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INTELLECTUAL OUTPUT 2

Benchmarks for Speech and Language Therapy Education

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Contents

Introduction	3
The Current Situation in Speech and Language Pathology in the EU	4
Definition of Speech and Language Pathology	4
Classifications of Speech and Language Disorders	4
Definition of SLP in the UK	6
Definition of SLP in Bulgaria	6
Definition of SLP in Slovenia	7
Definition of SLP in Belgium (Flanders).....	9
Definition of SLP in Turkey	10
Definition of SLP in Serbia	10
Summary of Speech and Language Pathology Definitions	11
Prevalence of Speech, Language and Communication Needs across the EU	11
Prevalence of SLCN in the UK.....	11
Prevalence of SLCN in Bulgaria	11
Prevalence of SLCN in Slovenia	14
Prevalence of SLCN in Belgium (Flanders)	14
Prevalence of SLCN in Turkey.....	15
Prevalence of SLCN in Serbia	16
Summary of Prevalance across the consortium countries	16
A legal basis for addressing Speech, Language and Communication Needs	16
The United Nations Development Agenda	16
European Law.....	17
Conclusions on legal aspects.....	17
Provision of SLT in the EU	17
SLT provision in the UK	17
SLT provision in Bulgaria	18
SLT provision in Slovenia.....	19
SLT provision in Belgium (Flanders)	19
SLT provision in Turkey	20
SLT provision in In Serbia	22
An Overview of SLT provision across the consortium.....	22
Assessment of Children for Speech, Language and Communication Needs (SLCN)	23
Assessment of Children for SLCN in the UK	23

Assessment of Children for SLCN in Bulgaria	24
Assessment of Children for SLCN in Slovenia.....	25
Assessment of Children for SLCN in Belgium (Flanders)	26
Assessment of Children for SLCN in Turkey	26
Assessment of Children for SLCN in Serbia	26
Overview of Assessment across the consortium	27
An investigation of available software and mobile apps for Speech and Language Therapy and Assessment in the partner countries.	28
Introduction	28
Applications, their Functionality and their Costs.....	29
Summary of the findings.....	34
Potential Technologies for Automated Recognition of Speech.....	34
Recommendations for the development phase	35
References/Sources	35

Introduction

Learning a language is a life-long process that begins in the first months of life and continues throughout the years of maturity. Learning processes develop in the early childhood at their fastest speed. Language acquisition and communication are essential for the success of children in kindergarten and school. Communication is a complex human skill that combines physical and mental elements and it is crucial for all children. Modern society requires a high level of communication skills; speech, language, vision and literacy are fundamental skills needed to meet these requirements. Dysfunction in one or more of these areas may lead to communication disorders. By the age of six, children learn basic vocabulary, grammar and more than 90% of the basic vocabulary in their native language. They use their accumulated speech knowledge to convey a wide variety of needs, desires, ideas and fears. As a form of communication, language can be defined as a conventional system of symbols that are combined and used, the latter ones are controlled by certain rules which main purpose is communication (Andreeva, 1999).

This first part of this document presents the current situation regarding Speech and Language Pathology provision in the partner countries, with particular emphasis on the implementation with regard to children’s services and schools. Its aim is to give a broad overview of regulation, structure and implementation of speech and language pathology across the consortium countries.

The second part of the document summarises research into the technologies available and being used in the field of Speech and Language Therapy. It highlights the parts of the assessment and therapy process which can be achieved with the apps in the different languages, and aims to identify gaps in the availability of free tools which could be filled with development in this project.

The Current Situation in Speech and Language Pathology in the EU

Definition of Speech and Language Pathology

Classifications of Speech and Language Disorders

The problem of speech and language functions, in accordance with its complexity, has a very wide variety of classification systems. For example: by cause, time of reporting, statement of characteristics, etc.

The broadest accepted classifications used by professionals in world practice are:

- ICD-10 (Classification of mental disorders data provided by the World Health Organization, the latest issue - The International Statistical Classification of Diseases and Related Health Problems, World Health Organization)
- DSM-IV (Classification of mental disorders by the American Psychiatrist Association, the latest issue - Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, American Psychiatric Association)

The most common disorders that occur in children (as highlighted in the Serbian report) are as follows:

Alalia

Undeveloped speech, a disorder in the functioning of nervous structures that is manifested by the complete lack of speech ability. This does not apply to underdeveloped speech as a result of a particular situation such as, for example, autism or hearing impaired

Aphasia

Very difficult lingual disorder, resulting from damage to brain structures. At an early age, it is most often the result of traumatic head injuries, while in the older age as one of the primary followers of various dementia states or as a result of stroke. It is manifested in various irregularities in the linguistic structure - from mild difficulties in recalling certain words, to the utter inability to understand and / or produce the speech.

Dyslalia

Disorder of articulation, inability or irregularity in pronunciation of votes. The causes of the formation are numerous and varied. For example - a bad speech role in the family or the surrounding environment; anatomical causes (short frenulum, cleft lip and / or palate, jaw irregularities, etc; neurological causes - developmental delays in motoring;

The most frequent dislocations in each country will vary as each language has its own distinct and specific set of sounds.

Dysgraphia

Incorrect manuscript, the lack of skills in writing a person who has learned this skill (does not apply to people who are not trained in writing skills). The cause is neurological nature, in specific outbreaks in the functioning of certain structures, either as a consequence of aphasia, developmental abnormalities, or, unfortunately, an unspecified cause. People with dysgraphia are mastered by writing to a certain level for the difference between people with AGRAPHIA (Agraphia). Dysgraphia is often associated with dyslexia and fine motor disorders.

Dyscalculia

Problem in mastering mathematical skills, despite adequate training. People with dyscalculia due to specific neurological outbreaks are not able to handle numbers in the way that most people can, the problem is seen even when collecting free numbers. A number of people have complete incompetence in mathematical skills, and this is called Acalculia.

Dyslexia

The problem of mastering the written language, despite adequate training. People with dyslexia also have specific and varied neurological disorders that make reading and reading activities difficult for them (analysis and synthesis of voices in spoken words, for example), which affects not only the assessment from the Serbian language, but also the complete education and life of a person with dyslexia. In our midst, the problem is significant because of the complete ignorance of the problem as such. A typical situation is the one in which parents and the school system create psychological pressure on the child, and this then pulls other problems, in terms of the child and the environment (depression, violent behaviour, leaving school before finishing - are just some of the possible sequences)

Dyspraxia

The problem is the inability or irregularity of our willing control of the movement of various muscles. The causes are various, as well as symptoms. It is most often recognized by the delay in the development of motoring, clumsiness, reluctant movements in the performance of certain movements. In the field of speech-linguistic function, the basic symptom is a delay in speaking, which is a special problem called verbal apracy.

Dysphagia

Neuromotor disorder seen in difficulty feeding, specifically swallowing, even spit and liquid foods. Children with dysphagia usually eat very slowly, do not eat enough, they are subject to frequent respiratory infections, they are constantly wet because of saliva that flows out of the mouth, ... Logopedic treatment involves exercises of stimulation of neuromuscular reflexes of swallowing and chewing...

Dysphonia

This is the name for voice disorder, most often by type of promiscuity. The causes are various, from respiratory infections, hormonal disorders, and psychological problems. The voice of changed quality is treated depending on the causes and types of damage: medication therapy, speech therapies, surgical.

Dysathria

Neuro-motor disorder affecting speech musculature. It is seen in disorders of breathing and speech production - speech is interrupted, muted, uneven height and intensity, or very slow. Following is the symptom of cerebral palsy, Parkinson's disease, multiple sclerosis, stroke, brain injury...

Balbuties

A language disorder that manifests itself in specific interruptions of rhythm and tempo, involuntary muscular healing, and speech is interrupted, with repetitions of certain voices or syllables. Stuttering has its neurological basis, and it also entails certain psychological problems. Incorrect access to

stuttering can lead to major problems! Every person who has a stuttering problem requires an individual program, depending on age, type of stuttering and specific sensitivity of a person.

Development Disease (Dysphasia)

A disturbance in the development of language structures, which is manifested in problems in understanding and formulating speech.

Definition of SLP in the UK

In the UK, speech and Language Pathology is more commonly referred to as Speech and Language Therapy. The Royal College of Speech and Language Therapists (RCSLT) is the professional body providing leadership and setting professional standards for speech and language therapy in the UK. They define speech and language therapy as follows:

“Speech and language therapists (SLTs) provide life-improving treatment, support and care for children and adults who have difficulties with communication, eating, drinking or swallowing.

“SLTs assess and treat speech, language and communication problems in people of all ages to help them communicate better. They also assess, treat and develop personalised plans to support people who have eating and swallowing problems.

“Using specialist skills, SLTs work directly with clients and their carers and provide them with tailored support. They also work closely with teachers and other health professionals, such as doctors, nurses, other allied health professionals and psychologists to develop individual treatment programmes.”

