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Brauns, Sarah; Abels, Simone

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THE FRAMEWORK FOR INCLUSIVE SCIENCE EDUCATION

KATEGORIENSYSTEM INKLUSIVER NATURWISSENSCHAFTLICHER UNTERRICHT (KinU)

Sarah Brauns, Simone Abels

Authors

Sarah Brauns, M.Ed.
Science Education I Institute of Sustainable and Environmental Chemistry (ISEC)
Leuphana University Lüneburg
Universitätsallee 1, 21335 Lüneburg
Sarah.brauns@leuphana.de

Prof. Dr. Simone Abels
Science Education I Institute of Sustainable and Environmental Chemistry (ISEC)
Leuphana University Lüneburg
Universitätsallee 1, 21335 Lüneburg
Simone.abels@leuphana.de

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Prof. Dr. Simone Abels
Science Education
Leuphana University Lüneburg
Universitätsallee 1
21335 Lüneburg, Germany

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THE FRAMEWORK FOR INCLUSIVE SCIENCE EDUCATION

Sarah Brauns, Simone Abels

The intention of this working paper is to provide the theoretical and methodical background of the Framework for Inclusive Science Education[1]. While other publications of the authors only present selected parts of the framework, readers will find a quotable complete version of the framework in this working paper. Thereby the framework and its design are made comprehensible and transparent. Practitioners and researchers may use the framework or parts of it for their projects, but only with appropriate citation. To cite the current version of the framework: Brauns, S., & Abels, S. (2020). The Framework for Inclusive Science Education. *Inclusive Science Education, Working Paper No. 1/2020*, Leuphana University Lüneburg, Science Education. The year and version number have to be updated eventually.

ABSTRACT

In this working paper we introduce the Framework for Inclusive Science Education. For the data collection, we applied a systematic literature review. In the process, n=297 titles were generated, which empirically or theoretically address the issue of inclusive science education. The sample was analysed both qualitatively and quantitatively. In a qualitative analysis, categories that combine characteristics of science education with an inclusive implementation were inductively derived. In total, n=935 categories on different abstraction levels were derived, which represent the framework. N=16 main categories were identified, which display the characteristics of science education to be combined with inclusive pedagogies. For the quantitative analysis of the sample and the framework, descriptive statistics were performed and differences between sub-samples analysed. Over the last ten years, a significant increase in publications has been observed. Moreover, there is a minor representation in titles relating to pre- and in-service teachers working in inclusive science education. Overall, in this paper we present not only the framework itself, but also give recommendations for the application of the framework.

[1] The Framework for Inclusive Science Education is available on the pages 48-75, appendix E, and the German version on the pages 76-106, appendix F.

1. INTRODUCTION

Inclusive science education describes the connection between science education and inclusive pedagogy. One approach to present this connection is to clarify what we mean by science education and what understanding of inclusion we follow. The overarching aim of science education is to achieve “Scientific Literacy for all learners” (Bybee, 1997, p. 69). Scientific Literacy, as it is defined by the OECD (2019), is divided into three areas: content knowledge, procedural knowledge and epistemic knowledge. Firstly, content knowledge is subsumed as “explaining phenomena scientifically” and is described as “knowledge of the facts, concepts, ideas and theories about the natural world that science has established” (OECD, 2019, p. 99f). Secondly, the procedural knowledge is summarised as “evaluating and designing scientific enquiry” and is described as “concepts on which empirical enquiry is based, such as repeating measurements to minimise error and reduce uncertainty, the control of variables, and standard procedures for representing and communicating data” and “concepts of evidence” (OECD, 2019, p. 99f). Thirdly, epistemic knowledge is subsumed as “interpreting data and evidence scientifically” and is described as the “understanding of the role of specific constructs and defining features essential to the process of building scientific knowledge [...] [and the] understanding of the function that questions, observations, theories, hypotheses, models and arguments play in science; a recognition of the variety of forms of scientific enquiry; and understanding the role that peer review plays in establishing knowledge that can be trusted” (OECD, 2019, p. 99f). To take all learners into account, we follow a wide concept of inclusion that manifests the participation of all students in education independent of their diversity characteristics in abilities, age, ethnicity, gender, sexual orientation, religion and other (UNESCO, 2005; Werning, 2014). In practical implementation, however, a narrow concept of inclusion is often pursued, i.e., that mostly differentiation measures are designed for students with additional educational needs or migration background instead of providing learning opportunities which, due to their open design and self-determination, enable participation for all students without prior categorisation in the sense of stigmatisation (Florian & Black-Hawkins, 2011). The narrow understanding of inclusion is also reflected when only diversity dimensions of difference such as achievement potential or disability are used as labels (e.g., Scruggs, Mastropieri, & Okolo, 2008; Therrien, Taylor, Watt, & Kaldenberg, 2014). Particularly critical are publications that state a wide understanding of inclusion, but do not redeem this understanding in terms of empirical and/or practical application. Furthermore, there can be a third understanding necessary concerning all learners, but especially concerning vulnerable groups (Lindmeier & Lütje-Klose, 2015). Thereby the focus is widened on marginalised learners, not only students with disabilities, but on all vulnerable groups who run the risk of being discriminated (ibid.) following the idea of “Education for all, and especially for some“ (UNESCO, 2005).

“Up to now, a scheme which systematizes and combines aspects of inclusive pedagogy and science education is still missing” (Stinken-Rösner et al., 2020, p. 30). With this introductory statement, Stinken-Rösner et al. (2020) draw attention to the fact that although discussions about the implementation of inclusion in schools have increased in recent years, the combination of inclusive teaching in subject matter education disciplines is still not fully established. Therefore, they developed a theoretical scheme for linking the perspective of inclusive pedagogy (acknowledging diversity, minimizing barriers and enabling participation, cf. Booth & Ainscow, 2016; UNESCO, 2005) and the perspective of science education (reasoning about scientific issues, learning science content, doing science, learning about science; cf. Hodson, 2014). This theoretical scheme shows possible connections between the demands of inclusion and science education. In this way, the scheme is intended to advance the basis of future research and lesson planning with the two perspectives thought together.

The approach of combining science education with inclusive pedagogy is also evident in the definition of inclusive science education by the members of the Network of Inclusive Science Education (German: Netzwerk inklusiver naturwissenschaftlicher Unterricht (NinU)):

> “Science education fosters inclusion by facilitating participation in science specific learning processes for all learners. By appreciating the diversity and individual prerequisites, science education involves individual and joint teaching and learning processes to promote scientific literacy” (Walkowiak, Rott, Abels & Nehring, 2018, p. 269).

On the one hand, this definition implies that inclusive approaches are compatible with science education. On the other hand, science educators would argue that on this general level the relation between inclusion and science education is not concrete enough. The understanding of science specific learning processes and the concretisation on how these connect to inclusive pedagogy are not explicit. Therefore, what is required are indications for action, specifying how science education can be implemented in an inclusive way. For this reason, we conducted a systematic literature review in order to establish a framework that can provide evidence how to implement inclusive science education. It is called the Framework for Inclusive Science Education (German: Kategoriensystem inklusiver naturwissenschaftlicher Unterricht (KinU)).

This framework provides the basis for our research in the Nawi-In project (Teaching Science Education inclusively (German: Naturwissenschaftlichen Unterricht inklusiv gestalten (Nawi-In)), which is funded by the German Ministry of Education and Research (no. 01NV1731). In this project, we investigate the development of student teachers competency profiles with regard to inclusive science education. More precisely, we evaluate student teachers' competency development in the first two of three semesters during a Master's program, which includes a research-oriented seminar. They gain theoretical foundations for inclusive science education and practice their noticing and reasoning skills through the analysis of science lesson video clips in the first of the three semesters (Sherin, 2007; Seidel, Stürmer & Schäfer, 2013; Stürmer, Seidel & Schäfer, 2013). Afterwards in the second semester the student teachers complete an school internship and conduct their own science lessons, which they also videotape and reflect. During the third semester, they analyse their own videos and present their results. The competency profiles of the student teachers are established by combining questionnaires on self-esteemed knowledge, attitudes and self-efficacy, the use of video reflections from other teachers' lessons, video analyses of classroom activities and video reflections of their own lessons (see outlook) (Brauns, Egger & Abels, accepted; Egger, Brauns, Sellin, Barth & Abels, 2019).

The concept of competency represents a complex construct, which can be related to larger factors and is conditioned by various influences such as bias, self-efficacy and motivation. For this reason, this study investigates the professional competency in the classroom and analysis competency on practice in the context of inclusive science education. In a very brief summary, competency is „the personal capacity to cope with specific situational demands" (Kunter et al., 2013, p. 27). In our project, we focus on two areas of competency: Professional Vision (e.g. Sherin, 2007) and Professional Knowledge (e.g. Baumert & Kunter, 2006; Baumert & Kunter, 2011). Professional Vision describes a component of teaching expertise and can serve as an indicator for conceptual knowledge (Stürmer et al., 2013). For this purpose, teaching videos are often used for reflection (ibid.). Overall, Professional Vision is divided into two areas: Noticing and Knowledge-Based Reasoning (Seidel et al., 2011). The first evaluates what the student teachers see and observe, i.e., notice in teaching videos and the second evaluates how they interpret what they have noticed before (ibid.). With the help of the framework, it is among other possible to analyse the student teachers' noticing abilities when reflecting on teaching videos. More specifically, inclusive scientific characteristics, which are noticed by the becoming teachers in their own and other teachers' lessons, can be analysed. In addition, the framework will be applied to the videotaped teaching of the student teachers in order to analyse the teaching activities in school practice. Regarding professional knowledge, the framework can be used to enrich the idea of pedagogical content knowledge with inclusive science characteristics which can be applied in practice.

On this basis, we set up the Framework for Inclusive Science Education that has shown to be very extensive. On the one hand, the methodological approach has been carried out comprehensively and, on the other hand, the framework itself is very large with a total of 935 categories[2]. The framework increases in quality by presenting the methodical procedure of literature search and selection in detail. This working paper is intended to provide a guide that leads through the structure of the entire framework and gives references on its application in practice and research. The advantage of the working paper is the possibility for continuous update of the framework and a full picture of the status quo.

2. METHODICAL APPROACH

> "A research literature review is a systematic, explicit, and reproducible method for identifying, evaluating, and synthesizing the existing body of completed and recorded work produced by researchers, scholars, and practitioners" (Fink, 2009, p. 3).

With this definition, Fink (2009) summarises the characteristics of the systematic procedure of a literature review as a method for data collection. Following a strict methodical procedure in a systematic literature review and discussing the selection of literature are meant to lead to reduce the bias of the researcher (Feak & Swales, 2009). Moreover, the procedure is made transparent for other researchers. The procedure of Fink (2009), which is followed by this systematic literature review, contains seven steps:

1. Selecting a research question
2. Selecting bibliographic or article databases
3. Choosing search terms
4. Applying practical screening criteria
5. Applying methodological screening criteria
6. Doing the review
7. Synthesising the results

The first step, selecting the research question, is particularly important in order to set a research focus for the review. Our systematic literature review focuses on the identification of characteristics of science education that are implemented inclusively in the classroom.

[2] For the use of certain terms a glossary is available on page 38.

For the data evaluation, categories are constructed inductively from the sample of the systematic literature review with the qualitative content analysis via focused summary according to Kuckartz (2016). The MAXQDA (version 20.0.7) software is used for technical support. The goal is to design a framework that structures the whole sample into categories of inclusive science education.

2.1 RESEARCH QUESTION

With the systematic literature review we answered the following question: What are the characteristics of inclusive science education. In order to show the connection between science education and inclusive pedagogy, we structure examples of inclusive science teaching following the characteristics of science education. The answer to the research question will be fundamental for the evaluation of the subquestion, which characteristics of inclusive science education student teachers reflect on and show in teaching. To answer this subquestion the framework will be applied to the data as analysis tool.

2.2 DATA COLLECTION

In order to make the data search procedure comprehensible, it is presented here in detail (Fig. 1). The structure results from the fact that the search has been repeatedly revised. After the first search (left strand in Fig. 1), it became apparent that important publications by authors from the field of inclusive science education were not present in the sample, therefore the search terms were refined (middle strand). The third search was carried out at the beginning of 2020 in order to keep the literature as up-to-date as possible.

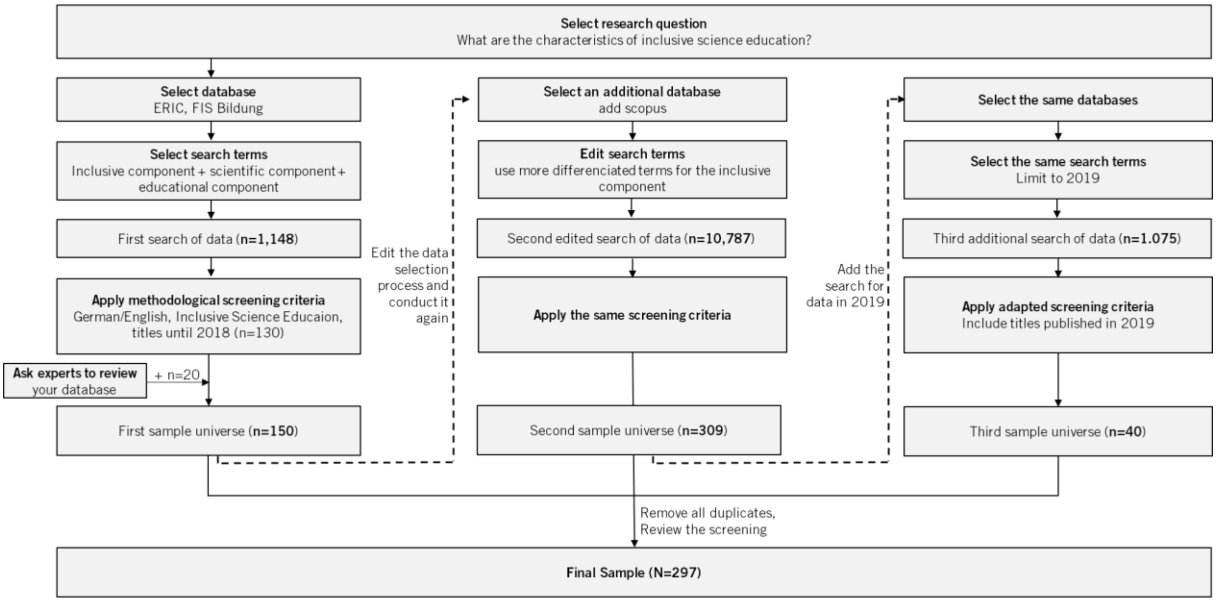

Figure 1. Search strategy

The data collection relates to the research question what the characteristics of inclusive science education are. The databases "ERIC" and the German equivalent "FIS Bildung" were used in the first search. Both databases contain specific literature from the pedagogical field. In the second search, the database "Scopus" was added to further increase the search radius and to include respective authors of the field. All three databases were used in the second and third search.

In the next step, the search terms were selected (Tab. 1). The search terms always consisted of an inclusive, a scientific AND an educational component. Initially, in the first search only the term "inclus*" was used as the inclusive component, consequently, a substantial part of the inclusive scientific literature was not listed as those often operate with terms like heterogeneity or integration. The term "exclusion" was added to list the opposite and to lead to literature in an inclusive context. The search terms should be chosen carefully, because they essentially determine whether titles are listed in the literature search or not. In this case, it can be reflected that despite the revision of the search terms, words like diversity or equity are still missing, which could especially increase the international hits. The reason why, despite these missing search terms, some titles with the word "diversity" (e.g., Markic & Abels, 2014; Watt, Therrien & Kaldenberg, 2014; Nawarathne, 2019) appeared in the sample is probably, because keywords were specified for these titles, which were taken into account in the data search. The science and educational components were slightly adapted in the second and third search (Tab. 1).

Table 1. Search terms for the first, second and third search of data

Language	Inclusive Component	Scientific Component	Educational Component
English	Inclus*[1, 2, 3] Heterogen*[2, 3] Integrat*[2, 3] Exclus*[2, 3]	Science[1, 2, 3] Natural science[1] Early science education[1] Chemistry[1, 2, 3] Biology[1, 2, 3] Physics[1, 2, 3]	Learning[1, 2, 3] Class[1, 2, 3] School[1, 2, 3] Primary[1, 2, 3] Secondary [1, 2, 3]
German	Inklus*[1, 2, 3] Heterogen*[2, 3] Integrat*[2, 3] Exklus*[2, 3]	Naturw*[1, 2, 3] Sachunterricht[1, 2, 3] Chemie[1, 2, 3] Biologie[1, 2, 3] Physik[1, 2, 3]	Unterricht[1, 2, 3] Primar*[1, 2, 3] Grundschule[1, 2, 3] Sek*[1, 2, 3] Weiterführende Schule[1]

([1]=first search, [2]=second search, [3]=third search)

When using the search terms, the combinations of the three components were formulated according to the search procedure of the databases, e.g., ERIC needs search terms like follows: "Inclusion AND science AND (learning OR class OR school OR primary OR secondary)".[3] In order to increase the quality of the data generation, only peer reviewed publications were considered in ERIC and Scopus. Furthermore, the ERIC and Scopus databases allow for searching in specific journals. We chose journals that were focused on science education or inclusive education so that the amount of data was feasible with the purpose of our inquiry. While the first two searches for publications were conducted until 2018, the third search was carried out once only for 2019 due to a turn of the year.

If we compare the publications found in the three searches, we count n=1,148 titles for the first data search, n=10,787 titles for the second search and n=1,075 titles for the third search. From the first to the second search, there is an enormous increase in the number of hits. This can result from different reasons. Especially, the terms of the inclusive component are often used in other contexts. The terms of this component may refer to processes at the molecular level, e.g, the integration of atoms into molecule structures, or to several meanings in the school context (e.g. Abramova, Shilova, Varankina & Rubanova, 2019; Abdella, Walczak, Kandl, & Schwinefus, 2011; Bardeche et al., 1980). In German, the word "integrative" also means the combination of chemistry, physics and biology into one subject called natural sciences. In this way, the revision of the search terms for the second search not only collected literature of the target group, but also literature that was eliminated again in the next step.

The search criteria were essentially the same in all three searches: time frame, language, school type, focus on inclusive science education. The only change that was made is that the first two searches include all titles until 2018 while the third search was restricted to 2019. A targeted search was conducted for publications in English

[3] The search strings and the exact search history is available on the pages 39ff, appendix A, B, C.

and German. All titles that explicitly refer to inclusive science education were included. Titles that explicitly refer to school types other than primary and secondary education were excluded. Similarly, when it came to the inclusion of teacher students at the university level into a scientific subject, the titles were sorted out (diversity sensitive teaching, e.g., Godovnikova, Gerasimova, Galchun, & Shitikova, 2019; Ghanbari, 2015; Alheit, 2009; Fraser, Giddings & McRobbie, 1992). When implementing inclusion, we refer to science education on school level and the inclusion of students in school science education. This is equally the case, when student teachers are taught at university level how to implement inclusion in science education at school (e.g., Brauns, Egger, Abels & Barth, 2019; Benny & Blonder, 2018; Kahn, Pigman & Ottley, 2017; Abels & Koliander, 2014). As a result, titles were retained in the sample if, for example, they dealt with teaching concepts or materials without specific reference to school levels.

In the first step of the selection process, the samples were selected according to the titles, then the abstracts were read and selected. A total of n=130 titles were identified in the first search, the sample was reviewed by experts from the network of inclusive science education (NinU) and extended by n=20 titles. Overall, the selection process resulted in n=150 titles for the first sample, n=309 titles for the second sample and n=40 titles for the third sample. Since all search strands were carried out separately, they were then merged. All duplicates were removed and the screening was once more reviewed. Finally, all publications were read completely for the later qualitative content analysis, which resulted in further eliminations. This complete data search and selection resulted in a final sample of n=297 titles[4].

2.3 DATA ANALYSIS

All titles in the sample were evaluated both quantitatively and qualitatively. The quantitative analysis not only describes the composition of the sample, but also shows the current state of research, which is represented by the systematic literature review. The aim of the qualitative analysis, which is the main focus of the literature analysis, was to derive categories from the literature to summarise characteristics of inclusive science education. All titles were evaluated with the qualitative content analysis via focused summary according to Kuckartz (2016) by inductively constructing categories from the data material. The basic approach is that paraphrases were derived from text passages, which were gradually abstracted more and more until they formed categories (Kuckartz, 2016). After the qualitative analysis of the literature resulting in the

[4] The literature list is available on the pages 107-126, appendix G.

framework, a further quantitative evaluation was carried out. The results of this can, for example, provide information on the main focus of the literature and which titles are most frequently cited in the framework.

2.3.1 QUANTITATIVE ANALYSIS OF THE SAMPLE

For the quantitative analysis of the sample, data was collected and evaluated using the statistics software SPSS (version 25) with the following variables: publication language, publication type, conception, school type, focus group(s), year of publication and diversity dimension(s) (Tab. 2). All measurement levels were nominally distributed.

Table 2. Variables and scales of the quantitative analysis of the sample

Variables	**Scale**
Publication language	1=German, 2=English
Publication type	1=journal article, 2=chapter, 3=monograph
Conception	1=empirical, 2=theoretical
Type of school	1=primary school, 2=secondary school, 3=indefinable
Focus groups	1=students, 2=teachers, 3=student teachers, 4=indefinable
Year of publication	1=before 1990, 2=1990-1994, 3=1995-1999, 4=2000-2004, 5=2005-2009, 6=2010-2014, 7=2015-2019
Diversity dimensions	1=wide concept of inclusion, 2=ethnicity (culture), 3=socio-economic status, 4=gender, 5=organisational role, 6=additional educational needs, 7=age, 8=religion, 9=sexual orientation, 10=language, 11=highly gifted

Concerning the type of school, it should be noted that the scale element ‘indefinable’ was used when the school form could not be clearly assigned. The fact that these titles were included in the sample is due to the fact that titles were only excluded in the selection process if they explicitly referred to a school form other than primary and secondary school. If no clear assignment to a school level was possible, the titles were retained in the sample. For the variable focus groups, an assignment to ‘indefinable’ is also possible. There were publications in which the protagonists of instruction were the central theme. However, it could also happen that educational models, teaching materials or teaching concepts were presented in the literature. In these cases, the titles were assigned to ‘indefinable’. The diversity dimensions are essentially based on the “Big 8” (Krell, Riedmüller, Sieben & Vinz, 2007) and have been expanded by the wide concept of inclusion, language and high talent. The wide concept was used for titles that refer to the inclusion of all students rather than to individual diversity dimensions. This variable sets a contrast to the narrow concept of inclusion associated with additional educational needs (see introduction). The understanding of vulnerable groups was not explicitly considered as it is not yet common in science education. Language has been considered separately from ethnicity because linguistic diversity is not always the cause of ethnical differences and in literature it is usually considered as a single factor. Whereas in the "Big 8" ability is listed as a facet, we have distinguished between the additional education focus and giftedness, because in the literature of our sample both are dealt with differently and even imply a contradiction.

Several means were used to assure the quality of the framework. Starting, the first 10 % of the literature were evaluated by a second trained coder. At that time the intercoder reliability in terms of Cronbachs alpha was 0.67. This dissatisfactory agreement may result from the fact that for the first part of the sample only the abstracts were analysed quantitatively. Both coders discussed each coding together along the data material. Afterwards, the whole sample was quantitatively analysed by one researcher. This led to the decision to read the texts completely for the analysis. All n=297 titles of the sample were read and coded according to the manual (Tab. 2). Finally, 10 % of the literature was again randomly selected and evaluated by the same second trained coder as above. The renewed intercoder reliability was 0.84. This result can be rated as good, but was not entirely satisfying for us. It became apparent that the variable of diversity dimensions caused this difference in the analysis. Therefore, all codes of this variable were reviewed and revised again. The difficulty in assigning diversity dimensions often lies in the fact that authors focus on one dimension but theoretically justify it with another dimension. As an example, a study investigates students with ethnic background. However, the theory in such an article describes the understanding of inclusion with a focus on special educational needs (e.g., Koomen, 2016). The reference to special educational needs is also sometimes made, although the authors explicitly mention that they refer to a broad understanding of inclusion. In these cases, it was necessary to discuss which diversity dimensions were actually addressed in the article.

2.3.2 QUALITATIVE ANALYSIS OF THE SAMPLE

The focus of the qualitative analysis is identification of categories for the Framework for Inclusive Science Education. We used the qualitative content analysis via focused summary according to Kuckartz (2016). Altogether, six guidelines serve as an orientation frame for the inductive category formation (Kuckartz, 2016):

1. Determine the goal of category formation on the basis of the research question
2. Determine category type and level of abstraction

3. Familiarise yourself with the data and determine the type of encoding unit
4. Edit the text sequentially and create categories directly on the text; Assign existing categories or create new ones
5. Systematising and organising the category system
6. Define the category system

In the following, the methodical procedure of the inductive category formation will be described in detail.

(1.) It is important to phrase a clear research question in order to be able to set a focus in the analysis. In our case, the research question was which characteristics of inclusive science education are suggested in literature. It is also relevant that a certain amount of prior knowledge of the subject area is available to the researcher so that passages in the text are considered relevant to the research question (Kuckartz, 2016). Based on the research goal, inductive categories should be formed that represent an aspect of science that has been combined with an aspect of inclusion. One can also ask the question of how a characteristic of science education is implemented in an inclusive way. In this case, the coders needed to be aware of what is specific about science education. It was necessary to know the scientific subject and to be able to distinguish it from other school subjects. When authors describe in the text how a characteristic of science education is implemented in the classroom, we first assumed that the implementation is meant to be inclusive, when the publication generally refers to inclusive education. However, at a later stage we will need to validate which categories actually contribute to inclusive science education.

(2.) The next step is to determine the level of abstraction of the categories. The goal of category formation was to construct categories that allow for precise statements about how exactly science education should be implemented in an inclusive manner. We wanted to obtain information that answer the question of what exactly can be done by (becoming) teachers in inclusive science education. First of all, codings were marked in the text and adopted as quotations of the text passages. From these codings, the paraphrases were made, which were as close as possible to the wording of the original text. Already the paraphrases were formed in such a way that they consisted of a characteristic of science education in combination with an infinitive representing means of inclusive pedagogy. This kind of construction ran not only through all paraphrases, but also through all categories. The example coding (Tab. 3) shows a coded section of text dealing with a thermometer that emits sounds and vibration pulses. The use of the thermometer represents the characteristic of science education, a scientific investigation method, which is adapted here inclusively. This example also shows that two aspects can be addressed in one sentence or with reference to the same characteristic of science education. In these cases, the individual aspects are each listed in their own paraphrase in order to be able to classify them later in the framework. An italic coding in the framework means that the code is from empirical findings in the literature. Empirical findings have been tested as effective for inclusive science education. The paraphrases derived from this were then also marked in italics, so that it is clear which paraphrases originate from empirical results and which originally come from a theoretically formulated text passage.

Table 3. Deriving categories from the publications

Coding	**Paraphrase**
„[…] The device is suitable for temperature measurements in degrees Celsius, emitting sounds and vibration pulses similar to morse code, with a measuring scale ranging from -15°C up to 115°C. This thermometer will give the opportunity to participate actively in the acquiring knowledge process […]“ (Vitoriano et al., 2016, p. B)	*Providing a device for temperature measurements emitting sounds similar to morse code* (Vitoriano et al., 2016, p. B) *Providing a device for temperature measurements emitting vibration pulses similar to morse code* (Vitoriano et al., 2016, p. B)

(Colour code: characteristics of science education, aspects of inclusive pedagogy, paraphrases with the focus on secondary education; *italic paraphrases are derived from empirical studies)*

(3.) The coding units were determined by one aspect occurring in a paraphrase of a coded text passage. The first objective is to choose a coding unit that is as small as possible to allow a paraphrase to be derived from it. This goal is always coupled with the condition that the coded passage must be coherently understandable for the coders and readers. This means that at least one-half sentence must be coded. This rule results from the fact that MAXQDA (version 20.0.7) is used as analysis software. After coding, this program lists all coded passages in a table separate from the original text. The coders must decide during the coding process whether the meaning of the coded unit can be understood without context. Therefore, a section with one aspect is to be coded at most. All parts except the methodological part were coded in each publication and of the final sample all titles were coded.

(4.) The coding procedure will now be determined. In the citation program Citavi, the literature in the sample was arranged by year, starting with 2019, and within years alphabetically. Due to the fact that the sample for 2019 was generated later, the first analyses were performed starting with 2018 and according to the alphabetical order. According to Mayring (2000), it is recommended to first analyse 10 % to 50 % of the sample using the inductive procedure. We started coding text passages with 30 % of the sample. Kuckartz (2016) states that the categories from the coding of the first part of the sample are usually applied to the further data in a deductive way. In our case, it turned out that we had to deviate from Kuckartz's (2016) methodical approach. Already after the analysis of 30 % of the sample, the preliminary framework was already very comprehensive, so that it was not practicable to apply it to further data material. For this reason, the remaining part of the sample was then analysed using the same inductive procedure. The inductive procedure had further advantages for the later quantitative evaluation of the framework as well as for the intersubjective transparency of the methodical procedure. The focus was also on being able to trace a reference to each source even later. MAXQDA then listed a table with all coded text sections. Paraphrases were formed manually from each coding (Tab. 3). In this way, the wording of the original text could be preserved. This information is important as it demonstrates how abstract or how concrete inclusive science education is explicated in the literature. Our assumption was that the empirical works represent the connection between science education and inclusion more concretely than the theoretical works, but also that inclusive science education is described rather superficially and not very concretely at all. The consequence of the diversity of the literature was that a saturation did not occur in the analysed 30 % of the sample. In order to minimise the gaps in the framework and to be able to evaluate the contents of the literature quantitatively at the end, all other titles in the sample were analysed in full.

(5.) When the categories formed become gradually unclear and when hardly any more categories are found, the derived categories should be structured in a framework (Kuckartz, 2016). In our case, the first structure of the framework was formed after analysing the first 30 % of the sample. First, all paraphrases formed were clustered according to the superordinate characteristics of science education. In this way, 16 characteristics of science education were identified, which serve as main categories in the framework. In the next step, the paraphrases were sorted according to their degree of abstraction within each main category. In this way, the four levels of abstraction of the framework were created: subcode, code, subcategory, main category (Fig. 2). On the main category level, the characteristics of science education are presented and written together with "implementing inclusively" or similar. On the subcategory level, the type of the inclusive implementation of the characteristics of science education is summarized. Up to the subcode level these implementation suggestions become more and more concrete, but on the subcategory and code level they leave open the question of the concrete implementation. It is only at the subcode level that concrete instructions for teaching inclusively are given, leaving no questions unanswered.

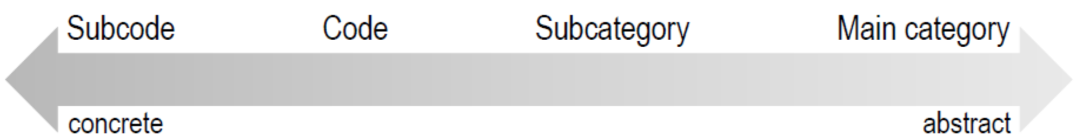

Figure 2. Levels of abstraction of the framework

Within the levels of abstraction, clusters were formed. In the example above in Table 3, a paraphrase from the text to a device for temperature measurements emitting sounds was derived from the coding. Similar paraphrases could have been formed from codings of other sources. These similar paraphrases were then combined into groups. In the process a cluster of different paraphrases was formed. In Table 4, all paraphrases refer to thermometers that make sounds. Each cluster has then been given a heading. In this example it is "Enabling the application of scientific investigation methods with acoustic thermometers". This heading is later adopted for the framework and forms a category. In this case, the category is concretely formulated and is therefore at the subcode level. In this way, a first structure of the framework was created. All categories were assigned to the four different levels of abstraction depending on how concrete the implementation suggestion was (Fig. 2). When assigning the categories, it was noticeable that a similar structure was created at the subcategory level throughout the framework. Consequently, care was taken to ensure that the structure of the framework is as uniform as possible at the subcategory level. After this first procedure, Kuckartz (2016) suggests asking oneself how many categories are reasonably needed for the evaluation, and to include economic factors as well as the goal of the research when answering the research question. Due to the large number of categories formed, the use of the framework for deductive analysis would have hardly ever been possible. One solution could have been to combine the categories to such an extent that the scope of the framework would have been reduced. Even if a maximum of ten main categories is recommended (Kuckartz, 2016), it was not expedient and not in line with the theoretical background to further summarise the 16 identified characteristics of science education. Furthermore, we found no concrete guidelines for inclusive science education in the literature sample. Definitions that were written at a general level tended to leave open the question of how exactly inclusive science education could be implemented. For this reason, the economic factor was rejected as the provision of concrete recommendations for action outweighed it. Therefore, inductive paraphrases were formed from the complete remaining sample, which were either added to existing categories or formed new categories.

Table 4. Clustering the paraphrases to form categories (example on subcode level)

Enabling the application of scientific investigation methods with acoustic thermometers
Providing a device for temperature measurements emitting sounds similar to Morse code, with a measuring scale ranging from -15 °C up to 115 °C (Vitoriano et al., 2016), Providing talking thermometers (Koehler & Wild, 2019), Providing alteration of common laboratory measurement devices for successful independent use by the visually impaired such as the substitution of talking thermometers for traditional visual thermometers (Watson & Johnston, 2007), *Providing a thermometer that provides information through beep sounds (Vitoriano et al., 2016),* Providing audible electronic to understand temperature thermometers (Teke & Sozbilir, 2019)

(Colour code: sources with the focus on secondary education; *italic paraphrases are derived from empirical studies)*

(6.) After arranging the categories within the first draft of the framework, definitions of the categories were established.

In a repeating review procedure by groups of researchers and revision by the authors, the structure of the framework was developed further until the current framework was created. It cannot be ruled out that, with advancing application of the framework and because of the vivid research field, it will be further revised. Reviewing and revising in the communicative process is a typical procedure in inductive category building to ensure the quality of the methodical approach. When it comes to the quality of the framework, Kuckartz (2016) points out that a distinction must be made between the creation of the framework and the application of the framework. When creating the framework, it is not possible to generate a perfect match between the coders. Therefore, all sub-steps of the inductive category deriving were optimised in ways of argumentative validation (Bortz & Döring, 2016) (Fig. 3).

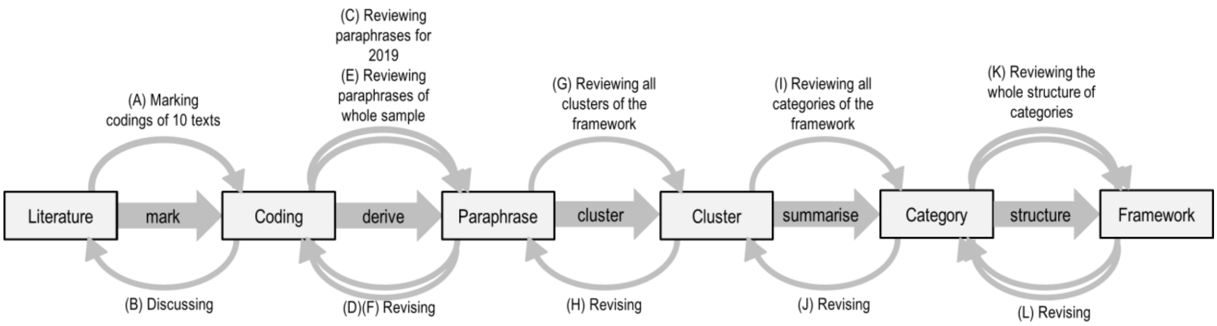

Figure 3. Argumentative validation of the inductive category deriving

The validation process of the category deriving is divided into twelve steps. (A) Ten randomly selected publications were coded by two coders. This means that the two coders inductively marked codings in the text that relate to inclusive science education. The aim was to find similarities and differences in the identification of the characteristics of science education and to make sure that an inclusive implementation was marked for these characteristics of science education. Afterwards, the codes were discussed, the coding units were defined particularly clearly and it was also brought to mind once again that the emphasis in the coding should be on the characteristics of science education in order not to code generally inclusive statements and not to lose the subject-specific focus. (B) After the paraphrases had been formed for the 2019 sample, (C) the process of summarising a coding to a paraphrase was reviewed by the second researcher. Overall, these paraphrases were used to review the first 25 % of all paraphrases derived from the literature of the entire sample. The aim was to ensure that the paraphrases were specific to the subject and particularly close to the wording of the original text. (D) All critical points were discussed and revised. These discussions were taken into account in the further procedure. (E) Then the paraphrases from all codings were derived, and this whole process was again reviewed by the second researcher. (F)

All irregularities were subsequently revised. (G) A similar approach was followed for allocating the paraphrases to the clusters. An argumentative process was chosen again, and this time again the second researcher reviewed all clusters of the complete framework with the 1627 paraphrases. (H) Changes resulting from the discussions were incorporated into the clusters. This means that paraphrases that did not belong to one group were added to other groups or new groups were created. (I) Each cluster received its own headline and these category names were also reviewed, discussed and (J) revised in dialogue. (K) In the final step, all categories and their assignments to the respective subcodes, codes, subcategories and main categories were discussed and (L) revised by experts in this field and within the Nawi-In project. Some of the revision processes were carried out in cycles in order to continually optimise the framework. In this final revision process the inductive procedure overlapped with a deductive procedure. In order to make the framework transparent, we created a structure that is recurrent. Therefore, there is an interaction between the inductive and the deductive procedure. For this purpose, the wording was deductively standardized on the subcategory and code level. On the subcategory level, a uniform structure was chosen, which was adopted for all main categories, and on the code level, the wording can also be found under the various subcategories.

2.3.3 QUANTITATIVE EVALUATION OF THE FRAMEWORK

After the framework was created, the categories and the paraphrases were each quantitatively analysed. The categories were evaluated by counting how many categories are listed in the respective abstraction level and in the different main categories. By counting the paraphrases, it can be determined which titles of the sample were cited most often in the framework and which categories or characteristics of science education are most often addressed in the literature. The categories were counted manually, while the citations were both counted through Citavi and checked manually. Using Citavi has the advantage that the program displays the number of citations per literature source automatically. The significances were calculated here with the Qhi-squared test and an alpha $\alpha = .05$ as in the quantitative analysis of the sample.

3. RESULTS

The presentation of the results is divided into three areas. First, the distributions of the sample are presented descriptively. Then, the presentation of the qualitative results, on which the focus of this paper is, are described. In this part, the Framework for Inclusive Science Education is not only presented, but also references for its application and adaptation in further research are given. Finally, the results of the quantitative evaluation of the framework are presented.

3.1 DESCRIPTIVE PRESENTATION OF THE SAMPLE

The quantitative analysis of the final sample is presented along the variables publication language, publication type, conception, type of school, focus groups, year of publication and diversity dimensions. Here a selection of the variables, which we surveyed, is shown descriptively and described in more detail, both individually and as cross-tables. The total sample consists of n=297 publications. Approximately one third of them are written in English and two thirds in German. Although the majority of the collected literature was found in English databases, a large part of the English literature was excluded in the selection process. This is due to the fact that the articles mostly focused on scientific subjects and did not show any connection to inclusive education. Next time, the search terms should be revised, for example, terms such as diversity should be included in the search terms, i.e., the search strings in the databases should be adapted again for a more international perspective.

If we look at the distribution of empirical and theoretical publications over the years, we can see that the number of titles has risen sharply, especially in the last ten years (Fig. 4). This is probably a consequence of the UN Convention of 2006, which established an agreement for the rights of people with disabilities and other vulnerable groups and which was gradually signed and ratified by the countries (United Nations, 2006). Germany ratified the agreement in 2009, which was a factor that stimulated the discussions on inclusive education. Accordingly, Figure 4 shows that the number of publications has increased along with the theoretical discussions. Particularly in the last five years, the empirical papers have risen sharply and exceeded the number of theoretical papers today. Initially, the difference of titles from 2005-2009 to 2010-2014 ($X^2(1, N = 114) = 5.053, p = .025^*$) is significant. While in the period from 2010 to 2014 n=31 empirical and n=54 theoretical titles were published, in the following period from 2015 to 2019 there have already been n=79 empirical and n=69 theoretical titles. The number of empirical and theoretical publications differ significantly within the periods 2000-2004 ($X^2(1, N = 18) = 5.556, p = .018^*$) and 2010-2014 ($X^2(1, N = 85) = 6.224, p = .013^*$). This is a welcome development, since inclusive science education can be further developed, especially if empirical studies can demonstrate how inclusive practice can be effectively implemented.

Figure 4. Empirical and theoretical titles distributed over the years. Significant differences are marked with asterisks (p < .05).

