EMPOWER NATIONAL REPORT ON THE USE OF MODELING-BASED LEARNING IN CURRICULA - GERMANY

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EMPOWER

Empowering Teachers for Science Learning Through Modelling-Based Approaches

Erasmus+ Project EMPOWER

EMPOWERING TEACHERS FOR SCIENCE LEARNING THROUGH MODELLING-BASED APPROACHES

Project-Team of the Workpackage (alphabetical order)
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Content

1 Introduction

The German education system is characterised by a strong federal structure, which has a significant impact on the design of curricula and, consequently, on the implementation of model-based learning (MbL) (Standing conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany [KMK], 2025). The sixteen federal states are responsible for education and exercise significant autonomy within the concept of 'cultural sovereignty' to determine key aspects of their education systems independently. These include the organisation of the school system (including the types of secondary schools), the development of curricula, school supervision, and the recruitment and remuneration of teachers (KMK, 2025).

The result of this decentralized approach is a diverse landscape of curricula with 16 different curricula developed for each school subject (see Attachment A). While this diversity allows for adaptation to regional contexts, it also poses challenges for the comparability and consistent implementation of innovative teaching approaches such as MbL (KMK, 2025).

The Standing Conference of the Ministers of Education and Cultural Affairs (Kultusministerkonferenz, KMK) plays a central coordinating role as a joint body of education ministers from all 16 federal states (KMK, 2025). It adopts cross-state agreements and binding educational standards, which are then enacted into state law by the individual federal states (Eurydice, n.d.). These standards form the basis for the development of state curricula, from which school-specific syllabuses are derived (Eurydice, n.d.).

Therefore, when analysing MbL in the German education system, it is important to consider the diversity among the federal states and the need for cross-state coordination.

2 Methodology

This report is based on a qualitative content analysis of the German biology curricula for lower secondary education (Mayring, 2015).

The analysis was conducted using the official curricula for Biology (or Natural Sciences if Biology is not taught independently) from all German federal states, as published by the responsible Ministries of Education. These materials are publicly accessible via the Ministries' official websites and constitute the formal regulatory frameworks guiding classroom instruction. Each of the 67 documents was examined in its entirety, ensuring a comprehensive

review of all relevant sections, including introductions, learning objectives, thematic content descriptions, and recommended instructional methodologies.

The analysis focused on identifying all references to modelling (such as models, modelling competence, modelling processes, or other model-related practices) within the documents. To ensure consistency, a common coding scheme, developed and agreed upon within the project consortium, was used to categorize the identified instances. In addition to the predefined codes, supplemental codes were introduced under the category "other" to capture cases that were not fully captured by the coding scheme. A summary of the coding scheme and the identified instances is presented in Table 1 below.

Table 1. Coding scheme used for the analysis of modelling references

Category	Sub-Category
Definitions of modelling competence	Specified
	Not specified
Significance of models	Significance of models in the natural sciences
	Not specified
Types of models	Digital models
	Functional models
	Feedback loop models
	Lock-and-key models
	Structural models
	Other
	Not specified
Contexts of model use	
Modelling practices	Model creation
	Model use/selection of models
	Model evaluation
	Model revision
	Not specified
Meta-modelling knowledge	Knowledge about the properties and functions of models
	Knowledge of the modelling process
	Not specified
Aim of text	For the teacher
	For the student
Ways/strategies of using MbL	Ready-made models
	Ready-made models by other students
	Develop models from scratch
	Not specified

The coding scheme was designed to capture the multidimensional representation of modelling within the curricular texts through a comprehensive set of interrelated categories and subcategories. Initially, the framework identifies (1) the definitions of modelling competence, distinguishing between specified and not specified instances. The second component of the scheme involves (2) the significance of models, which categorizes whether the text mentions the importance of models in the natural sciences, the educational process, or the modelling process in science, thereby capturing their conceptual role within the curriculum. Furthermore, (3) the scheme identifies various types of models, such as mental, conceptual maps, physical, 3D models, diagrams, drawings, and models available in the school biology labs, while a fourth component records (4) the contextual area that models are used across biological thematic areas such as the introduction of the text, living organisms, cells, human reproduction, nutrition, digestive system, circulatory system, ecological pyramids, and human physiology. MbL practices are also examined by (5) coding the actions required from students during teaching and learning with models – specifically model creation, use/selection, evaluation, and revision – whereas (6) meta-modelling knowledge codes distinguish between knowledge about the properties and functions of models and knowledge of the modelling process itself. Supplemental categories were introduced under "other" (7) to capture instances such as the discussion of the significance of modelling-based reasoning or the use of models to understand physical systems. Finally, the framework records (8) the aim of the text (directed at the teacher or the student) and (9) the specific ways or strategies of using MbL, such as the use of ready-made models or developing models from scratch, while consistently coding cases lacking explicit information as "not specified" to maintain analytical transparency.

The corpus consisted of text excerpts from lower secondary education biology curricula across all federal states (years 5-10/11) and for the various school types that exist in the states. Passages that explicitly referred to models, modelling competence, modelling processes, or other model-related practices were included. The units of analysis were complete sentences or shorter meaningful text units, enabling the precise identification of coherent statements. During the coding process, multiple coding was applied to passages that addressed more than one aspect of modelling competence. This ensured that the analysis remained closely aligned with the curricula. Based on this procedure, the analysis encompasses 1322 coding instances.

3 Background

The present analysis was based on biology curricula from all German federal states, taking into account the various school types. This included a total number of 67 curricula from all types of German secondary schools, encompassing academic, intermediate, and basic secondary schools as well as comprehensive schools for years 5-10/11 (students age 10-15). This approach captured the broad range of biology education contexts. As several federal

states teach combined natural sciences in years 5-6, the curricula also include non-biological content. The analysed curricula dates were from 2006 to 2025, with many updated versions in recent years.

The curricula were developed and published by the respective state ministries of education and cultural affairs, frequently in collaboration with state institutes specialising in school or quality development. Consequently, the curricula reflect state-specific educational policy decisions and ongoing subject-specific development processes (KMK, 2025). In practice, these curricula provide a binding framework for instruction and performance requirements in schools. They establish statewide competence and performance standards, while also serving as a reference point for the development of school-based subject curricula (Hessische Lehrkräfteakademie, n.d.). In this sense, they link overarching educational requirements with the practical organisation of teaching within schools.

