SAVEL – Electronic Assessment as an Instrument for Promoting Educational Success

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Abstract
A system of electronic evaluation, based on a digital platform, a database of educational resources, and a statistical processing unit, accessed via internet is presented and described.
The development of this system was aimed at the creation of a testbed for evaluating the advantages of electronic evaluation in education, by its utilization as an instrument for formative, summative, and self educational assessment. To accomplish such flexibility, an incremental implementation strategy was adopted, based on the aggregation of separate building blocks as needed by each functionality.
In a first phase, a tool for diagnosing mathematics and reading competences of primary school students (aged 7 to 9) was constructed. This tool included item presentation, mostly as closed questions, being supposed that students should know how to drag and drop, establish relations with the mouse, and mark multiple choice items, among other simple tasks. A further improvement included oral presentation of the stimuli to encompass students with reading difficulties.
In a following phase, a module containing hints and explanations was added to extend the system capabilities in order to help students when necessary. This improvement, together with quick feedback and adequate help, provided a formative evaluation character to the system.
A third upgrade consisted of allowing the aggregation of items to build tests. This feature enabled teachers to create an instrument capable of performing summative evaluations.
On the other hand, as this system of educational assessment is available through the Internet to a high number of students, and since the utilization of it depends on a registration procedure – aimed at collecting adequate information – it permits a certain form of system assessment. An interesting number of education indicators can be calculated and make available to school principals and to local authorities.
Finally, as each item is exposed to and resolved by a huge number of students, the data collected allows for the estimation of item parameters, namely, difficulty and discrimination characteristics, in the framework of Item Response Theory. Also, this information from statistical processing provides the assessment of item adequacy with respect to a corresponding curriculum.
The advantages of electronic evaluation systems include quick and accurate feedback about student performance (delivered to teachers, principals, students and/or parents), identification of unconsolidated subjects, therefore deserving further study (with the corresponding suggestion of new sets of items), utilization of interactive and appealing stimuli (taking advantage of the media sophistication), flexibility in terms of time and location for test administration, improvement of item quality by the incorporation of student and teacher feedback, and finally, the creation of adaptive tests in order to better assess teaching and learning.

1. Introduction
The increasingly widespread utilization of information and communication technologies (ICT) in the last decades in all domains of everyday life, including education, has a strong impact, not only in the teacher's work but also on students learning processes – at all levels of schoolings – which are far from being fully understood [1].

In fact, in the last years, the advances on information and communication technologies made available new tools, approaches and solutions in education allowing that simple tasks, which were impracticable few years ago – such as frequent educational assessments capable of providing quick and effective feedback to teachers and students – are now possible and easily usable.

A key factor for the development of modern education systems is the availability of feedback mechanisms, increasingly frequent, accurate and detailed, at several levels of decision making, either during the learning/teaching process or in the course of the process of definition and implementation of political measures.

The challenge imposed to education community by this information society is very heavy, demanding the development of a new set of students' competences allowing them an active and critical participation and interaction on a highly competitive global world, which values flexibility, creativity, capacity to find innovative solutions to the day life problems and lifelong learning abilities [2].

In this context, the main objective of contemporary education systems is to promote the creation of knowledge in a society where the information is ubiquitous, abundant, diverse, and not always correct, adequate, and reliable. In such a school, the role of teachers is no longer of a mere information transmitter but, in fact, of a learning mediator and of an adviser in the selection of relevant information to ensure an effective learning from a process of pervasive knowledge creation [1].

As a consequence, the school community ought to change methods and teaching techniques, defining and adopting new, more efficient and effective ways of preparing students for a knowledge society by the integration of all available technologies.

In Portugal, in the last decade, were implemented measures aiming at the diffusion of ICT through several programs: supply of laptops to teachers and students, development of educational software, teacher training in ICT, and school equipping with electronic whiteboards, computers and broadband internet access.

One of the instruments made possible by this ICT development is the introduction of electronic assessment of students. The present research describes the definition and implementation of an electronic assessment system capable of being used as a formative, summative, diagnostic, and self evaluation instrument.

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2. Electronic assessment

The mechanism of educational assessment is a fundamental element in the process of learning/teaching: for this reason it is a question of high concern for teachers and school principals. It is worth mentioning that educational evaluation aims at the determination of how and to what extent students are acquiring knowledge and skills, and simultaneously the promotion of the effort on the improvement of education by providing feedback to students, educators, parents, policy makers and the public about the effectiveness of the education system [3].

To evaluate learning competences of students using electronic assessment instruments poses specific and even bigger challenges to educational evaluation. One of these difficulties is the so called hidden curriculum which is "how students infer what is important in a course based on the ways in which their learning is assessed" [4]. This fact is of paramount importance in electronic evaluation. Other concerns include the non existence of face-to-face interaction and the resulting consequences, particularly in what regards guiding, the excess of standardization, the lack of self-regulation in learning and assessment, and the need for trustworthy assessment contexts and tasks. Finally, there are aspects which cannot be encompassed by electronic assessment instruments, such as speaking skills, writing abilities, reasoning explanation, among others. Some of these difficulties will be overcome by new innovations in the future.