Although the UN Convention refers to people with disabilities, which implies at first sight a narrow understanding of inclusion, the distribution of the concepts of inclusion over the years (Fig. 5) in the dataset shows that not a certain but both the wide and the narrow concept of inclusion are addressed more and more The wide concept of inclusion includes various dimensions of diversity. All titles, which do not focus on a single diversity dimension, but include all individualities of the students, are summarized in this category. Essentially, it means that all students can participate in science lessons. No additional educational needs are labelled in a deficit-oriented manner, but all students with their individual abilities are taken into account. The wide concept of inclusion is contrasted by the additional educational needs concept, which follows a narrow understanding of inclusion. To compare the distributions of both concepts, the graph shows that the number of titles with the wide concept of inclusion increases more steeply than the number of titles with the narrow concept. For comparison, the number of papers which focus on a wide concept of inclusion increase from n=37 (2010-2014) to n=76 (2015-2019) and for additional educational needs as the narrow concept of inclusion from n=34 (2010-2014) to n=57 (2015-2019). Nevertheless, this difference is not significant $(X^2(1, N = 204) = 2.373, p = .123)$.

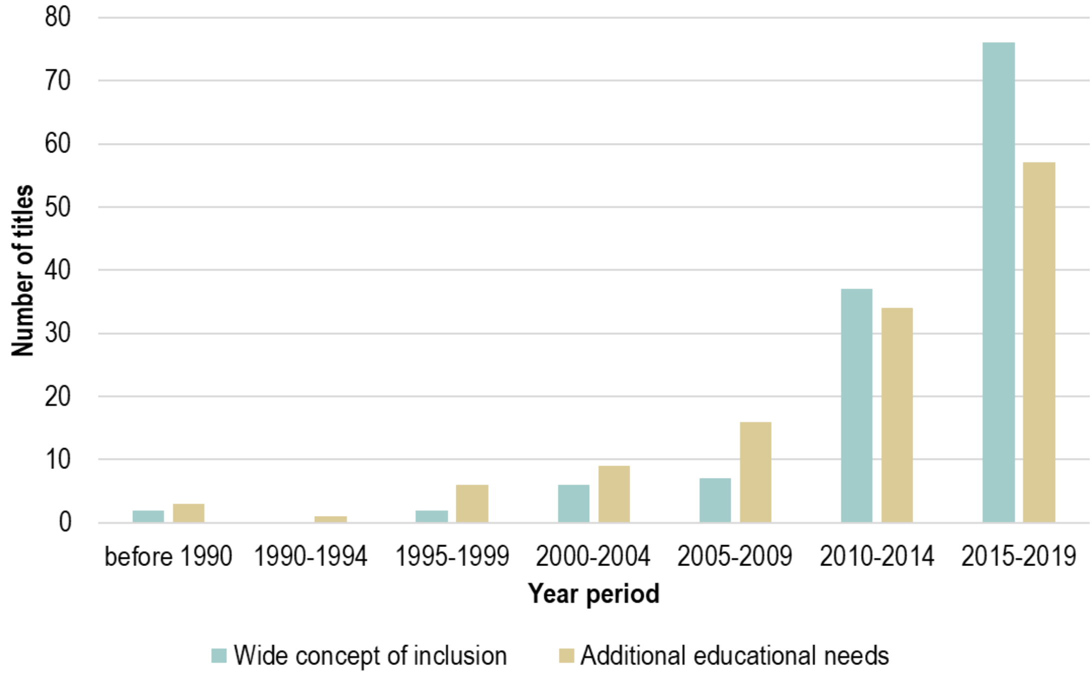

Figure 5. Distribution of the number of titles referring to a wide concept of inclusion and to additional educational needs.

If we look at the distribution of focus groups in the final sample universe (n=297), which illustrates the emphasis in the publications, two groups stand out: the students with 40.7 % and the indefinable group with 39.7 % (Fig. 6). 'Indefinable' includes all titles that have no specific reference to protagonists of the publication. This means that, for example, teaching concepts, educational models or teaching materials are discussed.

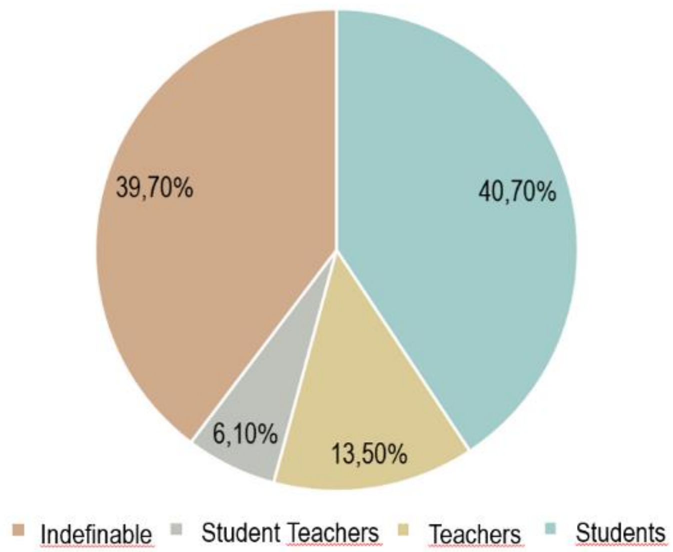

Figure 6. Distribution of the focus groups in the sample universe

In only 13.5 % of the publications teachers are researched or thematised. It is particularly noticeable that only 6.1 % of the titles focus on student teachers. This shows the strong need for pre- and in-service research. Focusing on student teachers is a prerequisite for advancing and further developing teacher education with regard to inclusive science teaching. It should not be neglected that student teachers are the ones who can take the new findings on inclusive science education into school.

With a deeper look into the two focus groups teachers and student teachers, the distribution of publications over the years shows that individual publications of both focus groups have already appeared between 1995 and 1999 (Tab. 5). Regarding teachers, an increasing trend began between 2005 and 2009. For student teachers, there was one publication between 2010 and 2014, but the actual work in this field has only begun in the current period from 2015 to 2019.

Table 5. Development of the focus on teachers and student teachers in publications on inclusive science education.

	Before 1990	1990-1994	1995-1999	2000-2004	2005-2009	2010-2014	2015-2019
Teachers	0	0	3	0	8	7	22
Student teachers	0	0	1	0	0	1	16

In summary, especially the last decade (since 2010) a steep increase in publications in the field of inclusive science education is noticeable. A similar development can be observed for empirical publications as well as for publications with a focus on teachers and becoming teachers.

3.2 THE FRAMEWORK FOR INCLUSIVE SCIENCE EDUCATION

The Framework for Inclusive Science Education is presented in full in the annex D (Tab. 8). It consists of 16 main categories[5] as listed in Figure 7. In green are the characteristics of science education marked which run through all levels of the framework with the same name. This means, for example, that under the category inquiry-based learning the term is used for all categories at sub-category level, code level and subcode level. The degree of abstraction level is determined by the red-coloured addition to the characteristic of science education. Here at the level of the main categories terms such as “developing inclusive…”, “adapting … for inclusive education”, “teaching … inclusively”, “creating inclusive …” are used. This highest abstraction level is intended to list the characteristics of science education and connect them to a phrase of inclusion. This very general level of the main categories does not

[5] The definitions of the main categories are available on the pages 42-47, appendix D.

answer in any way how the characteristics of science education can be implemented in inclusive practice.

<table>
<tr><td>Creating inclusive science learning environments</td><td>Adapting security for inclusive education</td><td>(Developing inclusive) diagnostics for scientific specifics</td><td>Teaching scientific concepts inclusively</td><td>Creating inclusive scientific contexts</td></tr>
<tr><td>Teaching the understanding of nature of science inclusively</td><td colspan="3" rowspan="3">THE FRAMEWORK FOR INCLUSIVE SCIENCE EDUCATION</td><td>Enabling the development of scientific terminology inclusively</td></tr>
<tr><td>Creating inclusive data evaluation and result presentation</td><td>Creating inclusive inquiry-based learning</td></tr>
<tr><td>Developing students' science conceptions inclusively</td><td>Teaching scientific phenomena inclusively</td></tr>
<tr><td>Creating inclusive application of scientific research methods</td><td>Creating inclusive scientific documentation</td><td>Developing inclusive scientific information media</td><td>Creating inclusive generation of hypotheses and research questions</td><td>Teaching scientific models inclusively</td></tr>
</table>

Figure 7. Main categories of the framework

To specify the connection between the characteristics of science education and the inclusive implementation, the further levels of the framework are necessary. At the subcategory level, a recurring pattern is used in the additions to the characteristics of science education regarding the terms of inclusive pedagogy. Essentially, the order of the subcategories is as follows for each main category, whereby it should be noted that the omission always mean a characteristic of science education.

1. Enabling … materially guided
2. Enabling … action-oriented
3. Supporting … linguistically
4. Enabling … digitally
5. Supporting … cognitively
6. Supporting… communicatively
7. Enabling … through various degrees of openness
8. Creating … on different levels of requirements
9. Enabling … reflectively
10. Pre-teaching …
11. Enabling … at certain learning locations
12. Enabling … in a constructive learning atmosphere

(1.) Materially guided refers to all things that can be perceived by the students with their senses. This includes visualisations, auditory materials, help cards etc. Categories are called for example "Enabling inquiry-based learning materially guided" or “Enabling scientific concepts materially guided". (2.) Activity-based includes actions such as experiments or exploratory learning that the students carry out. (3.) Linguistic support is used, for example, in connection with adaptations in easy language. (4.) Technology-based includes materials and equipment used which are meant to be digital implementations to foster inclusion in science teaching. (5.) Learning strategies are cognitive supports that are given to the students so that they can apply strategies for learning as independently as possible. (6.) Communicative support includes offers that are given orally, for example, by peer-support, by a learning group, and by the teacher as a learning companion. Work in multi-professional teams is also included under communicative support. (7.) Different degrees of openness describes the degree of guidance. Students can have strict guidelines for learning science or be more freely involved with a higher degree of self-activity. The different degrees of openness should not be confused with different levels of requirements. For example, if a new scientific method is introduced, it may be more teacher-led, but still place high demands on the learners' cognitive or practical skills (cf. Abels, 2015). (8.) The different levels of demands can also result from different levels of abstraction that occur in science teaching. Accordingly, the level of abstraction can be on a concrete phenomenal level or abstract thought processes can be on a molecular imaginary level (cf. Johnstone, 2000). (9.) Reflecting on a specific scientific feature is in some parts of the framework less and in other parts more superficially presented. It means, for example, that characteristics of science education are conveyed in distinction to something else. For example, when models are reflected, they are distinguished from reality or the existence of different models is justified. (10.) Pre-teaching is used when teachers prepare students in school for the actual science lesson. (11.) Different places of learning can be attended in or out of school. These include, for example, school laboratories, school gardens or museums. (12.) Finally, enabling a constructive learning atmosphere means, for example, that the students and their potential, but also any mistakes that occur, are respected and valued.

Only subcategories, which occurred in the literature are included in the framework. Therefore, not all main categories contain all theoretically possible subcategories. Although a comprehensive system of categories has been established based on the literature, there are gaps which we did not want to fill theoretically or arbitrarily, but which will be filled by further research and application. The Framework for Inclusive Science Education is a helpful tool to make these gaps visible.

With regard to the subcategories, it should also be noted that the first main category ‘Developing inclusive science learning environments’ has a different structure than the other main categories. This results from the fact that a room is adapted here that “behaves” differently from, for example, materials that the students use or actions that the students perform. Overall, on the subcategory level it can be seen in which directions adaptations can go in order to make the characteristics of science education more inclusive. However, the question of what exactly a teacher can do to make science lessons inclusive cannot be answered at this level either.

The next specific level in the framework is the code level. The code level also contains recurring terms. This level already gives concrete instructions on how the characteristics of science education can be implemented in an inclusive way. The instructions for action are given in even more detail at the subcode level. These categories leave no question of implementation unanswered. At this level, the distinctive feature is that the structure of the categories differs from the categories of the other levels of abstraction. While at all other levels a category consists of the characteristic of science education with an inclusive infinitive, at subcode level the category is formed with three dots and the inclusive implementation as a modal adverbial (e.g. "... by short sentences", "... with glossaries"). With the three dots, a link is made to the higher-level code whose wording is specified at this level. This means that the questions "what?", "with what?", "how?" are answered in a reduced form in relation to the higher-level code. The reductions were made in order to provide clarity and to simplify the reading of the framework.

3.3 DESCRIPTIVE PRESENTATION OF THE FRAMEWORK

The framework was analysed in terms of the distribution of the paraphrases and the categories. To repeat the terms, the paraphrases were initially clustered. Each paraphrase originate from a single citation. The clusters of paraphrases were then combined into headings, each of which represents a category. Overall, the categories or the paraphrases enclosed can be located on the four levels of abstraction of the framework.

The framework contains in total of n=935 categories. These are divided into n=421 subcodes, n=368 codes, n=130 subcategories and n=16 main categories (Fig. 8). We recall that categories were marked as empirically tested if they contain at least one paraphrase derived from empirical evidence. The distribution of empirical and theoretical categories shows that at subcode and code level over 40 % of the categories are empirical. At the subcategory level, over 20 % are empirical, while at the main category level almost 70 % are considered as empirical. In summary, the ratio of empirical categories to the total quantity is 0.41, which is lower than the ratio of theoretical categories to the total quantity. The difference between empirical and theoretical categories is significant at the subcategory level $(X^2(1, N = 130) = 15.934, p = .007^*)$ and the main category level $(X^2(1, N = 16) = 5.065, p = .024^*)$. Note that each category considered as empirical can also contain paraphrases originating from theoretical papers.

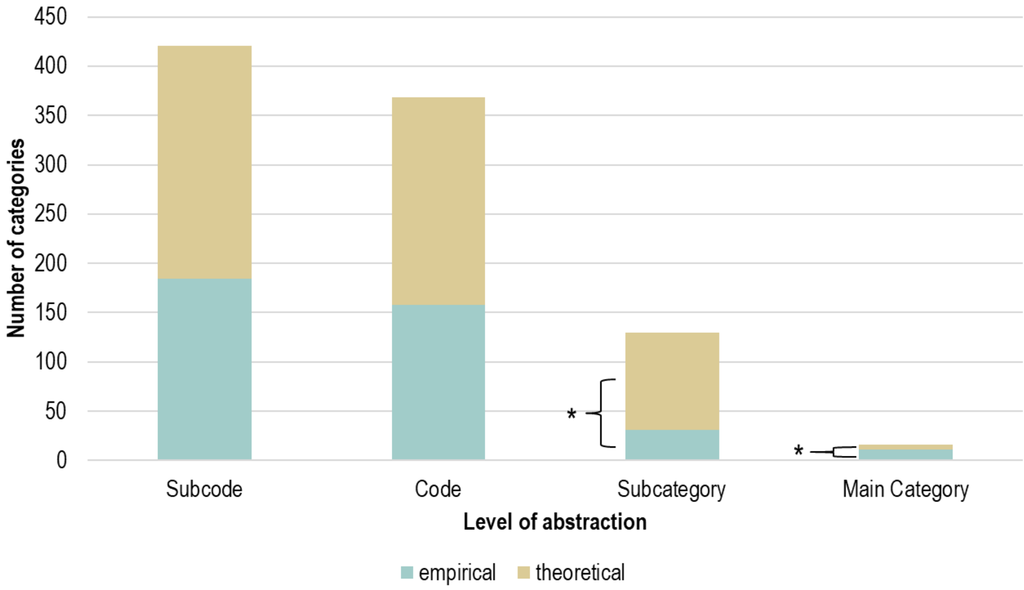

Figure 8. Number of empirical and theoretical categories on different levels of abstraction. Significant differences are marked with asterisks (p < .05).

The quantitative analysis of the categories also shows which main categories are the largest regarding the number of all underlying categories (subcategories, codes and subcodes). This provides information about which characteristics of science education are described extensively in the literature. The five largest main categories include 'Teaching scientific concepts inclusively', 'Developing inclusive scientific information media', 'Teaching scientific terminology inclusively' and 'Creating inclusive inquiry-based learning' (Fig. 9). Among these main categories, between 89 and 126 categories are listed. The other main categories, which are not listed in Figure 9, have between 20 and 55 categories.

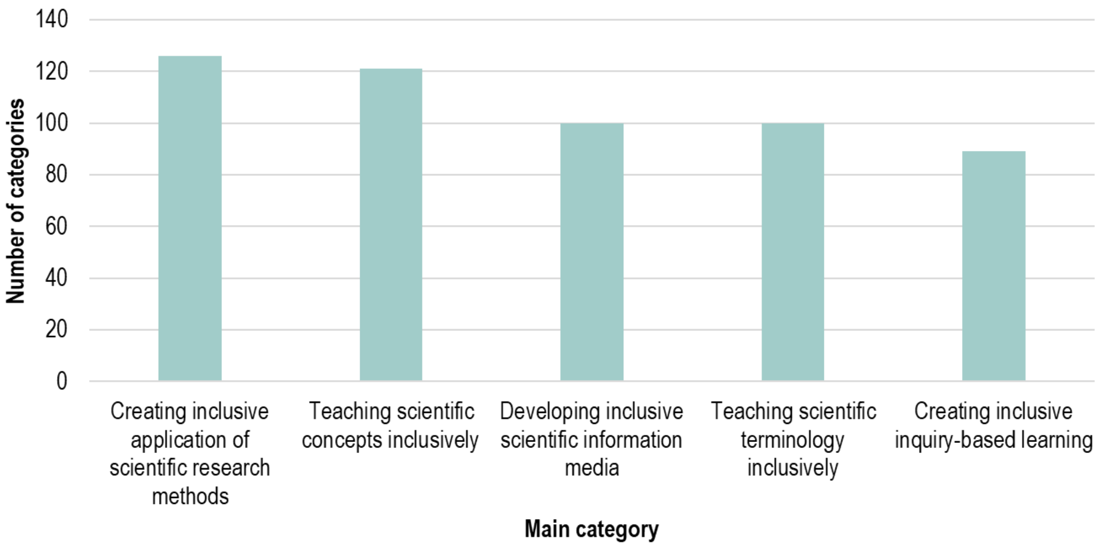

Figure 9. Main categories with the highest number of categories

The paraphrases were derived directly from the coded text passages. Each of the passages contains a single aspect and was quoted individually via Citavi. In this way, their quantitative analysis can establish a link from the framework to the literature and can provide conclusions about the content structure of the literature in the sample. Altogether n=1627 paraphrases were generated from the literature, which were later combined into categories. Of these, n=1023 were derived from theoretical and n=604 from empirical publications. More precisely, the difference between the theoretical and empirical paraphrases becomes apparent in the distribution across the abstraction levels of the framework (Fig. 10). N=603 paraphrases at subcode level, n=633 paraphrases at code level, n=206 paraphrases at subcategory level and n=185 paraphrases at main category level were derived from the text. The distribution of empirical paraphrases in the total amount of paraphrases per level of abstraction increases from main category level to subcode level. At the main category level, the percentage of empirical paraphrases in the total number of paraphrases per abstraction level is 25 %, at the subcategory level the percentage is 33 %, at the code level the percentage is 39 % and at the code level 40 %. The difference between the empirical and theoretical paraphrases is significant at the main category level ($X^2(1, N = 185) = 10.883, p = .001^*$). As we previously outlined the gaps in inclusive science education (see section 1.), this comparison shows that the parts in the literature that bring together the connection between science education and inclusion are mostly theoretical, but have not yet been empirically tested.

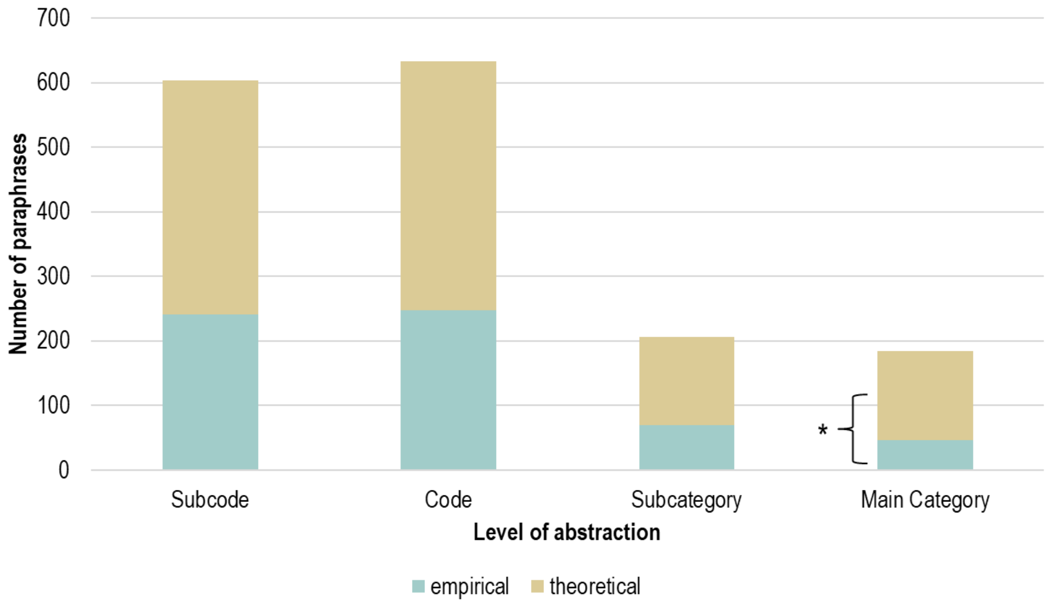

Figure 10. Distribution of the empirical and theoretical paraphrases on the levels of abstraction of the framework. Significant differences are marked with asterisks (p < .05).

In Figure 11, the distribution of paraphrases regarding the main categories is shown. This describes on which level of abstraction inclusive science education is depicted in the literature. It can be seen, that the paraphrases are most frequently found in the main categories ‘Teaching scientific concepts inclusively’, ‘Creating inclusive inquiry-based learning’ and ‘Creating inclusive application of scientific research methods’ with a number of paraphrases from n=238 to n=252. These main categories are closely followed by ‘Developing inclusive information media’ and ‘Teaching scientific terminology inclusively’ with a number of paraphrases of n=195 and n=182.

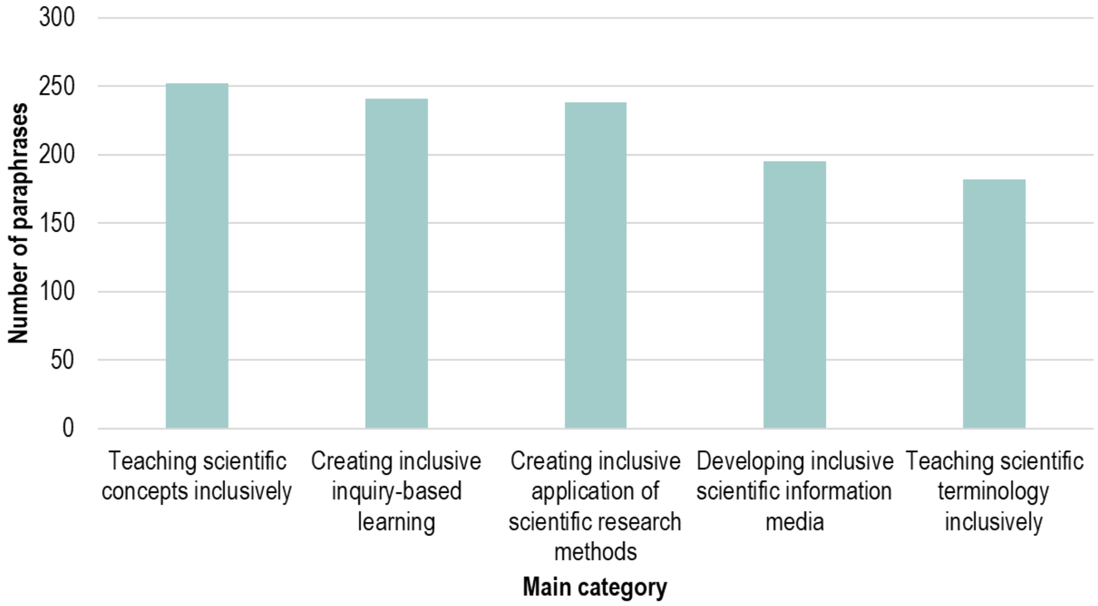

Figure 11. Main categories with the largest number of paraphrases

If we compare the main categories with the most categories and paraphrases, the same five main categories are listed in each case. This shows that the category deriving adequately summarises the data. There are differences in the number of paraphrases, i.e., how often content is taken from the literature, and the number of categories derived from it. This difference is particularly evident in the main category for inquiry-based learning. Considering the number of paraphrases it is in second place and considering the number of categories in fifth place. Here, more paraphrases were combined in clusters than, for example, in the main category of scientific concepts. The difference between the empirical and theoretical elements is greater for the paraphrases than for the categories. This means that the share of empirical elements is smaller for paraphrases than for categories.

In summary, it can be stated that the framework itself is very large due to the categories, summarised by the methodical derivation of the categories through the paraphrases. In relation to each other, from subcode to subcategory level, on average between 1.4 and 1.7 paraphrases are combined into one category. With this number the framework is rather delicate. We will discuss later why a higher degree of summary is not appropriate for our purposes.

4. DISCUSSION OF AND IMPLICATIONS FOR THE APPLICATION OF THE FRAMEWORK

Overall, the systematic literature review allows understanding the development of the state of research regarding inclusive science education. The quantitative analyses show the extent to which research in this area has developed and provide information on the quantitative structure and extent of the framework. The categories of the framework were generated by the qualitative analyses. These results do not only provide clues for the implementation of inclusive science education, but also indicate which areas or characteristics of science education are (not) addressed in literature up to now.

As the data search forms the basis of a systematic literature review, it has to be reflected upon first. The use of the search terms is decisive for the hits that are later available in the sample. During our data search, it became clear that despite the revision of the search terms, relevant terms such as "diversity" did not occur. Furthermore, we did not consider that in an international context the term "equity" is used for discussions on inclusion rather extensively. This limits the sample and the results generated from it. Another option for revising the data search is to use other than the listed databases. That means that a manual search in Google Scholar or on platforms like ResearchGate can be done as well. In our case it became clear that some titles were not listed during the data analyses, e.g., because the journals were not listed in the databases (e.g., Abels, 2019).

Also, it can be noted that the development of research in inclusive science education is rapidly increasing. Starting around 2010 there is a significant increase in publications. The overall increase is the strongest of all increases in the published literature since 1975 (Fig. 4). This development seems to indicate that the demand for work in inclusive science education is being addressed. A similarly positive development can be observed in relation to the wide concept of inclusion. The publications show a strong increase. Due to the fact that in our sample only a small number of titles refer to specific diversity dimensions such as ethnicity, gender or language, there are two possible reasons for this small number. Either the data search has to be specifically targeted to specific diversity dimensions, or little has been published in these fields of research so far – which is definitely not true for gender. This could mean that publications on certain diversity dimensions do not use keywords related to inclusion.

In the quantitative evaluation, we did not present the comparison of publications with the focus on primary and secondary school. Nevertheless, this comparison can be very interesting, since science education differs between the primary and secondary level, for example, especially in teaching and learning the scientific concepts. While the concepts of science in primary school are mainly at the phenomenal level, the level of abstraction (molecular or atomic level) increases with grade. At the phenomenal level, concepts can still be perceived with human senses. At the more abstract molecular level, for example, a certain amount of abstraction ability is required of the students. In terms of teaching scientific concepts, the implementation of inclusion can reach its limits at this point as a difficulty of the access to the abstract concepts may occur (Abels, 2020). Although we have not coded the different subjects (chemistry, biology and physics) in the quantitative analysis yet, it would be interesting to distinguish in which subjects the inclusive implementation of characteristics of science education is primarily discussed.

The quantitative evaluation of the focus groups shows the relatively small proportion of literature in the sample that is devoted to student teachers, but also to teachers. However, in order to be able to make science education inclusive, these are the protagonists responsible for the implementation of inclusive practice. For a long time teachers were not prepared for inclusive science education (Abels, 2019; Kahn, Pigman & Ottley, 2017). They were apparently left out in the process of implementing inclusion. This may also be a reason for the low level of research in this area.

All in all, the overview of the quantitative evaluation of the framework shows how extensive the framework is. With a total of n=935 categories the framework is rather uncommon in practical use. For this reason, we give information on how the framework can be applied later in this section. Although the framework has a large scope, it does not claim to be complete. If we compare the main categories, which essentially represent the characteristics of science education, with the goals of science education displayed by the OECD (2018), the characteristics of science education derived from the literature reflect the content of scientific literacy. The fact that the framework has gaps is obvious by looking at the subcategory level. A total of twelve different ways of implementing inclusion in the characteristics of science education were found at this level of abstraction (Section 3.2). However, not every main category is filled with all twelve different subcategories. This results from the fact that categories were only formed if they could be derived from literature. The structure of the subcategories essentially reflects the areas of the inclusive implementation of scientific characteristics. The extent to which these would need to be differentiated in order to emphasize important aspects of inclusive science education needs to be discussed. An example of this are the subcategories for science concepts and students' scientific conceptions, whether the enabling of different levels of abstraction should be given its own subcategory instead of falling under the subcategory of different levels of requirements. Nevertheless, for the consistent structure of the framework we have deductively modified the subcategories. Further publications are needed to fill these gaps. In process of developing the framework, it has to be taken into account that the categories or the framework are the result of an interaction of the English and German language. While the paraphrases were still derived in the original language of literature, the paraphrases were combined into categories in German. For this publication the German categories were then translated into English. By matching the English paraphrases, an attempt was made to stick to the original wording whenever possible. However, due to the summarization and translation processes, deviations may have occurred. It should be noted that this framework is to be understood as dynamic. This means that it will change in the future and will be expanded or reduced in some places. In order to represent the first stage of the framework and to be able to illustrate explicitly that the results from the literature up to 2019 are presented here, we decided not to fill the subcategories abductively at this stage. On the other hand, we have added a category "other" on the subcategory level, which is meant to emphasize that the framework is extensible. By using the framework in our Nawi-In project, we will provide more updated versions of the framework in the future. Furthermore, further publications on the use of the framework are expected. This working paper has been prepared to ensure that sufficient consideration is given to the complex methodological approach of the systematic literature and data evaluation. We will refer to this working paper in further publications on the contents of the framework and in which the main categories and characteristics of science education will be explained in detail.

The framework illustrates which areas of inclusive science education have been addressed in a more differentiated manner in theory and research and where a need for further theoretical discussions and empirical studies is. The OECD (2019) shows that the specificity of science education is already very clear, nevertheless the inclusive implementation of teaching and especially of subject teaching is not always distinct. The challenge lies in the fact that an inclusive implementation cannot only be presented theoretically, but that it must be empirically tested whether the implications of the framework actually lead to the implementation of inclusion in science education. The question here is which of the categories constitute truly inclusive science education and which categories just represent “good” science education. It is not always possible to determine from a single category whether this category is in fact inclusive. One example is to teach scientific concepts through technical language. Whether this implementation is just part of an ordinary science class or whether this example leads to an inclusive implementation is not clear. The reason for this is that the contents of the categories for this status were adopted from the literature without being discussed and selected theoretically with regard to the reference to inclusive implementation, and without being applied in practice. It is questionable in which form our project will be able to clarify the question of the actual inclusive implementation, if for its verification not only the teachers’ perspective is to be considered, but also the students’ and their well-being in class (Brauns, 2020). We can validate the extent to which the framework can be applied to practice using video analysis. It can be assumed that the implementation of inclusion in science education using the framework depends on the individuality of the learning group. This means that not all categories cannot and do not necessarily have to be applied in inclusive science teaching. The number of codes and sub-codes that have to be applied to a learning group in order to make science education inclusive depends on the learning group itself, the teaching objectives and the resources. We will empirically investigate which categories and how many categories lead to the implementation of inclusive science education in the future. Nevertheless, the quantitative presentation of the framework shows that some of the categories have so far only been formulated theoretically in the literature. In order to ensure practical efficacy of the framework in teaching further use is required. For this reason, the framework is to be applied and validated in practice in a next step of the research project (Section 5.). By examining the teachers' perspective of inclusive science education in our project, we will not be able to determine with the framework whether the teaching is in fact inclusive. For this, we would have to take the students' side into account. With the framework, we can interpret whether participation is facilitated in science lessons. Further research would have to clarify whether students feel recognized and accepted and actually develop scientific skills.

The framework created by the systematic literature review reflects the current theory and research on inclusive science education and can be used both as (1) an analysis grid for researching (student) teachers and as (2) a handbook for teaching. (1) For example, if the focus in a research project is set on the inclusive design of experiments, the main category 'Creating inclusive applications of scientific research methods' can be used with its subordinate categories as a stand-alone analysis grid to analyse the data of a project. The framework can also be used in research on inclusive science education, for example, with the main and/or sub-categories. In this case, the more abstract categories can be used to analyse the data material first. One way is to stay on this level of abstraction and summarising the results on a more general level. The challenge here, however, is that the more abstract the level is, the more difficult it is to understand the concrete implementation and actual description of the relationship between science education and inclusion. Therefore, after coding with the main or subcategories, it is recommendable to insert the results of the analysis at the code and subcode level. During this process, comparisons can be made with the existing codes and subcodes of the framework. In this step, either the results of the analysis are inserted into already existing codes and subcodes of the framework or they supplement the framework with new codes and subcodes that do not yet exist. Overall, the adaptation of the use of the framework must always be adapted to the research question and the research objectives.

(2) These approaches are also possible in teacher education. Becoming teachers can, for example, be given the main category 'Creating inclusive inquiry-based learning' to plan, design and implement inquiry-based science education during a school internship. Such a category can also serve as a stand-alone grid for student teachers to reflect on their own teaching or on teaching of experienced teachers. With the grid, becoming teachers can systematically be introduced to the idea of inclusive science teaching in instructional videos (Brauns, Egger & Abels, accepted). The other way to apply the framework is to first blend out the lower levels of abstraction. This means that the framework is considered as a whole, but the details are omitted. In teacher education, the advantage is that the student teachers are made aware of the specifics of science teaching. The challenge of being able to describe or analyse inclusive science education often lies in the fact that the inclusive implementation of teaching is not thought of in a subject-specific way (Egger, Brauns & Abels, in prep.). Egger et al. (in prep.) show that thinking science teaching and inclusion together requires high analytical skills, which is why novices need to be fostered specifically in this area. Only when the specifics of the natural sciences can be identified, it is possible, starting from this, to address inclusive and science specific implementation.

To make the framework practical for further application and validation, there are in summary two main ways to make the framework practical. On the one hand, fragments of the framework can be put into focus. This means that individual main categories can be considered separately from the framework. On the other hand, the framework can be applied to data on a more abstract level (e.g. only using main or subcategories).

5. OUTLOOK AND VALIDATION OF THE FRAMEWORK

The framework is used in our Nawi-In project for research of student teachers. For the validation of the framework we use the data of our project. The framework is applied to four different types of data: (1) student teachers' videotaped action in science classes, (2) student teachers' video-based and audiotaped self-reflection, (3) student teachers' audiotaped reflection on teaching videos of experienced teachers and (4) teaching videos of experienced teachers.

In order to collect the data for the validation of the framework, we accompany the student teachers for two semesters during a project seminar at master level offered by the second author (Brauns et al., accepted). In this seminar, the student teachers are theoretically prepared for the inclusive science lessons and practice their noticing with teaching videos in the first semester (Egger et al., 2019). In the second semester, the student teachers complete an internship in school. While they are at school, they plan and teach their own science lessons. They also conduct their own minor research project in which they use their videos to analyse their lessons in terms of inclusive science education (Brauns et al., accepted). These videos serve us as database. On the one hand, we can analyse which characteristics of inclusive science education the student teachers show in their own lessons. On the other hand, we can validate the framework itself as an analysis tool by deductively coding the teaching videos with the framework using qualitative content analysis (Kuckartz, 2016).

Moreover, these teaching videos are reflected by the student teachers. These self-reflections are recorded on audio and are analysed with the framework. Here, we consider the question of which characteristics of inclusive science education are noticed by the student teachers in their own videos. Furthermore, before and after the first seminar and after the internship, we record external reflections of the student teachers on audio at three times of data collection. They reflect other teachers' implementation of inclusive science education. These external reflections are also evaluated under the same question as the teacher students' self-reflections. All reflections get transcribed and the transcripts analysed with qualitative content analysis using the framework.

Despite to all data that we collect and evaluate from student teachers through our Nawi-In project we have access to videos of lessons by experienced teachers. These teachers teach inquiry-based learning in inclusive science lessons from primary and secondary schools. To these videos we also apply the framework.

In summary, we have a large amount of data with teaching videos of student teachers and experienced teachers as well as self- and external reflections of the student teachers as audio recordings available to validate the framework. With these data, a connection between the theoretical development of the framework and the practical application in the school context will be established. Finally, we will also address the question of which categories are indeed inclusive and which ones represent only “good” teaching. In this context, discussions with experts, for example from the NinU network, will be useful. To what extent this question can be answered will be a challenge.

