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„Cognitive discourse functions in upper secondary CLIL Physics lessons“

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Table of contents

List of tables

List of figures

List of extracts

1. Introduction

Over the past decade, the number of *Content and Language Integrated Learning* (CLIL) programmes in Europe has been increasing rapidly. Eurydice (2006: 7) defines the concept as an innovative approach that "seeks to develop proficiency in both the non-language subject and the language in which this is taught, attaching the same importance to each." Whereas CLIL researchers and practitioners agree on this idea of a simultaneous and dual emphasis on language and content as being characteristic of CLIL, Dalton-Puffer and Smit (2007: 12) argue that most CLIL programmes are either content-focused or language-focused, whereas the content-driven approach appears to be favoured in Europe.

In her article 'A construct of cognitive discourse functions for conceptualising content-language integration in CLIL and multilingual education', Dalton-Puffer (2013: 1) claims that this problem could be solved by establishing a "zone of convergence between content and language pedagogies." Therefore, she introduces seven *cognitive discourse functions* (CDFs) as constituents of such a zone of convergence and defines them as observable patterns that demonstrate "the students how rational/deliberate thought works" (2013: 17).

Since only little empirical research has been done to support the claims that Dalton-Puffer makes in her article (Dalton-Puffer 2007bc; Lose 2007; Llinares & Morton 2010; Lackner 2012), the primary aim of this thesis is to provide more information about how the construct of CDFs is applied in the classroom. In order to gain an insight on how the construct is realised in a very specific context, it focuses on upper secondary CLIL Physics lessons in Austria. Six lessons that were taught by three different teachers have been transcribed and coded according to a coding scheme that was developed on the basis of Dalton-Puffer's (2013) CDF construct and further supporting literature that will be reviewed in this thesis. The data has not only been coded in terms of CDFs, but also in regard to the person who performed them and the context in which they occurred. The 'realiser' – as it will be referred to in this thesis – has been taken into account in order to reveal a potential lack of student production, which I have personally witnessed while analysing similar data in the course of my studies, and thus decided to add out of personal interest. The context in which the CDFs were realised has been considered so as to address the content-focus that is said to be favoured in the European CLIL classroom.

By investigating various aspects of Dalton-Puffer's construct in a very specific context, the thesis aims at contributing to already existing subject-specific research and tries to encourage other researchers to use the results as a basis for further empirical research.

2. Dalton-Puffer's construct of cognitive discourse functions (CDFs)

In the following chapter, the construct of cognitive discourse functions (CDFs) as developed by Dalton-Puffer (2013) will be introduced in three steps. As a first step, the theory on which Dalton-Puffer bases her construct will be discussed. This part will not provide a plain list of the literature that she refers to, but will rather focus on the main points that she makes in connection with her construct. For a more detailed account of the theory behind Dalton-Puffer's construct, the respective article 'A construct of cognitive discourse functions for conceptualising content-language integration in CLIL and multilingual education' (2013) should be consulted. As a second step, the construct itself will be described and the seven CDFs introduced. Finally, a detailed account of the CDF types will be given based on relevant *ESP (English for Specific Purposes)* literature.

2.1 The theory behind the construct

Dalton-Puffer (2013) bases her construct of CDFs on educational objectives, which she looks at from two different perspectives: (1) subject-specific education and (2) applied linguistics. The cognitive learning goals that she collects from the relevant literature result in an unstructured list of more than fifty potential CDFs, which she then reorganises into the more compact construct of seven CDFs.

As a starting point for the subject-education perspective Dalton-Puffer (2013: 221) mentions Bloom et al.'s *Taxonomy of educational objectives* (1956), in which a hierarchical order of *thinking skills* is proposed. Dalton-Puffer (2013: 222), however, does not entirely agree with the hierarchy that is suggested and favours Anderson, Krathwohl et al.'s (2001) revision of Bloom's taxonomy, which rearranges the parameters in a two-dimensional matrix, whereby objectives can be placed into the cells according to cognitive processes and knowledge dimensions (see Table 1). In addition, Anderson, Krathwohl et al. (2001: 31) name nineteen specific cognitive processes which are associated with one of the six major process categories (see Table 2). Dalton-Puffer (2013: 222) points out that members of *Understand*, *Analyse* and *Evaluate* are of particular importance for her CDF construct.

Table 1 The taxonomy table by Anderson, Krathwohl et al. (2001: 28)

THE KNOWLEDGE DIMENSION	**THE COGNITIVE PROCESS DIMENSION**					
	REMEMBER	UNDERSTAND	APPLY	ANALYSE	EVALUATE	CREATE
FACTUAL KNOWLEDGE						
CONCEPTUAL KNOWLEDGE						
PROCEDURAL KNOWLEDGE						
META-COGNITIVE KNOWLEDGE						

Table 2 The six categories of the cognitive process dimension and related cognitive processes according to Anderson, Krathwohl et al. (2001: 31)

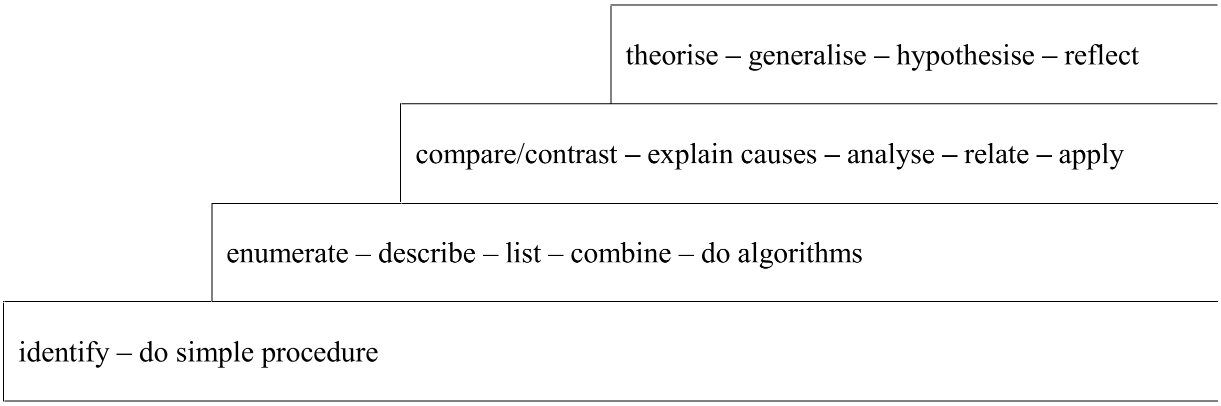
REMEMBER	RECOGNISING, RECALLING
UNDERSTAND	INTERPRETING, EXEMPLIFYING, CLASSIFYING, SUMMARISING, INFERRING, COMPARING, EXPLAINING
APPLY	EXECUTING, IMPLEMENTING
ANALYSE	DIFFERENTIATING, ORGANISING, ATTRIBUTING
EVALUATE	CHECKING, CRITIQUING
CREATE	GENERATING, PLANNING, PRODUCING

Nevertheless, Dalton-Puffer (2013: 222) does not simply adapt the revised taxonomy for her new construct and argues as follows:

> The revised taxonomy, as noted by its authors (Anderson et al. 2001) is neither the only nor the final word on educational goals and so it seemed advisable to juxtapose it with products of similar endeavours, some of which are more directly related to European educational contexts.

For this purpose Dalton-Puffer (2013: 222) consults the more recent book *Teaching for quality learning at university* (2011) by Biggs and Tang, which again provides a hierarchical order of learning outcomes. Dalton-Puffer's simplified version of the hierarchy as presented in Figure 1 focuses on the mental processes and thus allows a direct comparison to the taxonomy table as proposed by Anderson, Krathwohl et al. (compare Table 1).

Figure 1 Verbs for formulating learning outcomes (based on Biggs and Tang 2011; simplified by Dalton-Puffer 2013: 222)



Another text that Dalton-Puffer (2013: 223) refers to is Bailey and Butler's *An evidentiary framework for operationalizing academic language for broad application to K-12 education* (2003), which gives an account of the prerequisite language that is necessary for students in order to meet the content standards in the US. Bailey and Butler (2003) consider the national as well as the state content standards and also examine the K-12 ESL standards. From the national content standards they detect language descriptors that "provide some measure of what students are expected to do in service of cognitive operations", such as *describe and explain data, identify cause and effect, report on inquiries* (Bailey & Butler 2003: 15). Dalton-Puffer (2013) only focuses on the verbs that are mentioned so as to ensure consistency throughout the list of cognitive learning goals that she compiles. Bailey and Butler's (2013: 16) investigation of the state content and the K-12 ESL standards again results in a list of – this time exclusively – verbs that describe desired language proficiency (e.g. *compare, define, describe, explain, identify, justify*). An interesting point that Bailey and Butler (2013: 16) make is that students also need to know the verbs themselves as well as related ones in order to talk about the content in a proficient way (e.g. *contrast* to compare scientific concepts). The meta-level that is addressed here will be of importance for the study in this paper and will be discussed in detail later on.

A final main source for her list of cognitive learning goals that Dalton-Puffer (2013: 223) mentions is the project *Language(s) in other Subjects,* which is accessible on the Council of Europe's platform (http://www.coe.int/t/dg4/linguistic/langeduc/boxd2-othersub_EN.asp; 4 June 2013). For the purpose of this thesis Vollmer's (2010) contribution to the project is of particular importance since it discusses linguistic competences that are needed for science teaching and learning. The discourse functions that he presents in the form of an open list of infinitives "are to be understood as the discursive representation of both the cognitive processes and their linguistic realisation (in the sense of enactment) brought into play for the development/exposition of knowledge" (Vollmer 2010: 21). Vollmer (2010: 22) distinguishes between basic *macro-functions* and the less distinct *micro-functions,* some of which are presented in Table 3. In a later text, Vollmer (2011: 11) comments on the complex relationship between those two types of functions and argues that even though micro-functions cannot be unambiguously assigned to macro-functions, they are still connected in a logical way to a certain extent.

Table 3 Macro- and micro-functions according to Vollmer (2010: 22-23); (adapted; open list)

Macro-functions	**Micro-functions**
SEARCHING (explorative function)	asking questions
NAMING/POINTING (indexical function)	identifying
DESCRIBING (referential function)	classifying
NARRATING (narrative function)	reporting
EXPLAINING (relating function)	relating
ARGUING (argumentative function)	contrasting
EVALUATING (evaluative function)	hypothesising
NEGOTIATING (interactive function)	predicting
CREATING (creative function)	labelling

Dalton-Puffer (2013) collects all linguistic functions as mentioned in the literature reviewed in this section as well as in additional sources and arranges them in a list of gerunds (see Dalton-Puffer 2013: appendix). Even though the sources she uses show many overlaps, the list still consists of more than fifty potential cognitive discourse functions.

In the second part of her literature review, Dalton-Puffer (2013) adopts an applied linguistic perspective since she considers CLIL an intersection of two fields that applied linguistics is concerned with: 1) second language teaching and learning and 2) language for school learning in general (Dalton-Puffer 2013: 224). As a starting point, Dalton-Puffer (2013: 225) refers to Bailey and Butler's (2003: 8) definition of academic language proficiency, which I will also quote in the following:

> A student who is academically proficient in a language (first or second) can use global and domain-specific vocabulary, language functions, and discourse (rhetorical) structures in one or more fields of study to acquire new knowledge and skills, interact about a topic, or impart information to others.

Bailey and Butler (2003: 7) point out that there is a growing literature on exactly those characteristics of academic language proficiency, whereas they consider Cummin's (1980) construct of Basic Interpersonal Communication Skills (BICS) and Cognitive Academic Language Proficiency (CALP) as the basis of it all. Dalton-Puffer (2013: 226) agrees with Cummin's idea that BICS and CALP can only be developed through social interaction and concludes that the "very purpose of lived classroom interaction [is] to provide a stage for juxtaposing different oral and literate uses of language, with teachers guiding students in extending their repertoires towards the literate end" (227). Her construct of CDFs that will be introduced in the following section aims at combining applied linguistics with the language requirements that are found in the curriculum in order to provide a basis that enables researchers to investigate how actual classroom interaction looks like.

2.2 Introducing the construct

This section will only provide a basic outline of Dalton-Puffer's (2013) CDF construct before a detailed description of all CDFs is given in subchapter 2.3. Before the construct itself is introduced, Dalton-Puffer's notion of CDFs needs to be considered. In the introduction of her article she refers to them as constituents of

> a zone of convergence between content and language pedagogies [...] as the cognitive processes involving subject-specific facts, concepts and categories are verbalized in recurring and patterned ways during the event of co-creating knowledge in the classroom. (Dalton-Puffer 2013: 216)

Furthermore, she considers them visible analogues of thought processes that demonstrate students “how rational/deliberate thought works” (2013: 231-232).

Dalton-Puffer’s (2013) aim was to arrange the list of more than fifty potential CDFs in a more compact and structured way. In order to do so, she first formulated basic communicative intentions and then assigned most of the members of the list to one of them (2013: 233). The result was a construct with seven elements or CDF *types,* “each of which contains a larger or smaller array of actual realizations” (Dalton-Puffer 2013: 234). Table 4 presents the seven CDF types and their communicative intentions according to which they have been organised, as well as corresponding labels, which are only added for the purpose of quick accessibility and are not to be understood as the main cognitive processes of the respective CDF types.

Table 4 CDF types and their underlying communicative intentions according to Dalton-Puffer (2013: 234)

Function Type	Communicative Intention	Label
Type 1	I tell you how we can cut up the world according to certain ideas	CLASSIFY
Type 2	I tell you about the extension of this object of specialist knowledge	DEFINE
Type 3	I tell you details of what can be seen (also metaphorically)	DESCRIBE
Type 4	I tell you what my position is vis a vis X	EVALUATE
Type 5	I give you reasons for and tell you cause/s of X	EXPLAIN
Type 6	I tell you something that is potential	EXPLORE
Type 7	I tell you about sth. external to our immediate context on which I have a legitimate knowledge claim	REPORT

As it has already been pointed out, each CDF type stands for a group of further designations as shown in Table 5. Dalton-Puffer (2013: 235) stresses that “the categories are not all equally populated, neither are they all equally extensive.” Moreover, she considers overlaps and similarities between category members as characteristic of the construct as an entirely unambiguous structure of its members is simply not possible (232; 236). Also the categories themselves can be inclusive of each other, with classifications being part of DEFINE, for instance (Dalton-Puffer 2013: 236).

Table 5 CDF categories and their members according to Dalton-Puffer (2013: 235)

CLASSIFY	Classify, compare, contrast, match, structure, categorise, subsume
DEFINE	Define, identify, characterise
DESCRIBE	Describe, label, identify, name, specify
EVALUATE	Evaluate, judge, argue, justify, take a stance, critique, recommend, comment, reflect, appreciate
EXPLAIN	Explain, reason, express cause/effect, draw conclusions, deduce
EXPLORE	Explore, hypothesise, speculate, predict, guess, estimate, simulate, take other perspectives
REPORT	Report, inform, recount, narrate, present, summarise, relate

In order to gain an insight into which shapes all those fuzzy features of the construct take during actual classroom talk, much more empirical research needs to be done in the respective field. Therefore, the study in this thesis aims at providing information on how the construct applies to one specific context: upper secondary CLIL Physics lessons in Austria.

2.3 The seven CDF types

In this section a literature review of the respective CDF types will be provided as an overview on how the terms were defined for this particular study. The order in which they are discussed is the one suggested by Dalton-Puffer (2013: 234) (i.e. in alphabetical order) and does not represent a ranking according to their relevance or the like. Subchapter 3.4 will elaborate on how the CDF construct was applied and adapted for this study.

CLASSIFY

The first function type that Dalton-Puffer (2013: 234) lists is CLASSIFY. Its relevance in the science classroom is especially stressed by Trimble (1985: 85), who points out that it is one of the most frequently occurring functions in the discourse of *English for Science and Technology (EST)*. Furthermore, classifications are of particular importance since they are not only a basic feature of scientific expressions, but also of human thinking in general (Trimble 1985: 85).

In order to specify how the label CLASSIFY was understood in this study, part one and two of the verb's definition provided in the *Oxford English Dictionary (OED)* will be consulted:

to classify

1. to arrange in or analyse into classes according to shared qualities or characteristics; to make a formal or systematic classification of
2. to place in a particular class, esp. to assign to a position within a formal system of classification

It becomes apparent that the main functions of classifications are to structure certain concepts by identifying similarities and to order them according to already existent systems. This definition agrees with the basic communicative intention of CLASSIFY as identified by Dalton-Puffer (2013: 234): "I tell you how we can cut up the world according to certain ideas".

Widdowson et al. (1979a: 72) and Trimble (1985: 85) found that the process of classifying can take place in two different ways: (1) from the specific to the general or (2) from the general to the specific. Type 1, which Lackner (2012: 48) describes as "bottom-up" approach, starts with one or more members of a class and tries to find and name the class they belong to (Trimble 1985: 85). Type 2, the "top-down" approach (Lackner 2012: 48), proceeds from the class and intends to find its members (Trimble 1985: 85). Figures 2 and 3 provide an overview of the two types of classifications and also give a basic structure of their linguistic nature as suggested by Widdowson et al. (1979a: 75).

Figure 2 Classification Type 1

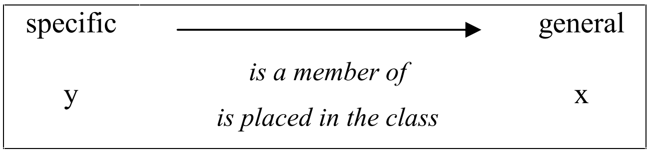


Figure 3 Classification Type 2

general	→	specific
x	*comprises*	y and z

Apart from distinguishing classifications according to their direction of approach as represented above, Trimble (1985: 86) argues that in EST discourse, classifications can furthermore be grouped into three different categories: (1) complete, (2) partial and (3) implicit classifications. In order for a classification to be considered complete, it must contain three sorts of information:

1. the item(s) or member(s) of a class being classified, which can also be referred to as sub-set(s)

   Here the names of the items that are to be classified are provided and a relationship between them is proposed, which is not further elaborated on.

2. the class (or set) to which those item(s) or member(s) belong

   At this point, the name of the class as well as further information on the relationship between the items is given.

3. those characteristics of each item that are similar and those that are different, which is the basis (or bases) for the classification

   This kind of information explicitly states the relationship between the items. If the similarities are already implied in the class, they might as well be omitted in this part.

(Trimble 1985: 86-93)

Widdowson et al. (1979a: 71) identify the same sorts of information as being characteristic for complete classifications, however, use different terms to describe them. The first kind of information that is referred to as 'items' or 'members' above are called 'examples' throughout their book. Instead of the label 'class' or 'set', they use the term 'entity' to describe the overall set to which the members belong. Finally, the 'basis' for classification is named 'criteria' in their text. Whereas all those types of information identified by Widdowson et al. (1979a: 71) and Trimble (1985: 93) are identical and just differ in their labels, there is one additional term introduced by Widdowson et al. (1979a: 71) that is not mentioned by Trimble

(1985). The word ‘group’ which they add intends to divide the class up into different sub-classes before the characteristics or the members are stated. As an example, Widdowson et. al (1979a: 71) choose *plants which can move* and *plants which cannot move* as two different groups and *plants* as the entity (or class) to which they both belong. Here it becomes apparent that the concept of ‘groups’ is an additional step of the classification process that combines naming the class and stating the criteria in order to create a new label for the sub-class to which the members belong. Depending on the situation, the use of groups to structure a classification can either be helpful or redundant.

In connection with complete classifications, Trimble (1985: 87) also mentions ‘closed classes’, which he considers classes that only consist of those members listed during the classification. In contrast, there are open-ended (or infinite) classes, where the person realising them chooses those items that are relevant to the discussion. This might also happen to classes with a finite number of members, if the person performing the classification decides that only some of the items are essential for their particular purpose (Trimble 1985: 87).

The second kind of classifications identified by Trimble (1985: 89) is the partial classification, which names the class and the members as stated above, but does not provide information about the basis. He argues that people performing classifications “usually fail to state the basis because they feel that it is obvious” (1985: 89).

The last kind Trimble (1985: 90) lists is the implicit classification, in which “all of the classifying information is present but is not stated as such” and in which the rhetorical function is not ‘to classify’. This concept leads to the question whether classifications always occur by themselves, or whether they are performed together with other CDF types. In the case of implicit classifications as described by Trimble, the overall CDF is not CLASSIFY, but elements of it occur within this other type of function. This idea of interacting CDF types can be found in various texts about the respective topic and will be discussed with focus on CLASSIFY for now.

Mohan and Slater (2005: 157), for instance, investigated the relationship between specific and general knowledge structures and identified a link between CLASSIFY and DESCRIBE, as items are classified through some sort of descriptions. Widdowson et al. (1979a: 80) also recognise this connection and mention two other CDF types with which CLASSIFY is typically combined: DEFINE and ‘exemplifications’, which we will later on learn are part of the CDF type EXPLAIN. The relationship between CLASSIFY and DEFINE is also pointed out in the course of Dalton-Puffer's (2013: 236) introduction of the CDF concept. She argues that even though classifications can certainly function by themselves, they are always included in definitions to a certain extent. This notion agrees with Trimble's (1985: 86) proposal which says that CLASSIFY and DEFINE are two functions so closely linked, that classifications can easily be taught through definitions in the EST classroom. However, he adds that due to its frequent occurrence as the main function, CLASSIFY should be studied in isolation (1985: 85). In order to provide a clear distinction between CLASSIFY and DEFINE, the two decisive characteristics as proposed by Trimble (1985: 86) are consulted:

> We find two essential differences between the rhetorical functions of formal definition and classification: the first is that definition deals with only one member of a class while classification deals with all (or the most important) members; the second is that the statement of difference in a formal definition has as its purpose the isolation of the term being defined, while its counterpart in classification, usually called the 'basis for (or criterion of) classification', has the purpose of naming something that is shared by all members of the class.

