuudesta oppitunnista, joissa jokaisessa on 2–3 tehtävää. Paketin teemaa tarkastellaan kolmesta eri näkökulmasta: maailma, Suomi ja kotiympäristö. Oppitunnit sisältävät monipuolisesti erilaisia tehtävätyyppejä, jotka kukin osaltaan harjoittavat opiskelijoiden kohdekielen hallintaa sekä sisällön ymmärtämistä.

Avainsanat – Keywords CLIL, material package, upper secondary school, English language, biology

Säilytyspaikka – Depository University of Jyväskylä

Muita tietoja – Additional information

FIGURES

TABLES

TABLE OF CONTENTS

1 INTRODUCTION

The field of education develops constantly, and newer pedagogical methods are invented and created while currently used methods are further developed and modified. This applies to language education as well. Growing globalization sets demands on linguistic skills in many fields and professions, which calls for high-quality language education. There is an abundance of different types of bilingual teaching programmes, which are used by educational institutions of different levels to improve the overall language proficiency of learners. One such widely used bilingual teaching programme is Content and Language Integrated Learning (CLIL) which, as Coyle et al. (2010: 1) describe, is an approach that aims to integrate the teaching of language and content. It is an effective method that focuses on authentic use of the target language through using it for teaching and learning a specific subject content (Mehisto et al. 2008: 29), and thus also makes learners familiar with the disciplinary conventions of the subjects-to-be-learned (García 2009: 324; Llinares et al. 2012: 14). CLIL has gradually gained ground in the field of language education, and the term is most often used to refer to bilingual education especially in European contexts (Peltoniemi et al. 2018: 16). This is due to the European Union's effort to differentiate the European bilingual programmes from the many other bilingual education programmes around the world (Baetens Beardsmore 2009: 208).

CLIL is widely used and proven to be an effective method (see e.g., Järvinen 1999; Pihko 2010: ch. 2; Olsson 2021; section 2.4) that has been found to improve, for instance, the effectiveness of language learning and increase motivation towards both the learning of language and content. However, there are some limitations to its use as well. One limiting factor is the lack of resources concerning, for example, the availability of materials, and the financial status of educational institutions. CLIL is used in different levels of education, and often there is a limited amount of suitable, commercially produced CLIL materials for different age groups. Creating materials often falls into the hands of individual teachers, who might already have quite a broad job description. Designing materials is time-consuming and demanding in many ways, which might prevent even the most enthusiastic teachers from taking up the challenge. Another limiting factor is the possible lack of financial resources (Lehti, Järvinen & Suomela-Salmi 2006: 310). Since a certain amount of financial aid is directed for education, in tight economic times extra money for creating new materials is out of reach for many schools. Yet another challenge regarding CLIL is the specific quality criteria for both materials and teaching. Firstly, the materials need to be based on an official curriculum that a school is demanded to follow. Secondly, since CLIL integrates both a language and non-language subject, it has its own pedagogical

features. The materials need to take into account the learning objectives of both the target language and the content. In addition, the materials need to be suitable for the target group in terms of the level of language and content knowledge. Thirdly, CLIL is suggested to be highly content-driven (Coyle et al. 2010: 1) and therefore CLIL lessons are often timetabled as content lessons (Dalton-Puffer 2011: 183). This means that CLIL teachers are often content experts but not necessarily language experts (Nikula & Mård-Miettinen 2014: 5). This might be a major challenge for teachers for they are expected to have sufficient language skills to be able to teach the content creditably.

To tackle the challenges regarding the availability of CLIL materials, this thesis introduces a CLIL-based material package that aims to integrate the teaching of English as a foreign language and the teaching of biology as content. The material package is designed for upper secondary school level. Upper secondary school modules ENA5 and BI3, introduced in the National Core Curriculum for General Upper Secondary Education 2019 (Finnish National Agency for Education 2019), are used as the basis and inspiration for the material package. The material package is designed to cover a distinct selection of each module's contents and learning objectives. Further, the material package aims to incorporate three of the six transversal competences introduced in the National Core Curriculum 2019: interaction competence, multidisciplinary and creative competence, and ethical and environmental competence. In addition to providing teachers with new material for the integration of these two particular subjects, I aim to inspire teachers and teachers-to-be to design more CLIL materials for different school levels, integrating different languages and subject contents. Designing CLIL materials gives teachers the opportunity to work with colleagues teaching different content-based subjects or languages and gives space for creativity.

In this thesis, section 2 first introduces the concept of CLIL. The section considers the starting points of CLIL, as well as its position in the Finnish education field. Secondly, the teaching of English as a Foreign Language (EFL) and biology in Finnish upper secondary schools are discussed briefly in section 3. More thorough attention is given to the modules used as the basis for the material package. In addition, the section also considers three transversal competence areas that are covered in the material package from the perspective of both EFL and biology. Section 4 introduces the framework for the material package, and it includes introducing the aims and the target group of the material package as well as its theme and structure. Lastly, section 5 reflects on the process of producing the material as well as on the finished material package.

2 CONTENT AND LANGUAGE INTEGRATED LEARNING

This section focuses on the concept of Content and Language Integrated Learning (CLIL). Firstly, the history and origins of CLIL are briefly discussed, before introducing the main features of CLIL that distinguish it from other bilingual education programmes (2.1). Secondly, the subsection 2.2 discusses the pedagogy of CLIL. Three pedagogical concepts central to CLIL are introduced. In addition, the subsection considers the concept of subject literacy and the features and criteria for CLIL materials. Thirdly, the role and position of CLIL in the field of Finnish bilingual education will be defined (2.3). Lastly, the section briefly introduces some of the main benefits that CLIL offers for education (2.4).

2.1 Defining CLIL

CLIL is not a simple concept to define since there are several viewpoints to it. CLIL can be used as an umbrella term that covers a vast variety of educational programmes where content is taught through some other language than the learner's first language (L1) (García 2009: 209), resulting in the simultaneous learning of an additional language and subject content. Similarly to García's definition, Dalton-Puffer's (2007: 13) definition of CLIL is also quite broad since they both describe CLIL as a method where the instructional language to teach content is some other than the learner's L1. Dalton-Puffer (2011: 183) emphasizes that, in CLIL, the target language is specifically a foreign language, and not, for example, a nation's second language. A more precise definition is provided by Coyle et al. (2010: 1), who emphasize CLIL as a teaching method and as a dual-focused approach, where equal amount of attention is given to language and content. Eurydice (2006), which is a network for educational information operating under the European Commission, provides an insightful view to define the CLIL method. Because the focus in CLIL is equally on the content and language, it is of great importance to understand that "the non-language subject is not taught *in* a foreign language but *with* and *through* a foreign language" (Eurydice 2006: 7).

Mehisto (2013) offers an interesting "redefined" view for CLIL, where the learners' L1 is also given attention alongside the target language to be learned. In his view, Mehisto (2013: 26) assumes that the learners' L1 is also the school's official language of instruction, although he reminds that this might not always be the case; for some learners the school's instructional language might be their second (L2) or even third language (L3). Mehisto (2013: 26) suggests

that even though the linguistic focus in CLIL is mainly on the target language, learners' L1 can be used with careful consideration to aid the learning of both the target language and the content. According to Mehisto (2013), this is because of the constant interaction between the two languages (the learner's L1 and the target language) during the learning process of content and language. This poses a challenge for teachers when having to decide which language(s) to use in teaching and how extensively for the teaching and learning of both, language and content, to be efficient. This relates to the concept of translanguaging, which has its own role in CLIL. Translanguaging will be discussed in greater detail in section 2.2.

The diverse use of the concept of CLIL has led to many using the term in parallel with other widely used terms for bilingual education, such as language immersion. Immersion refers specifically to the immersion programmes developed in Canada, which started blooming in the 1960's during which French was proclaimed as the second national language of the country (Nikula & Mård-Miettinen 2014: 1-2). Although the Canadian immersion programmes might have influenced the development of the CLIL method to some extent, there are some major differences between the development of the two methods (García 2009: 209; Lasagabaster & Sierra 2009: 370). CLIL has developed into its own teaching method and started blooming in the 1990's Europe (Nikula & Mård-Miettinen 2014: 1), when the term was officially introduced in Europe in 1994 (Mehisto et al. 2008: 9). The main defining features of CLIL, which distinguish it from other bilingual education programmes, are discussed next.

CLIL has secured its place in the field of language education gradually over the years due to constantly growing globalization (Nikula & Mård-Miettinen. 2014: 3). Growing globalization has enhanced, or even forced, the teaching of foreign languages throughout the world. It is also one of the main reasons for the language that is most often chosen as the target language in CLIL: English. Being the lingua franca of the world, English often surpasses any other language chosen as the target language in CLIL since it is seen as the most important language to be taught in many countries (Dalton-Puffer 2007: 13-14). Furthermore, Dalton-Puffer (2011: 183) highlights the role of the English as a global and crucial literacy feature. However, although English is most often chosen as the target language for CLIL, it does not mean that other languages are completely excluded. Bower et al. (2020: 4) suggest that changes that have occurred in sociocultural views in recent years have given space and attention to other languages as well. This offers an opportunity and encouragement to integrate other languages besides English to be the target language in CLIL. Bower et al. (2020) even suggest bringing indigenous languages into CLIL and have them gain a more prominent role in CLIL teaching. These lesser spoken languages could be brought into CLIL gradually alongside the main target

language, and later more CLIL programmes could be developed in which the target language is in fact a minority language.

The sheer popularity and wide-spread use of English around the world in CLIL programmes often means that CLIL teachers are non-native speakers of the CLIL target language (Nikula & Mård-Miettinen 2014: 5). Furthermore, as CLIL lessons are often scheduled as content lessons, CLIL teachers are therefore often content experts instead of language experts (Dalton-Puffer 2011: 183). Thus, CLIL teaching poses quite a challenge for teachers, because for CLIL teaching to be effective and of high-quality, teachers must master the language of instruction at a sufficient level to be able to teach professionally. In other words, teachers are required to have a high proficiency in the target language, although native level language skills are not expected (García 2009: 130). A regulation drawn up by the Finnish National Agency for Education, hereafter referred to as FNAE, sets specific demands that basic education teachers need to meet in order to teach in bilingual education programmes in Finland (FNAE 2022). For example, after completing language studies worth at least 60 credits in a Finnish university, teachers become qualified to teach bilingual education programmes. The aim of the regulation is therefore to guarantee that the integrated teaching of foreign/second language and non-language subject content is of high quality.

The third feature deals with CLIL's role in language learning in comparison to regular language lessons. Nikula and Mård-Miettinen suggest (2014: 5) that CLIL lessons are in no way designed to replace regular language lessons. This feature is also supported by Baetens Beardsmore (2009: 210), who emphasizes the fact that in bilingual education programmes, the target language is most often taught as an individual subject in the curriculum in addition to its use as a vehicular language in non-language subjects. As CLIL programmes are most often supplementary programmes or a part of a certain school subject taught in the target language, the programmes serve as complementary language learning opportunities and therefore aim to enhance language learning alongside regular language lessons.

The fourth feature that defines CLIL is the moment it is introduced to learners during their school path. CLIL programmes are usually targeted at older learners in secondary levels (Nikula & Mård-Miettinen 2014: 5) once learners are already familiar with the target language to some extent on the basic level (Dalton-Puffer 2011: 184). Although the target language is something to be learned in CLIL, it is also the language *through* which content is learned (Eurydice 2006: 7). Thus, since CLIL integrates the learning of both language and content, learning can be cognitively demanding (Dale & Tanner 2012: 11). As Coyle et al. (2010: 36) suggest, effective learning of content calls for sufficient language skills.

2.2 CLIL pedagogy

CLIL is one of the several methods in the field of bilingual education, and therefore the pedagogical practices it comprises follow the practices used in language education in general (García 2009: 314). Garcia (2009: 314) introduces three main approaches that are used as guidance when considering the pedagogical practices for bilingual education: grammatical, communicative, and cognitive approach. Of these three approaches, the cognitive approach is the most relevant regarding CLIL. García (2009: 316) emphasizes the cognitive approach's link to CLIL by stating its prevalence in European CLIL programmes. The link between the cognitive approach and CLIL stems from the fact that cognitive approach promotes "the transfer of knowledge (…) in one language to the learning of new tasks in a second language" (Garcia 2009: 316). In the cognitive approach García highlights the flexible roles of both the learner's L1 and the target language in the learning process. In other words, both a learner's L1 and the target language are used conveniently in a way that aids the learning of the content. This is related to the concept of translanguaging, which Coyle et al. (2010: 16) understand to mean that for the development of all three skills, language, content and cognitive skills, both a learner's L1 and the target language are used alternately in CLIL. Moore & Nikula (2016) suggest that the development of one's language proficiency/proficiencies can be compared to the process of building knowledge in any other discipline. In other words, a learner's first language always has a role in all learning processes, whether it is a foreign language or content (Moore & Nikula 2016: 212). The results from Olsson's study (2021) support these views by emphasizing the importance of using the learners' first language (Swedish) alongside the target language (English) as the languages of instruction. The strategic use of Swedish and English, when instructing students, enhanced both the acquisition of the target content as well as the academic language proficiency in both languages (Olsson 2021: 21). Academic language proficiency contains skills that are needed within different disciplines for learning (Olsson 2021: 2). The results of Olsson's study will be considered in greater detail in section 2.3.

As discussed previously, language has a central role in all learning. In CLIL, the target language is not only a target of learning, but it is also a tool to learn content. Coyle et al. (2010: 37) consider the important functions of CLIL in more detail through the Language Triptych introduced in Figure 1 below. Language triptych is a central concept in CLIL, and it views the functions of language in CLIL from three standpoints: the language *of* learning, the language *for* learning and the language *through* learning. According to the authors, language *of* learning relates to the subject content to be learned through CLIL. It is the language that learners need

in order to understand the most basic constructs related to the subject content to be able to further learn the topic of the content (Coyle et al. 2010: 37). In other words, language in this sense is heavily content related, and with this language learners are able to access the most central concepts related to the content (Klewitz 2021: 194). Coyle et al. (2010: 37, see also Ángeles & del Pozo 2016: 144) define language *for* learning to be the language that learners need to acquire to be able to act and function in an environment where teaching and learning take place in a foreign language. Language in this sense is something that enables learners to correctly operate and therefore learn in different types of situations where learning takes place, such as individual tasks or pair work (Coyle et al. 2010: 37). Lastly, language *through* learning considers the role of language in promoting effective learning (Coyle et al. 2010: 37). Ángeles and del Pozo (2016: 144) further define it as the language that is developed during the learning process; for the learning of content to proceed, necessary language skills need to be developed at the same time. In other words, effective learning of content requires new skills in language (Coyle et al. 2010: 37). Language and content knowledge therefore go hand in hand during the learning process.