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GLOSSARY

Coding
Marked part of text in the original literature, exact quote

Paraphrase
Shorten and condense the coding, similar to the wording of the original text

Category
Every single cell of the framework

Subcode
A category on the most concrete level of abstraction, to be found in the first column of the framework

Code
A category on the second most concrete level of abstraction, to be found in the second column of the framework

Subcategory
A category on the second most nonconcrete level of abstraction, to be found in the third column of the framework

Main category
A category on the most nonconcrete level of abstraction, to be found in the fourth column of the framework

Variable
A characteristic of the scale for the quantitative analysis of the sample

APPENDIX

APPENDIX A: SEARCH PROTOCOL FOR THE FIRST SEARCH OF DATA

Table 6. Search protocol for the first search of data

Database	**Search String**	**Results**
FIS Bildung	Inklus* natur* Unterricht	162
	Inklus* natur* primar*	13
	Inklus* natur* Grundschule	46
	Inklus* natur* sek*	33
	Inklus* natur* weiterführende Schule	1
	Inklus* Sachunterricht	93
	Inklus* Chemie Unterricht	38
	Inklus* Physik Unterricht	33
	Inklus* Biologie Unterricht	15
ERIC	Inclusion AND science AND (learning OR class OR school OR primary OR secondary) - peer-reviewed only	1441
Sample		**1148** (without duplicates)

APPENDIX B: SEARCH PROTOCOL FOR THE SECOND SEARCH OF DATA

Table 7. Search protocol for the second search of data

Database	Search String	Year	Results
FIS Bildung	Inklus* naturw*	2019	22
	Integrat* naturw*		303
	Heterogen* naturw*		0
	Exklus* naturw*		0
	Inklus* Biologie*		5
	Integrat* Biologie*		53
	Heterogen* Biologie*		0
	Exklus* Biologie*		0
	Inklus* Chemie*		6
	Integrat* Chemie*		52
	Heterogen* Chemie*		0
	Exklus* Chemie*		0
	Inklus* Physik*		4
	Integrat* Physik*		49
	Heterogen* Physik*		0
	Exklus* Physik*		0
	Inklus* Sachunterricht		9
	Integrat* Sachunterricht		0
	Heterogen* Sachunterricht		5
	Exklus* Sachunterricht		1
ERIC	(inclusion OR inclusive OR heterogenity OR heterogeneous OR integration OR integrative OR exclusion OR exclusive) AND (science OR chemistry OR biology OR physics) AND education - peer-reviewed only	2019	458
Scopus	(inclusion OR inclusive OR heterogenity OR heterogeneous OR integration OR integrative OR exclusion OR exclusive) AND (science OR chemistry OR biology OR physics) AND education - Include journal of chemical education, research in science education, biochemistry and molecolar biology education, sicence for education today, education sciences, interactive learning environments, international journal of science and mathematics education, journal of research in science teaching, international journal of scientific and technology research, international journal of inclusive education, international journal of science education, journal of biological education, cultural studies of science education, international journal of innovation in science and mathematics eduaction, school science and mathematics, science education	2019	108
Sample			**1 075** (without duplicates)

APPENDIX C: SEARCH PROTOCOL FOR THE THIRD SEARCH OF DATA

Table 8. Search protocol for the third search of data

Database	Search String	Results
FIS Bildung	Inklus* naturw*	181
	Integrat* naturw*	1030
	Heterogen* naturw*	577
	Exklus* naturw*	26
	Inklus* Biologie*	47
	Integrat* Biologie*	1211
	Heterogen* Biologie*	120
	Exklus* Biologie*	4
	Inklus* Chemie*	70
	Integrat* Chemie*	1165
	Heterogen* Chemie*	419
	Exklus* Chemie*	3
	Inklus* Physik*	66
	Integrat* Physik*	1136
	Heterogen* Physik*	349
	Exklus* Physik*	4
	Inklus* Sachunterricht	103
	Integrat* Sachunterricht	227
	Heterogen* Sachunterricht	98
	Exklus* Sachunterricht	2
ERIC	(inclusion OR inclusive OR heterogenity OR heterogeneous OR integration OR integrative OR exclusion OR exclusive) AND (science OR chemistry OR biology OR physics) AND education - peer-reviewed only	5 705
Scopus	(inclusion OR inclusive OR heterogenity OR heterogeneous OR integration OR integrative OR exclusion OR exclusive) AND (science OR chemistry OR biology OR physics) AND education - Include journal of chemical education, international journal of science education, journal of research in science teaching	470
Sample		**10.787** (without duplicates)

APPENDIX D: DEFINITIONS OF THE MAIN CATEGORIES

Table 9: Definitions of the Main Categories

Main category	Definition
1. Creating inclusive science learning environments	The science learning environment is described as the space in which science education is taught and its facilities like tables, sinks, fume cupboards, electricity and gas supplies etc. are used. In primary school science education, this is usually a classroom. In secondary education it is preferably a laboratory or classroom that is equipped for specific requirements. Out-of-school places of learning, such as learning laboratories, "Lernwerkstatt" (open inquiry workshop centers) or places in nature can also be described. Out-of-school places of learning can either be located in facilities independent of the school building (e.g. in museums, in universities) or be designed outdoors (e.g. in the forest, on the meadow, at the beach). In all cases, the learning location itself is described and how it is set up, equipped, decorated or structured. In inclusive science lessons, the special spatial conditions can lead to the fact that barriers for the mobility of the students or unusual stimuli need to be reduced. Nevertheless, certain learning environments can lead to an increased participation of the students due to their nature. Differentiation from other categories: This category is only coded, when the focus is on the room or the space itself, not when an action in this space is described, nor when the safety in respectively of the room is mentioned.
2. Adapting security for inclusive education	Guidelines require teachers to act in a safety-conscious and responsible manner in order to prevent hazards in science lessons as far as possible (e.g. American Chemical Society, 2016). In addition to the dangers that can arise from incorrect operation of equipment and chemicals, teachers are obliged not to leave students unattended in the classroom. Experiments and the proper handling of equipment, materials and chemicals by students are only to be carried out under the responsibility of the teacher. One of the safety aspects in science education is that it must be possible to flee from dangers when they arise, e.g. because the experimental set-up tips over or in case of fire (Hermanns, Krabbe, Hornung, Krüpper, & Pusch, 2019). Likewise, eye showers and fire extinguishers or similar facilities must be accessible for everyone, alarm signals and signs of escape routes as well as the safety instructions must be visible and understandable for everyone. In inclusive science education, different factors of the class must be taken into account to prevent dangers as much as possible. Especially motoric, emotional and social challenges can lead to the fact that certain devices and experiments are more suitable for some and less for others.
3. (Developing inclusive) diagnostics for scientific characteristics	In an inclusive context, diagnostics is usually related to a long-term and partially standardized process for determining the need for support among school students (Wuttke & Seifried, 2013). Diagnosing scientific aspects means for example observing, testing and evaluating scientific performance and checking students' understanding of the subject (e.g. concepts, students' ideas) (Kunter et al., 2013). In addition, the students' level of knowledge and learning progress can be evaluated (Weinert, 2000). In inclusive science education, the focus of diagnostics is shifted to the critical-individual reference level, where the students' staircase situations and learning steps are recognised (Prengel, 2016). This means that the

		individual learning paths are made transparent and individually evaluated through diagnostics, so that all achievements and learning progress at each level are valued. Diagnostics in an inclusive context can then be understood as learning assistive, developmental supportive and competence-oriented (Ziemen, 2016). It is oriented to the interests and potential of the students in order to support students in their learning of science (Veber & Fischer, 2016). In inclusive science lessons, various scientific characteristics can be applied in order to observe and interpret the learning processes, interests and potential of the students. Differentiation from other categories: This category is coded when the focus is on how scientific aspects in relation to the students' learning, interests or potentials are observed and not which scientific aspects are focused on.
4.	**Teaching scientific concepts inclusively**	Scientific concepts are summarised under the content knowledge students learn in science. They describe the facts, ideas and theories on a makroscopic or submicroscopic level (OECD, 2018). Phenomena can be explained by addressing the scientific concepts behind them. They answer the question why scientific processes happen. Science content knowledge as scientific concepts is selected by answering the question of what is to be learned (Heran-Dörr, 2010). These scientific concepts are detached from a context or thematic context (Kahlert, 2016). In inclusive science education, the aim is to enable all students to access and work with scientific concepts in their individual ways. Differentiation from other categories: This category is coded, when scientific concepts are described as scientifically appropriate and explanations of scientific phenomena, not subjective explanations like students' science concepts and not the description of observed phenomena. Additionally, it is how the concept itself is created to access for students and not how the context, which is created to provide a setting for several concepts, is created. Furthermore, e.g. scientific methods and terminology can be a way to make scientific concepts accessible. In this categoriy, it will not be coded, how they are made accessible for students.
5.	**Creating inclusive scientific contexts**	Scientific contexts form the setting, in which the scientific content or scientific concepts (see 3) can be embedded. They are also described as topics that show different perspectives of a content (Kahlert, 2016) and can show a relevance for the students' everyday life. By setting a topic or a context, a content is given a present or future reference for the students. In inclusive science education, the aim is to give all students access to the respective topics and to put science content into context. Differentiation from other categories: This category is coded, when the scientific contexts themselves are describes and not when they are used as a way to make other scientific characteristics accessible for the students.
6.	**Enabling the development of scientific terminology inclusively**	The ability to distinguish between everyday language and technical language should be acquired, so that context-dependent, appropriate arguments can be weighed. Here, connections between natural scientific facts and everyday phenomena play an important role. It is important to be able to 'translate' technical language into everyday language and vice versa. (translated from Gebhard, Höttecke, & Rehm, 2017, p. 55). The

		goal of science education is to promote bilingualism between everyday language and technical language. In inclusive science classes, there can be barriers for students to technical language, which have to be reduced by creating access to technical language. In addition, the diversity of the learning group may make it necessary to mediate between more than two languages.
7.	**Creating inclusive inquiry-based learning**	Inquiry-based learning is applied in practice according to the 5E Instructional Model consisting of the following phases: Engage, Explore, Exlain, Evaluate and Extend (Bybee et al., 2006). The aim is to enable students not only to learn scientific content, but also to conduct scientific research and reflect on its approaches (Abels, 2015). In inclusive science education, the degree of openness in inquiry-based learning can be varied through different levels in order to challenge but not overburden the students (Blanchard et al., 2010). In addition, various methods are possible to encourage the students during conducting the inquiry. The “Lernwerkstatt” (open Inquiry workshop centers) supports the application of open inquiry. Differentiation from other categories: This category is coded, when the inquiry-based learning itself described and how it is made accessible for the students, not when it is the way to make other scientific characteristics inclusive.
8.	**Teaching scientific phenomena inclusively**	Phenomena can be perceived or observed (Reiners, 2017). They are a on a macroscopic level and supposed to trigger students’ emotions, which can be both positive and negative (Gebhard et al., 2017). Phenomena can either be observed naturally in the environment or they can be generated during an experiment. In inclusive science education, the first step is to give the students the opportunity to perceive the phenomenon. Restrictions of the phenomena can lead to the fact that different approaches have to be created to make the phenomenon observable for all students. Differentiation from other categories: This category is coded, when the access to the phenomenon itself is described and not how students form or present their explanations or ideas about phenomena, nor the modelling of phenomena. This category is located only on the macroscopic level.
9.	**Teaching scientific models inclusively**	Scientific models are illustrative and demonstrations of scientific concepts or phenomena. To make explanations possible one uses scientific models as a substitute object or thought. The vividness and the principally provisional nature support models in their explanatory function: models explain phenomena or parts of them with theories and they are a means to enable connections between the macroscopic and submicroscopic level (Reiners, 2017). In addition, models should facilitate learning, present information in a collected form and connect it in a structured way. In inclusive science education, the first priority is to enable all students to work with models and to allow all students to use models (Rott & Marohn, 2018). This can take place, for example, through different approaches. The use of models can be differentiated by having different goals for the students. Differentiation from other categories: This category is coded when the nature of the models is described and what is done to enable all students to work with and understand models,

		not when models are a means to provide access to other scientific characteristics.
10.	**Creating inclusive generation of hypotheses and research questions**	Hypotheses are formulated from the previous knowledge, tested by an experiment and if the hypotheses are proved to be correct, generalizations or regularities can be formulated (Reiners, 2017). "Scientists formulate hypotheses to solve problems. Experiments can be used to refute hypotheses, but they cannot be verified beyond doubt. With hypotheses that have not (yet) been falsified, work continues until they are possibly refuted. Refutability is considered a normative characteristic of good scientific practice. The problem is that scientists are understandably not interested in refuting their own hypotheses. Rather, falsified hypotheses are often saved by ad-hoc hypotheses" (translated from Gebhard et al., 2017, 12 f.). In inclusive science education, different approaches and ways need to be provided to give all students the opportunity to cunsctruct scientific hypotheses and communicate their individual assumptions or scientific hypotheses.
11.	**Developing inclusive scientific information media**	Science education information media can be used in the form of worksheets, textbooks, digital media or other materials in the classroom. Experimental instructions describe, for example, how to carry out or proceed in an experiment and which materials and which equipment are used for the respective experiment. In addition to the experiment instructions, the set up of an experiment can be illustrated or described. Furthermore, scientific information media can illustrate scientific topics, give information about scientific contexts and give tasks to be completed by the students. In inclusive science education, methods and adaptions are applied to enable all pupils with various different skills to access the science information media.
12.	**Creating inclusive scientific documentation**	In science education, the students document, for example, their research procedures, their observations during experiments or the development of technical concepts or contents. A typical documentation medium is the protocol. It contains a topic or a question, the instructions for the experiment, the observation and interpretation accompanying the experiment. Due to the diversity of the students in inclusive science education, different forms of documentation are offered, which enable the students to record or store their observations and explanations or results of experiments in their own individual way. Differentiation from other categories: This category is coded, when students are supported with the documentation of something scientific, but not with the presentation of their results.
13.	**Creating inclusive application of scientific research methods**	In science education, various special working techniques are applied. These include, for example, collecting, comparing and organizing, experimenting, microscoping and observing (OECD, 2018). Experiments, for example, serve to demonstrate phenomena or laws and to practice scientific or science-like work practices (Gebhard et al., 2017). Scientific experiments are used to produce data (e.g. measured values, graphs, imaging processes) that are later interpreted (Gebhard et al., 2017). Experiments require special motor and cognitive skills, which, especially in inclusive science education, mean that barriers are reduced or individual approaches are created for students to participate in the

	experiment. This also includes the use of various aids and measures to regulate complexity. Differentiation from other categories: This category is coded, when the scientific research methods are mentioned, not the documentation of what is happening, e.g. in an experiment.
14. Developing students' science conceptions inclusively	Students' science conceptions are subjective and abstracted ideas from the students' individual previous knowledge and perception. In science education, students bring their own ideas into class, which do not always have to correspond to the ideal scientific conceptions (Barke, Harsch, Kröger, & Marohn, 2018). In subject education, students' conceptions are also described as everyday ideas, ideas from the world of life, original or pre-scientific ideas, pre-conceptions, pre-conceptions and also alternative ideas or conceptions. The explanation of phenomena presupposes the use of abstract, intellectual constructs, which in turn can result in students' science conceptions (Rott, 2018). In inclusive science education, special challenges may arise for students to reach the submicroscopic level. In an inclusive context, support methods are offered to help students develop appropriate ideas. The goal here is to enable all students to develop conceptions that are ready to develop further (Rott, Nowosadek, & Marohn, 2017). Differentiation from other categories: This category is only coded in terms of subjective science conceptions, they may not be the ideal and generally accepted theories.
15. Creating inclusive data evaluation and result presentation	The data evaluation is conducted after certain thinking processes, performed actions and documented procedures. Once the evaluation is completed, the data results are produced. These results are interpreted before they are fixed or are presented in different ways. The presentation of results is about bringing the results on all actions and processes into social exchange. The presentation of the results can take place in front of another person, group or in plenary. In inclusive science education, it is important to note that students are given the opportunity to express themselves individually and in a way that is understandable to others.
16. Teaching the understanding of nature of science inclusively	With understanding of Nature of Science (NOS), a meta level is taken, which describes the knowledge about the natural sciences. It summarizes the understanding that the knowledge of the natural sciences and its paths are dynamic and can be influenced by various factors (Koska & Krüger, 2012). It also refers to an understanding of the professional, epistemological, historical, social and cultural scope of scientific knowledge (Heering & Kremer, 2018). The understanding of NOS can be divided into different areas. According to McComas and Olson (1998) it is divided into Philosophy, History, Sociology and Psychology of Science. In these areas, the understanding of NOS is described as scientific knowledge that can change, can evolve over time through e.g. new technologies, can have a global impact, can be influenced by cultural traditions and socially, can be at the center of several controversies, all cultures can contribute, scientists have to make ethical decisions etc. (McComas & Olson, 1998). In inclusive science education, various scientific and cultural theories about and explanations of natural phenomena are to be included. For example, the theory of evolution of the scientific and a religious view of the origin of mankind can be contradictive, but made compatible. To

convey these different theories means that the existence of all different theories is accepted and respected. It is about taking a meta-level for a reflective approach to different theories without wanting to change the belief in the different theories of the students. In particular, cultural diversity in inclusive science education makes it possible for a worldview to exist that is different from the scientific one.

APPENDIX E: THE FRAMEWORK FOR INCLUSIVE SCIENCE EDUCATION

Highlighting

sources with a focus on secondary education; sources with a focus on primary education; sources indefinable regarding the focus; *italic categories are derived from empirical studies*

The German version of the Framework for Inclusive Science Education is available on the pages 76-106, appendix F.
The literature list of the framework and of the sample of the systematic literature review can be found on the pages 107-126, appendix G.

Table 10: The Framework for Inclusive Science Education

Subcode		Code		Subkategorie		Hauptkategorie	
1.1.1.1	**... without stairs or steps** (Thomsen, 2017)	1.1.1	**Enabling mobility at the science learning environment** (Thomsen, 2017)	1.1	**Creating science learning environments with less barriers** *(Kirch, Bargerhuff, Cowan, & Wheatly, 2007)*	1.	**Creating inclusive science learning environments** (Teke & Sozbilir, 2019), (Vitoriano et al., 2016)
1.1.1.2	**... by mobile deductions** (Thomsen, 2017)						
1.1.1.3	**... by barrier-free paths with mobile tables** (Thomsen, 2017)						
1.1.2.1	***... by switching off the ventilation system and fume cupboards to reduce background noises*** *(Schmitt-Sody, 2014)*	1.1.2	***Considering acoustic conditions at the science learning environment*** *(Schmitt-Sody, 2014)*				
1.1.3.1	**... by colored tape** (Filusch, 2017)	1.1.3	**Structuring the workspace in the science learning environment** (Filusch, 2017)				
1.1.3.2	**... by the material box on a separate table** (Filusch, 2017)						
		1.1.4	**Realising devices for left- and right-handed people in the scientific learning environment** (Thomsen, 2017)				
1.1.5.1	**... by gas and water supply with a valve at the end** (Thomsen, 2017)	1.1.5	**Realising devices horizontally accessible in the science learning environment**				
1.1.5.2	**... by fittings with extended lever** (Thomsen, 2017)						
1.1.5.3	**... by motion sensors** (Thomsen, 2017)						
1.1.5.4	**... by extendable tables and teaching desks** (Thomsen, 2017)						
1.1.5.5	**... by foldable tables and teaching desks** (Thomsen, 2017)						
1.1.6.1	**... by height-adjustable basins** (Thomsen, 2017)	1.1.6	**Realising devices vertically accessible at the science learning environment** (Thomsen, 2017)				
1.1.6.2	**... by height-adjustable fume cupboards** (Thomsen, 2017)						
1.1.6.3	**... by height-adjustable tables and teaching desks** (Thomsen, 2017)						
1.1.6.4	**... by shelves, cupboards and racks at an accessible height** (Thomsen, 2017)						

1.1.6.5	**… by lowerable overhead supplies (e.g. power connection)** (Thomsen, 2017)						
1.1.6.6	***… by blocks to lift the tables*** *(Kirch et al., 2007)*						
1.1.6.7	***… by higher laboratory tables*** *(Kirch et al., 2007)*						
1.1.7.1	**… by fume cupboards that can be driven under** (Thomsen, 2017)	1.1.7	**Realising devices that can be driven under at the science learning environment** (Thomsen, 2017)				
1.1.7.2	**… by basins that can be driven under** (Thomsen, 2017)						
		1.2.1	***Creating scientific learning environments in a multi-professional team*** *(Kirch et al., 2007)*	1.2	**Creating science learning environments communicatively**		
				1.3	**Preparing for the visit of scientific learning environments** (Schmitt-Sody & Kometz, 2013)		
				1.4	**Idenfinable**		
2.1.1.1	**… by gowns, which cover the legs while sitting** (Thomsen, 2017)	2.1.1	**Enabling security by protective clothing**	2.1	***Enabling security materially guided***	2.	**Adapting security for inclusive education**
2.1.1.2	**… by rubber aprons** (Thomsen, 2017)						
2.1.1.3	**… by protective visors** (Thomsen, 2017)						
		2.1.2	**Enabling security by barrier-free danger warnings** (Teke & Sozbilir, 2019)				
2.1.3.1	**… by heating plates and water boilers etc. instead of gas burners** (Thomsen, 2017) (Nehring et al., 2017)	2.1.3	**Enabling security by less dangerous materials**				
2.1.3.2	***… by plastic instead of glass objects*** (Thomsen, 2017) (Nehring et al., 2017) *(Kirch et al., 2007)* (Lunsford & Bargerhuff, 2006)						
2.1.4.1	**… by using chemical-resistant boxes for transport on the lap (for wheelchair users)** (Thomsen, 2017)	2.1.4	**Enabling security for individual needs during the transport of materials**				
2.1.5.1	**… by rubber gloves** (Thomsen, 2017)	2.1.5	**Enabling security by stability and non slip** (Schmitt-Sody et al., 2015)				
2.1.5.2	***… by non-slip underlays*** (Thomsen, 2017) *(Kirch et al., 2007)*						
2.1.5.3	**… with tripods and clamps** (Thomsen, 2017)						
2.1.5.4	**… by unsing stands with holes for vessels** (Thomsen, 2017)						
		2.1.6	***Enabling security by using less dangerous chemicals*** *(Siedenbiedel & Theurer, 2015)*				
2.1.7.1	**… by extending the levers** (Thomsen, 2017)	2.1.7	**Enabling security by vertically accessible emergency devices**				
2.1.7.2	**… by wall mounting the eye showers with extended hose** (Thomsen, 2017)						
2.1.8.1	**… by basins with eye showers that can be driven under** (Thomsen, 2017)	2.1.8	**Enabling security by means of emergency devices that can be driven under**				
2.1.9.1	**… by lower mounting heights of fire extinguishers** (Thomsen, 2017)	2.1.9	**Enabling security by horizontally accessible emergency devices**				
2.1.9.2	**… by additional small volume fire extinguishers** (Thomsen, 2017)						
		2.1.10	**Enabling security by alternative escape routes** (Thomsen, 2017)				

2.1.11.1	**… by a visualized fire alarm** (Schmitt-Sody et al., 2015) (Schmitt-Sody & Kometz, 2013)	**2.1.11**	**Enabling security by visualised emergency signals**				
		2.1.12	***Enabling security by visualised safety briefings*** *(Schmitt-Sody, 2014)*				
2.2.1.1	**… by using level 0 of inquiry-based learning** (Abels, 2015b)	**2.2.1**	**Enabling security by applying inquiry-based learning**	**2.2**	**Enabling security action-oriented**		
		2.3.1	***Enabling security by using simulations instead of dangerous experiments*** *(Bodzin et al., 2007)*	**2.3**	**Enabling security digitally**		
2.4.1.1	**… by one or two experimental setups that can be kept in view** (Abels, 2013b)	**2.4.1**	**Enabling security as a coach**	**2.4**	**Enabling security communicatively**		
2.4.1.2	***… by face-directed posture during the security briefing*** *(Schmitt-Sody, 2014)*						
		2.4.2	**Enabling security by multi-professional teams** (Menthe, Hoffmann, Nehring, & Rott, 2015), (Schmitt-Sody et al., 2015), (Abels, 2019), (Nehring et al., 2017)				
		2.4.3	***Enabling security by group division*** *(Schmitt-Sody, 2014)*				
		2.4.4	**Enabling security by assigning partners** (Thomsen, 2017)				
2.5.1.1	**… by considering that hearing aids must not get wet** (Schmitt-Sody et al., 2015)	**2.5.1**	**Reflecting security on the individual characteristics of the students** (Nehring et al., 2017) *(Pawlak & Groß, 2019)*	**2.5**	**Enabling security reflectively**		
2.5.1.2	**… by considering individual characteristics (startle response to pop noises or surprising effects)** (Nehring et al., 2017)						
2.5.1.3	**… by knowing which spontaneous behaviour can appear in pupils while experimenting** (z.B. unbewusste Tics) (Nehring et al., 2017)						
2.6.1.1	***… durch den Einsatz von Regeln und Konsequenzen beim Experimentieren*** *(Pawlak & Groß, 2019)*	**2.6.1**	***Enabling security by applying classroom management strategies*** *(Pawlak & Groß, 2019)*	**2.6**	**Enabling security in a constructive learning atmosphere**		
				2.8	**Indefinable**		
3.1.1.1	***… by chemistry photo stories*** *(Adesokan & Reiners, 2015)*	**3.1.1**	**Developing diagnostics for scientific characteristics visually** (Brendel et al., 2019), (Hwang & Taylor, 2016), (Menthe et al., 2015), (Buxton et al., 2019)	**3.1**	**Developing materially guided diagnostics for scientific characteristics**	**3.**	***(Developing inclusive) diagnostics for scientific characteristics*** (Hößle et al., 2017), (Rau-Patschke, 2019), (Brauer et al., 2017), (Koomen, 2016), (Kaiser & Seitz, 2017), (Hoffmann & Menthe, 2016), (Villanueva et al., 2012), (Buxton et al., 2019), (Brendel et al., 2019), (Lange-Schubert & Tretter,
3.1.1.2	**… by mind maps** (Gläser & Sothmann, 2015)						
3.1.1.3	**… by wall newspapers** (Kaiser & Seitz, 2017)						
3.1.1.4	***…by drawings*** (Brendel et al., 2019), *(Schroeder & Miller, 2019)*, (Kaiser & Seitz, 2017), (Hößle et al., 2017), *(Adesokan, 2015)*, (Gläser & Sothmann, 2015), *(Rott et al., 2017)*						
		3.1.2	**Developing diagnostics for scientific characteristics with portfolios** (Brendel et al., 2019), (Buxton et al., 2019), *(Bodzin et al., 2007)*				
		3.1.3	**Developing diagnostics for scientific characteristics with tables**(Buxton et al., 2019)				
3.1.4.1	**… by writing down interpretations** (Kaiser & Seitz, 2017)	**3.1.4**	**Developing diagnostics for scientific characteristics with texts** (Gläser & Sothmann, 2015)				
3.1.5.1	**… by applying the Diagnoser Question Set from the DIAGNOSER Project** (Fried, Elsholz, & Trefzger, 2015)	**3.1.5**	**Developing diagnostics for scientific characteristics with tests** (Knipping et al., 2017)				
3.1.5.2	**… by a triad test** (Knipping et al., 2017)						

		3.1.6	**Developing diagnostics for scientific characteristics model based**(Buxton et al., 2019)			2017), (Koehler & Wild, 2019), (Walkowiak & Nehring, 2019), (Schroeder & Miller, 2019), *(Meskill & Oliveira, 2019),* (Knipping, Tolsdorf, & Markic, 2017), (Menthe et al., 2015), (Watt et al., 2013)
3.2.1.1	***… by sorting given images*** *(Rott et al., 2017)*	3.2.1	**Developing diagnostics for scientific characteristics by sorting and ordering**	3.2	**Developing action-oriented diagnostics for scientific characteristics** (Buxton et al., 2019)	
		3.2.2	**Developing diagnostics for scientific characteristics by inquiry-based learning** (McGrath & Hughes, 2018), (Mumba et al., 2015), (Watt et al., 2013), (Maroney et al., 2003)			
		3.2.3	**Developing diagnostics for scientific characteristics by experimental observations** (Hößle et al., 2017)			
		3.2.4	**Developing diagnostics for scientific characteristics by hypotheses** *(Adesokan, 2015)*			
		3.3.1	**Developing multilingual diagnostics for scientific characteristics** (Buxton et al., 2019)	3.3	***Developing diagnostics for scientific characteristics on the basis of linguistic support*** *(Meskill & Oliveira, 2019),* (Buxton et al., 2019)	
3.3.2.1	**… by keywords** (Buxton et al., 2019)	3.3.2	**Developing diagnostics for scientific characteristics by linguistic simplifications**			
3.3.2.2	**… by providing the beginning of a sentence** (Buxton et al., 2019)					
				3.4	**Developing diagnostics for scientific digitally** (Buxton et al., 2019)	
		3.5.1	**Developing diagnostics for scientific characteristics with mathematisations** (Hößle et al., 2017)	3.5	**Developing diagnostics for scientific characteristics on the basis of cognitive support**	
		3.6.1	**Conducting diagnostics for scientific characteristics in groups** (Buxton et al., 2019)	3.6	**Developing diagnostics for scientific characteristics communicatively** (Pech, Schomaker, & Simon, 2019)	
		3.6.2	**Conducting diagnostics for scientific characteristics in partnership** (Buxton et al., 2019)			
3.6.3.1	**… in a questioning daialogue** (Watt et al., 2013)	3.6.3	**Conducting diagnostics for scientific characteristics as a coach**			
3.6.4.1	***… by stories or narrations oft he students*** *(Brendel et al., 2019),* (Menthe et al., 2015)	3.6.4	**Developing oral diagnostics for scientific characteristics**			
3.6.4.2	***… by the students talking about their drawings*** (Kaiser & Seitz, 2017), *(Adesokan & Reiners, 2015),* (Schomaker & Weddehage, 2016)					
3.6.4.3	**… by the students talking about the conduction oft he experiments** (Hößle et al., 2017)					
3.6.4.4	**… by the students dictating or whispering the interpretations or views** (Kaiser & Seitz, 2017)					
3.7.1.1	***… by the openness of hyptheses*** *(Adesokan, 2015)*	3.7.1	***Developing an open degree for diagnostics for scientific characteristics***	3.7	**Developing various degrees of openness for diagnostics for scientific characteristics**	
		3.8.1	**Developing diagnostics for scientific characteristics on a simple level of requirements** (Melle et al., 2017)	3.8	**Developing different levels of requirements for diagnostics for scientific characteristics** (Schmitt-Sody & Kometz, 2011)	
		3.8.2	**Developing diagnostics for scientific characteristics on a medium level of requirements** (Melle et al., 2017)			
		3.8.3	**Developing diagnostics for scientific characteristics on a high level of requirements** (Melle et al., 2017)			

		3.9.1	**Developing diagnostics for scientific characteristics with discussions** (Gläser & Sothmann, 2015)	3.9	**Developing diagnostics for scientific characteristics reflectively**		
		3.10.1	**Developing diagnostics for scientific characteristics multiculturally** (Buxton et al., 2019)	3.10	**Conducting diagnostics for scientific characteristics in a constructive learning atmosphere**		
				3.11	**Indefinable**		
4.1.1.1	**… by drawings** (Kaiser & Seitz, 2017)	4.1.1	***Teaching scientific concepts visually*** (Ferreira & Lawrie, 2019), (Koehler & Wild, 2019), *(Werther, 2019)*, (Rau-Patschke, 2019), (Hwang & Taylor, 2016), (Simon & Gebauer, 2014), *(Bodzin et al., 2007)*, *(Teke & Sozbilir, 2019)*, (McCarthy, 2005)	4.1	**Teaching concepts materially guided** (Kaiser & Seitz, 2017), (McGinnis, 2013), (Marino, 2010)	4.	***Teaching concepts inclusively*** (Menthe et al., 2015) *(Puddu, 2017)* (Kaiser & Seitz, 2017) (Abels, 2019) (Koehler & Wild, 2019) (Ferreira & Lawrie, 2019) (Teke & Sozbilir, 2019) (Hwang & Taylor, 2016) (Tobin & Tippett, 2014) (Abels, 2016) (Filusch, 2017) (Simon & Gebauer, 2014) (Watt et al., 2013) (Villanueva et al., 2012)
4.1.1.2	**… by concept-cartoons** (Busch & Ralle, 2013)						
4.1.1.3	***… by 2D representations of chemical reactions*** *(Teke & Sozbilir, 2019)*						
		4.1.2	***Teaching scientific concepts with helping cards*** *(Baumann et al., 2016)*				
4.1.3.1	**… by tasting salt water** (Filusch, 2017)	4.1.3	**Teaching scientific concepts by tasting materials**				
4.1.4.1	***… by Lego or building blocks*** (Nehring et al., 2017), *(Rott et al., 2017)*	4.1.4	***Teaching of scientific concepts model based*** (Koehler & Wild, 2019) *(Rosenblum et al., 2019)* (Teke & Sozbilir, 2019) (Rott & Marohn, 2016) *(Rott et al., 2017)* (Hoffmann & Menthe, 2016)				
4.1.4.2	**… by balls** (Nehring et al., 2017)						
4.1.5.1	***… by 3D representations of molecules from different beads*** *(Teke & Sozbilir, 2019)*	4.1.5	***Teaching scientific concepts tactilely*** *(Teke & Sozbilir, 2019)*				
4.1.5.2	**… by feeling stubstances** (Filusch, 2017), (Kaiser & Seitz, 2017)						
4.1.5.3	***… by tactile graphs and diagrams*** *(Rosenblum et al., 2019)*						
4.1.5.4	**… by tactile balancing of reaction equations** (Lunsford & Bargerhuff, 2006)						
4.1.5.5	**… by tactile drawings** (Teke & Sozbilir, 2019)						
		4.1.6	**Teaching scientific concepts with texts** (Teke & Sozbilir, 2019)				
4.1.7.1	**… by acoustic thermometers** (Teke & Sozbilir, 2019)	4.1.7	**Teaching scientific concepts with acoustic materials** (Teke & Sozbilir, 2019)				
		4.1.8	**Teaching scientific concepts with braille materials** (Koehler & Wild, 2019)				
4.1.9.1	**… by enlarged prints** (Koehler & Wild, 2019)	4.1.9	**Teaching scientific concepts with enlarged materials**				
		4.1.10	**Teaching scientific concepts with graphic organisers** (Watt et al., 2013)				
4.1.11.1	**… with a drum as the heartbeat** (Kaiser & Seitz, 2017)	4.1.11	**Teaching scientific concepts with the body**				
4.1.11.2	***… by rubbing the hands*** *(Schmitt-Sody, 2014)*, (Schmitt-Sody & Kometz, 2013)						
		4.2.1	**Teaching scientific concepts with building or constructing** (Rau-Patschke, 2019)	4.2	**Teaching scientific concepts action-oriented** (Teke & Sozbilir, 2019) *(Werther, 2019)* (Adl-Amini & Hardy, 2017) (Simon & Gebauer, 2014) (Marino, 2010) (Scruggs et al., 2008) *(McCarthy, 2005)* (Haskell, 2000) (Weinburgh, 1995)		
		4.2.2	**Teaching scientific concepts with experiments** *(Schmitt-Sody, 2014)* (Schmitt-Sody & Kometz, 2013) (McCarthy, 2005) (Rau-Patschke, 2019) (Baumann et al., 2018)				

		4.2.3	**Teaching scientific concepts with inquiry-based learning** *(Mumba et al., 2015)* (Brusca-Vega, Alexander, & Kamin, 2014) (Watt et al., 2013) (Villanueva, Taylor, Therrien, & Hand, 2012) (Scruggs & Mastropieri, 2007)			
4.2.4.1	**... by games like dominoes or silent mail, where the students have to switch between different representations** (Puddu, 2017)	4.2.4	**Teaching scientific concepts with games**			
4.2.4.2	**... with equipment in the sports hall** (Kaiser & Seitz, 2017)					
4.2.4.3	**... by replaying a story** (Kaiser & Seitz, 2017)					
4.2.4.4	**... with the text puzzle on substance properties** (Knipping et al., 2017)					
4.3.1.1	**... by providing verbs and word fields** (Puddu, 2017)	4.3.1	**Teaching scientific concepts with providing linguistic aids** (Abels, 2019), *(Buxton et al., 2019)*	4.3	**Teaching scientific concepts with linguistic support** (Basham, Israel, & Maynard, 2010)	
		4.3.2	**Teaching scientific concepts with scientific terminology** *(Meskill & Oliveira, 2019), (Rott & Marohn, 2018),* (Basham, Israel, & Maynard, 2010)			
		4.4.1	**Teaching scientific concepts with apps or computer programs** (Baumann & Melle, 2019), (Teke & Sozbilir, 2019), (Hwang & Taylor, 2016)	4.4	***Teaching scientific concepts digitally*** *(Werther, 2019) (Baumann & Melle, 2019)* (Koehler & Wild, 2019) (Marino, 2010) *(Bodzin et al., 2007)* (Meskill & Oliveira, 2019)	
		4.4.2	**Teaching of scientific concepts with simulations** (Schmitt-Sody & Kometz, 2011)			
4.4.3.1	***... by programs like „Wissen macht Ah!"*** *(Werther, 2019)*	4.4.3	**Teaching scientific concepts with films, broadcasts etc.**			
4.4.4.1	***... by audio books like „Löwenzahn"*** *(Werther, 2019)*	4.4.4	**Teaching scientific concepts with audio books**			
4.4.5.1	**... by a digital periodic table** (Teke & Sozbilir, 2019)	4.4.5	**Teaching scientific concepts with digital scientific information media**			
		4.4.6	***Teaching scientific concepts with PCs, smartphones, tablets etc.*** (Hwang & Taylor, 2016), *(Bodzin, Waller, Edwards, & Darlene Kale, 2007)*			
4.4.7.1	***... by a homepage like „Die Sendung mit der Maus"*** *(Werther, 2019)*	4.4.7	***Teaching scientific concepts with the internet*** *(Bodzin et al., 2007)*			
		4.5.1	**Teaching of scientific concepts with comparing and ordering** (McCarthy, 2005)	4.5	**Teaching the development of scientific concepts with cognitive support**	
4.5.2.1	**... by keyword strategies**(Watt et al., 2013)	4.5.2	**Teaching scientific concepts with memnoric strategies** (Abels, 2015b), (Watt et al., 2013)			
4.5.2.2	**... by the pegword method** (Watt et al., 2013)					
4.5.3.1	***... by examples in a concept book*** *(Rosenblum et al., 2019)*	4.5.3	***Teaching scientific concepts example-related*** *(Adesokan, 2015)*			
		4.5.4	**Teaching scientific concepts life-world related** (Menthe et al., 2015)			
		4.5.5	***Teaching scientific concepts context-based*** *(Siedenbiedel & Theurer, 2015)*			
		4.5.6	**Teaching scientific concepts problem-based** (Adl-Amini & Hardy, 2017)			
		4.5.7	***Teaching scientific concepts with nature of science*** *(Werther, 2019), (Meskill & Oliveira, 2019)*			

		4.5.8	***Teaching scientific concepts pre-knowledge/imagination-relatited*** (Ferreira & Lawrie, 2019) (Abels, 2019) (Adl-Amini & Hardy, 2017) *(Affeldt et al., 2017) (Rosenblum et al., 2019)*		
4.6.1.1	**… by discussions in the class council** (Rau-Patschke, 2019)	4.6.1	**Teaching scientific concepts orally** (Ferreira & Lawrie, 2019), (Teke & Sozbilir, 2019)	4.6	***Teaching scientific concepts communicatively*** (Abels, 2019) *(Werther, 2019) (Koehler & Wild, 2019) (McGrath & Hughes, 2018)* (Villanueva et al., 2012) *(Rott & Marohn, 2018)*
4.6.1.2	**… by the students explaining the phenomena** (Rau-Patschke, 2019)				
		4.6.2	***Teaching scientific concepts in plenary*** *(Meskill & Oliveira, 2019),* (Rank & Scholz, 2017)		
4.6.3.1	***… by peer tutoring*** *(Scruggs & Mastropieri, 2007)*	4.6.3	***Teaching scientific concepts with group work*** *(Meskill & Oliveira, 2019)*		
4.6.4.1	**… with special education teachers** (Watt et al., 2013)	4.6.4	***Teaching scientific concepts in multi-professional teams*** *(Koehler & Wild, 2019) (Rosenblum et al., 2019)* (Hwang & Taylor, 2016) (Watt et al., 2013) *(Meskill & Oliveira, 2019)*		
4.6.5.1	**… by a structured dialogue** (Marino, 2010)	4.6.5	***Teaching scientific concepts as a coach*** *(Baumann et al., 2016), (Bodzin et al., 2007)*		
4.6.5.2	**… by impulses in the conversation** (Adl-Amini & Hardy, 2017)				
4.6.5.3	**… by teacher supported groups** (Hainsworth, 2012), *(Meskill & Oliveira, 2019)*				
4.6.5.4	***…by feedback*** *(Bodzin et al., 2007)*				
		4.7.1	***Teaching scientific concepts by structured tasks*** *(Bodzin et al., 2007)*	4.7	**Teaching scientific concepts on various degrees of openness**
4.8.1.1	***… by „semantic waving"*** *(Buxton et al., 2019)*	4.8.1	**Teaching scientific concepts with created transitions between the levels**	4.8	**Teaching scientific concepts on different levels of requirements** (Hoffmann & Menthe, 2016), (Menthe et al., 2015), (Simon & Gebauer, 2014)
4.8.1.2	**… by using models** (Rott et al., 2017)				
4.8.1.3	***… first on the material level and then by including the submicroscopic level*** *(Adesokan, 2015)*				
		4.8.2	**Teaching scientific concepts by explicitly addressing the level of abstraction** (Abels, 2019)		
		4.8.3	**Teaching scientific concepts with different goals** (Menthe et al., 2015)		
		4.8.4	***Teaching scientific concepts on the phenomenal level*** (Abels, 2019), *(Brusca-Vega et al., 2014)*		
4.8.5.1	***… by self-dependent elaboration*** *(Freedberg et al., 2019)*	4.8.5	***Teaching scientific concepts on an abstract level*** *(Freedberg et al., 2019),* (Ferreira & Lawrie, 2019)		
4.8.5.2	**… by self-control** (Freedberg, Bondie, Zusho, & Allison, 2019)				
4.8.5.3	***… by fantasy journeys*** *(Rott et al., 2017)*				
		4.9.1	**Teaching scientific concepts with discussions** (Marino, 2010)	4.9	**Teaching scientific concepts reflectively**
		4.9.2	**Teaching scientific concepts with individual world constructions** (Gervé, 2014)		
		4.10.1	***Pre-teaching scientific terminology to enable the development of scientific concepts*** *(Rosenblum et al., 2019)*	4.10	***Pre-teaching scientific concepts*** *(Koehler & Wild, 2019), (Rosenblum et al., 2019),* (Marino, 2010)
		4.11.1	***Teaching of scientific concepts at school*** *(Werther, 2019)*		***Teaching scientific concepts at certain learning locations*** *(Werther, 2019)*