A more detailed characterisation of DEFINE will be provided in the following section.

DEFINE

At first, the entry for DEFINE given by the OED will be considered so as to provide a first general approach to the verb. The parts of the entry that are relevant to this study are the following:

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to define

1. to state exactly what a thing is; to set forth or explain the essential nature of
2. to set forth or explain what a word or expression means; to declare the signification of a word
3. to make a thing what it is; to give a character to
4. to separate by definition, to distinguish special marks or characteristics

---

Parts one and two both establish a link to EXPLAIN, which again shows that CDF types do not only exist by themselves. The connection between DEFINE and other CDFs will be discussed later in this section in more detail.

Part two of the entry suggests that definitions occasionally occur within the context of LANGUAGE, which directly leads to the question whether translations should be considered definitions as well. Generally speaking, the purpose of a translation is exactly what is described here: 'to explain what a word or expression means'. However, the difference between a simple translation (e.g. "incident ray heißt auf Deutsch einfallender Strahl" [B2]) and a typical definition (e.g. "scattering is the spreading out of waves into all directions from a small object" [B1]) is too fundamental as to treat them in the same way. Consequently, the sub-category DEFINE-TRANSLATION was added as a separate code so as to avoid misleading results that do not distinguish between translations and standard definitions.

What is worth mentioning in relation to part four of the provided entry is the focus on *separation* and *distinction* that characterises a definition. This reinforces Trimble's (1985: 86) notion of the difference between CLASSIFY and DEFINE as pointed out in the previous section. His two criteria of how to distinguish between the two CDF types (see quote above) is emphasised at this point since it was of particular importance during the coding process.

In her introduction of CDF types Dalton-Puffer (2013: 234) formulates a more general communicative intention of DEFINE: "I tell you about the extension of this object of specialist knowledge", which implicitly includes all of the parts stated by the OED above.

The significance of definitions in scientific communication is stressed by Kessler and Quinn (1987: 60), who identify the recognition of "scientific concept definition and their verbal labels" as a typical feature of the EST classroom. As opposed to rather multifaceted CDF types such as DESCRIBE, DEFINE is quite easy to conceptualise due to its relatively clear linguistic structure (Dalton-Puffer 2007a: 69). Widdowson et al. (1979a: 56) discovered three basic elements that constitute a definition: (1) the specific concept that is to be defined, (2) the class to which this concept belongs, and (3) certain characteristics of the concept that distinguish it from other members of the same class. Trimble (1985: 75-6) puts those factors in relation with each other by means of an equation and proposes different terms: *Species* (1) = *Genus* (2) + *Differentia* (3). Dalton-Puffer (2007b: 203) agrees with his representation and supplements it with two levels, resulting in the following schema:

Table 6 Definition Schema adapted from Dalton-Puffer (2007b: 203; 2007c: 131)

Conceptual Content	superordinate term (S) + specifying features (c1, c2, c3)	
Linguistic Form	*D (Definiendum) is a S*	*that is/has/does*
Meaning	**D is a S**	**having characteristics c1, c2, c3**

Widdowson et al. (1979a: 59) argue that, depending on the context, the person performing the definition chooses between two orders in which the elements are provided. The first one that has been examined so far (i.e. *Species* = *Genus* + *Differentia*) is what he calls a 'real definition', in which the term being defined is the theme of the definition (Widdowson et el. 1979a: 59). If the elements are ordered in a different way (i.e. *Genus* + *Differentia* = *Species*), the name of the term being defined is the new information. Widdowson et al. (1979a: 56) call definitions that are structured this way 'nominal definitions'. Gillett et al. (2009: 115) make the same distinction and provide examples of how real and nominal definitions can be realised linguistically:

Table 7 Real definitions and nominal definitions adapted from Gillett et al. (2009: 115)

Real Definition	X is a Y that ... X is a type of Y that/which ...
Nominal Definition	A Y that ... is X. A type of Y which ... is X.

Dalton-Puffer (2007a: 70) mentions that definitions can also be pragmatically adequate if they are not complete in terms of the elements that are listed above. Trimble (1985) goes into more detail and categorises definitions by how much information they provide. For a better overview they are summarised in Table 8.

Table 8 Types of definition according to Trimble (1985: 75-84)

1. Simple definition	2. Complex (or expanded) definition
a. formal	a. stipulation
b. semi-formal	b. operation
c. non-formal	c. explication

Definitions following the structure discussed so far are what Trimble (1985: 75-6) calls 'formal definitions'. This kind does not only provide the most but also the most precise information, whereas semi-formal definitions leave out the class (or *Genus*) (Trimble 1985: 75). Trimble (1985: 78) argues that non-formal definitions lack the amount as well as the precision of information due to the fact that their function "is to define in a general sense so that a reader can see the familiar element in whatever the new term may be." Examples for non-formal definitions are definitions by synonym, by negative statement, by antonym, and by stating the *Genus'* most common or outstanding characteristic (Trimble 1985: 78-9). The element that all simple definitions have in common is that they are performed in one sentence or less (Trimble 1985: 75).

Apart from the fact that complex definitions are developed in longer units than a sentence, one of their main features is their inclusion of other CDF types. Trimble (1985: 75) states that whereas their core statement is usually formulated as a formal or semi-formal definition, they are expanded by other rhetorical functions such as classifications or descriptions. Widdowson et al. (1979a: 60) also mention a link between DEFINE and DESCRIBE, and add exemplification (which is part of EXPLAIN) as a common combination partner of DEFINE. The close relationship between definitions and classifications as pointed out by Dalton-Puffer (2013: 236) has already been discussed in the previous section. Along the lines she also lists DESCRIBE as a common feature of definitions (Dalton-Puffer 2013: 236).

Trimble (1985: 81) gives three common examples of complex definitions: (1) stipulations, (2) operations and (3) explications. Stipulations have the purpose of setting limits to the central definition. An example he gives that is most relevant to this study is the one of mathematical stipulations, which is mostly used "to identify the symbols in a formula or an equation or to set values to variables" (e.g. 'In this formula X represents the vertical vector.') (Trimble 1985: 81). Operations aim at a definition through experience and therefore typically include instructions, which are usually given in the indicative, such as: 'The sound [f] is a voiceless, labio-dental fricative, formed by placing the lower lip lightly against the upper teeth, closing the vellum [...]' (Trimble 1985: 82). In this study, this type of definition will probably occur most frequently before or during experiments when devices or instruments are introduced. Finally, explications are a common example of definitions including elements of EXPLAIN and serve the purpose of providing "new information about the key terms in the original definition" (Trimble 1985: 83). Trimble (1985: 83) gives the following example:

> The two key phrases explicated in this definition are 'soil management' and 'crop production':
>
> 'Agronomy is a science which seeks improved methods of soil management and crop production. By crop production we mean new techniques that will increase the yield of field crops. By improved soil management we mean the use of fertilizers which contain the necessary nutrients needed for the crops'.

One can assume that this type of complex definition is present in the CLIL Physics classroom, especially when a new topic with unfamiliar terms is introduced.

DESCRIBE

The OED calls the concept of DESCRIBE that is relevant to this study the 'ordinary current sense' of the verb:

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to describe

> to set forth in words, written or spoken, by reference to qualities, recognisable features, or characteristic marks; to give a detailed or graphic account of

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This entry suggests that descriptions are objective operations that neither evaluate nor provide additional information such as reasons, for instance. Dalton-Puffer (2013: 234) proposes that their general communicative intention is to provide "details of what can be seen (also metaphorically)", which agrees with the OED's notion of the verb in the ordinary sense.

Different types of descriptions have been identified by various researchers (e.g. Widdowson et al. 1979a; Gillett et al. 2009; Trimble 1985), which all have their very specific linguistic features and include different amounts and kinds of information. The types that are mentioned most frequently in ESP literature are (1) physical (2) structural, (3) functional and (4) process descriptions.

According to Trimble (1985: 71), a "[p]hysical description gives the physical characteristics of an object and the spatial relations of the parts of the object to one another and to the whole, and of the whole to the other objects concerned, if any". As examples for characteristics that are typically described in EST discourse he lists "dimension, shape, weight, material, volume, colour, and texture" (Trimble 1985: 71). Trimble (1985: 71) additionally introduces a scale on which physical descriptions can be placed, ranging from specific to general descriptions. He gives examples of how the two sides of this scale can be realised, focusing on spatial relationships: Whereas terms like 'below' or 'close to' are used to perform general physical descriptions, specific descriptions include very precise phrases such as 'at the angle of 45°' or '1 mm from the centre' (Trimble 1985: 71-4).

Structural descriptions are closely connected to physical ones and express relationships between parts and wholes (Lackner 2012: 51). Gillett et al. (2009: 118) and Widdowson et al. (1979b: 39) propose a general linguistic structure of this kind of description, which was summarised by Lackner (2012: 52) as presented in Figures 4 and 5.

Figure 4 Structural Description Type 1 adopted from Lackner (2012: 52)

whole	*consists of* *is divided into* *is made up of* *includes*	parts

Figure 5 Structural Description Type 2 adopted from Lackner (2012: 52)

parts	*make up* *form*	whole

What becomes apparent when looking at the figures above is that there is a close connection to the CDF types CLASSIFY and DEFINE. Not only can structural descriptions, definitions and classifications all be constructed in two different ways (i.e. from the specific to the general or vice versa), but also their linguistic markers look similar. In order to distinguish between them, Lackner (2012: 52) points out the difference in relationship that they describe: *"[S]tructural description* can be said to express a relationship of meronymy (x *is a part of* y) in contrast to *classifying* and *defining*, which have been conceptualized as expressing the relation of hyponymy (x *is a kind of* y)."

The third main type of DESCRIBE that has been mentioned is the functional description. Trimble (1985: 71-4) points out that this particular kind is mainly concerned with describing devices, which is done by stating its purpose or use and/or the function of its individual parts, sometimes expressing a relation to each other or to the whole device. His example 'Depressing the lever causes the spring to compress' shows that functional descriptions may at some point be closely linked to cause/effect operations (Trimble 1985: 72). The difference between these two functions can be found in their linguistic realisations. Whereas functional descriptions make use of a simple 'x *causes* y' construction, cause/effect relationships add the element of reasoning, such as 'x *happens because* y'. A more detailed discussion of the latter construction will be provided in connection with EXPLAIN later on.

Just like structural descriptions, functional descriptions can be constructed from the general to the specific or vice versa. Again, Lackner (2012: 53) provides two figures that summarise their linguistic structure as proposed by Widdowson et al. (1979b: 44) and Gillett et al. (2009: 119) (see Figures 6 and 7).

Figure 6 Functional Description Type 1 adapted from Lackner (2012: 53)

whole/part	*serves to* *is responsible for* *performs the function of* *controls* *regulates*	function

Figure 7 Functional Description Type 2 adapted from Lackner (2012: 53)

The *A* *One*	*function* *purpose* *aim* *objective* *role*	*of the*	whole/part	*is to*	function

The last type of DESCRIBE that needs to be considered is the process description. Trimble (1985: 72-4) states that this particular kind describes a series of steps or stages of a procedure, the sequence in which they occur, and the goal that is pursued. An essential characteristic of these descriptions is that each of the steps but the first one is dependent on the preceding one (Trimble 1985: 74). Gillett et al. (2009: 123) identified certain linguistic features that are realised in process descriptions, which again were adapted by Lackner (2012: 54) and arranged in the compact way as shown in Figure 8.

Figure 8 Process Description adopted from Lackner (2012: 54)

Step 1	first (of) all, to begin with, the first step is
Step 2	secondly, then, after ... hours/days/years, the next step, next, subsequently
Step 3	finally, in the end, lastly, later, in the last stage

Widdowson et al. (1979a: 41) provide more detailed information on what the individual steps may include. Apart from the dependency on each other and the order in which they occur, they also list the purpose of the individual stages and the equipment that may be used as factors that can be described. Especially in the Physics classroom process descriptions might occur frequently in connection with experiments. Describing certain instruments or devices is therefore something that is expected to occur in this context.

The link between DESCRIBE and cause/effect operations (which are part of EXPLAIN) has already been pointed out before. Another CDF type that is connected to descriptions is CLASSIFY, which Mohan (1979: 179) categorises as part of DESCRIBE. Dalton-Puffer (2013: 236) stresses the functionality of DESCRIBE by itself, but adds that they might as well be part of explanations, reports and – as already mentioned earlier – definitions.

EVALUATE

Since the OED focuses on the mathematical understanding of the verb EVALUATE (i.e. to work out the value; to find a numerical expression for), a closely related one needs to be found in order to provide a dictionary definition as a starting point. Dalton-Puffer (2013: 235) provides a set of members for each CDF type. EVALUATE is the biggest category regarding the number of members listed, which already hints at the difficulty of finding verbs that are representative for the concept that is to be described. For EVALUATE Dalton-Puffer (2013: 235) suggests the following members: *evaluate, judge, argue, justify, take a stance, critique, recommend, comment, reflect, appreciate*. The communicate intention that she proposes for EVALUATE is the following: "I tell you what my position is vis a vis X" (Dalton-Puffer 2013: 234). This formulation agrees with the OED's definition of *judge.*

to judge

> to form an opinion or conclusion about (a person or thing), esp. following careful consideration or deliberation; to assess, evaluate, or appraise

Thompson and Hunston (2000) have a similar understanding of the CDF type. According to them, "[e]valuation is a broad cover term for the expression of the speaker or the writer's attitude or stance towards, viewpoint on, or feelings about the entities or propositions that he or she is talking about" (Thompson & Hunston 2000: 5).

Dalton-Puffer (2013: 236) points to the different applications of the CDF type in question, which depend on the context (i.e. the subject) in which it is used. As an example she uses *comment,* which she claims to be the CDF member typically occurring in language subjects or history, whereas in mathematics one is more likely to "evaluate different solution paths or the plausibility of the solution in relation to formulation of the problem" (Dalton-Puffer 2013: 236). As the Physics lessons under observation were expected to make use of EST just as mathematics, evaluations were thought to occur very likely. Nonetheless, Physics lessons bring in the additional element of experiments, which could cause periods of students or teachers commenting or reflecting. Thus, all members of EVALUATE as listed above can be of importance in the Physics classroom.

Mautner (2011: 140) identifies four main dimensions, according to which evaluations can be classified in a scientific context:

1. positive versus negative

   Does the realiser express a positive or a negate attitude towards the person/object/etc. evaluated? Do they consider it good (valuable) or bad (valueless)?

2. certain versus uncertain

   Does the realiser seem to be convinced of their evaluation or can a certain degree of doubt be detected? Does the realiser distance themselves from their evaluation?

3. important versus unimportant

   Does the realiser consider something important and draws the audience's attention to it or do they consider it unimportant and try to distract from it?

4. direct versus indirect

   Does the realiser attempt to make the evaluation being easily identified as such or do they prefer it being detected by its linguistic and/or social context?

These four word pairs represent the endpoints of four lines, along which evaluations can be realised and categorised. The dimensions interact with each other and leave room for various rhetorical realisations (Mautner 2011: 141). Thompson and Hunston (2000: 13) claim that evaluations can be identified by various linguistic signals, such as comparisons, subjectivity, or social value. Hyland (2005, 2010) goes into more detail and divides those signals up into what he calls 'interactive' and 'interactional' resources. Interactive ones occur in evaluations in written form and include devices such as endophoric markers or transition markers. Examples for interactional resources are engagement markers, boosters, hedges, self-mentions, or attitude markers (Hyland 2010).

Combinations or overlaps of EVALUATE and other CDF types are not mentioned in the relevant literature. This is probably due to the involvement of subjectivity, which is untypical for other CDF types and therefore makes it easy to be distinguished from others. Mautner (2011: 156) mentions possible occurrences of EVALUATE in the scientific classroom: weighing advantages and disadvantages of models and methods, criticising interpretations, considering practical applications as relevant or not. Consequently, EVALUATE may occur in combination with other CDF types, for instance when a method is described and opinions about it are expressed. The lack of discussion about this issue in ESP literature is probably due to the linguistic devices that communicate personal involvement, which make EVALUATE quite unique and easy to identify, and thus prevent classification problems.

EXPLAIN

EXPLAIN appears to be a very special CDF type, regarding both its crucial role in the scientific classroom and the degree of complexity that its categorisation involves. Martin and Rose (2003: 107), for instance, relate explanations to meanings of terms and argue that, in a scientific context, terms usually refer to abstract concepts which "can only be learned through a long series of explanations". Halliday (2008), on the other hand, stresses the importance of constructing logical sequences of reasoning when learning science. In general, however the term 'explain' is interpreted, it is recognised as an essential feature of the scientific classroom.

Interestingly, Dalton-Puffer (2007c: 150-1) argues that "students can hardly ever be found uttering explanations worth being called explanations" since they assume that the teacher knows the explanation and thus only have to trigger the respective concept in their mind. This shows that there is a thin line between what can be considered an explanation and what cannot. Therefore, a detailed discussion of which operations are part of EXPLAIN will be provided.

Before an account of what the CDF type entails is given, the OED entry of the respective verb shall be considered:

to explain

1. to give details of; to make clear the cause, origin, or reason of
2. to make one's meaning clear and intelligible

From the second part of this entry, Dalton-Puffer (2007c: 139) deduces the wider meaning of EXPLAIN, pointing out its connection to DEFINE: "*explanation* is the more general term so that definitions can be said to be an important element in explanations." She identifies the communicative intention of the two CDF types to be the main difference between them (see Table 9). Whilst definitions are oriented inwards (i.e. towards the definiendum itself), explanations "are oriented outward, towards an interlocutor who has expressed a comprehension problem or who is assumed by the speaker to have such a problem" (Dalton-Puffer 2007c: 139-140).

Table 9 Communicative Intention according to Dalton-Puffer (2013)

DEFINE	EXPLAIN
I tell you about the extension of this object of specialist knowledge	I give you reasons for and tell you cause/s of X

Lackner (2012: 45) points out that the concept of EXPLAIN is sometimes limited to causality and consequence. "In this view, explaining involves the linking of an explanandum to an explanans through semantic relations expressing cause or consequence" (Lackner 2012: 45). Widdowson et al. (1979b: 118) provides a basic linguistic structure for both cases:

1) *Causality*:	"X because Y." "Because X, Y."
2) *Consequence*:	"X. Hence/Consequently/As a result, Y."

Since those two operations as well as explanations of terms are crucial in the Physics classroom, Lackner (2012: 46) makes a valid point when he states that reducing EXPLAIN two one of those kinds only "seems counterintuitive to its meaning as it limits the actual complexity of explanations [and thus] a description of *explaining* covering both is needed." In this regard, Lemke's toolbox (1990: Appendix C) is referred to frequently (e.g. Dalton-Puffer 2007; Lackner 2012) as it covers the semantics of both logical sequences of reasoning and taxonomies of concepts, which Mohan and Slater (2005: 153) identify as characteristic of scientific explanations. Table 10 is an adapted version of this toolbox, in which the operations causality and consequence as provided above are part of what Lemke calls 'logical relation'.

Table 10 Adaptation of Lemke's toolbox (1990: Appendix C)

NOMINAL RELATIONS	ATTRIBUTE, CLASSIFIER, QUANTIFIER
TAXONOMIC RELATIONS	TOKEN, HYPONYM, MERONYM, SYNONYM, ANTONYM
TRANSITIVITY RELATIONS	AGENT, TARGET, MEDIUM, BENEFICIARY, RANGE, IDENTIFICATION, POSSESSION
CIRCUMSTANTIAL RELATIONS	LOCATION, TIME, MATERIAL, MANNER, REASON
LOGICAL RELATIONS	
ELABORATION	EXPOSITION (A, i.e. B)
	EXEMPLIFICATION (A, e.g. B)
	CLARIFICATION (A, viz. B)
ADDITION	CONJUNCTIVE (A and B)
	NEGATIVE CONJUNCTIVE (not A, nor B)
	ADVERSATIVE (A, but B)
VARIATION	REPLACIVE (not A, but B)
	EXCEPTIVE (A, but not B)
	ALTERNATIVE (A or B)
CONNECTION	CAUSE/CONSEQUENCE, EVIDENCE/CONCLUSION, PROBLEM/SOLUTION, ACTION/MOTIVATION, etc.

Like most CDF types, EXPLAIN is found to be combined with other functions. Dalton-Puffer (2013: 236), for instance, argues that descriptions are likely to occur within explanations, which particularly establishes a link between circumstantial and logical relations as categorised in the toolbox above. In the context of Physics lessons, this might occur when methods or experiments are described and reasons for certain outcomes are given. Trimble (1985: 153) formulates a similar idea when he links EXPLAIN to REPORT. He uses experiments as an example, too, and claims that during reports on them, explanations may be used in order to construct theory that supports certain ideas. By doing so, Trimble (1985: 168) concludes, students draw a connection between theory and practice and are trained towards reasoning from the theoretical. Overall, experiments seem to allow much space for combinations of CDF types and their separate realisations in general.

EXPLORE

EXPLORE is another CDF type that reinforces the claim that has just been made about experiments. In the Physics classroom students are able to predict outcomes, hypothesise about potential explanations, make guesses and estimations, simulate phenomena, etc. Nevertheless, EXPLORE appears to be a main function not only in the context of Physics, but in the general discussion about academic language functions and thinking skills, as pointed out by Dalton-Puffer (2007c: 159). Furthermore, she argues that the verbalisation of EXPLORE requires "the use of relatively complex verb phrases", which makes it "an interesting testing ground for the occurrence of 'more difficult grammar' in the language classroom" (Dalton-Puffer 2007c: 159).