Typically, the curricula begin with didactic guiding principles and statements on the educational value of Biology as a subject. This is followed by a description of a competence model, which is usually presented in the form of tables or lists of competence standards. The structure is often organised by year group or levels of attainment and supplemented by topic areas. Many curricula align their structure with KMK educational standards (KMK, 2020).
In terms of content, several competence areas are central to the curricula. Subject-specific knowledge involves describing and explaining biological phenomena. Scientific inquiry through the application of scientific working methods involves observing, experimenting, and working with models (KMK, 2020). Furthermore, the curricula include communication in the sense of subject-appropriate representation and communication of biological content, as well as evaluation, which is the reflective assessment of biological and socially relevant questions. Basic concepts such as System, Structure and Function, and Development are used to structure the subject content. These contribute to an integrated, cross-disciplinary approach to biological topics, (KMK, 2020).

4 Findings

4.1 Strategies for using MbL

The category ‘Ways/strategies for using Model-based learning (MbL)’ was divided into four subcategories (see Figure 1). Each item identified in the curricula was categorized as belonging to one of the four subcategories. A total of 931 items were identified and categorized. Nine percent of the items refer to the use of ready-made models by students. These mainly refer to well-established models, such as the lock and key model, which was mentioned in eight items in the relevant subcategory. Eleven percent of the items identified directly include the development of models from scratch by students, which often aligns with

the intention of making use of the developed model. No items in the category 'ready-made models by other students' were detected. The largest group consists of items belonging to the 'not discussed' category, which includes every item not belonging to the other three categories, mostly due to missing information in the statements.

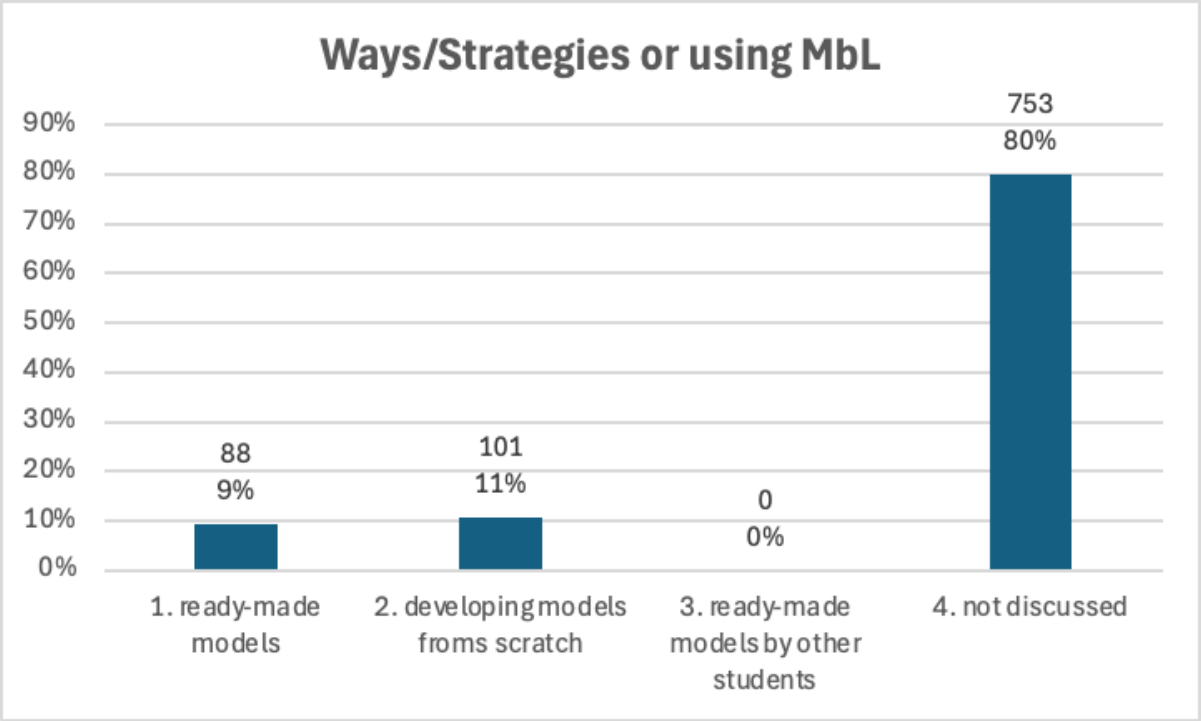

Figure 1: Relative coding frequencies (%) and absolute values for the category "ways/strategies for using model-based learning (MbL)"

4.2 Definitions of modelling competence

The analysis revealed no items belonging to the category of 'Definition of modelling competence'.

4.3 Significance of models in the natural sciences

A total of 105 items were identified as belonging to the 'Significance of models in the natural sciences' category, accounting for eight percent of total items (Figure 2). This category encompasses all items that refer to the role of models in the natural sciences.