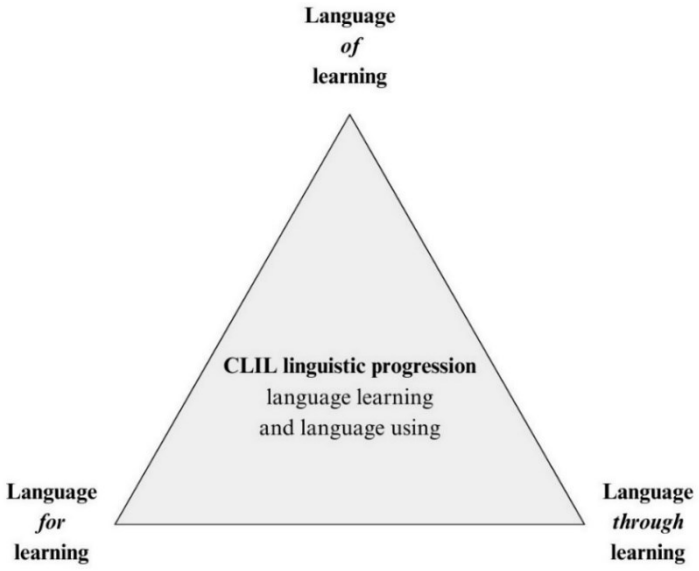

Figure 1 The Language Triptych (Coyle et al. 2010: 36)

Another central concept regarding CLIL introduced by Coyle et al. (2010) is the 4Cs Framework (Figure 2), which takes a more holistic view on CLIL as suggested by the authors. The four main constructs in the framework are content, communication, cognition, and culture. Content is the topic or theme covered in CLIL, whereas communication refers to the language that is learned and used (Coyle et al. 2010: 41). Cognition accounts for the processes of thinking and learning, and culture refers to the process of developing one's awareness of interculturality (Coyle et al. 2010: 41; Coyle 2007: 550). As opposed to the Language Triptych having its main

focus specifically on the language and its diverse functions in CLIL, the 4Cs Framework combines the four aforementioned elements (the 4 Cs) and considers them within a specific context which learning takes place in (Coyle et al. 2010: 41). The framework considers the elements' interconnectedness and the links between one another in certain contexts (Coyle et al. 2010: 41). Effective learning in CLIL takes place when learners are able to use language appropriately and use it as a means to learn content matter effectively (Coyle et al. 2010: 42; Coyle 2007: 550).

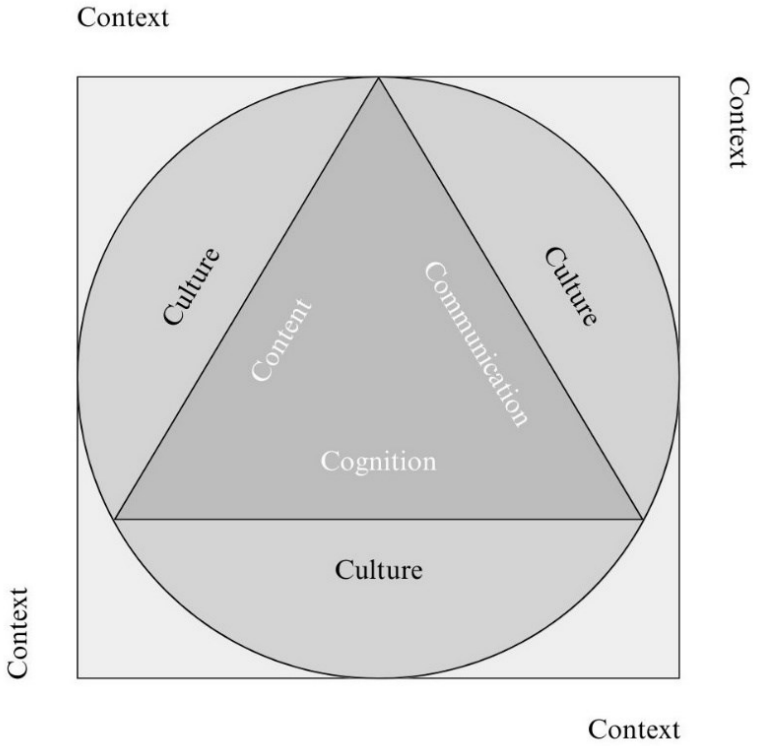

Figure 2 The 4Cs Framework (Coyle et al. 2010: 41)

The third concept that Coyle et al. (2010) introduce is the CLIL Matrix (Figure 3), which takes into account the increasing cognitive and linguistic demands as learning proceeds during CLIL. Integrating language and content is not an easy task, and many factors need to be taken into consideration. One important factor to remember when designing a CLIL based programme is the learners' linguistic and cognitive capabilities (Coyle et al. 2010: 43). In other words, the learners' linguistic skills need to be scaled with their cognitive skills. As discussed earlier, cognition refers to the processes of learning and thinking. As Coyle et al. (2010: 43) suggest, effective learning takes place only if learners are cognitively engaged at appropriate levels. If the language used as a means for learning the content matter is too demanding, the learning of content becomes a challenge and effective learning cannot take place (Coyle et al. 2010: 43). However, if learners with relatively high linguistic skills are not offered learning opportunities

that are cognitively demanding enough, effective learning becomes limited (Coyle et al. 2010: 43).

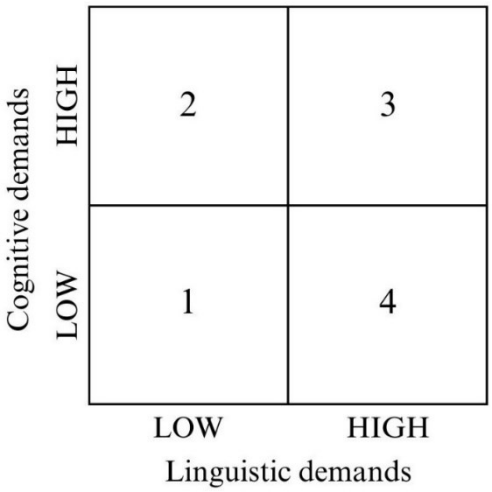

Figure 3 The CLIL Matrix (Coyle et al. 2010: 43)

The CLIL Matrix, as Coyle et al. (2010) suggest, can help CLIL educators to adjust the linguistic and cognitive demands to be suitable for a specific target group. As an example, Coyle et al. (2010: 68) position four different tasks on the CLIL matrix starting from quadrant 1 (one task), proceeding through quadrant 2 (two tasks) and eventually finishing in quadrant 3 (one task). The first task in quadrant 1 poses low demands on both linguistic and cognitive skills of learners, whereas the tasks in quadrant 2 increase the cognitive demands for learners. The first task in quadrant 2 uses recycled language, while the second task slightly increases linguistic demands by "extending familiar language into more complex structures" (Coyle et al. 2010: 68). Thus, the second task in quadrant 2 does not necessarily introduce any new linguistic knowledge but pushes learners to develop their current knowledge to a more complex level. The activity placed in quadrant 4 integrates completely new language and new content, which learners are able to practice through different actions (Coyle et al. 2010: 68). Thus, the demands of the last task in quadrant 4 is highly demanding on both linguistic and cognitive skills. With the help of this matrix CLIL teachers can choose tasks that gradually increase the level of linguistic and cognitive demands, which promotes effective learning.

2.2.1 Subject literacy

Language is a diverse term that can be used to describe the different ways of communication. Just like different cultures have different languages, every school subject has their own language (FNAE 2019: 22-23). Subject literacy is a key term when discussing the languages of school subjects. Llinares et al. (2012: 14) explain that subject literacy consists of the different

forms of spoken and written language through which learners are able to access the needed content knowledge. Before delving any further into the languages of school subjects, the ways in which the different languages typical for each school subject are in fact established are considered next.

A discipline, or a branch of science, contains its own distinct features depending on the field of study: the content between disciplines differs, as does the ways in which the knowledge of the content is constructed and communicated (Fang & Coatoam 2013: 628). Content in this context is the subject matter that is learned within a discipline. The different means and ways of producing and communicating the knowledge of the discipline form the disciplinary literacies typical for each discipline (Hynd-Shanahan 2013: 94). Hynd-Shanahan (2013: 94) further emphasizes the division between content knowledge and discipline knowledge. According to the author, content knowledge refers to the knowledge one has of the current topic at hand from a particular field of study, for example, climate change from the discipline of natural sciences. Discipline knowledge, on the other hand, refers to the ways and means in which one builds the knowledge of the current topic and how that knowledge is communicated both within and outside the discipline (Hynd-Shanahan 2013: 94). In educational contexts disciplines are transformed into subjects, which reflect the disciplines behind them (Sulkunen & Saario 2020: 42). Sulkunen and Saario (2020) explain that within each subject, there are certain ways to express information in different forms such as text, graphs, or pictures. They add that specific vocabulary and concepts are used in different subjects, and each subject brings their own point of view to different topics (Sulkunen & Saario 2020: 40). Thus, school subjects can be seen as "disciplinary discourses" (Fang and Coatoam 2013: 628) that take place in school contexts and are processed in ways that are suitable for the group of people processing them. In other words, in school subjects the conventions of disciplinary literacies are reshaped and modified in order for them to be suitable for educational purposes (Fang and Coatoam 2013: 628). In these educational contexts, the term used for disciplinary literacy becomes subject literacy, which comprises the forms of language by which the content knowledge is built by CLIL learners (Llinares et al. 2012: 14).

Llinares et al. (2012: 14) define subject literacy as consisting of *genre* and *register*, the first referring to the different text types typical for each subject and the latter referring to the grammatical features used most often within different subjects. Since the subject content of the material package introduced in this thesis is biology, which belongs to the discipline of science, the genre of science is now considered in greater detail. When it comes to science, Llinares et al. (2012: 112) identify three specific genres used most often in science teaching; procedures,

reports and explanations. Table 1 summarizes each of the science genres' main purposes and characteristics, which separate them from each other, by combining genre definitions from several sources.

Table 1 Science genres. Adapted from Llinares et al. 2012, Martin and Rose 2008, Schleppegrell 2004.

SCIENCE GENRES			
Source	*Genre*	*Objective*	*Genre characteristics/registers*
Schleppegrell 2004: 85, 115 Martin, J. R. & Rose, D. 2008: 182	**Procedure**	Giving precise instructions (written or oral) to perform a scientific experiment.	• Present tense • Imperative mood • Time sequence markers
		Precisely documenting what has been done in a scientific experiment.	• Past tense • Declarative mood • Passive voice
Schleppegrell 2004: 115 Martin, J. R. & Rose, D. 2008: 142-149	**Report**	Organizing scientific knowledge in an accumulating manner. Dividing, classifying and defining scientific knowledge.	• Timeless verbs • Simple present tense • Topic-related terminology • Relational process clauses
Martin, J. R. & Rose, D. 2008: 150 Schleppegrell 2004: 85, 115 Llinares et al. 2012: 112	**Explanation**	Explaining and defining science related phenomena, considering the factors taking part in and affecting the phenomena.	• Timeless verbs • Relational process clauses • Logical sequence organization

Each genre functions in its own way in building scientific knowledge. Llinares et al. (2012) define the three genres as follows: procedures define the precise steps taken, or to be taken, in a scientific experiment, whereas explanations "explain scientific processes" (Llinares et al. 2012: 112). In addition, Schleppegrell (2004: 85) adds that explanations aim to explain the phenomena that occur in scientific contexts. Reports, which Llinares et al. (2012: 112) define as the genre that "organizes scientific knowledge", is also suggested by Martin (1993) to be the genre most visible in science textbooks. Textbooks are defined as being their own kind of reports, in which scientific knowledge is structured in an accumulative way, making it more accessible to learners (Martin 1993: 293; Llinares et al. 2012: 116). Schleppegrell (2004: 85) further categorizes procedures and reports as factual genres and explanations as an analytical genre. In addition, Schleppegrell (2004) considers these three genres more thoroughly from the perspective of science, and further divides the genre of procedure into the act of giving instructions and providing a record of what has been done. In addition to the science genres and their characteristics, scientific reports that are written on scientific experiments have their own

specific characteristics, for instance, for the use of tenses and voices. In scientific reports, the focus is taken off from the researchers themselves by using passive voice and past tense (The University of Waikato: n. d.; The Writing Center, University of North Carolina at Chapel Hill: n.d.). Passive voice and past tense are recommended to be used in two sections of a scientific report: materials and methods, and results (The University of Waikato: n. d.).

According to the National Core Curriculum for General Upper Secondary Education 2019 (FNAE 2019: 58), hereafter referred to as the NCC 2019, it is a common objective in upper secondary schools to broaden and improve students' skills in multiliteracies. Multiliteracy skills refer to the ability to understand subject specific language (FNAE 2019: 58). Students are encouraged to produce, explore and interpret different types of texts from different disciplines, which further aids them in assessing the reliability that the texts as well as other sources of information offer (FNAE 2019: 58). Multiliteracy does not only contain subject specific languages, but also the languages with which we communicate. Students' language repertoires are taken into account in instruction, and the further development of students' language skills are highly encouraged (FNAE 2019: 58).

Sulkunen and Saario (2020: 41) state that each subject contributes to developing one's multiliteracy skills by offering differing learning contexts that each relate to the subject at hand. Every subject having their own ways to use language, and thus build and express knowledge, means that every non-language teacher is in fact a language teacher (FNAE 2019: 23; Moje 2008: 98). Llinares et al. (2012: 14) state that it is therefore of utmost importance that teachers recognize the typical features of the subject literacy they are teaching to be able to efficiently assist students in the learning of the subject content. This is because the learning of subject content can prove challenging due to the added linguistic demand (Llinares et al. 2012: 14). In other words, teaching learners subject literacy greatly enhances the learning of the subject content (Sulkunen & Saario 2020: 40).

2.2.2 CLIL materials

Although CLIL is a popular bilingual teaching method, the unfortunate lack of quality CLIL materials (Gondová 2015: 153; Coyle et al. 2010: 86) could hinder the implementation of the method into education. The issue is not only the lack of commercially produced materials, but also the lack of resources with which teachers could increase their understanding of language and content integration and develop their skills in creating new CLIL materials (Gondová 2015: 153). Ball (2018: 222) suggests that one main reason for the lack of commercially produced material could be the specificity of the needed materials: materials need to be aimed for a

specific target group with a specific L1 and consist of a specific target language and content. In addition, the use of the produced material can often be limited to only a very small target group (Ball 2018: 223). This lack of materials often pushes the burden of creating CLIL materials upon teachers.

High-quality teaching materials have a central role in all teaching. CLIL with its specific goal to integrate the learning aims of both a foreign language and subject matter (content) add to the challenge of producing quality materials (Ball 2018: 222). Although Mehisto (2012) introduces the main criteria for CLIL materials, which will be introduced later in this section, Ball (2018) mentions the lack of "standardized guidelines" that would act as guidance for teachers who are contemplating implementing CLIL in their teaching and hence would need advice on CLIL materials in general. He explains that the guidelines would help teachers to not only create their own material but also adapt and evaluate already existing materials to fit their specific needs in their own CLIL context (Ball 2018: 223). Yet another challenge in designing relevant quality material is the fact that often CLIL teachers are content specialists as discussed previously in section 2.1.