The CDF type that Dalton-Puffer's (2013) refers to as EXPLORE in her article is usually called *hypothesising* or *predicting* in other related texts, including earlier texts by Dalton-Puffer herself (e.g. 2007abc). By listing members of EXPLORE, she takes into account many verbs that are closely related to the general concept of the CDF type: *explore, hypothesise, speculate, predict, guess, estimate, simulate, take other perspectives* (Dalton-Puffer 2013: 235). Since she uses the definition of 'hypothesis' as given by the Merriam-Webster on-line dictionary in her book, it is also taken as a basis of categorisation in this thesis (Dalton-Puffer 2007c).

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hypothesis

1a.	an assumption or concession made for the sake of argument
1b.	an interpretation of a practical situation or condition taken as the ground for action
2. a	tentative assumption made in order to draw out and test its logical or empirical consequences

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Dalton-Puffer (2007c: 159) summarises and interprets the entry for the purpose of CLIL studies in the following way:

> In non-technical terms, then, a hypothesis is an assumption or prediction about what something will or would be like if certain conditions are met. It is an activity which incorporates facts but does not look at them as they are manifest (in the here and now or in the past) but rather sets them against a projection into the space of possibility, effect, or simply future time in general. *Hypothesizing* therefore amounts to talking about that which is not the case now, talking about that which could be in the future, or could have been in the past, but with a link to perceived factual reality. Hypothesizing thus is a prime example of 'talking about that which is not in the here and now'.

In her article of 2013, she then formulates this thought in the compact manner of the communicative intention of EXPLORE: "I tell you something that is potential" (Dalton-Puffer 2013: 234).

In the context of Physics education, combinations of EXPLORE and DESCRIBE are expected during experiments, for instance, when invisible concepts such as wave fronts are described. Subchapter 3.4 will address this issue in more detail. EXPLORE may also be combined with other CDF types such as EXPLAIN (e.g. predicting consequences), DEFINE or CLASSIFY (Widdowson et al. 1979a: 91-101).

Dalton-Puffer (2007c: 160) identifies various linguistic markers of EXPLORE: modal verbs (e.g. *may, will, can*), certain adverbs (e.g. *perhaps, probably, possibly),* conditional conjunctions (mostly *if*) and lexical phrases. Furthermore, she provides lists of verbs and phrases that are typically used to introduce episodes of EXPLORE:

Table 11 Lexical verbs introducing EXPLORE episodes (Dalton-Puffer 2007c: 160)

assume	propose
guess	speculate
hypothesise	suggest
imagine	suppose
predict	

Table 12 Phrases introducing EXPLORE episodes (Dalton-Puffer 2007c: 161)

let's think/say/assume/imagine	what would your prediction be?
(so) what would happen (if)	what would you propose
what will happen if	what would you do if
what happens if	anyone wanna take a guess?
can you predict	

REPORT

The last CDF type that Dalton-Puffer (2013) mentions as part of her construct is REPORT. The parts of the OED definition relevant for this study are the following:

to report

1. to provide or convey information
   a. to give an account of (a fact, event, person, etc.); to relate, recount, tell; to describe
2. a. to repeat (something heard); to relate as having been spoken by another; to retell
   b. to convey, impart, pass on (something said, a message, etc.) to a person as knowledge or information
3. to relate, state or bring in (information or intelligence discovered), esp. as the result of an investigation; to give a notification of (something observed)

From this entry it becomes apparent that the main function of reports is to *inform.* It can furthermore be deduced that there is a referential element involved in the process of reporting. Information that is passed on either refers to something that the realiser has experienced themselves (e.g. events, facts, investigations, people), or to something the realiser has heard or read about (e.g. messages, newspaper articles, documentaries). The communicative intention of REPORT as identified by Dalton-Puffer (2013: 234) (i.e. "I tell you about sth. external to our immediate context on which I have a legitimate knowledge claim") already hints at this referential element by including the word 'external'. The CDF type might therefore occur commonly in the context of META-SUBJECT, a category that will be discussed later on.

The basis for the exchange of information is an assumed gap in knowledge that the realiser intends to fill. Part three of the dictionary entry given above is especially relevant for this study, since this is the type of reporting that takes place when experiments are reported on.

Dalton-Puffer (2013: 235) lists the following verbs as members of REPORT: *report, inform, recount, narrate, present, summarise, relate*. When comparing those to the OED entry from above, one can see that many of those are referred to as synonyms. There is one member, however, that contains an additional character: *summarise*. Whereas all other members just describe the process of passing on information, *summarise* proposes slight alterations (or reductions) of the content. Gillett et al. (2009: 7) describe the verb in the following way: "Give the main points in a concise manner. Leave out details". This type of reporting may occur during revisions, for example.

Hyland (2004: 27) investigated which verbs are typically used during the performance of the CDF type in question and came up with three categories of *reporting verbs*: (1) *research acts* (e.g. 'discover'), which are concerned with real-world activities such as experiments, (2) *cognition acts* (e.g. 'believe'), describing mental processes, and (3) *discourse acts* (e.g. 'state'), which refer to verbal expressions.

Mautner (2011) looks at tenses that are used for reports and tries to find regularities. Whereas she claims that generally there is no definite distribution of tenses over certain uses of language or contexts, she detected a few tendencies (Mautner 2011: 168). In the particular case of REPORT, Mautner (2011: 168) found that past tense is typically used to describe individual studies, while the whole research area is usually discussed in the present perfect. These findings can be directly applied to the Physics classroom, where experiments might be retold in past tense ('what we did') and main findings are summarised in the present perfect ('what we have learned').

Due to the fact that REPORT has a referential character, it also has a tendency to interact with other CDF types. Its connection to DESCRIBE can be directly deduced from the first part of the OED entry provided above. Dalton-Puffer (2013: 236) also mentions that descriptions may be part of reports, which seems logical as REPORT includes descriptions of events, people or objects. Mohan and Slater (2005: 170) find the same combination of CDF types and furthermore connect REPORT to CLASSIFY. I would go even further and argue that any CDF type can be part of REPORT, especially since it might be referring to something someone else has said, which can involve any CDF type.

3. Study design

3.1 Research question

Dalton-Puffer (2013: 241) suggests that empirical research on CDFs has to be extended so as to support the claims which she makes in her article ‘A construct of cognitive discourse functions for conceptualising content-language integration in CLIL and multilingual education’. This study is an attempt to investigate whether the construct of CDFs as introduced by Dalton-Puffer (2013) is applicable to the CLIL classroom. It tries to answer the question how the concept is applied in the very specific context of upper secondary CLIL Physics lessons in Austrian schools. In order to do so, the following sub-questions as proposed by Dalton-Puffer (2013: 241) are considered:

1. Which CDF types are realised in the data and how frequently do they occur?
2. Who realises them?
3. In which context do they occur?
    a. Is explicit communication about language found in the data?
    b. Are CDFs explicitly mentioned? (Is there a meta-level?)

In addition to these questions suggested by Dalton-Puffer (2013: 241), particular attention is paid to the following ones:

4. How are the different CDF types realised in terms of moves?
5. Is there a connection between certain CDF types and the context in which they occur?
6. Is there a connection between certain CDF types and their realisers?

3.2 Method

In order to gain an insight on how CDFs are realised in the CLIL classroom, a qualitative data analysis of six CLIL lessons was carried out. As video recordings of CLIL Physics lessons had already been made for the purpose of another diploma thesis (Schrönkhammer 2012), they could be used as the basis for this study.

Firstly, the six video recordings were converted into MP3 files and imported into *Audacity,* a digital audio editor and recorder, for a better sound quality and simplification of the transcription process. The recordings were then transcribed using *the VOICE (Vienna-Oxford International Corpus of English) Transcription Conventions [2.1]: mark-up conventions.* Three of the lessons had already been transcribed in the course of a university seminar and thus only had to be revised in order to ensure consistency. Subsequently, a framework for analysis (see subchapter 3.4) was developed on the basis of the CDF construct as introduced by Dalton-Puffer (2013), which also takes into account further literature that has been reviewed in subchapter 2.3. Due to the fact that some codes require interpretation to a certain degree, the outcome is dependent on the researcher to some extent. Therefore, a framework for analysis as a point of reference was of particular importance during the coding process so as to ensure validity.

The transcriptions of the six lessons were then imported into *ATLAS.ti,* a qualitative data analysis and research software, and coded according to the constructed framework. In addition to coding the data in terms of CDF types, it was also coded with regards to the person who performed the CDFs (i.e. STUDENT, TEACHER, TEACHER/STUDENT) and the context in which they were realised (i.e. SUBJECT, LANGUAGE, META-SUBJECT, META-LANGUAGE). This means that whenever a passage was identified as an instance of a CDF type, it was also assigned to a realiser and a context, leaving every coded passage with exactly three variables (i.e. CDF type, realiser and context). As a final step of the coding process, the move structure of each CDF passage was coded by identifying individual and shorter CDF occurrences within the larger passages. A more precise description of this procedure will be provided in subchapter 3.4.

In addition, memos have been written for each CDF passage, which include general comments, an overview of move occurrences, striking aspects and initial thoughts. Since *ATLAS.ti* is a programme designed for coding as well as for conducting statistical analyses, it could also be used to investigate occurrences, distributions and correlations that are relevant to this study. Finally, the memos were consulted for additional information, which allowed a more detailed analysis.

3.3 Data overview

As already mentioned, the database that has been used for this study comprises six CLIL Physics lessons that had already been videotaped in the course of another diploma thesis. They are part of a collection of 14 lessons in total and were selected in terms of uniformity of grades and variety in teacher types. All relevant information about the schools and teachers that are presented in this chapter are borrowed from the respective thesis (Schrönkhammer 2012).

The analysed lessons took place in three different upper secondary classes and were conducted by three teachers in three different grammar schools. Every teacher was recorded during two lessons that they taught in the same class each. A detail about the teachers that is of importance for the purpose of this study is the fact that there are no formal requirements that have to be met in order for them to teach CLIL lessons at their schools. The reference system that has been developed by Schrönkhammer (2012) so as to ensure the anonymity of the involved schools, teacher and students, has been adopted without alterations as to facilitate potential comparisons in the future.

Table 13 is a modification of Schrönkhammer's (2012: 34) overview of lessons with those pieces of information deleted that are not relevant to this study. Capital letters from A to C were assigned to the three participating schools. The teachers and the classes will be referred to by capital letters as well (e.g. 'teacher A', 'class B'). However, those letters are nonconforming with the ones given to the corresponding schools as the teachers were selected out of a bigger collection and did not happen to occur in the same order. The label 'teacher A' is a special case, since it describes two people – the teacher himself, who is a German speaker, and the language assistant, who is a native speaker of English. In order to simplify the coding and the presentation of results, they are treated as one person throughout this study. Every lesson has its own combination of a capital letter and a number, with the letter referring to its corresponding class. For instance, 'lesson A1' would be the first lesson that was videotaped in class A. Table 14 provides an overview of the participating schools, teachers and classes, and is again an adaptation of Schrönkhammer's (2012: 35) reference system.

Table 13 Analysed lessons and their topics (Schrönkhammer 2012)

Lesson code	Teacher	Topic	Teacher type
A1	A	The Lorentz force	Combination of teacher (German speaker) and language assistant (native speaker)
A2	A	Applications of the Lorentz force	
B1	D	Huygens' principle	Teacher (German speaker)
B2	D	Huygens' principle – revision and application	
E1	E	Sankey diagrams	Teacher (native speaker)
E2	E	Conservation of energy	

Table 14 Overview of classes, schools and teachers (Schrönkhammer 2012)

Class	Teacher	School	Grade	Age	Comments
A	A	A	7th	16-17	
B	D	B	6th	15-16	The class is using an English as well as a German textbook side by side.
E	E	C	5th	14-15	The multilingual setting of school C means that the pupils are used to being confronted with and using a multitude of different languages daily. Many of them have neither German nor English as their mother tongue, but are very proficient in English. *For further information consult Schrönkhammer (2012).*

3.4 Applying the CDF construct and developing a coding scheme

The theoretical framework that was used for coding the data was based on the CDF construct as presented in chapter 2. Nevertheless, some adaptations had to be made in order to obtain the most informative results possible.

3.4.1 CDF types – problems and adaptations

During the coding process it became apparent that the teachers and students used German to a certain extent. Whereas individual German utterances within a CDF passage were treated like English ones, passages that were realised almost exclusively in German had to be made visible in some way. For those, separate codes were created in order to avoid misleading results that do not distinguish between English and German CDF passages. The CDF types in question are DESCRIBE, EXPLAIN and REPORT. For CDF types that did not occur in a German context, no separate codes were created so as to ensure a more compact representation of results.

Another separate code was added to the existing list of CDF types: DEFINE-TRANSLATION. Translations are treated separately simply because they are not definitions per se. For a passage to be coded DEFINE, it required certain characteristics as it has already been pointed out (i.e. species, genus, differentia). DEFINE-TRANSLATION, on the other hand, stands for a simple translation of a word or phrase. Even though it can be considered a subcategory of DEFINE, it would manipulate the data if it was added to DEFINE without further consideration.

One issue that was of particular importance during the coding process of the present study is the distinction between EXPLORE and DESCRIBE. Even though the dividing characteristics of those two CDF types seem rather straightforward, they showed frequent overlaps in the context of Physics education. This is due to the fact that Physics – or scientific subjects in general – deal with abstract and theoretical concepts rather than concrete ones. The mentioned overlaps were mostly found during experiments, in which things were described that were not actually visible (e.g. waves, wavelets, wave fronts). On the other hand, there were occasions in which the concepts being described were visualised by means of drawings or gestures (i.e. fingers/arms representing certain forces acting in different directions). The main criteria according to which the distinction between EXPLORE and DESCRIBE has been made in unclear cases was whether the concept being described was represented by some sort of visible means. This distinction was only possible due to the non-verbal contextual information that was included in the transcripts.

3.4.2 Introducing the 'moves'

The categorisation of CDF types as given in subchapter 2.3 has clearly revealed the complexity that arises through overlaps and combinations. The question that is most interesting to answer in this context is how CDF passages are constructed by means of other CDF types. In order to investigate this, the concept of 'moves' has been added to the coding system. This can be understood in the following way: First, a passage was identified to realise a certain CDF type. Within this passage, however, short occurrences of other CDF types were noticed. Those were then coded separately as moves within the passage. In order to exactly explore how CDF passages are built up, moves have also been coded if they agreed with the CDF type of the passage (e.g. an introductory DESCRIBE-MOVE in a passage coded DESCRIBE). There are, of course, also passages (mostly short ones) that do not include any moves. Table 15 provides a summary of all CDF types, additional categories and moves together with their corresponding codes.

Table 15 Codes for CDF types

CDF type	**CODES**			
	SIMPLE	**TRANSLATION**	**GERMAN**	**AS MOVES**
CLASSIFY	CL			CL-M
DEFINE	DF	DF-T		DF-M
DESCRIBE	DS		DS-G	DS-M
EVALUATE	EV			EV-M
EXPLAIN	EA		EA-G	EA-M
EXPLORE	EO			EO-M
REPORT	RE		RE-G	RE-M

The following example is an extract from one of the analysed lessons and demonstrates how CDF passages (in this case REPORT) are constructed by moves:

Extract 1 "Report: kinetic and potential energy"

01	T:	right. eh what we did last time? we had a quick look at this idea of changing energy types from one to another?	RE-M
		(.) uh so you should KNOW about the energy types the TWO TYPES of energy that we concerned (if) (.) uhm (1) MOVING things or when we talk about <3> <un> xxxx </un> </3>	CL-M
02	SX-m:	<3> <coughs> </3>	
03	T:	were (.) kinetic and potential energy?	
		(1) u:h (.) POTENTIAL energy you might think about <un> xxx </un> example of STORED energy? (.) uh can you think of an e- uhm an example that isn't like stored energy (when) <un> xxx. </un> (4) think of another type of STORED energy (1) <un> xx </un> (1) where else can you STORE energy. (.) yeah.	
04	S8:	no I'm	
05	S9:	in a rubber band?	EA-M
06	T:	okay excellent. like in a rubber band.	
		you STRETCH the rubber band you then let it go it <un> xxxx </un> (.) and shoots you favourite <un> xx </un> across the classroom. (.)	DS-M
		okay so that's another example of (.) POTENTIAL energy where it's sto:red (.) IN something. in the eh arrangement (in) the particles.	

In this extract, the teacher briefly revises two types of energy and energy changes, which was discussed in the previous lesson, and uses the passage as an introduction to the present lesson and the follow-up activity. The passage was coded REPORT, since the teacher's communicative intention is to retell/summarise the content (or at least the main points) of the previous lesson. This is done by an introductory report, during which the teacher refers back to the previous lesson using past tense. A short classification follows, in which kinetic and potential energy are classified as two different types of energy. The EXPLAIN-MOVE is an exemplification of potential energy (i.e. the rubber band) and includes a process description in the middle.

Within a German CDF passage (i.e. DS-G, EA-G, or RE-G) all coded moves need to be considered German utterances as well. Creating additional codes for each German move would have led to a confusing representation of results due to an immense number of codes.

German moves within the regular English CDF passages (e.g. DF, EV) have been coded like English moves and commented on in the memos.

3.4.3 The realiser

In order to answer the question by whom the various CDF passages were realised, the transcripts were coded in terms of 'realiser' as well. This was done for each passage that was coded with a CDF type. If all moves within a passage were performed by the teacher, the passage was coded TEACHER; if they were performed by students, it was coded STUDENT. Whenever a CDF passage was constructed by both the teacher and the students cooperating, it was coded TEACHER/STUDENT. As it can be inferred from Table 13, lessons A1 and A2 were taught by a teacher and a language assistant simultaneously. In order to ensure a consistent coding scheme across all six lessons, they were treated as one person during the coding process. That is to say that if all moves within a CDF passage were performed by the teacher and/or the language assistant – no matter if only by one of them or by both – it was coded TEACHER. Table 16 provides an overview on the three types of realisers and their corresponding codes.

Table 16 Codes for realisers

REALISER	CODE
TEACHER	T
STUDENT	S
TEACHER/STUDENT	TS

3.4.4 The context

One last issue that was considered during the coding process was in which context the CDF passages were realised. The context of SUBJECT describes the communication about topics that are in direct relation to Physics (e.g. wave phenomena). META-SUBJECT refers to issues that are not part of the immediate subject matter per se, but which are closely connected to it. They usually function as examples or ideas that support the present subject matter (e.g. a newspaper article on a relevant topic, a related anecdote, a conversation about diagrams/calculations etc. which make the present topic understandable). The context of LANGUAGE points to a communication that explicitly addresses language issues (e.g. looking for synonyms, working on a better phrasing, elaborating on an expression). Finally, META-LANGUAGE describes incidences during which CDFs are explicitly referred to. A reference does not necessarily have to be the name of the CDF type (e.g. ‘explore’), but can also be a synonym or member of the CDF concept (e.g. ‘predict’ as a reference to EXPLORE). Extracts 2 to 4 provide examples for each context type except for META-LANGUAGE as this context never occurred in the data.

Extract 2 Example of SUBJECT “Describe: Oersted experiment”

SUBJECT

01	T2:	good. this is the Oersted experiment. {walks over to overhead projector}	DS-M
02	T1:	nice. {S3 nods and smiles}	
03	T2:	so. (.) you can see? {moves blackboard so that slide is visible} this experiment? {points at slide} we have a:: (1) a wire here? (1) a:nd (.) if you (.) yah. let the=	
04	T1:	=if (the) current <7> passes through the wire </7>	EA-M
05	T2:	<7> cu- cu- passes through? </7> you see that the: (.) magnetic ah NEEdles uhm show a force. yah?	
06	T1:	<nodding> <soft> yah= </soft> </nodding>	
07	T2:	=SO.=	
08	T1:	=the magnetic compass needle is affected (.) by the current passing through the wire.	

Extract 3 Example of META-SUBJECT “Report: discovery Oersted”

META-SUBJECT

01 T: we were we were talking about the VARIATIONS? on the story? that we’ve heard? about this Oersted? and some people say that it was an ACCIDENT he was doing experiments of electricity (.) maybe just (.) OH. here is my compass next to this wire. look it’s freaking out. and it’s you know it’s it’s doing what the what it’s doing in the picture. WOW look at THAT. O::R the other stories that say that’s what he PLANNED to so. so @ there are different you have different options of which you want to believe.

Extract 4 Example of LANGUAGE “Define-translation: belastbar”

LANGUAGE

01	SX-f:	what’s what is what’s <L1de> belastbar </L1de> in English?	
02	T:	what?	
03	SX-f:	<L1de> belastbar? </L1de> you know like when you can put <un> xxx </un> something	
04	SX-f:	and it’s NOT	DF-M
05	SX-f:	and it’s not <un> x </un> break <un> x </un> something.	
06	SX-f:	(still not break.)	
07	T:	when you PRESS something. (.) (compression?)	DF-T-M
08	SX-f:	NO. (.) if like the baby needs	
09	S9:	durable?	DF-T-M
10	SX-f:	what?	
11	S9:	durable?	
12	SX-f:	that sounds WRONG.=	EV-M
13	S12:	=is it durable?	
14	SX-f:	durable? (.) <insecure> good. </insecure>	
15	S12:	durable is more (.) it can last for a long TIME. (.) <un> xxx </un> (1)	DF-M
		uhm (1) when you can apply much force to something before it breaks then it is	DF-M
16	T:	STRONG.	
17	S3:	@@@	
18	S12:	strong? @@	
19		<SS talking, hardly intelligible>	
20	S4:	<un> xxxx </un> kinetic energy.	
21	T:	uh (1) if you’re PRESSING something ACTUALLY it is quite an important thing in Physics (this). u:hm [first name7]?	
22	SX-f:	yes	
23	T:	if you’re PRESSING something? (.) you can (.) then it’s COMPRESSIVE strength? so it IS compression? (.) right? when you’re pressing down on something. (.)	DF-M
		when you PULL something? and you want to say it’s strong it <un> xxxx </un> it’s TENSILE strength. (1) {gesturing} so PULLING it that way is <un> x </un> and pressing is (.) compressive strength. (.)	DF-M
		so:: BRICKS in a house you’ve GOT to have a high(er) compressive strength. (.)	EA-M
		but generally speaking you don’t need a high TENSILE strength (1) ‘cause you don’t (.) pull them apart.	EA-M

The last extract is particularly interesting since the teacher uses a language issue as an opportunity to talk about two other terms relevant to Physics. This is a good example of how complications, problems or misunderstandings can be used as a basis for further learning. Another relevant factor in this example is that the teacher does not speak German, which requires the students to formulate definitions of terms they only know in German. The fact that most definitions are informal or incomplete in the example above should not necessarily be considered a negative aspect. Students should not only learn how to use formal definitions, which are usually provided by the teacher or the course book and are sometimes learned by heart, but should also learn how to include definitions in a more flexible and spontaneous way into their speech – in a school setting as well as in their everyday lives.