Some 12,500 SLTs are currently practising in the UK. They can provide benefits for the following patients:

1. Children – support with primary speech, language and communication difficulties, as well as communication difficulties, which are secondary to other conditions such as learning difficulty or hearing impairments.
2. Infants – premature babies and infants with specific conditions that affect drinking swallowing and early play and communication skills.
3. Adults with learning disabilities – specifically those with learning disabilities or autism.
4. Adults – Support for communication and swallowing difficulties following other medical conditions (e.g. stroke, Parkinson’s, dementia, certain cancers)

Children, are the focus of the speech and language pathology tools for teachers project, and so the tools and materials developed will be of interest to the subset of SLTs in the UK who specialise in point 1 above.

Definition of SLP in Bulgaria

Speech and language abnormalities are associated with communication problems and violation of the sound-articulation features of a person's speech. Breaches of this type that are of a biological nature are known as speech-language pathologies. Speech and language disorders are explored by the science of speech therapy.

The term logopedics (from logos, speech, and paideia-education) means science of speech disorders and methods of their prevention, diagnosis, overcoming, social rehabilitation of children and persons with speech and speech disorders. The Subject and focus of speech therapy are the regularities and peculiarities in the occurrence and development of speech disorders and the main

processes of correction and rehabilitation of speech functions. In the scope of logopedics is children from preschool and school age as well as adults with abnormal speech status. The main aim of speech therapy is to develop and implement scientifically proven and practically verified methods of speech prevention and treatment of speech pathologies through specialized systems for education, education and socialization of speech pathologists.

The main goal is realised through the following tasks:

- 1) Study of the causes for the occurrence, development, symptoms, and extent of speech abnormality.
- 2) Systematization and classification of different forms of speech abnormalities.
- 3) Development of methods for diagnosis of speech abnormalities.
- 4) To study the mechanisms of forming the speech function in the context of different deviations in the development of children and adults.
- 5) Development of principles, guidelines and organization of the aids, as well as institutions for its realization.
- 6) Creation of methods and methodologies for specific speech effects, as well as for education and re-education of speech..
- 7) Study on the stages of formation of correct speech under the influence of corrective action.
- 8) Prophylaxis of speech disorders (Karagiozov I., Garbacheva A., 1996, 71).

Language disorders are among the most widespread childhood disorders. They have a strong impact on mental processes and on the communication process, and are related to the emergence of learning problems as well as emotional and behavioural disorders. Early diagnosis and treatment is crucial for later personal and social functioning in adolescence and adulthood.

Language and speech pathologies affect the ability to obtain, understand, produce and express verbal, non-verbal and graphical information. Communication disabilities in childhood may lead to additional negative consequences, such as delay in the development of communicative abilities and normal acquisition of language. This in turn, can lead to limited educational achievements, reduced employment opportunities and social adaptation problems. Effective and early diagnosis of speech and language pathologies, as well as promotion, prevention and education, can create better opportunities for children with communicative disabilities. Such children need appropriate support which to enable them to be socially interactive and to participate fully in the educational processes.

Definition of SLP in Slovenia

In Slovenia, speech and language pathology is more commonly referred to as speech and language disorders. National Education Institute Slovenia is the main national research, development and consultancy institution in the field of pre-school, primary and general secondary education and is the professional body, setting standards and definitions for speech and language pathology in Criteria for the definition of the types and levels of deficits , obstacles or disruption of children with special needs.

They define Speech and Language disorders as follows:

Children and adolescents (hereinafter referred to as children) with speech-language disorders are a group of children who have a reduced ability to learn, understand, express and/or meaningfully use

speech, language and communication. Deviations in these areas have a significant impact on the child's everyday communication and learning. Consequences of speech and language disorders reflect on the child's ability to interact with the environment, learn through the language and on behaviour already in the pre-school period. During the school period, disorders are also reflected in adoption and dissemination of school knowledge and skills, interpersonal relationships, behaviour and feeling. In children with speech-lingual disorders, as a rule, they exist discrepancies between verbal and nonverbal abilities, and they are non-verbal abilities are usually better than verbal.

Speech-linguistic disorder is defined by a speech therapist according to professional standards per criteria for defining the disorder. Disorders appear on the continuum from easier to heavy disorders in one or more fields: pragmatics, semantics, syntax, phonology, articulation and fluency of speech. An important factor in defining a speech-language disorder is the finding that a speech-language disorder has a significant impact on children's educational attainment needs and performance, and performance in the educational process. Speech-lingual disorders may occur independently as primary disorders, secondary disorders (as a result of other disorders) or as associated disorders simultaneously with other disturbances if deviations are found in accordance with professional standards criteria for the definition of speech-language disorder.

Depending on speech-linguistic disturbances, children can be distinguished with lighter, moderate, heavier and severe speech-language disorders.

a) Children with minor linguistic disorders

Children's language-linguistic communication deviates from the average children in the same age group in at least one of these areas: pragmatics, semantics, syntax, phonology, articulation and fluency of speech. Language comprehension is consistent with the chronological age of the child. Understandability of the child's speech can be reduced due to replacement, distortion, and discharging several voices, inadequate rhythm, tempo and speed of speech. A child with the help of his speech mostly transmits information effectively, but requires more incentives and assistance than peers. In the pre-school age, the child may be in such a backdrop for speech development and language to influence the child's social inclusion. During the school period, the child especially needs support and adjustments in learning more demanding language content, in the acquisition of learning content and in dissemination of knowledge.

b) Children with moderate speech-language disorders

Children's language-linguistic communication significantly deviates from the average children in the same age group in several areas: pragmatics, semantics, syntax, phonology, articulation and fluency. The ability to understand the language can be reduced primarily in higher language levels. The understandability of the child's speech is reduced by one or more disorders such as substitution, distortion and omission of several voices or syllables, inappropriate use or omission, modest vocabulary, inadequate syntax, shorter average length of sentence, lag in phonological development, inadequate rhythm, tempo and speech speed and the like. By means of speech, the child communicates efficiently only with known people. The child needs both systematic assistance and support in both pre-school and school periods in the adoption, understanding, expression and / or sensible use of speech, language and language communication. The child can use the help of complementary or alternative communication. Speech-language disorders have an important impact on the acquisition of reading and writing skills and consequently on the overall child's learning performance.

c) Children with severe speech-lingual disorders

Children's speech-language communication compared to children in the same age group is very limited. The child is communicating effectively to a limited extent predominantly with people from the surrounding area. He or she communicates with gestures, individual voices, words and short phrases. The child's understanding of the language may be poorly developed, and therefore requires an adjusted way of providing information and the use of specific visual aids. Understandability of his/her speech is significantly reduced due to the less developed sociopragmatic skills, substitutions, distortions of several voices and syllables, inadequate use or omission of substantive words, problems with the recall of words and the poor vocabulary, problems in motor speech realization, inadequate syntax, simplified and truncated sentences, backlog in phonological development, inadequate rhythm, pace and speed of speech and the like. The child needs systematic speech therapy in both pre-school and school period. He is able to use complementary and alternative communication. During the school period, the child's learning performance is greatly reduced.

d) Children with severe speech-lingual disorders

Children's speech-language communication effectiveness compared to children in the same age group is significantly reduced. The child expresses a major backlog or severe functional disorders in communication with peers and adults. Most aspects of speech and language are disturbed: pragmatics, semantics, syntax, phonology, articulation and fluency of speech. The child's comprehension of the language may be limited to the understanding of familiar words and phrases in known circumstances, used by people from the immediate surroundings. The child needs a lot of concrete gadgets and extremely simplified speech. The child does not speak out or is his/her speech incomprehensible for the environment. The child needs logopedic help in the systematic learning of simple use of substitute and complementary communications that support communication in a recurring communication on a daily basis.

Definition of SLP in Belgium (Flanders)

In the nomenclature speech therapy, language disorders and also dysphasia are mentioned, specific disorders in the language development of children.

LANGUAGE DISORDERS

Language development follows a certain pattern (the different stages of language development). With a number of children this development has a delayed or deviant course. Speech therapists then speak about a dysphatic development or a primary language development disorder. The disorder affects both the development of the language form (inflections and conjugations and sentence structure), the language content (vocabulary) and language use. Sometimes the child also exhibits characteristics of hyperkinetic behaviour and disorders in attention and concentration. If the language does not develop normally as a result of a mental handicap, a hearing disorder or a mental disorder, then we speak of a secondary language development disorder. (source: <https://www.vvl.be/zorgverlener/taalstoornissen>)

DYSPHASIA

There is dysphasia when there are severe expressive and / or receptive language disorders that persist stubbornly after the fifth birthday and seriously interfere with social communication and / or daily activities requiring oral language. The language disorder is not the result of a pervasive developmental disorder, a hearing disorder (> 40 dB best ear), or an intelligent disorder (PIQ <85).

Definition of SLP in Turkey

Speech-language pathology/therapy (SLP) is a newly developing profession in Turkey. Currently, in the entire country, only seven persons hold advanced (Doctoral level) degrees in speech language pathology, having trained overseas at postgraduate levels mainly in England and the United States. Historically, medical specialists provided most of the rehabilitation services, with a special emphasis on diagnosis. Speech-language services were first introduced through the efforts of governmental organizations. Year by year, efforts have been made by psychologists, special educators and audiologists who are becoming interested in treating the communicatively handicapped.

