

A WEB-BASED SCREENING SYSTEM FOR DYSLEXIC PUPILS: DO TEACHERS NEED IT?

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ABSTRACT

Currently in Malaysia, schools that conduct the Dyslexia Special Program for dyslexic pupils have to rely on a manual screening instrument, which is cumbersome and slow in diagnosing dyslexic traits in pupils. Thus, this study was carried out to examine prevailing problems that helped in formulating an appropriate solution to overcome existing problems. A qualitative approach based on semi-structured interviews was used involving two teachers and a school principal from a primary school in Malacca, Malaysia. Findings of the research showed that the existing instrument is tedious, time-consuming, and prone to making errors. Moreover, the interviewees professed a strong need for a new instrument that could ease the screening process. More important, these findings underscore the imperative to introduce a new, novel screening application that is both efficient and effective to help schools involved in teaching dyslexic children.

Keywords: Dyslexia, Dyslexia Checklist Instrument, Dyslexia Special Program, Dyslexic Students, Screening Process.

INTRODUCTION

In this digital era, every facet of the world societies is drastically transformed by information and computer technologies, in particular the Internet. The pervasiveness of Internet is succinctly surmised by Guah and Currie (2006) who state that "...internet is simply a global network of networks that has become a necessity in the way people in enterprises access information, communicate with others, and do business in the 21st century". Easy access to the Internet is almost mandatory in today's societies as people use this technology for work, training and learning. Citing Tim Berners-Lee's visionary quotation, Vassalo (2003) restates that "The power of the web is in its universality - access by everyone regardless of disability is an essential aspect". Parallel with the current IT technology, the developments of Internet-Based Applications (IBAs) are also being aggressively pursued to provide many solutions to many sectors of the society, particularly in education to address a myriad of educational concerns. One of the educational issues is the teaching of children with learning difficulties due to Attention Deficit Hyperactive Disorder (ADHD), dyslexia, hearing problems, autism, and other learning problems.

A few decades ago, in the Malaysian context, the awareness to cater children's special needs was almost wanting; however, a seminar conducted in 1993 by the Gombak Rotary Club provided the catalyst for ensuing efforts to help these children (Zahrah, 2007). Notwithstanding, many Malaysian parents especially in rural areas whose children are dyslexic do not have the adequate knowledge in recognizing – even more so in handling such a situation – dyslexic traits among their children. Leaving them unattended for several years, these children would be deprived of a proper education that ultimately renders them poorly educated. These unfortunate children would be not be spared of the savagery of today's hectic, demanding life where Rajesvari (2008) cautions that untreated dyslexics would succumb to the many ills in their entire lives. In view of the impending problems, the general public is beginning to realise the needs to cater these children's rights to a proper education by paying greater concern to the causes and symptoms of dyslexia. Hinton (2009) states that "dyslexia is a specific learning disability that is neurobiological in origin...characterized by difficulties with accurate and/or fluent word recognition and by poor

spelling and encoding abilities". In short, according to Nor Hayati (2009), dyslexia refers to reading and writing problems experienced by certain individuals despite them having a normal IQ (i.e., a normal level of thinking). Efforts are being pursued to help improve current problems, and one of the initiatives was the 14-weeks Dyslexic Special Program, which was a special intensive program organized by the Ministry of Education (MOE) of Malaysia involving selected teachers who taught these children, which was an intensive 14-weeks dyslexia course. The special program was held in a school that pioneered the teaching of dyslexic pupils in the country. In this school, the disadvantaged pupils learn in a more conducive ambience. In contrast, learning conditions in other selected schools are far from conducive, which warrants some concerns to the MOE (Renganayar, 2009).

At the national level, Rohaty and Shafie (2005) reported that based on the MOE's estimate in 2001 there were about 290,000 school children out of 4.9 millions who exhibited a range of dyslexic symptoms. Worldwide, the number is even greater as an estimated 4% of the global populations are exhibiting some forms of cognitive abnormality indicative of dyslexia. To mitigate some of the learning problems, the Malaysian MOE has provided some specific educational systems for pupils needing special education. In addition, the MOE has given priority to cater the needs of pupils who had been diagnosed with Down Syndrome, Autism, Attention Deficit Hyperactive Disorder, and other learning problems such as dyslexia (Nurul Qistina, 2008). These are some examples of the noble efforts taken by the Malaysian MOE given the gravity of the problems faced by these disadvantaged pupils as stressed by Davis and Braun (cited in Nor Hasbiah (2007)) who ominously express that dyslexia is "Mother of Learning Disabilities". In learning, dyslexic pupils need a special learning approach that is different from the normal methods suited for the able-bodied students (Nor Hasbiah, 2007; Payne & Turner, 1999). Thus, a screening process has to be performed as early as possible, namely when the children enter formal elementary schooling. Through a better technique, children exhibiting dyslexic traits could be identified without delay; otherwise, sorting

out learning problems at a later stage would be difficult.