As already mentioned, there was not a single passage realised in the context of META-LANGUAGE in the data and thus no example can be provided. Due to the fact that the occurrence of a meta-level was one of the research questions, the code has been kept to ensure a valid and conclusive representation of results.

Just like CDF passages make use of moves from other CDF types, different contexts also work together in various ways. For instance, a passage that is realised in a SUBJECT context might include a short utterance that deals with a relevant term, adding a LANGUAGE context to it. Therefore, the concept of 'moves' was also applied to the context codes so as to indicate whenever the context of a move differed from the overall context of its corresponding passage. That is to say that all moves within a passage need to be understood as being realised in the same context as the passage itself, unless indicated otherwise by a context-move. The code SUBJECT-MOVE was not created due to the fact that there were no occurrences of such incidences. The context of SUBJECT is so immensely present in the data that it exclusively focuses on entire passages instead of short utterances. Table 17 gives an overview on the different context types and there codes. Extracts 5 and 6 are examples of how context-moves were coded.

Table 17 Codes for contexts

CONTEXT	CODE	AS MOVES
SUBJECT	SJ	
LANGUAGE	LG	LG-M
META-SUBJECT	M-SJ	M-SJ-M
META-LANGUAGE	M-LG	M-LG-M

Extract 5 Example of LANGUAGE-MOVE "Explain: experiment"

SUBJECT

01	SX-f:	it doesn't work or 'cause the balance is like in the front so you fall	EA-M	
02	T:	the balance is in the front. (.) okay. (.) uh (.)		
		have you got a little word for this THE BALANCE is in the front. another way of saying it.=	LG-M	DF-T-M
03	SX-f:	=MASS.		
04	SX-f:	the mass of the body (.) is mostly on the front.		
05	T:	the the MASS of the body is towards the front. <un> x </un> another word? (.) word in uh GERMAN (he's) got one		
06	S4:	<L1de> Schwerpunkt. </L1de>		
07	T:	(the) <LNde> Schwerpunkt. </LNde> you know what that is in English?		
08	S3:	(well you can calculate it.)		
09	SX-f:	middle point.		
10	T:	this middle <LNde> Schwerpunkt </LNde> middle <un> xx </un> (isn't) actually. no. (.) yeah?		
11	SX-m:	isn't it the centre of gravity		
12	T:	it's the centre of gravity.		
		(.) because the centre of gravity isn't above their feet? (1) and if it isn't above their feet then they fall over. good.	EA-M	

Extract 6 Example of META-LANGUAGE-MOVE "Define: refraction"

SUBJECT

01	T:	how could you **define** refraction?	**M-LG-M**
02	SX-m:	<un> x </un>	
03	T:	<L1de> also </L1de> (.) uh [SX-4]	
04	SX-4:	the bending of light waves when it's close to another medium.	DF-M
05	T:	exactly. the bending of light waves? but (.) when it when it (.) PASSES it's good? it's good? when it like at the boundary it happens at the boundary. yah? at the boundary between two (.) different (.) medium. media. exactly. yah? so refraction is the BENding of a wave at the boundary between two different (.) media?	

Apart from the contexts discussed so far, there was an additional one identified which was not relevant for this study: regulations. Whenever a regulative register was used, the passage in question was not coded since it was not part of the immediate learning/teaching process. Halliday (1973: 31) defines the regulatory function of language as "the use of language to control the behaviour of others, to manipulate the persons in the environment; the 'do as I tell you' function." In the particular case of the coded data, this type of language was used to ask students to be quiet or to hand in their homework assignments, for instance. There were also occasions in which communication about organisational issues took place (e.g. determining who will go on a school trip, agreeing on which office the students should bring their assignment sheets to, explaining how the students' grades are calculated). In these cases regulative language was not used per se, however, it was still language that regulated events to some extent. Since those passages were not relevant to the coding process either, they were put into the category of 'regulative language' as well.

One final remark needs to be made in connection with not coded passages. Sometimes repetitions of the content took place due to interruptions such as outside noise or people entering the classroom. Those repetitions were not coded as separate moves, since they would be counted twice in the results even though no new information was given.

Given that all codes have been described in detail now, a final extract is provided to demonstrate how each passage that was identified as performing a CDF type was coded according to said CDF type, the realiser, the context, and the move structure within.

Extract 7 Example of a completely coded passage "Report: electric effects in the past"

CDF type:	REPORT
context:	SUBJECT
realiser:	TEACHER/STUDENT

01	T:	yeah? so we've known about electric effects? (.) fo:r at LEAST about three thousand years now? {someone knocks at the door}	RE-M	
02	SX:	<L1de> es klopft= </L1de>	*regulative*	
03	T:	=<un> xx x </un> the door? <un> x xx </un> let (them) in? {opens door} hello. {a student comes in and takes a seat, T walks back to the blackboard}		
		okay. (1) so for instance EVEN EVEN as long as a three thousand years ago? (1) they knew that if you RUBBED a stone? such as amber? you know (what) amber is in German?	EA-M *cause/ effect*	DF-T-M
04	S3:	<L1de> Bernstein.= </L1de>		
05	T:	=yesss. so if you rub a stone like amber? that it would (demonstrate)		

		uhm specific electric effects. (1) yah? so this is even three thousand years ago. (1) yah? (.) a:nd uhm even TWO thousand years ago? (1) Chinese sailors knew about magnetic (forces). (1) yah? (.) <1> using </1>	RE-M
06	SX-f:	<1> <un> x xx </un> </1>	
07	T:	psht. {smiles} using the uh MAGNETITE STONE. they real- the already knew about magnetic forces. (1)	
		yeah? and why would sailors need magnetic forces? (.) or how would they USE magnetic forces?	EA-M *reasoning*
08	S4:	to know where they are?=	
09	T:	=know where they are? <2> USING? </2>	
10	S4:	<2> where </2> north is? (.) and (all that)?=	
11	T:	=using what?	
12	S4:	a compass?=	
13	T:	=using a compass. (exactly.) so we've been using compasses to tell where we ARE? (1) using MAGNETIC properties fo:r a REALLY long time? (.) already? (1) yah? so you use compass needles for navigation? to tell you WHERE you're going? and which diRECtion that you wanna go to. (.) yah? which direction you wanna go IN. (2)	DS-M *functional*
		yah? so EVEN (though) THOUSANDS AND THOUSANDS of years ago we knew about electric forces with stones like amber? {points at slide} (.) and we knew about magNETic forces with stones like magnetite? (1) we didn't we couldn't really EXPLAIN it. that long ago. we weren't advanced enough to explain WHY HOW things happened (.) we just knew that they HAppened. (1) yah? that we COULD use magnetic forces to:: get ourselves from place to place. you know as sailors.	RE-M

4. Results and preliminary interpretations

4.1 Introductory remarks

The six recorded lessons make up a total of 282 minutes (rounded to full minutes), resulting in an average of 47 minutes recorded per lesson. All lessons were 50 minutes long, however, the actual teaching time was shortened due to various organisational reasons (e.g. students sitting down and taking out their books at the beginning of the lesson, the teacher preparing slides before starting the lesson).

During the coding process, 95 CDF passages were identified and coded according to the CDF type, the realiser and the context in which they occurred. Furthermore, 504 moves were coded within those passages. All percentages presented in the following tables are rounded to the first decimal. The ones given in figures are rounded to the nearest whole number. The numbers given in the following tables and figures are total intervals and are therefore not rounded.

4.2 Occurrences and distribution of CDF types

In general, CDFs occurred regularly in all of the analysed CLIL Physics lessons (compare Table 18). A total number of 95 coded CDF passages result in an average of 16 CDF occurrences per lesson (rounded to the nearest whole number), which equals an average of approximately one CDF occurrence every three minutes. Lesson B1 shows the highest number of CDF passages, with lessons A2 and A1 following. CDFs are realised least frequently in lessons E1 and E2, which show approximately half as many occurrences than lessons B1 and A2.

All CDF types as introduced by Dalton-Puffer (2013) were realised, which were furthermore supplemented with occurrences of DEFINE-TRANSLATION, DESCRIBE-GERMAN, EXPLAIN-GERMAN and REPORT-GERMAN, adding four extra categories.

Table 18 Distribution of CDF types across lessons as total intervals

	LESSONS						
CDF	**A1**	**A2**	**B1**	**B2**	**E1**	**E2**	**TOTALS**
CL	0	0	1	0	2	0	**3**
DF	1	1	6	2	2	1	**13**
DS	8	1	9	5	3	1	**27**
EA	0	4	1	6	2	3	**16**
EO	3	3	2	1	1	2	**12**
EV	0	0	1	0	0	0	**1**
RE	4	6	2	0	1	2	**15**
DF-T	2	1	0	0	0	1	**4**
DS-G	0	1	0	0	0	0	**1**
EA-G	0	2	0	0	0	0	**2**
RE-G	0	0	0	1	0	0	**1**
TOTALS	**18**	**19**	**22**	**15**	**11**	**10**	**95**

Figure 9 shows the overall distribution of CDF types in all six lessons combined. DESCRIBE was the CDF type realised by more than a quarter of all CDF occurrences, which makes it the most common one. EXPLAIN is the second most common CDF type, followed by REPORT, DEFINE and EXPLORE. If the German CDF types are not taken into account, CLASSIFY and EVALUATE were the ones occurring least frequently.

Figure 9 Distribution of CDF types as percentages

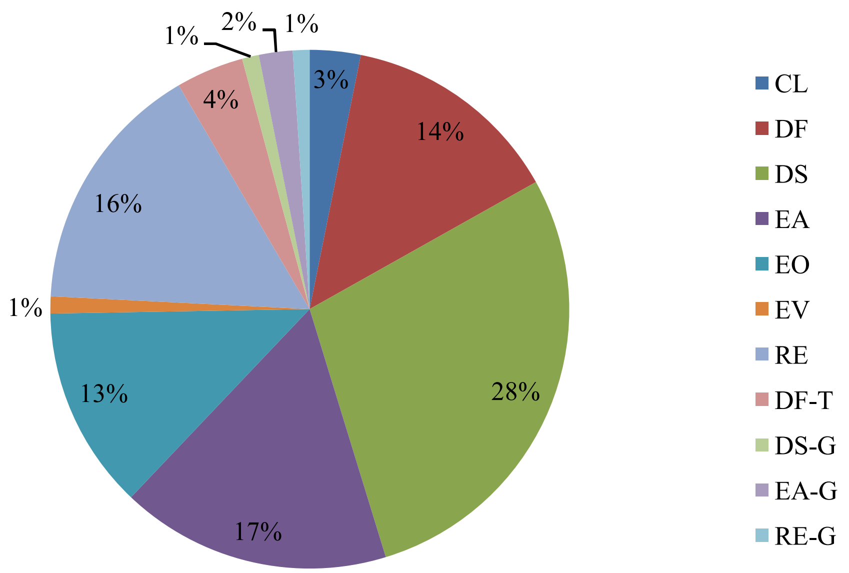
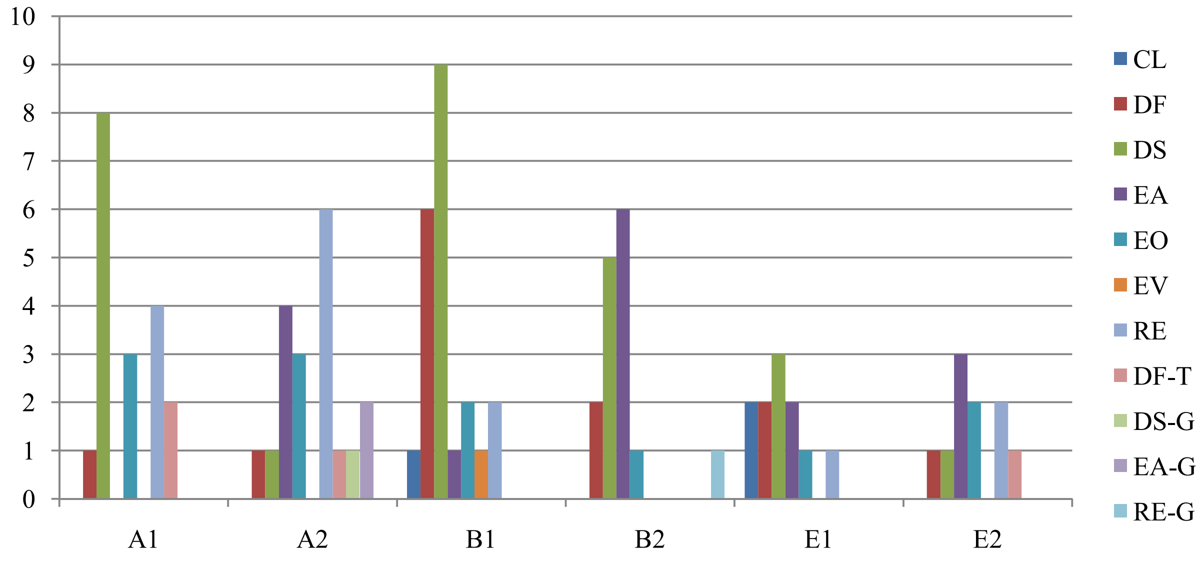


Table 19 and Figure 10 provide an overview of the distribution of CDF types across the six lessons as total intervals and as percentages of each lesson. DESCRIBE does not only seem to be strongly represented in the overall CDF distribution (Figure 9), but also if the lessons are considered individually. It is the most frequently occurring CDF type in lessons A1 (44.5% of all CDF occurrences), B1 (40.9%) and E1 (27.3%), and the second most common one in lesson B2 (33.3%). The same holds true for EXPLAIN, which is not only common in the overall distribution (17%), but also in most lessons, with it being the most frequently occurring CDF type in lessons B2 (40%) and E2 (30%) and the second most common one in lessons A2 (21.1%) and E1 (18.2%). REPORT is amongst the top two CDF types in three lessons (A2, A1 and E2), and DEFINE was used most frequently in lessons B1 and E1. Generally speaking, the most common CDF types as shown in the overall distribution by Figure 9 are representative of the most common ones in each lesson.

Table 19 Distribution of CDF types across lessons as percentages of total intervals per lesson

	LESSONS					
CDF	**A1**	**A2**	**B1**	**B2**	**E1**	**E2**
CL	0	0	4.5	0	18.2	0
DF	5.6	5.3	27.3	13.3	18.2	10
DS	44.5	5.3	40.9	33.3	27.3	10
EA	0	21.1	4.5	40	18.2	30
EO	16.7	15.8	9.1	6.7	9.1	20
EV	0	0	4.5	0	0	0
RE	22.2	31.6	9.1	0	9.1	20
DF-T	11.1	5.3	0	0	0	10
DS-G	0	5.3	0	0	0	0
EA-G	0	10.5	0	0	0	0
RE-G	0	0	0	6.7	0	0

Figure 10 Distribution of CDF types across lessons



When considering the least common CDF types in the following, the German ones will not be taken into account, since they are quite underrepresented with only one or two occurrences each and would therefore distract from the main functions. EVALUATE was the CDF type used least frequently in five lessons with no occurrences at all, and only occurred once in the remaining lesson, in which DEFINE-TRANSLATION was the least common one with zero occurrences. However, if DEFINE-TRANSLATION is considered a sub-category of DEFINE and is not treated separately, EVALUATE is the CDF type occurring least frequently in every lesson. If one takes a look at the three least common CDF types of each lesson, CLASSIFY is amongst the bottom three five times, EXPLAIN and REPORT twice each and EXPLORE once. DEFINE-TRANSLATION is amongst the bottom three three times, unless it is combined with DEFINE. The two least frequently occurring CDF types as detected from the overall distribution in Figure 9 are therefore representative of the least common ones in each lesson.

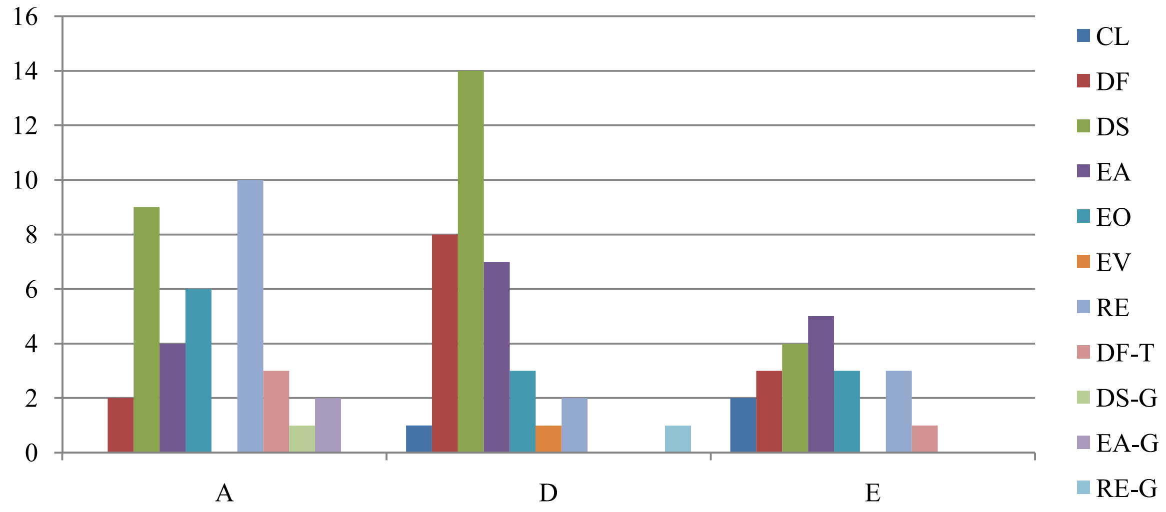
There are two CDF types which do not follow the distribution pattern as presented in Figure 9: EXPLAIN and REPORT. Whereas the other CDF types are approximately distributed across the individual lessons as suggested by Figure 9, the two exceptional ones are represented at both ends of the scale. Whereas they are the most common CDF types in some lessons, they are amongst the bottom three in others. Even though this discrepancy was detected, the overall distribution of CDF types as provided by Figure 9 can still be seen as a legitimate representation of the actual classroom practice and is not fundamentally manipulated by statistical outliers.

Of course, the occurrences of CDF passages are influenced by various factors, some of which can be investigated and others cannot. The data available for this study enables us to look into at least two of them: the nature of the lesson itself (e.g. activities, topics) as it has already been done above, and the teacher under observation (e.g. teaching style, language abilities, personal preferences). In order to investigate to which extent the analysed lessons were influenced by the teachers, the results were reorganised accordingly (see Table 20 and Figure 11). In this case, the term 'teacher' does not refer to the realiser of the presented CDF types, but describes the combination of two lessons that were taught by the same teacher (e.g. the numbers in column D represent the CDF occurrences within both lessons taught by teacher D and were not necessarily realised by the teacher himself).

Table 20 Distribution of CDF types across teachers as total intervals and as percentages of total intervals per teacher

	TEACHERS			
CDF	**A**	**D**	**E**	**TOTALS**
CL	0	1 (2.7)	2 (9.5)	**3 (3.2)**
DF	2 (5.4)	8 (21.6)	3 (14.3)	**13 (13.7)**
DS	9 (24.3)	14 (37.8)	4 (19.0)	**27 (28.4)**
EA	4 (10.8)	7 (18.9)	5 (23.8)	**16 (16.8)**
EO	6 (16.2)	3 (8.1)	3 (14.3)	**12 (12.6)**
EV	0	1 (2.7)	0	**1 (1.1)**
RE	10 (27.0)	2 (5.4)	3 (14.3)	**15 (15.8)**
DF-T	3 (8.1)	0	1 (4.8)	**4 (4.2)**
DS-G	1 (2.7)	0	0	**1 (1.1)**
EA-G	2 (5.4)	0	0	**2 (2.1)**
RE-G	0	1 (2.7)	0	**1 (1.1)**
TOTALS	**37**	**37**	**21**	**95**

Figure 11 Distribution of CDF types across teachers



It can be inferred from Table 20 that lessons taught by teacher E do not reveal as many CDF passages as lessons taught by teacher A or D, which almost show twice as many CDF occurrences each. This can be explained with the fact that lessons E1 and E2 both include relatively long periods of students working in silence, which is not the case for the other lessons.

In the lessons taught by teacher A, REPORT was used most frequently (27.0% of all CDF passages), with DESCRIBE following (24.3%). DESCRIBE was the most common CDF type in the lessons of teacher D (37.8%), followed by DEFINE (21.6%). If both lessons taught by teacher E are combined, EXPLAIN was used most frequently with 23.8 per cent and DESCRIBE second most frequently with 19.0 per cent. If the German CDF types are not taken into account and DEFINE-TRANSLATION is joined together with DEFINE leaving only the seven main categories as suggested by Dalton-Puffer (2013), CLASSIFY and EVALUATE are the CDF types realised least frequently in all of the three lesson combinations.

In general, there is a correlation between the distribution of CDF types in terms of teachers and the distribution in terms of the individual lessons they taught. Nonetheless, there is one exception observable in the lessons of teacher A. Whilst DESCRIBE is the most common CDF type in lesson A1 with 44.4 per cent of all occurrences, it is only used once in lesson A2 (5.3%).