Turkish is a non-Indo-European language, belonging to the Altaic branch of the Ural-Altai linguistic family. The language now spoken in Turkey is accepted as standard Turkish and is the descendant of Ottoman Turkish and its predecessor, the so-called Old Anatolian Turkish, which was introduced into Anatolia by the Seljuk Turks in the late 11th century AD. It is spoken as the native language of over 50 million people, as well as being the official language. The largest linguistic minority is Kurdish, spoken in southeast Turkey. There are Jewish and Armenian minorities as well who have grown up as bilinguals.

Turkish is an agglutinating language, that is, a fairly large number of affixes may be added to the root, each of which has only one meaning or grammatical function. Morphology is remarkably regular, with a few exceptions. Voice, negation, modality, aspect, tense, number, person, reflexives, reciprocals and causatives are all expressed by affixes attached to the verb, in agreement with their subjects. Postpositions are used rather than prepositions. Nouns are case-marked for genitive, accusative, dative-directional, locative, ablative, comitative instrumental, and deprivative ('without') as well as preceded by demonstratives, numerals, adjectives, and relative clauses. In strings of morphemes, each element retains its phonological and semantic identity as well as its relative position. The neutral word order is subject-object-verb (SOV). Word order in simple sentences and main clauses exhibits a high degree of variation for pragmatic purposes.

The standard orthography assigns one symbol per phoneme. Thus, Turkish assigns 29 symbols: 8 for vowels, 21 for consonant phonemes. The phoneme known as 'soft g' (denoted as /g̃/ in standard Turkish orthography) is controversial. In some dialects it is pronounced as a voiced velar fricative /g/. Some consider this sound as an allophone of /g/; others consider it as a vowel lengthening process in syllable-final position. Vowel length is also controversial; it is asserted as not being phonemic in modern Turkish, which means all vowels are short. The basic syllable pattern of Turkish does not permit consonant clusters except in a few word-final positions. Among the allophonic variations, vowel and consonant harmony (assimilation) are the unique ones well known in literature where within word boundaries certain vowels and consonants are assimilated to preceding phonemes. Vowel harmony operates throughout all words of native origin and for all grammatical suffixes, which harmonize with the last vowel of the noun or verb stem. Voiced non-continuant sounds (i.e., stops and affricates /b, d, g, c/) at the end of a root word often, but not always, alternate to a voiceless one before a suffix beginning with a vowel. With respect to stress patterning, Turkish is defined as a syllable-timed language, in which syllables recur at regular intervals.

Definition of SLP in Serbia

The broadest accepted classifications used by professionals in world practice, and also in Serbia are:

- ICD-10 (Classification of mental disorders data provided by the World Health Organization, the latest issue - The International Statistical Classification of Diseases and Related Health Problems, World Health Organization)

- DSM-IV (Classification of mental disorders by the American Psychiatrist Association, the latest issue
- Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, American Psychiatric Association)

In Serbia the accepted world practice, as highlighted above in the world practice section, is followed by professionals. The most frequent Dyslalia dislocations in the Serbian language are sigmatism (refers to the voices S, Z, C, Ć, Đ, Š, Ž, Č, DŽ), lambdacism (refers to voices L and LJ) and rotatism (refers to voice R).

Summary of Speech and Language Pathology Definitions

The definitions across the consortium countries are similar with most countries identifying SLCN in a number of categories of seriousness from mild to severe. The science of SLCN covers a range of conditions with a range of different causes, but the goals are common. To improve the speech, language and communication of the child by a planned set of interventions.

It can be noted from these definitions that different languages require the production of different sounds and articulations. This is key to any app for assessing and practicing speech sounds, and will be a key part of the design of any application for the project. Each language will require its own sets of materials in order to elicit positive results for the sounds within that language.

Prevalence of Speech, Language and Communication Needs across the EU

Prevalence of SLCN in the UK

The focus of the speech and language pathology tools for teachers project is on developing tools for use in schools and nursery, and so the focus will be on SLT work with Children. According to the RCSLT, 7% of all children aged around five years in the UK have specific speech and language impairment and a further 1.8% have speech, language and communication needs linked to other conditions. Speech, language and communication needs are the most common type of special educational need in 4-11 year old children. In more socially deprived areas speech language and communication issues may affect more than half of the children starting school.

Prevalence of SLCN in Bulgaria

The National Report on “Education Policies for at Risk Students and those with Disabilities of Bulgaria” describes the current status of special needs and inclusive education as well as reform efforts which are underway. This specific area of education has been fundamentally changed by the education reform initiated by the Public Education Act Reform in 2003/2004 and significant progress has been made towards the integration of children with special education needs into the mainstream school system. The concepts of integration and inclusion are central issues and attention is paid to barriers and problems of inclusion and equity in education, to parents’ participation and other support services. The report emphasises the importance of continued expansion of pilot programmes in inclusive education to affect mainstream education.

Important changes have occurred in the education system of the Republic of Bulgaria in the last few years, moving towards the inclusion of children with special education needs, children from other excluded groups such as minorities and the reduction of school-leavers. The UN Convention on the Rights of the Child, adopted by the UN General Assembly in 1989 and subsequently ratified by 192 countries, including Bulgaria, asserts the right of every child to education on an equal-opportunity basis (Article 28).

The convention recommends governments to undertake a systematic analysis of their laws, policies and practices in order to assess their education systems with respect to children with special needs.

The Bulgarian Government is striving to meet the requirements of the Convention to prohibit all forms of discrimination in access to education. In the last few years, the Ministry of Education and Science (MoES) has also been synchronising legislation with the requirements of the European Union, thereby improving education standards and working towards a quality education system.

Current priorities for the ministry include raising the quality of education, personal development, cultural integration through encouraging artistic talents, religious education, teaching of at least two foreign languages, developing a greater variety of Bulgarian language courses and the introduction of some new syllabi. The ministry has also developed legislation related to alterations in the Public Education Act, on the level of schooling and general education minimums.

In Bulgaria, the medical model of disability identification was applied in the past, focusing on the disturbances, damages or deficits incurred on the physical, mental or sensory development of the child. At present, the education process of disabled children in schools is beginning to move towards the social model taking into account the child's potential for learning as well as various environmental influences. The term "children with special education needs", which includes all children with disorders and disabilities, has come into usage, at least in the education system.

The "National Plan for Integration of Children with Special Education Needs" addressed towards children with physical, sensory, intellectual, speech and language or multiple disorders outlines the framework for implementation of inclusive education in Bulgaria. The plan applies to the education system as a whole, not just pre-school, primary and universities, but also regional inspectorates of education, departments for child protection at municipal level, the health system, the social-policy system, local municipal authorities, parents and NGOs. Specifically, the plan:

- Recommends inclusive education for children and pupils with special education needs in kindergartens and in all type of schools.
- Outlines responsibilities of state and municipal bodies to provide the necessary resources in all kindergartens and schools where children with special needs are educated.
- Suggests methods for assessment and planning for individual cases of inclusive education and recommends responsibilities for the development and implementation of programmes for inclusive education.
- Proposes methods for adaptation of the school to become a supporting environment that includes accessible architecture and proper accommodation and materials in kindergartens and schools where children and pupils with special education needs are educated.

The national plan defines inclusive education as a process in which all children, irrespective of their special needs, are included in the general education process. Their success will be possible with the establishment and development of a supporting environment. The integration process includes activities such as: legislative changes, finding resources for implementation, improving attitudes towards children with special needs, changing teaching methodologies and increasing participation of parents and the public.

The statistics below show the main educational data available related to children in all levels of schooling, by type of disability and numbers of special schools. These statistics include children from three years of age to grades XII (18-19 years). There are slightly fewer schools in 2002/2003 than there were in 2000/2001, a total of 139 instead of 152. The number of children in separate schools has only slightly diminished however, from 17 518 to 17 312.

Table 1 - Children enrolled in separate schools for special needs 2000-2003 (after OECD, 2006)

Special Schools	Number of schools			Number of children		
	2000/2001	2001/2002	2002/2003	2000/2001	2001/2002	2002/2003
Intellectually impaired children	74	74	72	9733	9 744	9 384
Children with hearing impairment	3	3	3	627	626	647
Children with visual impairment	2	2	2	317	327	331
Children with multiple disorders	1	1	1	46	48	46
Children with speech & language disorders	3	3	2	150	180	89
Logopedy Centres	2	2	2	-	-	-
Children with chronic diseases	28	25	23	3 284	3 352	4 007
Hospitalised Children	2	2	7	524	482	486
Children with deviant behaviour	32	30	27	2 837	2 716	2 322
Overall number	147	142	139	17 518	17 475	17 312

Schools and centres for therapy of children with language and speech disorders.