Current Screening Practices

To diagnose pupils with dyslexia, the Malaysian MOE proposed two methods: a screening test, and a checklist (Kementerian Pendidikan Malaysia, 2003). The checklist method is used in order to identify potential dyslexic pupils based on their weaknesses, which are deduced from their academic achievement levels: trailing behind their classmates by two years as cautioned by Hammond and Hughes in 1999 (cited in Rohaty & Shafie (2005)). On the other hand, the testing method is implemented by having pupils to sit for the Intelligence Test (IQ), Reading Test, and Screening Test, which comprise short questions related to learning problems. In addition, a comprehensive test consisting of various activities such as reading, spelling, drawing, mathematics, literacy, and others are also applicable (Rohaty & Shafie, 2005). In 2004, a special program had been implemented to treat dyslexic students in which specific dyslexia learning problems program was introduced. In tandem, the Special Education Department (SED) had developed an instrument called Dyslexia Instrument Checklist (Instrumen Senarai Semak Disleksia ISD) for screening dyslexic students. Essentially, the ISD is a screening tool used by relevant schools to measure the possibility of pupils who may experience Specific Dyslexia Learning Problem (SDLP).

Detecting and diagnosing pupils with dyslexia could be easily and accurately performed if there was a centralized repository of current data and information. Currently, in Malaysia, this kind of system is wanting, which impedes dyslexic coordinator teachers to gain fast access to current data pertaining to dyslexic pupils in the selected schools throughout the country. The current practice is to rely on related educational agencies, namely the Special Education Department to provide them relevant information. This kind of manual practice is not only time-consuming, but it is also prone to errors. In view of this prevailing scenario, a database system is urgently needed that can perform the followings: (a) to screen incoming pupils for dyslexic symptoms, (b) to process and store important data, and (c) to provide

reliable information such as current statistics to the stakeholders. The current practice of the screening process, which is done at schools, involves diagnosing every pupil, and those identified to exhibit the dyslexic symptoms will be recorded into the ISD forms. The detailed flow of the screening process is shown in Figure 1.

The current procedure is both not efficient and effective: the former attributed to having unnecessary personnel, and the latter due to the inherent nature of manual documentation steps that could result in the loss of vital files such as ISD forms. Another major limitation of the current practice is that the scoring of the screening tests is performed manually by the staff concerned, namely the dyslexic coordinators and appointed teachers; thus, mistakes could be made due to human errors, which are inherent in many manual calculation tasks. Having a new system that can accurately and quickly perform the process of screening pupils with dyslexia is not only desirable but urgently needed. Thus, a web-based screening system (e-ISD) for diagnosing pupils with dyslexia students was proposed in this research study. Its main function is to overcome existing problems of the manual-based process used by the relevant schools in Malaysia.

Based on the discussion in the preceding section, a study was carried out by the authors to address the following objectives: (a) to determine the current practice of the

school screening process that identifies pupils with potential dyslexic problem, (b) to determine the problems associated with the manual-based screening process (ISD), and (c) to investigate teachers' perceptions on the development and implementation of the proposed instrument named e-ISD. The work discussed in the following sections of the paper only focuses on the semi-structured interviews involving a small group of interviewees and the findings that would help in conceptualizing the framework of the tool at the later stage of the study. The interviews were carried out in an attempt to answer the following questions:

- What are the school's current practices in the screening process used to determine dyslexic pupils?
- What are the problems encountered by the school in using the manual screening process (ISD)?
- What are the interviewees' perceptions on the development of the proposed instrument, e-ISD?

Method

This research used a qualitative research method by means of semi-structured interviews that were carried out to elicit relevant, current data prior to developing the proposed prototype.