There seems to be a general tendency towards certain CDF types: DESCRIBE, EXPLAIN, REPORT and DEFINE. However, when comparing the distribution in terms of teachers with the distribution in terms of the individual lessons, their occurrences still appear to be dependent on the teacher and/or the nature of the lesson itself. The following statements are preliminary hypotheses about which of the two investigated factors influence the four most occurring CDF types. A more extensive set of data would be required in order to make scientifically founded statements about the influencing factor of the distribution of CDF types. Even though the data is quite restricted and no generalisations should be made from the following hypotheses, they can still be used as a starting point for further empirical research in the respective field.

- *The occurrence of* DESCRIBE *is dependent on the lesson.*
  DESCRIBE occurs very frequently in all three lesson pairs, but shows an inconsistency when the individual lessons are considered.

- *The occurrence of* EXPLAIN *is dependent on the lesson.*
  see above

- *The occurrence of* REPORT *is dependent on the teacher.*
  The distribution of REPORT is consistent across the two lessons taught by the same teachers, but each of those lesson pairs shows a different frequency to which it is realised.

- *The occurrence of* DEFINE *is dependent on the lesson and on the teacher.*
  The lesson pairs show different frequencies of DEFINE realisations and its distribution varies from lesson to lesson (except for the lesson pair A1/A2).

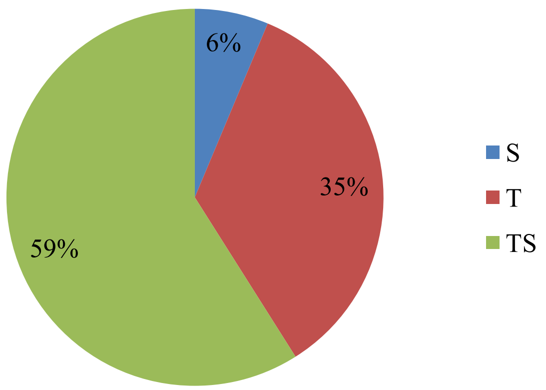
A further discussion about and possible explanations for these hypotheses will be given in chapter 5. No assumptions can be made about the other CDF types since they do not occur frequently enough as to suggest factors of influence.

4.3 Occurrences and distribution of realisers

4.3.1 Considered in isolation

When looking at who performed which CDF types, first attention needs to be paid to a general distribution of realisers in order to put any further results into context. Figure 12 shows that out of the 95 coded CDF passages, 59 per cent were realised by the teacher(s) and the students collectively. Approximately a third of all CDF occurrences were realised by the teacher(s) and only six per cent were performed by one or more students without the teacher(s) making any relevant contributions. In addition to the already apparent lack of student performance, it needs to be considered that some of the TS realisations only show limited student participation. In other words, even less student performance took place during the analysed lessons than visible from the results. This issue will be dealt with later on in subchapter 4.3.3.

Figure 12 Distribution of realisers as percentages



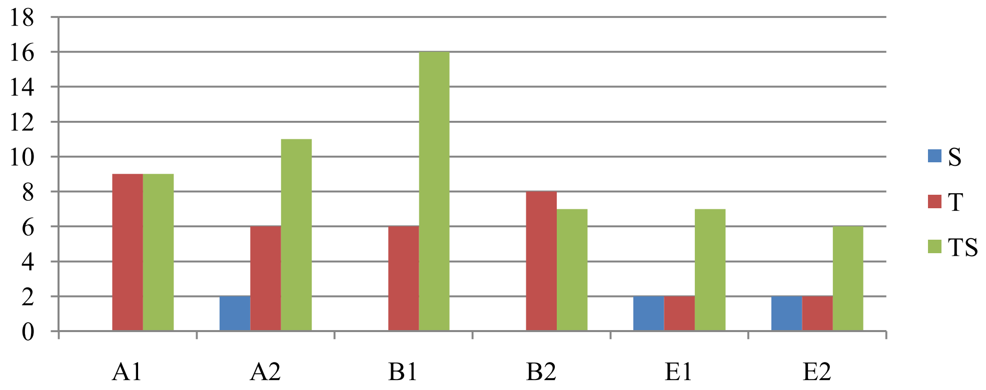
From Table 21 and Figure 13 it can be detected that in only half of the analysed lessons CDF passages were realised by students. Lessons A2, E1 and E2 show two student realisations each, which results in a total interval of only six CDF passages performed by students. In four lessons most CDF passages were realised collectively by the teacher(s) and the students. Lesson B2 shows the highest level of teacher dominance with more than half of all CDF occurrences being performed by the teacher and the remaining ones being TS realisations. The distribution of realisers in lesson A1 is similar with exactly half of all CDF passages being performed by the teacher(s) and the other half by the teacher(s) and the students collectively.

Needless to say, the realiser category of students was not the most dominant one in any of the coded lessons.

Table 21 Distribution of realisers across lessons as total intervals and as percentages of total intervals per lesson

	LESSONS						
REALISER	**A1**	**A2**	**B1**	**B2**	**E1**	**E2**	**TOTALS**
S	0	2 (10.5)	0	0	2 (18.2)	2 (20)	**6 (6.3)**
T	9 (50.0)	6 (31.6)	6 (27.3)	8 (53.3)	2 (18.2)	2 (20)	**33 (34.7)**
TS	9 (50.0)	11 (57.9)	16 (72.7)	7 (46.7)	7 (63.6)	6 (60)	**56 (58.9)**
TOTALS	**18**	**19**	**22**	**15**	**11**	**10**	**95**

Figure 13 Distribution of realisers across lessons

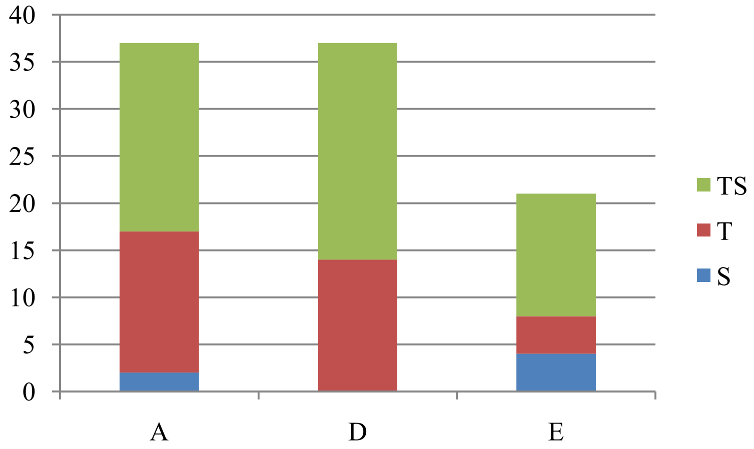


Like it has been done with the occurrences of CDF types before, the results from above have been rearranged into lesson pairs as to investigate whether the distribution of realisers shows characteristics dependent on the three different teachers (see Table 22 and Figure 14).

Table 22 Distribution of realisers across teachers as total intervals and as percentages of total intervals per teacher

	TEACHERS			
REALISER	**A**	**D**	**E**	**TOTALS**
S	2 (5.4)	0	4 (19.0)	**6 (6.3)**
T	15 (40.5)	14 (37.8)	4 (19.0)	**33 (34.7)**
TS	20 (54.1)	23 (62.2)	13 (61.9)	**56 (58.9)**
TOTALS	**37**	**37**	**21**	**95**

Figure 14 Distribution of realisers across teachers



As a first observation it can be detected that in each lesson pair teacher performance is very dominant. Since the lessons taught by teacher E have a similar distribution of realisers, their combination shows the same distribution pattern as when considered individually, with the same amount of S and T realisations and about three times as much TS performances. The lesson pair taught by teacher D is still very teacher dominant, but shows more TS than just T realisations if the lessons are combined. One might assume that the lack of student performance is characteristic for lessons taught by teacher D, however, if one considers the small representation of student performance in all lessons with a total of six realisations, it is reasonable to conclude that a lack of student realisations is a feature of all the lessons analysed. The lesson pair by teacher A follows the general distribution pattern of realisers as presented in Figure 13. Nevertheless, if compared to lessons A1 and A2 in Figure 14, the distribution seems to vary from lesson to lesson.

Generally speaking, the distribution of realisers is not dependent on the teacher and only varies from lesson to lesson to such a small extent that the general distribution as presented in Figure 13 can be seen as representative of the actual classroom practice. As a general rule, there is a strong tendency towards TS realisations and performances by teachers occurred more frequently than by students.

4.3.2 Realiser and CDF types

When it comes to the realisers of CDF passages, not only the general distribution as considered in the previous section is of importance, but also the connection between the realisers and the CDF types they performed. Table 23 provides an overview of which CDF types were realised by whom.

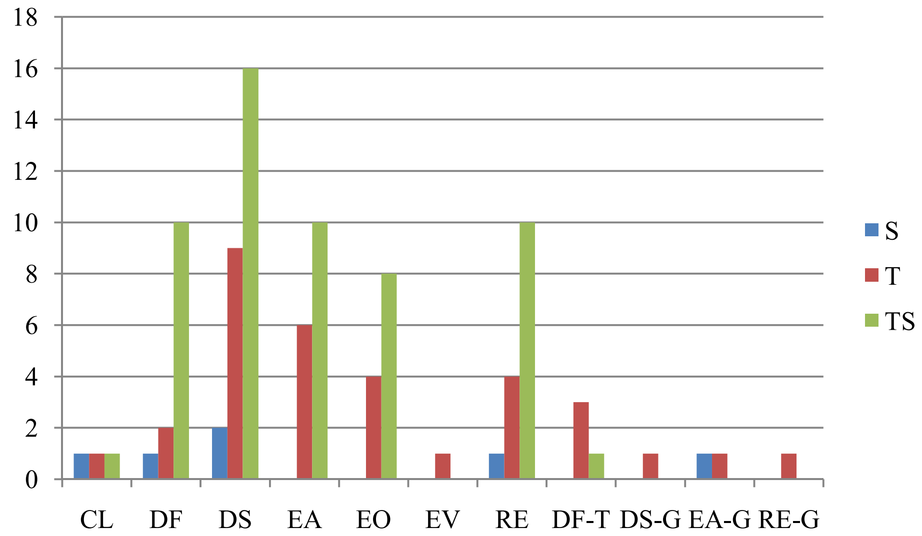
Table 23 Distribution of CDF types across realisers as total intervals

		REALISERS		
CDF	**T**	**S**	**TS**	**TOTALS**
CL	1	1	1	**3**
DF	2	1	10	**13**
DS	9	2	16	**27**
EA	6	0	10	**16**
EO	4	0	8	**12**
EV	1	0	0	**1**
RE	4	1	10	**15**
DF-T	3	0	1	**4**
DS-G	1	0	0	**1**
EA-G	1	1	0	**2**
RE-G	1	0	0	**1**
TOTALS	**33**	**6**	**56**	**95**

In order to investigate whether there is in fact a correlation between certain realisers and CDF types, the results were arranged in two different ways: (1) according to the realisers for each CDF type (compare Figure 15) and (2) according to the CDF types for each realiser (compare Figures 16). From the first organisation of results, information about the realiser patterns for each individual CDF type can be deduced, whereas the second kind provides an insight into the distribution of CDF types for each realiser.

Figure 15 shows that the CDF types CLASSIFY, DEFINE, DESCRIBE, and REPORT were performed by all three types of realisers. EXPLAIN, EXPLORE and DEFINE-TRANSLATION were realised by the teacher(s) as well as by the teacher(s) and the students collectively, but lack student realisation. EVALUATE, DESCRIBE-GERMAN and REPORT-GERMAN were realised by the teacher(s) exclusively, but only occurred once each in the data. EXPLAIN-GERMAN is the only CDF type that shows S and T realisations, but lacks collective performances by the teacher(s) and the students. Since this CDF type only occurred twice in the data, no well-founded conclusions can be drawn from this peculiarity.

Figure 15 Distribution of realisers across CDF types

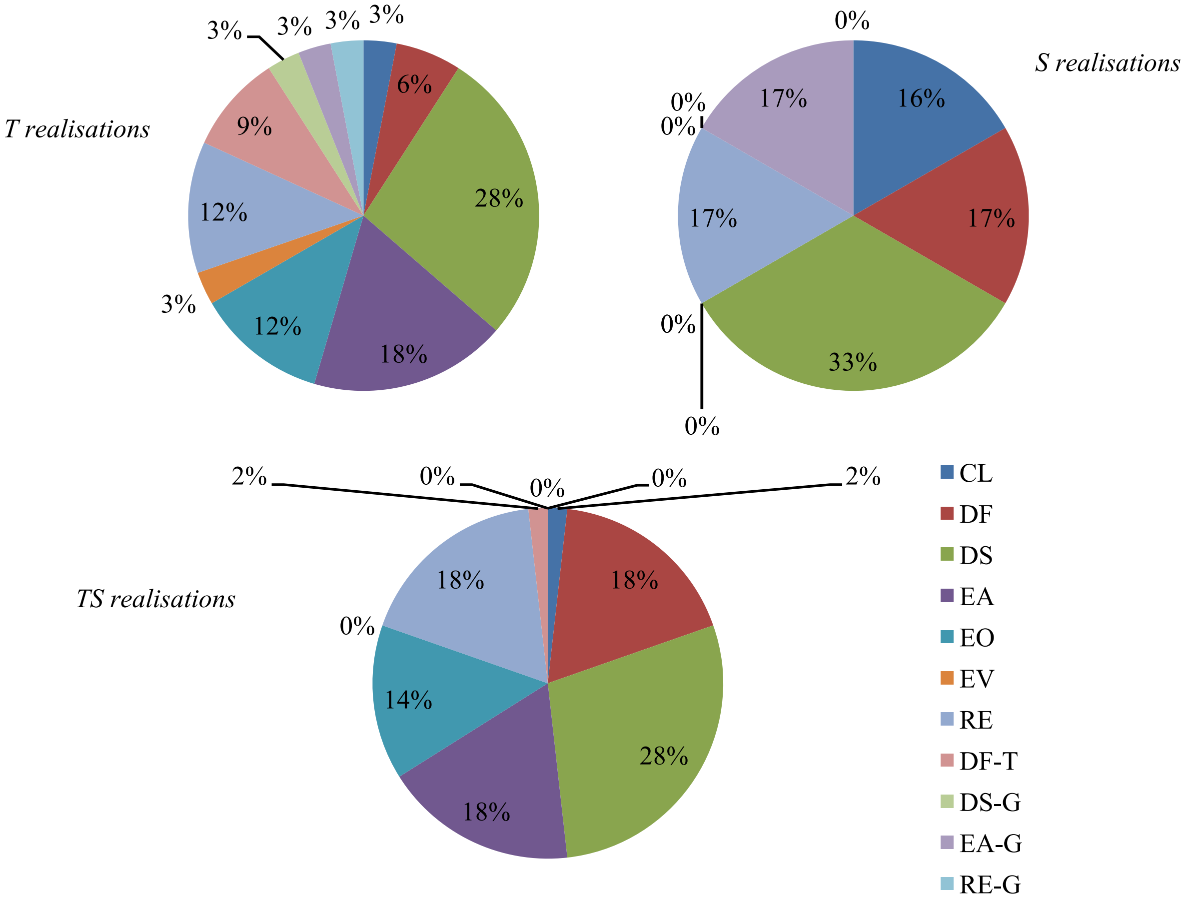


CLASSIFY is the only CDF type with an even distribution over all three realiser categories. Nevertheless, this CDF type only occurred three times in total, which means that there is only one occurrence of CLASSIFY per realiser. A more extensive set of data would be required in order to determine whether this even distribution is representative for the CDF type CLASSIFY.

The other three CDF types that were realised by each type of realiser (i.e. DEFINE, DESCRIBE and REPORT) all show a strong tendency towards TS realisation. The second most common type of realisation for each of those CDF types is teacher performance. Student realisation is the least popular one for the three CDF types in question. Since DEFINE, DESCRIBE and REPORT are amongst the four most common CDF types in the data, it is not really surprising that their individual distributions of realisers are close to the general one (compare Figure 12). This raises the question whether all (or at least some) CDF types would approach such a distribution if their occurrences increased. This idea can be illustrated by the CDF types EXPLAIN and EXPLORE in Figure 15, for instance. Their dominance of TS realisations as well as their T performances, which approximately make up a third of all realisations, looks very similar to the distribution of DESCRIBE, for instance (or the general distribution for that matter). If only one or two student realisations were added to EXPLAIN or EXPLORE, they would follow the general distribution pattern of realisers. In other words, it is reasonable to assume that the more extensive the set of data is, the more likely it is that the realiser distribution of each CDF type (at least for the seven main types) resembles the general distribution pattern.

Figure 16 gives an overview on the varieties of CDF types that were performed by the three types of realisers and also shows to which extent they made use of them. The teacher(s) realised all CDF types at one point in the data, whilst the students' performance is limited to only five CDF types. TS realisations were coded together with seven CDF types, whereas two of those only occurred once each. The most common CDF type for each realiser category is DESCRIBE with about a third of all occurrences each. EXPLAIN occurred as the second most common CDF type in the T performances with 18 per cent and shows the same percentage for the TS realisations, where it also is amongst the second most common CDF types (together with DEFINE and REPORT). EXPLAIN was not performed by the students at all, however, the category's German equivalent is the second most common CDF types with 17 per cent (among others).

Figure 16 Distribution of CDF types across realisers



As TS performances are strongly represented with 56 occurrences, they allow the most valuable and precise interpretation. The five most common CDF types are relatively evenly distributed (DS, DF, EA, RE, EO). The other two represented categories DEFINE-TRANSLATION and CLASSIFY with one occurrence each (i.e. 2%) require particular consideration. As it has been mentioned before, DEFINE-TRANSLATION can be considered a sub-category of DEFINE. If those two categories were combined, CLASSIFY (2%) and EVALUATE (0%) would be left as the only two main CDF types that are underrepresented in TS performances.

The students' performance is a special case as there are only six CDF occurrences in total. No legitimate interpretation about the students' CDF type preferences can be made based on a data set that limited. The only statement that can be made is that during the six analysed lessons, students realised one CDF passage each for the following CDF types: CLASSIFY, DEFINE, DESCRIBE, EXPLAIN-GERMAN and REPORT. DESCRIBE was realised twice, leaving

EXPLORE and EVALUATE with no representation. These results could hint at a relatively even distribution of CDF types with a tendency towards descriptions and switches to German for explanations. However, formulating these ‘thought experiments’ as actual hypotheses would be too far-fetched. This shows that empirical research in this field requires an extensive data set in order to collect enough realisations on which founded claims about student performances can be made.

The category of teacher performance shows the largest variety of CDF types even though there were only 33 occurrences detected (compare to TS with 56 occurrences). Apart from the few German CDF passages which do not really change the results to a large extent, there are two characteristics that can be observed in Figure 16. First of all, evaluations were only made by the teacher(s). However, from the results above we know that there was only one evaluation in total. Second of all, teachers show a stronger tendency to perform translations than the other realiser categories. Out of the four occasions on which they occurred in the data, three were realised by teachers and one by the teacher(s) and the students collectively. Even if this can only be observed from a few incidences, it shows that teachers are more willing than students to try out CDF types that are generally unpopular in the classroom.

From investigating the relationship between CDF types and realisers three main conclusions can be drawn:

1. The seven main CDF types have a general tendency towards the following ranking of realisers from most to least frequent: TS, T, S.
2. All three types of realisers performed DESCRIBE most frequently, followed by EXPLAIN or EXPLAIN-GERMAN (in the case of S realisation).
3. Teachers show the strongest tendency to perform CDF types that are not generally common.

4.3.3 Student participation

As already pointed out in the previous section, some TS passages showed limited student participation. In order to make it possible to take this issue into account when interpreting the distribution of realisers, a separate investigation of TS passages will be provided in the following. First of all, it needs to be clarified what is considered a ‘limited’ participation.

Extracts 8 and 9 are examples of a typical TS realisation and a TS passage with limited student participation. The students' contributions have been written in bold as to highlight the distribution of turns across the realisers.

Extract 8 Example of TS realisation "Explore: tripod"

01	T:	THIS gentleman here has got A (.) uh (2) piece of equipment here that is (.) uhm other expensive stuff he's sort of (.) standing on. okay. (.) any comments on u:h (1) why it is as it is. can you say anything about WHY (.) this
02	SX-m:	**tripod**.
03	SX-f:	**(Miss [last name1] don't you) call (it) a tripod**
04	T:	that's called a tripod. absolutely.=
05	S3:	=it's probably=
06	T:	=the TRI stands for
07	SS:	**three**.
08	T:	three. right. so: (.) any comments about it. WHY THREE. come on [first name8] listen. stop doing that and listen. (.) you as well [first name9]. yeah.
09	S3:	**I think it's mo- it's also because uhm there is that pole that goes <un> x </un> in the middle so basically i- it's easier to move it up and down.**
10	T:	well that STILL doesn't say you could have a pole in the middle when you've got ANY (odd) number <un> xx </un> around the <un> xx? </un>
11	S3:	well that would be <un> xxx </un>
12	T:	[first name10]?
13	SX-f:	**<un> xx </un> have like three legs (.) and isn't that if you only have two <un> xxx </un> fall down 'cause it wouldn't be like the weight wouldn't be=**
14	T:	=if you had TWO. then you know there'd be no hope for it. would there. wouldn't stand up.
15	SX-f:	**but with three it's like balanced**
16	T:	yeah. and uh WHY do you think THREE. why not FOUR.
17	S3:	**cheaper than four**
18	T:	@ yeah. ACTUALLY it IS a good reason? but uh <@> you're quite right </@> but any- anything else. [S4].
19	S4:	**<un> xxx </un> uhm (.) you don't need a lot of u:h**
20	S5:	**<13> material. </13>**
21	S4:	**<13> I don't know. </13> material to make it and it's the smallest number of (.) legs**
22	T:	okay. so that's that's the same REALLY answer <un> xx </un> it's cheaper. to use three than four. but are there any other (.) reasons for three <un> xx </un> four. (1) [S9].
23	S9:	**isn't the triangle the strongest shape <un> xxxx </un>**
24	T:	I think probably a triangle is a good shape for it. can you imagine what would happen if it

actually had FOUR legs. (.) and I pushed it from the side. you know I push from the s- it's got FOUR legs and I go (.) what happens. yeah.