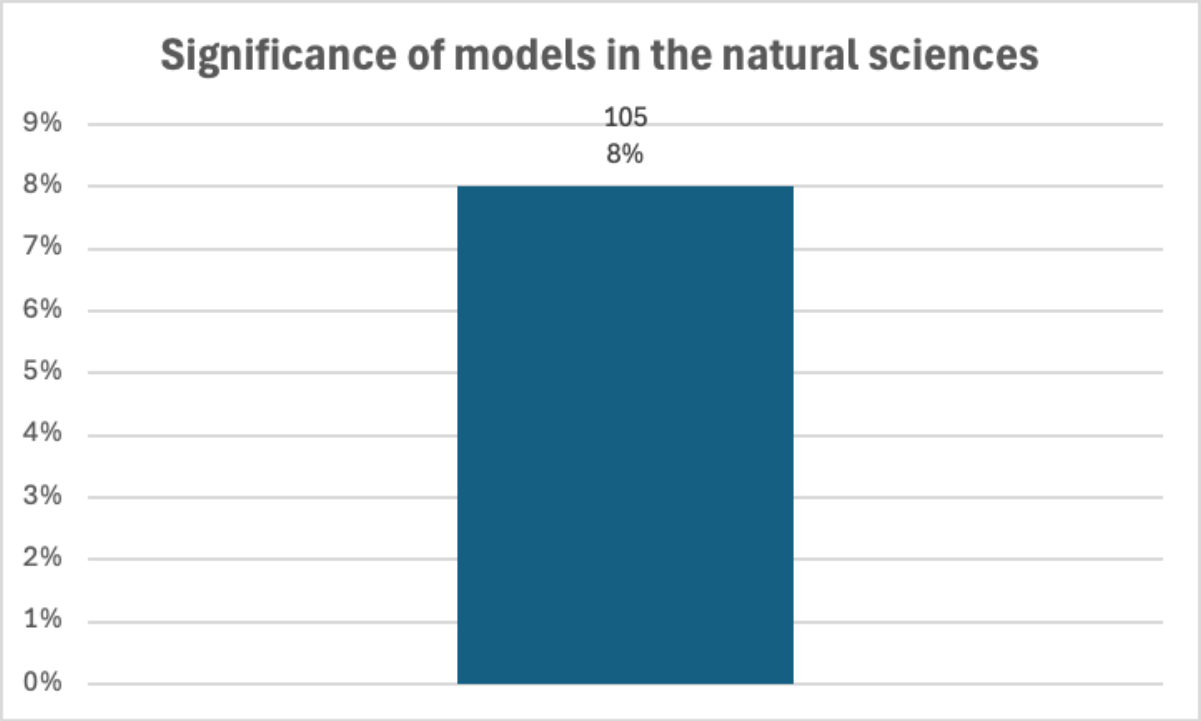

Figure 2: Relative coding frequency (%) and absolute value for category „Significance of models in the natural sciences“.

4.4 Types of models

During the analysis, items that referred to a specific model type were coded as the ‘Types of models’ category (Figure 3). A total of 77 items referred to a specific model type. The identified models were then grouped into five main clusters. Notably, items including functional models made up the largest groups, accounting for a quarter of all items coded as ‘Types of models’. It should be noted that this category also includes many items referring to model types linked to other STEM subjects. For example, the feedback loop models group includes models mentioned in the context of physics and technology. Models, that could not be coded under one of the clusters, were grouped in the category ‘other’.

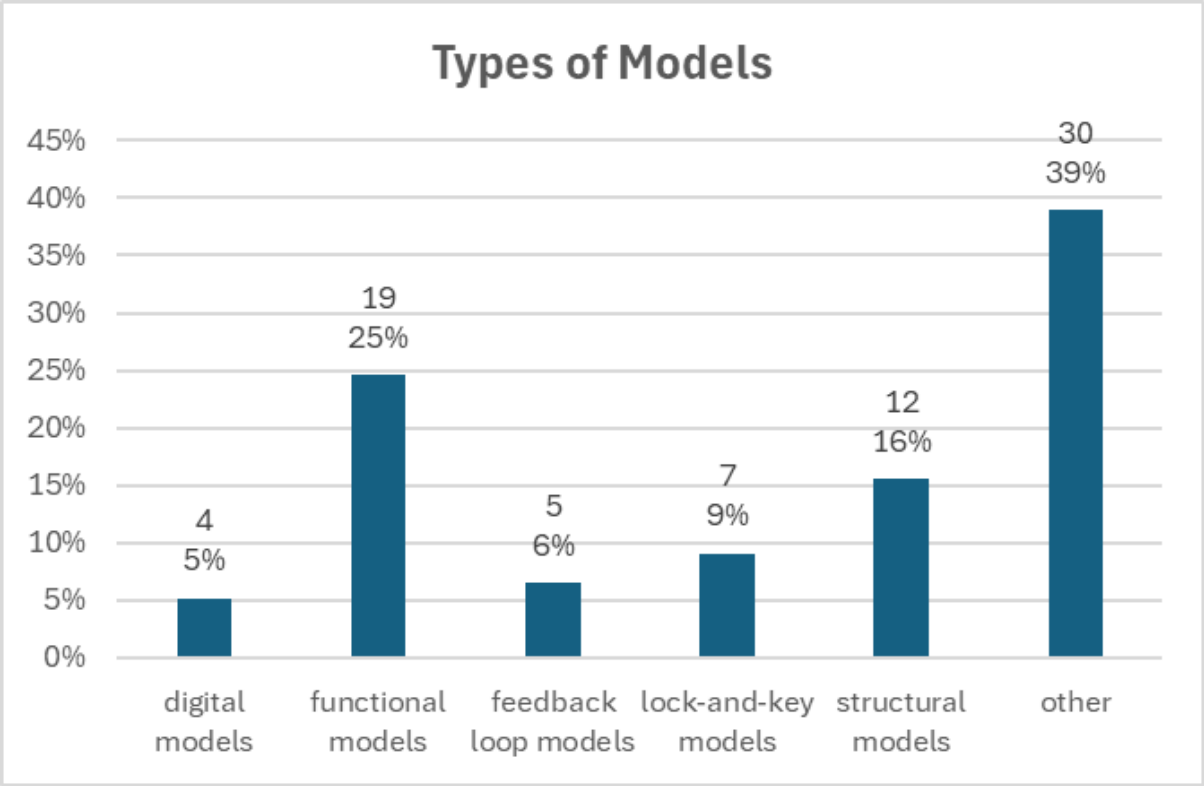

Figure 3: Coding frequencies (%) and absolute values for the category „Types of Models“ .

4.5 Contexts of model use

A total of 360 items were identified as containing information on specific contexts. Based on similar contents, these were clustered into seven groups (Figure 4). These groups also include contexts from STEM-related subjects, resulting in a group titled ’Physics and Technology/STEM’.