Participants

Two school teachers, namely the assessor and dyslexic coordinators, and a school principal were purposely selected to be the interviewees; they were drawn from a school in Malacca, which is involved with the special learning program. More important, this school was chosen because it is the pioneer in Malaysia that regularly conducts the manual screening process to determine the possibility of pupils who might have dyslexia.

Instruments

The main instruments used by the researchers in the study were based on two sets of structured interview questions. The first set of questions focused on the current tool used (ISD), which is the manual screening process currently used by the school; the second set of questions pertained to the implementation of a new screening process (e-ISD), which was to be appraised by the interviewees. The teachers and principal were interviewed by asking them a

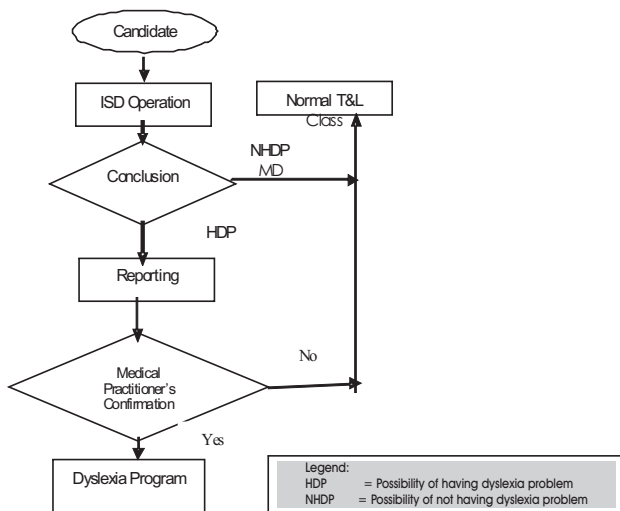


Figure 1. Flow of ISD Screening Process
(Source: Instrumen Senarai Semak Disleksia, 2003)

series of semi-structured questions; their responses, opinions and ideas were recorded accordingly by the researchers.

Procedure

An interview guide was designed and developed by the researchers covering relevant focused areas that helped in eliciting appropriate answers for the research questions based on a semi-structured interview approach (Robson, 2002). To obtain a top-down view of interest, the interview guide followed a funnel analogy; general questions appearing at the beginning of the guide, and more specific ones at the end. To ensure that the questions were comprehensible, unambiguous and primed to answer the research questions, the interview guide was reviewed by members of the research group and a representative of school teachers who has extensive experience in dealing with dyslexic students. The research procedure was conducted involving two phases as follows

Phase 1

Obtaining written permission from the Malaysian Ministry of Education, Special Education Department, and the principal of selected school before the implementation of the interviews.

Phase 2

Interviewing the assessor and dyslexic coordinator teachers, and the principal of the selected school. Through the semi-structured interviews, oral responses to the questions were recorded and then transcribed accordingly. All the interviewing sessions lasted not more than an hour.

Findings

Table 1 shows the demographic of the interviewees where there were three types of teachers involved, namely a female assessor teacher, a female dyslexia coordinator teacher, and a male school principal. Their ages ranged from 37 to 52 years, and their working experiences spanned nine to 28 years.

Table 2 shows the results of the current practices by the school in the screening process to identify students with dyslexia. The first and second questions helped to identify relevant staff involved in detecting and recommending

Respondent	1	2	3
Pseudo-name	Farah	Aminah	Ahmad
Designation	Assessor	Dyslexia Coordinator	Principal
Gender	Female	Female	Male
Age	37	38	52
Work experience (no. of years)	9	10	28

Table 1. Teacher's profile

Question	Respondent			Supportive data resources
	R1	R2	R3	
How many teachers are involved in the screening process?	3	3	3	3
Who are the teachers?				
i) Assessor	v	v	v	3
ii) Dyslexic Coordinator	v	v	v	3
iii) Principal	v	v	v	3
Does the Special Education Department provide any instrument to do the screening process?	v	v	v	3
Yes				
How is the screening process conducted?				
i) An assessor will observe student for ten months.	v	v	v	3
ii) An assessor will recommend the students' names to the Dyslexic Students' Coordinator	v	v	v	3
iii) Dyslexic Students' Coordinator will confirm the results and the result will then be endorsed by the principal	v	v	v	3

Table 2. Current practices of the school in screening process to determine identify dyslexic pupils

dyslexic students at the school level before any further actions were taken. All the teachers reported that there were three types of teachers involved in this process, namely the assessor teacher, the dyslexic coordinator teacher, and the school principal. The rest of the questions showed how the screening process is being practiced at this level. All the teachers reported that the instrument was provided by the relevant SED. They also agreed that the processes, which are shown in Table 2, have to be followed by all the parties involved in the screening process.