There are special kindergartens for children with communication disorders from the ages of 3-7 years. In these kindergartens, in preparation for school, the speech and language of children are corrected. There are also two schools, with I to IV grade classes, for correction of speech and language disorders (developmental dysphasia, dyslexia, stuttering, educational difficulties). In Bulgaria, speech therapy for children with communicational disorders can also be inclusive, so

children do not lose touch with families and their social environment. In kindergartens and primary schools, children who have disorders in their speech are taught in general educational courses and, in addition, their difficulties are addressed and corrected with speech and language therapy. Language and speech rehabilitation is offered to children with slight speech problems as well as to aphasic, dyslexic and dysgraphic children. Children whose mother tongue is not Bulgarian are not subjected to therapy; ethnic affiliation is not considered determining and logopedic specialists do not treat the lack of mastery of the Bulgarian language (OECD, 2006)

The adoption of the Ordinance for INCLUSIVE EDUCATION (Adopted by Council of Ministers Decree No. 286 of 04.11.2016 Prom. SG. No. 89 of 11 November 2016, Rev. SG. No. 86 of 27 October 2017) regulates public relations to ensuring the inclusive education of children and students in the system of pre-school and school education as well as the activities of the institutions in this system to provide support for the personal development of children and pupils.

Prevalence of SLCN in Slovenia

No official data about prevalence of speech, language, and communication disorders is currently available in Slovenia.

About 180 speech and language pathologists are responsible for the needs of children and adults with speech, language, and communication impairments. 20,000 users are examined by a speech and language pathologist annually, mostly children and adolescents.

According to National Institute of Public Health, there had been 8.6 percent of preschool children identified as children with speech and language disorders in the year of 2012. Statistical Office of the Republic of Slovenia reports that 1.3 percent of children with special needs are included in preschool education, and 5.87 percent of children with special needs are included in elementary school education including children with speech, language, and communication disorders.

Prevalence of SLCN in Belgium (Flanders)

In the literature we find prevalence figures between 5% and 10% for speech and language disorders. A limited survey in Flanders showed that speech and language development disorders occur in 8% of boys and 6% of girls (Scheiris J. and Desoete 2008). However, general prevalence figures for Flanders are lacking. We assume that the prevalence of problems in language development in Flanders is about the same as the prevalence mentioned in the international literature:

- 7 to 10% of children have language development problems. In a part of the children this can be eliminated by speech therapy (in that case we speak of a language delay or language delay). Three to 5% of children have a primary language development disorder (Kind en Gezin, 2010).
- Zink & Breuls state that developmental dysphasia has a prevalence of 3%, all secondary speech and language development problems together give a prevalence of about 2% (Zink & Bruels, 2012).
- It has also been found that some children who were diagnosed with a primary language development disorder at three or four years of age, after a number of years were no longer within the criteria for this diagnosis (Van hell & Vederburg, 2007)

- According to Goorhuis-Brouwer and De Boer 76% of the studied speech and language problems would be part of a broader problem, only 24% of the reported speech and language problems would thus be of a primary nature¹.

Prognosis²

The prognosis of speech and language development problems depends on the nature of the problem. For example, delayed speech and language development has a much better prognosis than developmental dysphasia. Furthermore, a child with only speech development problems has a better prognosis than a child with problems in speech and language production. A child with problems in terms of language comprehension, language and speech production has the least good prognosis.

The prognosis also depends on the strengths of the child. For example, a child with a high performal IQ has more chance of a favourable evolution than a child with besides developmental dysphasia (OD) also a peripheral performance IQ. A child with only speech and language development problems has a better prognosis than a child with comorbid problems, ...

The prognosis also depends on the supervision and therapy that the child receives (environmental factors).

Prevalence of SLCN in Turkey

The prevalence of hearing loss is 1-2 infants per 1,300 live births, and this number increases five times when the children reach 5 years of age in Turkey. Even if the hearing loss is mild, it may cause delay in speech and language development, cognitive, social and emotional development, and in the academic performance of the child. The European Consensus Statement on Hearing Screening of Preschool and School age Children declared 13 position statements. They mentioned the importance of preschool hearing screening and the negative impact of untreated hearing loss on speech, language and cognitive development and subsequently on academic achievements.

Lack of up-to-date and disaggregated data on the population with disabilities in Turkey poses a significant problem. The TurkStat study titled, "Problems and Expectations of Persons with Disabilities", published in 2010, was limited to the persons registered in the National Database of Disabled People. It provided information on the distribution of different types of disability across age groups. According to the study, 4.9% of the individuals who had medical reports and were registered in the database were aged 0-6 years and 16.2% were aged 7-14 years, while 17.2% were aged 15-24 years. The table provides an overview of disabilities across age groups.

¹ Goorhuis-Brouwer S.M. and Schaerlaekens A.M., Handboek Taalontwikkeling, taalpathologie en taaltherapie bij Nederlandssprekende kinderen, De Tijdstroom, Utrecht, 2000, page 109

² Zink I., wetenschappelijke validering 'protocol diagnostiek bij spraak- en/of taalproblemen en het vermoeden van een stoornis (written report 2013)

TABLE 1: THE DISTRIBUTION OF DISABILITY TYPES ACROSS AGE GROUPS (%), 2010								
Age group	Visual disability	Hearing disability	Speech and language disability	Orthopedic disability	Intellectual disability	Psychological and emotional disability	Chronic disease	Multiple disability
0-6	1.4	9.6	25.1	3.7	7.4	2.0	3.6	3.7
7-14	5.1	17.4	37.1	5.1	36.1	10.5	4.6	11.5
15-24	16.1	20.9	14.9	13.1	27.5	9.3	9.2	14.9
25-44	36.2	32.4	11.7	19.2	23.3	49.5	23.6	25.0
45-64	25.5	12.0	7.5	22.1	4.9	22.1	33.1	18.4
65+	15.8	7.7	3.7	16.7	0.8	6.6	25.9	26.4

Source: TurkStat and MFSP, 2010.

Table 2 – The distribution of disability types across age groups 2010 in Turkey (after Turkstat, 2010)

Prevalence of SLCN in Serbia

Unfortunately, according to the ULS (Association of speech therapist of Serbia) data, all the speech therapists that work in the health system, the education system and the social protection system are collected, and it follows that in Serbia on 20,000 people, comes in one logopedist. In Portugal, which is at the bottom of the scale among EU countries, this scale is 1: 15845). The European average is one speech therapist for 8,000 inhabitants. According to this parameter, the best is Belgium (one speech therapist on 2,567 citizens). This is the reason why in Serbia there are a lot of private logopedists institutions.

According to the Institute of Phonetics, more than 60 percent of children in Serbia have a speech disorder, eight times more than fifty years ago.

Summary of Prevalance across the consortium countries

The above sections highlight the fact that across the EU, speech, language and communication disorders are a high priority, and often account for a major section of the SEN component in schools. They also however highlight that in some of the countries the training for professionals in this field (eg Turkey and Serbia) has not been available. In some cases the only speech professionals present have been trained in overseas programmes.

The statistics for children in special schools in Bulgaria highlight that there are very few children with SLCN present in these schools, suggesting that these children are present in the mainstream education system. There, in fact, a described tendency in each of the countries to move towards inclusive education for all children with SEN, as directed by the EU. The long term effect of this strategy will be to increase the need for teachers less specialised in SEN to teach greater numbers of children with SLCN. Access will therefore be needed to tools that could help them to manage this both in terms of assessment and therapy/practice.

A legal basis for addressing Speech, Language and Communication Needs

The United Nations Development Agenda

In August 2015, the new post-2015 Development Agenda was agreed between the member states of the United Nations. The document is titled "To Transform the World: A Sustainable Development Agenda by 2030, according to which" all people, regardless of gender, age, race and ethnicity, as well as people with disabilities, migrants, indigenous peoples, children and young people, especially those in a vulnerable situation, should be able to study throughout their lives. "Sustainable

development goals have been identified, including: ensuring a healthy life and promoting well-being for all of all age groups; ensuring inclusive and equal quality education and promoting opportunities for all for lifelong learning. (Accountability and education: meeting our commitments; Global education monitoring report summary, 2017/8; 2017).

European Law

In the end of 2001 the Priority Program "Education for All" in the field of disability was launched in the European countries. The aim of the program was "to prioritize disability issues on the agenda of development programs (...) and (...) to promote inclusive education as a major approach to achieving universal education for all" (UNESCO, 2017). This initiative is dictated by the belief that "inclusive education offers a strategy for the introduction of effective universal education because it means building schools that are capable of meeting actual differences crustaceans needs of children and communities. It means both access and quality" "Education 2030" is an integral part of the Sustainable Development Agenda, which is Goal 4 of the Sustainable Development Objectives, which must continue the Millennium Development Goals. The new agenda is the focus on greater and wider access, equality and inclusion, quality and learning outcomes, as well as lifelong learning. It is particularly important to ensure early childcare and education to ensure their long-term development, learning and health. Early childhood education and care also enable early identification of disabilities and children at risk of disability, allowing parents, health workers and teachers to better plan the needs of children with disabilities (World Education Forum, 2015).