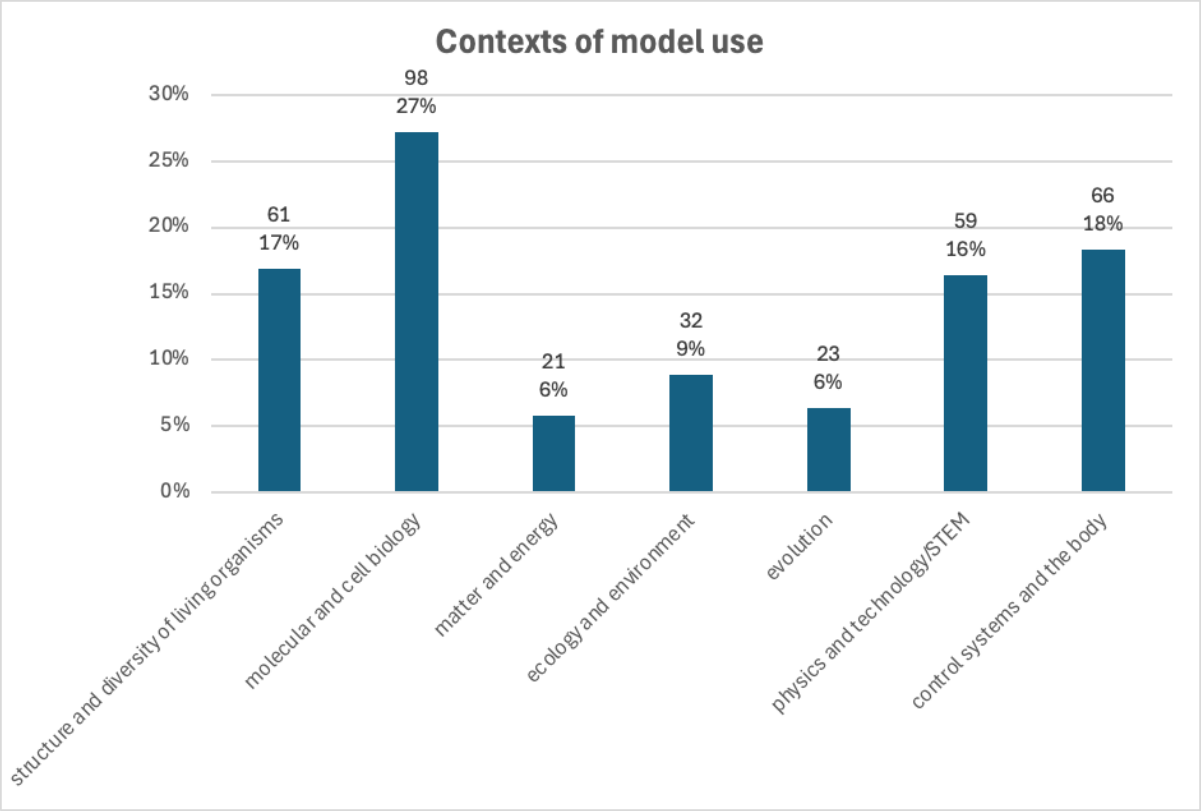

Figure 4: Coding frequencies (%) and absolute values for the category „Context of model use“.

4.6 Modelling practices

The ’Modelling practices’ category comprises four subcategories: ‘Model creation’, ‘Model use/selection of models’, ‘Model evaluation/model testing’ and ‘Model revision’. A total of 128 items were categorized as ‘Model creation’, making up 10% of the total number of codes and 19% of the main category. ‘Model use/selection of models’ was identified in 35% of cases, equalling 459 codes and forming the largest section of the subcategories at 66%. Seven percent of the codes (90 items) were identified as ‘Model evaluation/model testing’, making up seven percent of the main category. The smallest section of the main category, comprising one percent of the total number of codes, is formed by ’Model revision’ with two percent (seven items).

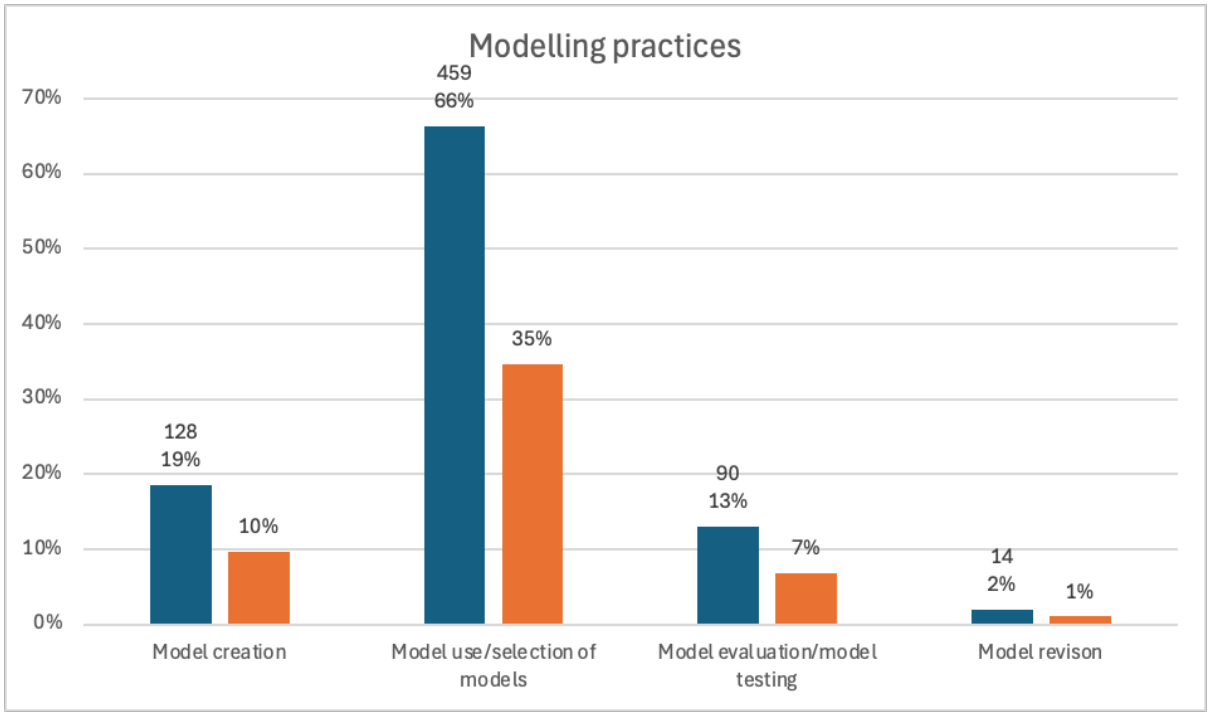

Figure 5: Coding frequencies (%) and absolute values for the category „Modelling practices“, visualized in the blue bars. The orange bars display the number of items belonging to the subcategory in reference to the total number of codes (%).

