Atollo Project

Breaking barriers
through education

D2.1 Programme Analysis Report

WP2 Programme Analysis and Framework Development for Inclusive Digital Education

15/05/2024 | TOBIAS BUCHNER & BRIGITTA HÖGER

Table of Contents

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About the Atollo project

The Atollo project aims to empower learners with disabilities by creating inclusive digital materials. Through a consortium of partners from Croatia, Bulgaria, Austria, Germany, Iceland, Norway, Ireland and Australia, including an EdTech company, universities, schools for children with SEN, public authorities, and NGO, we will analyse and compare existing programmes, develop innovative digital tools and create high-quality digital educational content. We will pilot and test the digital materials and evaluate their implementation and then focus on the improvement of developed digital materials based on the feedback from the learners, teachers and experts. The result of the scientific evaluation of the use of digital materials will be an inclusive digital education toolkit that will contain advice and instructions for everyone who works with it, and uses digital educational materials for children with SEN. We will use a user-centred design approach to ensure that the materials are accessible and inclusive for learners with various types of disabilities. This iterative process of improvement will help us create digital materials that are effective and engaging. Furthermore, the project will provide capacity building for teachers to use developed digital materials effectively. The expected results include a cutting-edge set of digital learning materials, capacity building for teachers and an inclusive digital education toolkit for policymakers and education institutions. We will share our findings and outcomes through various channels to reach a wider audience, including policymakers and education institutions, and create awareness about the importance of inclusive digital materials for learners with disabilities. The project will have a direct impact on the involved schools and their learners as well as a broader impact on the underrepresented group of children with disabilities, their educators and wider academic community through research paper derived from this project.

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This programme analysis focuses on key aspects of education systems of the countries participating in the Atollo project. The report at hand summarizes the findings of the programme analysis, which has been carried out by partners from March to May 2024. In the following, we provide a detailed overview of the programmes for learners with disabilities in the partner countries, including an analysis of their key similarities and differences. This report is intended as a reference point for the development of digital educational content that is relevant and applicable to all partner countries.

The Atollo project Consortium

The Atollo project consortium is an Erasmus Partnerships, bringing together 12 partners.

	Partner	Acronym	Country
1	PROFIL KLETT D.O.O.	PK	HR
2	SVEUCILISTE U ZAGREBU	UNIZG ERF	HR
3	HOGSKOLEN I INNLANDET	INN UNI	NO
4	REGIONALEN TSENTAR ZA PODKREPA NA PROTSESA NA PRIOBSHTAVASHTO OBRAZOVANIE SOFIA GRAD	RCSIE	BG
5	SKOLA ZA ODGOJ I OBRAZOVANJE PULA	STE PULA	HR
6	HASKOLI ISLANDS	UI	IS
7	MATRIX INTERNET APPLICATIONS LIMITED	MATRIX	IE
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No	Associated Partner	Acronym	Country
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Introduction

This programme analysis focuses on key aspects of education systems of the countries participating in the Atollo project. The report at hand summarizes the findings of the programme analysis, which has been carried out by partners from March to May 2024. In the following, we provide a detailed overview of the programmes for learners with disabilities in the partner countries, including an analysis of their key similarities and differences. This report is intended as a reference point for the development of digital educational content that is relevant and applicable to all partner countries. More precisely: the findings presented within this programme analysis report will serve as the foundation for the second task of Work package 2, the framework for common categorization of programme levels.

This report is based on the data collected via an online questionnaire on various aspects of inclusive and special education of the school systems of the partner countries, such as:

- Curricular regimes
- SEN-categories
- SEN-Assessment
- Inclusive and special education settings
- Digital education policies
- Barriers and challenges in practising inclusive and special education.

Furthermore, results from a literature review on inclusive and special education of partner countries are included within this report – as well as information provided by the European Agency for Special Needs and Inclusive Education and Eurydice.

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As a structure, that is able to present the individual aspects of inclusive and special education systems of partner countries in an illustrative, transparent way at the one hand and allow for comparison concerning similarities and differences at the other hand, authors chose the following structure.

This introduction is followed by country profiles of all eight countries participating in the Atollo project: Australia, Austria, Bulgaria, Croatia, Germany, Iceland, Ireland and Norway. These country profiles show a structure that evolved over the course of the analysis of the questionnaire and the results of the Think tank workshop that was facilitated in April 2024 in Iceland. In order to understand the embeddedness of inclusive and special education in the broader education system, we start each country profile by a description of the structure and key aspects of the respective education systems, such as guiding laws, educational stages as well as goals and policies. After that, the country profiles focus on inclusive and special education systems, referring to specific laws and administration units that regulate the provision of inclusive and special education – as well as a description of common settings of inclusive and special education in the countries. The third part of the country profiles focus on a very important aspect for the project, the assessment types of SEN and the respective SEN-categories. This is important as the project intends to address specific groups of learners with disabilities and the challenges to cater individualized, digital support for them. In the next part of the country profiles, we sketch latest policies on inclusive and special education as well as research results from recent studies conducted in the partner countries. The fifth part of the profiles focuses on digitalisation policies and to what extent these policies refer to students with SEN and/or inclusive and special education. In the last part of the profiles, we point out – based on the curriculum analysis by partners – similarities concerning the mathematical and digital competences inscribed in the first four years of primary education of partner countries. The decision to focus on these competences was taken by the steering committee, as teaching mathematics to all learners is highlighted as very challenging in the scientific literature and due to one of the result of the analysis of the questionnaire, namely that digital competences are considered as of key relevance for future citizens, but are mostly not explicated for learners with SEN. Thus, we seek to contribute with this project to provide empowering digital learning environments for students with SEN.

Based on the country profiles, in the third chapter of this report, we present similarities and differences between partner countries in areas of key relevance for the Atollo project.

In the fourth chapter, we draw conclusions and formulate recommendations for the next steps of the Atollo project.

Country reports

Australia

Structure of the education system

The Australian education system operates through an agreement between the Federal Government and all States and Territories. Guiding the implementation of this agreement are overarching publications and legislation. For example, the Alice Springs (Mparntwe) Education Declaration (2019) outlines aspirational goals to ensure a safe, inclusive, and equitable environment for all students in Australia. The Australian Curriculum, Assessment and Reporting Authority (ACARA), an independent statutory authority, provides all education providers with curriculum and assessment guidelines. Every education provider in Australia also must comply with Federal and International legislation.

Like Germany, each State and Territory in Australia has its own Education Act, which defines the legal obligations related to the delivery of education to children within those jurisdictions. These Acts govern the operation and management of educational institutions across the country by detailing the compulsory nature of education, the age requirements, and the responsibilities of both educators and parents.

The Education Acts and associated policies address issues such as school attendance, the curriculum, and the management of public and private schools. Moreover, they encompass the rights and protections for students, including anti-discrimination policies and measures to support students with disabilities. The overarching goal of Australian school law is to provide a consistent and supportive educational landscape for every student, irrespective of their background or personal circumstances.

Australian school law also regulates teacher accreditation, the safety standards of school facilities, and the handling of grievances and disciplinary actions. Importantly, these laws are complemented by national standards and policies that aim to maintain high educational outcomes across the country. For instance, the Australian Professional Standards for Teachers provides guidelines for teacher competence and development, ensuring that education quality is upheld nationally. Educators must also comply with their State or Territory's Codes of Conduct and Ethics.

The Australian education system is characterized by its structured and comprehensive approach, which caters to students from early childhood through to tertiary education. Initially, children often attend preschool or kindergarten, which is not compulsory but is widely encouraged to prepare children for the start of formal education. Subsequently, compulsory education begins at the primary level, typically starting at the age of five or six, depending on the state or territory. This primary education lasts for seven years. Following primary education, students transition to secondary school, which continues for five to six years. Secondary education is divided into lower and upper segments, commonly referred to as junior and senior secondary (Australian Government Department of Education, 2024). Moreover, senior secondary education prepares students for tertiary education or vocational training, focusing on more specialized subjects towards career paths or higher education. Additionally, the Australian education system includes vocational education and training (VET) institutions, which provide practical skills and training for a variety of careers, often in collaboration with industries. Furthermore, the tertiary sector includes universities and higher education providers that offer bachelor's degrees, postgraduate courses, and higher research opportunities.

Special Educational Needs Assessment and Categories

Section 1.4 of Disability Standards for Education 2005 (Australian Government Department of Education, 2005) defines "disability" as follows. Disability, in relation to a person, means

- total or partial loss of the person's bodily or mental functions; or
- total or partial loss of a part of the body; or the presence in the body of organisms causing disease or illness; or
- the presence in the body of organisms capable of causing disease or illness; or
- the malfunction, malformation or disfigurement of a part of the person's body; or
- a disorder or malfunction that results in the person learning differently from a person without the disorder or malfunction; or
- a disorder, illness or disease that affects a person's thought processes, perception of reality, emotions or judgment or that results in disturbed behaviour;

and includes a disability that:

- presently exists; or
- previously existed but no longer exists; or
- may exist in the future; or
- is imputed to a person." (Australian Department of Education, 2005, np)

Policies and Research

Learners with intellectual disabilities are often referred to as challenging concerning a tailored support in inclusive education settings, especially in mathematics (Faragher & Clarke, 2020). However, as research has shown, if teachers are equipped with the necessary skills and resources, participation of this group of learners is possible in mathematics and other subjects as well (Faragher et al., 2020; Faragher 2023).

Recent research has shown, that while there is a broad rhetoric about inclusive education at the federal level, interpretations of inclusion or rather inclusive education vary between states and territories (Mavropolou et al., 2021). The same research has pointed out that learners with various cognitive impairments form the largest group of learners

with special educational needs, including students with intellectual disabilities (Carrington et al, 2024). Furthermore, challenges remain to apply the National curriculum to the needs of learners with disabilities (Price & Slee, 2021). SEN categories and other medical-related labels, such as students with SEN, have been in considered in various research papers and books as a barrier for making teaching inclusive – as such a category-based perception leads to ability related grouping processes and not mass tailored instruction (e.g. Slee, 2011)

Digital Education Policies (and students with SEN)

Due to the federal structure of the Australian education system (see above), there have been policies and initiatives regarding digital education at various levels. At the federal level, the Australian Government has prioritized the development of digital infrastructure and resources, ensuring that schools are equipped with the necessary technology and high-speed internet connections. This initiative is supported by the National Innovation and Science Agenda, which seeks to prepare students for a future dominated by digital technologies and innovation (Australian Government Department of Education, 2020).

Each state and territory in Australia also develops its own digital education policies to cater to local needs. For example, the New South Wales Department of Education has its own framework for technology in schools, focusing on providing students with digital skills and integrating technology into all aspects of the curriculum (New South Wales Department of Education, 2021). Additionally, professional development for teachers is a critical component of these policies. Programmes are in place to enhance teachers' skills in using technology for classroom instruction and to keep them abreast of the latest digital tools and educational technologies.