A few important issues need to be taken into consideration, when creating or selecting and adapting materials for CLIL. First, teachers must make sure that the chosen materials meet the learning goals and cover the contents presented in the local curriculum (Gondová 2015: 156). Bovellan (2014) also acknowledges this fact and adds that following the curriculum in material design might sometimes be challenging. However, she adds that, for example, in the context of Finnish education textbooks very closely follow curricula (Bovellan 2014: 63). Thus, teachers are able to use the books as guidance, whether they create their own material or choose and adapt ready-made tasks from them, and that way be sure the curriculum contents are covered (Bovellan 2014: 63). Evaluating newly created or adapted materials against the local curriculum also helps teachers in choosing materials that are suitable for the intended target group (Gondová 2015: 156). Secondly, Gondová (2015: 156) reminds about the authenticity (see also Mehisto et al. 2008: 29) and up-to-dateness of the materials, and that the materials must offer enough variation in terms of their type, such as text, audio or audiovisual, individual or group work or written or spoken language. Up-to-dateness and authenticity mean that the materials offer timely information that is reliable and accurate. Authenticity also means that the materials promote the use of both language and content for authentic purposes and encourage learners to authentic language use (Mehisto 2012: 22). Gondová (2015: 156) adds that once these aspects are found in the chosen material, the material becomes more intriguing and interesting for both learners and teachers, and thus further encourages learning. Thirdly, Gondová (2015: 156)

states that the materials need to be of appropriate difficulty level in terms of both language and content. She adds that both (language and content) can be simplified with different methods, but that the level of difficulty must be increased gradually. It is crucial that the difficulty levels of neither language nor content are too high or too low. Learners may get bored quickly with too easy materials, whereas materials that are too challenging might result in learners getting frustrated. It is desirable to find the golden mean that challenges learners just enough so that learning can take place and it is still pleasant.

Lorenzo (2008) introduces three methods which can be used to adjust authentic materials to better suit the target group: simplification, elaboration and rediscursification. By simplification, teachers can simplify the input that learners receive (Lorenzo 2008: 23). Input is the information received through different types of ways, for example, texts, audio recordings, videos, speech and other such materials and actions (Gondová 2015: 153). Simplification lowers the linguistic demands of materials by, for instance, using simpler vocabulary or shorter sentence structures. Elaboration, on the other hand, does not alter the received input but rather expands it by, for instance repeating certain linguistic items or highlighting the most central concepts in the input material (Lorenzo 2008: 24-25). By elaboration, the cognitive demand of the received input can be reduced to a suitable level if it proves to be too demanding (Lorenzo 2008: 24). As Lorenzo (2008: 25) explains, rediscursification aims to deepen, but not broaden, the understanding of the topic by adding discursive elements such as questions, visual aids etc. to the materials used. Using these methods of adjustment highly depends on both the actual materials used and the target group the materials are used for.

Although it is said that CLIL materials need to consider both content and language objectives, it does not necessarily mean that each individual task has to focus equally on both. What is more important, is that the material as a whole covers the objectives of language and content learning in approximately equal amounts. To avoid the inequality in materials concerning language and content, Morton (2013: 117) suggests that more programmes should be available that guide, for example, subject teachers to create quality materials that focus equally on both subjects. Another means for teachers to make sure materials cover all learning objectives is cooperation between language and content teachers in the material design process. In addition, Bovellan (2014: 63) suggests handing the material over for a revision. For instance, language teachers can revise their materials through content teachers and vice versa. It is worth noting, once again, that language learning in CLIL is more than just, for instance, learning new words that relate to the topic of the content in the target language. As discussed earlier in section 2.2, language has three central roles in CLIL (Figure 1). Thus, language is not only needed for

understanding the content topic but also for being able to work and interact in the learning environment. In addition, as stated in section 2.2.1 language is different depending on the context it is used in. Learning a language suitable for a certain context and learning how to use it properly aids the learning of the target content present in the context. All learning can be thought of as language learning, because without language the learning of content becomes practically impossible.

Table 2 below introduces Mehisto's (2012) ten main criteria for quality CLIL materials. The criteria take into account many other aspects in addition to the goals of achieving the objectives of both language and content learning. Three other aspects that arise from these criteria are the development of learning skills, interaction skills and cognitive skills.

Table 2 Ten main criteria for CLIL materials. (Mehisto 2008: 17-25)

CRITERIA FOR QUALITY CLIL MATERIALS		
	1. Make the learning intentions & process visible to students	6. Foster cooperative learning
	2. Systematically foster academic language proficiency	7. Seek ways of incorporating authentic language and authentic language use
	3. Foster learning skills development and learner autonomy	8. Foster critical thinking
	4. Include self, peer and other types of formative assessment	9. Foster cognitive fluency through scaffolding • content, • language, • learning skills development helping student to reach well beyond what they could do on their own
	5. Help create a safe learning environment	10. Help to make learning meaningful

As Gondová (2015: 154) reflects on these particular set of criteria, quality CLIL materials highly promote learners' cognitive development since the goal in CLIL is to acquire knowledge of the content in a foreign language in addition to their L1. Quality CLIL materials also promote the development of interaction skills by offering tasks that demand different forms of interaction from learners. Lastly, depending on the language and content objectives, quality CLIL materials offer new ways of learning both language and content and therefore enable the development of diverse learning skills. As discussed earlier in this section, the concept of authenticity is central to CLIL. Authentic language and language use increases the meaningfulness of learning as well as makes the materials more intriguing to learners.

2.3 CLIL in Finland

Finland has ranked on the top of education multiple times in recent years, and education is seen as one of the most important elements of the Finnish welfare society (Ministry of Education and Culture n. d.). To its credit, Finns are known for their good language skills, too. Language education in Finland ranges all the way from early childhood and preschool education to basic and upper secondary education, and the scale and type of language education varies between municipalities and schools (FNAE 2016; FNAE 2014a; FNAE 2014b; FNAE 2019). From early childhood education to basic education, bilingual education is divided into two categories, large-scale (>25% teaching is given in another language) and small-scale programmes (<25% teaching is given in another language) (FNAE 2016; FNAE 2014a; FNAE 2014b). In addition to these bilingual education programmes, there is regular language teaching. In other words, in addition to regular language teaching, Finland offers different types of bilingual education programmes where a certain amount of teaching takes place in some other language than the learners' first language (FNAE 2014b: 91-92). Several surveys have been conducted in recent years on the state and development of bilingual education in Finland. After a brief review of the history of bilingual education in Finland, the current situation will be considered based on the latest surveys (i.e., Peltoniemi et al. 2018).

The amendment of the Basic Education Act with the act of 261/1991 in 1991 allowed the teaching of non-language subjects to take place in some other language than the school's official language of instruction in basic education (Peltoniemi et al. 2018: 18). The language of instruction could therefore be, for instance, Swedish or English. Ever since the amendment, CLIL alongside other bilingual education programmes has secured its place in Finnish education (Roiha 2019: 92; Nikula & Marsh 1996: 71). According to Takala et al. (1998: 141), bilingual education started gaining ground quite rapidly in the first few years. Nikula & Marsh (1996) conducted the first survey in which they studied the offering of bilingual education programmes in Finnish basic and upper secondary education. The next survey on the state of bilingual education in Finland was conducted by Lehti, Järvinen and Suomela-Salmi in 2005, in which the target level of education was the same as in Nikula and Marsh's survey. Comparing the results from these first two surveys, Pihko (2010: 16) states that the overall amount of bilingual education had decreased considerably in both basic and upper secondary education. Several reasons for the decrease were given by e.g., Lehti, Järvinen and Suomela-Salmi (2006), such as the lack of sufficient resources regarding, for instance, the weak financial status of municipalities. However, one possible and quite significant cause for the sudden decrease is the

proposition (7/011/99) made by the Finnish National Agency for Education in 1999, which demands the level of teachers' language proficiency to be on a sufficient level to teach content through a foreign language (Pihko 2010: 16). This proposition has later been renewed, and the latest version regarding basic education has come into action in 2023 (see section 2.1: FNAE 2022). According to Pihko (2010: 16), this requirement might have discouraged teachers from completing or starting new bilingual education programmes such as CLIL.

However, the many setbacks encountered during the years regarding bilingual education in Finland have not stopped the interest towards bilingual education (Pihko 2010: 16). The third survey on bilingual education in Finland was conducted in 2012 by Kangasvieri et al. and their focus was on early childhood education and basic education. The survey questionnaire was sent to all Finnish municipalities in Finland and the response rate was 54,4%. As stated earlier, in Finland, bilingual education programmes are divided into two categories, large-scale and small-scale programmes (FNAE 2014b: 89). Firstly, the survey focused on language immersion programmes, which are considered large-scale programmes. According to the survey, in these types of programmes teaching took place in either Finnish, Swedish or Sami (Kangasvieri et al. 2012: 48). Another focus in the survey was on bilingual education programmes that have a foreign language, such as English, as the target language. The survey results of these types of programmes will be considered in more detail, since they are the type of programmes that CLIL belongs to. Of all the respondents in the survey, 17 municipalities reported to offer some type of bilingual education in which the target language is a foreign language (Kangasvieri et al. 2012: 54). Out of these 17 responses, 4 used the term CLIL to refer to the offered bilingual programme. This is an indication of the incoherence in the definitions used for foreign language bilingual education programmes in Finland (Kangasvieri et al. 2012: 54). The results indicate that the offering of bilingual education decreases the older the target group is. For instance, bilingual education is more substantial in primary schools than in secondary schools (Kangasvieri et al. 2012: 54). The dominant language in these types of programmes is English, and some variation in the target language could be found only in the largest municipalities (Kangasvieri et al. 2012: 55).

In the most recent survey, Peltoniemi et al. (2018) assessed the scale of bilingual education in Finnish early childhood education, preschool education, and basic education. The survey was conducted via a questionnaire that was sent to each Finnish municipality. In addition, city officials, early childhood educators, teachers, pupils and parents from five different municipalities were interviewed. The results showed that English was the language offered most often regardless of the programme being small-scale or large-scale (Peltoniemi et al. 2018: 39).

Compared to the previous survey, the results indicated that bilingual education has gained ground especially in the category of small-scale bilingual programmes, and the greatest increase has taken place in preschools and primary schools (Peltoniemi et al. 2018: 66). The amount of large-scale bilingual education was said to have stayed approximately on the same level over the years between the two most recent surveys (Kangasvieri et al. in 2012 and Peltoniemi et al. in 2018) (Peltoniemi et al. 2018: 66). However, as Peltoniemi et al. (2018: 66) point out, the major difference in the response percentages between the two surveys need to be taken into account when discussing the current situation of bilingual education in Finland.

The fact that the two most recent surveys presented above have mainly focused on early childhood education, preschool education and basic education forces us to only speculate the current state of bilingual education offered in Finnish upper secondary education. There are no surveys on this issue from this or even the previous decade, the most recent one being from 2005 by Lehti, Järvinen and Suomela-Salmi. Comparing the 2005 (by Lehti et al.) survey to the previous one from 1996 (by Nikula and Marsh) the results suggest a decrease in the offering of CLIL at all levels of education with the most significant decrease (from 23,6% in 1996 to 11,0% in 2005) taking place in upper secondary schools (Lehti, Järvinen & Suomela-Salmi 2006: 299). In the 2005 survey, the authors use the term CLIL when referring to bilingual education, which to some extent differs from the definitions used in the other surveys presented. Since the authors used the term CLIL, it could be assumed that the results refer to bilingual programmes in which the target language is a foreign language. This is, however, not the case in this particular survey. This is because the languages reported to be used in the programmes offered in Finnish upper secondary schools were English (most popular), Swedish, German and Russian (Lehti, Järvinen & Suomela-Salmi 2006: 303). This only further proves the difficulty in defining bilingual education programmes used in Finland as discussed in the previous chapter (see Kangasvieri et al. 2012: 54). The survey does not separate programmes according to their scale as opposed to the surveys conducted in 2012 and 2018.

2.4 Benefits of CLIL

CLIL has proven to be an efficient method in the field of bilingual education in many contexts. It has been suggested by, for example, Mehisto et al. (2008: 112) that CLIL students' language proficiency develops more quickly compared to students taking regular language classes. The results from Olsson's (2021) study showed that implementing CLIL in three different schools in Sweden had a positive effect on the development of academic vocabulary, meaning that their

range of academic vocabulary increased. Academic vocabulary in the study was defined as vocabulary that is used mostly in academic texts produced in educational settings. Some differences in results were reported between the three CLIL schools, which were assumed to be caused by the different strategies of CLIL implementation. Differences in CLIL implementation included, for example, the differing nature of the tasks, which means that some tasks may elicit a wider range of academic vocabulary than others. Another and broader point of view on the effects of CLIL was taken by Järvinen (1999), who studied the effects of CLIL on learners' English as a foreign language development in a Finnish primary school context. The results indicated that CLIL learners' overall development of EFL skills was more effective, and, therefore, it was concluded that CLIL learners' English language learning was faster and more efficient (Järvinen 1999: 137-138). Furthermore, in her study, Pihko (2010) focused on the effects of foreign language education (CLIL) on three specific factors, *motivation orientation, language learner identity,* and *language anxiety*. The results showed that, compared to learners receiving regular language teaching, CLIL students' motivation towards the learning of English was higher, they were more confident in terms of their ability to learn and use English, and they suffered less from language anxiety (Pihko 2010: 34).

In his study, Roiha (2019) studied the experiences and perceptions of his former learners, who had taken part in one particular CLIL programme in Finland, with English as the target language. According to the analysis, the overall experience among the participants regarding CLIL teaching had been positive (Roiha 2019: 98-99). From the language perspective, the participants had experienced that CLIL had enhanced their overall English language proficiency, noticeable development having taken place especially in their confidence as English language users (Roiha 2019: 100). From the different areas of English language proficiency, Roiha highlights the participants' experiences in the development of vocabulary, oral skills and listening comprehension (Roiha 2019: 100). According to Roiha, from the perspective of content, most participants' experience had been that CLIL had not had a major effect on the learning of subject content, some had said content learning became even more efficient, and only a few participants' experience had been that CLIL had haltered the learning process of content on some occasions (Roiha 2019: 100.) Like Pihko (2010), Roiha (2019: 100) also brings up the fact that CLIL seemed to increase motivation towards language learning.

Increase in motivation towards learning has also been highlighted by Dale & Tanner (2012) from the perspective of content learning. They suggest that motivation towards learning content can increase considerably when teaching takes place in another, additional language. This is suggested to be due to the simultaneous development in language skills and content knowledge,

in other words, students might feel they are achieving more while learning a language and content at the same time (Dale & Tanner 2012: 11). Coyle et al. (2010: 17) introduce five commonly shared views of the benefits of introducing CLIL into education. Many of the views are also shared by Dale & Tanner (2012), who introduce the many benefits of CLIL for learners, including the aforementioned increase in motivation in both language and content learning. Table 3 below introduces the main benefits, shared by both Coyle and Dale & Tanner, of adopting CLIL into education.

Table 3 Benefits of CLIL. Adapted from Coyle 2010: 17; Dale & Tanner 2012: 11-13.