Detailed descriptions of the frameworks and application of laws on inclusion across the partner countries were given in Output 1 - "Speech and Language Therapy Childhood Education Report" of this project.

Conclusions on legal aspects

It was clear from the research presented in Output 1 that though a common regulation for inclusion exists across the EU states, the implementation of this varies widely and dramatically across the partner countries of this project. This is in part down to the historic frameworks of how schooling is implemented, the historic ways which children with special needs have been dealt with, and the financial and organisational restrictions on the implementation of new directives over these existing infrastructures and methodologies.

The overarching drive towards inclusion is being tackled in each of the countries in different ways, and from different starting points, and is leading to the earlier detection of greater numbers children in schools with speech, language, and communication needs, as has been observed by the professionals who undertook our survey.

It is hoped that the differing legal situations would not be a barrier to implementation of the developments of the project, but it is clear that the EU members involved in the project are each moving towards the EUs vision for inclusion and thus apps which target methods to detect SLCN and then improve SLC skills in children will drive their inclusion in the classroom.

Provision of SLT in the EU

SLT provision in the UK

The majority of SLTs in the UK are employed by the National Health Service (NHS), though a few now work wholly or partly in education or for charities, and some work independently and treat patients privately. To obtain the services of an SLT a child can be referred by a GP, district nurse, health visitor, or by nursery staff or a teacher. It is also possible to self-refer, so a parent can contact the Speech and Language Therapy Service at the local NHS directly.

SLT services are organised in different ways around the UK, and in some areas demand for the NHS service is very high. In some cases services prioritise first referrals prior to appointments. Waiting times for NHS assessment and treatment therefore vary. It is also possible in the UK to contact independent (private) therapists through The Association of Speech and Language Therapists in Independent Practice (ASLTIP) who will likely be able to make immediate appointments.

SLT provision in Bulgaria

The general support for personal development at school aiming at prevention of learning difficulties is to include individual pupils in activities such as:

1. additional training on subjects with emphasis on Bulgarian language education, including literacy of students for whom the Bulgarian language she is not the first one;
2. counselling on subjects and additional counselling on subjects outside the regular school hours;
3. Logopedic work with students.

Teamwork between teachers and other pedagogical specialists involves discussions on issues and exchange of good practices working with the same children and students to increase the effectiveness of pedagogical approaches. Teachers working in municipal kindergartens, schools and service units know and use in their direct work various types of general support for personal development. They discuss activities, share information and good pedagogical practices to support all teachers to improve their work with children in the classroom or classroom students. They hold regular meetings when they are for prevention purposes between a small group of teachers and other pedagogical specialists in the kindergarten, respectively, between the class teacher, teachers and other pedagogical specialists in the school.

Additional support for personal development under Art. 187 of the WSA addresses four groups of children and pupils: with special educational needs (SOPs) - at risk, with prominent gifts, with chronic diseases and working with a child and a student on a specific case. Additional support for personal development includes: - psycho-social rehabilitation, hearing and speech rehabilitation, visual rehabilitation, rehabilitation of communicative disorders and physical disabilities; - providing accessible architectural, general and specialized support environment, technical facilities, specialized equipment, didactic materials, methodologies and specialists; - providing training on special subjects for pupils with sensory disabilities; - resource support.

The State Educational Standard for inclusive education sets out the terms and conditions to provide general support for the personal development of children and pupils; as well as the conditions and order for providing additional support for the personal development of children and students under Art. 187, para. 2 of the Pre-school and School Education Act and the provision is based on the assessment of their individual needs as well as the preparation of a plan to support the child or the student from a team for support for personal development in the kindergarten or in the school (The Order for inclusive Education).

Support for personal development is provided in accordance with the individual educational needs of each child and each pupil and is carried out by teachers and other pedagogical specialists in the kindergarten or school - a psychologist, pedagogical counsellor, or pedagogical specialists at the centre for personal support development. To organize and coordinate the process of providing the general and additional support for the personal development of children and students by order of the kindergarten or school director at the beginning of each school year, a coordinating team.

The functions of the logopedist in the institutions of pre-school and school education are related to the effective prevention, diagnosis, therapy and counselling of communicative disorders of children and students. Features include:

1. carrying out an early assessment of the overall development of the child to identify needs to provide general and additional support for personal development;
2. prevention of educational difficulties through the implementation of programs for psychomotor, cognitive and linguistic development of children, etc., after acquainting the parents with the importance of prevention and obtaining their informed consent;
3. assessing the speech and language characteristics of children and students in order to determine the nature of communication disorders;
4. conducting logopedic tests or studies using standardized diagnostic tools and equipment;
5. interpretation of the results of standardized tests and studies and determination of appropriate forms of corrective and therapeutic work;
6. planning, conducting or participating in counselling, speech and speech retrieval programs as well as in programs for the prevention and correction of communicative disorders;
7. planning and conducting adaptive programs for children and students with communicative disabilities in physical disabilities;
8. tracking and supporting the progress in the individual communicative development of children and students, advising teachers and their parents on the specifics of working with them;
9. counselling parents of children and students with communicative disorders and, if necessary, directing them to additional medical or educational services;
10. participation in the personal development support team in the institution that assesses the individual needs of a child or pupil to provide additional support for personal development;
11. participation in planning and conducting forms of in-house training, including sharing good practices (Order 12 from 1st September 2016 concerning the status and the professional development of teachers, principals and the other pedagogical specialists)

SLT provision in Slovenia

Children with speech and language disorders are treated in pre-school or school environment as one of the groups of children with special needs.

SLT provision in Belgium (Flanders)

A Centre for Educational Guidance (CLB) is the designated institution for pupil guidance in Flanders in both primary and secondary education. These centres have emerged from the merger of the former Psycho-medical-social centres (PMS) and the centres for Medical School Surveillance (MST) since the decree of 01-12-1998.

There are 72 centres belonging to Community Education, the Education of Cities and Municipalities, Provincial Education and Free Education. The classification according to education network therefore applies. A CLB can count up to seven locations, so that a centre is never far away. The centres work independently of the school, they have their own management and regulations, but do conclude a triennial agreement with the school. Every school is obliged to conclude a policy plan or policy contract with a centre. For example, the centres are familiar with the ins and outs of the school, but still take enough distance to set up a support in the interest of the pupil, which does not always coincide with the importance of the school.

Each recognized school in Flanders works together with a pupil guidance centre (CLB). When registering, the school must inform the parent(s)/guardian(s) about the CLB with which it cooperates

and what this cooperation entails. The CLB works demand-driven: at the request of the parent(s)/guardian(s) or the school.

The centres are active in four domains:

- learning and studying: learning difficulties, reference to special education, study attitude, etc.
- school career counselling, including study and career choices, truancy, etc.
- psychological and social functioning: well-being, behavioural problems, problems at home etc.
- preventive health care: vaccination programs, health education, preventive medical screening etc.

The centre works in a multidisciplinary way (doctors, psychologists, pedagogues, social workers, nurses etc.). In the education of the French Community, this service is still called the psycho-medical social centre (Center psycho-médico-social, PMS).

That expertise is built up by a CLB in a multidisciplinary way. Given the broad interpretation of student guidance, this cannot be done otherwise. To look at questions and problems from different disciplines is of inestimable importance. An individual staff member cannot build up an equally profound expertise in all guidance areas, so it is good to be able to fall back on his team. Each CLB team is therefore multidisciplinary composed of people with different professions: psychologists, nurses, pedagogues, doctors, social workers and experience experts. This offers the school, parent(s)/guardian(s) and students a broad and comprehensive approach.

Pupil guidance is the task of the school and CLB together. The school assumes the internal supervision and the CLB the external guidance. The starting point is that the closest educator is the most suitable person to carry out an action or to address a problem if that can lead to an adequate result.

The centre of gravity will lie with the CLB when a larger or specific expertise is required. This does not necessarily have to be in the form of direct student guidance: it is best that the CLB supervisor coaches a teacher through the problem solving process. The CLBs are responsible for accommodating pupils with more specific problems. They are ideally placed for this: they know the education and the concrete schools, which facilitates an integrated approach for pupils.

A pupil guidance centre therefore works as a subsidiary to the school: it develops expertise complementary to that of internal pupils' tutors.

As a CLB they regularly refer to speech therapists. They never do this in the name of a specific speech therapist, but on the basis of a list of speech therapists.

When parents request help from a speech therapist on their own initiative, an intelligence investigation is carried out in the framework of the RIZIV (Belgische Rijksinstituut voor Ziekte- en Invaliditeitsverzekering - Belgian National Institute for Sickness and Invalidity Insurance) reimbursement. As CLB they can pass on available data. However, if the pupil has not been registered with a CLB before, or when during their counselling program there are no reasons to conduct an intelligence investigation, then they will not do so.