Equity is another significant focus of Australia's digital education policies. Efforts are made to ensure that students from all backgrounds, including those in remote and rural areas, have access to digital devices and resources. This is crucial in bridging the digital divide and promoting inclusivity in education.

Mathematical competences

The Australian primary curriculum for primary education is not based on a competence-based approach and students with SEN are not mentioned explicitly in the document. Rather, The Student Diversity section of the Australian Curriculum provides general information about developing inclusive teaching and learning programmes and official websites provide more specific comments about mathematics and includes some illustrations of good practice.

The learning areas of literacy, numeracy and personal and social capabilities is divided into different levels to be achieved which are also applicable for students with disabilities.

In Australian primary education, students embark on a journey of mathematical discovery, gradually building a comprehensive set of competences essential for their mathematical literacy. Beginning in Year 1, students should cultivate a solid understanding of foundational concepts, such as the connection between names, numerals, and quantities, and the ability to partition numbers in various ways. Fluency in counting sequences forwards and backwards and basic numeracy skills are crucial at this stage. Moreover, problem-solving should involve practical applications, like using materials to model authentic problems and discussing the reasonableness of solutions. As students progress to Year 2, they should deepen their understanding by connecting number calculations with counting sequences and exploring the relationships between arithmetic operations. Fluency expands to include activities like using informal units for measurement and describing outcomes of chance events. Problem-solving becomes more sophisticated, requiring students to formulate and model authentic situations and make connections between mathematical concepts and real-

world scenarios. By Year 3, students should further develop their understanding of number representations and fractions, fluency in multiplication facts, and problem-solving skills to include planning methods of data collection and representation. Reasoning skills advance as students generalize from number properties and results of calculations, compare angles, and interpret variations in data displays. Finally, in Year 4, students consolidate their understanding of numbers, place value, and operations, while also delving into decimals and symmetry properties. Fluency extends to accurate measurement using instruments and creating patterns with shapes. Problem-solving involves more complex scenarios, including comparing large numbers and time durations, and reasoning skills are honed through evaluating different graphical displays and deriving strategies for unfamiliar tasks. These competences lay a robust foundation for students' mathematical journey, fostering curiosity, confidence, and critical thinking skills essential for lifelong mathematical success.

Digital competences

In Australia, the Early Year Learning Framework outlines the acquisition of digital competences in primary education. The document provides the combined learning outcomes for the first and second as well as third and fourth year. Conceptually, it is not built on a competence approach but rather outline content, activities and learning outcomes and is built on the concept of computational thinking in relation to the personal experiences with digital phenomena, which the students bring to the table. Students with SEN are not specifically addressed when it comes to acquiring digital competences.

During year one and 2, students should be given the opportunity to create a range of digital solutions through guided play and integrated learning, such as using robotic toys to navigate a map or recording science data with software applications. They begin to learn about common digital systems and patterns that exist within data they collect. Students should learn to organize, manipulate and present this data, including numerical, categorical, text, image, audio and video data, in creative ways to create meaning. Furthermore, they should use the concept of abstraction when defining problems to identify the most important information. They begin to develop their design skills by conceptualizing algorithms as a sequence of steps for carrying out instructions, such as identifying steps in a process or controlling robotic devices. They should learn to describe how information systems meet information, communication and/or recreational needs.

During year three and four, students should learn to create a range of digital solutions, such as interactive adventures that involve user choice, modelling simplified real-world systems and simple guessing games. They should explore digital systems in terms of their components, and peripheral devices such as digital microscopes, cameras and interactive whiteboards. They should learn to collect, manipulate and interpret data, developing an understanding of the characteristics of data and their representation. Using the concept of abstraction, students should learn to define simple problems using techniques such as summarizing facts to deduce conclusions. They record simple solutions to problems through text and diagrams and develop their designing skills from initially following prepared algorithms to describing their own that support branching (choice of options) and user input. Their solutions are implemented using appropriate software including visual programming languages that use graphical elements rather than text instructions. They should learn to explain, in general terms, how their solutions meet specific needs and consider how society may use digital systems to meet needs in environmentally sustainable ways. With teacher guidance, students should learn to identify and list the major steps needed to complete a task or project. When sharing ideas and communicating in online environments, they develop an understanding of why it is important to consider the feelings of their audiences and apply safe practises and social protocols agreed by the class that demonstrate respectful behaviour.

Austria

Structure of the education system

According to Article 14 of the Austrian Federal Constitutional Law, as amended (Bundesverfassungs- Gesetz, B-VG, Art. 14), the foundational principles of education in Austria are democracy, humanity, solidarity, peace, and justice. Additionally, the educational system upholds principles of openness and tolerance towards all individuals, irrespective of their race, social status, or financial background. The Austrian Federal Constitution lays the foundation for the educational laws, delineating the responsibilities between the government and the federal states (Länder). The federal government primarily oversees general principles, curricular standards, and teacher training standards, while states handle school administration and some aspects of curriculum implementation. Austrian school law (SchOG) encompasses various types of educational institutions including compulsory primary and lower secondary schools, upper secondary schools (both general and vocational), and special schools. Each type of school has specific laws and regulations governing its operations, curricula, and assessment methods.

School stages/educational trajectory

Similar to Germany, the Austrian school system is structured into different stages, with compulsory education beginning at age 6. Children typically attend primary school ("Volksschule") from ages 6 to 10. After primary school, students proceed to lower secondary education, which includes "Mittelschule," or the first stage of academic secondary school ("AHS Unterstufe"), from ages 10 to 14. At age 14, students can choose between upper secondary options, like vocational schools ("Polytechnische Schule," "Berufsbildende Mittlere Schulen," or "Berufsbildende Höhere Schulen") or continue with academic secondary school ("AHS Oberstufe"). Compulsory education ends at age 15, but students usually pursue further education to enhance their career prospects.

Special Education System

Following several school projects on 'integrated education' in the 1980ies and early 1990ies, Austria has implemented a multi-track system for learners with SEN: Article 8 of the Compulsory School Act (Schulpflichtgesetz) (BMUKS, 1996) includes the so-called parents' right to choose ("Elternwahlrecht"). Thus, parents can choose if their children with SEN should attend a special school or a mainstream school setting aiming to be inclusive. Concerning special schools, ten different impairment-related focuses of special schools exist (such as special school for students with severe cognitive impairments, special schools for deaf children, etc. Special schools are characterized by small groups of learners, curricula which focus on education in relation to specific impairments and a high level of resources, such as own swimming pools and therapeutic facilities (European Agency for Special Needs and Inclusive Education (2020b). Education in special schools covers the whole range of compulsory schooling (nine years). Furthermore, further vocational training for students with SEN is offered in special schools rather often. The common typical inclusive education setting is the so called 'integration class' in Austria. These classes are located in mainstream schools and are characterized by a lower number of students (compared to 'regular' classes) and co-operative teaching by one special education teacher and a class teacher/subject teacher. Thus, teaching in these inclusive setting incorporates cooperative teaching methods (team teaching), individualized instruction, student-centered activities, open learning environments, and interdisciplinary, project-based approaches. Similar to Germany, also in Austria separated, impairment- related curricula for students with SEN exist (Buchner & Petrik, 2022).

Special Education Needs Categories

Within the "Rundschreiben 7/2019" (BMBWF, 2019) it is stated, that learners can be identified as having SEN, if they – because of a long standing impairment - cannot participate in a mainstream class without additional support measures. Thus, SEN must stand in a causal relation to a physical or cognitive impairment. The assessment procedure is conducted by the Education Directorates (Bildungsdirektionen). Applications for assessment may originate from parents or legal guardians, or, in exceptional cases, from teachers or other professionals. In relation to the ongoing development of the child, the implemented measures are periodically reviewed, especially when transitions to different types of schools occur. After a child has been diagnosed as having SEN, the curriculum for the learner is defined – depending on the diagnosed impairment and learning levels (European Agency for Special Needs and Inclusive Education, 2020a). As mentioned, similar to Germany, Austria has different, separated curricula. Concerning cognitive impairments, students with SEN can be taught by the curriculum for the general special school (Allgemeine Sonderschule) or by the school for students with high support needs ('Schule für Kinder mit erhöhtem Förderbedarf', a category that matches the international definitions of high support needs). However, there are further impairment related curricula, such as the curriculum for the school for blind children or the school for children with physical impairments. Interestingly, and different to other countries, gifted learners are not regarded as having SEN.

Policies and Research

Austria has signed and ratified United Nations Convention on the Rights of Persons with Disabilities (UN- CRPD). In line with the tasks associated with article 24 (to build an inclusive education system), Austria has taken several measures to increase inclusive education. For example, the implementation of inclusive model regions as part of the first National Action Plan on Disability 2012 to 2020 (BMASGK, 2012) or the aim to rise the percentage of students with SEN placed in mainstream settings as part of the second National Action Plan on Disability 2022 to 2030 (BMSGP, 2022). However, recent reports such as the Special Report on the Implementation of Inclusive Education by Austrian Monitoring Body of the UN- CRPD have pointed out a decrease in funding of special and inclusive education. Furthermore, research has shown that teachers struggle with practising inclusive education and tend to instruct students with SEN separated from their peers in mainstream schools (Buchner & Petrik, 2023; Buchner, 2021; 2017). These separation practices seem to be linked to a lack of knowledge on how to cater for the learning needs for all students (Buchner & Petrik, 2020). Especially students with intellectual disabilities are still regarded as 'impossible students' for mainstream schools (Buchner, 2021) and are most likely not to benefit from progress in implementing inclusive education in comparison to other students with SEN (Buchner et al., 2020). Furthermore, research has pointed out that SEN-labels, such as students with SEN or students with intellectual disabilities seem to be a barrier in perceiving the individuality of learners and orchestrating a mass tailored instruction (Buchner, 2020; 2017). Recent research in Austria has also pointed to a certain lack of resources, more precisely: of personal resources for practising inclusive education (Gasteiger-Klicpera et al., 2023).

In Austria, in the school year 2020/2021 around 60% of all students with SEN were placed in mainstream school settings (BMBWF, 2022).

Digital Education Policies (and students with SEN)

Austria has set numerous education policy priorities in recent years in order to drive forward the digital transformation of the education system. Various initiatives, measures and legal reforms have been bundled under the heading 'Digital

School', which are intended to drive forward the goal of creating a sustainable education system in the context of digitalisation in the long term (see BMBWF, 2020a). At the centre of this is the Master Plan for Digitalisation in Education (BMBWF, 2018) and the 8-Point Plan (BMBWF, 2020b). The masterplan defines three central fields of action. Firstly, these concern the curricular anchoring of digital teaching content and skills (see Federal Law Gazette II, 2018) - with the aim of "taking digitalisation into account methodically and didactically in all subjects in the sense of modern teaching" (BMBWF, 2023, n.p.). Secondly, the masterplan will accelerate the updating of the technological infrastructure in schools. Thirdly, it aims to empower educators for digital education processes through further education and training. The 8-point plan takes up these levels of action and specifies goals, measures and development steps up to 2024, such as equipping pupils and teachers with digital devices, developing digitalisation plans at all school locations, using subject-related apps for learning processes or training teachers in distance learning (BMBWF, 2020b). To support these measures, the Federal Ministry has set up eEducation Austria, a centre based at the University College of Teacher Education Upper Austria, which supports education administrators and schools in school development processes, e.g. through specific training measures. Finally, digitalisation is also to be promoted in tertiary educational institutions - in terms of both their infrastructure and teaching and learning arrangements (see BMDW, 2022).