25 SX-f: **it would ALSO fall down.**

26 T: it would be fallin- MUCH more likely to fall down? {moves camera} I could tip it over? okay? but it's gonna tip over here? (1) and return.

27 S3: interesting.=

28 T: =okay. so it MIGHT be that this idea of having A (.) triangle
(.) it might be a particularly useful shape. (.) and this (.) next lesson and today's lesson is about stability. (.) why things are stable why things stay (.) up right. yeah.

29 S10: **isn't it maybe because the point where all the pressure is on a triangle is exactly in the middle of it? (1) because if it has four legs that doesn't have to be? (.) but if it's THREE (.) then it's HAS to be in the middle.**

30 T: <un> x </un> wha- what's uh [S10] talking about. (if saying) about some point in the middle of it. (1) uh we need to work a bit more about this point in the middle. (1) yeah.

31 S3: **I think what she means is where the force is uhm concentrated? like when you walk over the icy you have if you have spikes on your shoes there will <un> xxx </un> ice <un> xx </un> break because (.) the forces are evenly distributed?**

32 T: now we're trying to (think then) about (.) sh <un> x. </un> we're trying to (think then) about uh (.) what happens with forces in (.) to make something stable. what's going on in there? uh (.) where is the weight of this acting.

33 S4: **in the middle. (1) in the middle (.) of the (.) <un> xxx. </un>=**

34 T: =down through THIS part in the middle there. (.) right.

Extract 9 Example of TS realisation with limited student participation "Report: electric effects in the past"

01 T: yeah? so we've known about electric effects? (.) fo:r at LEAST about three thousand years now? {someone knocks at the door}

02 SX: <L1de> es klopft= </L1de>

03 T: =<un> xx x </un> the door? <un> x xx </un> let (them) in? {opens door} hello. {a student comes in and takes a seat, T walks back to the blackboard}
okay. (1) so for instance EVEN EVEN as long as a three thousand years ago? (1) they knew that if you RUBBED a stone? such as amber? you know (what) amber is in German?

04 S3: **<L1de> Bernstein.= </L1de>**

05 T: =yesss. so if you rub a stone like amber? that it would (demonstrate) uhm specific electric effects. (1)
yah? so this is even three thousand years ago. (1) yah? (.) a:nd uhm even TWO thousand years ago? (1) Chinese sailors knew about magnetic (forces). (1) yah? (.) <1> using </1>

06 SX-f: <1> <un> x xx </un> </1>

07 T: psht. {smiles} using the uh MAGNETITE STONE. they real- the already knew about magnetic forces. (1)
yeah? and why would sailors need magnetic forces? (.) or how would they USE magnetic forces?

08 S4: **to know where they are?=**

09 T: =know where they are? <2> USING? </2>

10 S4: **<2> where </2> north is? (.) and (all that)?=**

11 T: =using what?

12 S4: **a compass?=**

13 T: =using a compass. (exactly.) so we've been using compasses to tell where we ARE? (1) using MAGNETIC properties fo:r a REALLY long time? (.) already? (1) yah? so you use compass needles for navigation? to tell you WHERE you're going? and which diRECtion that you wanna go to. (.) yah? which direction you wanna go IN. (2)
yah? so EVEN (though) THOUSANDS AND THOUSANDS of years ago we knew about electric forces with stones like amber? {points at slide} (.) and we knew about magNETic forces with stones like magnetite? (1) we didn't we couldn't really EXPLAIN it. that long ago. we weren't advanced enough to explain WHY HOW things happened (.) we just knew that they HAppened. (1) yah? that we COULD use magnetic forces to:: get ourselves from place to place. you know as sailors.

In the first extract the students contribute to the realisation of the CDF passage to a large extent. They provide explorations and perform moves that are relevant to the passage. The teacher takes part in the exploration process and tries to lead the students towards the right answer. This passage is followed by an experiment in which the term 'centre of gravity' is explained. The second extract has already been used as an illustration in chapter 3. It clearly shows a lack of student participation and the main part is communicated by the teacher. Nonetheless, the students realise moves that are relevant to the passage and thus need to be considered realisers as well. In cases where students did in fact talk but did not contribute anything to the CDF passage (e.g. no move performance, only adding information that is not relevant to the topic under discussion, asking unrelated questions), the passage was coded T. Within TS passages that show a lack of student participation, students often expressed themselves through (1) gestures, (2) short German utterances, and (3) even shorter English utterances that do not exceed a maximum of two words. Table 24 gives an overview of limited student participation and also takes into account the German element that has just been mentioned. Furthermore, Table 25 provides information on the percentages of TS passages that show limited student participation.

Table 24 TS passages with limited S participation as total intervals (G...how many of them include a significant number of German utterances by students)

	LESSONS						
CDF	**A1**	**A2**	**B1**	**B2**	**E1**	**E2**	**TOTALS**
DF			1 (1G)	1			**2 (1G)**
DS	3 (1G)	1	5 (4G)				**9 (5G)**
EA						1	**1**
EO	1 (1G)		1 (1G)				**2 (2G)**
RE	1	1 (1G)	2			1	**5 (1G)**
TOTALS	**5 (2G)**	**2 (1G)**	**9 (6G)**	**1 (0G)**	**0 (0G)**	**2 (0G)**	**19 (9G)**

Table 25 TS passages with limited S participation as total intervals and as percentages of total intervals per number of TS passages per lesson

	LESSONS						
REALISER	**A1**	**A2**	**B1**	**B2**	**E1**	**E2**	**TOTALS**
TS	9	11	16	7	7	6	**56**
limited S	5	2	9	1	0	2	**19**
percentages	**55.6**	**18.2**	**56.3**	**14.3**	**0.0**	**33.3**	**33.9**

Out of the 56 TS realisations, slightly over a third shows a lack of student participation. Approximately half of those passages include a significant number of German utterances on the side of the students. More than half of the TS passages coded in lessons A1 and B1 show a lack of student participation, with most of those passages being realisations of DESCRIBE. Lesson E1 does not show any TS passages with limited student participation. The lack of German utterances in lessons E1 and E2 can be explained with the teacher's mother tongue being English. Consequently, students need to stick to English in order to be understood. Concerning the usage of German, I do not want to go into more detail here. The focus of the study is on the realisation of CDFs and not on the distribution of different languages. In fact, students should also be taught to verbalise CDFs in their mother tongue (which is, of course, a quite optimistic goal in a classroom where more than one mother tongue is present, which is often the case). CLIL offers the opportunity for exactly that: learning how to verbally express CDFs is more than one language. Therefore, using languages apart from English in the CLIL classroom should not be frowned upon as long as it does not distract from or even replace the use of English. For the purpose of my thesis, I am therefore of the opinion that the separate German CDF types that mark extensive uses of German provide enough information about switches in language.

From Table 26 it can be detected that the five CDF types that show limited student participation within TS passages are also the most frequently realised ones by TS (and are the most common CDF types in the data in general). From these findings one can conclude that the more frequently a CDF type is realised by TS, the more likely it is to show limited student participation. In other words, a more extensive set of data might have shown higher percentages of limited student participation within TS passages and probably more CDF types would have been affected.

Table 26 TS passages with limited S participation as total intervals and as percentages of total intervals per CDF type

CDF	TS	limited S	percentages
CL	1	0	0
DF	10	2	20.0
DS	16	9	56.3
EA	10	1	10.0
EO	8	2	25.0
EV	0	0	0
RE	10	5	50.0
DF-T	1	0	0
DS-G	0	0	0
EA-G	0	0	0
RE-G	0	0	0
TOTALS	**56**	**19**	**33.9**

The two most important pieces of information that were found in connection with limited student participation within TS passages were (1) that the limitation is not dependent on the CDF type that is performed and (2) that student participation is even lower than it seems at a first glance.

4.4 Occurrences and distribution of contexts

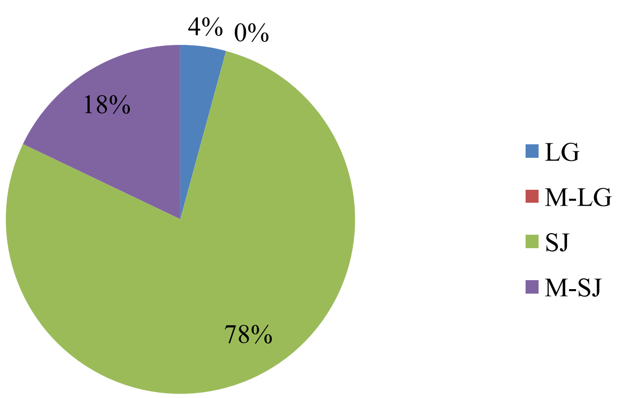
4.4.1 Considered in isolation

In the present data, the great majority of CDF passages was realised in a SUBJECT context (78%). The passages realised in connection with a META-SUBJECT context are limited to 18 per cent. Only four per cent of the coded CDF passages occurred in a LANGUAGE context, which took place in three out of the four lessons. The context of META-LANGUAGE did not occur in any of the analysed lessons (compare Table 27 and Figure 17).

Table 27 Distribution of contexts across lessons as total intervals

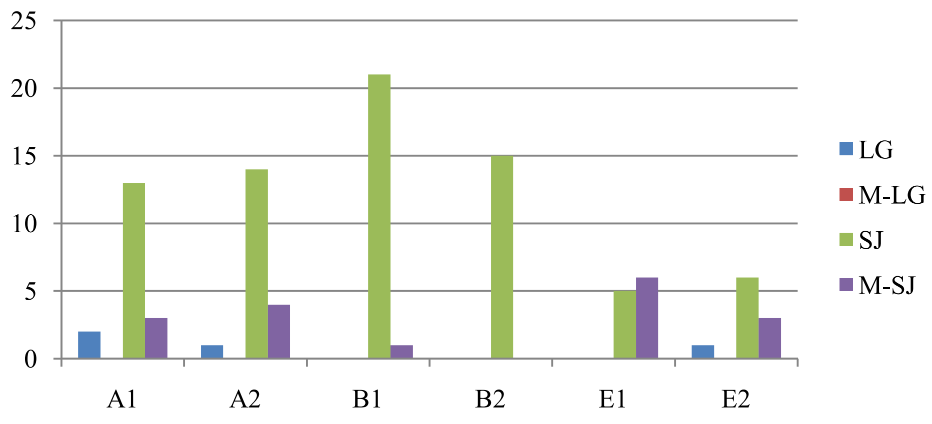
	LESSONS						
context	**A1**	**A2**	**B1**	**B2**	**E1**	**E2**	**TOTALS**
LG	2	1	0	0	0	1	**4**
M-LG	0	0	0	0	0	0	**0**
SJ	13	14	21	15	5	6	**74**
M-SJ	3	4	1	0	6	3	**17**
TOTALS	**18**	**19**	**22**	**15**	**11**	**10**	**95**

Figure 17 Distribution of contexts as percentages



As it has been done with the distribution of CDF types and realisers, the usage of contexts will be considered for each individual lesson in order to detect statistical outliers or lesson characteristics. Figure 18 shows that in all but one lesson CDF passages were most frequently realised in a SUBJECT context. Lesson B1 shows the most occurrences of the SUBJECT context, whereas lessons E1 and E2 show the fewest with their occurrences combined only resulting in half the number of occurrences of lesson B1. Lesson E1 is a special case as it is not only the lesson that shows the highest number of META-SUBJECT realisations, but is also the only lesson in which the META-SUBJECT context is the most common one. This is due to the fact that in this lesson many examples from everyday life were used to illustrate subject matters (e.g. estimating measurements of the classroom that are then used in a calculation). In lessons B1 and B2 not a great variety of contexts were realised, as all but one of their CDF passages occurred in a SUBJECT context (the exception being one META-SUBJECT context in lesson B1). This makes lesson B2 the only lesson that exclusively sticks to one context category. In general, there is a strong tendency towards the SUBJECT context in almost every lesson. Whilst a META-SUBJECT context was at least addressed on 17 occasions, language matters were only talked about four times. On top of that, there was not a single CDF passage that focused on the context of META-LANGUAGE.

Figure 18 Distribution of contexts across lessons



Since the lessons that were taught by the same teacher(s) show similar distribution patterns, the characteristics of each lesson pair can be directly detected from Figure 18. The context distribution of lessons by teacher A look similar to the general distribution in Figure 17. It is also the lesson pair with the highest number of LANGUAGE occurrences. The lesson pair B1/B2 shows a high level of SUBJECT dominance and completely lacks realisations in a LANGUAGE context. Lessons taught by teacher E have a stronger tendency towards the META-SUBJECT context than the other lesson pairs, with META-SUBJECT and SUBJECT occurrences almost being represented to the same degree (11 SJ, 9 M-SJ).

4.4.2 Context and CDF types

In the following, it will be investigated whether there is a connection between certain CDF types and the context in which they were realised. Table 28 gives an overview on the occurrences of each CDF type within the four different kinds of contexts.

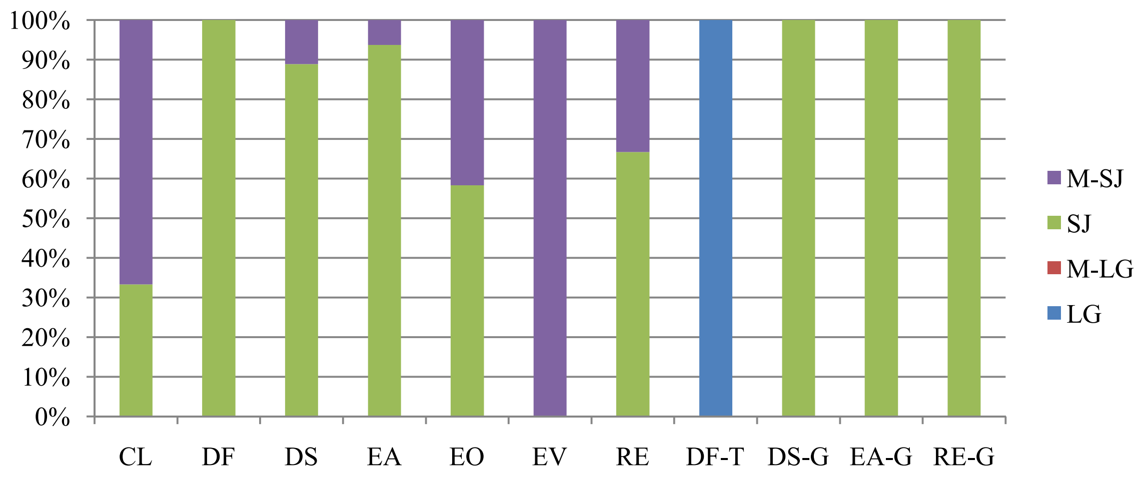
Table 28 Distribution of CDF types across contexts as total intervals

	CONTEXTS				
CDF	**LG**	**M-LG**	**SJ**	**M-SJ**	**TOTALS**
CL	0	0	1	2	**3**
DF	0	0	13	0	**13**
DS	0	0	24	3	**27**
EA	0	0	15	1	**16**
EO	0	0	7	5	**12**
EV	0	0	0	1	**1**
RE	0	0	10	5	**15**
DF-T	4	0	0	0	**4**
DS-G	0	0	1	0	**1**
EA-G	0	0	2	0	**2**
RE-G	0	0	1	0	**1**
TOTALS	**4**	**0**	**74**	**17**	**95**

From Figure 19 it can be detected that each CDF type was either realised in one or two different contexts. As it has already been established, the context of META-LANGUAGE was not represented in the analysed data. DEFINE-TRANSLATION is the only CDF type that occurred in a LANGUAGE context. It is not surprising that all definitions were realised in a LANGUAGE context, since this can be deduced from the category per se (see categorisation of

DEFINE-TRANSLATION in chapter 3). All German CDF types and DEFINE occurred in a SUBJECT context exclusively, whilst EVALUATE only shows META-SUBJECT realisations. CLASSIFY also shows a relatively high percentage of META-SUBJECT realisations. However, since CLASSIFY and EVALUATE are the least popular amongst the seven main CDF types, their high percentages of realisations in a META-SUBJECT context do not have much effect on the general distribution of contexts and cannot be used as a basis for founded interpretations.

Figure 19 Distribution of contexts across CDF types as percentages



There are a few conclusions that can be drawn from these results. First of all, whenever there was a switch to German for a longer period of time, it happened in combination with a SUBJECT matter. In other words, the teachers and the students generally stuck to English when talking about META-SUBJECT issues. This claim cannot be made about the LANGUAGE context, since this category only occurs in combination with DEFINE-TRANSLATION, which includes the usage of German per definition. Second of all, there are no CDF passages other than translations that deal with the language itself. Nevertheless, this does not necessarily mean that language issues were ignored entirely, as LANGUAGE-MOVEs have not been considered yet. What can be said, however, is that even if it turns out that LANGUAGE-MOVEs were in fact realised, there were no longer passages present that served the purpose of talking about the language itself. Exactly the same holds true for the context of META-LANGUAGE, where individual moves (i.e. M-LG-Ms) are the only potential way in which a meta-level was addressed. Finally, every definition was realised in a SUBJECT context. As the observed lessons were Physics lessons, a strong correlation between DEFINE and SUBJECT has been expected. A combination such as DEFINE and LANGUAGE, for instance, would mean an explicit communication about language structures (e.g. 'a noun phrase is...') and was not expected to occur.

4.5 Occurrences and distribution of moves

4.5.1 Moves and CDF types

In total, there were 504 moves coded in the six analysed lessons. All seven main CDF types were realised as moves in the data and were supplemented with occurrences of DEFINE-TRANSLATION-MOVEs and the three types of context moves as introduced in chapter 3. Table 29 gives an overview on the occurrences of each move category and their distribution across the CDF types along which they occurred.

Table 29 Distribution of moves across CDF types as total intervals

MOVE / CDF	CL-M	DF-M	DS-M	EA-M	EO-M	EV-M	RE-M	DF-T-M	LG-M	M-LG-M	M-SJ-M	TOTALS
CL	0	1	1	0	1	0	0	0	0	0	0	**3**
DF	5	25	2	5	3	1	3	1	3	7	2	**57**
DS	13	10	81	21	16	0	12	4	12	7	1	**177**
EA	1	5	21	32	7	0	7	2	2	13	2	**92**
EO	1	4	12	18	30	1	4	1	1	3	2	**77**
EV	0	0	0	0	0	1	0	0	0	0	0	**1**
RE	3	5	10	14	7	1	17	1	4	0	0	**62**
DF-T	0	5	0	3	0	1	0	5	2	0	0	**16**
DS-G	0	0	0	0	0	0	0	0	0	0	0	**0**
EA-G	0	0	2	4	0	0	0	0	1	3	0	**10**
RE-G	1	0	3	3	1	0	0	0	0	1	0	**9**
TOTALS	**24**	**55**	**132**	**100**	**65**	**5**	**43**	**14**	**25**	**34**	**7**	**504**

For an easier interpretation of results, only the seven main categories of CDF types and moves will be considered at first. The context moves will be discussed later on in a separate section.

Firstly, the general distribution of move types shall be considered in isolation from the CDF passages in which they occurred. Out of the seven main move categories, the most common ones were the DESCRIBE-MOVE and the EXPLAIN-MOVE, whereas CLASSIFY and EVALUATE were realised as moves least frequently. As it was suggested before, DEFINE-TRANSLATION can be considered a sub-category of DEFINE, which can as well be applied to their corresponding moves. Consequently, CLASSIFY-MOVE and EVALUATE-MOVE are the two types occurring least frequently. If the main CDF types and moves are arranged from most to least frequent, one receives the following ranking:

CDF	MOVE
DS	DS-M
EA	EA-M
RE	EO-M
DF	DF-M
EO	RE-M
CL	CL-M
EV	EV-M

Most CDF types are in the same ranking position as their corresponding moves. REPORT and EXPLORE are the only ones that are not, with their corresponding moves having switched positions. The similar rankings raise the question whether CDF types are mostly realised by their corresponding moves. An answer will be given soon.