[SLT provision in Turkey](#)

Speech-language pathology/therapy (SLP) is a newly developing profession in Turkey. Currently, in the entire country, only seven persons hold advanced (Doctoral level) degrees in speech language

pathology, having trained overseas at postgraduate levels mainly in England and the United States. Historically, medical specialists provided most of the rehabilitation services, with a special emphasis on diagnosis. Speech-language services were first introduced through the efforts of governmental organizations. Year by year, efforts have been made by psychologists, special educators and audiologists who are becoming interested in treating those with SLCN. In the 1950s and 1960s, K. Ingram from America and Y. Ozsoy from Turkey took special interest in communication disorders under special needs categories. In 1967, a graduate degree program (MSc and PhD) in Audiology was initiated at Hacettepe University, Ankara, at the Medicine Faculty, within the Ear, Nose and Throat Department. The name of the MSc program was changed to 'Audiology and Speech Disorders' in 1982. This clinic, being the pioneer in the field, has contributed new developments as well as challenges. A few years later, a similar audiology program was initiated at Marmara University, Istanbul. However, in the first program, the students have not been given a choice of Speech-Language Therapy or Audiology; but rather they were introduced to one compact program, with the emphasis on audiology and related auditory processing disorders. A few speech language elements were included which were appropriate for audiology courses. Fewer than a hundred audiologists, however, have received a master's degree from these programs since their initiation. At the beginning, it might have been sensible to provide both speech therapy and audiology. However, focusing on two related but different professions undermined the development of both disciplines, the result of which raised several issues concerning confusion in terms of scope of practice in SLP and in audiology. In most European countries and in the USA, the scope of practice is controlled by rules of ethics and legal regulations. It is essential that other professions should know their limitations except in emergency situations. The author considers that there should be a change in Turkey regarding the training for both professions, in line with best practice internationally.

Speech-language therapy activities as a 'distinct and independent discipline' were initiated by an assistant professor, A. Konrot, PhD, who was trained in England as a speech-language therapist in the 1980s. He set up a small speech therapy unit in the Medico-Social Hospital of Anadolu University in 1985. This unit has gained national attention by providing speech therapy services to the first cochlear implanted adults in Turkey. In 1988, a second speech therapist, who also trained in England, was employed at the Education Faculty at Anadolu University. In 1990, a doctoral program was initiated for the first time in Turkey in the Education of the Speech Handicapped under the sub-department of Education of the Speech Handicapped of Special Education. However, the Higher Education Board of Turkey soon closed this program as only three students graduated because of the academic reorganization of the Education Faculties in 1996. Thus, these graduates were faced with the difficulty of establishing speech-language therapy departments as well as delivering services in communication disorders independently.

In 1999, the Higher Education Board approved the foundation of the Research, Education and Training Centre for Speech and Language Disorders (DILKOM) at Anadolu University as a result of the efforts of the graduates. The objectives of DILKOM are to:

- diagnose and assess individuals who have speech and language disorders
- provide treatment to eliminate or minimize speech, language or related problems
- arrange educational and counselling programs for the parents or the family members of individuals with speech and language disorders
- organize short-term courses or seminars for special education teachers and other professionals

- undertake research focusing on the nature, assessment, and treatment of communication disorders

Pursuant to its mission, DILKOM initiated a graduate Master of Science program of Speech & Language Therapy in 2000 and a PHD in 2004, under the management of The Institute of Health Sciences at Anadolu University. The program graduated its first students in 2004.

SLPs are the key professionals in the delivery of services to those with SLCN. The profession serves as bridging personnel between health and education systems. However, it is assumed that this important duty of the profession in Turkey is not realized as it has been in most countries of the world. In order to recognize the status of the profession of speech-language therapy in Turkey this revealed tremendous inefficiency in the field of speech and language disorders. According to the results of this study the quality of service was found to be inadequate; there was a lack of speech and language therapists and of assessment-therapy materials.

The above study was replicated in 2000-2002 at a time of founding a graduate program in speech and language therapy and at a time of substantial change with new legal initiatives on conforming to the European Union. The following were the main aims of the survey:

- to establish the number of certified speech and language pathologists/therapists (SLPs) in Turkey (graduate or postgraduate MSc, PhD diploma in communication disorders and/or SLP). This aim was related chiefly to identifying the need for certified SLPs
- to establish which other professional bodies were working in the field of speech/language disorders and to determine their current competencies in managing speech/language disorders. This aim was concerned mainly with the question of whether the other professions are sufficiently skilled and experienced to conduct assessment and therapy in speech and language disorders to establish the referral patterns of available services to speech and language disordered people.

SLT provision in In Serbia

The common practise in Serbia is that each nursery and primary school has their own logopedists. They work with children and they are supposed to identify and treat any type of speech and language disorder.

An Overview of SLT provision across the consortium

The models for provision of SLT across the consortium countries vary widely as you would expect.

The UK offer a health service model, where SLTs are distinct from schools as health professionals and will go in to schools as required. In Bulgaria and Serbia, logopedists are located within schools. In Slovenia, the children with SLCN are supported by the SEN support in the schools. In Belgium, the children with SLCN would attend a Centre for Educational Guidance. In effect the child would go to the therapist. In Turkey SLT provision has been low until recently, when their connection with the EU has brought about new training programmes and professional bodies to increase the quality of SLT provision. The methods for this provision are only just emerging, but in general suitable therapy services are provided for these students at guidance and research centres.

The structure therefore of SLT provision varies and the numbers of available therapists per capita also varies widely. Even in the countries with well-established SLT professional bodies, there is a shortage of SLTs, and often long waiting lists for their services. This fact points to the need for both parents and other professionals such as teachers and teaching assistants to be able to take some of the load off the SLT professionals. Well-structured tools for assessment of SLCN and practicing SLC skills could be invaluable in this process.

Assessment of Children for Speech, Language and Communication Needs (SLCN)

There is clearly a need for assessment of children for SLCN which must be undertaken in order to identify those children with SLC needs who would benefit from some form of intervention. This process is affected by the structure of the education system, size and make-up of classes, and the ways that SLT provision is given. In this section we take a look at the differences and similarities between assessment processes across the consortium.

Assessment of Children for SLCN in the UK

In the UK, Children must get an education from the school term after their 5th birthday. In the vast majority of cases this is in state or private education. Also many children enter early education aged 3 or 4 years which is often available at primary schools in a linked nursery section. 15 or 30 hours per week of free childcare is available to three and four year olds in the UK (dependent on family circumstances).

Whilst in school in the UK children are continuously monitored by the teaching staff. There is expected to be a new baseline test introduced in reception classes (age 5) in the near future, which may also help in early identification of SLCN. There are currently also a phonics screening check in Y1 (age 6), an end of Key Stage test at the end of Y2 (aged 8), and another end of Key Stage test in Y6 (age 11). These tests and checks all offer additional opportunities for teachers compare each child to expected standards and to identify potential SLCN in children.

Beyond Measure is a document produced by the Communication Trust on the use of the reception baseline assessment in identification and support for children with speech, language and communication needs.

http://www.thecommunicationtrust.org.uk/media/382086/tct_beyondmeasure.pdf

All baseline assessments are required to link to the learning and development requirements of the communication and language, literacy and mathematics areas of learning from the Early Years Foundation Stage (EYFS) statutory framework. The document also links to a number of excellent resources for teachers on areas such as:

- expected abilities of children by age (www.thecommunicationtrust.org.uk/universallyspeaking),
- strategies for early identification of SLCN (http://www.thecommunicationtrust.org.uk/media/267020/strategies_for_every_classroom_early_identification_of_slcn.pdf)
- teacher knowledge assessment and access to training.

It also contains links to a number of targeted support interventions which may be used in the classroom or at home, and could form a basis for intervention apps in the Speech and Language Pathology Tools project.

Systems for referrals to the Speech and Language Therapy services vary across the UK as they are managed between different NHS Trusts and Local Government education departments. Guidelines state that Teachers or education professionals should seek the permission of a child's parents/carer before making a referral for speech and language therapy. Referrals lead to an appointment being made with the SLT service, which takes varying amounts of time (often dependent on the locale). Full assessment, diagnosis and recommendations are performed by the SLT.

For the purposes of teachers in the UK therefore the Tools developed in the project should assist in early identification of SLCN to enable referral at an early stage to SLT services.

The assessment made by an SLT may include looking at picture books, playing with toys or talking to the therapist, dependent on the age of the child. The SLT also talks to parents about their concerns and asks questions about the child's development including their communication and will seek to identify examples of the impact that this makes to everyday life for the child and parent/carer. Often recommendations include direct support from a SLT, individual or group support, and/or a programme of activities for teachers and parents/carers to carry out with the child.

Tools developed for SLTs would need to replicate standardised tests used in SLCN assessment if these are not already available. Other possible developments could include tools to support the SLT's recommended interventions of individual or group support, or activities to be carried out with parents/carers or teachers.