However, unlike in other countries, students with SEN or inclusive education settings are not mentioned explicitly in the policies listed above.

Mathematical competences

In primary education, students undergo a gradual and comprehensive development of mathematical competences crucial for their future academic and practical endeavors. Beginning with Mathematical Early Education, students embark on a journey that bridges theoretical concepts with practical applications drawn from their lived experiences. This foundational phase emphasizes not only the acquisition of basic mathematical skills but also the cultivation of a positive attitude towards mathematical inquiry. Through exploration, discovery, and hands-on activities, students engage with various mathematical concepts such as quantities, numbers, structures, measurements, and spatial relationships. They learn to estimate, compare, and analyze data, laying the groundwork for more complex mathematical reasoning in subsequent years.

Furthermore, the curriculum places a strong emphasis on fostering critical thinking and problem-solving skills from the outset. Students are encouraged to formulate and model real-world problems, applying mathematical principles to find solutions. This approach not only deepens their understanding of mathematical concepts but also equips them with essential problem-solving strategies applicable across diverse contexts. Moreover, by integrating mathematical learning with other subjects and real-life scenarios, students develop a holistic understanding of mathematics, recognizing its relevance and utility beyond the confines of the classroom.

As students progress through primary education, their mathematical competences are further honed and expanded to encompass fluency and reasoning abilities. They develop proficiency in basic mathematical operations, numerical fluency, and the ability to reason logically and coherently. Moreover, students are encouraged to communicate their mathematical ideas effectively, both orally and in writing, thereby enhancing their mathematical literacy and enabling them to articulate their reasoning processes.

In essence, the primary curriculum aims to empower students with a robust foundation in mathematical competences that not only prepares them for future academic pursuits but also equips them with essential life skills necessary for navigating an increasingly quantitative and data-driven world. Through a balanced blend of theoretical instruction,

practical application, and interdisciplinary connections, students emerge with a deep appreciation for the beauty and utility of mathematics, poised to tackle complex challenges with confidence and competence.

Digital competences

In the Austrian primary curriculum, digital competences are not limited to an individual subject, but mark an overarching learning dimension. Students with SEN are not explicitly addressed in the context of digital competences.

In primary education, students should acquire a diverse set of digital competences that empower them to effectively navigate and engage with digital technologies. This includes utilising digital devices and the internet for learning purposes, creating and designing digital drawings and images, and experiencing self-efficacy by creatively utilising digital technologies. Moreover, students should develop critical thinking skills to evaluate the impact of media, discern between reliable and unreliable sources of information, and understand the implications of digital communication on society and democracy. By fostering a critical and creative approach to media technologies, students enhance their digital literacy, enabling them to actively participate in society and contribute to its development. Additionally, a contemporary curriculum should integrate digital media into classroom practises, providing opportunities for students to explore, create, and critically reflect on digital content, thus fostering a holistic and creative engagement with texts and media.

Bulgaria

Structure of the education system

The Bulgarian education system is governed by the ministry of education and by 28 Regional Departments of Education. In 2016, the Bulgarian education system was subject to a huge reform: The new Pre-school and School Education Act extended compulsory pre-school education to children at age 4 (EURYDICE, 2023a). Thus, Pre-school education is mandatory from the school year in which the child reaches the age of 4. Parents choose one of the forms stipulated in Art. 67, and the state and municipalities provide conditions for children's coverage in kindergartens and preschool education groups. School education is compulsory until the child reaches the age of 16 and begins with the school year that begins in the year the child reaches the age of 7.

Thus, compulsory education starts with 4 and ends with 16. Interestingly for the Atollo project, the objectives of the Amendment were to improve access to education by removing barriers, thus addressing inequalities. They aim to foster inclusion and prevent social exclusion. Additionally, the Amendment seeks to prevent the accumulation of educational deficits and enhance literacy, as well as to promote the acquisition of skills and attitudes necessary for lifelong learning and a digitalized world.

School stages/educational trajectory

The education system in Bulgaria is organized into distinct stages, each designed to cater to specific age groups and educational needs. Primary education is divided in two different sub stages. Primary school caters for children aged 7 to 11. This stage includes Grades 1 to 4. The curriculum covers basic education in reading, writing, mathematics, and introduces natural and social sciences. All years of primary education are compulsory (EURYDICE, 2023a). Pre-secondary stage of primary education Lower secondary education serves students aged 11 to 14 and includes grades 5 to 7. This stage provides a continuation of basic education with a broader curriculum that includes languages, mathematics, natural sciences, humanities, and arts. Secondary education is available for students aged 15 to 18 or 19. This stage includes grades 8 to 12., which are, again, subdivided in two stages (8th to 10th grade and 11th to 12th grade). Students have the option to pursue general secondary education at a gymnasium, which prepares them for higher education through a broad general education. Alternatively, they can opt for vocational education and training (VET) schools, which combine academic coursework with vocational training to prepare students for specific careers or further vocational study.

Special Education System

Bulgarian school law includes a broad definition of inclusive education. As pointed out in § 1/22 of the Additional stipulations of the Law for Pre-school and School Education inclusive education stands for a process of building awareness, acceptance and support for the individuality of every child and also for the diversity of needs of all students through activating and including resources directed towards creating opportunities for development and participation of children in schools (European Agency for Special Needs and Inclusive Education, 2020c). Thus, numerous measures for the support and inclusion of children with special educational needs (SEN) are offered. Kindergartens and schools are required to enrol children and students with SEN, with a regulation allowing up to three such individuals per kindergarten group or school class. Moreover, children and students with SEN receive additional support intended to foster their personal development, provided by kindergartens, schools, personal development support centres, and

specialized service units. This specific support is granted following an assessment of individual needs, initiated upon the request of parents or guardians (see below for further details) (European Agency for Special Needs and Inclusive Education, 2020c).

Special Education Needs Categories

A support team, appointed by the kindergarten or school director specifically for the child or student, conducts this assessment. The team typically includes a psychologist, a speech therapist, a resource teacher, and, for those with hearing or visual impairments, a hearing and speech rehabilitator or a teacher specialized in these disabilities. Additionally, the team incorporates the teachers of the kindergarten group/classroom and those teaching the student at school (European Agency for Special Needs and Inclusive Education, 2020d).

Assessments evaluate cognitive development, communication skills, social skills, physical development, adaptive behaviour, mental reactions, and family functioning. For children or students who are non- native Bulgarian speakers, assessments are conducted in the language they are most proficient in, using a translator provided by the parents if necessary. Parents must provide written consent on the evaluation card, agreeing or disagreeing with the assessment of individual needs and the proposed additional support. In 2023 the former medical-based assessment of special needs was replaced by a more holistic, ICF-related diagnoses scheme.

Policies and Research

The Bulgarian education system has been subject to constant reform processes over the last 20 years. Already in the 2010s, most special schools in Bulgaria were closed. According to Art.44 of the Law for Pre- school and School Education there are only three types of special schools: for sensory impairments, some boarding schools for students with challenging behaviour and some boarding schools for children who do not have appropriate parental care. Until today, fostering inclusive education has been one of the key goals of Bulgaria. Only recently, the government of Bulgaria adopted the Strategic Framework for the Development of Education, Training, and Learning for 2021–2030. This framework sets forth nine priority areas, each supported by specific objectives and a specific list of actions intended to advance the country's educational standards. For example, the framework underscores a commitment to ongoing policy implementation to ensure early and equitable access to education and to reduce dropout rates. Priority is given to reducing disparities, fostering social inclusion, and increasing engagement from both learners and parents in the educational journey. More specifically, a significant focus within the Strategic Framework is on effective and sustainable inclusion. This includes specific goals such as removing regional, social, and economic barriers to education, enhancing the professional development of teachers, employing individualized approaches tailored to each learner's needs, ensuring active participation of students with special educational needs, and integrating learners from vulnerable groups into the education system. However, as was criticized, no implementation plan for this policy has been developed yet (European Agency, 2023).

Digital Education Policies (and students with SEN)

The Digital Bulgaria 2025 National Programme is designed to modernize and enhance digital solutions across all sectors of economy and social life. Additionally, the policy strategically aims to improve digital competencies and skills at all levels. More specifically, concerning the field of education, this policy aims to promote the development of a modern and reliable information and communication technology (ICT) infrastructure within schools, to enhance assessments of students' digital competences upon high school graduation, the modernization of educational curricula and to equip

teachers with the necessary skills to practise digital teaching methods (National Framework for the Development of Education). However, there is no special focus on learners with SEN included in this and other policy documents on digital education.

Mathematical competences

The Bulgarian mathematics curriculum for primary education is formulated in a competency-based approach and does not seem to differentiate between students with and without SEN.

In primary education, the teaching content in mathematics aims to cultivate foundational skills and understanding necessary for numerical proficiency while integrating digital tools to enhance learning experiences. In the first grade, students engage in activities focused on numbers, geometric shapes, measurement, and modelling. They develop familiarity with natural numbers up to 20 and subsequently up to 100, performing basic arithmetic operations with single and double-digit numbers. Digital resources supplement learning by providing interactive exercises for recognizing geometric figures, measuring line segments, and modelling mathematical expressions in real-world contexts. As students progress to the second grade, the curriculum expands to encompass more complex numerical operations, including multiplication and division. Students further explore geometric concepts, such as the properties of triangles and rectangles, and extend their understanding of measurement units and perimeter calculation. Digital platforms offer interactive simulations for visualizing geometric shapes and practising measurement skills, enhancing students' comprehension and engagement. By the third grade, students delve deeper into numerical concepts, mastering arithmetic operations with numbers up to 1000 and decimal positional systems. They refine their geometric knowledge by recognizing various types of lines and angles and deepen their understanding of measurement units and conversions. Digital tools facilitate modelling of mathematical relationships and real-world scenarios, fostering critical thinking and problem-solving skills. Through an integrated approach to teaching mathematics with digital resources, students develop a strong foundation in mathematical concepts and skills essential for their academic and practical endeavours.

Digital competences

In Bulgarian primary education, digital competences are to be acquired by students from 1st grade on. However, from 3rd school year onwards, they are taught within a specific subject. The curricular documents are based on a competency-based approach, yet students with SEN are not explicitly mentioned in them.

For both years, competences are divided into the four competence areas digital devices, digital identity, information and algorithms.