A system of electronic educational assessment should integrate two components: (i) a mechanisms for item presentation and answer collection and (ii) an item bank. The mechanism of item presentation includes the hardware and the software necessary to create and apply a test: the software does not include the items themselves, as these items should be the variable part of the system. One of the most difficult challenges of this project is the development of a large set of high quality items, allowing a very diverse type of interaction between the student and the system.

In a first phase, which included conception and development, a tool for diagnosing mathematical and reading competences of primary school students (aged 7 to 9) was constructed. This tool included item presentation, mostly as closed questions, being supposed that students should know how to drag and drop, establish relations with the mouse, and mark multiple choice items, among other simple tasks. In order to assure that even students without the necessary reading competences may use the evaluation system and successfully understand all the items, an oral presentation of stimuli is provided.

In this phase, the main goal of such tool was to provide primary school teachers diagnostic tests to be administered to students at the beginning of 2nd, 3rd and 4th grades. The set of mathematics and reading items constructed specially to integrate the item bank of SAVEL had into consideration the following criteria: (i) being relevant to students and to the predefined assessment goals, requiring students to show their performances only in the specific learning goal (the national curriculum and national learning goals were the two reference documents used to construct and classify the items); (ii) being clear in their formulation and wording – presenting clearly the task to the students; (iii) being concise – all items had to be formulated in a simple wording without unnecessary text, taking into consideration the age range of the students; (iv) being accurate, so ensuring that no scientific and technical errors or irrelevant tips were present – this could mislead students on the completion of a certain task; and finally, (v) being equitable to all students regardless of gender, religion or ethnicity.

The construction process of the items had also into consideration the independence between items, each one being associated to a specific theme, sub-theme and curriculum objective. This guarantees a very detailed feedback, giving teachers and students complete information about their learning process, identifying students' problems and knowledge gaps.

In a following phase, a module containing hints and explanations was added to extend the system capabilities in order to help students when necessary. This improvement, together with quick feedback and adequate help, provided a formative evaluation character to the system. At this stage the system enables not only diagnostic assessment but also formative evaluation at the same time, which permits students to practice and study autonomously. This is a very important characteristic potentiating self assessment.

A third upgrade consisted of allowing teachers themselves to aggregate items to build summative tests. With the classification of the item – in terms of theme, sub-theme and curriculum objective, and the information about item performance characteristics, namely level of difficulty and discrimination, teachers can develop the most appropriate tests to assess students' knowledge and competences or even to define different tests according to students' performance level. Another feature is, due to quick and automatic feedback, teachers could assess students as often as needed throughout the school year, both either to identify students at risk of failure or to assess the impact of changing teaching methods in students' progress. This feature enabled teachers to create an instrument capable of performing adaptive summative evaluations.

On the other hand, as this system of educational assessment is available through the Internet to a high number of students, and since the utilization of it depends on a registration procedure – aimed at collecting adequate information – it permits a certain form of education system assessment. An interesting number of education indicators can be calculated and make available to school principals and to local authorities.

Finally, as each item is exposed to and resolved by a huge number of students, the data collected allows for the estimation of item parameters, namely, difficulty and discrimination characteristics, in the framework of Item Response Theory. Also, this information from statistical processing provides the assessment of item adequacy with respect to a corresponding curriculum.

At this stage the major challenge of SAVEL project is to become an effective learning/teaching instrument that could be able to promote educational success and at the same time students (and also parents) being more aware of the importance of knowing what they know in order to continue learning throughout their school career and their future life.

3. Conclusions

One of the main concerns of implementing ICT projects in every school is the need for an extensive utilization and well succeeded exploitation of the resources provided by such a high investment, in terms of equipment, software and personnel, capable of support effective learning.

The main advantage of adopting this tool as an assessment instrument, capable of promoting student success resides on allowing: (i) a bigger flexibility in the administration of assessments, either in what respects the time frame (administration moment and frequency) and the place of administration, (ii) to provide answers to the several goals of student assessment, namely summarizing knowledge and competences of learners (summative assessment), (iii) the guiding of the learning/teaching process (formative assessment), and (iv) the evaluation of student knowledge and competences in order to detect problems and learning difficulties (diagnostic assessment). Beyond these advantages, such a system can also provide: a quicker feedback to students and teachers, available in every moment of the learning process, thus enabling an effective integration of evaluation information in the automatic monitoring of student activities.

Finally, other resources can be integrated in the system, such as video and audio stimuli, not only in the context of assessment, but also as a guide to help learners to acquire knowledge and competences through explanations, hints, recommendations for further study, etc..

Beyond all the efforts done in the implementation of ICT in the Portuguese education system there are other concerns deserving attention, namely teacher awareness and motivation for the use and consequently the rich advantages of the integration of SAVEL in the learning/teaching process of primary school students. There is also a need for more training in order to raise the utilization of the rich information provided by this type of instrument. Finally, it is important to stress the relevance of questions regarding the quality, security and reliability of assessment results.

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