Getting information on the current problems faced by the practitioners was done through the questioning sessions based on the second set of questions. Table 3 shows that there were three main problems: lengthy processing time, calculation errors, and misplacement or loss of ISD forms. In addition, information elicited from the first interviewee highlights the inherent psychological stresses that have to be endured in the processing of the ISD form. Another

glaring problem is that the status of pupils with dyslexia is not normally endorsed by the pediatricians, but rather is performed by the general practitioners.

The interviewees were asked to state their opinions with regard to the needs and the suitability of the proposed system. Based on Table 4 all the interviewees strongly opined that such a system was not only desirable but also urgently needed to assist the screening process. The interviewees were also queried for their professional thoughts and ideas regarding the essential features or functions that the proposed system should have for better handling compared to the current one. All the interviewees recommended that the system should be

Question	Respondent			Supportive data resources
	R1	R2	R3	
What are the main problems encountered in the manual screening process?				
Lengthy processing time	v	v	v	3
Scoring errors	v	v		2
Misplacement/Loss of ISD forms	v	v		2
Other factors:				
(i) Stresses	v			1
(ii) Inappropriate confirmation of pupils' status	v	v		2

Table 3. Problems encountered in the manual screening process (ISD)

Question	Respondent			Supportive data resources
	R1	R2	R3	
Do you think the proposed system to be developed have the necessary functions?				
Yes	v	v	v	3
What other features do you think need to be included in the system?				
Statistical display of the diagnosed dyslexic pupils	v	v	v	3
Direct access by the persons in charge, which expedites the screening process	v	v	v	3
Information written in Malay Language regarding dyslexia for the following:				
i) Definition and characteristics of dyslexic pupils.	v	v		2
iii) List of schools that cater dyslexic pupils.	v	v		2
Do you foresee the proposed system as an important solution to help alleviate the current problems, which is applicable to related schools nationwide?	v	v	v	3
Could the proposed system prototype be pilot - tested for its efficacy, which will involve your dyslexic pupils?				
Yes	v	v	v	3

Table 4. Teachers' perceptions of the proposed e-ISD

able to provide the latest statistics of diagnosed dyslexic pupils at the school, state or national levels. They also suggested that the proposed system should be able to expedite the screening process by allowing those in charge of the procedure a direct access to all relevant information.

Furthermore, two interviewees stressed on the capability of the system to list the names of related schools that have the special programs for dyslexic pupils; and they also voiced out the pressing need for the local language to be used for all information gathering and processing activities. On a final note, all the interviewees expressed strong hope for an effective, efficient system that could provide a viable solution for all schools, both locally and nationally, which are involved in handling dyslexic pupils.

Discussion

The findings of this study showed that the current practice of screening pupils for dyslexic symptoms mainly involves three types of teachers: the assessor teachers, dyslexic students' coordinators, and school principals. They are the appointed individuals who handle the responsibility in sorting out cases of school children who exhibit the first signs of dyslexia. More important, these teachers serve as the first group of people, apart from the children's parents, who first come into contact with children of special needs. These teachers had highlighted the inefficient, ineffective practice in which the screening process is being conducted in their schools. The standard, current practice is as follows: (i) an assessor will routinely observe her or his pupils for one semester, namely for six months), (ii) the same assessor will fill out the ISD form and then calculate the appropriate scores, (iii) the assessor will submit the names of pupils who scores are indicative of dyslexia to the dyslexic students' coordinator, (iv) the dyslexic students' coordinator will check to confirm the scoring results, and (v) the principal will endorse the reports, which will be reviewed by relevant personnel who are experts in handling dyslexic cases. These sequential steps involving a number of teachers are notoriously time-consuming and error-prone. This particular finding provides the answer to the first research question that seeks to pinpoint the current practice by teachers concerned in dealing

with the screening of school children for dyslexic traits. The involvement and commitment of this group of teaching staff, namely the assessors and coordinators, and school principals are very crucial in the screening process to identify dyslexic students. Hence, pupils experiencing dyslexic malady could be detected the soonest possible when the screening process is carried out by these officers to beginning students. Thus, this group of teachers could use suitable strategies in teaching dyslexic pupils if the status of dyslexic pupils is readily verified. This is important because the findings in Nor Hayati (2009) study show that out of 120 pupils, 91, 26 and 3 pupils are experiencing severe dyslexia, moderate dyslexia, and mild dyslexia, respectively. Treating dyslexic pupils with special care and customized instructions could help them pursue a course of a particular curriculum with greater chance of success.