4.7 Meta-modelling knowledge

The ’Meta-modelling knowledge’ category consists of two subcategories (Figure 6). ‘Knowledge about the properties and functions of models’ is the larger section, accounting for 93% (equal to 92 codes), while ‘Knowledge of the modelling process’ is the smaller section, accounting for seven percent (equal to seven codes). ’Knowledge about the properties and functions of models’ has been identified in seven percent of codes, whereas ‘Knowledge of the modelling process’ only makes up one percent of all the codes in total.

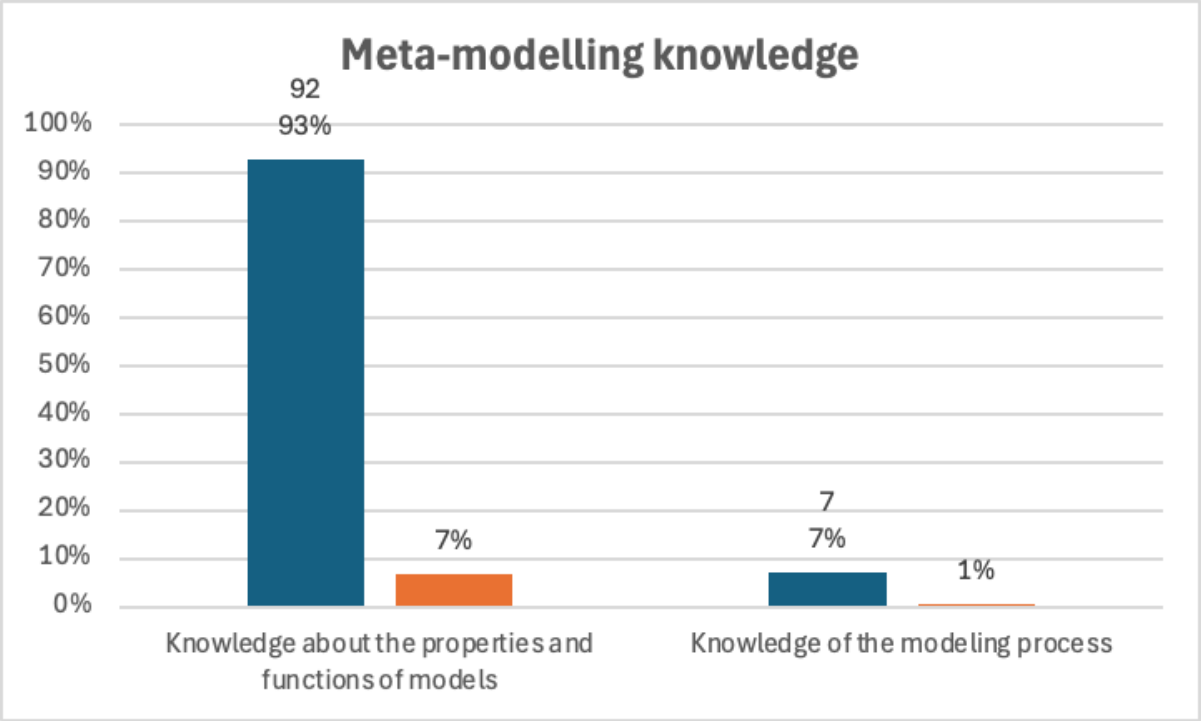

Figure 6: Coding frequencies (%) and absolute values for the category „Meta-modelling knowledge" are visualized in the blue bars. Relative coding frequencies are displayed in the orange bars.

4.8 Aim of the text

As a further step, the text was analysed to determine whether it referred to students or the teacher (Figure 7). Thirty-nine percent of the items included information directed at the teacher, while 61% included information regarding students' competencies.