BENEFITS OF CLIL	
THEME	**EFFECTS** *(Coyle 2010: 17; Dale & Tanner 2012: 11–13)*
motivation	CLIL can increase learners' motivation towards the learning of both the target language and content. Achieving the learning goals in content can increase language learning motivation and vice versa.
language skills	CLIL improves learners' overall target language skills, and the development of language proficiency is more effective.
subject skills	CLIL introduces learners to the distinct features of different subjects, such as the ways of building knowledge. Learners are able to notice the differences between different subject literacies.
learning strategies	Learners are introduced to new learning strategies that are distinct to each subject. Learners are able to recognize strategies that best suit their needs.
cultural awareness	Depending on the nature of CLIL programmes, learners might have the opportunity to communicate with people from different cultures. Foreign cultures might offer differing perspectives on learning different contents.
future	CLIL prepares learners for future studies and working life by developing their overall language skills and content knowledge of different subjects. Skills obtained from CLIL can open doors for international fields in terms of education and career.

In addition to the themes presented above, Dale and Tanner (2012) suggest additional CLIL benefits, such as learners' cognitive development, and meaningful interaction. They explain that cognitive development is more efficient the more challenging tasks learners are provided with, and in CLIL the challenge comes from the simultaneous learning of language and content. Studying content through an additional language can widen learners' understanding of the subject and develop their skills in critical thinking (Dale & Tanner 2012: 11). As for meaningful interaction, the non-language subject enhances language proficiency by providing meaningful content, whereas the target language enhances subject knowledge by providing new terminology and other linguistic aspects related to the subject matter, such as suitable styles of writing (Dale & Tanner 2012: 12).

3 EFL, BIOLOGY & TRANSVERSAL COMPETENCE IN THE CURRICULUM

First, sections 3.1 and 3.2 briefly present the overall general aims for EFL and biology as introduced in the National Core Curriculum for General Upper Secondary Schools 2019. After presenting the general aims, more thorough attention is given to the two specific modules that act as guidance for the material package produced in this thesis: ENA5 (Sustainable future and science) for EFL and BI3 (Human impact on ecosystems) for biology. The main contents and objectives of the two modules are presented and interpreted. Lastly, section 3.3 focuses on three transversal competence areas that are incorporated in the material. The relevant areas are discussed in more detail from the perspective of both EFL and biology.

3.1 EFL in Finnish upper secondary school

English studies in Finnish upper secondary schools are divided into six mandatory modules that each have their own specific aims. In addition to the six mandatory modules, two optional modules are offered, with which students are able to further improve their English language skills. Most importantly, in all of the modules, mandatory and optional, learning is diverse, and all four language skills are taken into account: reading, listening, writing and speaking. According to the NCC 2019 (FNAE 2019: 180), the first three modules focus on making students aware of their current language skills on the basis of which they set new language learning goals for themselves as the studies go on. Modules from 4 to 6 focus more on the language itself, and typical ways of using it in different contexts (FNAE 2019: 180). In these modules, studies promote the use of English as a tool for collecting and sharing essential information on different topics. Optional modules 7 & 8 further prepare students to use English in the future for different purposes. In the material package presented in this thesis, the focus is on module ENA5, which will be now discussed in more detail.

The English module ENA5 goes by the name “Sustainable future and science”. It is a 2-credit module and one of the six mandatory English modules as mentioned previously. Table 4 below introduces the main objectives and contents of the module as presented in the NCC 2019.

Table 4 Objectives and contents of the module ENA5 as presented in the NCC 2019 (FNAE 2019: 183)

ENA5 Sustainable future and science	
Objectives	Contents
Students 1. learn to use reading strategies and summarizing skills that are suitable for the context. 2. develop their skills in producing coherent reports of their observations on topics of interest both individually and in groups.	1. fields of knowledge and science that interest students 2. different visions for the future 3. innovations that promote the building of sustainable future; opportunities to solve complex issues 4. popularized texts, source criticism 5. English as the language of science, features of scientific texts

Science is one of the core themes of the module. The module introduces students to different fields of knowledge and aims to develop students' skills in understanding and using English as the language of science. Scientific texts have their own distinct features, which students learn to recognize. By reading popularized texts students learn to notice how complex scientific information is presented to a larger audience in a simpler and more understandable way. Students learn to collect information effectively on different topics presented in English and summarize and present that information to others in different ways depending on the context. Reliable information is central to scientific research, and thus students learn to evaluate the reliability of the information they have collected.

3.2 Biology in Finnish upper secondary school

Biology studies in Finnish upper secondary schools consist of three mandatory modules and three optional modules which together extensively cover the main themes of biology from cell biology and evolution to biotechnology. The common goals for the biology studies are to guide students to observe their surroundings and phenomena from the biological viewpoint, improve students' understanding of the basic biological processes and phenomena on different biological levels, and practice and apply their skills in different biological processes and projects (FNAE 2019: 235). The mandatory modules have a broader perspective on the subject and the main themes of these modules are evolution, ecology, and human impact on ecosystems. Optional modules focus on cell biology and heredity, human biology, and biotechnology and research.

Biology module BI3, which the material package is based on, named as "Human impact on ecosystems" is a 1-credit module and the last of the mandatory biology modules studied in

upper secondary school. Table 5 below introduces the main objectives and contents of the module as presented in the NCC 2019.

Table 5 Objectives and contents of the module BI3 as presented in the NCC 2019 (FNAE 2019: 238)

BI3 Human impact on ecosystems	
Objectives	Contents
Students 1. know methods with which to follow the state of the environment and to identify environmental issues. 2. can compare, analyze and evaluate the human impact on ecosystems. 3. can present reasonable solutions to environmental issues and recognize positive trends in the state of the environment. 4. can evaluate and justify their own actions in terms of ecological sustainability. 5. can collect, analyze, interpret and present ecological research data.	1. Changes in ecosystems caused by humans, and solutions to environmental issues. 1. effects of climate change on ecosystems 2. acidification 3. eutrophication 4. effects of contaminants on food chains 5. human impact on biodiversity 2. Heading towards a sustainable future. 1. importance of ecosystem services and ecologically sustainable development 2. actions to promote sustainable lifestyle and affecting the state of the environment

As the name of the module suggests, the themes of the module strongly revolve around the environment and the many impacts humans have on it. By searching for relevant information from reliable sources, students learn to recognize the impact of human activity on different types of ecosystems. Students learn to utilize different tools and methods with which to follow the state of the environment. Students not only learn to acknowledge the negative impacts and discuss the possible solutions for them, but also learn to notice the positive trends taking place in the state of the environment. Students also become aware of their own actions and how they might negatively or positively impact the environment, and thus learn to build a more sustainable future for their part.

3.3 Transversal competence

Transversal competence consists of six competence areas, which together form the common goals for all upper secondary school subjects (FNAE 2019: 60). The different areas of transversal competence are approached from the point of view of each subject. The main objectives of transversal competence are to increase students' general knowledge of the world, develop students' skills in building a more sustainable future, and prepare students for future studies and working life (FNAE 2019: 60). In addition, each area has their own more precise objectives that are expected to be achieved during the studies (FNAE 2019: 61). Table 6 below introduces

the six transversal competence areas, and the three areas that are incorporated in the material package are bolded. This section considers the three areas central for this material package and discusses them in more detail from the perspective of EFL and biology studies.

Table 6 Six transversal competence areas presented in the National Core Curriculum for General Upper Secondary Education 2019. Areas relevant for this thesis are bolded. (FNAE 2019; FNAE 2023).

TRANSVERSAL COMPETENCE	1. Well-being competence
	2. Interaction competence
	3. Multidisciplinary and creative competence
	4. Societal competence
	5. Global and cultural competence
	6. Ethical and environmental competence

The area of *interaction competence* aims to develop students' social and emotional skills, co-operation and communication skills and language awareness (FNAE 2019: 60). According to the NCC 2019, learning to acknowledge and recognize one's own and others' emotions is an integral part of social skills (FNAE 2019: 62). Recognizing different emotions during interactions is stated to improve students' overall communication skills and thus enhance cooperation and the ability to take part in constructive communication (FNAE 2019: 62-63). One way that the area of interaction competence is visible in EFL studies is that every student's English language proficiency is taken into account and valued, which increases students' confidence as users of English (FNAE 2019: 173). The NCC 2019 (FNAE 2019: 173) states that through EFL studies students learn to recognize the elements by which effective and constructive communication (mediation) can take place. EFL studies aim to guide students to acknowledge the importance of the English language proficiency in further studies and working life (FNAE 2019: 173). According to the NCC 2019 (FNAE 2019: 234), biology studies address the area of interaction competence by aiming at strengthening students' skills in using different argumentation strategies. With these strategies students can express their views on different topics efficiently and give reasons for these views (FNAE 2019: 234). Students learn to search for scientifically reliable information that they can reflect on and evaluate their own as well as other students' views (FNAE 2019: 234). The NCC 2019 (FNAE 2019: 234) emphasizes that teaching of biology takes place in various types of learning environments through different methods, which aim to enhance students' social and interactional skills.

The area of *multidisciplinary and creative competence* promotes curiosity and motivation to learn by encouraging students to search for meanings and to combine things in new ways (FNAE 2019: 60). As the NCC 2019 suggests, this area of competence enhances students' abilities in self-regulated learning, source criticism as well as encourages them to continuously develop their learning skills (FNAE 2019: 60). This area of transversal competence highlights the importance of multiliteracy skills in today's digitalized world (FNAE 2019: 60). As stated by the NCC 2019 (FNAE 2019: 175), multidisciplinary skills are highly promoted throughout EFL studies. Integrating English with non-language subjects in a supportive learning environment encourages students to take full advantage of and further improve their current English skills (FNAE 2019: 175). In addition, the NCC 2019 (FNAE 2019: 175) highlights that EFL studies offer an opportunity to gain access to different types of discourses and sources of information. As for biology studies, students' skills in the area of multidisciplinary and creative competence are developed by considering the subject literacy of biology and other related subjects in the field of natural sciences (FNAE 2019: 234). Teaching of biology offers students opportunities to develop their skills in building scientific knowledge, and the different types of learning environments provide a platform for creative learning (FNAE 2019: 234).

Ethical and environmental competence emphasizes the importance of taking value-based and ethical actions for the common good (FNAE 2019: 60). As stated in the NCC 2019 (FNAE 2019: 60), the area promotes the understanding and appreciation of biodiversity as well as highlights the importance of scientific knowledge regarding climate change. In addition, the area aims to increase the understanding of the significance of circular economy and ecological and consumer sustainability (FNAE 2019: 60). As defined by the NCC 2019 (FNAE 2019: 176) EFL studies support the area of ethical and environmental competence by offering students tools with which they are able to access crucial information and therefore understand the central concepts relating to the competence area. The NCC 2019 (FNAE 2019: 176) suggests that developing English proficiency encourages students to contact different parties in order to find solutions to the growing environmental problems. Students are also encouraged to find and produce reliable information as well as to consider their own actions and values in terms of ethical and environmental competence (FNAE 2019: 176). Biology studies promote the area of ethical and environmental competence by making students aware of the significance of biodiversity, and by improving their understanding of environmental competence (FNAE 2019: 235). As the NCC 2019 suggests (FNAE 2019: 235), teaching of biology considers the important role of ecosystem services in the journey towards a more sustainable future, and guides students to more environmentally friendly choices in the different aspects of life. Students are

encouraged to use their knowledge of biology in discussions and reflections requiring ethical thinking (FNAE 2019: 235).

4 FRAMEWORK FOR THE MATERIAL PACKAGE

This section introduces the target group and aims for the material package. The main reason for choosing the particular level of education is briefly discussed, and the main learning aims are introduced. Secondly, the theme chosen for the material package is introduced and the overall structure of the package is described. In addition, the activity types in the material package are briefly introduced.

4.1 Target group and aims

The material is aimed for students in the upper secondary school level. The main reason for choosing this particular level of education is the apparent decrease in the amount of bilingual education offered in Finnish upper secondary schools as discussed in section 2.3 (see Lehti, Järvinen & Suomela 2006). With this material package the aim is to offer new CLIL based teaching material that integrates upper secondary school English as a Foreign Language and biology. As discussed earlier in section 2.2.2, CLIL based teaching materials are often not readily available for several reasons. One major reason is the distinctiveness of CLIL materials, since they often integrate a specific language and subject content and are targeted at a specific target group.

This material package aims to integrate some of the objectives and contents of two upper secondary school study modules (ENA5 & BI3) as well as incorporate three transversal competence areas (interaction competence, multidisciplinary and creative competence, and ethical and environmental competence), all of which were introduced in section 3. The theme of the material package revolves strongly around the environment, the many impacts humans have on its ecosystems, and sustainability. Two main factors affected the formation of the theme for this material package; the importance and relevance of the theme and the compatibility of the two modules (ENA5 & BI3) used as the basis for the material. Both modules include objectives and contents that can be connected in a fairly convenient way. One major combining factor between the two modules is the strive for a more sustainable life. Together the modules accentuate the importance of the ability to find, understand and interpret scientific knowledge regarding the current state of the environment and sustainability. On the basis of the acquired knowledge that these modules promote, students are able to evaluate their own actions

regarding environmental health and sustainability, and possibly carry out relevant changes that aid them towards a more sustainable future.

With this material package, students are offered an alternative way to learn EFL and biology. By learning the subject content through a foreign language, learners interested in the field of natural science are able to improve their English language skills concerning this particular field of knowledge. Additionally, the socially relevant theme of the package, human impact on ecosystems, not only prepares students for possible future studies in the field of natural science, but also enables them to search for reliable information that prepares them to take part in public discussions about and take actions for sustainability in the journey towards a healthier environment and sustainable future.

4.2 Theme and structure

The material package consists of six lessons each containing several activities. The perspective taken on the theme of the material package changes throughout lessons. The first two lessons take on a global perspective on the theme, whereas the third and the fourth lesson explore the theme from the perspective of Finland. The last two lessons bring the theme even closer to students' own lives by taking a local perspective on the matter. Through this perspective students consider the state of their own immediate environment and consider the effects of their own actions regarding the environment and sustainability. The different perspectives in each lesson are indicated by specific symbols. The main language and content aims achieved through the activities as well as the area(s) of transversal competence covered are introduced at the beginning of each lesson.

The material package contains several types of activities, which means language and content are integrated in different ways. Activity types range from individual to pair and group activities, and from writing activities to listening and reading activities. The nature of each activity is indicated by specific symbols. Some activities contain several stages, which means that there is, for example, both individual and pair work. The activities also aim to promote students' creativity by encouraging them to combine things that they have previously learned in new ways. One such activity is in lesson 5, where students are asked to first photograph different types of environments and observe the possible human impacts visible in them. The observations are then reported to others in small groups. Different types of activities bring variation to learning, and through them students are able to improve their overall skills in both English and biology.