Addressing the second research question has revealed a number of problems encountered by teachers in the manual screening process. Being done without any technologies, the screening process inherently consumes longer time than necessary; coupled with this, the calculation of scoring to determine the probability of pupils having dyslexia is occasionally prone to error. Information and other important data, which are recorded on printed media, are easily misplaced at best or lost at worst. Misplacement of relevant documents will delay the already time-consuming procedure in identifying dyslexic pupils. In extreme cases, the loss of important documents will force teachers to repeat the procedure, which further compounds the existing problems. This is not surprising as manual-based processing systems contain inherent problems normally associated with longer processing time, calculation errors, and misplacement and/or loss of important documents (Abu Kassim, 2011; Harnani, 2009; Chowdhury, 1987). These three problems can happen separately or together, which bring in a host of chaotic situations. Each of these problems introduces its own unique impact on the screening process. Long processing time will put a lot of pressure on teachers to handle dyslexic cases as they will be responsible to their superiors and pupils' parents. A wrongly calculated score

sheet will result in a pupil getting a wrong diagnosis. The worst case scenario will be the case when a potential dyslexic pupil is diagnosed to be a healthy pupil. The gravity of these prevailing problems entails an introduction of a better screening procedure, possibly through the introduction of a computerized system. A case in point is the recent use of computer applications by the Malaysian industrial courts to overcome problems of recording and calculation of appropriate figures of settlements, which previously caused many grievances to related parties as some of the settlements were badly handled (Laporan Statistik Mingguan dan Laporan Komposit Mingguan, 2009). Another risk of using the manual processing system is associated with the psychological problems such as undue stresses and pressure. The long processing time will take much of the relevant teachers' resources, in particular their time, which they need to spend on teaching activities and other academic matters. It is a common knowledge that teachers nowadays are heavily burdened with teaching, mentoring and administrative activities (Abu Kassim, 2011). With higher pupils' population, their jobs could be unbearably demanding. Misplaced and lost documents will descend this problem to another low level, which could adversely affect them both mentally and physically. One problem detrimental to students' academic and health concerns is when confirmation on students' status is not done by the experts (i.e., pediatricians), but rather by the general practitioners. Though it is beyond the scope of this study, this problem warrants an immediate redress to avoid the risk of making wrong diagnoses.

The teachers expressed strong enthusiasm for the proposed system: it will be a great service to all schools that deal with the special dyslexic learning programs throughout the country. Thus, the third research question has been dealt with, suggesting the urgent introduction of a new, novel screening system to replace the inefficient one. The proposed system was emphatically well received to help the teachers in overcoming existing problems. The desired functionalities of the proposed system were also highlighted to ease the teachers' work.

The proposed system should be able to provide the latest statistics of dyslexic children in every school involved and to provide a summary of a nationwide statistics. Planning and implementation of special programs could be carried out effectively when this information becomes readily available to all concerns. Direct access to the proposed system is imperative for those in charge as relevant, current data could be retrieved to help them perform their work efficiently. Another feedback is concerned with the use of the national language, namely the Malay language in the instructions of the system as familiarity with other major languages such as English among the teachers is not exceptionally high. Misinterpretations could be avoided that further eases the work flow of the proposed screening process.

Recommendations

As a whole, the proposed system has received positive perception with all the recommended features, which would be pursued in the next stage of the research that is to build the system. Based on the manual system used by the relevant teachers with all the prevailing problems, the development of the proposed system, called e-ISD, is seen as a viable solution to improve the current situation. The conceptual framework for the proposed system with the required system components is shown in Figure 2.