Assessment of Children for SLCN in Bulgaria

Early assessment of the needs for support for personal development of children takes place in the preschool process and it is carried out by the pedagogical specialists and / or by the psychologist and the speech therapist in the kindergarten and the school. Children at the age of 5 and 6 in preparatory groups in kindergartens or in schools carrying compulsory pre-primary education are assessed for the risk of learning difficulties. (there, Article 10). Within 14 days by the end of the school year, the teacher of the relevant preparatory group establishes the child's readiness for school that includes physical, cognitive, linguistic, social and emotional development in a report.

Logopedic diagnosis of communicative disorders includes:

1. diagnosis of speech disorders;
2. neuropsychological diagnosis of entry and exit level of children from 3 to 6 years of age and of students from primary, lower secondary, first and second high school stage;
3. diagnosis of the language competence of children from 3 to 6 years of age.

The corrective-therapeutic activity with established indications of communicative disorders includes:

1. preparation of individual programs for corrective and therapeutic activity for all children and students with communicative disorders;
2. early logopedic effect with children aged 3-4 with complex communication disorders and at risk of learning disabilities;
3. conducting corrective-therapeutic activity with children and students with communicative disorders.

The advisory activity includes:

1. counselling teachers on the peculiarities and needs of children and students with communicative disorders and providing methodical support in working with children and pupils with communicative disorders;
2. counselling, supporting and motivating parents / representatives of children / carers for children with communicative disorders, for active participation in the logopedic process.

In carrying out the assessment of the individual needs of children and students, the specialists from the team under Art. 68, 2 obligatory:

1. Use assessment methodologies approved by the Ministry of Education and Science (Examples include: Methodology for assessment of the educational needs of children and students; Methodology for functional evaluation and work with children with intellectual disability and autistic spectrum of development; Methodology for assessment of the

individual needs of children and students with multiple disabilities; methods for verbal and non-verbal evaluation - PECS system; MACATON; hand-in-hand communication; Tadoma method; C-MAP method; standardization wounds instruments; Test "Binet-Terman"; Test Wexler, etc.);

2. take into account the educational and personal achievements of the child or pupil;
3. take into account the social and emotional development of the child or pupil;
4. use formal and informal methods of monitoring and evaluation;
5. use the information for the child and the student referred to in Article 22 so far;

In accordance with the World Health Organization (WHO) International Classification of Functioning of Man, Disability and Health (ICF) and taking into account the WHO International Classification of Diseases - ICD 10, the assessment of children and students is carried out with an Individual Needs Assessment Card the child or student. It contains the following components:

1. assessment of the functioning of the child or the student;
2. an opinion of the team that carried out the assessment of the individual needs for the resources needed for additional support for the personal development of the child or the student;
3. determination of the specificity and type of additional support - short-term or long-term;
4. a recommendation to use other services, including social services, or to engage in other activities.

Assessment of Children for SLCN in Slovenia

Systematic evaluation of speech, language, and communication development in preschool period is carried out from specialists in health institutions. Speech, language, and communication function is checked within the general medical examination at the age of three for the first time and at the age of five, for the second time.

At the age of three, children undergo a paediatric preventive examination, which includes psychological examination, where next to other, the psychologist also checks speech and language functioning.

At the age of five, before the school entry, children undergo another paediatric preventive examination. Psychologist tests child's functioning with Denver Developmental Screening Test, which also includes items of speech, language, and communication.

At the same age, the child visits a speech and language pathologist, who checks speech, language, and communication development using standard Slovenian screening tool named PLP-5 (preventive speech and language examination of five-year-olds).

If the child shows low functioning in speech, language, and/or communication, he/she is referred to a further diagnostics and treatment.

In addition to the health facilities, children also have the possibility of speech, language, and communication treatment in preschool and school settings.

Within the nursery and elementary school, there is a team of experts, including psychologist, special education teacher, social worker, speech and language pathologist and teacher. The team is responsible for the speech, language, and communication problems of children and pupils. 78.8 percent of pre-school children (aged from one to six years old) are included in public or private preschool settings. Professional workers in nursery school follow children's speech, language, and

communication development and refer them to further examination by speech and language pathologists if needed.

Children with speech, language, and communication disorders are referred to the Commission for the guidance of children with special needs (KUOPP) at the National Education Institute of the Republic of Slovenia, which defines the severity of speech, language, and communication disorder and suggests weekly therapy from speech and language therapist at the nursery school.

Same goes for school-aged children. If they have severe speech, language, and communication difficulties, they are also referred to the Commission for the guidance of children with special needs (KUOPP) at the National Education Institute of the Republic of Slovenia, where severity of the disorder is defined as well as physical adjustments and adjustments of content in the class are determined.

Assessment of Children for SLCN in Belgium (Flanders)

The Centre for Educational Guidance (CLB) is the institution for pupil guidance in Flanders in both primary and secondary education. The government considers a number of core activities to be the responsibility of the CLB (Leerlinggebonden aanbod, 2009), such as: reception, clarification of questions, provision of information and advice, diagnosis and collaboration with the network with regard to care questions concerning speech and language development.

Accompanying activities in support of the speech and language development of a pupil can fit within the four guidance domains of the CLB: learning and studying, educational career, psychological and social functioning and preventive health care.

Assessment of Children for SLCN in Turkey

The TurkStat study titled, “Problems and Expectations of Persons with Disabilities” (2010) was limited to the persons registered in the National Database of Disabled People. The study provided information regarding the educational levels of individuals registered in the database. 33.6% of people with speech and language disability are illiterate and 38.6% of them are literate without a diploma. 10.7 % were elementary school graduates, 11% were primary/middle school graduates and only 6.1% were high school graduates or above.

Children having speaking difficulties continue their education through inclusive education at regular schools where special measures are taken. These measures may be informative meetings organized by the guidance and research centres and child psychiatry offices for teachers, institution administrators and parents on individual and development characteristics of the child, guidance on the measures that have to be taken at school, class, and home without interrupting the educational environment and in-service training seminars for teachers and parents. Suitable therapy services are provided for these students at guidance and research centres.

The Turkish Education System provides guidance and psychological counselling as a systematic assistance process provided for groups or individuals in order to ensure that they meet their needs in the fields of success and academic development, personal and social relations, personal, and educational development and solve their problems.

Assessment of Children for SLCN in Serbia

In the Serbia, children must get an education from the school term after their 7th birthday. Also by the age of 6 six according to the law, they have to attend preschool education. Before they start with the school they are examined by the speech specialist. If the possible disorders are not observed earlier, the speech specialist will diagnose the speech disorder and prescribe the therapy.

Here are expected speech and language development for specific ages:

- four years

At the age of 4, the child enters the "curiosity" stage, when special intensity develops knowledge of the world around it, using it in a great deal of language. Applies a large number of items; uses analogous words: large-bit, boy-girl... ; has a word of about 1500 words. She/he knows how to describe the pictures. It gives an adequate answer to the questions: "What are you doing when you're sleepy?" "What are you doing when you're hungry?" "What are you doing when it's winter?" It's five or more and there are numerous shows for 2 or 3. to name 2-3 colors. It repeats 3 to 5 meaningless records and takes them after 30 seconds. Speaks understandable and complete sentences. A story about yourself, about others, about your events. The game is fictional games. Cautious follows the story contents and asks questions. It distinguishes the left and right sides of the body, recognizes and appoints a finger on both hands as a thumb. The way to talk to a famous person. He knows a three-stanza song.

- five years

Properly uses all speech elements. Speech is completely grammatical. The sentences use the conjugates: for, but, or. Defines simple words. Correctly distinguishes between morning and evening. He preaches the stories he heard. Counts in a row up to 10 and has a number of plays for 3 or 4. It can repeat 4 or 5 meaningless slogans and get them up after 45 seconds. It has a word of 2000 words or more. Pronounce and use 100% consensus. It corrects its own mistakes in pronouncing new words. He knows how many feet a dog has; which animal gives milk.

- six years

You fully understand the speech environment; executes three consecutive requests verbally. It can repeat 4-5 meaningless slogans. Speech is completely grammatical. He also spells the longer stories he heard. It can define simple words. The pronunciation uses all 30 Serbian language correctly. It counts up to 10 and over and has many shows for 3 or 4. After the period of intense development of the language, about sixth year comes its tediousness. The ability to use figurative expressions and double-meaning observations develops mainly after the sixth year. Something before school starts, there is a period of creativity in the language.

- seven years

This is the time of school leaving when a child's sentence reaches the level of development of the adult sentence with all spoken forms, though often lacking its length and variety. He has completely mastered the times. Child practically uses all kinds of words but there are the most frequent nouns and verbs. The pictures are described in complex terms. She/he can tell a story with a richer content. She/he knows how to name the season and explains the difference between them. She/he knows he counts up to 20 in advance and backwards. Though the child at this stage reached the point form of adults, his language development is not yet complete.

[Overview of Assessment across the consortium](#)

The assessment practices in each of the countries are carried out by trained professionals, psychologists, teachers or SLTs. In Serbia children are examined by a speech therapist before starting school. In Slovenia, speech is checked in general medical examinations at age 3 and 5. The UK checks speech of children on starting school and has periodic reviews of progress.

