

Libretto

Educational software - trading functionality for applicability

Presented by Pavel Boytchev, Faculty of Mathematics and Informatics, Sofia University
boytchev[at]fmi.uni-sofia.bg

Slide 2: Gaining more applicability via fewer functions. Using a wasteless technology in creation / using educational software.

I. THE BEGINNING: LIFECYCLE OF UNIVERSITY COURSES

Slide 4: On average, I create one new course per academic year. After 5 years of teaching a course, it becomes old and need retirement.

Slide 5: New courses must be modern, applicable, and useful. E.g. by using WebGL, HTML5, Javascript

Slide 6: Problem – they are new to me. To learn them I decide to create educational software.

II. CUBI - EDUCATIONAL SOFTWARE

Slide 8: A microworld for constructing with colour cubes. Multiplatform, intuitive, 3D, wasteless.

Slide 9: Prehistory: European project DALEST. A set of 10 applications for the secondary education.

Slide 10: In the word of cubes – photos of users (students and teachers) and some of their creations.

Slide 11: Collected a long wish list of users' requirements

Slide 12: All wishes are technically doable, but is this the best? Overfunctionality canalizes education, rather than catalyzing it.

III. EXPERIMENTS - SOFTWARE TESTING WITH ENDLESS USERS

Slide 14: Pilots with undergraduates – does the software work on various platforms? Users were students from Computer Science at my University.

Slide 15: Results: over 100 models, tested are 4 types of devices, 18 platforms, 6 browsers. Software failed only in 3 tests because WebGL was unavailable

Slide 16: Pilots with graduates – is it possible to create learning content? Students were from graduate program "Technology in Education of Mathematics and Informatics"

Slide 17: Three educational models were made: "My home", "For pupils" and "Let's write with cubes"

Slide 18: Pilots with teachers – are these modules suitable for students. What are their reactions? Tested are 82 students from 3rd to 10th grades.

Slide 19: Cubi is educationally useful. Results are reported in a course project for "Computer graphics in education". Citation: *"They were very enthusiastic. A wish for solving more problems emerged. Maybe this is the biggest problem in Math classes."*

Slide 20: Pilots with 3rd – 10th grade students – is the software intuitive, does it support creativity? Tested are students from the Bulgarian school in Prague.

Slide 21: Results: applicable to various grades. For younger students it is a game with research elements, for older students it is a research with gaming elements. Citation: *"It created*

willingness to try the software. After a while, they started to show me their own projects and to share their opinions".

Slide 22: Pilots with associate professor (that's me) – is it sufficient to make a new course? Result: the first WebGL course is now under construction. Another two new courses will be made in 2015.

IV. APPLICABILITY - EXAMPLES OF APPLICATION IN VARIOUS DOMAINS

Slide 24: A relation map of connections that Cubi fosters. Three sections with three items each: users (pupil, student, teacher), objects (task, project, course), actions (learning, creating, teaching)

Slide 25: A gallery of problems covering broad spectrum of topics. A demonstration of models made by pupils, students, teachers and me (we are all equal in the area of creativity).

Slide 26: A note from 40 years ago: "The urge to create is equally strong in all children. Boys and girls. It's imagination that counts. Not skill."

Slide 27: Models about art and design: "Mario Bros", "Football playground", "2D house", "3D house", "Kitchen", "Bedroom".

Slide 28: Recreational math: "3D maze", "Sudoku", "Color-crossword", "Inequalities puzzle", "See only even", "Shapes in cube's shadow".

Slide 29: Calculations and patterns: "Multiplication table", "3D printer coordinates", "The cost of a house", "7x13=101?", "A cube from „F“-shapes", "Flags of Norway, Indonesia, Poland, Finland, France, The Netherlands and Thailand"

Slide 30: CS Problems: "Decode the coding algorithm of Cubi", using its source code in the WebGL course.

V. SUMMARY AND FUTURE PLANS

Slide 32: Summary: Cubi is an educational software for all levels. It covers various activities and domains. It is wasteless and all its 100% useable. Also, I'm proud of my first WebGL/HTML5/JS application.

Slide 33: Future plans: finish the WebGL course, create two additional courses, create new applications using ideas from Cubi.

Slide 34: Citation of Neil Tyson (astrophysicist and science communicator): *"When students cheat on exams it's because our school system values grades more than students value learning."*

Slide 35: Learning during evaluation. Observation: about 200 students used Cubi and solved problems without a single cheating attempt. An attempt will be made to invent and implement an evaluation methodology and technology that will merge learning with evaluation and that will make students eager to be evaluated.

THE END

Thanks for your attention