EXAMS IN THE PERSPECTIVE OF AN INTENSIVE USE OF SOFTWARE IN REGULAR COURSES

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Abstract
In this paper is detailed an experience with exams in regular mathematics classes in an intensive software-supported learning environment. Some important software-induced changes when computers are allowed during all exams are discussed. In the same way, some aspects of the phases pre and post-examination are discussed but attention is focused on some problems around the phase of taking the exam. It's supported that computers allow us do a better examination and that students like this new kind of work. Due to restrictions on page count and formatting conditions after the Conference this paper turn on a big abstract of the complete paper in where it is explained the structure of the original paper, for to have it please contact the Author.

Introduction

In this section it is detailed the context of the experience. In respect to examinations, our experience in introducing software in regular math courses led to a fundamental question: Why we would teach students math using technology when they were forbidden to use it during exams? Seeing that the point was well-taken, I permitted, from the beginning, the use of calculators and software during exams. Of course, the introduction of information technology in exams was accomplished gradually, at first it was required for only a few questions. But now many exam questions require too appropriate skills using software.

Toward a "complete" examination

With respect to a better evaluation of a topic, the use of software has at least 4 fundamental advantages over traditional exams. These advantages imply a more "complete" evaluation of the topic since it allows you: To examine the students' knowledge not only in a small sample of the topic, as it is done traditionally, but almost in the totality of it; To examine, in a deeper and more global form, the

students' knowledge in specific topics; Focus the attention to the central nucleus of a curse; To examine mistakes in a more specific and personalised form. To illustrate the first three characteristics, in the complete paper are presented two examples from a traditional exam of differential equations and comparing it with exams taken by our students, in the examples it's possible to see that traditional exams focus only in the evaluation of algebraic techniques and, in general, are very poor from the conceptual point of view. Instead, our exams includes explicit questions about concepts, application problems, refered to non previously discussed in class topics following an idea also expressed in (Kokol-Voljc, 1999, p. 74) "the exam…becomes a learning situation…".

For this kind of tests, students use software almost exclusively to plot and calculate the complex integrals contained in the intermediate steps, sometimes because of calculations complexity, sometimes because of lacks inherited from precedent courses. For the last case, computer is being used as a mathematical compensation tool which allows less gifted students to deal with advanced topics (for example calculation of integrals to solve differential equations), according to (Kutzler, 1999), a very important topic pointed out as well in (Rothery, 1994, Bennett, 1995, Townend, 1994). In some processes students prefer to carry them out manually, which denotes kind of a judgement on selecting a tool. This process goes from traditional exams getting the solve with help of software and making gradual modifications in every examine session, analysing thoroughly the solutions that students put forward, re-examining additional bibliography, testing, building new exercises, extending the exercises exposed in the classroom, exchanging opinions with colleagues, an so on, making at the same time by intuition and an informal way a classification from similar questions expound in (Kokol-Voljic, 1999). Remarking on these type of exams is obvious a combination of different strategies under sight of White-Box/Black-box principle (Buchberger 1990). For example, with respect of specifically differential equations algorithms we follow a White-Box strategy

while we follow a Black-Box strategy for Calculus algorithms; in respect of modelling, the same specific differential equations algorithms turn into a Black-Box strategy. Automatism of a process is allowed when just the focus is in other place. Other important stuff is when is not used just one software, student decide not only when, where and how use a software, also he/she should select the most appropriate software to find out the solution a specific problem.

Students' errors and personalised evaluation

In this section it's presented one example of a situation in which the use of software helps to better qualify a test, independently if the students use or they didn't use a computer during the test. In this case software is used like a helping tool for the professor look for the kind of mistake committed by students and for to know nature and seriousness of they mistakes.

Some changes in teaching and in learning styles

Examinations changes induced by the use of information technology form a part of global changes in teaching and learning styles. In the complete paper it's discussed only four of them not pretending going to deep: Students' acceptance for the use of information technology, Blind trust, Not sequential tests, More creative and independent student performance.

Practical and institutional obstacles

In this section are discussed some practical and institutional problems that may become a big obstacle leading teachers to reduce significantly or even give up the use of information technology, situation pointed out too in Artigue (1997).

What do the students think about technology-supported examinations?

In this section are presented some opinion of students. It's very interesting to know the students' answers because their comments and suggestions turn on a valuable material in the integration redesign global process, they speak about situations pointed out by teachers and researchers and show a students' personal reflection about it's own actions.

Final remarks

I really think that the multiple and cumulative consequences of the integration of information technology in Mathematics Education can only be thoroughly evaluated over a long period of time and after continuous experiences in regular courses that include examinations.

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