Different types of activities bring variation to learning, and through them students are able to improve their skills not only in English and biology but also in learning in general (learning to learn). Laurillard (2012: 96) identifies six activity types that each promote learning in their own distinctive ways. The activity types are listed, and they are given summarized definitions on the website of Charles Sturt University (n. d.). The activity types are acquisition, inquiry, practice, production, discussion and collaboration. Each of these is covered in the material package to some extent. A few activities in the material package provide and engage students with different types of text and video material. According to the definition provided by Charles Sturt University (n. d.), such activities are identified as acquisition type activities. Activities that encourage students to consider and compare relevant concepts and ideas to improve their understanding of the content are considered inquiry type activities (Charles Sturt University n.d.). The material package offers this type of activities, for example, by asking students to give definitions to central concepts as well as collect relevant information from presented data reports. Practice type activities highlight the importance of putting theory into practice, and one such activity is fieldwork (Charles Sturt University n. d.). The material package offers at least one fieldwork type activity where students are asked to explore different types of environments and photograph them. Through production type activities students are expected to produce output in different forms, such as text or audio, which represents their understanding of the topic (Charles Sturt University n. d.). The material package includes activities where students are asked to produce output, for example, in written form as well as in the form of a short audio presentation. The written output includes short concept definitions, making of a mind map, and writing a longer piece of text. Discussion and collaboration type activities can be considered quite similar and complementary to each other. These activity types engage students in discussions with the teacher and peers, which creates a platform for expressing and developing one's conceptual understanding of relevant topics (Charles Sturt University n. d.). Collaboration type activities often include producing more concrete output, such as projects, as well as emphasize the importance of peer feedback for further learner development (Charles Sturt University n. d.). Several activities in the material package engage students in discussions and encourage them to collaborate to improve their overall understanding of the topics which at that moment are covered.

5 DISCUSSION AND REFLECTION

The aim of this thesis was to introduce new CLIL teaching material that integrates upper secondary school EFL and biology. This section reflects on the material package produced in this thesis. Firstly, section 5.1 considers the material against the criteria for CLIL-materials discussed in section 2.2.2. Secondly, section 5.2 discusses the material package's correspondence with the modules ENA5 and BI3 as well as the three transversal competence areas. Thirdly, section 5.3 discusses some of the challenges encountered during the process of designing and producing the material package. Finally, section 5.4 concludes this thesis.

5.1 Meeting the criteria set for CLIL materials

Quality teaching materials are central to all teaching as discussed in subsection 2.2.2. As CLIL materials need to take into account the learning objectives of both language and content, there are important aspects to consider when designing CLIL materials. Since the material package is based on two study modules introduced in the NCC 2019, it fulfills the criterion of covering and following the contents of the local curriculum, which Gondová (2015) emphasized as an important aspect in the process of creating CLIL materials. Using the curriculum contents as guidance also aided creating material that is suitable for the intended target group. The material package offers some adjustments, such as providing students with theme vocabularies, to make the activities an appropriate difficulty level for the target group. However, the material package could involve more adjustment methods that Lorenzo (2008) introduced (simplification, elaboration, rediscursification) to further adjust the materials to better suit the target group. Gondová (2015) also stressed the materials' up-to-dateness, which ensures the validity and accuracy of the information presented in the material package. The material package could be improved in this respect, as one activity, due to challenges in finding suitable content for the material package, included press release texts that some could consider out of date. However, the focus in the particular activity involving those press releases was more on language aspects than the content. Nonetheless, this does not exclude the fact that all materials used should always be topical and offer accurate information.

Mehisto (2012) emphasized the importance of making the learning aims and the process of learning visible to students. In the material package, the learning aims are introduced before each lesson. The aims are introduced separately for language and content, which helps both the

teacher and students to orientate to each lesson. By presenting the aims of each lesson, students know what is expected of them. In addition to the lesson aims, there is a brief explanation for the teacher about the contents and intentions of each activity. The possible preparations needed for each activity are also explained. The learning process in the material package can also be seen through the three perspectives the lessons take on the theme: global, Finland and home environment. The global perspective provides students with, for example, concepts that are central to the theme in general. The perspective then moves closer to the students' own lives and brings with it vocabulary and relevant concepts and language to process the content in the context of Finland and finally in the context of the home environment. Regarding the theme, to understand the issues met in our own immediate environment, the bigger picture has to be understood first, hence the different perspectives used in the material.

Advancing students' academic language proficiency is achieved by studying the different characteristics of scientific texts, such as text functions and subject-specific vocabulary (Mehisto 2012: 18). The material package includes two theme vocabularies that familiarize students with subject-specific concepts and terms. The first vocabulary has been compiled on the basis of a YouTube-video used in an activity in the first lesson. Although the video contains only speech and the language is somewhat informal in parts, some of the features of two science genres (report and explanation) introduced in Table 1, can be found in the speech. In the video, scientific knowledge is reported, and scientific phenomena explained. The second vocabulary has been compiled on the basis of a press release text where the results of an assessment on the state of Finnish habitats were reported. Although the text is a press release it does hold some of the qualities of a scientific text, such as topic-related vocabulary. However, as the text is a type of report structured on the basis of a scientific assessment, it holds more the features of a scientific report. The characteristics of a scientific report were also briefly introduced in section 2.2 (see The University of Waikato: n.d.).

In the material package there are at least four activities that could be said to meet the criterion of developing learning skills and learner autonomy. In the YouTube-video activity in lesson 1, students are asked to skim through the theme vocabulary before watching the video. This aims at preparing students to understand the contents of the video better. In another such activity in lesson 3, students are asked to skim through the press release text. After underlining unfamiliar words, students are asked to discuss their meanings in pairs. Each student then produces ten new sentences where some of the new words are used. The sentences are then shared with a pair, which further promotes the acquisition and understanding of new words. In the third such activity, students are asked to compare the press release to a news report written on the basis

of the said press release. In this activity, students compare e.g., the structural features of the two texts. Comparing the texts in this way shifts the focus more on linguistic features. In the fourth activity, the focus shifts more on the content's side when students are asked to fetch information from the press release text concerning the results of the assessment.

As the fifth criterion, CLIL materials are expected to create a safe learning environment. One way of achieving this is by making sure the materials avoid cognitive overload. In the material package, this has been taken into consideration, for instance, by offering students theme vocabularies, making instructions as concise and therefore as clear as possible, and dividing broader activities into several stages. With symbols defining the nature of the activities, students are able to prepare themselves for different types of activities. Another way the material package fosters a safe learning environment is by not including any sarcasm or ridicule, and by being respectful to diversity, as highlighted by Mehisto (2012: 20).

The material package enhances cooperative learning as many of the activities include parts where students interact in pairs or in groups. Cooperative learning is promoted through activities where students discuss and reflect on questions related to the content. These types of activities improve students' abilities to work in groups and manage group work. One central improvement for the material package concerning cooperative learning would be providing students with the language needed to operate in groups, such as group work related terminology and sets of phrases (Mehisto 2012: 21). This is related to one of the roles of language in CLIL, language *for* learning, introduced in the Language Triptych (Figure 1) (Coyle 2010) in section 2.2, which helps students to operate in the learning environment.

Authentic language is used throughout the material package in the form of texts and videos fetched from the media. The activities encourage students to seek authentic language as well as use the language for authentic purposes, such as when considering their own actions for a more sustainable future. Students look for information in the target language or translate information obtained in their L1 into the target language.

The material package offers students opportunities to create something new based on the content and language aspects they have learned, which fosters critical thinking and thus makes learning more cognitively challenging. However, the act of critical thinking is not necessarily emphasized enough in the material and thus would be an important aspect to consider when developing the material package further. Language, content and learning skills should be separated from each other more visibly and highlighted as individual aspects for critical thinking.

This material package offers scaffolding techniques for language and content to some extent, but not necessarily for learning skills. The material package scaffolds language by, for example, using simple instructions, offering useful links to an online dictionary and by providing students with theme vocabularies. Content scaffolding in the material package takes place by, for example, connecting the theme to students' own lives and using illustrative sources, such as videos, for learning. To develop the package further the scaffolding of language, content and learning skills should be considered more thoroughly.

The theme of the material package itself can be considered to relate to students' lives and thus make learning meaningful, since human impact on ecosystems and sustainability is a thing that should concern all. Towards the end of the material package, the connection to students' lives becomes stronger since the students are asked to consider the effects of their own actions on the environment and consider how they could live a more sustainable life. Other aspects of meaningful learning, such as offering students more control over the learning process, should be considered more thoroughly for the material to fully meet the criterion.

5.2 Correspondence with the NCC 2019

The material package integrates English as language and content from two upper secondary school modules ENA5 (Sustainable future and science) and BI3 (Human impact on ecosystems). The modules' objectives and contents were introduced in sections 3.1 and 3.2 (Table 4 & Table 5). The aim of the material package was to integrate some of the objectives and contents of the two modules as well as take three transversal competence areas into account: interaction competence, multidisciplinary and creative competence, and ethical and environmental competence.

As mentioned earlier, the learning aims of the lessons are introduced at the beginning of each lesson for both language and content in a table called "Lesson aims". The aims introduced in the table are mostly based on the two modules' objectives. Since the material package is heavily based on the two modules, it is important that each lesson contains activities where at least some of the modules' objectives and contents are visible. As for the three areas of transversal competence, each activity in the material package pursues at least one of the three competence areas depending on the nature of the activity. Therefore, it can be concluded that the material package corresponds relatively well with the NCC 2019.

5.3 Challenges in material design and production

As can be expected, there were some challenges in the process of designing and producing new CLIL material. One major challenge in the process was the limited time frame. In order to start the design process, relevant theory needed to be first introduced and considered. Content and language integrated learning is not the simplest method in bilingual education, and in a material package that integrates language and content, there are multiple things that need to be taken into account. This can already be seen in the set of criteria introduced in section 2.2.2. To meet all the requirements set for quality CLIL materials, the process of planning and creating the material would require a much wider time frame. In addition to planning and creating activities, another thing that requires planning time is the layout of the material package. The layout of the material must be clear and, for example, the fonts used must be readable.

Another challenging factor was the limited scope of the material package in terms of the number of lessons and the duration of each lesson. Therefore, the activities too had to be planned so as to fit the time frame of 50-70 minutes per lesson. Since the theme of the package alone is relatively broad and has multiple aspects to it, decisions had to be made which aspects of language and content are actually covered in the material. This posed some challenges when having to decide the most relevant aspects to include in the package.

During the designing of the material package some ethical questions had to be considered, too. The nature of the material package required searching for external source material in the form of text, videos and other media. To be able to use, for example, texts from external sources in the material package, permission needs to be obtained from the original publisher. Thus, finding suitable sources that can be used as such in the material package can prove challenging. Fortunately, the needed permissions were obtained in time for the texts used in this material package. However, in some cases, contacting the original author might be impossible. Thus, using external sources in a material package needs to always be carefully considered.

5.4 Conclusion

The purpose of this thesis was to create and produce new CLIL based teaching material that integrates upper secondary school English as a foreign language and biology. The material package has been developed on the basis of two upper secondary school modules; ENA5 (Sustainable future and science) and BI3 (Human impact on ecosystems). Furthermore, the

materials aimed to incorporate three out of six transversal competence areas into the activities (interaction competence, multidisciplinary and creative competence, and ethical and environmental competence).

All things considered the material package fulfills relatively well its purpose of offering new CLIL based teaching material. It integrates language (English) and content (biology) on the basis of the two aforementioned study modules. Thus, it can be used in upper secondary school education since it follows the contents and objectives set by the NCC 2019 for English as a foreign language and biology. Furthermore, the activities in the material package incorporate the intended three transversal competence areas in a way that each lesson promotes all three competences in different ways.

Although the activities in this material package are directed to upper secondary school students, some of them could be adjusted to suit other levels of education, such as lower secondary school. Useful adjustment methods (simplification, elaboration and rediscursification), introduced by Lorenzo (2008), have been discussed in section 2.2.2, and their use depends on the nature of each activity. Adjusting the material to lower levels would mean more scaffolding of language, content and learning skills. In other words, students should be offered more tools they can use to better understand the aspects of language and content, and tools that help them operate in different types of learning situations. Such tools could include, for example, wider theme vocabularies, guiding questions on both language and content, and suggesting useful words or phrases that aid students in, for instance, group work. It is also possible to use the material with a different target language, excluding the activities that contain English spoken videos and activities that are based on said videos. Text material from external sources could be translated to the new language, however, this would somewhat increase the workload of adjusting the material to suit another target language. In addition, the ethical issue of translating someone else's work to another language must be carefully considered, thus contacting the original author is recommendable.

Due to the limiting factors in the process of making this material package, such as the time frame in which the material package had to be produced and the limited scope of the material package, there is plenty of space for improvements. The theme of the material package is quite broad, which means there is plenty of content still to be covered. Language-wise the material package could be improved by, for example, considering the different roles of language more profoundly (see section 2.2 Figure 1). The activities and their logical continuum could be improved by giving the CLIL matrix (see section 2.2 Figure 3) a more prominent role as a guiding principle in the design process of the activities. In addition, since this material package did not

fully cover all of the criteria set for quality CLIL materials (see section 2.2.2), many improvements can be made based on the set of criteria alone.

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APPENDICES

APPENDIX 1

Permission from Finnish Environment Institute (SYKE) to use a report as part of the material package.

> Hei Annika,
>
> Voit käyttää raporttiamme oppimateriaalipaketin aineistona, kunhan mainitset raportin aineistolähteenä. Hyvä, että raportillemme tulee käyttöä tälläkin tavoin.
>
> Ystävällisin terveisin
> Anne Raunio
> Projektipäällikkö, Luontoratkaisut
> Suomen ympäristökeskus
> Latokartanonkaari 11, 00790 Helsinki
> e-mail etunimi.sukunimi@syke.fi
> puh. +358 400 148 690, 0295 251 547

APPENDIX 2

Permission from YLE to use a news report as part of the material package.

> Hei Annika!
>
> Voit käyttää Ylen artikkelia tutkimustyössäsi.
>
> Terveisin
> Eva Andberg
> Arkistotoimittaja
> Yle Arkistomyynti
> PL 61
> 00024 Yleisradio
> eva.andberg@yle.fi
> p. +358401280785

APPENDIX 3

Material package

Human impact on ecosystems

A material package for upper secondary schools
to integrate EFL and biology

Annika Ylituomaala
2023

Table of contents

Foreword

Dear fellow teacher,

It is a pleasure to welcome You to this material package that integrates the teaching of biology and English as a foreign language!

The pedagogical approach in this material is Content and Language Integrated Learning (CLIL), which is a widely used bilingual teaching method especially in the European context. The material has been designed according to two study modules introduced in the National Core Curriculum for General Upper Secondary Education 2019 (NCC 2019). Biology module BI3 "Human impact on ecosystems" offers the main theme for the material, whereas English module ENA5 "Sustainable future and science" directs focus on English as the language of science. Additionally, the material covers three of the six transversal competence areas introduced in the NCC 2019; Interaction competence, Multidisciplinary and creative competence, and Ethical and environmental competence. The objectives and contents of the modules and the aims of the transversal competence areas are introduced in more detail on the following page.