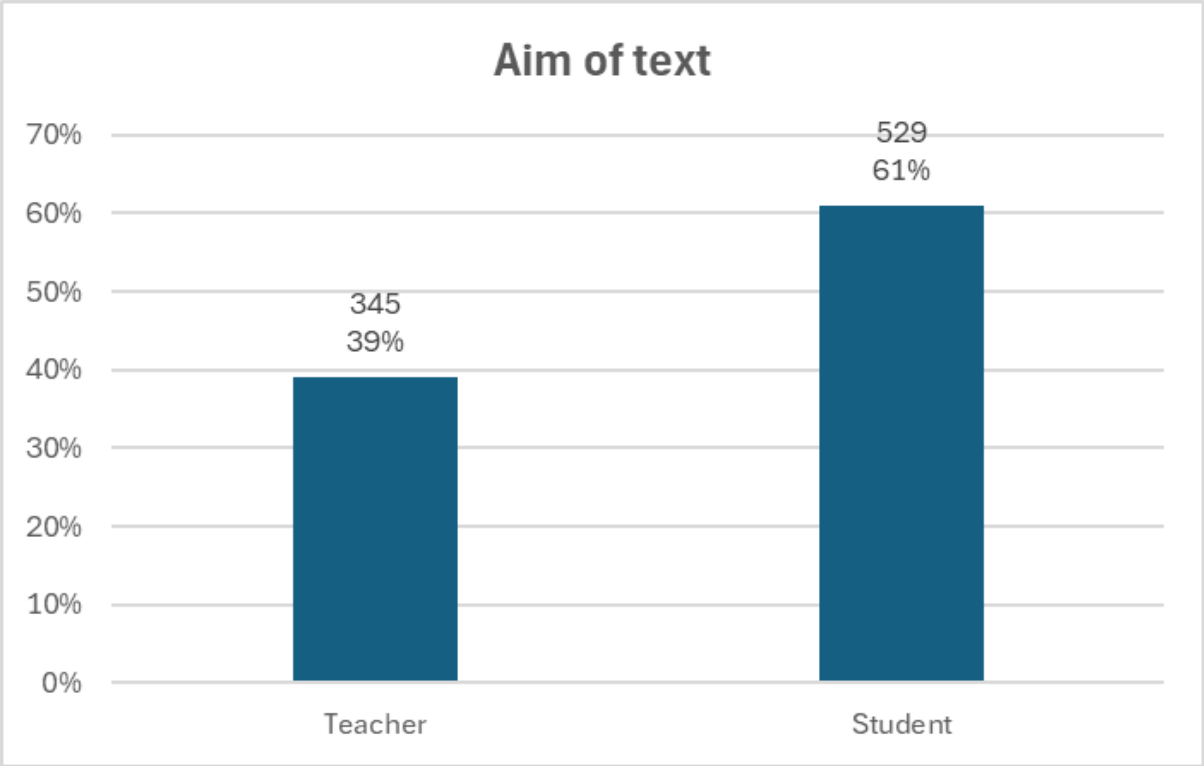

Figure 7: Coding frequencies (%) and absolute values for the category „Aim of text“.

4.9 Distribution across the curricula

The items were distributed unevenly across the federal states and different curricula within the states (see figure 8). Some states had very high numbers of items: Bavaria, Hamburg, Hesse and North Rhine-Westphalia all had more than 100 items in their curricula. The lowest number of items per state was 18 in Saxony with two documents analysed. The number of items per federal state however did not correlate with the number of documents. Several states had about 25 items coded between one and three documents (Berlin-Brandenburg[1], Bremen, Thuringia).

[1] The two federal states Berlin and Brandenburg share one curriculum document for biology in lower secondary school.

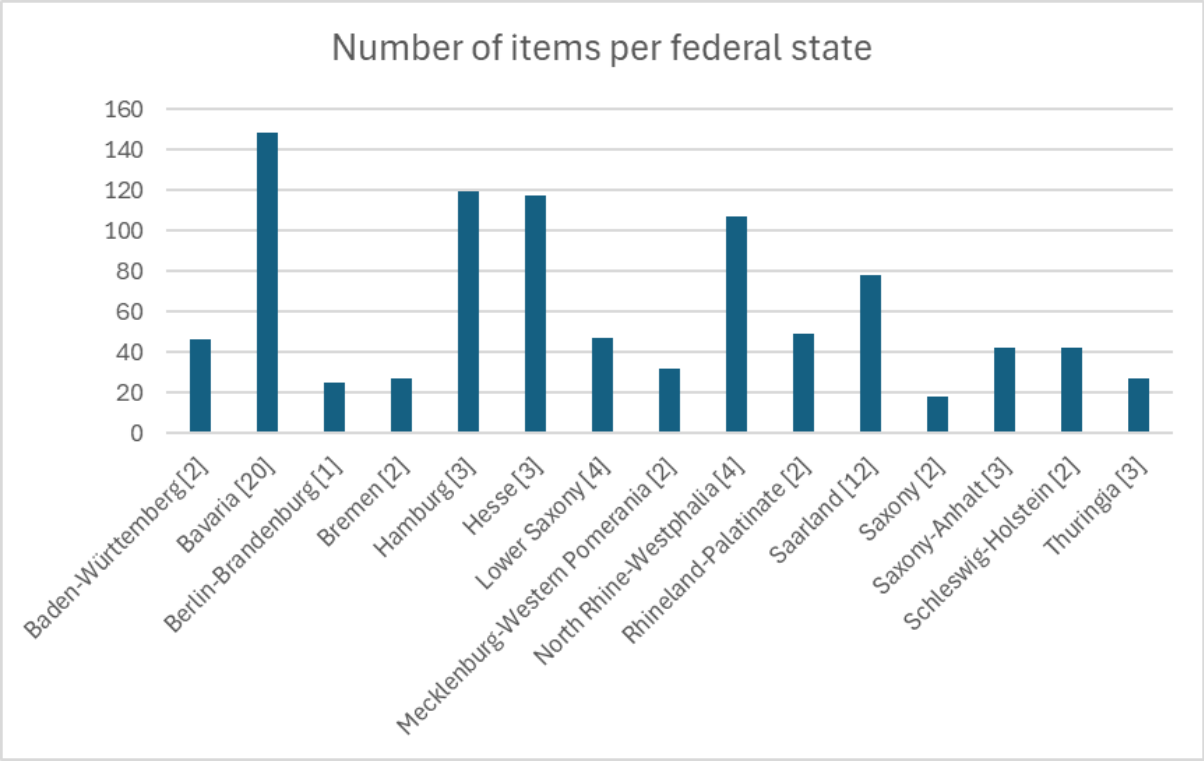

Figure 8: Number of items per federal state. Included is the number of documents per state in squared brackets.

4. References

Eurydice. (n.d.). Verwaltung und Steuerung auf nationaler und/oder regionaler Ebene. European Commission: Brussels. https://eurydice.eacea.ec.europa.eu/de/eurypedia/germany/verwaltung-und-steuerung-auf-nationaler-undoder-regionaler-ebene