		4.11.2	**Teaching scientific concepts in the scool garden** (Münchhalfen, Hennemann, & Schlüter, 2016)	4.11			
		4.11.3	***Teaching scientific concepts in zoos*** *(Werther, 2019)*				
		4.11.4	***Teaching scientific concepts in museums*** *(Werther, 2019)*				
4.11.5.1	***… by smelling a freshly mowed meadow*** *(Werther, 2019)*	4.11.5	***Teaching scientific concepts in nature*** *(Rosenblum et al., 2019), (Werther, 2019)*				
4.11.5.2	**… by testing Ethiopian dental wood or branches of the Neem tree for dental care** (Kaiser & Seitz, 2017)						
4.11.5.3	***… by collecting interesting things from nature****(Werther, 2019)*						
4.11.5.4	***… by laying at a stream or pond*** *(Werther, 2019)*						
4.11.5.5	***… by observing animals*** *(Werther, 2019)*						
4.11.5.6	***… by painting plants or animals in nature*** *(Werther, 2019)*						
4.11.5.7	***… by climbing up a tree*** *(Werther, 2019)*						
4.11.5.8	***… by planting flowers in different habitats*** *(Werther, 2019)*						
4.11.5.9	***… by holding in the hand or stroking animals*** *(Werther, 2019)*						
4.11.5.10	***… by caring of animals or plants*** *(Werther, 2019)*						
		4.12.1	***Teaching scientific concepts with classroom-management methods*** *(Pawlak & Groß, 2019)*	4.12	**Teaching of scientific concepts in a constructive learning atmosphere**		
				4.13	**Indefinable**		
		5.1.1	***Creating visual scientific contexts*** *(Schroeder & Miller, 2019)*	5.1	**Creating scientific contexts materially guided**	5.	**Creating inclusive scientific contexts** (Abels, 2015b), (Abels, 2019), (Gläser, 2014)
				5.2	**Creating action-oriented scientific contexts** *(Schroeder & Miller, 2019)*		
		5.3.1	**Creating phenomena-based scientific contexts** *(Freedberg, Bondie, Zusho, & Allison, 2019)*	5.3	**Creating scientific contexts with cognitive support**		
		5.3.2	**Creating scientific contexts with research biographies** (Schomaker & Weddehage, 2016)				
		5.3.3	**Creating scientific contexts via the learning object itself** (Schomaker & Weddehage, 2016)				
		5.3.4	**Creating relevant scientific contexts** *(Chetcuti, 2009)*				
				5.4	**Pre-teaching scientific contexts** (Abels, 2016)		
		5.5.1	***Creating gender-neutral scientific contexts*** *(Chetcuti, 2009)*	5.5	**Creating scientific contexts in a consctructive learning atmosphere**		
		5.5.2	***Creating scientific contexts on the basis of the students' cultural background*** *(Chetcuti, 2009)*				
				5.6	**Indefinable**		
6.1.1.1	**… by the pictorial representation of technical terms in the device list** (Markic & Bruns, 2013)	6.1.1	***Enabling the development of scientific terminology visually*** (Puddu, 2017), (Pötter, 2017), *(Schmitt-Sody,*	6.1	**Teaching scientific terminology materially guided**	6.	***Enabling the development of scientific***
6.1.1.2	***… by pictograms*** *(Adesokan & Reiners, 2015)*						

6.1.1.3	**… by cartoons about the scientific terms and their meaning** (Busch & Ralle, 2013)		*2014), (Watt et al., 2014),* (Markic & Abels, 2013), (Schmitt-Sody & Kometz, 2013), *(Schmitt-Sody, 2014)*			***terminology inclusively*** *(Meskill & Oliveira, 2019)* (Rau-Patschke, 2019) (Knipping et al., 2017) (Markic & Abels, 2013) (Watt et al., 2013) *(Puddu, 2017) (Adesokan & Reiners, 2015) (Browder et al., 2012)* (Koomen, 2016) (Ralle, 2015)
6.1.1.4	***… by labelling of illustrations*** *(Adesokan & Reiners, 2015)*					
6.1.1.5	***… by symbols*** *(Adesokan, 2015),*					
		6.1.2	**Enabling the development of scientific terminology model based** (Pötter, 2017)			
6.1.3.1	**… by help for text comprehension** (Puddu, 2017)	6.1.3	***Enabling the development of scientific terminology with texts*** *(Schmitt-Sody, 2014,)*(Markic & Abels, 2013)			
6.1.4.1	***… by word walls*** *(Collier et al., 2016)*	6.1.4	**Enabling the development of scientific terminology with graphic organisers** (Abels, 2014b) (Brusca-Vega et al., 2014) (Watt et al., 2013) (Rau-Patschke, 2019) (Rau-Patschke, 2019)			
6.1.4.2	***… by concept maps*** *(Schmitt-Sody, 2014)*					
		6.1.5	***Enabling the development of*** **scientific terminology with graphic organisers** *(Adesokan & Reiners, 2015),* (Markic & Abels, 2013)			
6.1.6.1	***… by glossaries*** *(Affeldt et al., 2018), (Schmitt-Sody & Kometz, 2014), (Schmitt-Sody, 2014)*	6.1.6	**Enabling the development of scientific terminology with lexical storages** (Pötter, 2017)			
6.1.6.2	**… by word lists** (Rau-Patschke, 2019)					
6.1.6.3	**… by posters** (Abels, 2013b)					
6.1.6.4	**… by tables with scientific terms** (Huber, 2017), (Markic & Bruns, 2013)					
6.1.7.1	**… by everyday meanings, which are in contrast to the scientific terms** (Knipping et al., 2017)	6.1.7	***Enabling the development of scientific terminology with help cards*** *(Adesokan, 2015)*			
6.1.7.2	***… by the concrete objects with the scientific terms*** *(Adesokan & Reiners, 2015)*					
		6.2.1	***Enabling the development of scientific terminology with inquiry-based learning*** *(McGrath & Hughes, 2018)*	6.2	***Enabling the development of scientific terminology action-oriented*** *(Adesokan, 2015) (Browder et al., 2012) (Bodzin et al., 2007) (Rosenblum et al., 2019)*	
		6.2.2	**Enabling the development of scientific terminology by presenting technical terms as action** (Markic & Abels, 2013)			
6.2.3.1	**… by text puzzles on scientific topics** (Knipping et al., 2017)	6.2.3	***Enabling the development of scientific terminology with games*** *(Puddu, 2017)*			
6.2.3.2	**… by silent mail** (Markic & Abels, 2013)					
6.2.3.3	**… by domino games** (Markic & Abels, 2013)					
6.2.3.4	**… by memory games** (Markic & Abels, 2013)					
6.2.3.5	**… by the image of a soccer game** (Schmitt-Sody & Kometz, 2011)					
6.3.1.1	**… by unsing short sentences** (Puddu, 2017)	6.3.1	**Enabling the development of scientific terminology with lingusitic simplifications**	6.3	**Enabling the development of scientific terminology with linguistic support** (Nehring et al., 2017) (Buxton et al., 2019) (Rau-Patschke, 2019) (Puddu, 2017) (Rau-Patschke, 2019)	
6.3.1.2	**… by using active instead of passive sentence constructions** (Puddu, 2017)					
6.3.1.3	**… by avoiding nominalization** (Puddu, 2017)					
6.3.1.4	**… by avoiding nesting** (Puddu, 2017)					

6.3.1.5	... by reducing scientific terms (Puddu, 2017)					
6.3.1.6	... by underlining important scientific terms as highlights (Hainsworth, 2012)					
6.3.1.7	... by syllable markings (Schmitt-Sody, 2014)					
6.3.1.8	... by articles and plural forms to the technical terms (Puddu, 2017) (Markic & Bruns, 2013)					
6.3.1.9	... by keywords (Therrien et al., 2014)					
6.3.1.10	... by sentence beginnings(Pötter, 2017)					
6.3.2.1	… by translating the scientific terms into many different languages (Kaiser & Seitz, 2017)	6.3.2	Enabling the development of scientific terminology multilingually (Puddu, 2017)			
6.3.2.2	… by using bilingual dictionaries (Collier et al., 2016)					
6.3.3.1	… by pictograms of the scientific sign language (Adesokan & Reiners, 2015)	6.3.3	Enabling the development of scientific terminology with scientific sign language (Adesokan & Reiners, 2015), (Adesokan, 2015), (Schmitt-Sody et al., 2015)			
6.3.3.2	…by cards with photo of the scientific sign language, word and short description (Schmitt-Sody, 2014)					
6.3.3.3	… by glossaries of the scientific sign language (Schmitt-Sody & Kometz, 2014), (Schmitt-Sody, 2014)					
6.3.3.4	… by chemistry photo stories of the scientific sign language (Schmitt-Sody, 2014)					
6.3.3.5	… by pictures with the scientific sign language (Schmitt-Sody, 2014)					
6.4.1.1	… by the „Keynote"-App (Ok et al., 2017)	6.4.1	Enabling the development of scientific terminology with apps or computer programs	6.4	Enabling the development of scientific terminology digitally (Meskill & Oliveira, 2019), (Sormunen, Lavonen, & Juuti, 2019)	
6.5.1.1	… by keyword strategies (Watt et al., 2014), (Scruggs, Mastropieri, & Okolo, 2008)	6.5.1	Enabling the development of scientific terminology with memnoric strategies (Puddu, 2017) (Abels, 2014b) (Watt et al., 2014) (Watt et al., 2013) (Scruggs & Mastropieri, 2007) (Abels, 2015b) (Rau-Patschke, 2019)	6.5	Enabling the development of scientific terminology with cognitive support	
6.5.1.2	… by key concepts oft he scientific terms (Watt et al., 2014)					
6.5.1.3	… by the „pegword"-method (Watt et al., 2014)					
6.5.1.4	… by letter strategies (Watt et al., 2014)					
6.5.2.1	… by writing repetitions (Schmitt-Sody, 2014)	6.5.2	Enabling the development of scientific terminology with repetition (Watt et al., 2014), (McGinnis, 2013), (Rau-Patschke, 2019)			
6.5.2.2	… by repeatedly showing the scientific terms (Browder et al., 2012)					
6.5.2.3	… by repeating important parts of a sentence (Puddu, 2017)					
6.5.3.1	… durch Erklärungen der Bedeutung der Fachbegriffe (Koomen, 2016), (Markic & Abels, 2013), (Knipping et al., 2017)	6.5.3	Enabling the development of scientific terminology by explanations (Puddu, 2017), (Meskill & Oliveira, 2019), (Schmitt-Sody & Kometz, 2011), (Arndt & Szolak, 2007), (Markic & Abels, 2013)			
6.5.4.1	… by example sentences for the scientific terms (Markic & Bruns, 2013)	6.5.4	Enabling the development of scientific terminology with examples (Rosenblum et al., 2019), (Rau-Patschke, 2019)			
6.5.4.2	… by analogies from everyday life (Markic & Abels, 2013), (Rosenblum et al., 2019), (Rau-Patschke, 2019)					
		6.5.5	Enabling the development of scientific terminology by using familiar terms (Adesokan & Reiners, 2015)			

		6.5.6	***Enabling the development of scientific terminology with concept-based*** *(Adesokan, 2015)*				
		6.5.7	**Enabling the development of scientific terminology context-based** (Busch & Ralle, 2013)				
6.5.8.1	**… by explaining various word associations** (Koomen, 2016), (Knipping et al., 2017)	6.5.8	**Enabling the development of scientific terminology with students' conceptions**				
6.6.1.1	**… by stories about the scientific terminology** (Markic & Abels, 2013)	6.6.1	**Enabling the development of scientific terminology orally**	6.6	**Enabling the development of scientific terminology communicatively** (Rau-Patschke, 2019), (Puddu, 2017)		
6.6.2.1	**… by groups according to the students' first languages** (Puddu, 2017)	6.6.2	**Enabling the development of scientific terminology with group work** (Rau-Patschke, 2019), (Markic & Abels, 2014)				
		6.6.2	**Enabling the development of scientific terminology with single work** (Rau-Patschke, 2019)				
6.6.3.1	**… as a role model** (Rau-Patschke, 2019), (Knipping et al., 2017)	6.6.3	**Enabling the development of scientific terminology as a coach**				
6.6.3.2	**… by a corrective approach to mistakes** (Rau-Patschke, 2019)						
6.6.3.3	**… by demanding the use of scientific terminology** (Rau-Patschke, 2019)						
6.7.1.1	***… by "semantic waving"*** *(Buxton et al., 2019)*	6.7.1	***Creating transitions to more abstract scientific terminology*** *(Buxton et al., 2019)*	6.7	**Enabling the development of scientific terminology on different levels of requirements** (Rau-Patschke, 2019)		
		6.7.2	**Creating the development of scientific terminology with different levels of operators** (Rau-Patschke, 2019)				
	… by everyday objects that have the same characteristics as the scientific terms (Markic & Abels, 2013)	6.8.1	***Enabling the development of scientific terminology with comparisons*** (Rau-Patschke, 2019) *(Collier et al., 2016)*	6.8	**Enabling the development of scientific terminology reflectively** (Rau-Patschke, 2019)		
6.8.2.1	**… by discussing incorrect formulations** (Busch & Ralle, 2013)	6.8.2	**Enabling the development of scientific terminology with discussions**				
				6.9	***Pre-teaching scientific terminonoly*** *(Rosenblum et al., 2019), (Kahn et al., 2017)*		
6.10.1.1	**… by appreciating mistakes** (Rau-Patschke, 2019)	6.10.1	**Enabling the development of scientific terminology appreciatively**	6.10	**Enabling the development of scientific terminology in a constructive learning atmosphere**		
		6.10.2	**Enabling the development of scientific terminology with time** (Rau-Patschke, 2019)				
				6.11	**Indefinable**		
7.1.1.1	**… by help cards for the experimental setup** (Abels et al., 2019)	7.1.1	***Creating inquiry-based learning with help cards*** (Abels, 2019), (Abels et al., 2019), *(Affeldt et al., 2017)*, (Abels, 2015b), (Abels, 2014b)	7.1	***Creating inquiry-based learning materially guided*** (Abels, 2015b), *(Abels et al., 2019)*	7.	***Creating inclusive inquiry-based learning*** (Koehler & Wild, 2019) (Vavougios, Verevi, Papalexopoulos, Verevi, & Panagopoulou, 2016) (Mulvey, Chiu, Ghosh, & Bell, 2016) (Markic & Abels,
7.1.1.2	**… by help cards with questions** (Abels et al., 2019)						
7.1.1.3	**… by help cards with hints on the materials that can be used** (Abels, 2015b)						
7.1.1.4	**… by help cards with hypotheses** (Abels, 2015b)						
7.1.1.5	**… by help cards with possible experimental procedures** (Abels et al., 2019)						
7.1.1.6	**… by joker cards to spy on other groups** (Abels, 2015b)						
7.1.2.1	***… by mapping the inquiry cycle*** *(Puddu, 2017)*	7.1.2					

7.1.2.2	**... by a drawing of the experimental setup** (Abels, 2015b)		**Creating inquiry-based learning visually** (Abels, Demmel, Minnemann, Rathig, & Semmler, 2019), (Abels, 2019)			2014) (Maroney, Finson, Beaver, & Jensen, 2003) (Abels et al., 2019) (Puddu, 2017) (Abels, 2015b) (Abels, 2019) (McGrath & Hughes, 2018) *(Kahn et al., 2017)* (Abels, 2015b) (Abels, 2013a) (Abels, 2016) (Puddu, 2017) (Abels, 2014b) *(Therrien et al., 2014)*
7.1.3.1	**... by a different number of materials on the material table** (Abels et al., 2014)	7.1.3	**Creating inquiry-based learning with material tables** (Abels, 2019), (Abels, 2015b), (Abels, 2013a)			
7.1.3.2	**... by adding materials on the material table according to the ideas of the students** (Abels et al., 2014)					
		7.1.4	**Creating inquiry-based learning with structuring materials** (Abels et al., 2019), (Abels et al., 2019)			
7.1.5.1	**… by glossaries** Developing glossary of terms that guide students through the inquiry process (Marino, 2010)	7.1.5	**Creating inquiry-based learning with lexical storages**			
		7.2.1	**Creating inquiry-based learning with text enhancements** (Abels, 2014b)	7.2	**Creating inquiry-based learning with linguistic support** (Abels, 2014b)	
		7.2.2	**Creating inquiry-based learning with scientific terminology** (Abels, 2014b)			
				7.3	***Creating inquiry-based learning digitally*** *(Bodzin et al., 2007)*	
7.4.1.1	***... by repeatedly thematizing the inquiry cycle*** *(Puddu, 2017)*	7.4.1	**Creating inquiry-based learning with repetition**	7.4	**Creating inquiry-based learning with cognitive support**	
		7.4.2	***Creating inquiry-based learning life-world related*** *(Bodzin et al., 2007),* (Maroney et al., 2003)			
7.5.1.1	**... by structuring elements that guide the group work** (Abels, 2015a)	7.5.1	***Creating inquiry-based learning with group work*** *(Abels et al., 2019),* (Abels, 2015b)	7.5	**Creating inquiry-based learning communicatively** (Abels, 2015a), (Abels, 2015b), (Maroney et al., 2003)	
		7.5.2	**Creating inquiry-based learning with partner work** (McGrath & Hughes, 2018)			
7.5.3.1	**… by „peer-tutoring“** (Abels, 2014b) (Brusca-Vega et al., 2014)	7.5.3	**Creating inquiry-based learning with collaborative help systems**			
7.5.4.1	**… by the “reflective toss”** (Abels, 2015b) (Puddu, 2017)	7.5.4	**Creating inquiry-based learning as a coach** (Abels et al., 2019) (Puddu, 2017) (Mulvey et al., 2016) (Abels, 2016) (Abels, 2014a) (McGrath & Hughes, 2018) (Abels, 2015b) (Abels, 2014b)			
7.5.4.2	**… by suggestions** (Marino, 2010) (Abels, 2015b)					
7.5.4.3	***... by questions for the further development of the students' ideas*** *(Puddu, 2017)* (Abels, 2015b)					
7.5.4.4	***... by focusing on the task*** *(Puddu, 2017)*					
7.5.4.5	***... with questions about the state of health*** *(Puddu, 2017)*					
7.5.4.6	***… by „open“ or „real“ questions*** *(Puddu, 2017)*					
7.5.4.7	**... by students getting approval** (Abels, 2015b)					
7.5.4.8	**… by prompts** (Marino, 2010)					
7.5.5.1	**… together with special educators** (Watt et al., 2013)	7.5.5	**Creating inquiry-based learning with multi-professional teams** (Brusca-Vega et al., 2014), (Maroney et al., 2003)			
7.6.1.1	**... together with special education teachers** (Watt et al., 2013)	7.6.1	***Introducing inquiry-based learning gradually***(Abels, 2016) (Abels, 2015b) (Abels et al., 2014) (Abels, 2019) (Puddu, 2017) *(Affeldt et al., 2017)*	7.6	**Creating inquiry-based learning with various degrees of openness** (Abels et al., 2019) (Abels, 2019) *(Affeldt et al.,*	
7.6.1.2	**... by controlling more parts in the beginning, until the students can take them over** (Puddu, 2017)					

7.6.2.1	**... by reducing the number of process steps** (Puddu, 2017)	7.6.2	**Applying Level 0 of inquiry-based learning** (Bronner, 2013), (Abels, 2015b)		*2018)* (Abels, 2015b) (Puddu, 2017) (Abels, 2014b) (Abels et al., 2014) (Mulvey et al., 2016) (McGinnis, 2013) (Watt, Therrien, Kaldenberg, & Taylor, 2013) (Abels, 2016) (Abels, 2014a) (Bachmann, 2012) (Bronner, 2013) *(Bodzin et al., 2007)*
7.6.2.2	***... by supporting the handling of the devices*** *(Puddu, 2017)* (Abels, 2015b) (Abels, 2014b)				
7.6.2.3	***... by supporting scientific methods*** *(Puddu, 2017)*				
7.6.2.4	***... by supporting with given implementations***(Puddu, 2017) (Abels, 2015b) (Abels, 2014b)				
7.6.2.5	***... by supporting with attention*** *(Puddu, 2017)*				
7.6.2.6	***... by supporting with focusing*** *(Puddu, 2017)*				
7.6.2.7	***... by supporting with activation of previous knowledge*** *(Puddu, 2017)*				
7.6.3.1	**... by letting the students implement simple scientific methods** (Puddu, 2017)	7.6.3	**Applying Level 1 of inquiry-based learning** (Bronner, 2013)		
7.6.3.2	**... by supporting the observing** (Puddu, 2017) (Abels, 2015b) (Abels, 2014b)				
7.6.3.3	***... by supporting with focussing*** *(Puddu, 2017)*				
7.6.3.4	**... by letting students implement data evaluation and presentation of results** (Abels, 2014b) (Abels, 2015b)				
7.6.3.5	**... by letting students observe** (Abels, 2014b)				
7.6.4.1	***... by letting scientific methods be implemented*** *(Puddu, 2017)* (Abels, 2015b)	7.6.4	***Applying Level 2 of inquiry-based learning*** *(Puddu, 2017)* (Bronner, 2013)		
7.6.4.2	**... by supporting in asking questions** (Abels, 2015b)				
7.6.4.3	***... by letting implement data evaluation and presentation of results*** *(Puddu, 2017)* (Abels, 2014b)				
7.6.4.4	***... by supporting the understanding of the task*** *(Puddu, 2017)*				
7.6.4.5	***... by supporting the formation of hypotheses*** (Puddu, 2017) (Abels, 2014b)				
7.6.5.1	**... by relieving learning through existing competencies of the students** (Abels et al., 2019)	7.6.5	**Applying Level 3 of inquiry-based learning** (Bronner, 2013)		
7.6.5.2	**... by letting students take responsibility** (Puddu, 2017) (Abels, 2015b)				
7.6.5.3	**... by letting students formulate hypotheses and scientific questions** (Puddu, 2017) (Abels, 2015b) (Abels, 2014b)				
7.6.5.4	**... by supporting them by responding to their ideas and thoughts** (Puddu, 2017)				
		7.7.1	**Creating inquiry-based learning with different levels of complexity of the task** (Abels, 2013a)	7.7	**Creating inquiry-based learning on different levels of requirements** (Puddu, 2017)
		7.8.1	**Identifying competences required for inquiry-based learning** (Maroney et al., 2003)	7.8	**Creating reflective inquiry-based learning** (Maroney et al., 2003)
		7.9.1	**Creating inquiry-based learning at out-of-school places of learning** (Simon & Pech, 2019)	7.9	**Creating inquiry-based learning for certain learning locations**
		7.10.1	**Creating inquiry-based learning with patience** (Maroney et al., 2003)	7.10	**Creating inquiry-based learning in a constructive learning atmosphere**

		7.10.2	**Creating inquiry-based learning meaningful and motivating** (Marino, 2010)				
7.10.3.1	**... by acknowledging unexpected results** (Maroney et al., 2003)	7.10.3	**Creating inquiry-based learning with flexibility** (Maroney et al., 2003)				
7.10.3.2	**... by admitting ignorance and readiness to find solutions** (Maroney et al., 2003)						
7.10.4.1	**... by selecting the questions according to interest** (Abels, 2013a)	7.10.4	**Creating inquiry-based learning student-centred** (Puddu, 2017)				
		7.10.5	**Creating inquiry-based learning with appreciating mistakes** (Maroney et al., 2003)				
7.10.6.1	**... without rating of the experimental approaches** (Maroney et al., 2003)	7.10.6	**Creating inquiry-based learning value-neutral**				
		7.10.7	**Creating inquiry-based learning with ingenuity** (Maroney et al., 2003)				
				7.11	**Indefinable**		
		8.1.1	**Teaching scientific phenomena with tangible materials** (Rank & Scholz, 2017)	8.1	**Teaching scientific phenomena materially guided**	8.	**Teaching scientific phenomena inclusively** (Rank & Scholz, 2017) (Schroeder, 2014) (Kaiser & Seitz, 2017) (Gebauer & Simon, 2012)
		8.1.2	**Teaching scientific phenomena in a tactile way** (Kaiser & Seitz, 2017)				
		8.1.3	**Teaching scientific phenomena with olfactory materials** (Kaiser & Seitz, 2017)				
		8.1.4	**Teaching scientific phenomena with acoustic materials**				
8.1.5.1	**… by wall newspapers** (Kaiser & Seitz, 2017)	8.1.5	**Teaching scientific phenomena visually** (Kaiser & Seitz, 2017), (Rank & Scholz, 2017)				
8.1.6.1	**… by models from building blocks** (Rott & Marohn, 2016)	8.1.6	**Teaching scientific phenomena model based**				
8.1.7.1	**… by magnifying glasses** (Kaiser & Seitz, 2017)	8.1.7	**Enabling access to phenomena with scientific equipment**				
8.2.1.1	**… by observing an experiment** (Rott & Marohn, 2016)	8.2.1	**Teaching scientific phenomena with experiments** (Rott & Marohn, 2016)	8.2	***Teaching scientific phenomena action-oriented*** *(Werther, 2019)* (Blumberg & Mester, 2017) (Adl-Amini & Hardy, 2017)		
		8.2.2	***Teaching scientific phenomena with inquiry-based learning*** *(Werther, 2019)*				
8.2.3.1	**… by memory games** (Markic & Abels, 2013)	8.2.3	**Teaching scientific phenomena with games**				
8.2.3.2	**… by domino games** (Markic & Abels, 2013)						
		8.3.1	**Teaching scientific phenomena with scientific literacy** (Puddu, 2017)	8.3	**Teaching scientific phenomena with linguistic support**		
		8.4.1	**Making scientific phenomena perceptible with a macro camera** (Kaiser & Seitz, 2017)	8.4	**Teaching scientific phenomena digitally**		
8.5.1.1	***… by simplification / reduction*** *(Siedenbiedel & Theurer, 2015)* (Rank & Scholz, 2017)	8.5.1	***Teaching scientific phenomena in an elementary way*** *(Siedenbiedel & Theurer, 2015)* (Rank & Scholz, 2017)	8.5	**Teaching scientific phenomena on different levels of requirements** (Schroeder, 2014) (Adl-Amini & Hardy, 2017)		
8.5.1.2	**… by reversing** (Rank & Scholz, 2017)						
8.5.1.3	**… by combining** (Rank & Scholz, 2017)						
8.5.1.4	**… by modifying** (Rank & Scholz, 2017)						
8.5.1.5	**… by substituting** (Rank & Scholz, 2017)						
8.5.1.6	**… by magnification** (Rank & Scholz, 2017)						

		8.5.2	***Teaching complex scientific phenomena*** *(Siedenbiedel & Theurer, 2015)*				
		8.6.1	***Teaching scientific phenomena in nature*** *(Werther, 2019)*	8.6	**Teaching scientific phenomena at different learning locations**		
8.7.1.1	**… by rituals** (Kaiser & Seitz, 2017)	8.7.1	**Teaching scientific phenomena with classroom management strategies**	8.7	**Teaching scientific phenomena in a constructive learning atmosphere**		
				8.8	**Indefinable**		
		9.1.1	**Teaching scientific models tactile** (Koehler & Wild, 2019), (Rosenblum, Ristvey, & Hospitál, 2019)	9.1	**Teaching scientific models materially guided** (Abels, 2019)	9.	***Teaching scientific models inclusively*** (Ferreira & Lawrie, 2019), *(Teke & Sozbilir, 2019)*
9.1.2.1	**… by verbal descriptions** (Rosenblum et al., 2019)	9.1.2	**Teaching scientific models with acoustic materials** *(Werther, 2019), (Lahav et al., 2019)*				
9.1.2.2	***… by different tones for colliding particles*** *(Lahav, Hagab, Levy, & Talis, 2019)*						
9.1.2.3	**… by translating text into speech** (Lahav et al., 2019)						
9.1.3.1	**… by modelling with modelling clay or similar** (Kaiser & Seitz, 2017)	9.1.3	**Teaching scientific models with modelable materials** *(Teke & Sozbilir, 2019)*, (Schroeder & Miller, 2019)				
9.1.3.2	**… by grinding material like soapstone** (Kaiser & Seitz, 2017)						
9.1.3.3	**… by everyday objects like mortars as tooth models** (Kaiser & Seitz, 2017)						
9.1.3.4	***… by modelling from platelets etc.*** *(Rott et al., 2017)*						
9.1.3.5	***… by modelling from Lego bricks*** *(Rott & Marohn, 2018)*						
9.2.1.1	**… with „NavMol“** (Vitoriano et al., 2016)	9.2.1	**Teaching scientific models with apps or computer programs**	9.2	**Teaching scientific models digitally**		
9.2.1.2	**… with the „Molecule viewer“** (Nehring et al., 2017)						
		9.2.2	***Teaching scientific models with simulations****(Koehler & Wild, 2019),*				
9.3.1.1	**… by comparing with your own body** (Kaiser & Seitz, 2017)	9.3.1	**Teaching scientific models by ordering or comparing**	9.3	**Teaching scientific models with cognitive support**		
		9.3.2	**Supporting the use of models by developing model competences** (Ferreira & Lawrie, 2019)				
		9.4.1	***Supporting the work with models in groups*** *(Schroeder & Miller, 2019)*	9.4	**Teaching scientific models communicatively**		
9.4.2.1	***… by instructions*** *(Teke & Sozbilir, 2019)*	9.4.2	**Supporting the work with models as a coach**				
		9.5.1	**Teaching models openly** (Schroeder & Miller, 2019)	9.5	**Teaching scientific models on various degrees of openness**		
		9.6.1	***Differentiating models from reality*** *(Adesokan, 2015)*	9.6	**Teaching scientific models reflectively** (Rott & Marohn, 2016) (Kaiser & Seitz, 2017)		
		9.6.2	***Justifying the existence of different models*** *(Rott et al., 2017)*				
		9.7.1	***Showing models in advance*** *(Rosenblum et al., 2019)*	9.7	**Pre-teaching scientific models**		
				9.8	**Indefinable**		
		10.1.1	**Creating the generation of hypotheses and research questions model based** (Pötter, 2017)	10.1	***Creating generation of hypotheses and research questions materially guided*** (Abels, Puddu, & Lembens, 2014), (Abels, 2013b), *(Abels, 2014a)*	10.	***Creating inclusive generation of hypotheses and research questions***
		10.1.2	***Creating the generation of hypotheses and research questions with help cards*** *(Adesokan, 2015)*, (Abels, 2013b)				

		10.1.3	***Creating the generation of hypotheses and research questions visually*** (Pötter, 2017), (Kaiser & Seitz, 2017), *(Siedenbiedel & Theurer, 2015)*, (Rank & Scholz, 2017)			*(Adesokan & Reiners, 2015)*
		10.1.4	**Creating the generation of hypotheses and research questions with graphic organisers** (Kaiser & Seitz, 2017)			
		10.1.5	**Creating the generation of hypotheses and research questions with structuring on the blackboard** (Kaiser & Seitz, 2017), (Hainsworth, 2012)			
		10.2.1	**Creating the generation of hypotheses and research questions multilingual** (Kaiser & Seitz, 2017)	10.2	***Creating generation of hypotheses and research questions with linguistic support*** *(Siedenbiedel & Theurer, 2015)*	
10.2.2.1	***… by ticking off*** (Rank & Scholz, 2017), *(Siedenbiedel & Theurer, 2015)*	10.2.2	**Creating the generation of hypotheses and research questions with linguistic simplifications**			
10.2.2.2	**… by given sentence beginnings** (Abels et al., 2014), (Pötter, 2017)					
10.2.2.3	**… by pre-formulated sentences** (Rank & Scholz, 2017)					
		10.3.1	***Creating the generation of hypotheses and research questions phenomena based*** *(Abels, 2014a)*	10.3	**Creating generation of hypotheses and research questions with cognitive support**	
10.3.2.1	***… by assigning the materials to the corresponding terms*** *(Schmitt-Sody, 2014)*	10.3.2	**Creating the generation of hypotheses and research questions by ordering or comparing**			
10.3.2.2	***… by assigning images to the corresponding terms*** *(Schmitt-Sody, 2014)*					
		10.4.1	***Supporting the generation of hypotheses and research questions in plenary*** *(Baumann et al., 2016)*	10.4	**Creating generation of hypotheses and research questions communicatively**	
		10.4.2	**Supporting the generation of hypotheses and research questions in partner work** (Abels, 2013b)			
10.4.3.1	**… by including and integrating into the students' thinking process** (Kaiser & Seitz, 2017)	10.4.3	**Supporting the generation of hypotheses and research questions as a coach** (Maroney et al., 2003)			
10.5.1.1	**… by specifications** (Abels et al., 2014)	10.5.1	**Creating the generation of hypotheses and research questions in a closed way**	10.5	**Creating generation of hypotheses and research questions with various degrees of openness**	
		10.5.2	**Creating the generation of hypotheses and research questions in an open way**(Abels, 2019)			
		10.6.1	**Creating transitions of hypotheses and research questions from concrete to abstract** (Buxton et al., 2019)	10.6	**Creating the generation of hypotheses and research questions on different levels of requirements**	
		10.6.2	***Enabling the generation of challenging hypotheses and research questions*** *(Freedberg, Bondie, Zusho, & Allison, 2019)*			
		10.7.1	***Enabling the generation of hypotheses and research questions in the „Lernwerkstatt"*** (Abels, 2016) *(Abels, 2014a)*	10.7	**Creating the generation of hypotheses and research questions at different learning locations**	
		10.8.1	**Enabling the generation of hypotheses and research questions appreciatively** (Kaiser & Seitz, 2017)	10.8	**Creating the generation of hypotheses and research questions in a constructive learning atmosphere**	

		10.8.2	**Enabling the generation of hypotheses and research questions starting from the questions of the students** (Kaiser & Seitz, 2017)				
				10.9	**Indefinable**		
11.1.1.1	**… by producing sketches** (Arndt & Szolak, 2007)	11.1.1	***Developing visual scientific information media*** *(Puddu, 2017)* (Scholz, Dönges, Dechant et al., 2016) (Rott & Marohn, 2016) (Nehring et al., 2017) (Rank & Scholz, 2017) *(Kahn et al., 2017)* (Pötter, 2017) (Filusch, 2017) *(Adesokan & Reiners, 2015)* (Schmitt-Sody et al., 2015) *(Schmitt-Sody, 2014)* (Abels, 2013b) (Markic & Bruns, 2013) *(Baumann et al., 2016)*	11.1	***Developing scientific information media materially guided*** *(Muth & Erb, 2019) (Rosenblum, Ristvey, & Hospitál, 2019) (Teke & Sozbilir, 2019)* (Melle, Schlüter, Nienaber, & Wember, 2017) (Scholz, Dönges, Dechant et al., 2016) *(Puddu, 2017)* (Abels, 2019)	11.	**Developing inclusive scientific information media** (Schmitt-Sody & Kometz, 2011) (Pötter, 2017) (Abels, 2013b) (Koehler & Wild, 2019) (Nehring et al., 2017)
11.1.1.2	**… by symbols which represent the whole text** (Scholz, Dönges, Dechant et al., 2016)						
11.1.1.3	**… by symbols for important words of the sentence** (Scholz, Dönges, Dechant et al., 2016)						
11.1.1.4	**… by symbols as mathematical equations** (Scholz, Dönges, Dechant et al., 2016)						
11.1.1.5	***… by photos, pictograms or symbols*** (Scholz, Dönges, Dechant et al., 2016) *(Schmitt-Sody, 2014)*						
11.1.1.6	***… by graphs*** *(Muth & Erb, 2019) (McGrath & Hughes, 2018)* (Scruggs et al., 2008)						
11.1.2.1	**… by short one-sentence-constructions** (Markic & Bruns, 2013)	11.1.2	***Developing scientific information media with aids by text design*** (Scholz, Dönges, Dechant et al., 2016), *(Puddu, 2017), (Schmitt-Sody, 2014),* (Abels, 2013b)				
11.1.3.1	***… by braille periodic tables*** (Lunsford & Bargerhuff, 2006) (Koehler & Wild, 2019) *(Fantin et al., 2016)* (Teke & Sozbilir, 2019)	11.1.3	***Developing scientific information media with braille****(Teke & Sozbilir, 2019)*				
11.1.3.2	***… by the braille printers*** *(Teke & Sozbilir, 2019)*						
11.1.3.3	**… by braille science books** (Vitoriano et al., 2016)						
		11.1.4	***Developing tactile scientific information media*** *(Koehler & Wild, 2019), (Rosenblum et al., 2019)*				
11.1.5.1	***… by calendar representations*** *(Siedenbiedel & Theurer, 2015)*	11.1.5	***Developing scientific information media with graphic organisers*** (Koomen, 2016), *(Watt, Therrien, & Kaldenberg, 2014),* (Watt et al., 2013)				
11.1.5.2	**… by concept maps** (Hwang & Taylor, 2016)						
		11.1.6	***Developing enlarged scientific information media*** *(Rosenblum et al., 2019),* (Nehring et al., 2017), (Nehring et al., 2017)				
11.1.7.1	**… by reading aloud** (Schmitt-Sody & Kometz, 2011), (Cawley, Hayden, Cade, & Baker-Kroczynski, 2001)	11.1.7	***Developing acoustic scientific information media*** *(Koehler & Wild, 2019),* (Teke & Sozbilir, 2019), *(Rosenblum et al., 2019)*				
11.1.7.2	***… by verbal descriptions of science books*** *(Fantin et al., 2016)*						
11.1.7.3	***… by real-time data readings*** *(Koehler & Wild, 2019)*						
11.1.7.5	***… by audio pens*** *(Fantin et al., 2016)*						
11.1.8.1	**… by video instructions with individual plot sections as scenes** (Scholz, Dönges, Dechant et al., 2016)	11.1.8	***Developing scientific information media video based*** (Scholz, Dönges, Dechant et al., 2016), *(McGrath & Hughes, 2018)*				
11.1.8.2	**… by video instructions from the perspective of the person himself** (Scholz, Dönges, Dechant et al., 2016)						
		11.1.9	**Developing scientific information media comi based** (Affeldt et al., 2018)				
11.1.10.1	***… by help cards with pictures and explanatory aids for implementation*** *(Schmitt-Sody, 2014)*	11.1.10	***Developing scientific information media with help cards*** *(Baumann et al., 2018), (Affeldt et al., 2018)*				
11.1.11.1	***… by word lists*** (Busch & Ralle, 2013) *(Affeldt et al., 2017)*	11.1.11					

11.1.11.2	**... by glossaries** (Abels, 2013a)		**Supporting learning with scientific information media by structuring** (Nehring et al., 2017), (Rott & Marohn, 2016), (Schmitt-Sody et al., 2015), (Melle et al., 2017)			
11.1.11.3	**... by vocabulary books** (Abels, 2013a)					
11.1.11.4	***... by a large line spacing*** (Scholz, Dönges, Dechant, & Endres, 2016) (Markic & Bruns, 2013)					
11.1.11.5	***... by headlines*** *(Puddu, 2017)*					
11.1.11.6	***... by paragraphs*** *(Puddu, 2017)*					
11.1.11.7	***... by keywords*** *(Puddu, 2017)* (Markic & Bruns, 2013) (Scruggs et al., 2008)					
11.1.11.8	***... with highlights*** *(Puddu, 2017)* (Scruggs et al., 2008) *(Schmitt-Sody, 2014)*					
11.1.11.9	***... by fonts for better readability*** *(Schmitt-Sody, 2014)*					
11.1.11.10	**... by the font size** (Markic & Bruns, 2013)					
11.1.11.11	**... by checklists** (Melle et al., 2017)					
11.1.11.12	**... by separating individual action steps for experiments page by page** (Rank & Scholz, 2017)					
11.1.11.13	***... by general questions*** *(Puddu, 2017)*					
11.1.11.14	**... by paragraphs each with one main idea** (Scruggs et al., 2008)					
				11.2	***Developing scientific information media action-oriented*** *(Bodzin et al., 2007)*	
11.3.1.1	***... by avoiding unnecessary scientific terms*** *(Affeldt et al., 2018)* (Markic & Bruns, 2013)	11.3.1	***Supporting learning with scientific information with scientific terminology*** (Koomen, 2016) (Scholz, Dönges, Dechant et al., 2016) (Schmitt-Sody & Kometz, 2011)	11.3	***Developing scientific information media with linguistic support*** (Rott & Marohn, 2016) (Scholz, Dönges, Dechant et al., 2016) (Rank & Scholz, 2017) *(Adesokan & Reiners, 2015)* *(Schmitt-Sody, 2014)* (Markic & Bruns, 2013) (Melle et al., 2017) (Schmitt-Sody & Kometz, 2011)	
11.3.1.2	***... by vocabulary recognition*** *(Koomen, 2016)*					
		11.3.2	***Supporting learning with scientific information media with scientific sign language*** *(Schmitt-Sody et al., 2015)*			
		11.3.3	***Supporting learning with scientific information media multilingually*** *(Brusca-Vega et al., 2014)* (Markic & Abels, 2014)			
		11.3.4	***Supporting learning with scientific information media contently*** *(Scholz, Dönges, Risch et al., 2016)* (Scholz, Dönges, Dechant, & Endres, 2016)			
11.3.5.1	***... by simple sentence structures*** *(Puddu, 2017)*	11.3.5	***Supporting learning with scientific information media grammatically*** (Scholz, Dönges, Dechant, & Endres, 2016) *(Puddu, 2017)*			
11.3.5.2	***... by avoiding subordinate clauses*** *(Schmitt-Sody, 2014)*					
11.3.5.3	***... by using the active*** *(Puddu, 2017)*					
11.3.5.4	***... by using the imperative*** *(Puddu, 2017)*					
11.3.5.5	**... by using prepositional expressions** (Busch & Ralle, 2013)					
11.3.6.1	***... by numerical notation*** *(Schmitt-Sody, 2014)*	11.3.6	**Supporting learning with scientific information media with linguistic simplification**			
11.3.6.2	***... by working out colloquial terms*** *(Schmitt-Sody, 2014)*					