In addition to offering students an alternative approach to covering and achieving some of the contents and learning objectives of the two aforementioned study modules, the material aims to prepare students for the future challenges regarding environmental issues. There is no arguing that the constantly growing environmental issues are mostly caused by us humans. It is of utmost importance that everyone of us acknowledge these issues so that we can try and make this world a better place to live. In order to achieve this, we need reliable information about the state of the environment by which to decide the reconstructive actions to be taken. The fight for a healthier environment means collaborating with people all around the world. To be able to collaborate with people, we need communication skills in which language proficiency poses a major role.

Although environmental issues are largely global, the approach to the theme stays for the most part within the Finnish and the students' own immediate environmental contexts. However, to understand the issues met in our own environment, we need to understand the bigger picture, which is why the material package begins with a global perspective.

The material consists of six lessons approximately 50-70 minutes in length. Each lesson contains different types of activities from individual to pair and group work. Activities include writing and oral activities and listening and reading activities. Content and language go hand in hand throughout the material, each activity emphasizing more or less both English and biology. In the beginning of each lesson there is an info box about the activities for the teacher, and the main aims for each lesson are introduced.

Enjoy!
Sincerely,
Annika Ylituomaala

Modules ENA5 & BI3

ENA5 Sustainable future and science	
Objectives	Contents
Students 1. learn to use reading strategies and summarizing skills that are suitable for the context 2. develop their skills in producing coherent reports of their observations on topics of interest both individually and in groups	• fields of knowledge and science that interest students • different visions for the future • innovations that promote the building of sustainable future; opportunities to solve complex issues • popularized texts, source criticism • English as the language of science, features of scientific texts

Source: Finnish National Agency for Education. (2019). Lukion opetussuunnitelman perusteet 2019. p. 183.

BI3 Human impact on ecosystems	
Objectives	Contents

Students
1. know methods with which to follow the state of the environment and to identify environmental issues
2. can compare, analyze and evaluate the human impact on ecosystems
3. can present reasonable solutions to environmental issues and recognize positive trends in the state of the environment
4. can evaluate and justify their own actions in terms of ecological sustainability
5. can collect, analyze, interpret and present ecological research data
	• Changes in ecosystems caused by humans, and solutions to environmental issues
	  ◦ effects of climate change on ecosystems
	  ◦ acidification
	  ◦ eutrophication
	  ◦ effects of contaminants on food chains
	  ◦ human impact on biodiversity
	• Heading towards a sustainable future
	  ◦ importance of ecosystem services and ecologically sustainable development
	  ◦ actions to promote sustainable lifestyle and affecting the state of the environment

Source: Finnish National Agency for Education. (2019). Lukion opetussuunnitelman perusteet 2019. p. 238.

Transversal competence areas

1. Interaction competence	2. Multidisciplinary and creative competence	3. Ethical and environmental competence
• Emotional and empathy skills • Social and cooperation skills, collaboration skills • Language awareness and skills in constructive communication	• Curiosity and motivation to learn as well as find new meanings and combine things in new ways • Self-regulated learning, source critisism and continuous development of learning skills • Multiliteracy skills in todays digital era	• Value-based and ethical action for the common good • Valuing biodiversity and developing one's climate knowledge based on research data • Understanding circular economy and sustainable consumerism

Source: Finnish National Agency for Education. (2019). Lukion opetussuunnitelman perusteet 2019. p. 60.

Symbols

Transversal competence areas

The following symbols are used to indicate which of the three transversal competence areas each activity covers:

TC 1 — Interaction competence

TC 2 — Multidisciplinary and creative competence

TC 3 — Ethical and environmental competence

Theme perspectives

The material package begins by taking a global perspective on the theme of human impact on ecosystems. Next, the theme is considered from the perspective of Finland. Finally, the theme is brought even closer to students' lives and considered in the contexts of students' nearby home environment. The following symbols are used to indicate each perspective:

Global

Finland

Home environment

Activity symbols

The lessons comprise of different types of activities. The following symbols are used to indicate the type of each activity and which skills they aim to develop. Each activity is also given an approximate duration time.

work individually

work in pairs

work in groups

read

listen

write

speak/discuss

create

approximate activity duration

LESSON 1

For the teacher:

Activity 1: The purpose of this activity is to orient students to the theme of the material package: human impact on the environment.

Activity 2: Students first familiarize themselves with the vocabulary related to human impacts on the environment. The vocabulary is based on the YouTube-video introduced in the activity. The activity has several steps and includes both individual and pair work.

Preparation: Print Appendix 1 (answer key) to each pair.

Activity 3: In this activity students are asked to find reliable information from the internet and other possible sources such as books or articles if available. The activity will later serve in Lesson 5.

Preparation: Go through the features and criteria of what is a reliable source of information. You can use e.g. the following websites for help.
1: https://peda.net/p/eevapek/6-jakso/oltth/otjlk
2: http://www03.edu.fi/oppimateriaalit/lahdeesiin/

Lesson aims:

	Language:	Content:
Activity 1 TC 1	• Learn to discuss the theme in English • Practice oral skills	• Orient to the theme
Activity 2 TC 1 TC 2 TC 3	• Learn new vocabulary • Practice listening comprehension	• Familiarize with five major impacts humans have on the environment • Understand the meanings of key concepts and terms related to the content
Activity 3 TC 1 TC 2 TC 3	• Learn to use reading strategies and gather reliable information • Write coherent descriptions	• Understand central concepts and learn to define them • Understand the importance of ecosystem services and their benefits

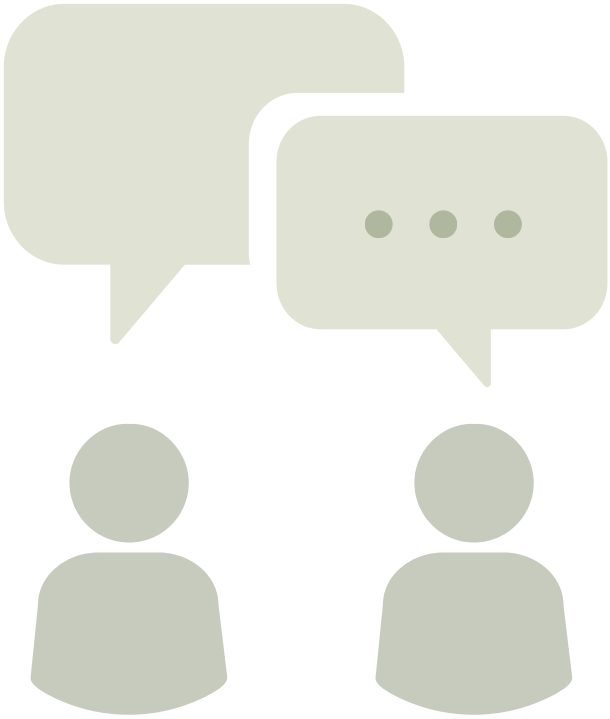
Activity 1: Warm up discussion

10 min.

Instructions

Discuss the questions with your partner:

1. In what ways do humans impact the environment?
    - What are some negative impacts?
    - What are some positive impacts?
2. What kind of human effects on the environment have you noticed in your own life?



Activity 2: YouTube-video on human impacts

45 min.

Instructions

A. Skim through the Theme vocabulary on page 7.

B. With your device, search and watch the video once without pauses. Turn subtitles on if needed.

C. Read through the following questions and make sure you understand them:

1. What are the four ecosystem services?
2. What is said about biodiversity?
3. How do high-biodiversity and low-biodiversity ecosystems differ from each other and how are they affected if one species is removed?
4. What are the five detrimental impacts that humans pose on the environment?
5. How does large-scale desertification take place?
6. How does the video shortly and concisely explain global warming?
7. What are the effects of global warming mentioned in the video?
8. How does the current climate change differ from all the other climate changes that have taken place over the history of the Earth?

D. Watch the video again, pause it whenever needed, and answer the questions shortly. Write your answers in your notebook or on your device.

E. With a pair, compare and check your answers.

F. Return to the answers for question 4 and discuss:
Why do you think the five detrimental impacts continue to happen, and what could we do to prevent them?

Video: 5 human impacts on the environment

YouTube: Crash Course, 5 Human Impacts on the Environment: Crash Course Ecology #10
https://www.youtube.com/watch?v=5eTCZ9L834s

Theme vocabulary: 5 human impacts on the environment

extinction	sukupuutto
ecosystem service	ekosysteemipalvelu
intact	ehjä, vahingoittumaton
biosphere	biosfääri, elokehä
deforestation	metsäkato
acid rain	happosade
desertification	aavikoituminen
support services	ylläpitopalvelut
to replenish	täyttää, täydentää
compound	yhdiste
carbon	hiili
nitrogen	typpi
phosphorus	fosfori
provisioning services	tuotantopalvelut
aquifer	pohjavesikerrostuma
to yield	(tässä) antaa, tuottaa
regulating services	säätelypalvelut
fungi (mon., fungus yks.)	sienet (sieni)
to decompose	hajottaa
flood control	tulvasuojelu, tulvan säännöstely
robust	elinvoimainen
tangible	aineellinen
cultural services	kulttuuripalvelut
resilient	vastustuskykyinen, kestävä
to cascade	jakaa, saada aikaan tapahtumasarja
to clear-cut	hakata paljaaksi
to graze	laiduntaa
to harvest	korjata (satoa)
to absorb	imeä, imeytyä
runoff	valuma
to seep	suotautua
cascade effect	peräkkäis-/ kerrannaisvaikutus
fertile	hedelmällinen

Activity 3: Search for information

Instructions

A. Work in pairs.

B. Using the internet and other relevant sources, define the following concept in English:

- ecosystem services

C. Find information from sources you consider realiable on the benefits that each four ecosystem service offers. Write in English. List all the sources you used.

D. Share and compare your answers with another pair. Compare the sources you used and explain why you think they are reliable sources of information.

LESSON 2

For the teacher:

Activity 1: While the explicit focus in this task is on content, it integrates focus on language as well. The missing words being either prepositions, adjectives, verbs or nouns challenge students to focus on both linguistic forms and content knowledge. The sentences are related to Activity 2 (YouTube-video) from Lesson 1. With this activity, students are able to test the knowledge they gained from the previous lesson. By explaining their answers to a peer, students are challenged to justify their answers which might help them notice possible mistakes more easily. If needed, students can use the video for help.

Activity 2: This activity aims to develop both students' content knowledge and language proficiency related to the theme introduced so far. The activity tests students' current knowledge on and understanding of the key terms/concepts learned so far as well as their linguistic abilities to define them. If the activity is too challenging, students can revise the vocabulary beforehand. Students can write the definitions in Finnish first. The definitions for each term/concept are introduced after which the group forms a definition for each term/concept in English. The activity can be repeated with different terms/concepts as many times as necessary.

Preparation: choose 5-10 key terms/concepts from the Theme vocabulary on page 7, number them, and make them visible for the whole class (e.g., a whiteboard). Each student needs a piece of A4-sized paper. For this task, students are divided into groups with as many participants as there are terms/concepts, and they are given a number corresponding to the chosen terms/concepts.

Lesson aims:

	Language:	Content:
Activity 1 TC 1 TC 2	• Acquire subject specific vocabulary • Develop oral skills • Acquire subject literacy conventions (science genres: information is presented with specific sentence structures) • Focus on form	• Develop content knowledge • Acquire subject specific vocabulary
Activity 2 TC 1	• Learn to define concepts in one's own words	• Understand the meaning of essential concepts

Activity 1: Vocabulary – fill in the gaps

Instructions

The following sentences are missing either prepositions, nouns, adjectives or verbs. All sentences relate to the video from the previous lesson. The theme vocabulary on page 7 can also be used for help.

A. Fill in the gaps in the sentences according to the clues below.

B. Compare your answers with a pair and take turns in explaining why you chose the particular words for the gaps.

1. Forests provide all four types of _____.

2. Provisioning services can be seen as _____ services, because they provide something concrete that can, for example, be sensed physically.

3. The higher an ecosystem's _____ is, the more _____ it is _____ the changes that occur.

4. Carbon dioxide is the principle _____ in the atmosphere, and the more carbon dioxide there is, the _____ the Earth will be.

5. Human action has major impacts _____ ecosystems all over the world.

6. _____ and _____ are the most important nutrients.

7. Nature provides humans with different kinds of _____ that can be used _____ clothing, for instance.

8. Bacteria and _____ _____ dead organisms, and therefore are a part _____ _____ _____.

9. Abundant vegetation acts efficiently _____ _____ _____ by _____ some of the rainwater.

10. Cutting down forests and other vegetation results in _____.

1. noun (plural)
2. adj.
3. noun/adj./prepos.
4. noun/adj. (comparative)
5. prepos.
6. noun/noun
7. noun (plural)/prepos.
8. noun (plural)/verb/prepos./ ylläpitopalvelut
9. prepos./noun/verb
10. noun

Activity 2: Vocabulary – define terms and concepts

Instructions

A. Word consequences

1. The teacher selects and writes a certain number of terms/concepts from the Theme vocabulary on a whiteboard and gives them a number.

2. Work in groups. The number of participants in a group depends on the number of terms/concepts the teacher has chosen for this task.

3. After you have been given a number by the teacher, look up the term/concept directed to you.

4. Write your number and the term/concept at the top of the paper. Define it in your own words. Write the definition under the given term/concept.

5. Fold the paper so that the definition is hidden.

6. Write down your number and the term/concept again at the top of the paper. In a clockwise manner, give the paper to the person sitting next to you. Make sure your definition stays hidden.

7. Give a definition to the next term/concept you receive. Fold the paper, and write the number + term/concept at the top.

8. Repeat until all participants have given their own definitions to each term/concept. Each student should end up with the term/concept they started with.

B. In the group, compare the definitions for each word one at a time. Choose the best definition for each word. Present the definitions to the rest of the class.

LESSON 3

For the teacher:

Activity 1: The purpose of this activity is to prepare students for understanding the contents of the text as well as to acquire new content-related vocabulary. Forming new sentences in which the unfamiliar words are used enhances students' understanding of the words. Sharing the sentences with a pair and discussing the meanings further enhance the understanding and the correct contextual use of the words.

Preparation: Text A can be printed to each student if it makes underlining/highlighting the words easier. Text B can also be printed for upcoming Activity 3.

Activity 2: This activity shifts the focus on the content and thus enhances the understanding of the text's contents. Students read the text and formulate five questions related to the content and write answers to their questions on a separate document/sheet of paper. Giving answers to their own as well as other student's questions amplifies the processing and therefore the understanding of the content.

Preparation: Unless students are able to use their own devices conveniently (e.g. share an electronic document), provide each student with two sheets of paper; one for questions and one for answers.

Activity 3: With this activity, the focus is again shifted more on language aspects. This activity emphasizes the ways in which information is presented in the two different texts (press release and news report). Comparing the texts, students are able to notice the differences in reporting information, and the ways in which key information has been summarized.