In primary education, students should acquire fundamental digital competences that enable them to navigate and utilize digital technologies effectively and responsibly. By the third grade, students should be capable of safely operating various fixed and mobile digital devices, understanding their basic components, and adhering to health standards when using them. They should also develop digital identities by creating avatars, distinguishing between digital and physical personas, and understanding online privacy and security measures. Furthermore, they should learn to manage digital information by understanding how data is stored and organized in files and folders. Additionally, they should begin to grasp basic algorithms, such as arranging blocks in a sequence to create stories or animations. By the fourth grade, students should deepen their understanding of digital devices by describing their functionality and components, while also being aware of ethical considerations and environmental impacts associated with digital technology use. They

should further refine their digital identities by recognizing and mitigating potential threats in digital environments and understanding how to seek help when needed. Moreover, they should develop skills in managing digital information, including different means of obtaining information and forms of information representation, while also understanding the importance of respecting digital resource rights. Additionally, students should advance their understanding of algorithms by engaging in block programming to create digital content, controlling characters in games, and creating interactive projects incorporating various multimedia elements. Overall, these competences lay a strong foundation for students to navigate and thrive in an increasingly digital world.

Croatia

Structure of the education system

According to articles 65 and 66 of the Croatian Constitution, primary education has to be free and is mandatory. However, secondary, and higher education are also available to everyone under equal conditions. Thus, every individual is entitled to education that corresponds to their abilities, needs, and personal development. Indeed, providing equal access to education has been considered as a key strategy to combat social exclusion in Croatia (EURYDICE, 2023b).

School stages/educational trajectory

In Croatia, compulsory education starts at the age of 6 and ends at 14 years. Primary education includes ISCED levels 1 and 2 constitutes an integrated, compulsory system that spans eight years. However, from 1st to 4th grade, students are taught by one class teacher in all subjects (except foreign languages and religion), such as mathematics, Croatian and nature. From 5th to 8th grade, teaching is organized by a subject teacher system: In difference to 'regular' students, children diagnosed as having cognitive impairments are allowed to go to school until 21 years of age. Secondary education in Croatia (ISCED 3) is not mandatory, yet it is attended by the majority of students and starts with 13/14 years, ending with state matura exams (university qualification certificate). Secondary education (Grades 1 to 4) encompasses several types of school forms: gimnazija (either general or specialized), vocational or trade schools, and schools dedicated to the arts (such as music, dance, and visual arts) (EURYDICE, 2023b).

Special Education System

The special education system in Croatia aims to support students with SEN, ensuring their right to education and fostering their inclusion. Students with SEN are supported in different school settings (European Agency for Special Needs and Inclusive Education, 2020):

- mainstream classes in regular schools
- part-time education in mainstream classes, mixed with introduction in special classes in mainstream schools
- special classes in mainstream schools
- special schools

Concerning the curricula (referred to as 'programme' in Croatia) and content of teaching, four different tiers can be identified:

- teaching in line with the standard curriculum with individualization
- teaching in relation to the standard curriculum with both content modifications and individualized procedures,
- special curricula
- special training for students with cognitive impairments which focuses on enhancing life and vocational skills – in order to develop the abilities for independent living.

The type of curriculum is chosen by regional authorities based on the student's needs assessment (see below). Professional support is predominantly offered by a team consisting of teachers, educational and rehabilitation professionals, teaching assistants, and professional communication mediators. Educational adaptations includes the use of modified IT equipment, specialized didactic tools and resources, textbooks adjusted in language, script, and medium, electro-acoustic devices, and alternative communication methods. Additional support measures may include the

organisation of home-based instruction, remote learning, and educational provisions within healthcare facilities as required. A typical inclusive environment includes up to three students with developmental disabilities who, with appropriate support are educated following standard curricula with adaptations.

Special Education Needs Categories

The registration of students with special needs into primary education stage is governed by the "Regulation on the Process of Assessing the Psychophysical State of Children and Students and the Structure of Expert Committees" (Official Gazette, Nos. 55/11 and 67/14). This regulation mandates the assessment of a child's psychophysical condition to ascertain the most appropriate educational curriculum and type of schooling. Additionally, it helps determine the requisite support, instructional methods, and educational tools needed for each child (European Agency for Special Needs and Inclusive Education, 2020f).

In Croatia, the status of special educational needs (SEN) is linked to medical based assessment. Students regarded as having SEN are offered, as mentioned above already, specific support in order to access and succeed in education. The types of SEN can be classified into the following categories.

- Physical impairments: This category includes students with mobility impairments, neurological disorders, and chronic health issues. They may need physical accessibility features in schools, assistive devices, or personalized support.
- Sensory impairments, including visual and hearing impairments. Students may require specialized learning materials (Braille, large print, audio resources) or devices like hearing aids, as well as communication support.
- Cognitive impairments. Students with cognitive impairments are subdivided in four different categories: mild, moderate, severe and profound cognitive impairments. They are instructed following individualized education plans (IEPs) and tailored teaching strategies.
- Challenging behaviour and mental health problems: students facing challenges like attention deficit hyperactivity disorder (ADHD), anxiety, or depression may need psychological support, behavioural interventions, and counselling.
- Speech and language disorders: students with speech impediments or language processing issues are offered speech therapy and specialized language interventions.
- Giftedness: Although not traditionally viewed as a 'need,' gifted students often require special programmes or acceleration to meet their educational needs.

Policies and Research

Like the other partner countries, Croatia has signed and ratified United Nations' Convention on the Rights of persons with disabilities (United Nations, 2006). In line with the interlinked obligations inscribed in article 24, Croatia has shown several efforts to make its education system more inclusive. However, despite these efforts, several problem areas remain, such as the employment status of teaching assistants for students with disabilities is inadequate. Furthermore, regulations and strategic documents have been considered as neglecting necessary spatial adaptations for children with cognitive impairments (Bouillet et al., 2024).

Digital Education Policies (and students with SEN)

Over the course of the last ten years, Croatia has implemented several policies and initiatives which are part of the country's broader efforts to modernize its educational system, ensuring that students are prepared for a digital world, and reducing the digital divide among students across different regions of Croatia. The Croatian Digital Maturity of Schools (e-Schools) Programme 2030 can be considered as one of the main policies (Croatian Department of Education, 2015). Launched in 2015, the e-Schools programme aims to develop digital competencies in students and improve the digital maturity of schools. The programme includes training teachers in digital skills, equipping schools with modern IT infrastructure, and implementing digital management systems to enhance the efficiency of school administration. In addition, Croatia developed a new curriculum for the subject of informatics. Introduced as a compulsory subject in primary schools and as an elective in upper secondary schools, the curriculum for informatics focuses on developing students' computational thinking, coding skills, and understanding of digital technology. While broader in its scope, the Strategy for Education, Science, and Technology includes significant components focused on digital education, such as the integration of digital content and methodologies into teaching and learning processes.

Recently, Croatia launched the Digital Croatia Strategy until 2032-Policy, in which the further digitalisation of all parts of the education system is identified as a key priority.

Within the National Development Plan for the for the Education System for the Period until 2027, it is stated that digitalisation would potentially enhance the effective inclusion of vulnerable groups/groups with special educational needs (Ministry of Education, 2020). However, how this should be achieved is not elaborated within the document.

Mathematical competences

The Croatian primary curriculum for mathematics is based on a competency-based approach.

For Students with special educational needs (students with disabilities and gifted students), teachers are supposed to devise a student-centered curriculum. The peculiarities and difficulties of students require appropriate individualized and differentiated procedures, learning goals, the level of achievement of the educational outcome, scope and depth of content learning and teaching strategies and activities that aim to achieve the set outcomes, as well as ways of evaluating the achieved achievements.

In the Croatian primary mathematics curriculum, students delve into a comprehensive exploration of mathematical concepts and skills. Beginning with foundational topics such as the set of natural numbers up to 20, including zero, students acquaint themselves with numbers, digits, and number words. They navigate the concept of a number line, learning about predecessors and successors, as well as ordinal numbers up to 20. Through problem-solving situations and computational tasks, students develop fluency in basic arithmetic operations, including addition, subtraction, multiplication, and division, within the context of one- and two-digit numbers.

As students' progress through primary education, their mathematical competences are further enriched with a focus on more complex topics. They extend their understanding to include numbers up to 100, exploring decadal units, place value, and the comparison of numbers within this range. Additionally, students delve into ordinal numbers up to 100 and Roman numerals up to 12. They master addition and subtraction of tens, as well as two-digit and one-digit numbers, laying the groundwork for tackling more intricate arithmetic operations involving multiple numbers and factors.

Further advancement in mathematical proficiency is achieved as students tackle concepts related to numbers up to 10,000. They deepen their understanding of place value, comparing numbers within this expanded range and exploring various strategies for addition, subtraction, multiplication, and division. Problem-solving becomes increasingly sophisticated, requiring students to apply their knowledge of calculation operations and number relationships to real-world scenarios.

In the final stages of primary education, students extend their mathematical repertoire to encompass numbers up to a million. They refine their skills in written addition, subtraction, multiplication, and division within this extended range, applying calculation operations to solve complex problem situations. Moreover, students explore geometric concepts such as angles, triangles, circles, and polygons, enhancing their spatial reasoning and geometric visualization skills.

Throughout the curriculum, an emphasis is placed on practical application, critical thinking, and problem- solving, ensuring that students develop not only mathematical fluency but also the ability to apply mathematical concepts to diverse contexts. By fostering a deep understanding of fundamental mathematical principles and cultivating a positive attitude towards mathematical inquiry, the Croatian primary mathematics curriculum equips students with essential mathematical competences necessary for success in further academic pursuits and everyday life.

Digital competences

In the Croatian primary curriculum, digital competences are outlined for each year based on a competence approach. Students with SEN are mentioned explicitly in terms of the necessity to continuously diagnose, evaluate and give feedback to students regarding their learning success and to find opportunities for individual work for children with specific needs (i.e., gifted students as well as students with developmental disabilities).

In the first year, students should become familiar with digital technology under the guidance of their teacher in a safe environment. They should learn to differentiate between various digital content, devices, and procedures for creating them. Basic logical thinking skills should be introduced as they follow sequential steps to solve simple tasks. With teacher support, they should engage with basic digital programmes and educational content, learning to create simple digital materials. They should also begin to understand responsible use of technology, including safeguarding personal data and adhering to healthy computer habits.

During the second year, students should delve deeper into computer use and the role of programmes. They should learn to navigate the Internet for specific services and information. Basic problem-solving skills should be honed as they analyse and correct instructions for tasks. With guidance, they should create digital content and collaborate in safe online environments. They should also begin to recognize potential risks associated with technology and practice responsible online behaviour to protect their personal data and reputation.

In the third year, students should progress to using symbols to represent data and tackling simple hardware/software issues. They should gain hands-on experience creating programs and organizing data effectively. They should become more independent in selecting devices and programs, while still receiving guidance on their usage. Collaboration in secure digital environments should become more refined, and students should learn to manage their digital time wisely while maintaining healthy habits. They should also develop skills to address digital dangers and protect personal data, both their own and others'.

By the fourth year, students should deepen their understanding of computer networks and their applications. They should learn to use symbols effectively for data representation and engage in more complex programming tasks.

