Using "TBT Shell" software for online testing in "Water Treatment" education course

Authors:
Konstantin Orlov
Valeriy Ochkov
Sergey Gromov
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TBT Shell software:

• Started developed in 1997
• Used for “Electronic Encyclopedia of Energetics” and “Encyclopedia of physical-chemical technologies in power industry”
• Installed in most Russian companies from power industry and educational institutions
• Universal computer program for developing and viewing educational courses (modules) with:
  • Multimedia
  • Text
  • Annotations
  • Questionary
  • Computer simulators
  • Vector graphics and drawings
• Can be expanded with extension libraries
“TBT Shell” software can be used online:

1. Standard html-page for viewing in browser. All data is stored on MPEI’s server.
2. Click to link opens “TBT Shell” software with specific course module information (online module).
3. Module data (by “TBT Shell”) automatically downloaded to user computer through standard http protocol.
4. “TBT Shell” opens module locally (for information or testing purpose).
5. Full report (which is standard feature of “TBT Shell”) uploaded to MPEI’s server.
Features of “TBT Shell”, used for online testing:

1. Online module can be password-protected. Password can be single for many students or different.
2. There is the option to require user contact information (name, group).
3. Option for date/time access settings for each user.
4. User computer information can be also saved and authenticate specific computer.
5. All reports are automatically saved to server. Standard testing information can be extracted and results of testing available to tutor (can be represented as Excel file).
6. Tests can be in different form: questions, calculation task (with random generated input), drawing task, video-materials question – all the forms, that supported by offline “TBT Shell” (with or without extension libraries).
“Water Treatment” education course:

1. More than 100 students (3rd year of bachelor degree) each year.

2. “Water Treatment” requires knowledge in chemistry (mainly in water treatment chemistry). Such knowledge is the problem for most students. And for many years most students have difficulties for learning this subject.

3. Basic principles (impurities concentration, types of impurities, acids) are knowledge’s out-of-range for most students (however it should be).

4. Not enough educational hours for providing state-of-art information in the field of water treatment. Most of lectures are used for providing basic principles (even from school).

5. There are five control dates per semester. Result mark for each student should be provided at each control date. Offline tests can be used, but will require huge paperwork each 3 weeks: check the tests for more than 100 students.

Features of online testing procedure for “Water Treatment” course with “TBT Shell” software:

1. “Question module” with 1353 testing task: questions, calculation task (with random generated input), question with answer ordering.

2. “Testing module” with 12 tests (with defined: time, testing tasks list, number of testing tasks, result mark system etc.) for different chapters in “Water Treatment” course. Testing tasks are taken from “Question module”

3. Both “question” and “testing” modules are available online without access limitations (students can apply for question or test at any moment). So students can prepare for tests at any time they want.

4. All the information about time which is spent in “Question” or “Testing” modules for each student is collected in our server.

5. Testing tasks (especially for calculation tasks) are developed in order to control knowledges from school-time basics to generalized knowledge of water treatment.
Features of online testing procedure for “Water Treatment” course with “TBT Shell” software:

6. “Question module” has the option (standard feature of “TBT Shell”) to show right answers (in question or calculation tasks). So students can use not only documentation with answers for all questions, but also check how they calculate using calculator. Sometimes three significant digits in water treatment calculations are not enough.

7. Students at the beginning should spend many hours for learn basics, but in the end they knows more in the water treatment study.

8. At offline testing procedure (for control dates) students opens the same “Testing module” like at home, but tutor should check that they don’t use any cheat sheet (offline or online). Of course input for calculation tasks will be different (each time is random generated).
Results representation for tutor (teacher):

1. Reports are stored in MPEI’s server and can be processed for:
   - user information (date/time, ip-address etc.)
   - name of module
   - full list of modules pages (page represent question or calculation task or any specific part of module) visited by student with time information
   - “Testing report” used for tests: test name, result mark, time spent in test etc.

2. All modules are collected to Excel file and presented to tutor/teacher.

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Few statistics:

1. “Questions module”:
   • total usage count: 3364 times
   • total time: 542 days 5 hours

2. “Testing module”:
   • total usage count: 12831 times
   • total time: 362 days 9 hours

3. One student (with highest mark for course) for both modules:
   • total usage count: 119 times
   • total time: 6 days 9 hours 21 minutes

4. Another student for both modules:
   • total usage count: 184 times
   • total time: 1 day 20 hours 36 minutes
Conclusion:

1. Full-time online access for question database and testing modules.
2. Testing with supervision with online software.
3. Huge testing database which covers basics and advances in water treatment.

Leads:

1. Improved students knowledge in the field of study.
2. Knowledge evaluation without subjectivity (different teachers provides the same result mark).
3. Easy formulas for students to understand their mark for tests, for control date, for full course.
4. Small teacher’s overhead for conducting a knowledge slice through semester.
Thank you for attention!

Speaker’s contacts:

Konstantin Orlov
OrlovKA@mpei.ru
MPEI

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