Preparation: Together with students, go through the principles of a summary. You can use, for example, the following websites for help:
1. https://webcgi.oulu.fi/oykk/abc/tekstinhuolto/tekstilajeja/referaatti/
2. https://www.kielikello.fi/-/asiatekstin-referointi-kielenkayton-perustaito

Lesson aims:

	Language:	Content:
Activity 1 TC 1 TC 2 TC 3	• Acquire new subject related vocabulary • Use words in a correct contexts	• Acquire new subject related vocabulary • Develop content knowledge
Activity 2 TC 1 TC 2 TC 3	• Develop reading strategies • Focus on form (questions)	• Understand the content • Develop content knowledge • Recognize possible cause and effect relations • Interpret reported data
Activity 3 TC 1 TC 2	• Recognize reliable sources of information • Recognize the features of a popularized text	

Activity 1: Finding new words

Instructions

20 min.

A. Skim through Text A and underline or highlight words that are unfamiliar to you.

B. Share your underlined words with a pair. Discuss the meanings of the words to make sure you understand them correctly. You can use an online dictionary (e.g. Redfox) and other sources for help.

C. Come up with ten new sentences. In each sentence, use at least one underlined/highlighted word. Use the same word only once. Share the sentences with your pair.

Example: An oligotrophic habitat lacks nutrients that are necessary for organisms.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

Assessment of threatened habitat types in Finland 2018: The status of natural habitats continues to deteriorate

The threat status of habitat types in Finland was evaluated for the second time. Almost half (48%) of the nearly 400 habitat types across the country were assessed to be threatened. In southern Finland, the proportion of threatened habitats is clearly higher (59%) than in northern Finland (32%). The status of habitat types has not improved during the past decade; instead, the trend among many habitat types is assessed to be declining. However, it is possible to improve the status of habitats.

57 habitat types were classified as Critically Endangered (CR). Out of these, as many as 40 were semi-natural biotopes, i.e., grasslands, meadows, pastures and grazed woodlands. Other habitats classified as Critically Endangered include river habitats in clay soil areas in southern Finland, rich fens, and snowbeds in fell areas threatened by climate change. The highest numbers of Endangered (EN) and Vulnerable (VU) habitat types were found in groups of mires, forests and coastal habitat types by the Baltic Sea.

Semi-natural grasslands are the most threatened, while rocky and fell habitat types are better preserved

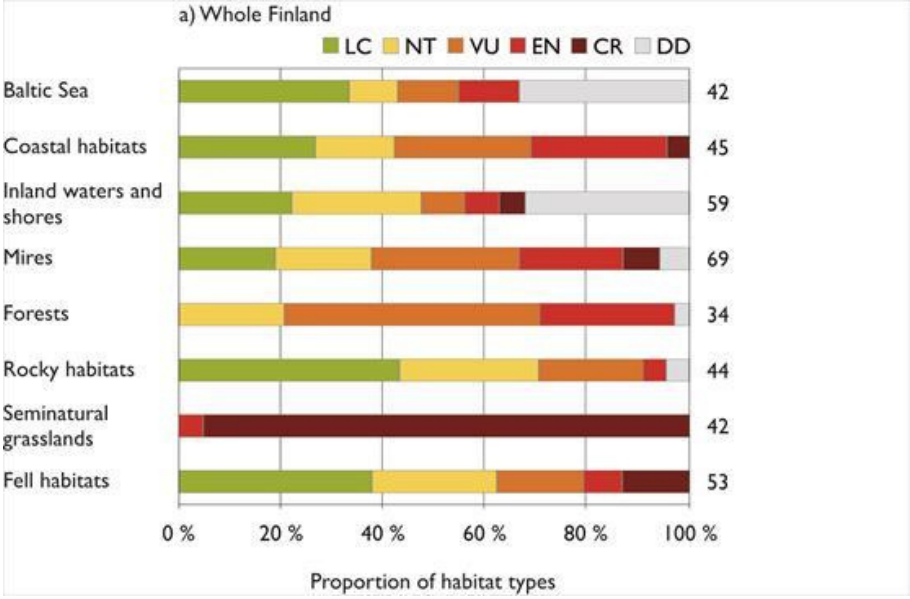
All semi-natural grasslands and grazed woodlands were assessed to be threatened, with a majority of them assessed as Critically Endangered. Forest habitat types have the second largest share (76%) of threatened habitats, while the lowest shares are found in inland waters (20%), the Baltic Sea (24%) and rocky habitats (25%). The small percentages in the Baltic Sea and inland waters can partly be explained by the poor knowledge of the status of these habitats. It should also be noted that the percentages of threatened habitat types do not only reflect the recent pace of decline, rather, the results may also have been affected by historical decline. When the quantity and quality of habitat types were compared to the pre-industrial era, the threat status was increased in nearly a quarter of all habitat types, although recent decline in those habitats may not have been as strong.

The highest numbers of non-threatened habitat types (categories Near Threatened or Least Concern) were found among the rocky and fell habitats. For example, acidic rock outcrops and scree, as well as some of the oligotrophic mire habitats found predominantly in northern Finland are assessed to be of Least Concern. Habitats in the category Least Concern also include habitat types that have increased in area in recent decades and show no significant deterioration, such as coastal reedbeds with Phragmites australis and coastal Salix spp. thickets.

Habitat types face many threats but there are ways to improve their status

The most important reasons for habitat types being threatened were forestry, drainage, clearing of areas for arable land, construction, and eutrophication. Among the reasons in the past, climate change was considered to have little impact (with the exception of the fell area) but it is estimated to gain considerable significance as a threat factor in the future.

Decisions on how to apply the results of this assessment will be made later, following a broad-based preparatory work. In order to facilitate this preparatory work, the expert teams have proposed 70 measures in total for improving the status of the threatened habitat types. The key is in paying more attention to threatened habitat types in land use planning and the use of natural resources.



The division of habitat types into Red List Categories in each habitat type group according to the number of habitat types. The number of habitat types in each group is shown on the right. The Red List categories: LC = Least Concern, NT = Near Threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered, and DD = Data Deficient. Habitat types classified as VU, EN and CR are threatened.

The protection, management and restoration of habitats must be made more efficient and we must find new methods, such as ecological compensation. Climate change increases further the need to launch and find new, efficient measures to improve the status of threatened habitat types as it intensifies the negative impact of many threats, such as eutrophication.

Finland at the forefront of assessing habitat types

A new international method, the IUCN Red List of Ecosystems, was used in the assessment. Finland is pioneering the use of this method. The method provides detailed criteria for evaluating the changes in the quantity and quality of habitat types, and their rarity. Evaluation was performed on all main groups of habitat types: the Baltic Sea, its coast, inland waters and shores, mires, forests, rocky habitats, semi-natural grasslands and grazed woodlands, and fell habitats.

Changes were examined during the past 50 years and over a longer time span with a comparison to the pre-industrial era of the 1750s. Attempts were also made to predict future changes. In addition, current trends for each habitat type were assessed to be improving, stable, or deteriorating.

Due to a change in method, the results of the first and the second threat assessment are not directly comparable, but the results indicate the cases where genuine change in threat is seen from the previous evaluation. Genuine change was only observed in 22 habitat types, and in almost all cases, the change meant moving to a higher threat category. Evaluations of the current trends of habitat types also indicate a primarily downward direction: in the whole country, the trend for 57% of habitat types was estimated to be deteriorating, while the percentage for an improving trend was 5.

The threat assessment of habitat types was performed in an extensive three-year project involving more than 120 experts from various research institutions, universities and agencies. The work was coordinated by the Finnish Environment Institute (SYKE), and participants include all national key actors, such as Natural Resources Institute Finland (Luke), several universities, the Metsähallitus Parks and Wildlife Finland, the Geological Survey of Finland, Finnish Museum of Natural History, Centres for Economic Development, Transport and the Environment, the Government of Åland, the Finnish Forest Centre and the Reindeer Herders' Association. The work was steered and funded by the Ministry of the Environment and a steering group set by the Ministry and made up of all the key bodies that generate information on natural habitats.

Appendices

NOTE:

Appendices included more detailed assessment results from each habitat group in PDF form. The separate files can be found here:

Text: Suomen ympäristökeskus (SYKE) / Finnish Environment Institute. Press release. 18.12.2018. https://www.syke.fi/en-US/Current/Assessment_of_threatened_habitat_types_i(48849)

Assessment of threatened habitat types…

assessment	arvio
threat	uhka
habitat type	luontotyyppi, biotooppi
to evaluate	arvioida
to assess	arvioida
to improve	parantaa, edistää
Critically Endangered (CR)	äärimmäisen uhanalainen
biotope	biotooppi. luontotyyppi
climate change	ilmastonmuutos
Endangered (EN)	erittäin uhanalainen laji
Vulnerable (VU)	vaarantunut laji
mire	suo

Semi-natural grasslands are…

semi-natural grasslands	perinneympäristöt (niityt, laidunmaat)
grazed woodlands	metsälaitumet (esim. poro, karja)
forest habitat	metsäelinympäristö
share	osuus
inland waters	sisävedet (järvet, lammet, joet, purot)
the Baltic Sea	Itämeri
rocky habitat	kallioelinympäristö
recent	viimeaikainen, äskettäinen
pace	tahti
decline	lasku
quantity	määrä
quality	laatu
to increase	kasvaa, nousta / kasvattaa, nostaa
Near Threatened	silmälläpidettävä laji
Least Concern	elinvoimainen laji
fell habitat	tunturielinympäristö
predominantly	lähinnä
deterioration (to deteriorate)	huonontuminen, heikkeneminen
coastal reedbed	rantakaislikko, -ruoikko

Habitat types face many threats...

forestry	metsätalous, metsänhoito
drainage	tässä; ojittaminen, (maan)kuivattaminen
arable land	viljelyskelpoinen maa
construction	rakentaminen
eutrophication	rehevöityminen
protection	suojelu
management	ylläpito
restoration	ennallistaminen
ecological compensation	ekologinen kompensaatio

Finland at the forefront of assessing...

rarity	harvinaisuus
shore	ranta
to indicate (smth)	merkitä, osoittaa jtn

Activity 2: What do the assessment results say?

Instructions

A. Read Text A.

B. Come up with five questions related to the contents of the text. Write them down. You can use your device or write them on a sheet of paper provided by the teacher.

C. On a separate document/sheet of paper, write the answers to your questions.

D. Give the questions to your partner. In turn, write answers to the questions your partner has come up with.

E. Check your answers.

Activity 3: Press release vs news report

Instructions

The Finnish Environment Institute (SYKE) with other major institutes and organisations carried out an assessment on the state of the main habitats in Finland in 2018. After the assessment, the press release (Text A) was published by SYKE. On the basis of the press release, the Finnish Broadcasting Company YLE wrote a news report (Text B).

A. Read the press release once again and then the news report (Text B) individually.

B. After reading, discuss the texts with your partner. Write down your thoughts.

1. How do the texts/publications differ from each other
    a. by structure?
    b. by language?
    c. by how information is presented in them? (e.g. text, graphs, etc.)
    d. by content?
2. If the texts/publications do differ, consider why.
3. Suggest three improvements for the news report.
4. How do you know if the texts are reliable sources of information?

C. Share your thoughts with another pair.

Report: Finland's environment suffering from human activity

Almost half of the nearly 400 habitat types across the country are under threat, mainly from human activity, says a new environmental evaluation.

The status of natural habitats in Finland has continued to deteriorate over the past decade with 48% of the nearly 400 habitat types across the country evaluated as threatened, according to a new environmental threat assessment released on Tuesday.

Coordinated by the Finnish Environment Institute (SYKE), the threat assessment of habitat types was the outcome of an extensive three-year project involving more than 120 experts from various research institutions, universities and agencies.

The share of habitats classified as threatened in southern parts of the country (59%) is significantly higher than in the north (32%).

The most important reasons for habitat types being threatened were found to be forestry, drainage, clearing of areas for arable land, construction, and eutrophication. Among the reasons in the past, climate change was considered to have little impact, with the exception of the fell area, but it is estimated to gain considerable significance as a threat factor in the future.

A new international method, the IUCN Red List of Ecosystems, was used in the assessment. The method provides detailed criteria for evaluating the changes in the quantity and quality of habitat types, and their rarity.

Evaluation was performed on all main groups of habitat types: the Baltic Sea, its coast, inland waters and shores, mires, forests, rocky habitats, semi-natural grasslands and grazed woodlands, and fell habitats. Changes were examined during the past 50 years and over a longer time span with a comparison to the pre-industrial era of the 1750s. Attempts were also made to predict future changes.

Semi-natural grasslands and grazed woodlands

All of Finland's semi-natural grasslands and grazed woodlands are threatened. They were divided into twelve groups (such as dry meadows, alluvial meadows and wooded pastures) and forty habitat types (such as grass rich dry meadows, herb rich alluvial meadows and wooded pastures dominated by coniferous trees) in the assessment. Of the forty habitat types, as many as 38 were deemed Critically Endangered (CR) in the entire country.
The only semi-natural habitat types that are slightly less threatened are graminoid heaths and dwarf shrub heaths, but they were also categorised as Endangered (EN).

Forests habitats diminishing

Forests in Finland have significantly lost their natural ecological characteristics. At the same time, the expanse of many forest habitats has diminished. As a result of these changes, 76% of forest habitats in Finland are now threatened.

Another 21% of the forest habitats were assessed as nearly threatened, and one forest habitat was assessed to be data deficient.

Lake conditions improved

Most streams and rivers outside of northern fell regions were found to be threatened or near threatened. Flowing water habitats are endangered especially in southern Finland. Inland water habitats have suffered from measures including shoreside construction, forest clear cutting, agriculture and peat production.

The condition of lakes has improved over the past decade with most classed under the heading of least concern.

Eutrophication still a threat to Baltic Sea

Eutrophication continues to be the most important threat to underwater marine habitats in the Baltic Sea. It was considered to be the most significant cause of deterioration for almost all threatened or Near Threatened marine habitats, such as seafloor biotopes of bladder wrack, red algae and common eelgrass.

A total of 42 Baltic Sea habitats was listed, of which 10 were estimated to be threatened and four to be Near Threatened. However, 14 habitat types were classified as Data Deficient, which shows that more information is needed about underwater marine habitats.

Overgrowth along Baltic Sea coast

The coast of the Baltic Sea was divided into 45 habitat types, 58% of which were assessed to be threatened and 15% to be near threatened. Only a bit over a quarter of them (27%) was assessed to be in the category "Least Concern".

The most significant reasons for the habitats becoming threatened are coastal overgrowth due to the eutrophication of the Baltic Sea and eutrophication increasing atmospheric fallout, construction activities and wear of vegetation in popular recreational areas.

Fells subject to climate change

In fell areas, climate change causes gradual advancement of pine forests, increasing damage to mountain birch forests as new moth species spread into the area, and shorter duration of snow cover.

Of all fell habitat types 20, or 38%, were estimated to be threatened -- almost the same as the total area covered by these fell habitat types.

Mire habitats affected by forestry drainage

Drainage for forestry is the main reason for mire habitats being threatened. More than half of Finland's mires have already been drained for this purpose.

The evaluation covered 50 mire types, 54% of which were assessed threatened in the entire country, while a further 20% are Near Threatened.