Problem-solving abilities should be further developed, both with and without the aid of computers. Students should explore a wider range of digital tools, recommending and exploring their capabilities. They should also begin planning and executing collaborative projects online, while also considering health and safety guidelines for computer use. Additionally, they should explore various careers in the realm of information and communication technology.

Germany

Structure of the education system

https://www.european-agency.org/country-information/germany/legislation-and-policy

Germany is constituted as a Federal Republic comprised of 16 federal states, known as 'Länder'. The extent of the Federal Government's obligations within the domain of education is delineated in the Basic Law ('Grundgesetz'; Federal Republic of Germany, 1949). The development across the federal states is notably heterogeneous. Each state is endowed with autonomous authority, including the capacity to enact its own legislation within the framework established by the Basic Law. A fundamental aspect of this autonomous status is their sovereignty concerning their oversight of education, science, and culture. Consequently, each federal state is principally responsible for formulating its own educational and cultural policies. These policies are expected to reflect the unique historical, geographical, cultural, and socio-political characteristics of the respective federal state, thereby fostering diversity and competitiveness within the national education system and cultural sector. However, despite their individual responsibilities, the federal states collectively share a joint responsibility for the welfare of the federal state as a whole – and organise in the so called 'Kultusministerkonferenz' (KMK). This collective responsibility both grants and mandates them to collaborate among themselves and with the Federal Government (EURYDICE 2023d).

School stages/educational trajectory

After primary school, which ends after grade 4—or grade 6 in the regions of Berlin and Brandenburg— an initial stratification occurs, directing students into distinct academic tracks that lead to various (but hierarchized) qualifications, including the Erster Schulabschluss, Mittlerer Schulabschluss, and Allgemeine Hochschulreife (university qualification exam). Within the Federal Republic of Germany, compulsory education starts for all children in the calendar year they attain the age of six and encompasses nine years of full-time schooling (ibid.).

Special Education System

Similar to Austria, parents (the so-called 'Elternwahlrecht') have a right to choose between a mainstream school or a special school. Thus, Germany has both a rather strong special school system and mainstream school settings in which students with and without disabilities are educated together, often considered as 'inclusive settings' (Blanck, 2020; Powell, 2011).

In line with the federal structure outlined above, each federal state has its own school law including the rights and provisions for students with SEN (European Agency for Special Needs and Inclusive education, 2020g). Thus, the configuration of the special education system differs among federal states. However, a typical inclusive education setting is characterized by a joint instruction of students and students considered as having special educational needs (SEN). Support in inclusive education settings in Germany is supposed to be organized through collaborative efforts involving individualized education plans, special education teachers, teaching assistants, therapists, and regular team meetings (Gasterstädt, 2019). Special education teachers provide tailored instruction, while teaching assistants offer additional support. Therapists address specific needs, and ongoing professional development ensures staff are equipped with necessary skills.

Special Education Needs and support

In order to perceive long-term inclusive/special education support in schools, students need to have the status special educational needs (SEN). In order to achieve this status, students need to have a medical diagnosis (Gasterstädt et al., 2022). Interestingly, the category SEN encompasses different, impairment- related types of special educational needs support, such as seeing ('sehen'), learning, emotional and social development, speech, 'mental development (intellectual disabilities), hearing, physical and motor development, instruction for 'ill pupils' ('Förderschwerpunkt kranke Schüler:innen') ((European Agency for Special Needs and Inclusive education, 2020h).

In most federal states, students with intellectual disabilities are instructed in relation to a special school curriculum, which differs significantly concerning expectations and topics of learning from the curricula for mainstream schools.

Policies and Research

Over the course of the last years, also due the ratification process of the UN-CRPD, Germany has intensified its efforts to make its education system more inclusive. However, progress as well as quality and availability of inclusive settings varies across federal states (Klemm, 2020). Nonetheless, on a national level, gearing school policies towards inclusive education has led to a decrease of special schools (ibid). In line with this tendency, the so-called exclusion quote for all over Germany has dropped by 0.52 percentage points (Klemm, 2022). Also, the total numbers of students with SEN (from 88.784 in school year 2008/2009 to 234.796 in 2018/2019) and of students with intellectual disabilities in mainstream schools rose significantly over the course of the last years (from 2254 to in school year 2008/2009 to 12.673 in 2018/2019) (Hollenbach-Biele & Klemm, 2020). Concerning type of impairment and SEN, it has to be noted that students with learning disabilities (39,9% of all learners with SEN) are the largest group of learners with SEN and students with intellectual disabilities the third largest group of learners with SEN (17,5%) (Klemm, 2022).

Digital Education Policies (and students with SEN)

Over the course of the last ten years, several policies focused on the digitalisation of the German school system: the white paper "Bildung in der digitalen Welt" (KMK 2016), the "Digital Pakt Schule" (KMK 2019) and the supplement paper to the white paper "Lernen und Lehren in der Digitalen Welt" (KMK, 2021. Already in the white paper, the importance of inclusive digital education is highlighted, as digital education is regarded as an opportunity to support the construction of individualized learning environments and inclusive education processes in general (KMK; 2016). Within the supplement paper, it is stated that for the field of inclusive pedagogy, accessibility, usability and the assistive and adaptive functions of the usability of digital media and tools play a key role (KMK, 2021). Furthermore, participation in digital education is seen as a right of learners and teachers with disabilities. Among other things, teaching and learning sets and learning programmes are supposed to be didactically supported by and with digital media and tools and should enable learning processes following a broad understanding of inclusion (KMK 2021, 6).

In sum, all three main policies point to the potential of digitalisation to support inclusive education and demand practitioners to use teachers to use digital tools for an individualized teaching and learning.

For Germany, we refer, in the following to the Bildungstandards im Fach Mathematik für den Primarbereichs' (KMK, 2004).

Mathematical competences

In the German mainstream school curriculum, students embark on a journey of mathematical discovery that begins with developing a strong foundation in number sense. They learn to understand the concept of numbers, counting, and cardinality, laying the groundwork for further mathematical exploration. Basic operations such as addition and subtraction within a certain range, typically up to 10, are introduced, enabling students to build fluency in these fundamental arithmetic operations. Shapes and spatial awareness are emphasized, with students recognizing and describing basic shapes and understanding spatial relationships.

Measurement becomes a focal point as students explore concepts of length, weight, volume, and time using non-standard units, fostering an understanding of quantitative attributes and their measurement. Patterns and sequences are identified and created, enhancing students' ability to recognize and extend patterns in various contexts. Problem-solving skills are honed through hands-on activities and real-life situations, empowering students to apply mathematical concepts to practical challenges they may encounter. For students with cognitive impairment, the curriculum in Hessen is designed to be flexible and individually tailored to their needs and abilities. Mathematical competencies are adapted to accommodate varying support areas and developmental levels, with an emphasis on basic mathematical concepts relevant to daily life. Skills such as counting, simple addition and subtraction, understanding quantities and sizes, and the application of mathematical concepts in practical situations are prioritized, aiming to equip students with foundational skills that foster independence and facilitate their engagement with their environment. As students progress through their education, the curriculum expands to encompass a broader range of mathematical concepts and skills. They move beyond basic arithmetic to understand numbers up to 100, extending their mastery of addition, subtraction, and introducing basic multiplication and division. Measurement, geometry, and data handling are explored through hands-on activities, providing students with opportunities to engage with mathematical concepts in a meaningful way. Problem-solving tasks become more complex, requiring students to apply their mathematical knowledge to real-life situations, thereby deepening their understanding and reinforcing their skills. In later stages of the curriculum, students master larger numbers and delve into more advanced mathematical concepts such as fractions, decimals, and percentages. Geometry is further developed, with a focus on angles, symmetry, perimeter, area, volume, and transformations. Problem-solving skills are strengthened through multi-step and real-world problems, fostering mathematical reasoning and fluency. Proficiency in measurement and conversions is emphasized, ensuring that students are well-equipped with the mathematical competencies necessary for success in further academic pursuits and everyday life.

Iceland

Structure of the education system

The Icelandic education system is characterized by a high level of coherence. In 2008, a range of laws were implemented to ensure this coherence for all educational levels, namely the Pre-School, Compulsory School, Upper-Secondary Education and Higher Education Acts. The laws are designed to ensure that all children and young people have equal access to education that promotes their overall development and prepares them for participation in a democratic society. To further ensure the quality and coherence of the education system, and unlike most other European countries, Iceland has implemented a 'curriculum for all' (see below).

The Icelandic school system is divided in two stages. Following preschool education (Leikskóli), compulsory education (Grunnskóli) starts at the age of six and continues until the age of 16, spanning ten years. This stage is divided into two cycles: the first cycle (ages 6-9) and the second cycle (ages 10-15). The curriculum covers a wide range of subjects, including Icelandic, mathematics, science, social studies, arts, physical education, and languages (EURYDICE, 2023d). Learning environments are thought to be inclusive (see below), emphasizing individual learning needs and a holistic approach to education, ensuring that each student achieves their educational potential. Following compulsory education, upper secondary education (Framhaldsskóli) lasts for four years, from the ages of 16 to 20. This stage is not compulsory but is attended by the majority of students. Upper secondary education offers both academic and vocational tracks, allowing students to prepare for higher education or enter the workforce with vocational qualifications. Schools offer a range of programmes, including general academic studies, vocational studies, and specialized programmes like artistic or technical studies.

Inclusive and Special Education System

As a result of coherent policies geared towards inclusive education since the 1990ies (see below), Iceland has only three special schools: one for students with severe disabilities and two for students with challenging behaviour. Thus, the great majority of students with SEN is educated in mainstream schools, including students categorized as having intellectual disabilities (European Agency for Special Needs and Inclusive Education, 2020h).

Special education is provided through various arrangements:

- mainstream class at the learner's home school: the learner receives additional, special education resources. These may include supplementary instruction in subjects such as reading and mathematics, or support for daily living activities
- through exchange hours within the class: the learner participates in the same subjects as their peers but receives education in an adapted format within the classroom environment
- by individual instruction separated from the mainstream class or in special groups, either part-time or full-time
- in a special class within a mainstream school
- in alternative locations as the learner's home if regarded as more suitable.

As mentioned, Iceland has implemented a 'curriculum for all'. Thus, there is only one national curriculum. The curriculum guidelines ensure conformity of the goal of inclusive education across the whole range of compulsory schooling – for example, by creating learning materials, that provide opportunities of participation for every student.

The objectives of study and instruction and the working practices of pre- primary, compulsory and upper-secondary schools are such as to prevent discrimination based on origin, gender, residence, class, religion or disability.

The regulation on learners with special needs in compulsory schools (number 585, from 2010), applies to learners who need special educational support in accordance with assessed needs. This regulation focuses on learner equality in education. The regulation aims:

- to ensure that learners have equal opportunities for both education and active participation in inclusive primary schools, so their needs are met,
- to ensure that students with SEN receive diverse training suitable for a motivating learning environment and appropriate accommodation that takes into account their needs and status
- to develop learning environments that help students to develop their personality, talents and creativity, as well as mental and physical abilities and be socially active members of the school community, based on their strengths.