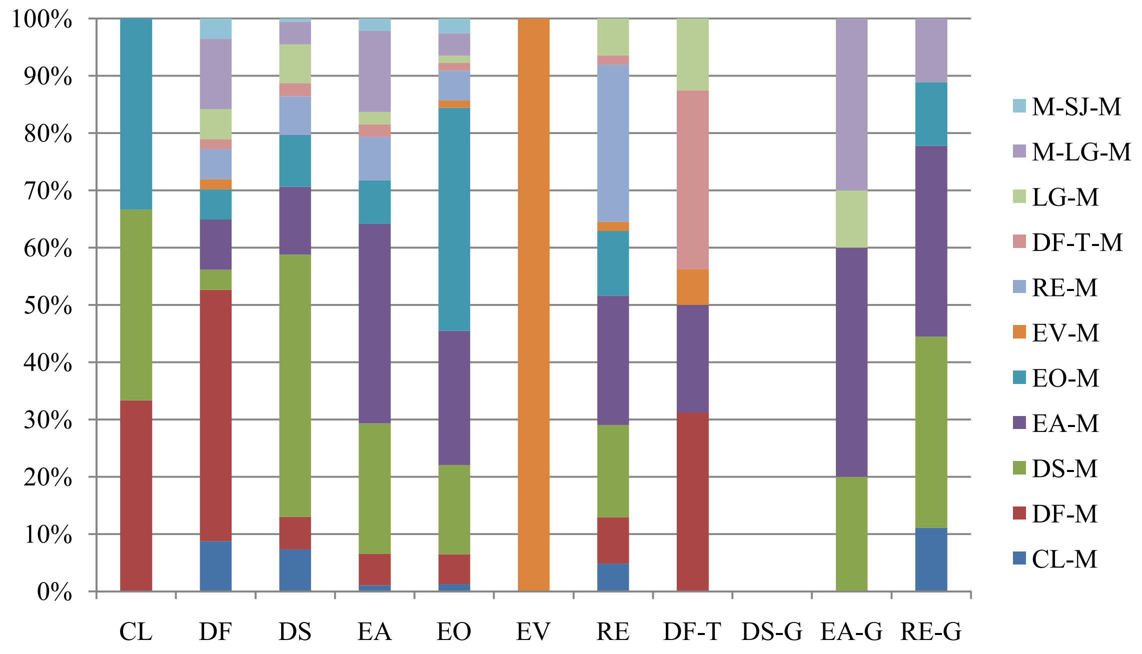
Secondly, the number of move occurrences for each of the seven main CDF type is focused on. Most moves occurred within the CDF types DESCRIBE and EXPLAIN, whilst CLASSIFY and EVALUATE show the smallest number of moves. If the CDF types are organised according to their frequencies as well as to their numbers of moves, we get a second ranking:

CDF type according to frequency	CDF type according to number of moves
DS	DS
EA	EA
RE	EO
DF	RE
EO	DF
CL	CL
EV	EV

The two top and bottom CDF types are in the same position twice, whereas the three in the middle switched positions. The similar rankings on both sides lead to another question: Is the average number of moves within a CDF passage the same for each CDF type (or at least approximately)? In other words, are all CDF types made up of (approximately) the same number of moves? This question will also be answered soon.

As a next step, the distribution of moves for each CDF type will be considered. From Figure 20 it is immediately evident that some CDF types have a more complex structure than others, i.e. the number of move types that are used to realise a CDF passage varies across the individual CDF types. DEFINE and EXPLORE, for instance, make use of all eleven types of moves, whereas CLASSIFY and EVALUATE do not show a great variety of move categories. DESCRIBE-GERMAN is the only CDF type without any move occurrences. Nonetheless, since the German CDF types are rather underrepresented in the data, the move distribution as shown in Figure 20 cannot be considered representative of the CDF types. A detailed analysis of the move structure for each CDF type will not be given as it would go beyond the scope of this thesis. Figure 20, however, gives a compact overview on the various move structures and can be used as a basis for further detail-oriented research. In addition, individual points will be focused on in the following so as to investigate some main characteristics.

Figure 20 Distribution of moves across CDF types as percentages



One question that has been asked before was whether CDF types are mostly realised by their corresponding moves. In order to answer this, the most frequent moves for each CDF type have been highlighted in Table 30. Since the German CDF types do not have corresponding moves and the context moves do not have matching CDF types, only the seven main categories of moves and CDFs will be considered in the following. A strong correlation between the CDF types and their corresponding moves would be represented by diagonally highlighted numbers from the top left down to the bottom right corner. As expected, the highlights are very close to this suggested diagonal, with CLASSIFY being the only CDF type that does not stick to the pattern. First of all, the most common move category for CLASSIFY is not its corresponding move. The CDF type shows one occurrence of the DEFINE-MOVE, the DESCRIBE-MOVE and the EXPLORE-MOVE each, and was not realised by any other move types. This leads to the second even more striking characteristic of CLASSIFY: it does not show any occurrences of its corresponding move at all. DEFINE-TRANSLATION does not reveal an irregularity as such, but shows the same number of occurrences for two move categories: DEFINE-MOVE and DEFINE-TRANSLATION-MOVE. Nevertheless, DEFINE and DEFINE-TRANSLATION are so closely related that it cannot really be considered an irregularity.

Table 30 Most frequent moves per CDF type

MOVE / CDF	CL-M	DF-M	DS-M	EA-M	EO-M	EV-M	RE-M	DF-T-M	LG-M	M-LG-M	M-SJ-M	TOTALS
CL	0	1	1	0	1	0	0	0	0	0	0	**3**
DF	5	25	2	5	3	1	3	1	3	7	2	**57**
DS	13	10	81	21	16	0	12	4	12	7	1	**177**
EA	1	5	21	32	7	0	7	2	2	13	2	**92**
EO	1	4	12	18	30	1	4	1	1	3	2	**77**
EV	0	0	0	0	0	1	0	0	0	0	0	**1**
RE	3	5	10	14	7	1	17	1	4	0	0	**62**
DF-T	0	5	0	3	0	1	0	5	2	0	0	**16**
DS-G	0	0	0	0	0	0	0	0	0	0	0	**0**
EA-G	0	0	2	4	0	0	0	0	1	3	0	**10**
RE-G	1	0	3	3	1	0	0	0	0	1	0	**9**
TOTALS	**24**	**55**	**132**	**100**	**65**	**5**	**43**	**14**	**25**	**34**	**7**	**504**

Generally speaking, the majority of the seven main CDF types is realised by a great variety of move types. CLASSIFY and EVALUATE, on the other hand, seem to be rather straight-forward or simple in terms of their move types. Quite surprisingly, the examination of the correlation between CDF types and their corresponding moves revealed that only moves of DEFINE, DESCRIBE and EXPLORE were used in order to realise classifications. At the same time, CLASSIFY-MOVEs were used to perform other CDF types, which will be looked at in more detail soon. On closer examination, the concept of classifications does not appear to be as straight-forward as it does at first.

An issue that needs to be considered is that CLASSIFY and EVALUATE are the least frequently occurring categories out of the seven main CDF types. It is therefore quite possible that a more extensive data set would lead to quite different results in terms of moves. The question arises whether the variety of move types for all CDF types would increase together with the number of CDF passages. Quantitative data analysis is necessary in order to answer this question, whereas a subsequent qualitative approach would be preferable to analyse the move structure for each individual CDF type in detail.

Another question that has been asked before was whether all CDF types are made up of (approximately) the same number of moves. Table 31 answers this question for the seven main categories. The average number of moves per CDF passage is 5.4 (rounded to the first decimal). Four CDF types are below this average (CL, DF, EV, RE) and three are above it (DS, EA, EO). DESCRIBE shows the highest average number of moves per occurrence, whereas CLASSIFY and EVALUATE show the smallest with one move each.

Table 31 Average number of moves per CDF type

CDF	number of occurrences	number of moves within CDF type	average number of moves per occurrence
CL	3	3	1
DF	13	57	4.4
DS	27	177	6.6
EA	16	92	5.8
EO	12	77	6.4
EV	1	1	1
RE	15	62	4.1
TOTALS	**87**	**469**	**5.4**

The question whether the average number of moves per CDF passage is similar for each CDF type can clearly be answered with 'no'. Once again, the CDF types have been ranked according to two different criteria:

CDF type according to frequency	CDF type according to average number of moves per occurrence
DS	DS
EA	EO
RE	EA
DF	DF
EO	RE
CL	CL
EV	EV

The rankings look quite similar, with EXPLORE, EXPLAIN and REPORT having switched positions. There are no drastic differences in the two rankings apart from EXPLORE climbing three positions in the right one. Especially the top one (DESCRIBE) and the bottom two categories (CLASSIFY and EVALUATE) never change position in any of the presented rankings.

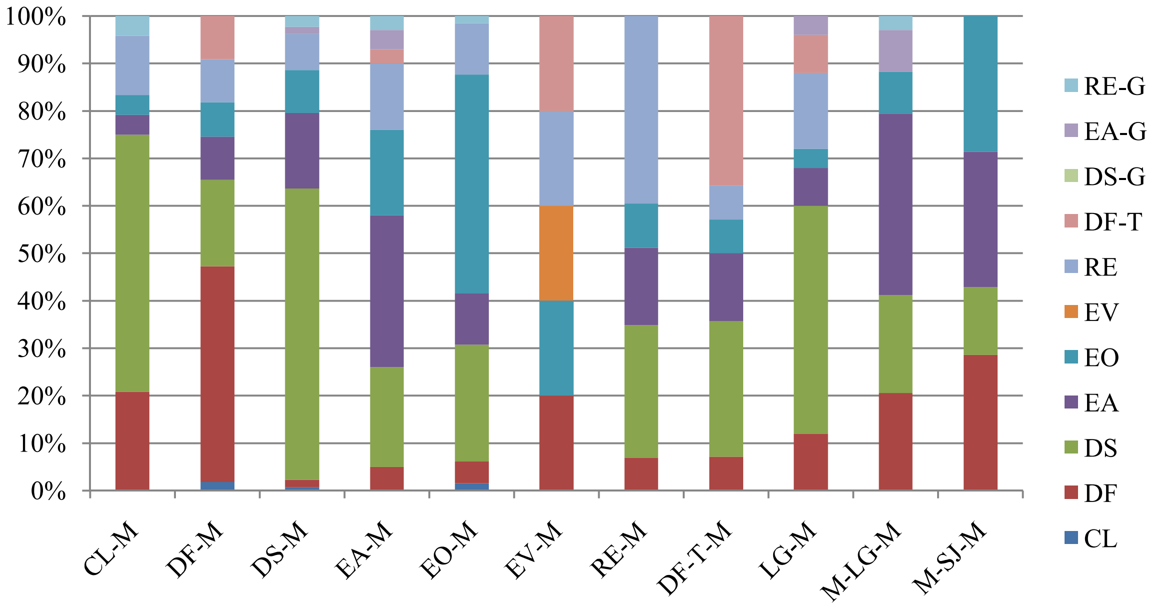
In general it can be said that there is no average number of moves per occurrence that holds true for each CDF type. The rankings from before that compared the frequency of CDF types and the frequency of moves per CDF type were not similar because all CDF types have the same average number of moves, but because – generally speaking – the more common a CDF type is, the more moves it has per occurrence. This statement should be considered a preliminary suggestion that can be used as a basis for further research. There are too many changes in the ranking in order to draw conclusions at this stage, however, the 'extreme' values (i.e. both ends of the scale) suggest a certain pattern that should be further investigated.

An explanation for this result might be that the more comfortable (or competent) students and teachers are with realising certain CDF types, the longer the respective passages will be, which leads to more space for moves. Furthermore, students and teachers might try out more things (i.e. different moves) if they feel comfortable and/or confident, which will additionally lead to an increase in moves. Another explanation might be that certain CDF types are more popular due to the fact that their realisations are more open to interpretation and personal style than others (i.e. more moves are allowed), and that they do not have such strict sets of rules that need to be followed. In other words, a too structured CDF concept might keep students and teachers from using it.

The peculiarity of CLASSIFY that has been detected before raised the question for which CDF types the CLASSIFY-MOVE is used if not for its corresponding one. In order to investigate this issue for every CDF type, Figure 21 gives an overview on which CDF types the different kinds of moves are used for.

The three kinds of context moves will be left aside for now and focused on in a separate section. The CLASSIFY-MOVE mostly occurred in DESCRIBE passages. It was also occasionally used to realise DEFINE and REPORT passages as well as EXPLAIN and EXPLORE passages to a smaller degree. From Figure 21 is becomes evident very quickly that DESCRIBE is again the most dominant CDF type, as two kinds of moves (CL-M and DS-M) occur during descriptions most frequently and five other move types (DF-M, EA-M, EO-M, RE-M, DF-T-M) second most frequently. The EVALUATE-MOVE is the only one that is not used in order to perform descriptions. The distribution of CDF types for each individual move can be taken from Figure 21 and will not be analysed separately since this would go beyond the scope of this thesis. Again, the results can be taken as a basis for further research about the move structure of CDF types.

Figure 21 Distribution of CDF types across moves as percentages



4.5.2 Context moves

In this section it will be pointed out how the three context moves LANGUAGE-MOVE, META-LANGUAGE-MOVE and META-SUBJECT-MOVE occurred within the different CDF types. Table 32 gives the usual distribution of moves across the CDF types and additionally provides the percentages to which the context moves occurred within each CDF type. Relevant numbers were highlighted in the table.

The LANGUAGE-MOVE occurred 25 times during the six coded lessons. It was not realised within CLASSIFY, EVALUATE and two of the German CDF types. It occurred most frequently within DESCRIBE, which only makes up 6.8 per cent of all LANGUAGE-MOVEs due to the large number of descriptions within the data. Considering the percentages, the LANGUAGE-MOVE is most common within DEFINE-TRANSLATION, which can again be traced back to the linguistic nature of the CDF type. If DEFINE-TRANSLATION was combined with DEFINE, however, the LANGUAGE-MOVE would only occur in 6.8 per cent of all move occurrences, which is the same percentage as it shows for DESCRIBE. Therefore, the significance of the percentage of LANGUAGE-MOVEs within descriptions should not be underestimated. The relatively high percentage of LANGUAGE-MOVEs within the CDF type EXPLAIN-GERMAN (10%) cannot really be taken as a basis for any conclusions due to the small number of moves as well as of occurrences of the CDF type itself.

Table 32 Distribution of context moves over CDF types as total intervals and percentages of total intervals per CDF type

MOVE / CDF	CL-M	DF-M	DS-M	EA-M	EO-M	EV-M	RE-M	DF-T-M	LG-M	M-LG-M	M-SJ-M	TOTALS
CL	0	1	1	0	1	0	0	0	0	0	0	**3**
DF	5	25	2	5	3	1	3	1	3 (5.3)	7 (12.3)	**2 (3.5)**	**57**
DS	13	10	81	21	16	0	12	4	**12 (6.8)**	7 (4.0)	1 (0.6)	**177**
EA	1	5	21	32	7	0	7	2	2 (2.2)	**13 (14.1)**	2 (2.2)	**92**
EO	1	4	12	18	30	1	4	1	1 (1.3)	3 (3.9)	2 (2.6)	**77**
EV	0	0	0	0	0	1	0	0	0	0	0	**1**
RE	3	5	10	14	7	1	17	1	4 (6.5)	0	0	**62**
DF-T	0	5	0	3	0	1	0	5	**2 (12.5)**	0	0	**16**
DS-G	0	0	0	0	0	0	0	0	0	0	0	**0**
EA-G	0	0	2	4	0	0	0	0	1 (10.0)	**3 (30.0)**	0	**10**
RE-G	1	0	3	3	1	0	0	0	0	1 (11.1)	0	**9**
TOTALS	**24**	**55**	**132**	**100**	**65**	**5**	**43**	**14**	**25 (5.0)**	**34 (6.7)**	**7 (1.4)**	**504**

The META-LANGUAGE-MOVE occurred 34 times in the analysed data, which makes up 6.7 per cent of all moves that were realised. It only occurred within DEFINE, DESCRIBE, EXPLAIN, EXPLORE and two of the German CDF types. The META-LANGUAGE-MOVE did not only occur most frequently within EXPLAIN, but also shows its highest percentage within this CDF type. However, if the German CDF types are taken into account, EXPLAIN-GERMAN is again the one that shows the highest percentage (30%). The same holds true as for the LANGUAGE-MOVE: EXPLAIN-GERMAN does not occur frequently enough so as to make profound statements about whether META-LANGUAGE-MOVEs are characteristic for the German CDF type. Nonetheless, the fact that the context of META-LANGUAGE seems to occur in English as well as in German explanations to a relatively high degree, leads to the assumption that it is a general characteristic of the CDF concept – no matter which language it is performed in.

The META-SUBJECT-MOVE was rather underrepresented in the data with only seven occurrences in total. It was only realised within DEFINE, DESCRIBE, EXPLAIN and EXPLORE passages, whereas it shows its highest percentage in combination with DEFINE. The percentages, however, are so low that the META-SUBJECT-MOVE does not appear to be a characteristic of any of the CDF types.

A context move of particular interest is the META-LANGUAGE-MOVE. So far it has been pointed out that even though META-LANGUAGE was not realised in the data in terms of passages, it occurred in fact in terms of moves. The tables from above only showed within which CDF types references to META-LANGUAGE were made, but not which CDF types it was referred to. The mere fact that a META-LANGUAGE-MOVE was realised within a certain type does not mean that it was the type itself that was talked about. Table 33 shows which CDF types it was in fact referred to during the six lessons. A reference does not necessarily have to be the name of the CDF code (e.g. EXPLORE), but can also be a synonym or member of the CDF concept (e.g. ‘predict’ as part of EXPLORE).

Table 33 Distribution of META-LANGUAGE-MOVEs referring to CDF types as total intervals

REFERENCE	M-LG-M
CL	0
DF	9
DS	3
EA	18
EO	4
EV	0
RE	0
TOTALS	**34**

References were made to DEFINE, DESCRIBE, EXPLAIN and EXPLORE, with EXPLAIN being the CDF type most frequently mentioned. Those are exactly the four CDF types in which references occur (leaving aside the German types). This could mean that a META-LANGUAGE-MOVE within a CDF type usually refers to the CDF type itself. Nevertheless, the fact that the 34 references are not distributed across the four CDF types in the same way in both tables shows that this cannot be the case for every reference (compare Tables 32 and 33).

An important issue that needs to be considered in connection with META-LANGUAGE is that the realiser might not use it correctly. Table 33 is a representation of what students and teachers *think* they are doing in terms of CDFs, which does not necessarily coincide with what is actually being performed. In order to investigate whether the references were used correctly, a qualitative analysis has been conducted for the individual META-LANGUAGE-MOVEs (using the memos). Table 34 shows how many wrong references were made to each CDF type and which CDF type was meant in fact.

Table 34 Distribution of wrong references within META-LANGUAGE-MOVEs as total intervals and as percentages of total intervals per number of references to each CDF type

REFERENCE to	number of M-LG-Ms realising the reference	number of wrong references	actual CDF type
CL	0	0	
DF	9	0	
DS	3	1 (33.3) *A1*	DF
EA	18	2 (11.1) *A2, B2*	DF, DS/EO
EO	4	0	
EV	0	0	
RE	0	0	
TOTALS	**34**	**3 (8.8)**	

Out of the 34 references to CDF types that were realised by META-LANGUAGE-MOVEs, three referred to CDF types that were actually not meant or used in those situations. Interestingly enough, all three of them were realised by teachers. The fact that teacher realisation is by far more common than student realisation provides an explanation for this finding. Therefore, the results do not imply that students are more familiar with CDF concepts than teachers.

References to DEFINE and EXPLORE were always realised in the correct sense. One might expect that a CDF type with many references will also show wrong ones, but DEFINE proves that it depends on the CDF type and not on the number of references. Out of the 18 references to EXPLAIN, one should in fact have been to DEFINE, whereas the other one was trying to refer to an overlap of DESCRIBE and EXPLORE. One out of the three references to DESCRIBE was actually meant for a definition. In order to illustrate how references were realised and how they were identified as correct or incorrect, Extract 10 is provided in the following.

Extract 10 Example of wrong reference; Part of "Describe: Huygens's principle"

reference:	EXPLAIN
actual CDF type:	DESCRIBE/EXPLORE

01	S5:	reflection refraction diffraction scattering=	
02	T:	=scattering. <L1de> ja ok ahm kannst du mir sagen ich hab euch da gezeigt {yes okay can you tell me I showed you there} </L1de> I showed you when you have uh when you have a gap or like an opening and there's waves coming to the opening **what can you explain wha- what happens then**	M-LG-M (*reference to* EXPLAIN)
03	S5:	so uhm (.) it is a::h	
04	T:	wide gap? or what?	
05	S5:	{starts drawing on blackboard} uhm yeah it is a wide gap?	
06	T:	okay.	
07	S5:	uhm (2) **here** are all this is (1) it's a wave (1) this one? (.) and then here?	
08	T:	aha?	
09	S5:	it only **could** be near there?	
10	T:	mhm?	
11	S5:	and **then** from here. (3) it starts like (2) coming.=	
12	T:	=but WHEN do you get like a circle. {S5 stops drawing on blackboard}	
13	S5:	uhm when it's very=	
14	T:	=when it's very very THIN. the way YOU drew it? it **wouldn't** just go through straight.	

15 S5: yah.

16 T: yah? it **would** JUST go through straight. right. and always you have enough you have enough wavelets {mobile phone rings} to get a new straight wave front. <L1de> ausschalten bitte {turn it off please} </L1de> uhm if the gap is very NARROW? {S5 draws on blackboard} right. then?

17 S5: uhm and then you have

18 T: then you basically just get ONE like so to speak one of those

In the extract, the teacher asks the student during a revision to *explain* what he has shown them in the previous lesson. The student, however, is supposed to first describe the drawing on the blackboard and then a hypothetical process. The whole extract is a combination of a process description and an exploration.

In terms of META-LANGUAGE, DESCRIBE seems to be the most problematic CDF type: it was referred to when in fact another CDF type was meant, and it was not referred to when it should have been. It is the only CDF type where both of those kinds of wrong references took place. It is puzzling that the most common CDF type only shows three references, out of which one is used incorrectly. A discussion about this issue will follow in the next chapter.

5. Conclusion

5.1 Summary of main findings

The aim of this study was to gain an insight into the practical use of CDFs as introduced by Dalton-Puffer (2013). It particularly addressed the question how the construct is realised in the specific context of upper secondary CLIL Physics lessons in Austrian schools. Even though the study was limited to three classes in three different schools, the presented results show certain tendencies that might also hold true for other upper secondary CLIL Physics lessons, and can be used as initial reference points for further research.

First of all, the question whether Dalton-Puffer's (2013) construct is applicable to the specific context of this study needs to be answered. As there were no complications during the coding process nor while analysing the results, the general answer is 'yes'. A distribution of the suggested CDF types was detected across all six lessons and common patterns could be identified. If the construct is directly applied to classroom practice, the results will provide an instructive overview of the realisation of CDFs. If more detailed information on their verbalisations is asked for, an additional analysis of the move structure as suggested in this study can be conducted.