11.3.6.3	**... by using familiar words** (Scholz, Dönges, Dechant, & Endres, 2016)						
11.3.6.4	**... by avoiding unnecessary operators** (Markic & Bruns, 2013)						
11.3.6.5	***... by cloze texts*** *(Affeldt et al., 2017)*						
11.4.1.1	***... by step-by-step animations*** *(Bodzin et al., 2007)*	11.4.1	**Developing scientific information media with animations**	11.4	***Developing scientific information media digitally*** *(Siedenbiedel & Theurer, 2015), (Bodzin et al., 2007),* (Watson & Johnston, 2007), (Marino, 2010)		
11.4.2.1	**... by Pictor-Selector** (Scholz, Dönges, Dechant et al., 2016) (Filusch, 2017)	11.4.2	**Developing scientific information media with digital symbol collections**				
11.4.2.2	**... by Metacom** (Scholz, Dönges, Dechant et al., 2016)						
11.4.2.3	**... by Sclera-Symbols** (Scholz, Dönges, Dechant et al., 2016)						
11.4.2.4	**... by own image databases** (Scholz, Dönges, Dechant et al., 2016)						
		11.5.1	**Supporting learning with scientific information media with self-monitoring strategys** (Koomen, 2016)	11.5	**Developing scientific information media with cognitive support**		
		11.5.2	**Supporting learning with scientific information media with summary strategies** (Scruggs et al., 2008)				
11.5.3.1	***... by „Survey! Question! Read! Recite! Review!“*** (Koomen, 2016)	11.5.3	***Supporting learning with scientific information media with reading strategies*** *(Koomen, 2016)*				
11.5.3.2	**... by slow reading** (Arndt & Szolak, 2007)						
		11.5.1	***Supporting learning with scientific information media in a multi-professional team*** *(Rosenblum et al., 2019)*	11.6	**Developing scientific information media communicatively**		
11.7.1.1	**... by visualisations** (Melle et al., 2017) (Filusch, 2017),	11.7.1	**Enabling learning with scientific information media on an easy level**	11.7	**Developing scientific information media with different levels of requirements** (Filusch, 2017), (Demir-Walther, 2016), (Demir-Walther, 2016)		
11.7.1.2	**... by structuring aids** (Melle et al., 2017)						
11.7.1.3	**... by avoiding scientific terminology** (Melle et al., 2017)						
11.7.1.4	**... by simple speech** (Melle et al., 2017)						
11.7.1.5	**... by reduced texts** reduzieren (Filusch, 2017)						
11.7.2.1	**... by uniform typeface** (Filusch, 2017)	11.7.2	**Enabling learning with scientific information media on a difficult level**				
11.7.2.2	**... by more text** (Abels, 2013b)						
11.7.2.3	**... by reducing or leaving out the sentence beginnings** (Abels, 2013b)						
11.7.2.4	**... by reducing or leaving out the term cards** (Abels, 2013b)						
11.7.2.5	**... by using fewer symbols** (Filusch, 2017)						
		11.8.1	***Introduce scientific information media before using them*** *(Rosenblum et al., 2019)*	11.8	**Pre-teaching scientific information media**		
				11.9	**Indefinable**		
12.1.1.1	***... by signs*** (Kaiser & Seitz, 2017), *(Adesokan, 2015)*	12.1.1	***Creating scientific documentation visually*** *(Adesokan & Reiners, 2015)*	12.1	**Creating scientific documentation materially guided**	12.	***Creating inclusive scientific documentation*** (Rau-Patschke, 2019) (Filusch, 2017)
12.1.1.2	***... by photos*** (Melle et al., 2017) *(Baumann et al., 2018) (Rott et al., 2017)* (Rank & Scholz, 2017) (Filusch, 2017)						
12.1.1.3	***... by drawings*** (Filusch, 2017) *(Adesokan & Reiners, 2015) (Schmitt-Sody, 2014)* (Rank & Scholz, 2017) *(Schmitt-Sody, 2014)*						

12.1.1.4	**... by assembling pre-printed symbols** (Filusch, 2017)					(Fruböse, 2013) *(Baumann et al., 2016) (Baumann et al., 2018) (Adesokan & Reiners, 2015)* (Busch & Ralle, 2013)
12.1.2.1	**... *by dividing into units of meaning*** *(Baumann et al., 2016)*	**12.1.2**	**Creating scientific documentation with structuring** (Filusch, 2017), *(Adesokan & Reiners, 2015)*			
12.1.2.2	**... *by guiding questions*** *(Baumann et al., 2016) (Puddu, 2017)*					
12.1.2.3	**... *by word blocks*** *(Baumann et al., 2016)*					
12.1.2.4	**... by wall newspapers** (Kaiser & Seitz, 2017)					
12.1.3.1	**... *by filming the experiment*** (Rank & Scholz, 2017) *(Baumann et al., 2018)*	**12.1.3**	**Creating scientific documentation video based** (Melle et al., 2017)			
12.1.4.1	**... by writing down sentences** (Rank & Scholz, 2017)	**12.1.4**	**Creating scientific documentation text based**			
12.1.4.2	**... *by shortening texts*** *(Adesokan & Reiners, 2015)*					
12.1.5.1	**... *by giving lines for writing*** *(Schmitt-Sody, 2014)*	**12.1.5**	**Creating scientific documentation with tamplates** (Grumbine & Alden, 2006)			
		12.1.6	**Creating scientific documentation in logbooks** (Kaiser & Seitz, 2017)			
12.2.1.1	**... *by ticking off*** (Filusch, 2017) (Rank & Scholz, 2017) *(Adesokan & Reiners, 2015)*	**12.2.1**	**Creating scientific documentation with linguistic simplifications**	**12.2**	***Creating scientific documentation with linguistic support*** (Filusch, 2017), *(Baumann et al., 2018)*	
12.2.1.2	**... by pre-formulations** (Busch & Ralle, 2013)					
12.2.1.3	**... *by reading aloud the written sentences*** *(Puddu, 2017)*					
12.2.1.4	**... *by cloze texts*** *(Adesokan & Reiners, 2015)*					
12.2.1.5	**... *by example sentences*** *(Baumann et al., 2018) (Puddu, 2017)*					
12.2.1.6	**... *by sentence beginnings*** *(Adesokan & Reiners, 2015)* (Busch & Ralle, 2013)					
		12.2.2	***Creating scientific documentation with scientific terminology*** (Pötter, 2017), (Busch & Ralle, 2013), *(Adesokan & Reiners, 2015),*			
12.3.1.1	**... *by audio recordings*** *(Baumann et al., 2018) (Sormunen et al., 2019)*	**12.3.1**	**Enabling scientific documentation with smartphones**	**12.3**	***Creating digital scientific documentation*** *(Schmitt-Sody, 2014)*	
12.3.1.2	**... *by using camera functions*** *(Sormunen et al., 2019)*					
12.3.1.3	**... *by making notes on it*** *(Sormunen, Lavonen, & Juuti, 2019)*					
		12.4.1	**Ritualising scientific documentation** (Rau-Patschke, 2019)	**12.4**	**Creating scientific documentation with cognitive support**	
		12.5.1	***Enabling oral scientific documentation*** *(Puddu, 2017)* (Melle et al., 2017) (Pötter, 2017),	**12.5**	**Creating scientific documentation communicatively**	
12.6.1.1	**... by providing the protocol** (Pötter, 2017)	**12.6.1**	**Enabling scientific documentation closed**	**12.6**	**Creating scientific documentation with various degrees of openness**	
		12.6.2	***Enabling scientific documentation semi-open*** *(Adesokan, 2015)*			
		12.6.3	***Enabling scientific documentation open*** (Pötter, 2017) (Filusch, 2017) *(Adesokan & Reiners, 2015)*			
		12.7.1	***Enabling scientific documentation at substance level*** *(Adesokan, 2015)*	**12.7**	**Creating scientific documentation on different levels of requirements** (Münchhalfen et al., 2016)	
		12.7.2	***Enabling scientific documentation at sub-microscopic level*** *(Adesokan, 2015)*			
				12.8	**Indefinable**	

13.1.1.1	**... by the smell as an indicator** (Teke & Sozbilir, 2019)	13.1.1	**Creating application of scientific research methods olfactory**	13.1	***Creating application of scientific research methods materially guided*** *(Kahn et al., 2017)* (Koehler & Wild, 2019) (Teke & Sozbilir, 2019)	13.	***Creating inclusive application of scientific research methods*** (Schmitt-Sody & Kometz, 2011) *(Kirch et al., 2007) (Muth & Erb, 2019) (Pawlak & Groß, 2019)* (Pötter, 2017) (Koehler & Wild, 2019) (Schroeder & Miller, 2019) *(Teke & Sozbilir, 2019)* (Melle et al., 2017) (Vitoriano et al., 2016) *(Baumann et al., 2016) (Schmitt-Sody, 2014)* (Schmitt-Sody & Kometz, 2013) *(Bodzin et al., 2007)* (Hills, 2011) (Rank & Scholz, 2017) (Scholz, Dönges, Dechant et al., 2016) (Filusch, 2017)
13.1.1.2	***... by the smell of burning things*** *(Baumann et al., 2018)*						
13.1.2.1	***... by the temperature of the flame*** *(Baumann et al., 2018)*	13.1.2	**Creating application of scientific research methods tangible**				
13.1.2.2	***... by feeling the position of objects while swimming and sinking*** *(Kahn et al., 2017)*						
13.1.2.3	**... by vibration of a loudspeaker e.g. to blow out a flame** (Rank & Scholz, 2017)						
13.1.3.1	***... by rising fumes or smoke*** *(Baumann et al., 2018)*	13.1.3	**Creating application of scientific research methods visual** *(Schmitt-Sody et al., 2015)*, (Schmitt-Sody & Kometz, 2013)				
13.1.3.2	**... by the wave propagation of sound in water** (Rank & Scholz, 2017)						
13.1.3.3	***... by sketches of the experiment*** *(Großmann & Woest, 2014)*						
13.1.3.4	***... by symbols*** *(Adesokan, 2015)*						
		13.1.4	**Creating application of scientific research methods model based** (Schmitt-Sody & Kometz, 2013)				
13.1.5.1	**... by concept maps** (Watson & Johnston, 2007)	13.1.5	**Creating application of scientific research methods with graphic organisers**				
		13.1.7	***Creating application of scientific research methods with research booklets*** *(Muth & Erb, 2019)*, (Bachmann, 2012)				
13.1.8.1	***... by protocols*** *(Baumann et al., 2018), (Bodzin et al., 2007)*	13.1.8	**Creating application of scientific research methods with structuring** (Rank & Scholz, 2017), (Pötter, 2017), *(Schmitt-Sody, 2014)*, (Abels, 2013b), (Schmitt-Sody & Kometz, 2013)				
13.1.8.2	**... by outlines** (Watson & Johnston, 2007)						
13.1.9.1	**... by the avoidance of measurements and the provision of suitable quantities** (Filusch, 2017)	13.1.9	**Creating application of scientific research methods in terms of measurements**				
13.1.10.1	***... by glossaries*** *(Schmitt-Sody et al., 2015),*	13.1.10	**Creating application of scientific research methods lexical storages**				
13.1.10.2	**... by word lists** (Huber, 2017)						
13.1.10.3	***... by graduated references to single experimental phases*** *(Affeldt et al., 2018)*						
13.1.11.1	**... by the avoidance of measurements and the provision of suitable quantities** (Filusch, 2017)	13.1.11	***Creating application of scientific research methods with help cards*** *(Muth & Erb, 2019) (Baumann et al., 2018) (Affeldt et al., 2018) (Grossmann & Woest, 2015) (Großmann & Woest, 2014) (Schmitt-Sody, 2014)* (Markic & Bruns, 2013) (Schmitt-Sody & Kometz, 2013) (Abels, 2013a) (Fischer, 2010)				
13.1.11.2	***... by help cards for the equipment and chemicals*** *(Grossmann & Woest, 2015)*						
13.1.11.3	***... by help cards with sketches of the structure of the experiment****(Grossmann & Woest, 2015)*						
13.1.11.4	***... by help cards with the implementation*** *(Grossmann & Woest, 2015)*						
13.1.11.5	***... by help cards with aids to observation*** *(Grossmann & Woest, 2015)*						
13.1.11.6	***... by help cards for evaluation****(Grossmann & Woest, 2015)* (Markic & Bruns, 2013)						

13.1.12.1	**... by exchanging pictures and objects** (Rank & Scholz, 2017)	13.1.12	**Creating application of scientific research methods with exchange counters** (Rank & Scholz, 2017)		
13.1.13.1	**... by extended oculars at the microscopes** (Thomsen, 2017)	13.1.13	**Creating application of scientific research methods with extended equipment**		
13.1.14.1	***... by braille rulers*** (Koehler & Wild, 2019) *(Rosenblum, Ristvey, & Hospitál, 2019)*	13.1.14	***Creating application of scientific research methods with braille or tactile markings on the devices*** *(Koehler & Wild, 2019)*		
13.1.14.2	**… by tactile markings on graduates cylinders** (Watson & Johnston, 2007)				
13.1.14.3	**… by tactile markings on graduated flasks** (Watson & Johnston, 2007)				
13.1.14.4	**… by tactile markings on graduated metersticks** (Watson & Johnston, 2007)				
13.1.14.5	**… by tactile markings on graduated beakers** (Watson & Johnston, 2007)				
13.1.14.5	**... by braille labels on the chemicals and materials** (Watson & Johnston, 2007), (Teke & Sozbilir, 2019),				
13.1.15.1	**... by magnifying glasses** (Watson & Johnston, 2007)	13.1.15	***Creating application of scientific research methods with enlargers*** *(Koehler & Wild, 2019)*		
13.1.15.2	***... by cameras on articulated arms*** *(Fantin et al., 2016)*				
13.1.15.3	***... by measuring instruments with enlarged writing*** *(Koehler & Wild, 2019)*				
13.1.16.1	***... by "Talking Lab Quest"*** *(Koehler & Wild, 2019)* (Vitoriano et al., 2016)	13.1.16	***Creating application of scientific research methods with sensory devices*** *(Koehler & Wild, 2019)*, (Rank & Scholz, 2017)		
13.1.16.2	**… by light sensors** (Teke & Sozbilir, 2019)				
13.1.16.3	***… by "SciVoice"*** *Providing SciVoice© (Koehler & Wild, 2019)*				
13.1.17.1	**... by mirrors for reading the burette** (Thomsen, 2017)	13.1.17	**Creating application of scientific research methods with additional equipment for devices**		
13.1.18.1	**... by screen equipment as attachment for the microscope** (Thomsen, 2017)	13.1.18	**Creating application of scientific research methods with digital facilities for devices**		
13.1.18.2	***... by screen equipment for thermometers*** *(Vitoriano et al., 2016)*				
13.1.19.1	***... by vibrating thermometers*** *(Vitoriano et al., 2016)*	13.1.19	**Creating application of scientific research methods with vibrating devices**		
13.1.20.1	***... by spoons*** *(Kirch et al., 2007)*	13.1.20	**Creating application of scientific research methods with everyday devices**		
13.1.20.2	***… by salad tongs*** *(Kirch et al., 2007)*				

13.1.20.3	***... by large funnels*** *(Kirch et al., 2007)*				
13.1.20.4	***... by squeeze bottles*** *(Kirch et al., 2007)*				
13.1.20.5	***... by measuring cups*** *(Kirch et al., 2007)*				
13.1.21.1	**... by low cartridge burners** (Thomsen, 2017)	13.1.21	**Creating application of scientific research methods with height-adapted devices**		
13.1.22.1	***... by acoustic calculators*** *(Kirch et al., 2007) (Koehler & Wild, 2019)*	13.1.22	**Creating application of scientific research methods with acoustic devices** (Teke & Sozbilir, 2019)		
13.1.22.2	***... by acoustic thermometers*** (Vitoriano et al., 2016) (Koehler & Wild, 2019) (Watson & Johnston, 2007) (Teke & Sozbilir, 2019)				
13.1.22.3	**... by acoustic clocks** (Watson & Johnston, 2007)				
13.1.22.4	***... by acoustic scales*** *(Kirch et al., 2007)*				
13.1.22.5	***... by acoustic globes*** *(Rosenblum et al., 2019)*				
13.2.1.1	**... at level 0 or 1 of inquiry-based learning** (Abels, 2016)	13.2.1	**Creating application of scientific research methods with inquiry-based learning**	13.2	**Creating application of scientific research methods action-oriented** (Melle et al., 2017)
		13.2.2	***Creating application of scientific research methods with demo experiments*** *(Muth & Erb, 2019),* (Pötter, 2017)		
		13.2.3	***Creating application of scientific research methods with aids for implementation*** *(Affeldt et al., 2018), (Bodzin et al., 2007)*		
		13.2.4	**Creating application of scientific research methods with supporting experiments** (Schmitt-Sody & Kometz, 2013)		
		13.2.5	***Creating application of scientific research methods with partial experiments*** *(Schmitt-Sody, 2014)*		
13.2.6.1	***... by reducing the number of experiments per lesson*** *(Siedenbiedel & Theurer, 2015)*	13.2.6	**Creating application of scientific research methods with the number of experiments** (Schmitt-Sody & Kometz, 2011)		
13.2.7.1	**... by experimental corners** (Bachmann, 2012)	13.2.7	***Creating application of scientific research methods with station work*** *(Muth & Erb, 2019)*		
13.3.1.1	***... by sign language with article, picture and short description*** *(Schmitt-Sody et al., 2015)*	13.3.1	***Creating application of scientific research methods with sign language*** *(Schmitt-Sody, 2014)*	13.3	***Creating application of scientific research methods with linguistic support*** *(Affeldt et al., 2018), (Schmitt-Sody, 2014)*
13.3.1.2	***... by help cards with sign language*** *(Schmitt-Sody et al., 2015)*				
		13.4.1	***Creating application of scientific research methods with a LCD projector for digital laboratory work*** *(Bodzin et al., 2007)*	13.4	***Creating application of scientific research methods digitally*** (Teke & Sozbilir, 2019), (Marino, 2010), *(Koehler & Wild, 2019)*
			Creating application of scientific research methods with PCs, smartphones, tablets etc. (Ok et al., 2017), *(Rosenblum et al., 2019)*		
		13.4.2	***Creating application of scientific research methods with simulated online experiments*** *(Bodzin et al., 2007)*		
		13.5.1	***Creating application of scientific research methods based on previous knowledge*** *(Schmitt-Sody, 2014)*	13.5	

		3.5.2	***Creating application of scientific research methods life-world related*** *(Schmitt-Sody, 2014), (Affeldt et al., 2018)*		**Creating application of scientific research methods with cognitive support**	
		13.6.1	**Creating application of scientific research methods orally** (Schmitt-Sody & Kometz, 2013)	13.6	**Creating application of scientific research methods with communicatively** (Abels, 2013b), (Schmitt-Sody & Kometz, 2011)	
13.6.2.1	***… by explaining the materials and equipment*** *(Kahn et al., 2017)* (Pötter, 2017)	13.6.2	**Creating application of scientific research methods with explanations** (Schmitt-Sody & Kometz, 2013)			
13.6.2.2	***… by explaining what happens during experimentation*** *(Kahn et al., 2017)*					
13.6.3.1	**… by different roles within the groups** *(Pawlak & Groß, 2019)*	13.6.3	***Creating application of scientific research methods with group work*** *(Muth & Erb, 2019)* (Nehring et al., 2017) *(McGrath & Hughes, 2018) (Baumann et al., 2016)* (Pötter, 2017) *(Pawlak & Groß, 2019) (Baumann et al., 2018)*			
13.6.3.2	**… by different tasks in the group** (Kaiser & Seitz, 2017)					
		13.6.4	***Creating application of scientific research methods with collaborative help systems*** *(Koehler & Wild, 2019)*			
		13.6.5	***Creating application of scientific research methods with partner work*** *(Baumann et al., 2018)*			
		13.6.6	***Creating application of scientific research methods in plenary*** *(Schulte, Kurnitzki, Lütje-Klose, & Miller, 2019)*			
13.6.7.1	***… by face-directed demonstrations of experiments*** *(Schmitt-Sody, 2014)*	13.6.7	***Supporting application of scientific research methods as a coach*** *(Bodzin et al., 2007), (Muth & Erb, 2019), (Baumann et al., 2016)*			
13.6.7.2	**… by teacher- supported groups** (Hainsworth, 2012)					
		13.6.8	***Creating application of scientific research methods in multi-professional teams*** *(Rosenblum et al., 2019),* (Teke & Sozbilir, 2019), *(Rosenblum et al., 2019),* (Nehring et al., 2017), (Schmitt-Sody, Urbanger, & Kometz, 2015), (Conn, 2001)			
13.7.1.1	***… by concrete instructions for action*** *(Scruggs & Mastropieri, 2007) (Schmitt-Sody, 2014)* (Pötter, 2017) *(Baumann et al., 2016)* (Filusch, 2017) *(Schmitt-Sody et al., 2015) (Baumann et al., 2018)*	13.7.1	***Creating application of scientific research methods closed*** *(Bodzin et al., 2007)*	13.7	**Creating application of scientific research methods with various degrees of openness** (Pötter, 2017)	
13.7.2.1	***… by giving partial steps for experimenting*** (Pötter, 2017) *(Baumann et al., 2018)*	13.7.2	***Creating application of scientific research methods semi-open*** *(Grossmann & Woest, 2015)*			
13.7.3.1	***… by open instructions*** *(Baumann et al., 2018)*	13.7.3	***Creating application of scientific research methods open*** *(Freedberg et al., 2019), (Baumann et al., 2016),* (Rank & Scholz, 2017), (Pötter, 2017), (Filusch, 2017), (Gläser & Sothmann, 2015), *(Grossmann & Woest, 2015),* (Schmitt-Sody et al., 2015)			
13.8.1.1	**… as an explorative- or decisive-experiment** (Schmitt-Sody & Kometz, 2011)	13.8.1	**Creating application of scientific research methods target different**	13.8	***Creating application of scientific research methods on different levels of requirements*** *(Affeldt et al., 2018)* (Schmitt-Sody et al., 2015) (Schmitt-Sody & Kometz, 2013) (Schmitt-Sody & Kometz, 2011) *(Schmitt-Sody, 2014)*	
13.8.2.1	***… by short experiments*** *(Schmitt-Sody, 2014)* (Schmitt-Sody & Kometz, 2013)	13.8.2	**Creating application of scientific research methods on a simple level**			
13.8.3.1	***… by additional experiments*** *(Muth & Erb, 2019) (Baumann et al., 2016)* (Pötter, 2017) *(Schmitt-Sody et al., 2015) (Schmitt-Sody & Kometz, 2014)*	13.8.3	**Creating application of scientific research methods on a higher level**			

		13.9.1	**Letting identifying the limits of scientific investigation methods** (Brauer et al., 2017)	13.9	**Creating application of scientific research methods reflectively**		
		13.10.1	***Pre-teaching the application of scientific research methods in one-to-one supervision*** *(Rosenblum et al., 2019)*	13.10	**Pre-teaching scientific research methods**		
		13.10.2	***Pre-teaching unknown terms for application of scientific research methods*** *(Schmitt-Sody et al., 2015)*				
13.11.1.1	**... by longer breaks and shorter experimental phases** (Schmitt-Sody & Kometz, 2014)	13.11.1	**Creating application of scientific research methods with time**	13.11	**Creating application of scientific research methods in a consctructive learning atmosphere**		
13.11.1.2	***... by enough time for experiments*** *(Schmitt-Sody, 2014)* (Kaiser & Seitz, 2017)						
13.11.1.3	**... by experiments running at different speeds** (Schmitt-Sody & Kometz, 2011)						
		13.11.2	**Creating application of scientific research methods motivating** (Lange-Schubert & Tretter, 2017)				
				13.12	**Indefinable**		
		14.1.1	**Developing students' science conceptions visually** (Hwang & Taylor, 2016)	14.1	**Developing students' science conceptions materially guided** (Nehring et al., 2017), (Kaiser & Seitz, 2017)	14.	***Developing students' science conceptions inclusively*** *(Rott & Marohn, 2018)* (Ferreira & Lawrie, 2019) (Brendel et al., 2019) (Watt et al., 2013) (Villanueva et al., 2012) *(Bodzin et al., 2007)*
		14.1.2	**Developing students' science conceptions text based**(Brendel et al., 2019)				
		14.1.3	***Developing students' science conceptions with checkpoints****(Rott et al., 2017)*				
		14.1.4	***Developing students' science conceptions example-related*** *(Buxton et al., 2019)*				
14.1.5.1	***... by creating models from plasticine or similar*** *(Adesokan & Reiners, 2015)*	14.1.5	***Developing students' science conceptions model based*** (Ferreira & Lawrie, 2019), *(Rott & Marohn, 2018), (Rott et al., 2017)*				
14.2.1.1	***... by dissolving sugar in water*** *(Rott et al., 2017)*	14.2.1	**Developing students' science conceptions with experiments**	14.2	**Developing students' science conceptions action-oriented** (Rott & Marohn, 2018) (Lange-Schubert & Tretter, 2017)		
		14.3.1	***Developing students' science conceptions with scientific terminology*** *(Buxton et al., 2019)*	14.3	**Developing students' science conceptions with linguistic support**		
		14.4.1	**Developing students' science conceptions in dialogue** (Brendel, Siry, Haus, & Breedijk-Goedert, 2019), (Pech, Schomaker, & Simon, 2019)	14.4	**Developing students' science conceptions communicatively** (Rau-Patschke, 2019), (Lange-Schubert & Tretter, 2017)		
		14.5.1	**Developing students' science conceptions with questions** (Abels, 2015a)	14.5	**Developing students' science conceptions with various degrees of openness**		
14.6.1.1	**... by semantic waving** (Buxton et al., 2019)	14.6.1	**Creating transitions to more abstract students' science conceptions** (Buxton et al., 2019) (Knipping et al., 2017)	14.6	**Developing students' science conceptions on different levels of requirements** (Menthe et al., 2015)		
		14.6.2	**Enabling students' science conceptions on a naive and concrete level** (Adl-Amini & Hardy, 2017)				

		14.6.3	**Enabling the developement of students' science conceptions on an abstract level** (Adl-Amini & Hardy, 2017)				
		14.7.1	**Enabling the developement of students' science conceptions by comparing them with the scientific perspective** (Brauer et al., 2017)	14.7	**Developing students' science conceptions reflectively**		
		14.7.2	**Enabling the developement of students' science conceptions with discussions** (Brendel et al., 2019)				
				14.8	**Indefinable**		
15.1.1.1	**… by smbols** (Filusch, 2017)	15.1.1	***Creating data evaluation and result presentation visually*** (Brendel et al., 2019), *(Sormunen et al., 2019), (Adesokan, 2015), (Siedenbiedel & Theurer, 2015)*	15.1	**Creating data evaluation and result presentation materially guided**	15.	***Creating inclusive data evaluation and result presentation*** (Vitoriano, Teles, Rizzatti, & Pesssoa de Lima, Régia C., 2016) (Teke & Sozbilir, 2019) *(Adesokan & Reiners, 2015)* (Watt et al., 2013) *(Affeldt et al., 2018)*
		15.1.2	**Creating data evaluation and result presentation text based** (Brendel, Siry, Haus, & Breedijk-Goedert, 2019)				
15.1.3.1	***… by help cards with sample solutions*** *(Baumann et al., 2016)*	15.1.3	***Creating data evaluation and result presentation with help cards*** (Huber, 2017) *(Grossmann & Woest, 2015) (Großmann & Woest, 2014)* (Pötter, 2017)				
		15.1.4	**Creating data evaluation and result presentation with illustrative material** (Ferreira & Lawrie, 2019)				
		15.1.5	***Creating data evaluation and result presentation with braille*** *(Rosenblum, Ristvey, & Hospitál, 2019)*				
		15.1.6	**Creating data evaluation and result presentation with adaptive material** (Teke & Sozbilir, 2019)				
15.1.7.1	**… by sonification of infrared spectra** (Vitoriano et al., 2016)	15.1.7	***Creating data evaluation and result presentation acoustically*** *(Sormunen et al., 2019)*				
		15.1.8	**Creating data evaluation and result presentation model based** *(Adesokan, 2015)*				
				15.2	**Creating data evaluation and result presentation action based** (Scruggs et al., 2008)		
15.3.1.1	***… with cloze texts*** *(Schmitt-Sody, 2014)* (Markic & Bruns, 2013)	15.3.1	**Creating data evaluation and result presentation with linguistic simplifications**	15.3	**Creating data evaluation and result presentation with linguistic support** (Ferreira & Lawrie, 2019), (Markic & Bruns, 2013)		
15.4.1.1	***… by graphically displaying data in a simulated experiment*** *(Bodzin et al., 2007)*	15.4.1	**Creating data evaluation and result presentation with simulations**	15.4	***Creating data evaluation and result presentation digitally*** *(Baumann et al., 2016)* (Ok et al., 2017) *(Baumann et al., 2018)* (Marino, 2010) *(Sormunen et al., 2019)*		
		15.5.1	***Creating data evaluation and result presentation orally*** *(Bodzin et al., 2007)*	15.5	**Creating data evaluation and result presentation communicatively**		
		15.5.2	***Creating data evaluation and result presentation in groups*** *(Schulte, Kurnitzki, Lütje-Klose, & Miller, 2019), (Schulte et al., 2019),* (Münchhalfen et al., 2016), *(Bodzin et al., 2007)*				

		15.5.3	**Creating data evaluation and result presentation in dialogue** (Brendel et al., 2019), (Schmitt-Sody & Kometz, 2011)				
15.5.4.1	***... by questions*** *(Puddu, 2017)*	15.5.4	***Creating data evaluation and result presentation as a coach*** *(Bodzin et al., 2007)*				
15.5.5.1	**... in the seat circle together in the plenum** (Kaiser & Seitz, 2017)	15.5.5	***Creating data evaluation and result presentation in plenary*** *(Rott et al., 2017)*				
15.6.1.1	***... by strong structuring*** *(Scruggs & Mastropieri, 2007)*	15.6.1	**Creating closed data evaluation and result presentation** (Goschler & Heyne, 2011)	15.6	**Creating data evaluation and result presentation with various degrees of openness**		
15.6.2.1	**... by giving partial solutions** (Pötter, 2017)	15.6.2	**Creating semi-open data evaluation and result presentation**				
		15.6.3	***Creating open data evaluation and result presentation*** *(Adesokan, 2015)*				
15.7.1.1	**... by didactic reduction of supplementary illustrations** (Pötter, 2017)	15.7.1	**Enabling data evaluation and result presentation on a simple level of requirement**	15.7	**Creating data evaluation and result presentation on different levels of requirements** (Pötter, 2017)		
15.7.2.1	***... by letting find alternative solutions*** *(Freedberg et al., 2019)*	15.7.2	**Enabling data evaluation and result presentation on a higher level of requirement**				
15.7.2.2	***... by providing follow-up questions*** *(Freedberg et al., 2019)*						
15.7.2.3	***... by demanding more details in the answers*** *(Freedberg, Bondie, Zusho, & Allison, 2019)*						
		15.8.1	***Creating transitions to more abstract data evaluation*** *(Buxton et al., 2019)*	15.8	***Creating data evaluation and result presentation on different levels of abstraction*** *(Affeldt et al., 2018),* (Schmitt-Sody & Kometz, 2011)		
		15.8.2	**Enabling data evaluation and result presentation on a higher level of abstraction** (Schmitt-Sody & Kometz, 2011)				
		15.9.1	***Creating data evaluation and result presentation with raising awareness*** *(Puddu, 2017)*	15.9	**Creating data evaluation and result presentation reflectively**		
		15.9.2	***Creating data evaluation and result presentation with discussion of mistakes*** *(Puddu, 2017)*				
15.10.1.1	**... by school newspapers** (Kaiser & Seitz, 2017)	15.10.1	**Creating data evaluation and result presentation to publish** (Kaiser & Seitz, 2017)	15.10	**Creating data evaluation and result presentation at certain learning locations**		
15.10.1.2	**... by exhibitions in school** (Kaiser & Seitz, 2017)						
		15.11.1	***Creating data evaluation and result presentation with paying attention*** *(Puddu, 2017)*	15.11	**Creating data evaluation and result presentation in a consctructive learning atmosphere**		
		15.11.2	***Creating data evaluation and result presentation with giving enough time*** *(Bodzin et al., 2007)*				
15.11.3.1	***... by appreciating wrong answers and unexpected results*** *(Puddu, 2017)*	15.11.3	***Appreciating data evaluation and result presentation*** *(Puddu, 2017)*				
				15.12	**Indefinable**		
		16.1.1	***Teaching the understanding of nature of science visually*** *(Bodzin et al., 2007), (Adesokan & Reiners, 2015)*	16.1	**Teaching the understanding of nature of science materially guided**	16.	***Teaching the understanding of nature of science inclusively*** *(Puddu, 2017), (Bodzin et al., 2007), (McGrath & Hughes, 2018)*
		16.1.2	**Teaching the understanding of nature of science with graphic organisers** (Watson & Johnston, 2007)				
				16.2	***Teaching the understanding of nature of science action-oriented*** *(Puddu,*		

					2017), *(Mumba, Banda, & Chabalengula, 2015)*		
				16.3	***Teaching the understanding of nature of science digitally*** *(Bodzin et al., 2007)*		
		16.4.1	**Teaching the understanding of nature of science with rule-based templates** (Grumbine & Alden, 2006)	16.4	**Teaching the understanding of nature of science with cognitive support**		
16.5.1.1	**… by open dialogues** (Carvalho, 2016)	16.5.1	**Teaching the understanding of nature of science as a coach**	16.5	**Teaching the understanding of nature of science communicatively**		
16.5.1.2	***… by questions*** *(Mulvey et al., 2016)*						
16.5.1.3	***… by feedback*** *(Bodzin et al., 2007)*						
		16.5.2	***Teaching the understanding of nature of science in teams with colleagues*** *(Mulvey et al., 2016)*				
		16.6.1	**Teaching the understanding of nature of science with conceptions about research personalities** (Schomaker & Weddehage, 2016)	16.6	**Teaching the understanding of nature of science reflectively** (Carvalho, 2016)		
		16.6.2	**Teaching the understanding of nature of science relating to individual world views and their significance for life** (Carvalho, 2016)				
		16.6.3	**Teaching the understanding of nature of science relating world views to the meaning in life** (Carvalho, 2016)				
		16.7.1	**Adressing the understanding of nature of science carefully** (Carvalho, 2016)	16.7	**Teaching the understanding of nature of science in a positive constructive learning atmosphere**		
				16.8	**Indefinable**		
						17.	**Indefinable**

APPENDIX F: KinU - KATEGORIENSYSTEM INKLUSIVER NATURWISSENSCHAFTLICHER UNTERRICHT

Legende

Literatur mit Fokus auf der Sekundarstufe I; Literatur mit Fokus auf die Primarstufe; Literatur mit undefinierbarem Fokus auf die Schulstufe;
kursive Kategorien stammen aus empirischen Ergebnisteilen der Literatur

Die Literaturliste des Kategoriensystems und der Stichprobe des systematischen Literaturreviews kann auf den Seiten 107-126, Anhang G, gefunden werden.