Furthermore, the status SEN encompasses the creation of educational plans tailored to the needs of individual students or groups. These plans are devised based on comprehensive observations and evaluations of the student's overall circumstances, including academic performance and mental and physical development. The educational strategies include both long-term and short-term objectives tailored to the educational progression of the student.

Special Education Needs and Categories

Unlike the other partner countries, Iceland took a very specific course concerning the concept SEN already in the 2000s. Indeed, the 2008 Act on the regulation of learners with special needs already used the concepts of support system and support service instead of special needs education. It built education on learners' competencies instead of subject areas, and required schools to make an active plan of screening learners from first grade upwards to ensure that they are taught and supported according to their needs (Lög um grunnskóla, nr. 91/2008). The regulation on learners with special needs from 2010 further transformed special needs education by shifting the focus from special needs and remediating learners' failings to emphasizing learners' strengths, abilities, and circumstances. It also addresses how the school responds to diversity, equal opportunity, and participation in learning, giving the policy of inclusion increased depth (Reglugerð um nemendur með sérþarfir, nr. 585/2010) (European Agency for Special Needs and Inclusive Education, 2020i)

Thus, there is no typical SEN-assessments implemented in Iceland, but a student is entitled to special if consensus is reached among the parents, teachers, and the school's specialist team that the provision of special support is appropriate. The head teacher is responsible for initiating this process in collaboration with the parents. Should there be any disagreement regarding the provision, the matter is delegated to the local authority for a decision. According to the Regulation on School Support and Special Education for Pre-Primary and Compulsory Schools (No. 584/2010), special services include students in compulsory education as well as a counselling and support of their parents and school staff involved. This support is carried out by local specialist services, aiming to provide educational, psychological, developmental, and sociological expertise. These services strive to enhance the capability of schools as professional entities to master various educational challenges by providing tailored guidance and support to teachers and other school personnel.

Policies and Research

Iceland has ratified the UN-CRPD in 2016. Furthermore, the Icelandic Government incorporated the United Nations (UN) Convention on the Rights of the Child (1992) into Icelandic law in 2013 and also adopted the Salamanca Statement (UNESCO, 1994) as well as the Dakar Declaration on Education for All (2000).

The 'Education for all'-policy is the guiding policy for Iceland's national education system from early years to transition into work/tertiary education. This means addressing and responding to all students' learning needs without treating or defining those in need of special support any differently from other learners. In accordance with this, the legislation for the four educational levels mentioned above includes all learners. More concrete,, Education for All' means that

- all learners have equal opportunities to attend school and acquire education in accordance with their ability and needs
- all schools have to focus and support the abilities and needs of all learners
- all learners and their parents decide on which school they would like to inscribe
- all learners have the right to the support and provision that they need.

According to the statistics of the European Agency for Inclusive and Special Education, Iceland was at the European Forefront concerning placements of students with SEN in mainstream settings in school year s020/2021: 97.35 percentage points in ISCED 1 and 97.9 percentage points in ISCED 2 (European Agency for Inclusive and Special Education, 2021).

Digital Education Policies (and students with SEN)

Iceland's digital education policies were already implemented in the 2000s. In 2005, the policy document Dare with responsibility: The Ministry of Education's policy on information technology in education, culture and science 2005–2008 (Menntamálaráðuneytið, 2005) was published and a revised curriculum was introduced between 2005 and 2007. Small changes were made to the curriculum in information and technical education at primary school level (2007), other than those that design, and construction were no longer required in the field. In the reference timetable, the combined teaching time of the year groups in information education was four hours per week in grades 1–4. grade, three lessons in grades 5-7. grade and one in 8th-10th. grade, plus the possibility of elective subjects with information technology as a subject. In information education, the goals were divided into technical literacy (the ability to use equipment to acquire knowledge and communicate it), information literacy (knowledge and skills in acquiring, sorting, and processing information critically and creatively), and cultural literacy (the ability to enjoy culture) and willingness to process various aspects of it creatively and ethically). In computer use in elementary school, the goals were divided into the category attitudes, computer literacy, computer use and technical understanding. In innovation and utilization of knowledge, the objectives were divided into the categories of information and technological literacy; idea, solution, product; and individuals, technology and environment.

However, none of these policies focuses specifically on disabled students or mentions inclusive or special education.

Mathematical Competences

In the Icelandic curriculum for mathematics, students are evaluated on their competence across seven categories, with assessments conducted in the 4th, 7th, and 10th years of compulsory education. It is not based on a competency approach In their mathematical studies, pupils should not only engage with mathematical content but also develop

essential skills and attitudes towards the subject. This includes the ability to propose and solve assignments, reflect on different methods and models, and evaluate their findings. Mathematical competence goes beyond mere calculation; it involves having a clear understanding of mathematics, using it to question and answer, and mastering its language and tools.

To acquire mathematical competence, pupils need to cultivate a positive attitude towards mathematics, fostering self-confidence and recognizing its relevance and utility. This involves approaching mathematical problems with creativity, reflection, and logical reasoning, as well as presenting mathematical models effectively. Moreover, students should develop a deep understanding of mathematical concepts, operations, and relationships, enabling them to apply flexible, efficient, and precise methods to problem-solving.

Furthermore, pupils should be adept at using various tools and aids, including information technology, to propose, code, and solve mathematical problems. This emphasizes the importance of integrating technology into mathematical learning to enhance students' problem-solving abilities and provide access to a wide range of mathematical resources.

Additionally, mathematical competence entails the ability to communicate mathematically, explaining their reasoning to others, discussing solution methods, and verifying solutions collaboratively. This emphasizes the importance of communication skills in mathematics, as students learn to articulate their mathematical thinking and engage in meaningful mathematical discourse.

In summary, the Icelandic curriculum emphasizes not only the acquisition of mathematical content knowledge but also the development of critical thinking skills, problem-solving strategies, and effective communication in mathematics. By fostering a positive attitude towards mathematics and providing opportunities for creative exploration and collaborative learning, the curriculum aims to equip students with the mathematical competence needed.

Digital competences

In the Icelandic curriculum, competences are laid out for year one to year four combined and are based on a competence approach. The main objective of education in information and communication technology is to encourage the information and media literacy of pupils and to assist them in obtaining sound general technology skill and literacy.

The competence criteria for information and communication technology are detailed in five different categories: methods of work, technology and equipment, creation and communication and ethics and security. Although these categories are listed separately, it is crucial to consider them in an integrated manner. This means that when one criterion is considered, it should be kept in mind that education is a continuous process and creative activity, rather than obtaining limited knowledge and training a specific skill. Students with SEN are not specifically addressed in respect to the acquisition of digital competences.

At the end of year four, regarding methods of work, pupils should be able to use information for their benefit and pleasure, such as for reading, listening and guided discovery learning. Regarding technology and equipment, students should be able to use software/computer programs for simple written assignments and presentation of statistical data, use simple software/computer programs for image processing as well as software for simple web design. In respect of creation and communication, students should be able to describe digital information as part of foundational competences of media literacy. Lastly, regarding ethics and security, students should be able to display some degree of responsibility in handling information.

Ireland

Structure of the education system

The legal framework governing Irish education is delineated by a series of statutes and regulatory The Education Act of 1998 forms the cornerstone of this legal structure, detailing the responsibilities of school boards, principals, and teachers, and introducing the National Education Welfare Board. Now part of Tusla (The Child and Family Agency), this board ensures compulsory education and regular attendance for all children. Complementing this, the Education (Welfare) Act of 2000 emphasizes the importance of regular attendance at school, outlining the role of the Educational Welfare Services in supporting student attendance and progression through the education system. Discrimination within educational settings is addressed by the Equal Status Acts 2000-2018, which prohibit discrimination based on factors such as gender, marital status, family status, sexual orientation, religion, age, disability, race, or membership in the Traveller community. The Education for Persons with Special Educational Needs (EPSEN) Act of 2004 champions the rights of individuals under 18 years of age with special educational needs. It advocates for their right to inclusive education, ensuring they are integrated into mainstream educational environments with appropriate support. Moreover, the Children First Act of 2015 underscores the duty of individuals and organisations to safeguard the safety and welfare of children, mandating specific professionals and others to report concerns of child abuse to Tusla.

The Department of Education oversees the primary, post-primary, and special education sectors, ensuring adherence to these laws, while Tusla – The Child and Family Agency is responsible for enforcing education welfare, guaranteeing that all children receive an education and that their welfare is maintained in educational settings. Key principles such as the right to education are guaranteed by the Irish Constitution, allowing parents to select schools that best suit their children's needs and involving them in school governance through participation in school boards. The principle of inclusivity ensures that educational opportunities are equitable and accessible to all students, regardless of their background or needs.

The Irish educational system is structured into several distinct stages: early childhood education, primary education, secondary education, and higher education. Early childhood education in Ireland, though not mandatory, is accessible through a variety of pre-school settings, often beginning at the age of three or four. This early stage emphasizes developmental play rather than formal schooling.

Primary education is compulsory and typically starts at the age of four to five and lasts for eight years. Irish primary schools focus on providing a broad curriculum that includes English, Irish (Gaelic), mathematics, history, geography, science, music, physical education, and arts.

Secondary education also spans approximately five to six years and is divided into the Junior Cycle (three years) and the Senior Cycle (two years, extendable to three with the inclusion of a transition year). The Junior Certificate Examination is taken at the end of the Junior Cycle. Secondary education offers a more diversified curriculum and prepares students for the Leaving Certificate Examination, which is crucial for higher education pursuits.

Inclusive and Special Education System

The Department of Education in Ireland advocates for the provision of special needs education primarily within mainstream settings. The already mentioned Education for Persons with Special Educational Needs Act (EPSEN Act) 2004 tries to ensure that children are educated in inclusive settings in mainstream schools unless such an arrangement

is considered as not to serve the child's best interests or would hinder the effective educational provision for other children in a mainstream setting. In sum, education for students considered as having SEN is provided in provided in mainstream classes in mainstream schools, in special classes in mainstream schools or in special schools. In the first setting mentioned, mainstream classes in mainstream schools, students with SEN are assisted by learning support and resource teachers as well as care support from special needs assistants (SNAs). Within special classes in mainstream schools, students with SEN are educated separately from their peers with lower teacher – student ratios (compared to so-called mainstream classes) (Banks et al., 2016). In special schools, support for students with more complex SEN or rather those students with SEN where teaching in mainstream schools is considered as not in their best interest.

The already mentioned EPSEN-Act also foresees an individual education plan for every learner with SEN. However, his system is not yet in place, but its implementation is being coordinated by the National Council for Special Education (NCSE) which has published Guidelines for the Individual Education Plan process (pdf).