In the analysed data, CDFs were a present feature of the classroom talk and were realised on a regular basis throughout all six lessons. There was an average of 16 CDF occurrences per lesson, which results in approximately one CDF realisation every three minutes. All CDF types as introduced by Dalton-Puffer (2013) were found in the data, whereas their distribution varies according to the teachers and the lessons themselves. In general, there is a strong tendency towards descriptions with more than a quarter of all CDF passages being coded DESCRIBE. Except for CLASSIFY and EVALUATE, which hardly show any occurrences, all the other CDF types as introduced by Dalton-Puffer (2013) occurred quite regularly in the data.

The majority of CDF passages (59%) were realised by the teacher(s) and the students collectively. A third of them were performed by the teacher(s), and only six per cent were contributions of one or more students. The lack of student performance becomes even more apparent when one considers that CDF passages were only realised by students in half of the analysed lessons. Furthermore, a third of all passages realised by the students and the teacher(s) collectively show a lack of student participation.

One of the questions that the study tried to answer was whether there is a connection between certain CDF types and the different kinds of realisers. Even though there was no such correlation found, general tendencies could be detected. First of all, all seven CDF types approach the general distribution of realisers (from most to least frequent: TS, T, S). Further research would be needed in order to investigate whether this approximation becomes in fact clearer for a more extensive set of data. Second of all, all three types of realisers performed descriptions most frequently and explanations second most frequently. This shows that the different realisers do not prefer any CDF types that are generally unpopular. Nevertheless, teachers show the strongest tendency to realise CDF types that are not common in general.

The great majority of CDF passages that were found in the data was realised in a SUBJECT context (78%). Realisations in connection with a META-SUBJECT context are limited to 18 per cent, and only four per cent of all CDF passages occurred in a LANGUAGE context. There was not a single CDF passage realised in a META-LANGUAGE context. The distribution of contexts varies across the lesson pairs taught by the three different teachers. Lesson pair A1/A2 follows the general distribution pattern, whereas lessons B1 and B2 show an especially strong SUBJECT dominance and completely lack LANGUAGE contexts. Lessons taught by teacher E, on the other hand, show a balance between SUBJECT and META-SUBJECT contexts.

The SUBJECT context was so particularly common in the data that no special connection between certain CDF types and other contexts could be detected. The fact that translations and the LANGUAGE context only occurred with each other can be directly explained with the concept of translations per se. Much like this finding, the discovery that definitions exclusively occurred in a SUBJECT context has been expected.

All seven CDF types as introduced by Dalton-Puffer (2013) occurred in terms of moves on a regular basis. The most common CDF types were also the most frequently occurring ones in terms of moves (i.e. DESCRIBE-MOVE and EXPLAIN-MOVE). The same holds true for the least common CDF types, as the CLASSIFY-MOVE and the EVALUATE-MOVE were the least frequently occurring move types. In the previous chapter it has been claimed that the CDF types vary in the complexity of their move structure, i.e. different CDF types show different numbers of moves and move types that are used to realise them. In addition, it has been suggested that the more common a CDF type is, the more moves it has per occurrence. In the present study this holds true for the two end points of the scale, i.e. the most and least common CDF types. Further research with a more extensive data set is necessary in order to investigate this hypothesis. At last, a result that has been expected in connection with move structures was that move types are very likely to occur within their corresponding CDF types.

Another question the study tried to answer was whether communication about language took place in the analysed lessons. As it has already been pointed out, there were only a few passages that were realised in a LANGUAGE context, which were all translations. Individual LANGUAGE-MOVEs are thus the more common way in which language was directly addressed. In total, there were 25 occurrences of the LANGUAGE-MOVE, with DESCRIBE being the CDF type they were realised in most frequently. The CDF type with the highest percentage of LANGUAGE-MOVEs is DEFINE-TRANSLATION. Generally speaking, there was communication about language during the analysed lessons. However, this communication was limited to a small number of individual moves, which restricted explicit talk about language to short comments and made an actual conversation about linguistic issues impossible.

A final question that needs to be answered is whether there was a meta-level found in the present data. As there was not a single CDF passage realised in the META-LANGUAGE context, META-LANGUAGE-MOVEs were the only way in which a meta-level was present in the analysed lessons. In total, only 6.7 per cent of all moves explicitly mentioned CDFs, with EXPLAIN being the CDF type referred to most frequently. CLASSIFY, EVALUATE and REPORT were not mentioned at all. Out of the 34 META-LANGUAGE-MOVEs, only three referred to CDF types that were actually not meant or used in the current situations. A quite striking result was that the concept of DESCRIBE – the most common CDF type – seems to be misunderstood as it was amongst the CDFs that were referred to in the wrong sense. Furthermore, a CDF type that is as common as DESCRIBE would be expected to be mentioned explicitly more often than it is in the data (i.e. three times in total).

5.2 Possible explanations, further questions and suggestions

This section will try to give possible reasons for the results of the study. Moreover, further questions will arise in connection with the potential explanations, which will lead to suggestions for further related research.

5.2.1 CDF types

The results of the study show that the distribution of CDF types varies according to the teacher(s) and the lessons. In chapter 4 hypotheses have been made about the influencing factors of the four most common CDF types. It has been suggested that DESCRIBE and EXPLAIN were used to different extents depending on the nature of the lesson. Lesson pairs A1/A2 and B1/B2 demonstrate how descriptions are more common in the first lesson of each pair, whilst explanations occurred more frequently in the second lesson. As it has been presented in the study design (chapter 3, Table 13), lessons A1 and B1 dealt with theoretical concepts, whereas lessons A2 and B2 focussed on their applications. Therefore, it is reasonable to assume that descriptions are frequently used in order to talk about theories (e.g. slides/pictures in the book representing a theoretical concept), while explanations are especially common when practical aspects are discussed (especially cause/effect pairs during experiments, which are followed by reasoning).

I would like to suggest three possible explanations why DESCRIBE and its corresponding move are so dominant in the data, which are not mutually exclusive:

1. DESCRIBE and DESCRIBE-MOVE are easy to realise. Teachers and students have understood the concept of the CDF type and thus feel comfortable using it.

2. Descriptions are a common feature of Physics lessons. This might also hold true for other subjects or classroom talk in general.

3. The concept of DESCRIBE covers many related operations and therefore more realisations are found that can be labelled 'DESCRIBE' (process descriptions, physical descriptions, functional descriptions, etc.).

The third hypothesis should not be seen as a problem for the coding process or as a manipulation of results, but rather supports Dalton-Puffer's (2013: 235) idea that the different CDF categories or not equally extensive. For a more detailed analysis of DESCRIBE subcategories such as 'process description' and 'physical description' could be used.

REPORT was said to be dependent on the teacher(s) since its distribution across both lessons of each lesson pair is consistent. The large number of reports in lessons A1 and A2 could be traced back to the fact that they were taught by a teacher and a language assistant at the same time. It is possible that the presence of two 'teachers' leads to a more communicative setting and thus provides more opportunities for 'story telling' (which seems to be an important factor of reports as META-SUBJECT occurrences are frequently found in connection with REPORT). The more likely teachers and students are to tell anecdotes (e.g. stories about discoveries, applications in the past, documentaries they have seen), the more likely REPORT passages are to occur. In addition, there is not just one teacher interacting with the students, but there are two 'teachers' who also exchange ideas with each other. One teacher might tell a story that triggers a memory of the other one, which is then retold as well. In this study, reports seem to be characteristic of team teaching lessons.

The final hypothesis was that the occurrence of DEFINE is dependent on the teacher(s) as well as on the lesson. Lesson pair B1/B2 shows a relatively large number of definitions compared to the other lesson pairs. Since lessons B1 and B2 are the only ones that are taught by a German speaker and teacher performance is very dominant in this lesson pair, it raises the question whether German speakers rather stick to clearly structured CDFs than native speakers of English or team teaching pairs. Research on the different teacher categories and their qualifications is necessary in order to answer this question. As lesson B1 shows an especially large number of definitions, the lesson itself also seems to be an influencing factor of the distribution of DEFINE. Again, the fact that lesson B1 focuses on a theoretical concept is a very likely explanation for this result. The topic of the lesson does not only require definitions of central concepts (i.e. four types of wave phenomena, such as reflection), but also of additional terms (e.g. dispersion, wave front).

There were no hypotheses made about the remaining CDF types since they were not realised frequently enough in order to reveal potential influencing factors. Nevertheless, they will be briefly commented on in the following.

The context of META-SUBJECT occurred quite frequently in combination with EXPLORE. This is due to the fact that hypotheses, estimations, assumptions and speculations were made about subject-related matters that were then used as examples for subject matters (e.g. measurements of ordinary things were estimated and then used to calculate examples of energy changes).

Evaluations showed an even stronger correlation with the META-SUBJECT context. However, EVALUATE only occurred once in total, which cannot be used as a basis for further interpretations. What it shows, however, is that critical thinking was not very present in the analysed lessons. The fact that the present data was collected from Physics lessons is a highly probable explanation for this result. In Physics, it is rather difficult to argue or express one's opinion about a subject matter, and since the context of SUBJECT was extremely dominant, no space for evaluations was created. Subjects like History, for instance, provide more opportunities in which evaluations can be realised. Nevertheless, one might have expected more combinations of EVALUATE and META-SUBJECT, which could have taken place during experiments, for instance (e.g. judging which devices work best, evaluating the resulting diagram). In conclusion, I believe that encouraging students to formulate evaluations is a viable starting point to teach critical thinking in every subject and thus EVALUATE is far to underrepresented in the present data.

The last CDF type that needs to be mentioned is CLASSIFY. The few instances in which it occurred were either in connection with SUBJECT or META-SUBJECT. This shows that the Physics classroom does not only provide opportunities to formulate classifications in relation to the subject itself, but also in relation to META-SUBJECT issues, such as diagrams or instruments. Even though classifications did not occur as frequently as one might expect from Physics lessons, the regular occurrence of definitions adds some sort of classification to the lessons.

5.2.2 Analysis of lesson pairs

For the following part, the general distribution of CDF occurrences is considered leaving aside the different CDF types. If the distribution across the three lessons pairs A1/A2, B1/B2 and E1/E2 is looked at in more detail, the following question arises: Do teachers who are native speakers of English not make as much use of and/or provide as many opportunities for CDFs as German speaking teachers or team teaching pairs? It would be interesting to use the results of this study as a basis for further research in order to investigate whether the 'natural' talk of teachers who are native speakers of English prevent the realisation of CDFs in the classroom.

The distribution of realisers for each lesson pair also suggests the attribution of certain characteristics to the different teachers or teaching teams. Lessons taught by teacher A approximately follow the general distribution of realisers, whereas lessons by teacher D entirely lack student realisation. Lesson pair E1/E2 shows a relatively, in the broad sense of the term, ‘even’ distribution of realisers in comparison to the other two lesson pairs. The following three statements shall now be considered:

1. teacher A (teacher: German speaker; language assistant: native speaker) shows student realisations in one of the two lessons
2. teacher D (teacher: German speaker) shows no student realisation at all
3. teacher E (teacher: native speaker) shows the same number of student and teacher realisations

A comparison of those statements leads to the assumption that lessons that are taught by native speakers of English show more student realisations than lessons taught by German speakers. Furthermore, the results showed that lessons by teacher E have the smallest percentage of limited student participation in TS passages. A reason could be a more natural and hence interactive atmosphere that is created more easily due to the fact that the teachers do not have to concentrate on the language itself. Nevertheless, the results could also be dependent on the personal teaching styles of the different teachers, which are not necessarily influenced by their mother tongues. A larger variety of teachers and teacher ‘types’ would need to be investigated in order to validate or refute the hypothesis above.

The distribution of contexts across the three lesson pairs provides much information for interpretations as well. Lesson pair A1/A2 follows the general distribution of context, just like it does for the distribution of realiser as pointed out before. The lessons mostly show SUBJECT contexts, but have the highest percentage of LANGUAGE contexts if they are combined. A possible explanation is the fact that the lessons in question are taught by a German speaker and a native speaker of English. It is reasonable to assume that the high percentage of LANGUAGE contexts is a result of conscious language teaching in those lessons. The presence of two ‘teachers’ with different mother tongues provides an opportunity to turn languages themselves into a topic. During lessons A1 and A2 it happened several times that the language assistant corrected the teacher’s phrasing or that they talked about language issues simply because they both have different levels of proficiency. I consider such a linguistically diverse classroom as an ideal environment for CLIL teaching, since situations in which the language is in focus automatically arise even if the context is addressed most of the times (as the results show).

The lessons taught by teacher D are a very extreme case of context distribution as all but one CDF passages were realised in a SUBJECT context. Furthermore, the corresponding lesson pair B1/B2 is the only one that does not show any LANGUAGE context occurrences at all. These findings support the hypothesis that native speakers add a linguistic element to the CLIL classroom. In this regard, it is crucial to remember that in Austria teachers are not required to receive appropriate training in both the language and the subject in order for them to teach CLIL lessons. It is therefore quite reasonable to assume that a potential lack of language skills on the side of German speaking subject teachers results in a subject focus. I strongly believe that appropriate CLIL training and a compulsory CLIL qualification for teachers would lead to a focus shift towards a more dual-focused approach.

The lesson pair taught by teacher E has a stronger tendency towards META-SUBJECT contexts than the other two pairs. As it has been pointed out in the previous chapter, this is due to the fact that the teacher referred to examples from everyday life quite frequently. If it is, again, assumed that this depends on the teacher's mother tongue and not on her personal teaching style, this would mean that native speakers tend to put subject matters into a more natural setting. As it has already been suggested before, this might be the case because they do not have to concentrate on their language use and can therefore focus on the teaching itself. However, the small number of LANGUAGE context again shows the lack of CLIL training for teachers and proves that the simple act of putting a native speaker into a CLIL setting does not guarantee a dual-focused approach.

If the distributions of realisers and the distributions of contexts of all teachers are compared, a general pattern becomes visible. The lesson pair taught by teacher A follows the general distribution in both cases (i.e. realisers and contexts), which makes them more or less 'average'. The lesson pair B1/B2 shows the most limited variety of categories in realiser as well as in context distribution, and the lesson pair that was taught by teacher E is closest to an even distribution of categories in both cases. What is also worth considering is that the more teacher realisation was present in a lesson, the more passages were realised in a SUBJECT context. Thus, I suggest that the two variables – context and realiser – are likely to influence each other and thus teachers should try to change at least one of them if they feel the need to improve their CLIL practice. For instance, referring to examples of everyday life (i.e. META-SUBJECT) could encourage students to talk about their own experiences, retell an article they have read, or summarise a documentary they have seen. This would be an example of how the context can influence the realiser. It can also work the other way, that is to say that the realiser can influence the context. If there is a high level of student performance, for instance, language issues are likely to occur (e.g. grammatical errors, vocabulary problems, misunderstandings, mispronunciation), which will ideally lead to communication about language itself. If the teacher sees those language issues as an opportunity, they can even initiate communication about META-LANGUAGE.

5.2.3 Meta-talk

As the results have shown, the lack of META-LANGUAGE occurrences in the data does not mean that this kind of context is ignored entirely as META-LANGUAGE-MOVEs are used to address meta-talk explicitly. Nevertheless, the lack of a more detailed communication about META-LANGUAGE leads to a form of teaching that is not transparent in terms of CDFs. Consequently, the students do not learn to verbalise the different concepts, which leads to a lack of student realisation. In addition, there were instances in which teachers themselves did not even know which CDF type they were using, which leads to further confusion and a wrong understanding of concepts on the part of the students. It seems that obvious definitions – usually of nouns that directly refer to the topic of the lesson (e.g. reflection) – were identified as such and referred to correctly. This is probably due to the fact that those definitions were given in the book or by the teacher and could thus be learnt by heart. On the other hand, if definitions were used in a more complex, rather 'hidden' or 'imbedded' way, they were sometimes mistakes for other CDF types such as DESCRIBE or EXPLAIN.

The word 'explain' was expected to be used in a rather colloquial way, which would have resulted in many wrong references to the CDF type EXPLAIN. Nevertheless, this only took place twice in the data, which shows that the word is not used as loosely as one might expect.

Fortunately, the results have shown that wrong usages of CDF names do not occur very frequently. This might, however, be due to the fact that references did not occur on a regular basis. In general, I believe that already single META-LANGUAGE-MOVEs as they occurred in the present data can help students understand the basic concepts of CDFs. Nonetheless, CLIL is considered a dual-based approach and hence should leave enough space for more extensive meta-talk passages and a more detailed communication about the language itself.

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Appendix A

Abstract

The frequency of *Content and Language Integrated Learning* (CLIL) programme implementation has been increasing over the past decade. Even though the approach is supposed to focus on the development of proficiency in the language as well as in the non-language subject to the same extent, teachers tend to attach more importance to one of the two fields – depending on whether they are subject or language teachers (Eurydice 2006; Dalton-Puffer 2013). Dalton-Puffer (2013: 216) proposes that this problem could be solved by establishing "a zone of convergence between content and language pedagogies" and argues that cognitive discourse functions (CDFs) are constituents of such a zone as they are verbalisations of cognitive processes used to communicate content knowledge. In her article 'A construct of cognitive discourse functions for conceptualising content-language integration in CLIL and multilingual education', Dalton-Puffer (2013) introduces a construct of such CDFs and points out that empirical research is necessary in order to support the claims that she makes in the text. This thesis investigates the application of CDFs in the specific context of upper secondary CLIL Physics lessons in Austria by analysing six lessons in terms of CDF types (i.e. CLASSIFY, DEFINE, DESCRIBE, EVALUATE, EXPLAIN, EXPLORE, REPORT), the people who perform them (i.e. STUDENT, TEACHER, TEACHER/STUDENT), and the context in which they occur (i.e. LANGUAGE, SUBJECT, META-LANGUAGE, META-SUBJECT). The coding scheme according to which the data has been analysed was based on Dalton-Puffer's (2013) construct of CDFs and additional ESP literature. The results showed that even though all CDF types occurred in the data, there was an uneven distribution with a strong tendency towards descriptions and an underrepresentation of CLASSIFY and EVALUATE. The majority of CDF occurrences was performed by the teachers and most of them were realised in a SUBJECT context. Since CLIL is considered a dual-focused approach it is argued that the explicit communication about language should play a bigger role in CLIL classroom talk – no matter which subject is being taught. Furthermore, student participation needs to be encouraged in order for them to learn how to verbalise the different cognitive processes. As a first step, CLIL teachers need to find a balance between content and language teaching and become aware of the existence and importance of CDFs. Consequently, they can consciously include them in their lessons and teach their students the concepts of the different CDF types.

Zusammenfassung

Innerhalb der letzten zehn Jahre wurde *Content and Language Integrated Learning* (CLIL) immer häufiger an Schulen praktiziert. Obwohl mit dieser Methode Sprachkenntnisse und fachliche Inhalte im gleichen Ausmaß angestrebt werden sollen, neigen Lehrer/innen dazu sich mehr auf eines der beiden Felder zu konzentrieren, was hauptsächlich davon abhängt ob sie selbst ausgebildete Sprach- oder Sachfachlehrer/innen sind (Eurydice 2006; Dalton-Puffer 2013). Dalton-Puffer (2013) meint, dass dieses Problem durch das Eruieren eines Überschneidungsbereiches beider fachdidaktischen Ansätze gelöst werden könnte und stellt kognitive Diskursfunktionen (*cognitive discourse functions, CDFs*) als Komponenten dieses Bereiches vor, die sie als Verbalisierung kognitiver Prozesse bezeichnet, mit deren Hilfe über Sachinhalte kommuniziert werden kann. In ihrem Artikel 'A construct of cognitive discourse functions for conceptualising content-language integration in CLIL and multilingual education' schlägt Dalton-Puffer (2013) ein Modell solcher CDFs vor und weist darauf hin, dass empirische Forschungen nötig sind um ihre Thesen zu unterstützen. In dieser Diplomarbeit wird die Anwendung der CDFs in einem sehr spezifischen Kontext untersucht: CLIL-Physikstunden der Oberstufe in Österreich. Im Zuge dessen wurden sechs Unterrichtsstunden analysiert, wobei drei Faktoren betrachtet wurden: die verschiedenen CDF Arten (CLASSIFY, DEFINE, DESCRIBE, EVALUATE, EXPLAIN, EXPLORE, REPORT), die Personen, die sie ausführten (Schüler/innen, Lehrer/innen, Schüler/innen und Lehrer/innen) und der Kontext in dem sie auftraten (LANGUAGE, SUBJECT, META-LANGUAGE, META-SUBJECT). Das Kodierungssystem, nach dem die Daten analysiert wurden, beruht sowohl auf Dalton-Puffers (2013) CDF Modell als auch auf zusätzlicher ESP Literatur. Die Ergebnisse zeigten, dass alle CDF Arten präsent waren, jedoch eine ungleiche Verteilung dieser stattfand. Eine starke Tendenz zu Beschreibungen (DESCRIBE) konnte entdeckt werden, während Klassifizierungen und Evaluationen kaum vorkamen. Der Großteil der CDFs wurde von den Lehrpersonen verbalisiert und die meisten kamen im sachfachlichen Kontext vor. Da CLIL durch einen Doppelfokus auf Sprache und Sachfachinhalt geprägt sein soll, ist es nötig, der expliziten Kommunikation über Sprache mehr Aufmerksamkeit zu schenken – unabhängig von dem Fach in dem unterrichtet wird. Außerdem soll die Beteiligung der Schüler/innen gefördert werden, damit diese lernen die verschiedenen kognitiven Prozesse zu verbalisieren. Zuerst müssen CLIL-Lehrer/innen ein Gleichgewicht zwischen Sprache und Sachinhalten finden und sich der Existenz und Wichtigkeit der CDFs bewusst werden. Erst dann können sie sie

bewusst in ihren Unterricht einbauen und den Schüler/innen die verschiedenen Konzepte hinter den CDF Arten nahebringen.

Appendix B

Curriculum Vitae

Angaben zur Person

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