Table 11: KinU - Kategoriensystem inklusiver naturwissenschaftlicher Unterricht

Subcode		Code		Subkategorie		Hauptkategorie	
1.1.1.1	**... ohne Treppen oder Stufen** (Thomsen, 2017)	**1.1.1**	**Am naturwissenschaftlichen Lernort Mobilität ermöglichen** (Thomsen, 2017)	**1.1**	**Naturwissenschaftliche Lernorte barrierearm gestalten** *(Kirch, Bargerhuff, Cowan, & Wheatly, 2007)*	**1.**	**Naturwissenschaftliche Lernorte inklusiv gestalten** (Teke & Sozbilir, 2019), (Vitoriano et al., 2016)
1.1.1.2	**... durch mobile Abzüge** (Thomsen, 2017)						
1.1.1.3	**... durch barrierefreie Wege mit mobilen Tischen** (Thomsen, 2017)						
1.1.2.1	***... durch Ausschalten der Lüftungsanlage und Abzüge, um Hintergrundlärm zu verringern*** *(Schmitt-Sody, 2014)*	**1.1.2**	***Am naturwissenschaftlichen Lernort akustische Bedingungen berücksichtigen*** *(Schmitt-Sody, 2014)*				
1.1.3.1	**... durch farbiges Klebeband** (Filusch, 2017)	**1.1.3**	**Am naturwissenschaftlichen Lernort den Arbeitsplatz strukturieren** (Filusch, 2017)				
1.1.3.2	**... durch die Materialkiste auf einem separaten Tisch** (Filusch, 2017)						
		1.1.4	**Am naturwissenschaftlichen Lernort Vorrichtungen für Links- und Rechtshänder*innen verwirklichen** (Thomsen, 2017)				
1.1.5.1	**... durch Gas- und Wasserversorgung mit einem Ventil am Ende** (Thomsen, 2017)	**1.1.5**	**Am naturwissenschaftlichen Lernort Vorrichtungen horizontal zugänglich machen**				
1.1.5.2	**... durch Armaturen mit verlängertem Hebel** (Thomsen, 2017)						
1.1.5.3	**... durch Bewegungsmelder** (Thomsen, 2017)						
1.1.5.4	**... durch ausziehbare Tische und Lehrpulte** (Thomsen, 2017)						
1.1.5.5	**... durch klappbare Tische und Lehrpulte** (Thomsen, 2017)						
1.1.6.1	**... durch höhenverstellbare Waschbecken** (Thomsen, 2017)	**1.1.6**	**Am naturwissenschaftlichen Lernort Vorrichtungen vertikal zugänglich machen** (Thomsen, 2017)				
1.1.6.2	**... durch höhenverstellbare Abzüge** (Thomsen, 2017)						
1.1.6.3	**... durch höhenverstellbare Tische und Lehrpulte** (Thomsen, 2017)						
1.1.6.4	**... durch Regale, Schränke und Ablagen auf erreichbarer Höhe** (Thomsen, 2017)						

1.1.6.5	**… durch absenkbare Deckenversorgungen (z.B. Stromanschluss)** (Thomsen, 2017)						
1.1.6.6	***… durch Blöcke zum Anheben der Tische*** *(Kirch et al., 2007)*						
1.1.6.7	***… durch höhere Labortische*** *(Kirch et al., 2007)*						
1.1.7.1	**… durch unterfahrbare Abzüge** (Thomsen, 2017)	1.1.7	**Am naturwissenschaftlichen Lernort Vorrichtungen unterfahrbar gestalten** (Thomsen, 2017)				
1.1.7.2	**… durch unterfahrbare Waschbecken** (Thomsen, 2017)						
		1.2.1	***Naturwissenschaftlichen Lernort im multiprofessionellen Team gestalten*** *(Kirch et al., 2007)*	1.2	**Naturwissenschaftlichen Lernort kommunikativ gestalten**		
				1.3	**Auf den Besuch naturwissenschaftlicher Lernorte vorbereiten** (Schmitt-Sody & Kometz, 2013)		
				1.5	**Sonstiges**		
2.1.1.1	**… durch Kittel, die im Sitzen die Beine bedecken** (Thomsen, 2017)	2.1.1	**Sicherheit durch Schutzkleidung gewährleisten**	2.1	***Sicherheit materialgeleitet gewährleisten***	2.	**Sicherheit für den inklusiven Unterricht adaptieren**
2.1.1.2	**… durch Gummischürzen** (Thomsen, 2017)						
2.1.1.3	**… durch Schutzvisiere** (Thomsen, 2017)						
		2.1.2	**Sicherheit durch barrierefreie Gefahrenhinweise gewährleisten** (Teke & Sozbilir, 2019)				
2.1.3.1	**… durch Heizplatten und Wasserkocher etc. anstelle von Gasbrennern** (Thomsen, 2017), (Nehring et al., 2017)	2.1.3	**Sicherheit durch weniger gefährliche Materialien gewährleisten**				
2.1.3.2	***… durch Kunststoff- anstelle von Glasgegenständen*** (Thomsen, 2017), (Nehring et al., 2017), *(Kirch et al., 2007)*, (Lunsford & Bargerhuff, 2006)						
2.1.4.1	**… durch chemikalienresistente Kisten für den Transport auf dem Schoß (bei Rollstuhlfahrenden)** (Thomsen, 2017)	2.1.4	**Sicherheit beim Transport von Materialien für die individuellen Bedürfnisse gewährleisten**				
2.1.5.1	**… durch Gummihandschuhe** (Thomsen, 2017)	2.1.5	**Sicherheit durch Stand- und Rutschfestigkeit gewährleisten** (Schmitt-Sody et al., 2015)				
2.1.5.2	***… durch rutschfeste Unterlagen*** (Thomsen, 2017), *(Kirch et al., 2007)*						
2.1.5.3	**… durch Stative und Klemmen** (Thomsen, 2017)						
2.1.5.4	**… durch Ständer mit Bohrungen für Gefäße** (Thomsen, 2017)						
		2.1.6	***Sicherheit durch weniger gefährliche Chemikalien gewährleisten*** *(Siedenbiedel & Theurer, 2015)*				
2.1.7.1	**… durch Verlängerungen der Hebel** (Thomsen, 2017)	2.1.7	**Sicherheit durch vertikal zugängliche Noteinrichtungen gewährleisten**				
2.1.7.2	**… durch Wandmontage der Augenduschen mit verlängertem Schlauch** (Thomsen, 2017)						
2.1.8.1	**… durch unterfahrbare Waschbecken mit Augenduschen** (Thomsen, 2017)	2.1.8	**Sicherheit durch unterfahrbare Noteinrichtungen gewährleisten**				
2.1.9.1	**… durch geringere Montagehöhen von Feuerlöschern** (Thomsen, 2017)	2.1.9	**Sicherheit durch horizontal erreichbare Noteinrichtungen gewährleisten**				
2.1.9.2	**… durch zusätzlich kleinvolumige Feuerlöscher** (Thomsen, 2017)						

		2.1.10	**Sicherheit durch alternative Fluchtwege gewährleisten** (Thomsen, 2017)				
2.1.11.1	**… durch einen visualisierten Feueralarm** (Schmitt-Sody et al., 2015), (Schmitt-Sody & Kometz, 2013)	2.1.11	**Sicherheit durch visualisierte Notsignale gewährleisten**				
		2.1.12	***Sicherheit durch visualisierte Sicherheitseinweisungen gewährleisten*** *(Schmitt-Sody, 2014)*				
2.2.1.1	**… durch Level 0 des Forschenden Lernens** (Abels, 2015b)	2.2.1	**Sicherheit durch Forschendes Lernen gewährleisten**	2.2	**Sicherheit handlungsorientiert gewährleisten**		
		2.3.1	***Sicherheit durch den Einsatz Simulationen statt gefährlicher Experimente gewährleisten*** *(Bodzin et al., 2007)*	2.3	**Sicherheit digital gewährleisten**		
2.4.1.1	**… durch ein bis zwei Versuchsaufbauten, die im Blick behalten werden können** (Abels, 2013b)	2.4.1	**Sicherheit als Lernbegleitung gewährleisten**	2.4	**Sicherheit kommunikativ gewährleisten**		
2.4.1.2	***… durch antlitzgerichtete Körperhaltung ermöglichen*** *(Schmitt-Sody, 2014)*						
		2.4.2	**Sicherheit durch mulitprofessionelle Teams gewährleisten** (Menthe, Hoffmann, Nehring, & Rott, 2015), (Schmitt-Sody et al., 2015), (Abels, 2019), (Nehring et al., 2017)				
		2.4.3	***Sicherheit durch Gruppenteilung gewährleisten*** *(Schmitt-Sody, 2014)*				
		2.4.4	**Sicherheit durch Zuteilung von Partner*innen gewährleisten** (Thomsen, 2017)				
2.5.1.1	**… durch Berücksichtigung, dass Hörgeräte nicht nass werden dürfen** (Schmitt-Sody et al., 2015)	2.5.1	**Sicherheit auf die individuellen Besonderheiten der Schüler*innen hin reflektieren** (Nehring et al., 2017), *(Pawlak & Groß, 2019)*	2.5	**Sicherheit reflektierend gewährleisten**		
2.5.1.2	**… durch Berücksichtigung individueller Besonderheiten (Schreckhaftigkeit auf Knallgeräusche oder überraschende Effekte)** (Nehring et al., 2017)						
2.5.1.3	**… durch Wissen, welches spontane Verhalten bei Schüler*innen beim Experimentieren auftreten kann** (Nehring et al., 2017)						
2.6.1.1	***… durch den Einsatz von Regeln und Konsequenzen beim Experimentieren*** *(Pawlak & Groß, 2019)*	2.6.1	***Sicherheit durch Classroom-Management gewährleisten*** *(Pawlak & Groß, 2019)*	2.6	**Sicherheit in konstruktive Lernatmosphäre gewährleisten**		
				2.8	**Sonstige**		
3.1.1.1	***… durch Chemie-Foto-Storys*** *(Adesokan & Reiners, 2015)*	3.1.1	**Diagnostizieren naturwissenschaftlicher Spezifika visuell gestalten** (Brendel et al., 2019), (Hwang & Taylor, 2016), (Menthe et al., 2015), (Buxton et al., 2019)	3.1	**Diagnostizieren naturwissenschaftlicher Spezifika materialgeleitet gestalten**	3.	***Diagnostizieren naturwissenschaftlicher Spezifika (inklusiv gestalten)*** (Hößle et al., 2017), (Rau-Patschke, 2019), (Brauer et al., 2017), (Koomen, 2016), (Kaiser & Seitz, 2017), (Hoffmann & Menthe, 2016), (Villanueva et
3.1.1.2	**… durch Mind Maps** (Gläser & Sothmann, 2015)						
3.1.1.3	**… duch Wandzeitungen** (Kaiser & Seitz, 2017)						
3.1.1.4	***…durch Zeichnungen*** (Brendel et al., 2019), *(Schroeder & Miller, 2019),* (Kaiser & Seitz, 2017), (Hößle et al., 2017), *(Adesokan, 2015),* (Gläser & Sothmann, 2015), *(Rott et al., 2017)*						
		3.1.2	***Diagnostizieren naturwissenschaftlicher Spezifika mit Portfolios gestalten*** (Brendel et al., 2019), (Buxton et al., 2019), *(Bodzin et al., 2007)*				
		3.1.3	**Diagnostizieren naturwissenschaftlicher Spezifika tabellarisch gestalten** (Buxton et al., 2019)				

3.1.4.1	**... durch Aufschreiben von Deutungen und Ansichten** (Kaiser & Seitz, 2017)	3.1.4	**Diagnostizieren naturwissenschaftlicher Spezifika mit Texten gestalten** (Gläser & Sothmann, 2015)			al., 2012), (Buxton et al., 2019), (Brendel et al., 2019), (Lange-Schubert & Tretter, 2017), (Koehler & Wild, 2019), (Walkowiak & Nehring, 2019), (Schroeder & Miller, 2019), *(Meskill & Oliveira, 2019),* (Knipping, Tolsdorf, & Markic, 2017), (Menthe et al., 2015), (Watt et al., 2013)
3.1.5.1	**... durch das Diagnoser Question Set aus dem DIAGNOSER Projekt** (Fried, Elsholz, & Trefzger, 2015)	3.1.5	**Diagnostizieren naturwissenschaftlicher Spezifika testbasiert gestalten** (Knipping et al., 2017)			
3.1.5.2	**... durch einen Triadentest** (Knipping et al., 2017)					
		3.1.6	**Diagnostizieren naturwissenschaftlicher Spezifika modellbasiert gestalten** (Buxton et al., 2019)			
3.2.1.1	***... durch das Sortieren gegebener Bilder*** *(Rott et al., 2017)*	3.2.1	**Diagnostizieren naturwissenschaftlicher Spezifika über Sortieren und Ordnen gestalten**	3.2	**Diagnostizieren naturwissenschaftlicher Spezifika handlungsorientiert gestalten** (Buxton et al., 2019)	
		3.2.2	**Diagnostizieren naturwissenschaftlicher Spezifika durch Forschendes Lernen gestalten** (McGrath & Hughes, 2018), (Mumba et al., 2015), (Watt et al., 2013), (Maroney et al., 2003)			
		3.2.3	**Diagnostizieren naturwissenschaftlicher Spezifika durch Versuchsbeobachtungen gestalten** (Hößle et al., 2017)			
		3.2.4	***Diagnostizieren naturwissenschaftlicher Spezifika durch Vermutungen gestalten*** *(Adesokan, 2015)*			
		3.3.1	**Diagnostizieren naturwissenschaftlicher Spezifika multilingual gestalten** (Buxton et al., 2019)	3.3	***Diagnostizieren naturwissenschaftlicher Spezifika auf Basis sprachlicher Unterstützung durchführen*** *(Meskill & Oliveira, 2019),* (Buxton et al., 2019)	
3.3.2.1	**... durch Schlüsselbegriffe** (Buxton et al., 2019)	3.3.2	**Diagnostizieren naturwissenschaftlicher Spezifika mit sprachlichen Vereinfachungenn durchführen**			
3.3.2.2	**... durch Vorgeben von Satzanfängen** (Buxton et al., 2019)					
				3.4	**Diagnostizieren naturwissenschaftlicher Spezifika digital gestalten** (Buxton et al., 2019)	
		3.5.1	**Diagnostizieren naturwissenschaftlicher Spezifika mit Mathematisierungen gestalten** (Hößle et al., 2017)	3.5	**Diagnostizieren naturwissenschaftlicher Spezifika auf Basis kognitiver Unterstützung durchführen**	
		3.6.1	**Diagnostizieren naturwissenschaftlicher Spezifika in der Gruppe durchführen** (Buxton et al., 2019)	3.6	**Diagnostizieren naturwissenschaftlicher Spezifika kommunikativ gestalten** (Pech, Schomaker, & Simon, 2019)	
		3.6.2	**Diagnostizieren naturwissenschaftlicher Spezifika in Partner*innenarbeit durchführen** (Buxton et al., 2019)			
3.6.3.1	**... im fragenden Dialog** (Watt et al., 2013)	3.6.3	**Diagnostizieren naturwissenschaftlicher Spezifika als Lernbegleitung durchführen**			
3.6.4.1	***... durch Geschichten oder Erzählungen der Schüler*innen*** *(Brendel et al., 2019),* (Menthe et al., 2015)	3.6.4	**Diagnostizieren naturwissenschaftlicher Spezifika mündlich ermöglichen**			
3.6.4.2	***... durch das Sprechen der Schüler*innen über ihre Zeichnungen*** (Kaiser & Seitz, 2017), *(Adesokan & Reiners, 2015),* (Schomaker & Weddehage, 2016)					
3.6.4.3	**... über das Beschreiben der Schüler*innen von Versuchsdurchführungen** (Hößle et al., 2017)					
3.6.4.4	**... über das Diktieren oder Flüstern der Schüler*innen von Deutungen und Ansichten** (Kaiser & Seitz, 2017)					

3.7.1.1	***… durch freies Aufstellen lassen von Vermutungen*** *(Adesokan, 2015)*	3.7.1	***Diagnostizieren naturwissenschaftlicher Spezifika offen gestalten***	3.7	**Diagnostizieren naturwissenschaftlicher Spezifika auf unterschiedlichen Offenheitsgrade gestalten**		
		3.8.1	**Diagnostizieren naturwissenschaftlicher Spezifika auf einfachem Anforderungsniveau gestalten** (Melle et al., 2017)	3.8	**Diagnostizieren naturwissenschaftlicher Spezifika auf unterschiedlichen Anforderungsniveaus gestalten** (Schmitt-Sody & Kometz, 2011)		
		3.8.2	**Diagnostizieren naturwissenschaftlicher Spezifika auf mittlerem Anforderungsniveau gestalten** (Melle et al., 2017)				
		3.8.3	**Diagnostizieren naturwissenschaftlicher Aspekte auf erhöhtem Anforderungsniveau gestalten** (Melle et al., 2017)				
		3.9.1	**Diagnostizieren naturwissenschaftlicher Spezifika mit Diskussionen gestalten** (Gläser & Sothmann, 2015)	3.9	**Diagnostizieren naturwissenschaftlicher Spezifika reflektierend gestalten**		
		3.10.1	**Diagnostizieren naturwissenschaftlicher Spezifika multikulturell gestalten** (Buxton et al., 2019)	3.10	**Diagnostizieren naturwissenschaftlicher Spezifika in konstruktiver Lernatmosphäre durchführen**		
				3.11	**Sonstige**		
4.1.1.1	**… durch Zeichnen** (Kaiser & Seitz, 2017)	4.1.1	***Entwicklung naturwissenschaftlicher Konzepte visuell ermöglichen*** (Ferreira & Lawrie, 2019), (Koehler & Wild, 2019), *(Werther, 2019),* (Rau-Patschke, 2019), (Hwang & Taylor, 2016), (Simon & Gebauer, 2014), *(Bodzin et al., 2007), (Teke & Sozbilir, 2019),* (McCarthy, 2005)	4.1	**Entwicklung naturwissenschaftlicher Konzepte materialgeleitet ermöglichen** (Kaiser & Seitz, 2017), (McGinnis, 2013), (Marino, 2010)	4.	***Naturwissenschaftliche Konzepte inklusiv entwickeln*** (Menthe et al., 2015) *(Puddu, 2017)* (Kaiser & Seitz, 2017) (Abels, 2019) (Koehler & Wild, 2019) (Ferreira & Lawrie, 2019) (Teke & Sozbilir, 2019) (Hwang & Taylor, 2016) (Tobin & Tippett, 2014) (Abels, 2016) (Filusch, 2017) (Simon & Gebauer, 2014) (Watt et al., 2013) (Villanueva et al., 2012)
4.1.1.2	**… durch Concept-Cartoons** (Busch & Ralle, 2013)						
4.1.1.3	***… durch 2D Repräsentationen von chemischen Reaktionen*** *(Teke & Sozbilir, 2019)*						
		4.1.2	***Entwicklung naturwissenschaftlicher Konzepte mit Hilfekarten unterstützen*** *(Baumann et al., 2016)*				
4.1.3.1	**… durch Schmecken von Salzwasser** (Filusch, 2017)	4.1.3	**Entwicklung naturwissenschaftlicher Konzepte durch Material zum Schmecken ermöglichen**				
4.1.4.1	***… durch Lego- oder Bausteine*** (Nehring et al., 2017), *(Rott et al., 2017)*	4.1.4	***Entwicklung naturwissenschaftlicher Konzepte modellbasiert ermöglichen*** (Koehler & Wild, 2019) *(Rosenblum et al., 2019)* (Teke & Sozbilir, 2019) (Rott & Marohn, 2016) *(Rott et al., 2017)* (Hoffmann & Menthe, 2016)				
4.1.4.2	**… durch Kugeln** (Nehring et al., 2017)						
4.1.5.1	***… durch 3D-Darstellungen von Molekülen aus veschiedenen Kügelchen*** *(Teke & Sozbilir, 2019)*	4.1.5	***Entwicklung naturwissenschaftlicher Konzepte taktil ermöglichen*** *(Teke & Sozbilir, 2019)*				
4.1.5.2	**… durch Spüren von Stoffen** (Filusch, 2017), (Kaiser & Seitz, 2017)						
4.1.5.3	***… durch taktile Graphen und Diagrammen*** *(Rosenblum et al., 2019)*						
4.1.5.4	**… durch taktiles Ausbalancieren von Reaktionsgleichungen** (Lunsford & Bargerhuff, 2006)						
4.1.5.5	**… durch taktile Zeichnungen** (Teke & Sozbilir, 2019)						
		4.1.6	**Entwicklung naturwissenschaftlicher Konzepte durch Texte ermöglichen** (Teke & Sozbilir, 2019)				

4.1.7.1	**… durch akustische Thermometer** (Teke & Sozbilir, 2019)	4.1.7	**Entwicklung naturwissenschaftlicher Konzepte durch akustische Materialien ermöglichen** (Teke & Sozbilir, 2019)			
		4.1.8	**Entwicklung naturwissenschaftlicher Konzepte durch blindenschriftliche Materialien ermöglichen** (Koehler & Wild, 2019)			
4.1.9.1	**… durch vergrößerte Ausdrucke** (Koehler & Wild, 2019)	4.1.9	**Entwicklung naturwissenschaftlicher Konzepte durch vergrößerte Materialien ermöglichen**			
		4.1.10	**Entwicklung naturwissenschaftlicher Konzepte mit „graphic organizers“ unterstützen** (Watt et al., 2013)			
4.1.11.1	**… durch eine Trommel als Herzschlag** (Kaiser & Seitz, 2017)	4.1.11	**Entwicklung naturwissenschaftlicher Konzepte über den eigenen Körper ermöglichen**			
4.1.11.2	***… durch Reiben der Hände*** *(Schmitt-Sody, 2014),* (Schmitt-Sody & Kometz, 2013)					
		4.2.1	**Entwicklung naturwissenschaftlicher Konzepte durch Bauen oder Konstruieren ermöglichen** (Rau-Patschke, 2019)	4.2	***Entwicklung naturwissenschaftlicher Konzepte handlungsorientiert ermöglichen*** (Teke & Sozbilir, 2019) *(Werther, 2019)* (Adl-Amini & Hardy, 2017) (Simon & Gebauer, 2014) (Marino, 2010) (Scruggs et al., 2008) *(McCarthy, 2005)* (Haskell, 2000) (Weinburgh, 1995)	
		4.2.2	***Entwicklung naturwissenschaftlicher Konzepte durch Experimente ermöglichen*** *(Schmitt-Sody, 2014)* (Schmitt-Sody & Kometz, 2013) (McCarthy, 2005) (Rau-Patschke, 2019) (Baumann et al., 2018)			
		4.2.3	***Entwicklung naturwissenschaftlicher Konzepte durch Forschendes Lernen ermöglichen*** *(Mumba et al., 2015)* (Brusca-Vega, Alexander, & Kamin, 2014) (Watt et al., 2013) (Villanueva, Taylor, Therrien, & Hand, 2012) (Scruggs & Mastropieri, 2007)			
4.2.4.1	**… durch Spiele wie Domino oder Stille Post, wobei die Schüler*innen zwischen verschiedenen Repräsentationen wechseln müssen** (Puddu, 2017)	4.2.4	**Entwicklung naturwissenschaftlicher Konzepte spielerisch ermöglichen**			
4.2.4.2	**… durch Geräten in der Sporthalle** (Kaiser & Seitz, 2017)					
4.2.4.3	**… durch das Nachspielen einer Geschichte** (Kaiser & Seitz, 2017)					
4.2.4.4	**… durch Textpuzzle zu Stoffeigenschaften** (Knipping et al., 2017)					
4.3.1.1	**… durch Bereitstellen von Verben und Wortfeldern** (Puddu, 2017)	4.3.1	***Entwicklung naturwissenschaftlicher Konzepte durch Bereitstellen von Hilfen sprachlich unterstützen*** (Abels, 2019), *(Buxton et al., 2019)*	4.3	**Entwicklung naturwissenschaftlicher Konzepte sprachlich unterstützen** (Basham, Israel, & Maynard, 2010)	
		4.3.2	***Entwicklung naturwissenschaftlicher Konzepte fachsprachlich ermöglichen*** *(Meskill & Oliveira, 2019), (Rott & Marohn, 2018),* (Basham, Israel, & Maynard, 2010)			
		4.4.1	**Entwicklung naturwissenschaftlicher Konzepte durch Apps oder Computerprogramme ermöglichen** (Baumann & Melle, 2019), (Teke & Sozbilir, 2019), (Hwang & Taylor, 2016)	4.4	***Entwicklung naturwissenschaftlicher Konzepte digital ermöglichen*** *(Werther, 2019) (Baumann & Melle, 2019)* (Koehler & Wild, 2019) (Marino, 2010) *(Bodzin et al., 2007)* (Meskill & Oliveira, 2019)	
		4.4.2	**Entwicklung naturwissenschaftlicher Konzepte durch Simulationen ermöglichen** (Schmitt-Sody & Kometz, 2011)			

4.4.3.1	***… durch Sendungen wie „Wissen macht Ah!“*** *(Werther, 2019)*	**4.4.3**	**Entwicklung naturwissenschaftlicher Konzepte durch Filme, Sendungen etc. ermöglichen**			
4.4.4.1	***… durch Hörbücher wie „Löwenzahn“*** *(Werther, 2019)*	**4.4.4**	**Entwicklung naturwissenschaftlicher Konzepte durch Hörbücher ermöglichen**			
4.4.5.1	**… durch digitale Periodensysteme** (Teke & Sozbilir, 2019)	**4.4.5**	**Entwicklung naturwissenschaftlicher Konzepte durch digitale Informationsmedien ermöglichen**			
		4.4.6	***Entwicklung naturwissenschaftlicher Konzepte durch PCs, Smartphones, Tablets etc. ermöglichen*** (Hwang & Taylor, 2016), *(Bodzin, Waller, Edwards, & Darlene Kale, 2007)*			
4.4.7.1	***… durch Homepages wie „ Die Sendung mit der Maus“*** *(Werther, 2019)*	**4.4.7**	***Entwicklung naturwissenschaftlicher Konzepte durch das Internet ermöglichen*** *(Bodzin et al., 2007)*			
		4.5.1	**Entwicklung naturwissenschaftlicher Konzepte durch Vergleichen oder Ordnen unterstützen** (McCarthy, 2005)	**4.5**	**Entwicklung naturwissenschaftlicher Konzepte kognitiv unterstützen**	
4.5.2.1	**… durch Schlüsselwortstrategien** (Watt et al., 2013)	**4.5.2**	***Entwicklung naturwissenschaftlicher Konzepte mit Gedächtnisstrategien unterstützen*** (Abels, 2015b), (Watt et al., 2013)			
4.5.2.2	**… durch die „pegword”-Methode** (Watt et al., 2013)					
4.5.3.1	***… durch Beispiele in einem Konzeptbuch*** (Rosenblum et al., *2019)*	**4.5.3**	***Entwicklung naturwissenschaftlicher Konzepte beispielbezogen ermöglichen*** *(Adesokan, 2015)*			
		4.5.4	**Entwicklung naturwissenschaftlicher Konzepte lebensweltbezogen ermöglichen** (Menthe et al., 2015)			
		4.5.5	**Entwicklung naturwissenschaftlicher Konzepte kontextbasiert ermöglichen** *(Siedenbiedel & Theurer, 2015)*			
		4.5.6	**Entwicklung naturwissenschaftlicher Konzepte problemorientiert ermöglichen** (Adl-Amini & Hardy, 2017)			
		4.5.7	***Entwicklung naturwissenschaftlicher Konzepte über Nature of Science ermöglichen*** *(Werther, 2019), (Meskill & Oliveira, 2019)*			
		4.5.8	***Entwicklung naturwissenschaftlicher Konzepte vorwissens-/vorstellungsbezogen ermöglichen*** (Ferreira & Lawrie, 2019) (Abels, 2019) (Adl-Amini & Hardy, 2017) *(Affeldt et al., 2017) (Rosenblum et al., 2019)*			
4.6.1.1	**… durch Diskussionen im Klassenrat** (Rau-Patschke, 2019)	**4.6.1**	**Entwicklung naturwissenschaftlicher Konzepte mündlich ermöglichen** (Ferreira & Lawrie, 2019), (Teke & Sozbilir, 2019)	**4.6**	***Entwicklung naturwissenschaftlicher Konzepte kommunikativ unterstützen*** (Abels, 2019) *(Werther, 2019) (Koehler & Wild, 2019) (McGrath & Hughes, 2018)* (Villanueva et al., 2012) *(Rott & Marohn, 2018)*	
4.6.1.2	**… durch das sich Erklären lassen von Phänomenen** (Rau-Patschke, 2019)					
		4.6.2	***Entwicklung naturwissenschaftlicher Konzepte im Plenum unterstützen*** *(Meskill & Oliveira, 2019),* (Rank & Scholz, 2017)			
4.6.3.1	***… durch „peer tutoring“*** *(Scruggs & Mastropieri, 2007)*	**4.6.3**	***Entwicklung naturwissenschaftlicher Konzepte mit Gruppenarbeit unterstützen*** *(Meskill & Oliveira, 2019)*			
4.6.4.1	**… durch Sonderpädagog*innen** (Watt et al., 2013)	**4.6.4**	***Entwicklung naturwissenschaftlicher Konzepte mit multiprofessionellen Teams unterstützen*** *(Koehler & Wild, 2019) (Rosenblum et al., 2019)* (Hwang			

			& Taylor, 2016) (Watt et al., 2013) *(Meskill & Oliveira, 2019)*			
4.6.5.1	**… im strukturierten Dialog** (Marino, 2010)	**4.6.5**	***Entwicklung naturwissenschaftlicher Konzepte als Lernbegleitung unterstützen*** *(Baumann et al., 2016), (Bodzin et al., 2007)*			
4.6.5.2	**… durch Impulse in der Gesprächsführung** (Adl-Amini & Hardy, 2017)					
4.6.5.3	**… durch Gruppenarbeiten in „teacher-supported groups“** (Hainsworth, 2012), *(Meskill & Oliveira, 2019)*					
4.6.5.4	***…durch Feedback*** *(Bodzin et al., 2007)*					
		4.7.1	***Entwicklung naturwissenschaftlicher Konzepte durch stark strukturierte Aufgaben ermöglichen*** *(Bodzin et al., 2007)*	**4.7**	**Entwicklung naturwissenschaftlicher Konzepte durch verschiedene Offenheitsgrade ermöglichen**	
4.8.1.1	***… über „semantic waving“*** *(Buxton et al., 2019)*	**4.8.1**	**Übergänge der Abstraktionsniveaus naturwissenschaftlicher Konzepte gestalten**	**4.8**	**Entwicklung naturwissenschaftlicher Konzepte auf unterschiedlichen Anforderungsniveaus gestalten** (Hoffmann & Menthe, 2016), (Menthe et al., 2015), (Simon & Gebauer, 2014)	
4.8.1.2	**… durch Anschauungsmodelle** (Rott et al., 2017)					
4.8.1.3	***… durch Arbeiten erst auf stofflicher Ebene und dann durch Einbezug der submikroskopischen Ebene*** *(Adesokan, 2015)*					
		4.8.2	**Abstraktionsebene naturwissenschaftlicher Konzepte explizit adressieren** (Abels, 2019)			
		4.8.3	**Entwicklung naturwissenschaftlicher Konzepte zieldifferent ermöglichen** (Menthe et al., 2015)			
		4.8.4	***Entwicklung naturwissenschaftlicher Konzepte auf Phänomenebene ermöglichen*** (Abels, 2019), *(Brusca-Vega et al., 2014)*			
4.8.5.1	***… durch selbstständige Erarbeitung*** *(Freedberg et al., 2019)*	**4.8.5**	**Entwicklung abstrakter naturwissenschaftlicher Konzepte ermöglichen** *(Freedberg et al., 2019),* (Ferreira & Lawrie, 2019)			
4.8.5.2	**… durch Selbstkontrolle** (Freedberg, Bondie, Zusho, & Allison, 2019)					
4.8.5.3	***… durch Fantasiereisen*** *(Rott et al., 2017)*					
		4.9.1	**Entwicklung naturwissenschaftlicher Konzepte über Diskussionen unterstützen** (Marino, 2010)	**4.9**	**Entwicklung naturwissenschaftlicher Konzepte reflektierend ermöglichen**	
		4.9.2	**Entwicklung naturwissenschaftlicher Konzepte mit individuellen Weltkonstruktionen ermöglichen** (Gervé, 2014)			
		4.10.1	***Für Entwicklung naturwissenschaftlicher Konzepte Fachbegriffe vorvermitteln*** *(Rosenblum et al., 2019)*	**4.10**	***Naturwissenschaftliche Konzepte vorvermitteln*** *(Koehler & Wild, 2019), (Rosenblum et al., 2019),* (Marino, 2010)	
		4.11.1	***Entwicklung naturwissenschaftlicher Konzepte in der Schule ermöglichen*** *(Werther, 2019)*	**4.11**	***Entwicklung naturwissenschaftlicher Konzepte an bestimmten Lernorten ermöglichen*** *(Werther, 2019)*	
		4.11.2	**Entwicklung naturwissenschaftlicher Konzepte im Schulgarten ermöglichen** (Münchhalfen, Hennemann, & Schlüter, 2016)			
		4.11.3	***Entwicklung naturwissenschaftlicher Konzepte in Zoos ermöglichen*** *(Werther, 2019)*			
		4.11.4	***Entwicklung naturwissenschaftlicher Konzepte in Museen ermöglichen*** *(Werther, 2019)*			
4.11.5.1	***… über das Riechen einer frisch gemähten Wiese*** *(Werther, 2019)*	**4.11.5**				

4.11.5.2	... über das Erproben äthiopischer Zahnhölzer oder Zweige des Neem-Baumes zur Zahnpflege (Kaiser & Seitz, 2017)		*Entwicklung naturwissenschaftlicher Konzepte in der Natur ermöglichen* (Rosenblum et al., 2019), (Werther, 2019)				
4.11.5.3	*... über das Sammeln interessanter Dinge aus der Natur* (Werther, 2019)						
4.11.5.4	*... über das Spielen an einem Bach oder Teich* (Werther, 2019)						
4.11.5.5	*... über das Beobachten von Tieren* (Werther, 2019)						
4.11.5.6	*... über das Malen von Pflanzen oder Tieren in der Natur* (Werther, 2019)						
4.11.5.7	*... über das Klettern auf einen Baum* (Werther, 2019)						
4.11.5.8	*... über das Pflanzen von Blumen in unterschiedlichen Lebensräumen* (Werther, 2019)						
4.11.5.9	*... über das in der Hand halten oder Streicheln von Tieren* (Werther, 2019)						
4.11.5.10	*... über das Versorgen von Tieren oder Pflanzen* (Werther, 2019)						
		4.12.1	*Entwicklung naturwissenschaftlicher Konzepte durch Classroom-Management ermöglichen* (Pawlak & Groß, 2019)	4.12	Entwicklung naturwissenschaftlicher Konzepte in konstruktiver Lernatmosphäre ermöglichen		
				4.13	Sonstige		
		5.1.1	*Naturwissenschaftliche Kontexte visuell gestalten* (Schroeder & Miller, 2019)	5.1	Naturwissenschaftliche Kontexte materialgeleitet gestalten	5.	Naturwissenschaftliche Kontexte inklusiv gestalten (Abels, 2015b), (Abels, 2019), (Gläser, 2014)
				5.2	*Naturwissenschaftliche Kontexte handlungsorientiert gestalten* (Schroeder & Miller, 2019)		
		5.3.1	*Naturwissenschaftliche Kontexte phänomenbasiert gestalten* (Freedberg, Bondie, Zusho, & Allison, 2019)	5.3	Naturwissenschaftliche Kontexte kognitiv gestalten		
		5.3.2	Naturwissenschaftliche Kontexte forschungsbiografisch gestalten (Schomaker & Weddehage, 2016)				
		5.3.3	Naturwissenschaftliche Kontexte über die Sache selbst zugänglich gestalten (Schomaker & Weddehage, 2016)				
		5.3.4	*Naturwissenschaftliche Kontexte relevant gestalten* (Chetcuti, 2009)				
				5.4	Naturwissenschaftliche Kontexte vorvermitteln (Abels, 2016)		
		5.5.1	*Naturwissenschaftliche Kontexte geschlechtsneutral gestalten* (Chetcuti, 2009)	5.5	Naturwissenschaftliche Kontexte in konstruktiver Lernatmosphäre gestalten		
		5.5.2	*Naturwissenschaftliche Kontexte über Hintergrund und Kultur der Schüler*innen gestalten* (Chetcuti, 2009)				
				5.6	Sonstige		
6.1.1.1	... durch die bildliche Darstellung von Fachbegriffen in der Geräteliste (Markic & Bruns, 2013)	6.1.1	*Entwicklung von Fachsprache visuell unterstützen* (Puddu, 2017), (Pötter, 2017), *(Schmitt-Sody, 2014), (Watt et al., 2014)*, (Markic & Abels, 2013), (Schmitt-Sody & Kometz, 2013), *(Schmitt-Sody, 2014)*	6.1	Entwicklung von Fachsprache materialgeleitet unterstützen	6.	*Entwicklung von Fachsprache inklusiv vermitteln* *(Meskill & Oliveira,*
6.1.1.2	*... durch die Visualisierung von Fachbegriffen mit Piktogrammen* (Adesokan & Reiners, 2015)						

6.1.1.3	**… durch Cartoons zu den Fachbegriffen und ihrer Bedeutung** (Busch & Ralle, 2013)					*2019)* (Rau-Patschke, 2019) (Knipping et al., 2017) (Markic & Abels, 2013) (Watt et al., 2013) *(Puddu, 2017) (Adesokan & Reiners, 2015) (Browder et al., 2012)* (Koomen, 2016) (Ralle, 2015)
6.1.1.4	***… durch das Beschriften von Abbildungen*** *(Adesokan & Reiners, 2015)*					
6.1.1.5	***… durch die Visualisierung von Fachbegriffen mit Symbolen*** *(Adesokan, 2015),*					
		6.1.2	**Entwicklung von Fachsprache modellbasiert ermöglichen** (Pötter, 2017)			
6.1.3.1	**… durch Hilfen zum Textverstehen** (Puddu, 2017)	**6.1.3**	***Entwicklung von Fachsprache durch Texte unterstützen*** *(Schmitt-Sody, 2014)*(Markic & Abels, 2013)			
6.1.4.1	***… durch Wörterwände*** *(Collier et al., 2016)*	**6.1.4**	**Entwicklung von Fachsprache mit “graphic organizers” strukturieren** (Abels, 2014b) (Brusca-Vega et al., 2014) (Watt et al., 2013) (Rau-Patschke, 2019) (Rau-Patschke, 2019)			
6.1.4.2	***… durch Concept-Maps*** *(Schmitt-Sody, 2014)*					
		6.1.5	***Entwicklung von Fachsprache durch Anschauungsmaterialien unterstützen*** *(Adesokan & Reiners, 2015),* (Markic & Abels, 2013)			
6.1.6.1	***… durch Glossare*** *(Affeldt et al., 2018), (Schmitt-Sody & Kometz, 2014), (Schmitt-Sody, 2014)*	**6.1.6**	**Entwicklung von Fachsprache mit Wortspeichern unterstützen** (Pötter, 2017)			
6.1.6.2	**… durch Wortlisten** (Rau-Patschke, 2019)					
6.1.6.3	**… durch Plakate** (Abels, 2013b)					
6.1.6.4	**… durch Fachvokabeltabellen** (Huber, 2017), (Markic & Bruns, 2013)					
6.1.7.1	**… zu alltagsweltlichen Bedeutungen, die kontrastiv zu den Fachbegriffen stehen** (Knipping et al., 2017)	**6.1.7**	***Entwicklung von Fachsprache mit Hilfekarten unterstützen*** *(Adesokan, 2015)*			
6.1.7.2	***… zu den konkreten Objekten mit den Fachbegriffen*** *(Adesokan & Reiners, 2015)*					
		6.2.1	***Entwicklung von Fachsprache durch Forschendes Lernen ermöglichen*** *(McGrath & Hughes, 2018)*	**6.2**	***Entwicklung von Fachsprache handlungsorientiert ermöglichen*** *(Adesokan, 2015) (Browder et al., 2012) (Bodzin et al., 2007) (Rosenblum et al., 2019)*	
		6.2.2	**Entwicklung von Fachsprache durch Darstellung von Fachwörtern als Aktion oder Tätigkeit ermöglichen** (Markic & Abels, 2013)			
6.2.3.1	**… durch Textpuzzle zu fachlichen Themen** (Knipping et al., 2017)	**6.2.3**	***Entwicklung von Fachsprache spielerisch ermöglichen*** *(Puddu, 2017)*			
6.2.3.2	**… durch Stille Post** (Markic & Abels, 2013)					
6.2.3.3	**… durch Dominospiele** (Markic & Abels, 2013)					
6.2.3.4	**… durch Memoryspiele** (Markic & Abels, 2013)					
6.2.3.5	**… durch das Bild eines Fußballspiels** (Schmitt-Sody & Kometz, 2011)					
6.3.1.1	**… durch kurze Sätze** (Puddu, 2017)	**6.3.1**	**Entwicklung von Fachsprache durch sprachliche Vereinfachung unterstützen**	**6.3**	**Entwicklung von Fachsprache sprachlich unterstützen** (Nehring et al., 2017) (Buxton et al., 2019) (Rau-Patschke, 2019) (Puddu, 2017) (Rau-Patschke, 2019)	
6.3.1.2	**… durch Verwendung aktiver statt passiver Satzkonstruktionen** (Puddu, 2017)					
6.3.1.3	**… durch Vermeidung von Nominalisierung** (Puddu, 2017)					
6.3.1.4	**… durch Vermeidung von Verschachtelungen** (Puddu, 2017)					

6.3.1.5	**… durch Reduzierung von Fachbegriffen** (Puddu, 2017)					
6.3.1.6	**… durch das Unterstreichen wichtiger Fachbegriffe als Hervorhebungen** (Hainsworth, 2012)					
6.3.1.7	***… durch Silbenmarkierungen*** *(Schmitt-Sody, 2014)*					
6.3.1.8	***… durch Artikel und Pluralformen zu den Fachbegriffen*** *(Puddu, 2017)*, (Markic & Bruns, 2013)					
6.3.1.9	***… durch Stichpunkte*** *(Therrien et al., 2014)*					
6.3.1.10	**… durch Satzanfänge** (Pötter, 2017)					
6.3.2.1	**… durch das Übersetzen von Fachbegriffen in möglichst viele Sprachen** (Kaiser & Seitz, 2017)	6.3.2	**Entwicklung von Fachsprache multilingual ermöglichen** (Puddu, 2017)			
6.3.2.2	***… durch die Verwendung von bilingualen Wörterbüchern*** *(Collier et al., 2016)*					
6.3.3.1	***… durch Piktogramme zu den Fachgebärden*** *(Adesokan & Reiners, 2015)*	6.3.3	***Entwicklung von Fachsprache über Fachgebärden ermöglichen*** *(Adesokan & Reiners, 2015), (Adesokan, 2015), (Schmitt-Sody et al., 2015)*			
6.3.3.2	***… durch Karten mit Fotos der Gebärden, Wörtern und kurzen Beschreibungen*** *(Schmitt-Sody, 2014)*					
6.3.3.3	***… durch Glossare mit Fachgebärden*** *(Schmitt-Sody & Kometz, 2014), (Schmitt-Sody, 2014)*					
6.3.3.4	***… durch Chemie-Foto-Storys mit Fachgebärden*** *(Schmitt-Sody, 2014)*					
6.3.3.5	***… durch Bilder zum Lernen der Fachgebärden*** *(Schmitt-Sody, 2014)*					
6.4.1.1	**… durch die „Keynote"-App** (Ok et al., 2017)	6.4.1	**Entwicklung von Fachsprache durch Apps oder Computerprogramme ermöglichen**	6.4	***Entwicklung von Fachsprache*** **digital** ***ermöglichen*** (Meskill & Oliveira, 2019), *(Sormunen, Lavonen, & Juuti, 2019)*	
6.5.1.1	***… durch Schlüsselwortstrategien*** *(Watt et al., 2014)*, (Scruggs, Mastropieri, & Okolo, 2008)	6.5.1	***Entwicklung von Fachsprache mit Gedächtnisstrategien unterstützen*** (Puddu, 2017) (Abels, 2014b) *(Watt et al., 2014)* (Watt et al., 2013) *(Scruggs & Mastropieri, 2007)* (Abels, 2015b) (Rau-Patschke, 2019)	6.5	**Entwicklung von Fachsprache kognitiv unterstützen**	
6.5.1.2	***… durch Schlüsselkonzepte der Fachbegriffe*** *(Watt et al., 2014)*					
6.5.1.3	***… durch die „pegword"-Methode*** *(Watt et al., 2014)*					
6.5.1.4	***… durch Buchstabenstrategien*** *(Watt et al., 2014)*					
6.5.2.1	***… durch Verschriftlichungen als Wiederholungen*** *(Schmitt-Sody, 2014)*	6.5.2	***Entwicklung von Fachsprache durch Wiederholungen unterstützen*** *(Watt et al., 2014)*, (McGinnis, 2013), (Rau-Patschke, 2019)			
6.5.2.2	***… durch wiederholtes Zeigen der Fachbegriffe*** *(Browder et al., 2012)*					
6.5.2.3	**… durch Wiederholungen wichtiger Satzteile** (Puddu, 2017)					
6.5.3.1	**… durch Erklärungen der Bedeutung der Fachbegriffe** (Koomen, 2016), (Markic & Abels, 2013), (Knipping et al., 2017)	6.5.3	***Entwicklung von Fachsprache durch Erklärungen ermöglichen*** *(Puddu, 2017), (Meskill & Oliveira, 2019)*, (Schmitt-Sody & Kometz, 2011), (Arndt & Szolak, 2007), (Markic & Abels, 2013)			
6.5.4.1	**… über Beispielsätze zu den Fachbegriffen** (Markic & Bruns, 2013)	6.5.4	***Entwicklung von Fachsprache beispielbezogen ermöglichen*** *(Rosenblum et al., 2019)*, (Rau-Patschke, 2019)			
6.5.4.2	***… über Analogien aus dem Alltag*** (Markic & Abels, 2013), *(Rosenblum et al., 2019)*, (Rau-Patschke, 2019)					
		6.5.5	***Entwicklung von Fachsprache über bekannte Begriffe ermöglichen*** *(Adesokan & Reiners, 2015)*			