Special Education Needs Assessment and Categories

Under Part 2 of the Disability Act (2005), all are entitled to request through their parents or guardians an assessment of their health and educational needs that arise from (suspected) disabilities. The Act mandates that the Health Service Executive (HSE) empower Assessment Officers to organize, supervise, and coordinate these assessments, and to generate a report summarizing the results. Importantly, these assessments are to be conducted independently of any considerations regarding resource availability or the capacity to deliver the services required. Thus, assessment officers maintain independence in their statutory roles. Following an assessment, if there is a determination of the need for health or educational services, a liaison officer is tasked with preparing a service statement. This document outlines the health services that are to be provided and specifies the timeframe for their provision. However, the service statement can only include recommendations for services that are within the resource capabilities of the HSE. Notably, educational services are not included in this statement, as they fall under the purview of the Department of Education and Skills.

Most notably, the Irish assessment system distinguishes between students with learning difficulties and students with SEN, who are subdivided in students with high incidence disabilities and students with low incident disabilities. The first category, students with learning diffculties, includes:

- children with mild speech and language difficulties
- students with mild social or emotional difficulties
- students with mild co-ordination or attention control difficulties (such as ADHD, for example).

Students with SEN which is expected to arise from so-called high incidence disabilities (which occur more frequently in the population) include the following diagnosis:

- borderline mild general learning disability
- mild general learning disability
- specific learning disability.

The last category, low incidence special educational needs are characterized by their relatively infrequent occurrence within the general population:

- moderate, severe or profound general learning disability
- significant physical or sensory impairment

- emotional disturbance and/or behaviour problems
- autistic spectrum disorder.

The National Council for Special Education (NCSE), utilising its Special Educational Needs Organiser (SENO) network, distributes supplementary teaching resources to primary schools catering to children with low incidence special educational needs. Consequently, requests for additional teaching hours intended to support pupils with low incidence disabilities are required to be supported by pertinent professional reports that provide assessment and diagnostic details. Furthermore, the allocation of resource teaching hours to schools varies based on the category of special educational needs, as stipulated by the Department of Education and Skills (DES) Circulars.

Policies and Research

Ireland has ratified the United Nations Convention on the Rights of Persons with Disabilities in 2018 – and the ratification process so far intensified some debates around the implementation of Inclusive Education. For example, in 2019, the NCSE published a report titled 'An Inclusive Education for an Inclusive Society?' This report poses fundamental questions regarding how the Irish school system can become more inclusive (NCSE, 2019). Especially the Irish model of special classes in mainstream schools has been questioned in terms of inclusivity (NCSE, 2019; Shevlin & Banks, 2023). Furthermore, debates concerning the funding of inclusive and special school settings are still present and discussed intensively (Banks, 2021; Shevlin & Banks, 2023).

Recently, the Irish government launched a policy termed 'Statement of Strategy 2023–2025'. This policy follows a vision for an education system that is of the highest quality and where every member of educational communities, including students, their families and teachers as well as support staff, are valued and supported. One of the overarching goals is to enable the provision of high-quality education and improve the learning experience to meet the needs of all children and young people, in schools and early learning and care settings.

Ireland showed across the 2019s a relatively high percentage of students with SEN placed in mainstream schools (around 80%) and of students with intellectual disabilities placed in mainstream settings (ca. 30%, Buchner et al., 2020).

Also, in Ireland teachers report to be struggling with one of the key aims of inclusive education, to adapt curricula to the needs of every learner and to provide individualized learning opportunities (O'Riordan, 2017).

Digital Education Policies (and students with SEN)

Adopted by the Department of Education and Skills of the Government of Ireland in 2022, the Digital Strategy for Schools to 2027 is designed to enhance the school system by integrating digital technologies comprehensively. This strategy ensures that learners acquire the essential skills to navigate an increasingly digital world, developed through a broad consultation process. It outlines a series of high-level objectives aimed at embedding digital technologies within teaching, learning, and assessment processes (Department of Education Ireland, 2022).

Key goals include empowering learners and educators to develop digital competence, enhancing inclusion, equity, and personalized learning opportunities, and promoting professional development for educators to use digital technologies effectively. The strategy also emphasizes the provision of adequate digital infrastructure, establishing sustainable funding for the purchase and maintenance of technology, and ensuring all schools have suitable broadband connectivity.

Most importantly concerning the Atollo project, digitalisation has been regarded as potentially beneficial for inclusive education within the plan: "It is clear that technology has the potential to promote inclusion and remove barriers to

learning when used successfully. The use of digital technologies can support differentiated learning, tailored to meet individual learner needs […] The use of digital technologies can promote and facilitate inclusiveness and support the principles of the Universal Design for Learning (UDL) model of multiple means of engagement, representation and action/expression." (Department of Education Ireland, 2022, 28)

Mathematical competences

The Irish curriculum for mathematics in primary education is not based on a competence approach and does not mention students with SEN explicitly.

In primary education, students should engage with a diverse range of teaching content to cultivate their digital fluency in mathematics. This content encompasses interactive activities aimed at exploring, extending, and creating patterns and sequences, leveraging digital tools for enhanced visualization and manipulation. Moreover, students should delve into interpreting and explaining data through digital platforms, enabling them to analyse and draw insights from various datasets effectively. Within the realm of measurement, digital teaching content should facilitate hands-on experiences where students compare and contrast attributes like length, weight, capacity, and area using virtual simulations and interactive exercises. Furthermore, students can develop a nuanced understanding of time management and financial literacy by engaging with digital applications that simulate real-world scenarios involving money transactions and time calculations. Emphasis should also be placed on leveraging digital resources to reinforce fundamental mathematical concepts such as number operations, counting strategies, and spatial relationships. Through interactive digital models, students can explore geometric properties in both 2-D and 3-D shapes, fostering a deeper comprehension of shape attributes and transformations. By integrating these teaching content elements seamlessly into the curriculum, students can actively engage in mathematical exploration and problem-solving activities, thereby enhancing their mathematical proficiency and digital competency simultaneously.

Digital competences

In the Irish educational system there is no official national curriculum of digital education for primary education. However, the Digital Learning Framework for Primary Schools specifies several learning outcomes and learning experiences for the area of digital competences. Students with SEN are not explicitly mentioned in this regard.

During their primary education, students should have the opportunity to use a variety of digital technologies for knowledge creation to source, critique, and manage information and to reflect on their learning. Digital interactions, among students and between students and teachers, should be respectful, challenging and support the well-being of all students. They should use digital technologies to respectfully communicate, collaborate, and co-create knowledge through active engagement in appropriate public discourse and civic participation. Furthermore, they should have ample opportunity to use digital technologies to creatively and critically develop their competence as autonomous, self-directed learners and are able to set meaningful personal goals for future learning.

With regard to learning outcomes, students should be able to use appropriate digital technologies to foster their active, creative and critical engagement in attaining challenging learning outcomes.

They should be able to use digital technologies to collect evidence, record progress, evaluate and reflect, and to create new solutions and/or products. Furthermore, they should develop a positive attitude towards the use of digital technologies, being aware of possible risks and limitations, and have the confidence and skills to realise the benefits. They should be able to confidently protect their digital identity and manage their digital footprint. In collaboration with

their teacher and/or parents, students should learn to follow their individual learning needs and preferences with the aid of appropriate digital technologies. They should develop the capacity to use digital technologies in highly effective ways to develop their knowledge, skills and understanding in accordance with the content objectives, learning outcomes, skills and concepts of the Primary School Curriculum.

Norway

Structure of the education system

The Norwegian school system is structured to provide comprehensive and inclusive education, reflecting the country's commitment to egalitarian values. Education in Norway is compulsory for all children aged 6 to 16, typically encompassing primary and lower secondary education. The Norwegian school system is designed to ensure that every child receives equal opportunities to learn in an environment that adapts to their individual needs, as pointed out in the Education Act ("Opplæringslova") (Norwegian Ministry of Education, 1998).

Primary education in Norway begins at the age of six and lasts for seven years, followed by lower secondary education, which lasts for three years. During these foundational years, the curriculum focuses on basic academic skills, such as reading, writing, language learning and mathematics, along with encouraging physical activity and creative subjects like art and music.

After completing lower secondary education, students have the option to proceed to upper secondary education, which lasts for three additional years. Upper secondary education in Norway is divided into two main tracks: general studies and vocational training. The general studies track prepares students for higher education, while the vocational track provides practical training in various trades, leading to immediate employment opportunities or further specialization.

The objectives and quality framework for primary and secondary education are established in the National Curriculum (Kunnskapsløftet, Norwegian Ministry of Education, 2006), which is applicable to all levels of primary and secondary education and training. This curriculum is comprised of the Core Curriculum, the allocation of subjects and hours, and the specific curricula for each subject. These components serve as regulations under the Education Act and dictate the content of education and training. This policy was even strengthened by the Knowledge Promotion Reform in 2020, which aims to make schools even more learner-active, aiming to include all learners and to focus on in depth learning.

Inclusive and Special Education System

Inclusive education is a core principle in Norwegian primary and secondary education, emphasizing that all children and young people should be treated with trust and respect at school, regardless of disabilities, gender, social background, ethnic, religious or linguistic affiliations, sexual orientation, or gender identity. To achieve inclusive education, schools must organize and adapt tuition to accommodate all students, ensuring that each pupil has the opportunity to learn in a manner tailored to their individual talents and abilities. Additionally, Norway invests significant resources in providing special educational support and special needs education. It has been a longstanding political goal to enhance adapted tuition in schools with the aim of improving learning outcomes for all pupils, thereby reducing the need for special needs education.

However, regarding learning settings, the following placements of students with SEN are evident in Norway:

- Mainstream school classes
- Special classes in mainstream schools
- Special needs schools.

Statped, the government agency for special needs education, plays a critical role in supporting local and regional authorities to provide adapted tuition in inclusive and special school learning environments. The agency is tasked with

offering equitable services to municipal and county authorities that seek support. Additionally, Statped collaborates with the Educational and Psychological Counselling Service (PPT) but also has the capacity to directly approach municipalities or counties to extend its services. Moreover, Statped is endowed with specialist expertise in six essential areas: vision, hearing, deafblindness or combined loss of vision and hearing, language and speech, multiple learning difficulties, and acquired brain injuries. This specialized knowledge enables Statped to effectively contribute to the development and implementation of educational strategies tailored to diverse learning needs.

SEN diagnosis and categories

A concrete assessment determines if a child requires special consideration or support, guided by Chapter 5 of the Education Act and involving educational, psychological counselling, and consultation with the learner and their parents. Typically, teachers identify a learner's special needs and notify the Educational and Psychological Counselling Service (PP-tjenesten, PPT). The PPT, obligated to involve parents and the school, employs discussions, observations, and tests to thoroughly assess the learner's abilities and needs, either at the educational institution or a PPT office.

Following the evaluation, the PPT drafts an expert assessment, recommending interventions the school can implement. These usually lead to special educational support or specific teaching arrangements, with the school head making the final decision on special needs education—a decision that can be appealed. An Individual Education Plan outlines the educational goals and content, aiding teachers who, along with the PPT, monitor and adjust the learner's progress as needed. Furthermore, children requiring long-term health coordination are entitled to an individual plan to ensure coordinated, tailored services across various providers (European Agency for Inclusive and Special Education, 2020).