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5. Attachments

Attachment A. An overview of the curricula of the 16 federal states

Federal state	Type of school	Type of school (English Equivalent)	School year	Title of the syllabus/curriculum	Year of publication	Subject
Baden-Württemberg	Gymnasium	Academic track school (Gymnasium)	Grade 5-12	Bildungsplan des Gymnasiums Biologie - Überarbeitete Fassung vom 08.März 2022	2016	Biology
Baden-Württemberg	Grade 5-10 (across all school types)	Cross-school type curriculum	Grade 5-10	Gemeinsamer Bildungsplan der Sekundarstufe 1 Biologie - Überarbeitet Fassung vom 08. März 2022	2016	Biology
Bavaria	Gymnasium	Academic track school (Gymnasium)	Grade 5	LehrplanPLUS Gymnasium Bayern - Fachlehrplan Natur und Technik	2017	Nature and Technology
Bavaria	Gymnasium	Academic track school (Gymnasium)	Grade 6	LehrplanPLUS Gymnasium Bayern - Fachlehrplan Natur und Technik	2017	Nature and Technology
Bavaria	Gymnasium	Academic track school (Gymnasium)	Grade 7	LehrplanPLUS Gymnasium Bayern - Fachlehrplan Natur und Technik	2017	Nature and Technology
Bavaria	Gymnasium	Academic track school (Gymnasium)	Grade 8	LehrplanPLUS Gymnasium Bayern - Fachlehrplan Biologie	2017	Biology
Bavaria	Gymnasium	Academic track school (Gymnasium)	Grade 9	LehrplanPLUS Gymnasium Bayern - Fachlehrplan Biologie	2017	Biology
Bavaria	Gymnasium	Academic track school (Gymnasium)	Grade 10	LehrplanPLUS Gymnasium Bayern - Fachlehrplan Biologie	2017	Biology
Bavaria	Realschule	Intermediate secondary school	Grade 5	LehrplanPLUS Realschule Bayern - Fachlehrplan Biologie	2017	Biology
Bavaria	Realschule	Intermediate secondary school	Grade 6	LehrplanPLUS Realschule Bayern - Fachlehrplan Biologie	2017	Biology
Bavaria	Realschule	Intermediate secondary school	Grade 7	LehrplanPLUS Realschule Bayern - Fachlehrplan Biologie	2017	Biology
Bavaria	Realschule	Intermediate secondary school	Grade 8	LehrplanPLUS Realschule Bayern - Fachlehrplan Biologie	2017	Biology
Bavaria	Realschule	Intermediate secondary school	Grade 10	LehrplanPLUS Realschule Bayern - Fachlehrplan Biologie	2017	Biology
Bavaria	Mittelschule	General secondary school	Grade 5	LehrplanPLUS Mittelschule Bayern - Fachlehrplan Natur und Technik	2017	Nature and Technology
Bavaria	Mittelschule	General secondary school	Grade 6	LehrplanPLUS Mittelschule Bayern - Fachlehrplan Natur und Technik	2017	Nature and Technology
Bavaria	Mittelschule mittlere Reife	General secondary school	Grade 7	LehrplanPLUS Mittelschule Bayern - Fachlehrplan Natur und Technik M7	2017	Nature and Technology
Bavaria	Mittelschule Regelklasse	General secondary school	Grade 7	LehrplanPLUS Mittelschule Bayern - Fachlehrplan Natur und Technik R7	2017	Nature and Technology
Bavaria	Mittelschule mittlere Reife	General secondary school	Grade 8	LehrplanPLUS Mittelschule Bayern - Fachlehrplan Natur und Technik M8	2017	Nature and Technology
Bavaria	Mittelschule Regelklasse	General secondary school	Grade 8	LehrplanPLUS Mittelschule Bayern - Fachlehrplan Natur und Technik R8	2017	Nature and Technology
Bavaria	Mittelschule mittlere Reife	General secondary school	Grade 9	LehrplanPLUS Mittelschule Bayern - Fachlehrplan Natur und Technik M9	2017	Nature and Technology
Bavaria	Mittelschule Regelklasse	General secondary school	Grade 9	LehrplanPLUS Mittelschule Bayern - Fachlehrplan Natur und Technik R9	2017	Nature and Technology
Bavaria	Mittelschule	General secondary school	Grade 10	LehrplanPLUS Mittelschule Bayern - Fachlehrplan Natur und Technik M10	2017	Nature and Technology
Bavaria	Fachoberschule	Vocational upper secondary school	Grade 10	LehrplanPLUS Fachoberschule Bayern - Fachlehrplan Biologie Vorklasse (ABU)	2017	Biology
Bavaria	Fachoberschule	Vocational upper secondary school	Grade 10	LehrplanPLUS Fachoberschule Bayern - Fachlehrplan Biologie Vorklasse (S, GH)	2017	Biology
Berlin-Brandenburg	Schulformübergreifend	Cross-school type curriculum	Grade 7-10	Rahmenlehrplan für Berlin und Brandenburg - Teil C Biologie	2015	Biology
Bremen	Oberschule	Integrated secondary school	Grade 5-10	Naturwissenschaften Biologie, Chemie, Physik - Bildungsplan für die Oberschule	2010	Natural Sciences
Bremen	Gymnasium	Academic track school (Gymnasium)	Grade 5-9	Naturwissenschaften, Biologie - Chemie - Physik Bildungsplan für das Gymnasium	2006	Natural Sciences
Hamburg	Gymnasium	Academic track school (Gymnasium)	Grade 5-10	Bildungsplan Gymnasium Sekundarstufe 1 Biologie	2024 (revised version)	Biology
Hamburg	Stadtteilschule	Comprehensive school	Grade 5-11	Bildungsplan Stadtteilschule Jahrgangsstufen 5-11 Biologie	2024 (revised version)	Biology
Hamburg	Stadtteilschule	Comprehensive school	Grade 5-10	Bildungsplan Stadtteilschule Jahrgangsstufen 5-10 Lernbereich Naturwissenschaft und Technik	2023 (revised version)	Natural Science and Technology
Hesse	Gymnasium	Academic track school (Gymnasium)	Grade 5-9	Bildungsstandards und Inhaltsfelder - Das neue Kerncurriculum für Hessen	2021	Biology
Hesse	Hauptschule	General secondary school	Grade 5-9	Bildungsstandards und Inhaltsfelder - Das neue Kerncurriculum für Hessen	2021	Biology
Hesse	Realschule	Intermediate secondary school	Grade 5-10	Bildungsstandards und Inhaltsfelder - Das neue Kerncurriculum für Hessen	2021	Biology