		6.5.6	***Entwicklung von Fachsprache konzeptbasiert ermöglichen*** *(Adesokan, 2015)*				
		6.5.7	**Entwicklung von Fachsprache kontextbasiert ermöglichen** (Busch & Ralle, 2013)				
6.5.8.1	**… durch Erklärungen von verschiedenen Wortassoziationen** (Koomen, 2016), (Knipping et al., 2017)	6.5.8	**Entwicklung von Fachsprache über Schüler*innenvorstellungen ermöglichen**				
6.6.1.1	**… durch Geschichten mit den Fachbegriffen** (Markic & Abels, 2013)	6.6.1	**Entwicklung von Fachsprache mündlich unterstützen**	6.6	**Entwicklung von Fachsprache kommunikativ unterstützen** (Rau-Patschke, 2019), (Puddu, 2017)		
6.6.2.1	**… durch Gruppen nach den Erstsprachen** (Puddu, 2017)	6.6.2	**Entwicklung von Fachsprache in Gruppenarbeit unterstützen** (Rau-Patschke, 2019), (Markic & Abels, 2014)				
		6.6.2	**Entwicklung von Fachsprache in Einzelarbeit unterstützen** (Rau-Patschke, 2019)				
6.6.3.1	**… als Vorbild** (Rau-Patschke, 2019), (Knipping et al., 2017)	6.6.3	**Entwicklung von Fachsprache als Lernbegleitung unterstützen**				
6.6.3.2	**… durch einen korrigierenden Umgang mit Fehlern** (Rau-Patschke, 2019)						
6.6.3.3	**… durch Einforderung der Anwendung von Fachsprache** (Rau-Patschke, 2019)						
6.7.1.1	***… durch „semantic waving"*** *(Buxton et al., 2019)*	6.7.1	***Übergänge zur abstrakteren Fachsprache gestalten*** *(Buxton et al., 2019)*	6.7	**Entwicklung von Fachsprache auf unterschiedlichen Anforderungsniveaus ermöglichen** (Rau-Patschke, 2019)		
		6.7.2	**Entwicklung von Fachsprache über verschiedene Niveaus der Operatoren vermitteln** (Rau-Patschke, 2019)				
	… durch Alltagsgegenstände, die gleiche Charakteristika wie die Fachbegriffe besitzen (Markic & Abels, 2013)	6.8.1	***Entwicklung von Fachsprache durch Vergleiche ermöglichen*** *(Collier et al., 2016),* (Rau-Patschke, 2019)	6.8	**Entwicklung Fachsprache reflektierend ermöglichen** (Rau-Patschke, 2019)		
6.8.2.1	**… durch das Diskutieren über fehlerhafte Formulierungen** (Busch & Ralle, 2013)	6.8.2	**Entwicklung von Fachsprache durch Diskussionen ermöglichen**				
				6.9	***Fachsprache vorvermitteln*** *(Rosenblum et al., 2019), (Kahn et al., 2017)*		
6.10.1.1	**… durch Wertschätzen von Fehlern** (Rau-Patschke, 2019)	6.10.1	**Entwicklung von Fachsprache wertschätzend ermöglichen**	6.10	**Entwicklung von Fachsprache in konstruktiver Lernatmosphäre ermöglichen**		
		6.10.2	**Entwicklung von Fachsprache zeitlich unterstützen** (Rau-Patschke, 2019)				
				6.11	**Sonstige**		
7.1.1.1	**… durch Hilfekarten zum Versuchsaufbau** (Abels et al., 2019)	7.1.1	***Forschendes Lernen mit Karten unterstützen*** (Abels, 2019), (Abels et al., 2019), *(Affeldt et al., 2017),* (Abels, 2015b), (Abels, 2014b)	7.1	***Forschendes Lernen materialgeleitet unterstützen*** (Abels, 2015b), *(Abels et al., 2019)*	7.	***Forschendes Lernen inklusiv gestalten*** (Koehler & Wild, 2019) (Vavougios, Verevi, Papalexopoulos, Verevi, & Panagopoulou, 2016) (Mulvey, Chiu, Ghosh, & Bell, 2016) (Markic & Abels, 2014) (Maroney,
7.1.1.2	**… durch Hilfekarten mit Fragestellungen** (Abels et al., 2019)						
7.1.1.3	**… durch Hilfekarten mit Hinweisen zu den verwendbaren Materialien** (Abels, 2015b)						
7.1.1.4	**… durch Hilfekarten mit Hypothesen** (Abels, 2015b)						
7.1.1.5	**… durch Hilfekarten mit möglichen Versuchsabläufen** (Abels et al., 2019)						
7.1.1.6	**… durch Jokerkarten zum Spionieren bei anderen Gruppen** (Abels, 2015b)						
7.1.2.1	***… durch Abbildungen des Forschungskreislaufs*** *(Puddu, 2017)*	7.1.2					

7.1.2.2	**… durch eine Zeichnung zum Versuchsaufbau** (Abels, 2015b)		**Forschendes Lernen visuell unterstützen** (Abels, Demmel, Minnemann, Rathig, & Semmler, 2019), (Abels, 2019)			Finson, Beaver, & Jensen, 2003) (Abels et al., 2019) (Puddu, 2017) (Abels, 2015b) (Abels, 2019) (McGrath & Hughes, 2018) *(Kahn et al., 2017)* (Abels, 2015b) (Abels, 2013a) (Abels, 2016) (Puddu, 2017) (Abels, 2014b) *(Therrien et al., 2014)*
7.1.3.1	**… durch unterschiedlich viele Materialien auf dem Materialtisch** (Abels et al., 2014)	7.1.3	**Forschendes Lernen durch Materialtische unterstützen** (Abels, 2019), (Abels, 2015b), (Abels, 2013a)			
7.1.3.2	**… durch Ergänzen von Materialien auf dem Materialtisch nach den Ideen der Schüler*innen** (Abels et al., 2014)					
		7.1.4	**Forschendes Lernen durch strukturierende Materialien unterstützen** (Abels et al., 2019), (Abels et al., 2019)			
7.1.5.1	**… durch Glossare** Developing glossary of terms that guide students through the inquiry process (Marino, 2010)	7.1.5	**Forschendes Lernen mit Wortspeichern unterstützen**			
		7.2.1	**Forschendes Lernen mit Textverbesserungen unterstützen** (Abels, 2014b)	7.2	**Forschendes Lernen sprachlich unterstützen** (Abels, 2014b)	
		7.2.2	**Forschendes Lernen mit Lernen der Fachvokabeln unterstützen** (Abels, 2014b)			
				7.3	***Forschendes Lernen digital unterstützen*** *(Bodzin et al., 2007)*	
7.4.1.1	***… durch wiederholtes Thematisieren des Forschungszyklus*** *(Puddu, 2017)*	7.4.1	**Forschendes Lernen durch Lernen mit Wiederholungen unterstützen**	7.4	**Forschendes Lernen kognitiv unterstützen**	
		7.4.2	***Forschendes Lernen lebensweltbezogen ermöglichen*** *(Bodzin et al., 2007),* (Maroney et al., 2003)			
7.5.1.1	**… durch strukturierende Elemente, die die Gruppenarbeit lenken** (Abels, 2015a)	7.5.1	***Forschendes Lernen in der Gruppe unterstützen*** *(Abels et al., 2019),* (Abels, 2015b)	7.5	**Forschendes Lernen kommunikativ unterstützen** (Abels, 2015a), (Abels, 2015b), (Maroney et al., 2003)	
		7.5.2	**Forschendes Lernen in Partner*innenarbeit unterstützen** (McGrath & Hughes, 2018)			
7.5.3.1	**… durch „peer-tutoring“** (Abels, 2014b), (Brusca-Vega et al., 2014)	7.5.3	**Forschendes Lernen mit einem kollaborativen Hilfesystem unterstützen**			
7.5.4.1	**… durch der „reflective toss”** (Puddu, 2017), (Abels, 2015b)	7.5.4	***Forschendes Lernen als Lernbegleitung unterstützen*** (Abels et al., 2019) (Puddu, 2017) (Mulvey et al., 2016) (Abels, 2016) (Abels, 2014a) (McGrath & Hughes, 2018) (Abels, 2015b) (Abels, 2014b)			
7.5.4.2	**… durch Vorschläge** (Abels, 2015b)					
7.5.4.3	***… durch Fragen zur Weiterentwicklung der Schüler*innenideen*** *(Puddu, 2017),* (Abels, 2015b)					
7.5.4.4	***… durch Fokussierung auf die Aufgabe*** *(Puddu, 2017)*					
7.5.4.5	***… durch Fragen zum Befinden*** *(Puddu, 2017)*					
7.5.4.6	***… bei starken Schüler*innen mit „offenen“ oder „echten“ Fragen*** *(Puddu, 2017)*					
7.5.4.7	**… durch Freigaben** (Abels, 2015b)					
7.5.4.8	**… durch Aufforderungen** (Marino, 2010)					
7.5.5.1	**… zusammen mit Sonderschulpädagog*innen** (Watt et al., 2013)	7.5.5	**Forschendes Lernen im multiprofessionellen Team unterstützen** (Brusca-Vega et al., 2014), (Maroney et al., 2003)			

7.6.1.1	**… dadurch, dass am Anfang mehr Teile gesteuert werden, bis die Schüler*innen sie selbst übernehmen können** (Puddu, 2017)	7.6.1	***Forschende Lernen schrittweise einführen*** (Abels, 2016) (Abels, 2015b) (Abels et al., 2014) (Abels, 2019) (Puddu, 2017) *(Affeldt et al., 2017)*	7.6	***Forschendes Lernen durch verschiedene Offenheitsgrade ermöglichen*** (Abels et al., 2019) (Abels, 2019) *(Affeldt et al., 2018)* (Abels, 2015b) (Puddu, 2017) (Abels, 2014b) (Abels et al., 2014) (Mulvey et al., 2016) (McGinnis, 2013) (Watt, Therrien, Kaldenberg, & Taylor, 2013) (Abels, 2016) (Abels, 2014a) (Bachmann, 2012) (Bronner, 2013) *(Bodzin et al., 2007)*	
7.6.1.2	**… dadurch, dass die Anzahl der Prozessschritte reduziert wird** (Puddu, 2017)					
7.6.2.1	***… den Umgang mit den Geräten unterstützen*** *(Puddu, 2017),* (Abels, 2015b), (Abels, 2014b)	7.6.2	**Level 0 des Forschenden Lernens anwenden** (Bronner, 2013), (Abels, 2015b)			
7.6.2.2	***… naturwissenschaftliche Methoden unterstützen*** *(Puddu, 2017)*					
7.6.2.3	**… den Umgang mit Sicherheitsmaßnahmen unterstützen** (Puddu, 2017), (Abels, 2014b)					
7.6.2.4	***… durch vorgegebene Durchführungen unterstützen*** *(Puddu, 2017),* (Abels, 2015b), (Abels, 2015b), (Abels, 2014b)					
7.6.2.5	***… durch Aufmerksamkeit unterstützen*** *(Puddu, 2017)*					
7.6.2.6	***… durch Fokussierung unterstützen*** *(Puddu, 2017)*					
7.6.2.7	***… durch Aktivierung von Vorwissen unterstützen*** *(Puddu, 2017)*					
7.6.3.1	**… einfache naturwissenschaftliche Methoden von den Schüler*innen durchführen lassen** (Puddu, 2017)	7.6.3	**Level 1 des Forschenden Lernens anwenden** (Bronner, 2013)			
7.6.3.2	**… das Beobachten unterstützen** (Puddu, 2017), (Abels, 2015b), (Abels, 2014b)					
7.6.3.3	***… durch Fokussierung unterstützen*** *(Puddu, 2017)*					
7.6.3.4	**… die Datenauswertung und Ergebnispräsentation durchführen lassen** (Abels, 2014b) (Abels, 2015b)					
7.6.3.5	**… Schüler*innen beobachten lassen** (Abels, 2014b)					
7.6.4.1	***… naturwissenschaftliche Methoden anwenden lassen*** *(Puddu, 2017),* (Abels, 2015b)	7.6.4	***Level 2 für Forschendes Lernen anwenden*** *(Puddu, 2017)* (Bronner, 2013)			
7.6.4.2	**… Fragen vorgeben** (Abels, 2015b)					
7.6.4.3	***… die Datenauswertung und Ergebnispräsentation durchführen lassen*** *(Puddu, 2017)* (Abels, 2014b)					
7.6.4.4	***… beim Verstehen der Aufgabe unterstützen*** *(Puddu, 2017)*					
7.6.4.5	***… bei der Bildung von Hypothesen unterstützen*** (Puddu, 2017), (Abels, 2014b)					
7.6.5.1	**… durch vorhandene Kompetenzen der Schüler*innen entlasten** (Abels et al., 2019)	7.6.5	**Level 3 für des Forschenden Lernens anwenden** (Bronner, 2013)			
7.6.5.2	**… Schüler*innen die Verantwortung übernehmen lassen** (Puddu, 2017), (Abels, 2015b), (Abels, 2014b)					
7.6.5.3	**… Schüler*innen Hypothesen und naturwissenschaftliche Fragestellungen aufstellen lassen** (Puddu, 2017), (Abels, 2015b), (Abels, 2014b)					
7.6.5.4	**… durch das Eingehen auf die Schüler*innenideen und -gedanken unterstützen** (Puddu, 2017)					
		7.7.1	**Forschendes Lernen auf unterschiedlichen Komplexitätsgraden der Aufgabenstellung ermöglichen** (Abels, 2013a)	7.7	**Forschendes Lernen auf unterschiedlichen**	

					Anforderungsniveaus ermöglichen (Puddu, 2017)		
		7.8.1	**Für Forschendes Lernen benötigte Kompetenzen aufzeigen** (Maroney et al., 2003)	7.8	**Forschendes Lernen reflektierend ermöglichen** (Maroney et al., 2003)		
		7.9.1	**Forschendes Lernen an außerschulischen Lernorten ermöglichen** (Simon & Pech, 2019)	7.9	**Forschendes Lernen an bestimmten Lernorten ermöglichen**		
		7.10.1	**Forschendes Lernen mit Geduld unterstützen** (Maroney et al., 2003)	7.10	**Forschendes Lernen in konstruktiver Lernatmosphäre ermöglichen**		
		7.10.2	**Forschendes Lernen sinnstiftend und motivierend ermöglichen** (Marino, 2010)				
7.10.3.1	**… durch Anerkennung unerwarteter Ergebnisse** (Maroney et al., 2003)	7.10.3	**Forschendes Lernen mit Flexibilität unterstützen** (Maroney et al., 2003)				
7.10.3.2	**… durch Eingestehen von Unkenntnis und Bereitschaft zur Lösungssuche** (Maroney et al., 2003)						
7.10.4.1	**… durch die Auswahl der Fragestellungen nach Interesse** (Abels, 2013a)	7.10.4	**Forschendes Lernen schüler*innenzentriert unterstützen** (Puddu, 2017)				
		7.10.5	**Forschendes Lernen durch Wertschätzen von Fehlern unterstützen** (Maroney et al., 2003)				
7.10.6.1	**… ohne Wertung der Versuchsansätze** (Maroney et al., 2003)	7.10.6	**Forschendes Lernen wertneutral unterstützen**				
		7.10.7	**Forschendes Lernen mit Einfallsreichtum unterstützen** (Maroney et al., 2003)				
				7.11	**Sonstige**		
		8.1.1	**Phänomene mit spürbaren Materialien vermitteln** (Kaiser & Seitz, 2017), (Rank & Scholz, 2017)	8.1	**Phänomene materialgeleitet vermitteln**	8.	**Phänomene inklusiv vermitteln** (Rank & Scholz, 2017) (Schroeder, 2014) (Kaiser & Seitz, 2017) (Gebauer & Simon, 2012)
		8.1.2	**Phänomene taktil vermitteln** (Kaiser & Seitz, 2017)				
		8.1.3	**Phänomene mit Materialien zum Riechen vermitteln** (Kaiser & Seitz, 2017)				
		8.1.4	**Phänomene mit akustischen Materialien vermitteln** (Kaiser & Seitz, 2017)				
8.1.5.1	**… durch Wandzeitungen** (Kaiser & Seitz, 2017)	8.1.5	**Phänomene visuell vermitteln** (Kaiser & Seitz, 2017), (Rank & Scholz, 2017)				
8.1.6.1	**… durch Teilchenmodelle aus Bausteinen** (Rott & Marohn, 2016)	8.1.6	**Phänomene modellbasiert vermitteln**				
8.1.7.1	**… durch eine Lupe** (Kaiser & Seitz, 2017)	8.1.7	**Zugänge zu Phänomenen mit naturwissenschaftlichen Geräten ermöglichen**				
8.2.1.1	**… durch das Beobachten eines Versuchs** (Rott & Marohn, 2016)	8.2.1	**Phänomene durch Experimente vermitteln** (Rott & Marohn, 2016)	8.2	***Phänomene handlungsorientiert vermitteln*** *(Werther, 2019)*, (Blumberg & Mester, 2017), (Adl-Amini & Hardy, 2017)		
		8.2.2	***Phänomene durch Forschendes Lernen vermitteln*** *(Werther, 2019)*				
8.2.3.1	**… durch Memoryspiele** (Markic & Abels, 2013)	8.2.3	**Phänomene spielerisch vermitteln**				
8.2.3.2	**… durch Dominospiele** (Markic & Abels, 2013)						
		8.3.1	**Phänomene fachsprachlich vermitteln** (Puddu, 2017)	8.3	**Phänomene sprachlich unterstützt vermitteln**		
		8.4.1	**Phänomene mit einer Makrokamera erfahrbar machen** (Kaiser & Seitz, 2017)	8.4	**Phänomene digital vermitteln**		

8.5.1.1	***… durch Vereinfachung/Reduktion*** *(Siedenbiedel & Theurer, 2015),* (Rank & Scholz, 2017)	**8.5.1**	***Phänomene elementarisiert vermitteln*** *(Siedenbiedel & Theurer, 2015),* (Rank & Scholz, 2017)	**8.5**	**Phänomene auf unterschiedlichen Abstraktionsniveaus vermitteln** (Schroeder, 2014), (Adl-Amini & Hardy, 2017)		
8.5.1.2	**… durch Umkehren** (Rank & Scholz, 2017)						
8.5.1.3	**… durch Kombinieren** (Rank & Scholz, 2017)						
8.5.1.4	**… durch Modifizieren** (Rank & Scholz, 2017)						
8.5.1.5	**… durch Substituieren** (Rank & Scholz, 2017)						
8.5.1.6	**… durch Magnifizieren** (Rank & Scholz, 2017)						
		8.5.2	***Komplexe Phänomene vermitteln*** *(Siedenbiedel & Theurer, 2015)*				
		8.6.1	***Phänomene in der Natur vermitteln*** *(Werther, 2019)*	**8.6**	**Phänomene an verschiedenen Lernorten vermitteln**		
8.7.1.1	**… durch Rituale** (Kaiser & Seitz, 2017)	**8.7.1**	**Phänomene durch Classroom-Management unterstützt vermitteln**	**8.7**	**Phänomene in konstruktiver Lernatmosphäre vermitteln**		
				8.8	**Sonstige**		
		9.1.1	***Zugang zu Modellen taktil ermöglichen*** (Koehler & Wild, 2019), (Rosenblum, Ristvey, & Hospital, 2019)	**9.1**	**Modelle materialgeleitet vermitteln** (Abels, 2019)	**9.**	***Modelle inklusiv vermitteln*** (Ferreira & Lawrie, 2019), *(Teke & Sozbilir, 2019)*
9.1.2.1	**… durch verbale Beschreibungen** (Rosenblum et al., 2019)	**9.1.2**	***Zugang zu Modellen durch akustische Materialien ermöglichen*** *(Werther, 2019), (Lahav et al., 2019)*				
9.1.2.2	***… durch unterschiedliche Töne für kollidierende Teilchen*** *(Lahav, Hagab, Levy, & Talis, 2019)*						
9.1.2.3	**… durch die Übersetzung von Text in mündliche Sprache** (Lahav et al., 2019)						
9.1.3.1	**… durch Modellieren mit Modelliermasse o.ä.** (Kaiser & Seitz, 2017)	**9.1.3**	***Zugang zu Modellen durch modellierbare Materialien ermöglichen*** *(Teke & Sozbilir, 2019),* (Schroeder & Miller, 2019)				
9.1.3.2	**… durch Schleifen von Material wie Speckstein** (Kaiser & Seitz, 2017)						
9.1.3.3	**… durch Alltagsgegenstände wie Mörser als Zahnmodell** (Kaiser & Seitz, 2017)						
9.1.3.4	***… durch Modellieren mit Plättchen etc.*** *(Rott et al., 2017)*						
9.1.3.5	***… durch Modellieren mit Bausteinen*** *(Rott & Marohn, 2018)*						
9.2.1.1	**… mit „NavMol“** (Vitoriano et al., 2016)	**9.2.1**	**Modelle mit Apps oder Computerprogrammen vermitteln**	**9.2**	**Modelle digital vermitteln**		
9.2.1.2	**… mit dem „Molekülbetrachter“** (Nehring et al., 2017)						
		9.2.2	***Modelle mit Simulationen vermitteln*** *(Koehler & Wild, 2019),*				
9.3.1.1	**… durch Vergleiche mit dem eigenen Körper** (Kaiser & Seitz, 2017)	**9.3.1**	**Modelle durch Ordnen oder Vergleichen vermitteln**	**9.3**	**Modelle kognitiv vermitteln**		
		9.3.2	**Verwendung von Modellen durch Entwicklung der Modellkompetenzen unterstützen** (Ferreira & Lawrie, 2019)				
		9.4.1	***Arbeit mit Modellen in der Gruppe unterstützen*** (Schroeder & Miller, 2019)	**9.4**	**Modelle kommunikativ vermitteln**		
9.4.2.1	***… durch Anleitungen*** *(Teke & Sozbilir, 2019)*	**9.4.2**	**Arbeit mit Modellen als Lernbegleitung unterstützen**				
		9.5.1	**Modelle offen vermitteln** (Schroeder & Miller, 2019)	**9.5**	**Modelle durch verschiedene Offenheitsgrade vermitteln**		

		9.6.1	***Modelle von Realität unterscheiden*** *(Adesokan, 2015)*	9.6	**Modelle reflektierend ermöglichen** (Rott & Marohn, 2016), (Kaiser & Seitz, 2017)		
		9.6.2	***Existenz von unterschiedlichen Modellen begründen*** *(Rott et al., 2017)*				
		9.7.1	***Modelle vorab zeigen*** *(Rosenblum et al., 2019)*	9.7	**Modelle vorvermitteln**		
				9.8	**Sonstige**		
		10.1.1	**Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen modellbasiert ermöglichen** (Pötter, 2017)	10.1	***Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen materialgeleitet ermöglichen*** (Abels, Puddu, & Lembens, 2014), (Abels, 2013b), *(Abels, 2014a)*	10.	***Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen inklusiv gestalten*** *(Adesokan & Reiners, 2015)*
		10.1.2	***Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen mit Hilfekarten unterstützen*** *(Adesokan, 2015)*, (Abels, 2013b)				
		10.1.3	***Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen visuell ermöglichen*** (Pötter, 2017), (Kaiser & Seitz, 2017), *(Siedenbiedel & Theurer, 2015)*, (Rank & Scholz, 2017)				
		10.1.4	**Aufstellen von Hypothesen und naturwissenschaftliche Fragestellungen mit „graphic organizers" strukturieren** (Kaiser & Seitz, 2017)				
		10.1.5	**Aufstellen von Hypothesen und naturwissenschaftliche Fragestellungen an der Tafel strukturieren** (Kaiser & Seitz, 2017), (Hainsworth, 2012)				
		10.2.1	**Hypothesen und naturwissenschaftliche Fragestellungen multilingual dokumentieren lassen** (Kaiser & Seitz, 2017)	10.2	***Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen sprachlich unterstützen*** *(Siedenbiedel & Theurer, 2015)*		
10.2.2.1	***… durch Ankreuzen lassen*** (Rank & Scholz, 2017), *(Siedenbiedel & Theurer, 2015)*	10.2.2	**Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen durch sprachliche Vereinfachungen unterstützen**				
10.2.2.2	**… durch vorgegebene Satzanfänge** (Abels et al., 2014), (Pötter, 2017)						
10.2.2.3	**… durch vorformulierte Sätze** (Rank & Scholz, 2017)						
		10.3.1	***Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen phänomenbasiert ermöglichen*** *(Abels, 2014a)*	10.3	**Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen kognitiv unterstützen**		
10.3.2.1	***… durch Zuordnen lassen der Materialien zu den entsprechenden Begriffen*** *(Schmitt-Sody, 2014)*	10.3.2	**Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen durch Ordnen und Vergleichen unterstützen**				
10.3.2.2	***… durch Zuordnen lassen von Bildern zu den entsprechenden Begriffen*** *(Schmitt-Sody, 2014)*						
		10.4.1	***Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen im Plenum unterstützen*** *(Baumann et al., 2016)*	10.4	**Aufstellen von Hypothesen und naturwissenschaftliche Fragestellungen kommunikativ unterstützen**		
		10.4.2	**Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen in Partner*innenarbeit unterstützen** (Abels, 2013b)				

10.4.3.1	**… durch Aufgreifen und Integrieren in den Denkprozess der Schüler*innen** (Kaiser & Seitz, 2017)	**10.4.3**	**Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen als Lernbegleitung unterstützen** (Maroney et al., 2003)				
10.5.1.1	**… durch Vorgaben** (Abels et al., 2014)	**10.5.1**	**Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen geschlossen ermöglichen**	**10.5**	**Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen auf verschiedenen Offenheitsgraden ermöglichen**		
		10.5.2	**Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen offen ermöglichen** (Abels, 2019)				
		10.6.1	**Übergang der Hypothesen und naturwissenschaftlichen Fragestellungen von konkret zu abstrakt gestalten** (Buxton et al., 2019)	**10.6**	**Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen auf unterschiedlichen Anforderungsniveaus ermöglichen**		
		10.6.2	***Aufstellen von herausfordernden Hypothesen und naturwissenschaftlichen Fragestellungen ermöglichen*** *(Freedberg, Bondie, Zusho, & Allison, 2019)*				
		10.7.1	***Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen in der Lernwerkstatt ermöglichen*** (Abels, 2016), *(Abels, 2014a)*	**10.7**	**Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen an bestimmten Lernorten ermöglichen**		
		10.8.1	**Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen wertschätzend gestalten** (Kaiser & Seitz, 2017)	**10.8**	**Aufstellen von Hypothesen und naturwissenschaftlichen Fragestellungen in konstruktiver Lernatmosphäre ermöglichen**		
		10.8.2	**Beim Aufstellen der Hypothesen und naturwissenschaftlichen Fragestellungen von den Fragen der Schüler*innen ausgehen** (Kaiser & Seitz, 2017)				
				10.9	**Sonstige**		
11.1.1.1	**… durch das Anfertigen von Skizzen** (Arndt & Szolak, 2007)	**11.1.1**	***Naturwissenschaftliche Informationsmedien visuell gestalten*** *(Puddu, 2017)* (Scholz, Dönges, Dechant et al., 2016) (Rott & Marohn, 2016) (Nehring et al., 2017) (Rank & Scholz, 2017) *(Kahn et al., 2017)* (Pötter, 2017) (Filusch, 2017) *(Adesokan & Reiners, 2015)* (Schmitt-Sody et al., 2015) *(Schmitt-Sody, 2014)* (Abels, 2013b) (Markic & Bruns, 2013) *(Baumann et al., 2016)*	**11.1**	***Naturwissenschaftliche Informationsmedien materialgeleitet gestalten*** *(Muth & Erb, 2019) (Rosenblum, Ristvey, & Hospitál, 2019) (Teke & Sozbilir, 2019)* (Melle, Schlüter, Nienaber, & Wember, 2017) (Scholz, Dönges, Dechant et al., 2016) *(Puddu, 2017)* (Abels, 2019)	**11.**	**Naturwissenschaftliche Informationsmedien inklusiv gestalten** (Schmitt-Sody & Kometz, 2011) (Pötter, 2017) (Abels, 2013b) (Koehler & Wild, 2019) (Nehring et al., 2017)
11.1.1.2	**… durch Symbole, die den ganzen Text repräsentieren** (Scholz, Dönges, Dechant et al., 2016)						
11.1.1.3	**… durch Symbole für wichtige Wörter der Sätze** (Scholz, Dönges, Dechant et al., 2016)						
11.1.1.4	**… durch Symbole als mathematische Gleichungssysteme** (Scholz, Dönges, Dechant et al., 2016)						
11.1.1.5	***… durch Fotos, Piktogramme oder Symbole*** (Scholz, Dönges, Dechant et al., 2016), *(Schmitt-Sody, 2014)*						
11.1.1.6	***… durch Grafen*** *(Muth & Erb, 2019), (McGrath & Hughes, 2018),* (Scruggs et al., 2008)						
11.1.2.1	**… durch kurze Ein-Satz-Konstruktionen** (Markic & Bruns, 2013)	**11.1.2**	***Lernen mit naturwissenschaftlichen Informationsmedien durch Textgestaltung unterstützen*** (Scholz, Dönges, Dechant et al., 2016), *(Puddu, 2017), (Schmitt-Sody, 2014),* (Abels, 2013b)				
11.1.3.1	***… durch blindenschriftliche Periodensysteme*** (Lunsford & Bargerhuff, 2006), (Koehler & Wild, 2019), *(Fantin et al., 2016), (Teke & Sozbilir, 2019)*	**11.1.3**	***In Naturwissenschaftlichen Informationsmedien Blindenschrift einsetzen*** *(Teke & Sozbilir, 2019)*				

11.1.3.2	***... durch Blindenschriftdrucker*** *(Teke & Sozbilir, 2019)*				
11.1.3.3	**... durch blindenschriftliche Naturwissenschaftsbücher** (Vitoriano et al., 2016)				
		11.1.4	***Naturwissenschaftliche Informationsmedien taktil gestalten*** *(Koehler & Wild, 2019), (Rosenblum et al., 2019)*		
11.1.5.1	***... durch Kalenderdarstellungen*** *(Siedenbiedel & Theurer, 2015)*	11.1.5	***Naturwissenschaftliche Informationsmedien mit „graphic organizers" strukturieren*** (Koomen, 2016), *(Watt, Therrien, & Kaldenberg, 2014),* (Watt et al., 2013)		
11.1.5.2	**... durch Concept Maps** (Hwang & Taylor, 2016)				
		11.1.6	***Naturwissenschaftliche Informationsmedien vergrößert gestalten*** *(Rosenblum et al., 2019),* (Nehring et al., 2017), (Nehring et al., 2017)		
11.1.7.1	**... durch Vorlesen** (Schmitt-Sody & Kometz, 2011), (Cawley, Hayden, Cade, & Baker-Kroczynski, 2001)	11.1.7	***Naturwissenschaftliche Informationsmedien akustisch gestalten*** *(Koehler & Wild, 2019),* (Teke & Sozbilir, 2019), *(Rosenblum et al., 2019)*		
11.1.7.2	***... durch verbale Beschreibungen von Naturwissenschaftsbüchern*** *(Fantin et al., 2016)*				
11.1.7.3	***... durch Echtzeit-Datenablesungen*** *(Koehler & Wild, 2019)*				
11.1.7.5	***... durch Audiostifte*** *(Fantin et al., 2016)*				
11.1.8.1	**... durch Videoanleitungen mit einzelnen Handlungsabschnitten als Szenen** (Scholz, Dönges, Dechant et al., 2016)	11.1.8	***Naturwissenschaftliche Informationsmedien videobasiert gestalten*** (Scholz, Dönges, Dechant et al., 2016), *(McGrath & Hughes, 2018)*		
11.1.8.2	**... durch Videoanleitungen aus Sicht der Person selbst** (Scholz, Dönges, Dechant et al., 2016)				
		11.1.9	**Naturwissenschaftliche Informationsmedien comicbasiert gestalten** (Affeldt et al., 2018)		
11.1.10.1	***... durch Hilfekarten mit Bildern und Erklärungshilfen zur Durchführung*** *(Schmitt-Sody, 2014)*	11.1.10	***Lernen mit naturwissenschaftlichen Informationsmedien mit Hilfekarten unterstützen*** *(Baumann et al., 2018), (Affeldt et al., 2018)*		
11.1.11.1	***... durch Wortlisten*** (Busch & Ralle, 2013), *(Affeldt et al., 2017)*	11.1.11	**Lernen mit naturwissenschaftlichen Informationsmedien durch Strukturierung unterstützen** (Nehring et al., 2017), (Rott & Marohn, 2016), (Schmitt-Sody et al., 2015), (Melle et al., 2017)		
11.1.11.2	**... durch Glossare** (Abels, 2013a)				
11.1.11.3	**... durch Vokabelhefte** (Abels, 2013a)				
11.1.11.4	***... durch einen großen Zeilenabstand*** *(Scholz, Dönges, Risch et al., 2016),* (Markic & Bruns, 2013)				
11.1.11.5	***... durch Überschriften*** *(Puddu, 2017)*				
11.1.11.6	***... durch Absätze*** *(Puddu, 2017)*				
11.1.11.7	***... durch Stichpunkte*** *(Puddu, 2017),* (Markic & Bruns, 2013), (Scruggs et al., 2008)				
11.1.11.8	***... durch Hervorhebungen*** *(Puddu, 2017),* (Scruggs et al., 2008), *(Schmitt-Sody, 2014)*				
11.1.11.9	***... durch Schriftarten zur besseren Lesbarkeit*** *(Schmitt-Sody, 2014)*				
11.1.11.10	**... durch die Schriftgröße** (Markic & Bruns, 2013)				
11.1.11.11	**... durch Checklisten** (Melle et al., 2017)				

11.1.11.12	**… durch seitenweisen Separierungen einzelner Handlungsschritte für Experimente** (Rank & Scholz, 2017)					
11.1.11.13	***… durch übergeordnete Fragen*** *(Puddu, 2017)*					
11.1.11.14	**… durch Absätze mit jeweils einer Hauptidee** (Scruggs et al., 2008)					
				11.2	***Naturwissenschaftliche Informationsmedien handlungsorientiert gestalten*** *(Bodzin et al., 2007)*	
11.3.1.1	***… durch Vermeidung unnötiger Fachbegriffe*** *(Affeldt et al., 2018),* (Markic & Bruns, 2013)	**11.3.1**	***Lernen mit naturwissenschaftlichen Informationsmedien fachsprachlich unterstützen*** (Koomen, 2016), (Scholz, Dönges, Dechant et al., 2016), *(Schmitt-Sody, 2014),* (Schmitt-Sody & Kometz, 2011)	**11.3**	***Lernen mit naturwissenschaftlichen Informationsmedien sprachlich unterstützen*** (Rott & Marohn, 2016) (Scholz, Dönges, Dechant et al., 2016) (Rank & Scholz, 2017) *(Adesokan & Reiners, 2015) (Schmitt-Sody, 2014)* (Markic & Bruns, 2013) (Melle et al., 2017) (Schmitt-Sody & Kometz, 2011)	
11.3.1.2	***… durch Vokabelerkennungen*** *(Koomen, 2016)*					
		11.3.2	***Lernen mit naturwissenschaftlichen Informationsmedien durch Gebärdensprache unterstützen*** *(Schmitt-Sody et al., 2015)*			
		11.3.3	***Lernen mit naturwissenschaftlichen Informationsmedien multilingual unterstützen*** *(Brusca-Vega et al., 2014),* (Markic & Abels, 2014)			
		11.3.4	***Lernen mit naturwissenschaftlichen Informationsmedien inhaltlich unterstützen*** *(Scholz, Dönges, Risch et al., 2016),* (Scholz, Dönges, Dechant, & Endres, 2016)			
11.3.5.1	***… durch einfache Satzstrukturen*** *(Puddu, 2017)*	**11.3.5**	***Lernen mit naturwissenschaftlichen Informationsmedien grammatikalisch unterstützen*** (Scholz, Dönges, Dechant, & Endres, 2016), *(Puddu, 2017)*			
11.3.5.2	***… durch Vermeiden von Nebensätzen*** *(Schmitt-Sody, 2014)*					
11.3.5.3	***… durch Verwenden des Aktivs*** *(Puddu, 2017)*					
11.3.5.4	***… durch Verwenden des Imperativs*** *(Puddu, 2017)*					
11.3.5.5	**… durch präpositionale Ausdrücke** (Busch & Ralle, 2013)					
11.3.6.1	***… durch Ziffernschreibweise*** *(Schmitt-Sody, 2014)*	**11.3.6**	**Lernen mit naturwissenschaftlichen Informationsmedien durch sprachliche Vereinfachungen unterstützen**			
11.3.6.2	***… durch die Erarbeitung umgangssprachlicher Begrifflichkeiten*** *(Schmitt-Sody, 2014)*					
11.3.6.3	**… durch Verwenden bekannter Wörter** (Scholz, Dönges, Dechant, & Endres, 2016)					
11.3.6.4	**… durch Verzichten auf unnötige Operatoren** (Markic & Bruns, 2013)					
11.3.6.5	***… durch Lückentexte*** *(Affeldt et al., 2018), (Affeldt et al., 2017)*					
11.4.1.1	***… durch Step-by-Step Animationen*** *(Bodzin et al., 2007)*	**11.4.1**	**Naturwissenschaftliche Informationsmedien mit Animationen gestalten**	**11.4**	***Naturwissenschaftliche Informationsmedien digital gestalten*** *(Siedenbiedel & Theurer, 2015), (Bodzin et al., 2007),* (Watson & Johnston, 2007), (Marino, 2010)	
11.4.2.1	**… durch Pictor-Selector** (Scholz, Dönges, Dechant et al., 2016), (Filusch, 2017)	**11.4.2**	**Naturwissenschaftliche Informationsmedien mit digitalen Symbolsammlungen gestalten**			
11.4.2.2	**… durch Metacom** (Scholz, Dönges, Dechant et al., 2016)					
11.4.2.3	**… durch Sclera-Symbols** (Scholz, Dönges, Dechant et al., 2016)					

11.4.2.4	**… durch eigene Bilddatenbanken** (Scholz, Dönges, Dechant et al., 2016)						
		11.5.1	**Lernen mit naturwissenschaftlichen Informationsmedien mit Strategien zur Selbstkontrolle unterstützen** (Koomen, 2016)	11.5	**Lernen mit naturwissenschaftlichen Informationsmedien kognitiv unterstützen**		
		11.5.2	**Lernen mit naturwissenschaftlichen Informationsmedien durch Förderung von Zusammenfassungsstrategien unterstützen** (Scruggs et al., 2008)				
11.5.3.1	***… durch „Survey! Question! Read! Recite! Review!“*** (Koomen, 2016)	11.5.3	***Lernen mit naturwissenschaftlichen Informationsmedien lesestrategisch unterstützen*** *(Koomen, 2016)*				
11.5.3.2	**… durch langsames Lesen** (Arndt & Szolak, 2007)						
		11.5.1	***Lernen mit naturwissenschaftlichen Informationsmedien im multiprofessionellen Team ermöglichen*** *(Rosenblum et al., 2019)*	11.6	**Lernen mit naturwissenschaftlichen Informationsmedien kommunikativ ermöglichen**		
11.7.1.1	**… durch Visualisierungen** (Melle et al., 2017), (Filusch, 2017),	11.7.1	**Lernen mit naturwissenschaftlichen Informationsmedien auf einfachem Niveau ermöglichen**	11.7	**Verschiedene Anforderungsniveaus für das Lernen mit naturwissenschaftlichen Informationsmedien ermöglichen** (Filusch, 2017), (Demir-Walther, 2016), (Demir-Walther, 2016)		
11.7.1.2	**… durch Strukturierungshilfen** (Melle et al., 2017)						
11.7.1.3	**… durch Verzicht auf Fachsprache** (Melle et al., 2017)						
11.7.1.4	**… durch einfache Sprache** (Melle et al., 2017)						
11.7.1.5	**… durch reduzierten Text** (Filusch, 2017)						
11.7.2.1	**… durch einheitliches Schriftbild** (Filusch, 2017)	11.7.2	**Lernen mit naturwissenschaftlichen Informationsmedien auf schwerem Niveau ermöglichen**				
11.7.2.2	**… durch mehr Text** (Abels, 2013b)						
11.7.2.3	**… durch Reduzieren oder Weglassen der vorgegebenen Satzanfänge** (Abels, 2013b)						
11.7.2.4	**… durch Reduzieren oder Weglassen der Begriffskarten** (Abels, 2013b)						
11.7.2.5	**… durch Gebrauch weniger Symbole** (Filusch, 2017)						
		11.8.1	***Naturwissenschaftliche Informationsmedien vor dem Einsatz einführen*** *(Rosenblum et al., 2019)*	11.8	**Naturwissenschaftliche Informationsmedien vorvermitteln**		
				11.9	**Sonstige**		
12.1.1.1	***… durch Schilder*** (Kaiser & Seitz, 2017), *(Adesokan, 2015)*	12.1.1	***Naturwissenschaftliches Dokumentieren visuell ermöglichen*** *(Adesokan & Reiners, 2015)*	12.1	**Naturwissenschaftliches Dokumentieren materialgeleitet unterstützen**	12.	***Naturwissenschaftliches Dokumentieren inklusiv gestalten*** (Rau-Patschke, 2019) (Filusch, 2017) (Frubӧse, 2013) *(Baumann et al., 2016) (Baumann et al., 2018) (Adesokan & Reiners, 2015)* (Busch & Ralle, 2013)
12.1.1.2	***… durch Fotos*** (Melle et al., 2017) *(Baumann et al., 2018) (Rott et al., 2017)* (Rank & Scholz, 2017) (Filusch, 2017)						
12.1.1.3	***… durch Zeichnungen*** (Filusch, 2017) *(Adesokan & Reiners, 2015) (Schmitt-Sody, 2014)* (Rank & Scholz, 2017) *(Schmitt-Sody, 2014)*						
12.1.1.4	**… durch das Zusammenstellen von vorgedruckten Symbolen** (Filusch, 2017)						
12.1.2.1	***… durch die Einteilung in Sinneinheiten*** *(Baumann et al., 2016)*	12.1.2	***Naturwissenschaftliches Dokumentieren durch Strukturierung unterstützen*** (Filusch, 2017), *(Adesokan & Reiners, 2015)*				
12.1.2.2	***… durch Leitfragen*** *(Baumann et al., 2016), (Puddu, 2017)*						
12.1.2.3	***… durch Wortblöcke*** *(Baumann et al., 2016)*						
12.1.2.4	**… durch Wandzeitungen** (Kaiser & Seitz, 2017)						

12.1.3.1	***… durch das Filmen des Experiments*** (Rank & Scholz, 2017), *(Baumann et al., 2018)*	12.1.3	**Naturwissenschaftliches Dokumentieren videobasiert ermöglichen** (Melle et al., 2017)			
12.1.4.1	**… durch das Aufschreiben von Sätzen** (Rank & Scholz, 2017)	12.1.4	**Naturwissenschaftliches Dokumentieren durch Text unterstützen**			
12.1.4.2	***… durch Textkürzungen*** *(Adesokan & Reiners, 2015)*					
12.1.5.1	***… durch Vorgeben von Zeilen zum Beschreiben*** *(Schmitt-Sody, 2014)*	12.1.5	**Naturwissenschaftliches Dokumentieren durch Vorlagen unterstützen** (Grumbine & Alden, 2006)			
		12.1.6	**Naturwissenschaftliches Dokumentieren in Logbüchern ermöglichen** (Kaiser & Seitz, 2017)			
12.2.1.1	***… durch Ankreuzen lassen*** wählen (Filusch, 2017), (Rank & Scholz, 2017), *(Adesokan & Reiners, 2015)*	12.2.1	**Naturwissenschaftliches Dokumentieren durch sprachliche Vereinfachungen unterstützen**	12.2	***Naturwissenschaftliches Dokumentieren sprachlich unterstützen*** (Filusch, 2017), *(Baumann et al., 2018)*	
12.2.1.2	**… durch Vorformulierungen** (Busch & Ralle, 2013)					
12.2.1.3	***… durch Vorlesen der geschriebenen Sätze*** *(Puddu, 2017)*					
12.2.1.4	***… durch Lückentexte*** *(Adesokan & Reiners, 2015)*					
12.2.1.5	***… durch Beispielsätze*** *(Baumann et al., 2018), (Puddu, 2017)*					
12.2.1.6	***… durch Satzanfänge*** *(Adesokan & Reiners, 2015),* (Busch & Ralle, 2013)					
		12.2.2	***Naturwissenschaftliches Dokumentieren fachsprachlich unterstützen*** (Pötter, 2017), (Busch & Ralle, 2013), *(Adesokan & Reiners, 2015),*			
12.3.1.1	***… durch Audioaufnahmen*** *(Baumann et al., 2018), (Sormunen et al., 2019)*	12.3.1	**Naturwissenschaftliches Dokumentieren mit dem Smartphone ermöglichen**	12.3	***Naturwissenschaftliches Dokumentieren digital ermöglichen*** *(Schmitt-Sody, 2014)*	
12.3.1.2	***… durch Benutzen der Kamerafunktionen*** *(Sormunen et al., 2019)*					
12.3.1.3	***… durch Anfertigen lassen von Notizen auf dem Smartphone*** *(Sormunen et al., 2019)*					
		12.4.1	**Naturwissenschaftliches Dokumentieren ritualisieren** (Rau-Patschke, 2019)	12.4	**Naturwissenschaftliches Dokumentieren kognitiv unterstützen**	
		12.5.1	***Naturwissenschaftliches Dokumentieren mündlich ermöglichen*** *(Puddu, 2017),* (Melle et al., 2017), (Pötter, 2017),	12.5	**Naturwissenschaftliches Dokumentieren kommunikativ unterstützen**	
12.6.1.1	**… durch Vorgeben des Protokolls** (Pötter, 2017)	12.6.1	**Naturwissenschaftliches Dokumentieren geschlossen gestalten**	12.6	**Verschiedene Offenheitsgrade für naturwissenschaftliches Dokumentieren ermöglichen**	
		12.6.2	***Naturwissenschaftliches Dokumentieren halboffen gestalten*** *(Adesokan, 2015)*			
		12.6.3	***Naturwissenschaftliches Dokumentieren offen gestalten*** (Pötter, 2017), (Filusch, 2017) *(Adesokan & Reiners, 2015)*			
		12.7.1	***Naturwissenschaftliches Dokumentieren auf stofflicher Ebene ermöglichen*** *(Adesokan, 2015)*	12.7	**Verschiedene Abstraktionsniveaus für naturwissenschaftliches Dokumentieren ermöglichen** (Münchhalfen et al., 2016)	
		12.7.2	***Naturwissenschaftliches Dokumentieren auf submikroskopischer Ebene ermöglichen*** *(Adesokan, 2015)*			
				12.8	**Sonstige**	
13.1.1.1	**… durch den Geruch als Indikator** (Teke & Sozbilir, 2019)	13.1.1		13.1		13.