Interestingly, and unlike other countries, due to the 'curriculum for all'-policy and a more holistic approach to diagnosis, there is no differentiated medical-based diagnoses regime in place, as the Norwegian Education Act already emphasizes that special education should be adapted to the individual student's needs and ensure that the student receives comprehensive personal and academic development.

Policies and Research

Educational statistics mirror the ambitioned approaches towards inclusive education. In school year 2020/2021, 97.65% of all students with a SEN statement were placed in mainstream schools at ISCED level 1 and 95.81% at ISCED level 2 (European Agency for Inclusive and Special Needs Education, 2021). However, most notably, research shows that around 80% of students with SEN receive support rather often in settings separated from mainstream classrooms in Norway (Nordahl, 2018). These numbers point to a high frequency of so-called pull-out practices of students with SEN in Norwegian mainstream schools, as indicated by other studies (Nes et al., 2017, Demo et al. 2021).

Teachers perceive the task to deliver mass-tailored support for every student as often challenging – due to a lack of competences and resources (Nordahl, 2018).

However, students with intellectual disabilities are regarded as a group of learners to benefit least from the progress regarding the implementation of inclusive education (Sigstad, 2017).

Digital Education Policies (and students with SEN)

Norway has consistently demonstrated a commitment to advancing digitalisation in education, enacting several policies and strategies in recent years. Firstly, the Digitalisation Strategy for Primary and Secondary Education and Training

(2017-2021) was formulated by the Ministry of Education and Research. This strategy emphasizes enhancing digital skills, developing digital infrastructure, and utilising digital learning resources to improve educational outcomes. Moreover, according to the Norwegian national curriculum, digital skills are identified as one of the five fundamental skills integrated across all subjects and educational levels in primary and secondary schools. Additionally, the government has invested substantially in ensuring robust broadband access for all schools, which facilitates the effective use of digital tools by students and teachers. Furthermore, the Norwegian Digital Learning Arena (NDLA), a publicly funded initiative, offers high-quality, open digital learning resources at no cost to all secondary schools. In terms of data privacy and security, the Norwegian Directorate for Education and Training has issued guidelines and resources to safeguard sensitive information in educational settings, aligning with the General Data Protection Regulation (GDPR).

There is also a significant focus on teacher training, emphasizing the development of professional digital competence to enhance the integration of digital tools in teaching. Lastly, various initiatives, such as those led by the Norwegian Centre for ICT in Education, promote the innovation and development of digital methods and resources for education. These collective efforts underscore Norway's proactive approach to embedding digitalisation within its educational framework.

Mathematical competences

In Norwegian primary education, the curriculum for mathematics is conceptualized following a competency-based approach. Students with SEN are not specifically addressed.

In primary education, the teaching content in mathematics aims to foster a multifaceted understanding of numerical concepts while integrating digital tools to enhance learning experiences. Students engage in activities centered on sorting and comparing numbers, quantities, and shapes, utilising interactive digital platforms to organize and analyse data effectively. Exploration of numbers extends beyond traditional methods, as students immerse themselves in play, nature, and literature, leveraging digital resources to represent numbers in diverse contexts. Counting exercises involve experimenting with patterns and sequences, facilitated by interactive digital tools that provide dynamic visualizations. Furthermore, students explore foundational arithmetic operations such as addition, subtraction, multiplication, and division, employing digital simulations to deepen their comprehension and problem- solving skills. Geometry concepts are elucidated through digital models and simulations, enabling students to visualize and manipulate geometric figures in both two- and three-dimensional spaces. Additionally, digital applications support students in grasping measurement concepts and understanding time through interactive clock and calendar simulations. By integrating digital resources seamlessly into the curriculum, students are equipped to navigate mathematical challenges with confidence and proficiency, preparing them for future academic and real-world endeavours.

Digital competences

In Norwegian primary education, digital competences mark one of the five skill areas in which students should develop competences during their entire education.

Digital competencies encompass the adept and ethical utilization of digital instruments, media, and resources for the execution of practical tasks, the acquisition and manipulation of information, the creation of digital products, and the dissemination of content. Additionally, these skills involve cultivating digital discernment through the assimilation of knowledge and effective strategies for Internet usage. They are considered foundational for ongoing education and for active engagement in both the workforce and a perpetually evolving society.

Comparisons: Similarities and differences of inclusive and special education systems

As the country profiles show impressively, education systems differ - sometimes even significantly – across countries. Thus, also inclusive and special education systems differ between the partner countries of the Atollo project. One of the main problems arising from that is the structure of the German education system – as it has own curricula for each federal state. Australia has a federal education system as well – but, in difference to Germany – one National curriculum. However, a similarity between most of the partner countries is, that the first four years of primary education are conceptualized as a cycle focused to equip learner with basic competences following a class teacher concept. As the research group found out over the course of the Atollo project runtime so far, this specific similarity is a suitable and feasible focus point of reference, because, as shown, competences to be achieved within this period are rather similar (see more on that aspect below).

As an analysis of recent policies has shown, all partner countries have geared their systems more strongly towards inclusive education over the course of the last decade – also due to the obligations following the ratification of the Convention on the Rights of Persons with Disabilities. At the same time, many teachers and other practitioners complain about a lack of resources for inclusive teaching. However, concerning our project, this strong tendency towards making education systems more inclusive, indicates that the product should support teachers in building inclusive education environments. This conclusion is strengthened by the facts provided concerning the percentage of placements of learners with SEN in Iceland and Norway, which is already over 95%, but also due to the rather high percentages in other partner countries.

Comparing SEN categories across the partner countries shows us that the concept SEN, but also the medical based subcategories, such as intellectual disabilities, learning difficulties, mild, moderate or severe cognitive impairments, and so on differ greatly between countries. Furthermore, research has shown that some of these categories related to cognitive dis/abilities remain rather fuzzy and blurred. However, research conducted in partner countries also indicates that students with cognitive impairments are the biggest group of learners with SEN. Teachers report that they have strong difficulties in providing inclusive learning environments that meet the needs of students labelled as having intellectual disabilities – due to a lack of personal resources and know-how. Thus, covering students with cognitive impairments, and especially students with intellectual disabilities, might help to fill the gap indicated above. In other

words, there seems to be growing demand for supporting teachers to cater for the educational needs of learners with cognitive impairments.

However, SEN categories and other medical-related labels, such as students with SEN, have been considered in various research papers and books as a barrier for mass tailored teaching – as such a category-based perception leads to ability related grouping processes and not individualized instruction. Furthermore, research has pointed out that SEN-labels, such as students with SEN or students with intellectual disabilities seem to be a barrier in perceiving the individuality of learners and orchestrating a mass tailored instruction. Thus, a focus on a specific, medical-based category seems problematic if the product of the project should enable teachers to support all students.

Another important result of the analysis of country reports concerns the area of digital education policies. In all partner countries, there have been strong efforts to digitalize education systems. Numerous policies have been implemented to help equip schools with the necessary hardware and other parts of a digital infrastructure, to help teachers to acquire the necessary skills and knowledge to prepare children and young people to become citizens of a digitalized world. However, taking a look at the respective policy papers, the digitalisation of the education system is, at best (e.g. in Croatia or Norway), mentioned as potentially beneficial to help to cater for the individual needs of learners and, hence, make education and teaching more just. Apart from such phrases, policies seem – in difference to other aspects, to lack precision how digitalisation can help inclusive education. Furthermore, students with SEN seem to be the forgotten or invisible population of learners in policy papers on digital education in Europe.

In primary education across partner countries, mathematical competences are systematically developed to equip students with essential skills for numerical literacy and problem-solving. While specific curriculum frameworks may vary, there are several commonalities observable across nations:

Firstly, foundational concepts such as numbers, quantities, and basic arithmetic operations are introduced in the early years, laying the groundwork for numerical proficiency. Students engage in hands-on activities, explorations, and practical applications to deepen their understanding of mathematical principles and develop fluency in counting, calculation, and measurement. Furthermore, problem-solving is emphasized as an integral component of mathematical learning, with students encouraged to apply mathematical concepts to authentic scenarios and develop strategies for tackling complex problems. As students progress through primary education, their mathematical competences are further honed and expanded to encompass more advanced topics such as fractions, decimals, geometry, and data analysis. Digital technologies play a significant role in enhancing mathematical learning experiences, providing interactive simulations, visualizations, and tools to support conceptual understanding and skill development. Additionally, there is a strong emphasis on critical thinking, communication, and collaboration in mathematics, as students learn to articulate their reasoning, evaluate mathematical solutions, and engage in meaningful mathematical discourse. Overall, these shared educational priorities underscore a collective commitment to nurturing mathematical curiosity, confidence, and competence in students from the earliest stages of their education, preparing them for success in further academic pursuits and everyday life.

The curricular documents regarding digital skills of Austria, Bulgaria, Croatia, Germany, Iceland and Norway are all designed in a competence-based manner, while Australia's curriculum for digital competences is not.

Students with SEN are only explicitly mentioned in the Croatian curriculum, yet the document only mentions what appears to be a rather general remark regarding the need for inner differentiation and individualization in acquiring digital competencies, while more specific information appears to be lacking.

In primary education across various countries, digital competences are intricately woven into the curriculum, reflecting a collective effort to equip students with essential skills for navigating and engaging with digital technologies effectively and responsibly. While specific curriculum frameworks may vary, there are several common themes observed across nations. Firstly, students are systematically introduced to digital devices and systems, learning not only how to operate them safely but also understanding their basic components and functionalities. Moreover, there is a pronounced emphasis on digital identity, encompassing the recognition of the distinction between digital and physical personas, alongside the practice of responsible online behaviour to safeguard personal information and privacy. Additionally, students are guided to master the management of digital information, including data organisation, storage, and retrieval, while also exploring fundamental concepts of algorithms and basic programming to foster computational thinking and creativity. Furthermore, there is a concerted effort to instil critical digital literacy skills, empowering students to critically evaluate digital content, discern reliable sources of information, and comprehend the societal implications of digital communication. Collaborative and creative digital projects are frequently integrated into the curriculum, providing students with opportunities to actively engage in problem-solving, communication, and collaboration within digital environments. Overall, these shared educational priorities underscore a collective commitment to preparing students to thrive in an increasingly digital world by nurturing their digital literacy, critical thinking, and responsible digital citizenship from the earliest stages of their education.

Conclusions

In light of the results of the programme analysis conducted within the Atollo project, we would draw the following recommendations for the product of the Atollo project:

- the product should help teachers to practise mass-tailored education – both in inclusive as well as special school learning settings
- the product should be able to offer differentiated tasks for a heterogeneous group of learners concerning cognitive abilities. Thus, the product should cover a spectrum of cognitive ability levels, ranging from learning levels often associated with intellectual disabilities to gifted children. Covering such a spectrum, students (or teachers for them) could choose a level and the app would not be limited to a category label
- the product should focus on the first four years of primary education
- the product should focus on mathematical and digital competences.

As pointed out above, such a product would fill a gap in the area of digitalisation concerning inclusive and special education – and would be a favourable tool for teachers as it would make teaching inclusively a bit easier.

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