Protection for rocky habitats

The assessment highlights calcareous and serpentine rock outcrops as the most threatened rocky habitat types. Protecting these most threatened yet highly important habitats for rock species from the effects of land use would not require large protection areas.

Preserving the calcareous and serpentine rock outcrops would not require more than 10 square kilometres of additional protection areas. This could also be partly achieved by means of voluntary protection.

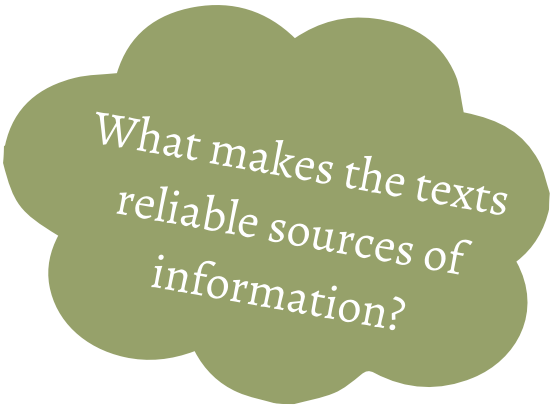
70 remedial measures proposed

Decisions on how to apply the results of this assessment will be made later, following large-scale preparatory work. The expert teams involved have proposed a total of 70 measures for improving the status of the threatened habitat types.

The Finnish Environment Institute says that the key is in paying more attention to threatened habitat types in land use planning and the use of natural resources. The protection, management and restoration of habitats must be made more efficient.

Climate change, it notes, further increases the need to launch and find new, efficient measures to improve the status of threatened habitats.

More detailed information from the assessment, including appendices, is available in English on the Finnish Environment Institute website



Text: Yleisradio Oy (YLE) / Finnish Broadcastin Company. News report. 18.12.2018.
https://yle.fi/a/3-10560090

LESSON 4

For the teacher:

Activity 1: This activity continues with the theme of summarizing essential information. It takes advantage of the notes students have written in the previous lesson about the differences between a press release text and a news report text. The focus in this activity is quite equally on both language and content aspects. In terms of both language and content, students learn to recognize essential points and cause and effect relations. Content-wise students familiarize themselves with one major factor that has an effect on the environment. Language-wise students acquire new vocabulary and learn to summarize essential information. This activity also promotes English writing skills.

Preparation: If necessary, go through the principles of a summary once more with the students. You can use the websites provided in lesson 3 for help:
1. https://webcgi.oulu.fi/oykk/abc/tekstinhuolto/tekstilajeja/referaatti/
2. https://www.kielikello.fi/-/asiatekstin-referointi-kielenkayton-perustaito

Activity 2: This activity further exercises students' skills in summarizing essential information. In addition, the activity aims to develop students' oral skills. An optional follow up step of the activity enhances students' skills in picking up the most essential information from a short recording and compiling a mind map of the key vocabulary used in the report.

Lesson aims:

	Language:	Content:
Activity 1 TC 1 TC 2 TC 3	• Acquire new theme related vocabulary • Recognize essential information from a longer piece of text • Recognize cause and effect relations • Learn to summarize essential information • Learn to use suitable reading strategies	• Understand essential points from the text • Recognize cause and effect relations • Acquire deeper knowledge on at least one major factor that affects the environment and its ecosystems
Activity 2 TC 1 TC 2 TC 3	• Learn to summarize essential information • Recognize essential information from a short audio report • Develop listening comprehension	• Develop content knowledge • Understand the main points from a short report

Activity 1: Writing your own news report

30 min.

Instructions

A. Choose one out of the following three press releases (SYKE), read it and make notes. Pay attention the main points introduced on the topic. Use an online dictionary (e.g. Redfox) if needed to recognize unfamiliar words.

1.

"Global warming causes significant changes on the Baltic Sea region" (SYKE 2015)

2.

"Microplastics - a risk to inland and marine waters in Finland" (SYKE 2017)

3.

"Road traffic is a significant source of microplastics" (SYKE 2020)

B. Recall the notes you made in Lesson 3, Activity 3. On the basis of your chosen press release above, write your own news report on the topic. Lenght about 300-400 words.

Activity 2: Audio report

20 min.

+ Optional: 10 min.

Instructions

A. Do an audio recording where you report the main points from your written news report. Length about 20-30 seconds.

Alternatively: If the study facilities allow, record you report in video format.

+ Optional. Find a pair. Listen to each other's recordings. From the recording, pick up words that you think are the most relevant and form a mind map. Show the mind maps to each other and check if you have understood the main points of each other's reports.

There is a homework pre-task to be completed for Lesson 5. See instructions on page **32**.

LESSON 5

For the teacher:

Activity 1: Students are required to complete this activity as homework before activity 2. This activity directs students to observe their surroundings in their own nearby environments. They learn to compare different types of environments and recognize their features.

Activity 2: This activity has three different steps that all relate to activity 1. In step A students learn to recognize human impacts in the environments they have photographed. In step B students learn to report their observations to others in small groups. In step C students are required to recall the four ecosystem service types from Lesson 1 and consider which services can be found in the environments they have photographed.

Preparation: Print appendices 2, 3 and 4 for each student.

Lesson aims:

	Language:	Content:
Activity 1 TC 2 TC 3		• Recognize different types of environments in which different types of human impacts can be observed
Activity 2 TC 1 TC 2 TC 3	• Summarize central observations understandably • Report central observations in different ways (written & spoken, individual & group)	• Observe and recognize different types of human impacts on different types of environments. • Recognize and identify human impact on biodiversity. • Develop understanding of the significance of ecosystem services

Activity 1: Observe your surroundings

This activity is a homework pre-task for Activity 2.

Instructions

A. Before the next lesson, observe your surroundings wherever you go. Find at least four environments that differ from each other as much as possible. Take a picture of each environment (4 pictures total). The environments can differ, for example, in:

- vegetation
- buildings and other structures/constructions
- land use (e.g. field, park, production forest, etc.)

Activity 2A: Human impact on different environments

15 min.

Instructions **Appendix 2 and Appendix 3 needed.**

A. Look at the photos you have taken of the different types of environments. Title the photos and write down your observations on appendices 1 and 2 accordingly:

1. How can human action be seen in them?
2. Are the effects of these actions positive or negative and for who?

See example below:

Example:

Appendix 2

Photo title	Observable human impacts
1. Field scenery	*Agriculture, drainage, forestry (one dominating tree species in the forest nearby, pine forest)*

Appendix 3

Photo title	+	-
1. Field scenery	*People: food, economic growth, cultural scenery* *Animals: food (crops), shelter (hay barns)*	*People: no natural scenery* *Animals: living habitat loss* *biodiversity loss, drainage issues*

Activity 2B: Report your observations

15 min.

Instructions

A. Form groups of three. Report your observations from Activity 2A.

Activity 2C: Ecosystem services

Appendix 4 needed.

20 min.

Instructions

A. Recall the four types of ecosystem services that nature and ecosystems provide (Lesson 1, Activity 2).

B. Consider which of the four ecosystem services can be found in each of the environments you have photographed. Tick the corresponding boxes on Appendix 3.

C. Below the boxes, write notes on how the services can be seen in each environment.

D. Introduce your findings to your group.

LESSON 6

For the teacher:

Activity 1: This activity introduces students to the principle of four R's: refuse, reduce, reuse, recycle. Students watch the video individually and pick up the definitions for the four R's which are then shared with a pair. This activity enhances students' understanding of the four concepts as well as the concept of "resource".

Activity 2: Through this task students become aware of their own consumption habits. The activity encourages them to consider and reflect on what they could do to possibly live a more sustainable life.

Activity 3: Through this activity students are encouraged to consider and reflect on their actions regarding sustainability more in depth. The activity also promotes students' skills in writing and in the search for reliable information. Activity 2 can be used for help in this writing assignment. Students can start this activity during the lesson and finish it at home.

Lesson aims:

	Language:	Content:
Activity 1 TC 1 TC 2 TC 3	• Acquire content related language	• Learn about actions that help in achieving a more sustainable lifestyle and thus a more sustainable future
Activity 2 TC 2 TC 3	• Learn to concisely report about your own actions when heading towards a sustainable lifestyle	• Become aware of your own actions regarding sustainability • Become aware of the changes you can make in your own life to live more sustainably
Activity 3 TC 1 TC 2 TC 3	• Learn to express your thoughts on sustainability in more detail • Learn to reason rationally • Learn to use English as the language of science	• Expand your knowledge on and consider sustainability more in depth • Learn to give reasons for why sustainable way of life is important

Activity 1: 4 R's: Refuse, Reduce, Reuse, Recycle

Instructions

15 min.

A. Watch a video about the four R's and shortly explain the meanings of:

- a resource
- the 4 R's

ClickView, The Four R's: Refuse, Reduce, Re-use, Recycle.
https://www.youtube.com/watch?v=MqAyI6caMv4

B. Share your definitions with a pair.

A resource =

REFUSE

REDUCE

REUSE

RECYCLE

Activity 2: Sustainable life

15 min.

Instructions

A. Through the four R's, consider your own consumption habits and how you could possibly live a more sustainable life.

I will refuse…

I will reduce…

I will reuse…

I will recycle…

Activity 3: Writing assignment on sustainable life

Instructions

A. Write a short essay on the importance of sustainability and how you are prepared to live your life more sustainably. Lenght about 500-700 words.

1. Explain

- the 4 R's.

2. Consider

- why the rule of 4 R's is important.
- why everyone should follow the rule.

3. Explain

- how you are prepared to live a more sustainable life. Use the 4 R's table from Activity 2 as guidance.

Search for reliable sources for more information. Remember to list your sources at the end of your essay. If necessary, use the following websites for help.

1. https://peda.net/p/eevapek/6-jakso/oltth/otjlk
2. http://www03.edu.fi/oppimateriaalit/lahdeesiin/

References

Canva: Free Design Tool: Presentations, Social Media + More [online]. (n. d.). https//www.canva.com/ (1 March, 2023)

Template: Minimalist Watercolor Branch Stationary Paper Border A4 Document by Power of Victory

Symbols:

- activity duration: andrigraphic
- create: Barudak Lier
- Finland: Magtira Paolo
- global: Macrovector
- home environment: Bogdan Rosu
- info circle (For the teacher): victoriagr
- listen: keenicon
- Monoline Goal Planning Icon (Lesson aims): Wena Vega
- read: nomadion
- speak/discuss: OpenClipart-Vectors
- symbol frames: Fahmi Cedric's Images
- work individually, work in pairs & work in groups: Luana Muniz
- write: Clker-Free-Vector-Images

Lesson 1:

- Crash Course. (2013, January 8). *5 Human Impacts on Ecosystems*. [video]. https://www.youtube.com/watch?v=5eTCZ9L834s (23 January, 2023).
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- Icons:
  - Chat Message Icon: OpenClipart-Vectors
  - Person Icon Avatar: Luana Muniz

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Lesson 3:

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- Icons:
  - Illustration of Wheat Grain: OpenClipart-Vectors
  - Loupe icon: Miratsu sholicha
  - Tall Pine Tree: Clker-Free-Vector-Images
- Photo by Annika Ylituomaala

Lesson 4:

- Icons:
  - Illustration of Waveform: GDJ
  - Microphone Function Icon: OpenClipart-Vectors

Lesson 5:

- Photo by Annika Ylituomaala
- Icons:
  - Binoculars gradient icon: Eucalyp
  - biosphere gradient icon: Eucalyp
  - camera icon: hafizdzakimcd
  - Tall Pine Tree: Clker-Free-Vector-Images

Lesson 6:

- ClickView. (2022, May 13). *The Four R's: Refuse, Reduce, Re-use, Recycle*. [video] https://www.youtube.com/watch?v=MqAyI6caMv4 (4 May, 2023).
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- Icons:
  - Ban symbol illustration: Clker-Free-Vector-Images
  - Black T-Shirt Flat Icon: Clker-Free-Vector-Images
  - Clean Pressured Curved Arrow: Jenzon Lopez
  - Lined Clean Minimalist Flat…: Trendify
  - Loose Imperfect Cartoony…: Trendify
  - Plastic Bag with Border Pack…: Sketchify
  - Recycle Sign: Clker-Free-Vector-Images
  - Semi-Realistic Lined Distress…: sparklestore

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All fonts, colors, symbols and the template have been created by Canva or Canva Creators

Appendices

Appendix 1: Lesson 1, Activity 2: Answer key

Appendix 2: Lesson 5, Acitivity 2A: Observable human impacts

Appendix 3: Lesson 5, Activity 2A: Positive/negative effects

Appendix 4: Lesson 4, Activity 2C: Ecosystem services

Appendix 1: Lesson 1, Activity 2: Answer key

1. **What are the four ecosystem services?**
    - support services = ylläpitopalvelut
    - provisioning services = tuotantopalvelut
    - regulating services = säätelypalvelut
    - cultural services = kulttuuripalvelut

2. **What is said about biodiversity?**
    - Biodiversity makes ecosystems more resilient to changes such as disturbances.

3. **How do high-biodiversity and low-biodiversity ecosystems differ from each other and how are they affected if one species is removed?**
    - The more species an ecosystem has the higher its biodiversity. High-diversity ecosystems are species-rich while low-diversity ecosystems have very few species. Removing one species from a high-diversity ecosystem does not affect its functionality too much while removing one species from a low-diversity ecosystem can have major effects on the ecosystem and its functions.

4. **What are the five detrimental impacts that humans pose on the environment?**
    - deforestation = metsäkato
    - desertification = aavikoituminen
    - global warming = ilmaston lämpeneminen
    - nonnative species = vieraslajit
    - overharvesting = ylikorjuu

5. **How does large-scale desertification take place?**
    - Deforestation combined with grazing cattle and irrigation. Desertification removes all the trees from the grazing cattles way. Irrigating crops with groundwater causes natural salts to build up in the soil which prevents any organism living there.

6. **How does the video shortly and concisely explain global warming?**
    - Trees that absorb CO_2 are cut down while the burning of fossil fuels continues to . This results in the increase of greenhouse gases (CO_2) in the atmosphere which further insulate the Earth and raise the temperature.

7. **What are the effects of global warming mentioned in the video? (4)**
    - Polar sea ice continues to melt rapidly
    - Species living in the polar sea ice environments lose their habitat
    - The warmer habitats attract new species, which further decreases the habitat of the original species
    - Hotter and drier conditions lead to more grass and forest fires

8. **How does the current climate change differ from all the other climate changes that have taken place over the history of the Earth?**
    - The current climate change is taking place a lot faster than the previous ones, causing organisms to not have enough time to adapt to the changes.

Appendix 2: Lesson 5, Activity 2A: Observable human impacts

Photo title	Observable human impacts
1.	
2.	
3.	
4.	

Appendix 3: Lesson 5, Activity 2A: Positive/negative effects

Photo title	1.	2.	3.	4.
+				
-				

Appendix 4: Lesson 5, Activity 2C: Ecosystem services

	Ecosystem services			
Photo title	**Provisioning services**	**Regulating services**	**Support services**	**Cultural services**
1.				
2.				
3.				
4.				

1.

2.

3.

4.