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# **TOETS: DEVELOPMENT OF A COMPUTER ASSISTED ASSESSMENT SYSTEM**

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# **TOETS: development of a computer assisted assessment system**

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## **Abstract**

TOETS is a comprehensive and flexible computer assisted assessment system that delivers an item bank, an item editor, a test editor, a management tool and of course a student assessment tool. All these tools are internet based and are using the TCP-IP protocol to connect to a database on a TOETS-server. The re-use of items and complete assessments within new items or assessments and cooperation between instructors on items and assessments are very important characteristics of this software. Central issues during the development were also the ease of use, an intuitive graphical interface and flexibility. All kinds of multimedia (sound, pictures, video, animations) can be integrated in the items and in the feedback.

## **Development and implementation?**

The 'Impulscentrum voor onderwijsvernieuwing' is a cooperation from KULAK (a local part of the university of Leuven, 800 students) and the KATHO high school (5000 students). Theme : innovation of education.

TOETS had its origin in an institution-wide (KULAK and KATHO) questionnaire on the needs of the innovation of our education. Within the whole group of teachers and instructors assessment was found to be the hottest item. Instructors of both our institutions were asking for training, support and tools to improve quality of assessment. That was in 1998.

Today, three years later, three projects have already been worked on. The original goals and project options have been profoundly changed. The first project aimed at making 'assessment'-templates within existing programs like MS Word and Authorware. Now TOETS is an independent program written in C++ with an extensive and internet-based open source database. Ready for implementation...

Recently the University of Louvain decided to implement a campus-wide computer assisted assessment system. An advisory committee decided to attain a product of a private company. This decision to 'outsource' CAA had nothing to do with the quality of our or other products. The development and support of a CAA-system within the university itself was perceived as too risky...

## A comprehensive and flexible CAA-system

TOETS is a comprehensive and flexible computer assisted assessment system.

TOETS is Internet based. However it does not make use of a browser like Internet Explorer or Netscape. TOETS has its own interface allow users (students, instructors and system administrators) to interact with the TOETS database on a server on the Internet. TOETS uses the TCP-IP protocol that is the Internet protocol. The choice for building a TOETS interface that did not work in a browser was made for reasons of flexibility (a broader variation of interactions is possible) and security.

TOETS contains a big and highly structured open source database.

TOETS has a modular architecture. Within each of the three modules all functions and features of importance for a specific user group are integrated. The three modules of TOETS are: instructor, student and management..

## The management module

TOETS is installed on a server on the Internet. It can be used by one institution by a co-operation of several institutions. In both cases TOETS needs a system administrator. His function is to manage users, groups, organisational units, educational units, and courses.

## The instructors module

If one wants to make tests available to students on the Internet, the first thing one needs are items, a lot of good items. An item has many multimedia components and properties: question, answer, distracters, scores, pictures, sounds, video, comments and feedback, hints, links to external resources, etc. At this moment only multiple choice is available. Instructors can insert one or more multimedia components (picture, sound, video) on all levels: on the question level, on the answer and distracter level, on the general or answer specific feedback level. It also possible to add meta-information on items... (difficulty, course, description, author, date of last modification,... ).

A group of items form a test. Instructors can add and modify tests. They are able to change lay-out, preferences and options of tests (the colour, background, feedback

on/off, timeline on/off, free or fixed navigation through the test, etcetera). Each test consists out of one or more blocks of items, their preferences and options (see above). TOETS has the possibility to build user defined or system defined item blocks (a selection of items in a certain order). In a user defined item block the instructor selects the items and chooses the order of the items in the block, using the search and browse tool. In a system defined item block the instructor selects a combination of criteria and rules. The system (TOETS) then picks out, at random, items based on the rules and criteria. It is possible to do this only once in advance at the instance of the instructor (resulting in an identical test for all users). But it is also possible that the selection of items from the item bank is made (based on the instructor-defined criteria) at the very moment that a particular student wants to do his or her test (resulting in a different test for all students).

Very powerful tools of TOETS are the block rules and block navigations. At the end of each block instructors can set rules and connect them with navigations. TOETS holds a score for the test as a whole but also for each block or group of blocks that were defined in an test. In one or more rules (e.g. "if the score on block 1 is less than 50 %") instructors can directly navigate students to another block or to the end of the test (navigation). This system of blocks (and groups of blocks) gives the instructors a very flexible way to build student centred tests.

When a test is ready instructors can decide for which students (or group of students (see management-module)) a test was published. It is also possible to specify a period in which the test is available. We call this a session.

Tools to analyse and report results are under construction. We are working on tools to analyse items (difficulty, mean score, number of times the test was run,...), to analyse tests and sessions (difficulty, scores, mean score, highest score, lowest score, standard deviation,...), to report the results of individual students (and groups of students) on an test or a session (difficulty, scores, mean, highest score, lowest score, standard deviation,...), to calculate item-test correlation (discrimination), A-values (attractiveness of distracters),etc...

## The student module

The function of the student module is quite straightforward. To let students choose a test that was made available for them (see management module) for this period (a session). To let students do a test. To give students feedback. To create the possibility to interact with (send email to) the instructor if there are problems while doing a test.