Mecklenburg-Western Pomerania	Gymnasium/Gesamtschule	Academic track school & comprehensive school	Grade 7-10	Rahmenplan für den Sekundarbereich 1 Biologie	2022 (Trial version)	Biology
Mecklenburg-Western Pomerania	Orientierungsstufe	Orientation stage	Grade 5-6	Rahmenplan für die Orientierungsstufe Biologie	2022 (Trial version)	Biology
Lower Saxony	Hauptschule	General secondary school	Grade 5-10	Kerncurriculum für die Hauptschule Schuljahrgänge 5-10 Naturwissenschaften	2015	Natural Sciences
Lower Saxony	Realschule	Intermediate secondary school	Grade 5-10	Kerncurriculum für die Realschule Schuljahrgänge 5-10 Naturwissenschaften	2015	Natural Sciences
Lower Saxony	Oberschule	Multi-track secondary school	Grade 5-10	Kerncurriculum für die Oberschule Schuljahrgänge 5-10 Naturwissenschaften	2013	Natural Sciences
Lower Saxony	Gymnasium	Academic track school (Gymnasium)	Grade 5-10	Kerncurriculum für das Gymnasium Schuljahrgänge 5-10 Naturwissenschaften	2015	Natural Sciences
North Rhine-Westphalia	Gymnasium	Academic track school (Gymnasium)	Grade 5-10	Kernlehrplan für die Sekundarstufe 1 Gymnasium in Nordrhein-Westfalen Biologie	2019	Biology
North Rhine-Westphalia	Hauptschule	General secondary school	Grade 5-10	Kernlehrplan für die Hauptschule in Nordrhein-Westfalen Lernbereich Naturwissenschaten	2011	Natural Sciences
North Rhine-Westphalia	Realschule	Intermediate secondary school	Grade 5-10	Kernlehrplan für die Realschule in Nordrhein-Westfalen Biologie	2011	Biology
North Rhine-Westphalia	Gesamtschule	Comprehensive school	Grade 5-10	Kernlehrplan für die Gesamtschule in Nordrhein-Westfalen Naturwissenschaften	2011	Natural Sciences
Rhineland-Palatinate	Schulformübergreifend	Cross-school type curriculum	Grade 5-6	Rahmenlehrplan Naturwissenschaften für die weiterführenden Schulen	2010	Natural Sciences
Rhineland-Palatinate	Schulformübergreifend	Cross-school type curriculum	Grade 7-10	Lehrpläne für die naturwissenschaftlichen Fächer für die weiterführenden Schulen	2014	Natural Sciences
Saarland	Gymnasium	Academic track school (Gymnasium)	Grade 5-6	Naturwissenschaften Lehrplan Neunjähriges Gymnasium Klassenstufen 5 und 6	2023	Natural Sciences
Saarland	Gymnasium	Academic track school (Gymnasium)	Grade 8	Lehrplan Biologie Gymnasium Klassenstufe 8 (naturwissenschaftlicher Zweig)	2014	Biology
Saarland	Gymnasium	Academic track school (Gymnasium)	Grade 9	Lehrplan Biologie Gymnasium Klassenstufe 9 -Erprobungsphase-	2014	Biology
Saarland	Gymnasium	Academic track school (Gymnasium)	Grade 7	Biologie Lehrplan Neunjähriges Gymnasium Klassenstufe 7	2024	Biology
Saarland	Gymnasium	Academic track school (Gymnasium)	Grade 8	Biologie Lehrplan Neunjähriges Gymnasium Klassenstufe 8	2024	Biology
Saarland	Gymnasium	Academic track school (Gymnasium)	Grade 9	Biologie Lehrplan Neunjähriges Gymnasium Klassenstufe 9 - einstündig-	2025	Biology
Saarland	Gymnasium	Academic track school (Gymnasium)	Grade 10	Biologie Lehrplan Neunjähriges Gymnasium Klassenstufe 10	2025	Biology
Saarland	Gymnasium	Academic track school (Gymnasium)	Grade 9	Biologie Lehrplan Neunjähriges Gymnasium Naturwissenschaftlicher Zweig Klassenstufe 9 - zweistündig-	2025	Biology
Saarland	Gemeinschaftsschule	Comprehensive school	Grade 5-6	Naturwissenschaften Lehrplan Gemeinschaftsschule Klassenstufen 5 und 6	2025	Natural Sciences
Saarland	Gemeinschaftsschule	Comprehensive school	Grade 7-8	Naturwissenschaften Lehrplan Gemeinschaftsschule Klassenstufen 7 und 8	2025	Natural Sciences
Saarland	Gemeinschaftsschule	Comprehensive school	Grade 9-10	Lehrplan Biologie Gemeinschaftsschule -Erprobungsphase-	2016	Biology
Saarland	Gemeinschaftsschule	Comprehensive school	Grade 5-10	Lehrplan Naturwissenschaften Gemeinschaftsschule -Erprobungsphase- Jahrgangsübergreifender Teil	2014	Natural Sciences
Saxony-Anhalt	Sekundarschule	Integrated secondary school	Grade 5-10	Fachlehrplan Sekundarschule Biologie	2012 (Adjustment 2019)	Biology
Saxony-Anhalt (no separate curricul	Sekundarschule	Integrated secondary school	Grade 7-10	Kurslehrplan Sekundarschule Angewandte Naturwissenschaften	2015	Natural Sciences
Saxony-Anhalt	Gymnasium	Academic track school (Gymnasium)	Grade 5-12	Fachlehrplan Gymansium Biologie	2022	Biology
Saxony	Gymnasium	Academic track school (Gymnasium)	Grade 5-12	Lehrplan Gymnasium Biologie	2025	Biology
Saxony	Oberschule	Multi-track secondary school	Grade 7-10	Lehrplan Oberschule Biologie	2025	Biology
Schleswig-Holstein	Allgemein bildende Schulen	General education schools	Grade 5-10	Fachanforderungen Naturwissenschaften	2014	Natural Sciences
Schleswig-Holstein	Allgemein bildende Schulen	General education schools	Grade 5-13	Fachanforderungen Biologie	2023	Biology
Thuringia	Regelschule	Integrated secondary school	Grade 7, 9	Thüringer Lehrplan für den Erwerb des Hauptschul- und des Realschulabschlusses	2024	Biology
Thuringia	Gymnasium	Academic track school (Gymnasium)	Grade 7, 9 and 11	Thüringer Lehrplan für den Erwerb der allgemeinen Hochschulreife	2024	Biology
Thuringia	Regelschule	Integrated secondary school	Grade 7-10	Lehrplan für den Erwerb des Hauptschul- und des Realschulabschlusses	2012	Biology