The proposed system will be designed along the principles of the decision support systems (DSS): the Analytical Hierarchy Process (AHP) model, and the Human Computer Interface model of Abowd and Beale Interaction. These principles would help the researchers to better manage the decision making process during the

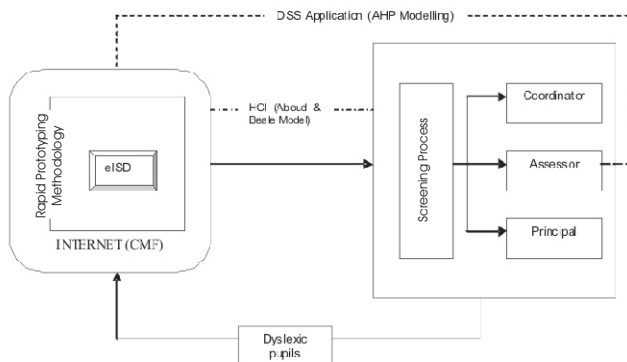


Figure 2. Conceptual Framework of the eISD

development of the required system. Such a system has been making inroads in schools' activities such as assisting school counselors in dealing with the many counseling tasks without which their jobs will be unbearably manageable (Harnani, 2009). AHP is a theory of how prioritization or ranking decisions should be made (Power, 2003), and it is an excellent method for selecting competing activities using distinct criteria. The criteria can either be quantitative or qualitative in nature; and the latter criteria are more preferred by many decision-makers who are more concerned with the structural rather than numerically properties of information (Turban, Aronson & Ting-Peng, 2005). The DSS approach will be used together with the AHP model in the design phase of the development of eISD, which is to screen dyslexic pupils through hierarchical configuration based on three elemental criteria for computing the probability of having dyslexic.

Moreover, the HCI model, which is based on Abowd and Beale interaction model, will also be applied in the development process. This model comprises four components: User, Input, System and Output as depicted in Figure 3. The main advantage of this implementation is that a more realistic interaction framework is realizable. The strength of this approach is stressed by Hinze-Hoare (2007) who states that Abowd and Beale's interaction framework is based on Norman's model, which is highly realistic. Based on this model, user needs will be defined by the interface action, which is then translated into system changes. These needs will be depicted in the form

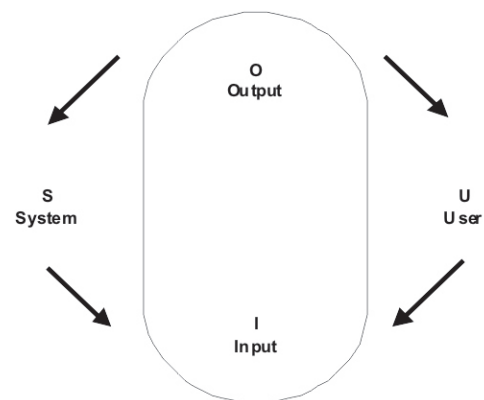


Figure 3. Abowd and Beale's Interaction model (Source reported by Hinze-Hoare, 2007)

of an output to the display and subsequently be translated by the user.

As learned from the interview, the proposed e-ISD will be designed and developed into a working prototype that efficiently and effectively perform the following tasks: (i) to automatically generate the probability scores of pupils who may exhibit dyslexic traits, (ii) to accurately process the probability scores through a reliable computerized system; (iii) to safely keep all important data in a digitally format; and (iv) to use the national language in all transactions and instructions. With these functionalities put in place, the tasks in screening and handling dyslexic cases would be fast, accurate and easy. On a final note, with more efforts put in, the proposed prototype could serve as a showcase for wider adoption of a viable solution to relevant schools nationwide that will benefit all the stakeholders.

Conclusion

Pupils experiencing dyslexia need appropriate teaching and learning strategies and approaches as their cognitive needs are not the same as their able-bodied counterparts. Thus, dyslexic pupils have to be identified the soonest possible so that they can be placed into special programs that cater pupils with learning disabilities. Place them together with ordinary pupils will not only be unfair but prejudicial to their cognitive developments over the long term, which may span throughout their entire lives. In essence, the earlier they are identified with this learning problem the higher the chances they have to being placed into proper learning conditions. However, detecting pupils with dyslexia in Malaysian schools has been a bane to many appointed staff as the current system is not effective and efficient, which causes undue dissatisfaction and also stresses. Thus, a solution to overcome these problems grows more and more imperative. Premised on this context, the researchers proposed a solution through a computerized system, named e-ISD, which could be feasibly implemented in related schools. The proposed system will be equipped with the essential features or functionalities deemed vital as learned from the interview. The salient points raised are that the proposed system should be

easily accessible, which in today's context points toward a web-enabled solution; and it must be built based on a robust framework to perform all the screening activities without any major glitches.

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