

A distributed computer-based screening system for learning disabilities with centralised data processing

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Abstract: A reliable validated tool is being created to automatically screen students for learning disabilities, administered locally with minimal expert supervision, supported by a centralised data processing and evaluation system and a wide support network for students, educators, and parents. The component tasks address typical aspects of a learning disability profile. Development phases planned include software design and implementation (completed), pilot application for validation and tuning (underway), and final standardisation and widespread application in the school system. This project falls within the framework of an overarching integrated web-based environment for learning and support communities in the Greek educational system.

Learning disabilities in Greece

Despite a lack of official figures on the prevalence and characteristics of learning disabilities in Greece, a growing concern among relevant authorities has recently culminated in legislation addressing important relevant infrastructure issues within the general framework of persons with special educational needs. A significant increase in funding to support efforts in the domain of learning disabilities is anticipated in the context of the stated priorities of the Ministry of Education to combat functional illiteracy and reduce school drop-out rates. Substantial structural and material organisation will be required, including the creation of tools and materials for assessment and remediation. Currently, scant testing materials exist and most educational personnel are not adequately trained to administer or evaluate them. Moreover, regions far from urban centres are particularly disadvantaged with respect to availability of specialists.

Purpose, Scope and Context

The present project aims to develop a reliable validated tool for the automated screening of students for learning disabilities, to be administered locally with minimal expert supervision, supported by a centralised data processing and evaluation system and a wide support network for students, educators, and parents. The human network will be developed and structured over the platform developed by the Hellenic Pedagogical Institute (HPI), in the context of the project “Added Value Services in the Greek Web for Schools” (Papadopoulos et al, 2000). HPI will provide an integrated web-based environment to facilitate establishing and operating learning and support communities across Greece. The communities will bridge learning disabilities research centres (mainly in cities) to schools across the country. Interactions between special educators, teachers, and parents will help reduce social isolation related to learning disabilities. Participating teachers will be supported through web-based training courses to support efficient use of the screening tool and to found a virtual training and research centre, also introducing educators and parents to the benefits of information and communication technologies for educational needs.

Design of Test Components

The planned testing battery will apply accepted assessment methods and tasks using appropriate language-specific materials. As a first approach, for practical reasons of implementation and wide-ranging administration, the first grade of secondary education is selected for initial application and standardisation.

The motivation for the test components departs strongly from a typical diagnostic focus and instead emphasises practical screening efficiency over concerns regarding theory or comprehensiveness. The outcome of the test administration need not provide any theoretically coherent or practically comprehensive profile of the students but only a designation of status with respect to recommendation for referral to professional assessment. Therefore the implemented components address aspects of the learning disability profile likely to detect students in need of specific remedial or supplementary education. International experience (Gredler, 1999) with computerised screening tests indicates that a diversity of tested skills is common and perhaps most reliable. Relevant skills for screening purposes include aspects of the typical “dyslexic profile” for the particular linguistic setting as well as related cognitive and perceptual abilities. Practical constraints restrict the task space to tests admitting a mouse selection response, precluding oral responses. Thus many potentially useful tests, such as phonological awareness tests, cannot be considered.

In Greek the most prominent characteristics of reading disability (the most common recognised type of learning disability) include slow reading and poor spelling (Porpodas, 1999). Thus one test assesses reading speed, controlling for comprehension, via a timed reading task followed by picture matching to the text content. Another test assesses spelling ability in a selection task that requires detection and correction of misspelled words in context. A third test assesses isolated word spelling in a visual discrimination task in which the word matching a displayed picture must be selected among misspellings.

Commonly mentioned aspects of learning disability include difficulties with auditory processing (Ahissar et al, 2000). Three such tests are included: a tone detection task in a backward masking context, a pure tone frequency discrimination task, and a tone sequence reproduction task. The first test assesses temporal resolution and auditory integration intervals, the second test addresses spectral resolution with some taxing of auditory memory, and the third addresses auditory sequencing under severe time pressure.

Short-term memory (STM) is an important cognitive mechanism related to cognitive ability and linguistic ability and can be impaired in cases of learning disability (Swanson, 1994). This screening system includes two STM tests with a language flavour. One is a letter-span test, analogous to standard digit span tasks but with consonants instead of digits. The second is a phonological memory task presenting a pseudoword of increasing complexity to be reproduced orthographically.

Implementation Planning

System development is planned over three phases. The first, already completed, includes the design and implementation of the eight screening test components on a multimedia development platform running on personal computers commonly available in secondary schools. The second phase, currently underway, includes pilot application of the testing battery in a representative sample of Greek students. The same students will be administered conventional testing to be independently classified as learning disabled or not. Analysis of the computerised testing battery results with respect to the conventional assessment will provide indices of validity and reliability for the test components, and a first attempt at standardisation. In the third phase, only tasks and content items correlating best with expert assessment will be retained. The trimmed battery will be administered on a large representative population of students to derive psychometric standardisation and reliability validation. The final outcome will be supplemented with informational materials for the educators and parents, detailed instructions and recommendations for using the system, and the aforementioned support network by the HPI. Centralised processing and evaluation of the test data will facilitate statistical analysis and further validation, allow research questions to be addressed regarding learning disabilities in Greece, and will greatly contribute to empirical information sharing among sites of implementation and coordination, including special educators, teachers, and parents.

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