In each case the children are compared to a set of expected abilities for their current age, and only a discrepancy between actual ability and expected ability will trigger a need for intervention.

An investigation of available software and mobile apps for Speech and Language Therapy and Assessment in the partner countries.

Introduction

This section summarises the examples of best practice in the field of Speech and Language Pathology Apps and software to try to identify the necessary development areas. Following the survey and literature study phase, a number of pieces of software were identified as being used by SLTs and teachers in their treatment and assessment of children with SLCN. In order to identify the types of tools being found useful, and the areas within SLT that they are helping to address, the team created a table to summarise the main functionalities of the identified applications.

The following target skills were identified, and plotted against the cost and the available languages of each app:

- vocabulary
- Phonological awareness Practicing making speech sounds
- Auditory discrimination Assessment of speech
- Associating letters and sounds (reading) Multiple languages
- Sequencing sound
- Word recognition
- Comprehension
- Language structure
- Communication assistant (AAC)

There follows a table detailing this data.

Applications, their Functionality and their Costs

Intervention vs target skill	COST	vocabulary	Phonological awareness	Practicing making speech sounds	Auditory discrimination	Assessment of speech	Associating letters and sounds (reading)	Multiple languages	Sequencing sound	Word recognition	Comprehension	Language structure	Communication assistant (AAC)
UK													
Earobics	\$65	y	y		y		y		y				
Fast Forward	Price on request		y				y			y	y		
Phoneme Factory	£64 £99		y	y		y							
Colourful Semantics	£12.99	y										y	
Widget Go	£55												y
SWIPE	\$65					y							
Literactive	Free (flash)						y						
Read With Fonics	£7.99 (in app purchase unlock)		y	y	y								
Smarty Ears	Paid and variable					y	y						y

Intervention vs target skill	COST	vocabulary	Phonological awareness	Practicing making speech sounds	Auditory discrimination	Assessment of speech	Associating letters and sounds (reading)	Multiple languages	Sequencing sound	Word recognition	Comprehension	Language structure	Communication assistant (AAC)
Serbia													
Logoped Igrica	free	y											
Logoped Srbija	free	Y	y	y		y	y			y		y	
Logoped Bojanka	free	y											
Nighty Night		y							y	y			
Vucilo	free	y	y				y			y	y	y	
Turkey													
Special Words	£12.99	y	y	y	y			Y					
Turkish Articulation Therapy	£49.99		y	y	y						y		
Articulation Test Centre (little Bee Speech)	£0.99 /use Pro £54.99					y	TR						
Otsimo	free		y	m	m		m		m				y
Bulgaria													
Assessment of linguistic and speech expression in oral speech. Articulation research	free		y							y	y	y	

Intervention vs target skill	COST	vocabulary	Phonological awareness	Practicing making speech sounds	Auditory discrimination	Assessment of speech	Associating letters and sounds (reading)	Multiple languages	Sequencing sound	Word recognition	Comprehension	Language structure	Communication assistant (AAC)
When students find it hard to read, write or think. To help the teacher	free		Y	y					Y	y			
DDE-2 Assessment Kit for Dyslexia and Development Discretion - 2 (Bulgarian version), Test 3. Reading pseudo-words	Not free	y		y	y	y			y	y	y		
Painting test for phonological awareness for children from 4 to 7 years /PTPHA 4-7/	Not free		y	y					y	y	y	y	
MAP to assess educational needs the child or student	free	y	y	y	y	y	y	y	y	y	y	y	y
TEST Diagnosis and Language Prevention 3-4 (DPL 3-4)	Not free		y						y	y	y		
FM communication systems	Not free		y	y							y	y	y
Handbook for teachers and specialists on methodologies and practices for working with children with special educational needs	Not free		y										y
Slovenia													
Speech Biubs: Language Therapy	Not free			y									

Intervention vs target skill	COST	vocabulary	Phonological awareness	Practicing making speech sounds	Auditory discrimination	Assessment of speech	Associating letters and sounds (reading)	Multiple languages	Sequencing sound	Word recognition	Comprehension	Language structure	Communication assistant (AAC)
Moj komunikator	?												y
Belgium													
Woord kasteel	FREE											y	
Computer meester	FREE											y	y
Mind Express 4	Approximately 750 euros												y
R Dice	90 euros		y	y									
Speech Assistent AAC	Light version is free. Full version around 10 euros.												y
LetMeTalk	free							y					y
Free apps to stimulate language development	free	y	y	y	y					y	y		
Articulation Application	34,99 euros		y	y									
The TH (and R) Bundle	Not free		y	y									

Intervention vs target skill														
	COST	vocabulary	Phonological awareness	Practicing making speech sounds	Auditory discrimination	Assessment of speech	Associating letters and sounds (reading)	Multiple languages	Sequencing sound	Word recognition	Comprehension	Language structure	Communication assistant (AAC)	
Total Number identified		9	13	11	6	5	8	1	3	5	4	5	8	

Summary of the findings

It was clear from our earlier research in the survey phase of the project that there was a need for free and easy to use apps which enabled children to practice their SLC skills and a slightly smaller need for apps which enabled assessment of SLC skills. This need was expressed by high percentages (80% and above) of the teachers and SLTs surveyed. Many of the teachers and SLTs were not using any apps because they were unaware of their existence. It seems from the assessment above however that in many cases there may simply not be the right software available in the right languages, or that pricing could be a limiting factor of take-up of these apps.

What is clear from this table of identified SLC software is that there is very little SLT software available supporting multiple languages. The majority of the apps identified supported phonological awareness, practicing making speech sounds, vocabulary and associating letters with sounds. There did also seem to be smaller numbers of apps available that supported most of the identified target skills. Multiple language support is problematic in that the nature of this field means that different media and example sets would be required for different languages. The practicing of certain sounds may require a set of images with objects with that sound in their names. These image sets are clearly not transferable between languages, which probably explains the lack of multi-language support. Sets of media will need to be developed for each of the project languages to elicit this functionality in any app designed for the project.

Assessment apps available tend to be costly (excluding one free Serbian example), which is likely because they target the professional audience and hence have a more limited target sales audience. Some of these apps also charge on a per participant basis meaning that the cost is ongoing rather than one off.

There are a number of communication assistant apps available, a number of which are free, so this is perhaps not an area where development should be focused.

Potential Technologies for Automated Recognition of Speech

In the initial meeting, a desire was expressed by the school partners that the software could do an automated assessment of a child's speech. The project team has therefore investigated the possibility for this automated recognition of correct or incorrect pronunciations. In order to be able to use a library that could do this, an open source and creative commons library would need to be identified in order to support the free distribution model planned for our software.

The technical teams (SoftQNR) experimented with the OPEN SOURCE SPEECH RECOGNITION TOOLKIT <https://cmusphinx.github.io/> by building a PoC (small mobile app). Results were satisfactory for English, which has the best language model. The team were unsure of the reliability for other supported languages, which claimed to include several other languages including French, Mandarin, German, Dutch, Russian. It does not however support the full range of project languages.

The framework has the ability to build models for any language (Model – knowledge base for each supported language). However to build a new model (new language) would take at least 400 hours of reading text (teaching the model), with no guarantees about the speech recognition results. Of course, the quality of the results depends on model. The quality can be improved with further iterations, hence more hours of reading text. This amount of resource for each language is clearly not available in this project due to limitations on development time available.

TalkNicer software (<http://talknicer.com>) - is another free pronunciation assessment software. It is server based and also works on Android. Only the English language is supported however. The speech recognition system can be used to compare the acoustic scores and durations of phonemes, words, and phrases to an expected list of phonemes. However the system would only again be available in the English language, which would mean a lack of functionality in the other language versions.

After performing various tests with a proof of concept app and checking Best Practices apps, we concluded that it is unfeasible in this project to attempt to implement automatic detection of speech problems. While automation can identify problems, it is unreliable at this time, and it is not acceptable or ethical to have an unreliable system diagnosing health related issues. The conclusion therefore from the research is that unfortunately automated recognition of words cannot be used in the apps to be developed in this project.

Recommendations for the development phase

From the research undertaken, the need for a free, simple to use app, which enables a child to practice their word pronunciation skills is a priority for development. This would need sets of words for each language with each practice sound in different scenarios (initial, medial and end of words). As the literacy of the children using the application would vary, the use of symbols or images as well as words to instigate the child's speech is also a requirement.

It is also clear that there is a need for a simple and free app that can help a professional to perform a simple analysis of a child's SLC skills, and present the results in a clear and simple way. In order to do this the app would be used with a professional, assessing the pronunciation of a set of prescribed words and logging the results. In order to create such an app, it will be necessary for each language to identify the sounds to be assessed, and to create sets of words to test the pronunciation skills in different scenarios (initial, medial and end of words). An app which could do this would enable initial assessment of a child, and would also provide a means to record the ongoing development of the child's speech skills. In conjunction with an age calculator and some information on expected development, which could also be delivered by the app, it could be used to assess the child's development compared to age expectation.

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