13.1.1.2	***... durch den Geruch von brennenden Dingen*** *(Baumann et al., 2018)*		**Anwendung naturwissenschaftlicher Untersuchungsmethoden olfaktorisch ermöglichen**	***Anwendung naturwissenschaftlicher Untersuchungsmethoden materialgeleitet unterstützen*** *(Kahn et al., 2017)* (Koehler & Wild, 2019) (Teke & Sozbilir, 2019)	***Anwendung naturwissenschaftlicher Untersuchungsmethoden inklusiv gestalten*** (Schmitt-Sody & Kometz, 2011) *(Kirch et al., 2007) (Muth & Erb, 2019) (Pawlak & Groß, 2019)* (Pötter, 2017) (Koehler & Wild, 2019) (Schroeder & Miller, 2019) *(Teke & Sozbilir, 2019)* (Melle et al., 2017) (Vitoriano et al., 2016) *(Baumann et al., 2016) (Schmitt-Sody, 2014)* (Schmitt-Sody & Kometz, 2013) *(Bodzin et al., 2007)* (Hills, 2011) (Rank & Scholz, 2017) (Scholz, Dönges, Dechant et al., 2016) (Filusch, 2017)
13.1.2.1	***... durch die Temperatur der Flamme*** *(Baumann et al., 2018)*	13.1.2	**Anwendung naturwissenschaftlicher Untersuchungsmethoden spürbar ermöglichen**		
13.1.2.2	***... durch Ertasten von Objektpositionen beim Schwimmen und Sinken*** *(Kahn et al., 2017)*				
13.1.2.3	**... durch Vibration eines Lautsprechers z.B. zum Auspusten einer Flamme** (Rank & Scholz, 2017)				
13.1.3.1	***... durch aufsteigende Dämpfe oder Rauch*** *(Baumann et al., 2018)*	13.1.3	***Anwendung naturwissenschaftlicher Untersuchungsmethoden visuell ermöglichen*** *(Schmitt-Sody et al., 2015)*, (Schmitt-Sody & Kometz, 2013)		
13.1.3.2	**... durch die Wellenausbreitungen** (Rank & Scholz, 2017)				
13.1.3.3	***... durch Skizze zum Aufbau des Experiments*** *(Großmann & Woest, 2014)*				
13.1.3.4	***... durch Symbole*** *(Adesokan, 2015)*				
		13.1.4	***Anwendung naturwissenschaftlicher Untersuchungsmethoden modellbasiert ermöglichen*** (Schmitt-Sody & Kometz, 2013)		
13.1.5.1	**... durch Concept Maps** (Watson & Johnston, 2007)	13.1.5	**Anwendung naturwissenschaftlicher Untersuchungsmethoden mit „graphic organizers" strukturieren**		
		13.1.7	***Anwendung naturwissenschaftlicher Untersuchungsmethoden mit Forscher*innenheften unterstützen*** *(Muth & Erb, 2019)*, (Bachmann, 2012)		
13.1.8.1	***... durch Protokolle*** *(Baumann et al., 2018), (Bodzin et al., 2007)*	13.1.8	***Anwendung naturwissenschaftlicher Untersuchungsmethoden durch Strukturierung unterstützen*** (Rank & Scholz, 2017), (Pötter, 2017), *(Schmitt-Sody, 2014)*, (Abels, 2013b), (Schmitt-Sody & Kometz, 2013)		
13.1.8.2	**... durch Gliederungen** (Watson & Johnston, 2007)				
13.1.9.1	**... durch den Verzicht auf Maßangaben und der Bereitstellung passender Mengen** (Filusch, 2017)	13.1.9	**Anwendung naturwissenschaftlicher Untersuchungsmethoden bzgl. der Maßangaben unterstützen**		
13.1.10.1	***... durch Glossare*** *(Schmitt-Sody et al., 2015),*	13.1.10	***Anwendung naturwissenschaftlicher Untersuchungsmethoden mit Wortspeichern unterstützen***		
13.1.10.2	***... durch Gerätelisten*** *(Affeldt et al., 2018)*				
13.1.10.3	**... durch Wortlisten** (Huber, 2017)				
13.1.11.1	***... durch gestufte Hinweise zu einzelnen Experimentierphasen*** *(Affeldt et al., 2018)*	13.1.11	***Anwendung naturwissenschaftlicher Untersuchungsmethoden mit Hilfekarten unterstützen*** *(Muth & Erb, 2019) (Baumann et al., 2018) (Affeldt et al., 2018) (Grossmann & Woest, 2015) (Großmann & Woest, 2014) (Schmitt-Sody, 2014)* (Markic & Bruns, 2013) (Schmitt-Sody & Kometz, 2013) (Abels, 2013a) (Fischer, 2010)		
13.1.11.2	***... durch Hilfekarten zu den Geräten und Chemikalien*** *(Grossmann & Woest, 2015)*				
13.1.11.3	***... durch Hilfekarten mit Skizzen zum Aufbau*** *(Grossmann & Woest, 2015)*				
13.1.11.4	***... durch Hilfekarten mit der Durchführung*** *(Grossmann & Woest, 2015)*				
13.1.11.5	***... durch Hilfekarten mit Hilfen zur Beobachtung*** *(Grossmann & Woest, 2015)*				
13.1.11.6	***... durch Hilfekarten zur Auswertung unterstützen*** *(Grossmann & Woest, 2015)*, (Markic & Bruns, 2013)				

13.1.12.1	**… durch Tauschen von Bildern und Gegenständen** (Rank & Scholz, 2017)	13.1.12	**Anwendung naturwissenschaftlicher Untersuchungsmethoden mit Tauschtheke untersützen** (Rank & Scholz, 2017)		
13.1.13.1	**… durch verlängerte Okulare beim Mikrosko** Beim Mikroskop verlängerte/abgewinkelte Okulare verwenden (Thomsen, 2017)	13.1.13	**Anwendung naturwissenschaftlicher Untersuchungsmethoden mit verlängerten Geräten ermöglichen**		
13.1.14.1	***… durch blindenschriftliche Lineale*** (Koehler & Wild, 2019), *(Rosenblum, Ristvey, & Hospitál, 2019)*	13.1.14	***Anwendung naturwissenschaftlicher Untersuchungsmethoden mit blindenschriftlichen bzw. taktilen Markierungen auf den Geräten ermöglichen*** *(Koehler & Wild, 2019)*		
13.1.14.2	**… durch taktile Markierungen auf Messzylindern** (Watson & Johnston, 2007)				
13.1.14.3	**… durch taktile Markierungen auf Kolben** (Watson & Johnston, 2007)				
13.1.14.4	**… durch taktile Markierungen auf Maßstäben** (Watson & Johnston, 2007)				
13.1.14.5	**… durch taktile Markierungen auf Bechern** (Watson & Johnston, 2007)				
13.1.14.5	**… durch blindenschriftliche Labels auf den Chemikalien und Materialien** (Watson & Johnston, 2007), (Teke & Sozbilir, 2019),				
13.1.15.1	**… durch Lupen** (Watson & Johnston, 2007)	13.1.15	***Anwendung naturwissenschaftlicher Untersuchungsmethoden mit Vergrößerungen oder Vergrößerungsgeräten ermöglichen*** *(Koehler & Wild, 2019)*		
13.1.15.2	***… durch Kameras an Gelenkarmen*** *(Fantin et al., 2016)*				
13.1.15.3	***… durch Messgeräte mit vergrößerter Schrift*** *(Koehler & Wild, 2019)*				
13.1.16.1	***… durch „Talking Lab Quest“*** *(Koehler & Wild, 2019)*, (Vitoriano et al., 2016)	13.1.16	***Anwendung naturwissenschaftlicher Untersuchungsmethoden mit sensorischen Geräten ermöglichen*** *(Koehler & Wild, 2019)*, (Rank & Scholz, 2017)		
13.1.16.2	**… durch Lichtsensoren** (Teke & Sozbilir, 2019)				
13.1.16.3	***… durch „SciVoice“*** *(Koehler & Wild, 2019)*				
13.1.17.1	**… durch einen Spiegel zum Ablesen der Bürette** (Thomsen, 2017)	13.1.17	**Anwendung naturwissenschaftlicher Untersuchungsmethoden mit Zusatzmaterial für Geräte ermöglichen**		
13.1.18.1	**… durch Bildschirmeinrichtungen als Aufsatz für das Mikroskop** (Thomsen, 2017)	13.1.18	**Anwendung naturwissenschaftlicher Untersuchungsmethoden mit digitalen Einrichtungen für Geräte ermöglichen**		
13.1.18.2	***… durch Bildschirmeinrichtungen für Thermometer*** *(Vitoriano et al., 2016)*				
13.1.19.1	***… durch vibrierende Thermometern*** (Vitoriano et al., 2016)	13.1.19	**Anwendung naturwissenschaftlicher Untersuchungsmethoden mit vibrierenden Geräten ermöglichen**		
13.1.20.1	***… durch Löffel*** *(Kirch et al., 2007)*	13.1.20	**Anwendung naturwissenschaftlicher Untersuchungsmethoden mit Alltagsgeräten ermöglichen**		
13.1.20.2	***… durch Salatzangen*** *(Kirch et al., 2007)*				
13.1.20.3	***… durch große Trichter*** *(Kirch et al., 2007)*				

13.1.20.4	***… durch Spritzflaschen*** *(Kirch et al., 2007)*					
13.1.20.5	***… durch Messbecher*** *(Kirch et al., 2007)*					
13.1.21.1	**… durch niedrige Kartuschenbrennern** (Thomsen, 2017)	**13.1.21**	**Anwendung naturwissenschaftlicher Untersuchungsmethoden mit höhenadaptierten Geräten ermöglichen**			
13.1.22.1	***… durch akustische Taschenrechnern*** *(Kirch et al., 2007), (Koehler & Wild, 2019)*	**13.1.22**	**Anwendung naturwissenschaftlicher Untersuchungsmethoden mit akustischen Geräten ermöglichen** (Teke & Sozbilir, 2019)			
13.1.22.2	***… durch akustische Thermometern*** (Koehler & Wild, 2019), (Watson & Johnston, 2007), *(Vitoriano et al., 2016),* (Teke & Sozbilir, 2019)					
13.1.22.3	**… durch akustische Uhren** (Watson & Johnston, 2007)					
13.1.22.4	***… durch akustische Waagen*** *(Kirch et al., 2007)*					
13.1.22.5	**… durch akustische Globen** *(Rosenblum et al., 2019)*					
13.2.1.1	**… auf Level 0 oder 1 des Forschenden Lernens** (Abels, 2016)	**13.2.1**	**Anwendung naturwissenschaftlicher Untersuchungsmethoden mit Forschendem Lernen ermöglichen**	**13.2**	**Anwendung naturwissenschaftlicher Untersuchungsmethoden handlungsorientiert unterstützen** (Melle et al., 2017)	
		13.2.2	***Anwendung naturwissenschaftlicher Untersuchungsmethoden mit Demoexperimenten unterstützen*** *(Muth & Erb, 2019),* (Pötter, 2017)			
		13.2.3	***Anwendung naturwissenschaftlicher Untersuchungsmethoden mit Hilfen zur Durchführung unterstützen*** *(Affeldt et al., 2018), (Bodzin et al., 2007)*			
		13.2.4	**Anwendung naturwissenschaftlicher Untersuchungsmethoden durch Hilfsexperimente unterstützen** (Schmitt-Sody & Kometz, 2013)			
		13.2.5	***Anwendung naturwissenschaftlicher Untersuchungsmethoden mit Teilexperimenten unterstützen*** *(Schmitt-Sody, 2014)*			
13.2.6.1	***… durch Reduzierung der Anzahl der Experimente pro Stunde*** *(Siedenbiedel & Theurer, 2015)*	**13.2.6**	**Anwendung naturwissenschaftlicher Untersuchungsmethoden durch die Anzahl der Experimente unterstützen** (Schmitt-Sody & Kometz, 2011)			
13.2.7.1	**… durch Experimentierecken** (Bachmann, 2012)	**13.2.7**	***Anwendung naturwissenschaftlicher Untersuchungsmethoden mit Stationsarbeit ermöglichen*** *(Muth & Erb, 2019)*			
13.3.1.1	***… durch Gebärden mit Artikel, Abbildung und kurzer Beschreibung*** *(Schmitt-Sody et al., 2015)*	**13.3.1**	***Anwendung naturwissenschaftlicher Untersuchungsmethoden gebärdensprachlich ermöglichen*** *(Schmitt-Sody, 2014)*	**13.3**	***Anwendung naturwissenschaftlicher Untersuchungsmethoden sprachlich unterstützen*** *(Affeldt et al., 2018), (Schmitt-Sody, 2014)*	
13.3.1.2	***… durch Hilfekarten mit Gebärden*** *(Schmitt-Sody et al., 2015)*					
		13.4.1	***Anwendung naturwissenschaftlicher Untersuchungsmethoden mit einem LCD Projektor für eine digitale Laborarbeit ermöglichen*** *(Bodzin et al., 2007)*	**13.4**	***Anwendung naturwissenschaftlicher Untersuchungsmethoden digital ermöglichen*** (Teke & Sozbilir, 2019), (Marino, 2010), *(Koehler & Wild, 2019)*	
			Anwendung naturwissenschaftlicher Untersuchungsmethoden durch PCs, Smartphones,			

			Tablets etc. ermöglichen (Ok et al., 2017), *(Rosenblum et al., 2019)*			
		13.4.2	***Anwendung naturwissenschaftlicher Untersuchungsmethoden durch simulierte online Experimente ermöglichen*** *(Bodzin et al., 2007)*			
		13.5.1	***Anwendung naturwissenschaftlicher Untersuchungsmethoden vorwissensbasiert ermöglichen*** *(Schmitt-Sody, 2014)*	13.5	**Anwendung naturwissenschaftlicher Untersuchungsmethoden kognitiv unterstützen**	
		3.5.2	***Anwendung naturwissenschaftlicher Untersuchungsmethoden lebensweltbezogen ermöglichen*** *(Schmitt-Sody, 2014), (Affeldt et al., 2018)*			
		13.6.1	**Anwendung naturwissenschaftlicher Untersuchungsmethoden mündlich ermöglichen** (Schmitt-Sody & Kometz, 2013)	13.6	**Anwendung naturwissenschaftlicher Untersuchungsmethoden kommunikativ unterstützen** (Abels, 2013b), (Schmitt-Sody & Kometz, 2011)	
13.6.2.1	***… durch Erklärungen der Materialien und Geräte*** (Pötter, 2017)	13.6.2	**Anwendung naturwissenschaftlicher Untersuchungsmethoden durch Erklärungen ermöglichen** (Schmitt-Sody & Kometz, 2013)			
13.6.2.2	***… durch Erklärungen, was beim Experimentieren geschieht*** *(Kahn et al., 2017)*					
13.6.3.1	**… durch unterschiedliche Gruppenrollen** *(Pawlak & Groß, 2019)*	13.6.3	***Anwendung naturwissenschaftlicher Untersuchungsmethoden in der Gruppe ermöglichen*** *(Muth & Erb, 2019)* (Nehring et al., 2017) *(McGrath & Hughes, 2018) (Baumann et al., 2016)* (Pötter, 2017) *(Pawlak & Groß, 2019) (Baumann et al., 2018)*			
13.6.3.2	**… durch Zuteilung bestimmter Teilaufgaben pro Gruppe** (Kaiser & Seitz, 2017)					
		13.6.4	***Anwendung naturwissenschaftlicher Untersuchungsmethoden mit einem kollaborativen Hilfesystem ermöglichen*** *(Koehler & Wild, 2019)*			
		13.6.5	***Anwendung naturwissenschaftlicher Untersuchungsmethoden in Partner*innenarbeit ermöglichen*** *(Baumann et al., 2018)*			
		13.6.6	***Anwendung naturwissenschaftlicher Untersuchungsmethoden im Plenum ermöglichen*** *(Schulte, Kurnitzki, Lütje-Klose, & Miller, 2019)*			
13.6.7.1	***… durch antlitzgerichtetes Demonstrieren von Experimenten*** *(Schmitt-Sody, 2014)*	13.6.7	***Anwendung naturwissenschaftlicher Untersuchungsmethoden als Lernbegleitung ermöglichen*** *(Bodzin et al., 2007), (Muth & Erb, 2019), (Baumann et al., 2016)*			
13.6.7.2	**… durch „teacher- supported groups“** (Hainsworth, 2012)					
		13.6.8	***Anwendung naturwissenschaftlicher Untersuchungsmethoden im multiprofessionellen Team ermöglichen*** *(Rosenblum et al., 2019),* (Teke & Sozbilir, 2019), *(Rosenblum et al., 2019),* (Nehring et al., 2017), (Schmitt-Sody, Urbanger, & Kometz, 2015), (Conn, 2001)			
13.7.1.1	***… durch konkrete Handlungsanweisungen*** *(Scruggs & Mastropieri, 2007) (Schmitt-Sody, 2014)* (Pötter, 2017) *(Baumann et al., 2016)* (Filusch, 2017) *(Schmitt-Sody et al., 2015) (Baumann et al., 2018)*	13.7.1	***Anwendung naturwissenschaftlicher Untersuchungsmethoden geschlossen ermöglichen*** *(Bodzin et al., 2007)*	13.7	**Verschiedene Offenheitsgrade für die Anwendung naturwissenschaftlicher Untersuchungsmethoden ermöglichen** (Pötter, 2017)	

13.7.2.1	***… durch Vorgeben von Teilschritten beim Experimentieren*** (Pötter, 2017), *(Baumann et al., 2018)*	13.7.2	***Anwendung naturwissenschaftlicher Untersuchungsmethoden halboffen ermöglichen*** *(Grossmann & Woest, 2015)*				
13.7.3.1	***… durch offene Anleitungen*** *(Baumann et al., 2018)*	13.7.3	***Anwendung naturwissenschaftlicher Untersuchungsmethoden offen gestalten*** *(Freedberg et al., 2019), (Baumann et al., 2016),* (Rank & Scholz, 2017), (Pötter, 2017), (Filusch, 2017), (Gläser & Sothmann, 2015), *(Grossmann & Woest, 2015),* (Schmitt-Sody et al., 2015)				
13.8.1.1	**… als Erkundungs- oder Entscheidungsexperiment** (Schmitt-Sody & Kometz, 2011)	13.8.1	**Anwendung naturwissenschaftlicher Untersuchungsmethoden zieldifferent ermöglichen**	13.8	***Verschiedene Anforderungsniveaus für die Anwendung naturwissenschaftlicher Untersuchungsmethoden ermöglichen*** *(Affeldt et al., 2018)* (Schmitt-Sody et al., 2015) (Schmitt-Sody & Kometz, 2013) (Schmitt-Sody & Kometz, 2011) *(Schmitt-Sody, 2014)*		
13.8.2.1	***… durch kurze Experimente*** *(Schmitt-Sody, 2014),* (Schmitt-Sody & Kometz, 2013)	13.8.2	**Anwendung naturwissenschaftlicher Untersuchuchungsmethoden auf einfachem Niveau ermöglichen**				
13.8.3.1	***… durch zusätzliche Experimente*** *(Muth & Erb, 2019) (Baumann et al., 2016)* (Pötter, 2017) *(Schmitt-Sody et al., 2015) (Schmitt-Sody & Kometz, 2014)*	13.8.3	**Anwendung naturwissenschaftlicher Untersuchungsmethoden auf erhöhtem Anforderungsniveau ermöglichen**				
		13.9.1	**Grenzen naturwissenschaftlicher Untersuchungsmethoden erkennen lassen** (Brauer et al., 2017)	13.9	**Anwendung naturwissenschaftlicher Untersuchungsmethoden reflektierend ermöglichen**		
		13.10.1	***Anwendung naturwissenschaftlicher Untersuchungsmethoden in Eins-zu-Eins-Betreuung vorvermitteln*** *(Rosenblum et al., 2019)*	13.10	**Naturwissenschaftliche Untersuchungsmethoden vorvermitteln**		
		13.10.2	***Für Anwendung naturwissenschaftlicher Untersuchungsmethoden unbekannte Begriffe vorvermitteln*** *(Schmitt-Sody et al., 2015)*				
13.11.1.1	**… durch längere Pausen und kürzere Experimentierphasen** (Schmitt-Sody & Kometz, 2014)	13.11.1	**Anwendung naturwissenschaftlicher Untersuchungsmethoden zeitlich unterstützen**	13.11	**Anwendung naturwissenschaftlicher Untersuchungsmethoden in konstruktiver Lernatmosphäre ermöglichen**		
13.11.1.2	***… durch genügend Zeit für Experimente*** *(Schmitt-Sody, 2014),* (Kaiser & Seitz, 2017)						
13.11.1.3	**… durch unterschiedlich schnell verlaufende Experimente** (Schmitt-Sody & Kometz, 2011)						
		13.11.2	**Anwendung naturwissenschaftlicher Untersuchungsmethoden motivierend ermöglichen** (Lange-Schubert & Tretter, 2017)				
				13.12	**Sonstige**		
		14.1.1	**Entwicklung von Schüler*innenvorstellungen visuell ermöglichen** (Hwang & Taylor, 2016)	14.1	**Entwicklung von Schüler*innenvorstellungen materialgeleitet unterstützen** (Nehring et al., 2017), (Kaiser & Seitz, 2017)	14.	***Entwicklung von Schüler*innenvorstellungen inklusiv ermöglichen*** *(Rott & Marohn, 2018)* (Ferreira & Lawrie, 2019) (Brendel et al., 2019) (Watt et al., 2013) (Villanueva et al., 2012) *(Bodzin et al., 2007)*
		14.1.2	**Entwicklung von Schüler*innenvorstellungen textbasiert ermöglichen** (Brendel et al., 2019)				
		14.1.3	***Schüler*innenvorstellungen mit Checkpoints unterstützen*** *(Rott et al., 2017)*				
		14.1.4	***Entwicklung von Schüler*innenvorstellungen beispielbezogen ermöglichen*** *(Buxton et al., 2019)*				
14.1.5.1	***… durch Erstellung von Modelle aus Knetmasse o.ä.*** *(Adesokan & Reiners, 2015)*	14.1.5	***Entwicklung von Schüler*innenvorstellungen modellbasiert ermöglichen*** (Ferreira & Lawrie, 2019), *(Rott & Marohn, 2018), (Rott et al., 2017)*				

14.2.1.1	***… durch Lösen von Zucker in Wasser*** *(Rott et al., 2017)*	14.2.1	**Entwicklung von Schüler*innenvorstellungen durch Experimentieren ermöglichen**	14.2	**Entwicklung von Schüler*innenvorstellungen handlungsorientiert ermöglichen** (Rott & Marohn, 2018) (Lange-Schubert & Tretter, 2017)		
		14.3.1	***Entwicklung von Schüler*innenvorstellungen fachsprachlich ermöglichen*** *(Buxton et al., 2019)*	14.3	**Entwicklung von Schüler*innenvorstellungen sprachlich unterstützen**		
		14.4.1	**Entwicklung von Schüler*innenvorstellungen im Dialog ermöglichen** (Brendel, Siry, Haus, & Breedijk-Goedert, 2019), (Pech, Schomaker, & Simon, 2019)	14.4	**Entwicklung von Schüler*innenvorstellungen kommunikativ unterstützen** (Rau-Patschke, 2019), (Lange-Schubert & Tretter, 2017)		
		14.5.1	**Entwicklung von Schüler*innenvorstellungen durch Fragen ermöglichen** (Abels, 2015a)	14.5	**Entwicklung von Schüler*innenvorstellungen durch verschiedene Offenheitsgrade unterstützen**		
14.6.1.1	**… durch „semantic waving“** (Buxton et al., 2019)	14.6.1	**Übergänge zu abstrakteren Schüler*innenvorstellungen gestalten** (Buxton et al., 2019), (Knipping et al., 2017)	14.6	**Verschiedene Abstraktionsniveaus für die Entwicklung von Schüler*innenvorstellungen ermöglichen** (Menthe et al., 2015)		
		14.6.2	**Schüler*innenvorstellungen auf naiv-konkretem Niveau ermöglichen** (Adl-Amini & Hardy, 2017)				
		14.6.3	**Schüler*innenvorstellungen auf abstraktem Niveau ermöglichen** (Adl-Amini & Hardy, 2017)				
		14.7.1	**Entwicklung von Schüler*innenvorstellungen durch Gegenüberstellen mit der fachlichen Perspektive ermöglichen** (Brauer et al., 2017)	14.7	**Entwicklung von Schüler*innenvorstellungen reflektierend ermöglichen**		
		14.7.2	**Entwicklung von Schüler*innenvorstellungen durch Diskussionen ermöglichen** (Brendel et al., 2019)				
				14.8	**Sonstige**		
15.1.1.1	**… durch Symbole** (Filusch, 2017)	15.1.1	***Datenauswertung und Ergebnisdarstellung visuell ermöglichen*** (Brendel et al., 2019), *(Sormunen et al., 2019), (Adesokan, 2015), (Siedenbiedel & Theurer, 2015)*	15.1	**Datenauswertung und Ergebnisdarstellung materialgeleitet unterstützen**	15.	***Datenauswertung und Ergebnisdarstellung inklusiv gestalten*** (Vitoriano, Teles, Rizzatti, & Pesssoa de Lima, Régia C., 2016) (Teke & Sozbilir, 2019) *(Adesokan & Reiners, 2015)* (Watt et al., 2013) *(Affeldt et al., 2018)*
		15.1.2	**Datenauswertung und Ergebnisdarstellung textbasiert ermöglichen** (Brendel, Siry, Haus, & Breedijk-Goedert, 2019)				
15.1.3.1	***… durch Hilfekarten mit Musterlösungen*** *(Baumann et al., 2016)*	15.1.3	***Datenauswertung und Ergebnisdarstellung mit Hilfekarten unterstützen*** (Huber, 2017) *(Grossmann & Woest, 2015) (Großmann & Woest, 2014)* (Pötter, 2017)				
		15.1.4	**Datenauswertung und Ergebnisdarstellung durch Anschauungsmaterial ermöglichen** (Ferreira & Lawrie, 2019)				
		15.1.5	***Datenauswertung und Ergebnisdarstellung blindenschriftlich ermöglichen*** *(Rosenblum, Ristvey, & Hospitál, 2019)*				

		15.1.6	**Datenauswertung und Ergebnispräsentation durch adaptierte Materialien ermöglichen** (Teke & Sozbilir, 2019)			
15.1.7.1	**… durch Sonifikation von Infrarotspektren** (Vitoriano et al., 2016)	15.1.7	***Datenauswertung und Ergebnisdarstellung akustisch ermöglichen*** *(Sormunen et al., 2019)*			
		15.1.8	***Datenauswertung und Ergebnisdarstellung modellbasiert ermöglichen*** *(Adesokan, 2015)*			
				15.2	**Datenauswertung und Ergebnispräsentation handlungsorientiert ermöglichen** (Scruggs et al., 2008)	
15.3.1.1	***… durch Lückentexte*** *(Schmitt-Sody, 2014),* (Markic & Bruns, 2013)	15.3.1	**Datenauswertung und Ergebnisdarstellung durch sprachliche Vereinfachungen unterstützen**	15.3	**Datenauswertung und Ergebnisdarstellung sprachlich unterstützen** (Ferreira & Lawrie, 2019), (Markic & Bruns, 2013)	
15.4.1.1	***… durch graphische Darstellung von Daten in einem simulierten Experiment*** *(Bodzin et al., 2007)*	15.4.1	**Datenauswertung und Ergebnisdarstellung durch Simulationen ermöglichen**	15.4	***Datenauswertung und Ergebnisdarstellung digital ermöglichen*** *(Baumann et al., 2016)* (Ok et al., 2017) *(Baumann et al., 2018)* (Marino, 2010) *(Sormunen et al., 2019)*	
		15.5.1	***Datenauswertung und Ergebnisdarstellung mündlich ermöglichen*** *(Bodzin et al., 2007)*	15.5	**Datenauswertung und Ergebnisdarstellung kommunikativ unterstützen**	
		15.5.2	***Datenauswertung und Ergebnisdarstellung in der Gruppe ermöglichen*** *(Schulte, Kurnitzki, Lütje-Klose, & Miller, 2019), (Schulte et al., 2019),* (Münchhalfen et al., 2016), *(Bodzin et al., 2007)*			
		15.5.3	**Datenauswertung und Ergebnisdarstellung im Dialog ermöglichen** (Brendel et al., 2019), (Schmitt-Sody & Kometz, 2011)			
15.5.4.1	***… durch Fragen*** *(Puddu, 2017)*	15.5.4	***Datenauswertung und Ergebnisdarstellung als Lernbegleitung ermöglichen*** *(Bodzin et al., 2007)*			
15.5.5.1	**… im Sitzkreis gemeinsam im Plenum** (Kaiser & Seitz, 2017)	15.5.5	***Datenauswertung und Ergebnisdarstellung im Plenum ermöglichen*** *(Rott et al., 2017)*			
15.6.1.1	***… durch starke Strukturierung*** *(Scruggs & Mastropieri, 2007)*	15.6.1	**Datenauswertung geschlossen gestalten** (Goschler & Heyne, 2011)	15.6	**Verschiedene Offenheitsgrade für Datenauswertung und Ergebnisdarstellung ermöglichen**	
15.6.2.1	**… durch Vorgeben von Teillösungen** (Pötter, 2017)	15.6.2	**Datenauswertung und Ergebnisdarstellung halboffen gestalten**			
		15.6.3	***Datenauswertung offen gestalten*** *(Adesokan, 2015)*			
15.7.1.1	**… durch didaktische Reduktion von ergänzenden Abbildungen** (Pötter, 2017)	15.7.1	**Einfaches Anforderungsniveau für Datenauswertung und Ergebnisdarstellung ermöglichen**	15.7	**Verschiedene Anforderungsniveaus für Datenauswertung und Ergebnisdarstellung ermöglichen** (Pötter, 2017)	
15.7.2.1	***… durch Finden lassen alternativer Lösungen*** *(Freedberg et al., 2019)*	15.7.2	**Erhöhtes Anforderungsniveau für Datenauswertung und Ergebnisdarstellung ermöglichen**			
15.7.2.2	***… durch Bereitstellen von Folgefragen*** *(Freedberg et al., 2019)*					
15.7.2.3	***… durch Fordern von mehr Details in den Antworten*** *(Freedberg, Bondie, Zusho, & Allison, 2019)*					

		15.8.1	*Übergänge zur abstrakteren Datenauswertung gestalten* (Buxton et al., 2019)	15.8	*Datenauswertung und Ergebnisdarstellung auf verschiedenen Abstraktionsniveaus ermöglichen* (Affeldt et al., 2018), (Schmitt-Sody & Kometz, 2011)		
		15.8.2	Erhöhtes Abstraktionsniveau für Datenauswertung und Ergebnisdarstellung ermöglichen (Schmitt-Sody & Kometz, 2011)				
		15.9.1	*Datenauswertung und Ergebnisdarstellung durch Bewusstmachen ermöglichen* (Puddu, 2017)	15.9	Datenauswertung und Ergebnisdarstellung reflektierend ermöglichen		
		15.9.2	*Datenauswertung und Ergebnisdarstellung durch Fehlerdiskussion ermöglichen* (Puddu, 2017)				
15.10.1.1	… durch Schulzeitungen (Kaiser & Seitz, 2017)	15.10.1	Datenauswertung und Ergebnisdarstellung öffentlich ermöglichen (Kaiser & Seitz, 2017)	15.10	Datenauswertung und Ergebnisdarstellung an bestimmten Lernorten ermöglichen		
15.10.1.2	… durch Ausstellungen in der Schule (Kaiser & Seitz, 2017)						
		15.11.1	*Datenauswertung und Ergebnisdarstellung durch Entgegenbringen von Aufmerksamkeit ermöglichen* (Puddu, 2017)	15.11	Datenauswertung und Ergebnisdarstellung in konstruktiver Lernatmosphäre ermöglichen		
		15.11.2	*Für Datenauswertung und Ergebnispräsentation mehr Zeit zur Verfügung stellen* (Bodzin et al., 2007)				
15.11.3.1	*… durch Wertschätzen falscher Antworten und unerwarteter Ergebnisse* (Puddu, 2017)	15.11.3	*Datenauswertung und Ergebnisdarstellung wertschätzen* (Puddu, 2017)				
				15.12	Sonstige		
		16.1.1	*Verstehen von Nature of Science visuell ermöglichen* (Bodzin et al., 2007), (Adesokan & Reiners, 2015)	16.1	Verstehen von Nature of Science materialgeleitet unterstützen	16.	*Verstehen von Nature of Science inklusiv vermitteln* (Puddu, 2017), (Bodzin et al., 2007), (McGrath & Hughes, 2018)
		16.1.2	Verstehen von Nature of Science mit „graphic organizers“ strukturieren (Watson & Johnston, 2007)				
				16.2	*Verstehen von Nature of Science handlungsorientiert ermöglichen* (Puddu, 2017), (Mumba, Banda, & Chabalengula, 2015)		
				16.3	*Verstehen von Nature of Science digital ermöglichen* (Bodzin et al., 2007)		
		16.4.1	Verstehen von Nature of Science mit regelbasierten Vorlagen unterstützen (Grumbine & Alden, 2006)	16.4	Verstehen von Nature of Science kognitiv unterstützen		
16.5.1.1	… durch offene Dialoge (Carvalho, 2016)	16.5.1	Verstehen von Nature of Science als Lernbegleitung unterstützen	16.5	Verstehen von Nature of Science kommunikativ unterstützen		
16.5.1.2	*… durch Fragen* (Mulvey et al., 2016)						
16.5.1.3	*… durch Feedback* (Bodzin et al., 2007)						
		16.5.2	*Verstehen von Nature of Science im Team mit Kolleg*innen ermöglichen* (Mulvey et al., 2016)				
		16.6.1	Verstehen von Nature of Science durch Vorstellungen zu Forscher*innenpersönlichkeiten ermöglichen (Schomaker & Weddehage, 2016)	16.6	Verstehen von Nature of Science reflektierend ermöglichen (Carvalho, 2016)		
		16.6.2	Verstehen von Nature of Science durch Bezugnahme auf individuelle Weltanschauungen und ihre Bedeutung für das Leben ermöglichen (Carvalho, 2016)				

	16.6.3 Verstehen von Nature of Science durch in Beziehung setzen von Weltansichten zur Bedeutung im Leben vermitteln (Carvalho, 2016)		
	16.7.1 Verstehen von Nature of Science rücksichtsvoll thematisieren (Carvalho, 2016)	**16.7 Verstehen von Nature of Science in konstruktiver Lernatmosphäre vermitteln**	
		16.8 Sonstige	
			17. Sonstige

APPENDIX G: LIST OF LITERATURE OF THE SYSTEMATIC REVIEW

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