

# **Use of Information and Communication Technologies (ICT) for National Assessment in Israel**

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# The Center for Educational Technology (CET) in Israel

## Our Expertise

- ◆ Leading educational NGO in Israel since 1971
- ◆ Content development
- ◆ Pioneer in introducing ICT into Israeli educational system
- ◆ Capacity building
- ◆ Assessment and evaluation

CET provides services to the Ministry of Education, local authorities, schools, funding organizations, etc.

- Dr. Tali Freund - VP Planning, Information and Evaluation
- Yakov Schwartz - Testing Center Manager

# Structure of Israeli System of Education

Age	Grade	Institution	Certificates
5-6	K	Kindergarten	Transition to first grade
6-12	1-6	Elementary school	Transition to junior high school
12-15	7-9	Junior high school	Transition to high school
15-18	10-12	High school (academic/ technological)	Matriculation certificate
18-20	13-14	Post-secondary vocational education	Diploma (technician /practical engineer)

According to the Israeli Compulsory Education Law, **compulsory** education applies to children from the age of 5 through the age of 16 and is provided **free** of charge through the age of 18.

# Large-Scale Assessment in Israel

(initiated by the Ministry of Education)

Type of school	Age groups	Subjects of examination *
Elementary	Second grade	Mother tongue (Hebrew, Arabic)
Elementary Junior high school	Fifth grade Eighth grade	Mother tongue (Hebrew, Arabic), English, Math, Sciences
High school	10th - 12th grades	Matriculation in <b>required</b> subjects (academic) and <b>optional</b> (academic and <b>technological</b> ) subjects
Post-secondary	13th - 14th grades	Certification exams for technicians and practical engineers

\* The exams in maroon are developed by CET.

# Computer Infrastructure and Computer Use in Israel

- ◆ At the beginning of the 90s, Israel invested **substantial resources to equip schools with computer infrastructures.**
- ◆ In Israel today there is an average of **one computer for every 10 students.**
- ◆ Currently, computer infrastructures are used primarily for **teaching-learning and administration.**

# The Use of Computer Infrastructures for Large-Scale Assessment in Israel

The use of computer infrastructures for assessment of educational achievements at the national level is very low.

Only in 2000 did the Ministry of Education begin to take the first steps towards developing computer-based tests.

# Computer-Based Tests (CBT)

- ◆ In a CBT, the questions are **presented to the student via a computer terminal**.
- ◆ The student's answers are typed in at the computer keyboard and **recorded electronically**. In most cases, they are also **marked electronically**.
- ◆ CBT can be **administered** by using:
  - ◆ Stand-alone computers
  - ◆ A local area network
  - ◆ The Internet

# CBT in Israel Today

- ◆ Most of the national tests have only paper & pencil version. Some other national tests have both paper & pencil version and CBT version or only CBT version.
- ◆ We use the **traditional CBT**, as opposed to **CAT** (Computer-Adaptive Tests).
- ◆ The CBT is a **fixed-length test**, which presents the **same number of questions** to each test taker, without considering how well he is doing on the exam.
- ◆ The score of this type of test depends on the **number of questions answered correctly**.

# Rationale for Using a Computerized Environment for Large-Scale Assessment (1)

## Pedagogical needs:

- ◆ Adapting assessment methods to innovative teaching-learning processes, both in formative and summative aspects.
- ◆ Development of different types of innovative and challenging assessment tasks.
- ◆ Improving quality of assessment provided by assessors.
- ◆ Mapping the students' knowledge more accurately.
- ◆ Responding to the special needs of students with learning disabilities.

# Rationale for Using a Computerized Environment for Large-Scale Assessment (2)

## Logistical needs:

- ◆ Making the process of **distributing** the questions and **collecting** the answers more efficient.
- ◆ Shortening the **duration** of the scoring process.
- ◆ Reducing **costs**.
- ◆ Enhancing **convenience**.
- ◆ Efficient **retrieval** of assessment items.

# Other Positive Effects of CBT

- ◆ Upgrading of **computer infrastructures** at schools.
- ◆ Increasing **integration of ICT** in teaching-learning processes.
- ◆ Improving the level of **computer literacy** of teachers.
- ◆ Increasing **the prestige of the subject** in which CBT is offered.

# Difficulties and Risks in CBT (1)

## In pedagogical terms:

- ◆ Unskilled school staff in using computers in teaching and assessment.
- ◆ Need for pre-training of examinees.
- ◆ Need for development (if any) of both CBT and paper & pencil versions (?)

## Difficulties and Risks in CBT (2)

### In technological terms:

- ◆ Major differences in computer infrastructures at schools.
- ◆ Loss of answers of examinees.
- ◆ Computers crashing.
- ◆ Loss of connections.
- ◆ Electrical outage at schools.
- ◆ Cheating by examinees.
- ◆ Break-ins by hackers.

# CET's Implementations of Computer Technologies for Assessment

Development and administration of national computerized matriculation exams over the Internet in subjects like **architecture, biotechnology, geography**

## **And also:**

- ◆ Development and administration of computerized **databases of assessment tasks** over the Internet.
- ◆ Support for **grading of "virtual notebooks"** over the Internet.
- ◆ Development and operation of computerized tools for **calibration of tests** (standard setting).

# Matriculation Exams over the Internet (1)

In 1999, the Ministry of Education took the trial step of offering matriculation exams over the Internet.

## Basic assumptions in operating CBT:

- ◆ Preference for subjects **integrating ICT** in teaching-learning.
- ◆ Use of the **computer infrastructures existing** in the schools.
- ◆ Examinees **do not have direct access** to the Internet.
- ◆ Same **proctoring conditions** as in the paper & pencil exams.
- ◆ **Not enhance cheating opportunities.**
- ◆ Ensuring a **highly reliable process.**
- ◆ Relying on **school teams, including IT coordinator.**

## Matriculation Exams over the Internet (2)

### Tools developed by CET for operating CBT:

- ◆ Web site that includes an interactive database for:
  - ◆ Transferring current information to the schools.
  - ◆ Organizational activities site.
- ◆ **Client-server software** for management of :
  - ◆ Downloading the test and **uploading** the examinees' answers.
  - ◆ **Distribution** of the test to the examinees' terminals over the internal network and **collection** of examinees' answers.
  - ◆ Prevention of cheating. [Flow chart](#)

## Matriculation Exams over the Internet (3)

### Tools developed by CET to prepare schools:

- ◆ **In-service training** for teachers and IT coordinators at the schools.
- ◆ **Free practice** on CBTs throughout the year.
- ◆ **Simulation** of a real test event operated simultaneously at all schools.
- ◆ **User manual** for school staff.
- ◆ **Support team** available throughout the year and during the actual test.

# Matriculation Exams over the Internet (4)

## Development of the next-generation of CBT:

- ◆ CET has begun developing the next-generation of CBT, which will be taken **online** via a central server (starting in the summer 2007 session).
- ◆ **Two major issues** need to be resolved:
  - ◆ Preventing examinees from making improper use of the Internet.
  - ◆ Loss of connection between the examinee and the central server.

# Evaluation of the Computerized Matriculation Exams over the Internet

- ◆ One of the matriculation exams conducted lately, included both **paper & pencil and CBT versions** for one out of its five units.
- ◆ Being tested in the CBT version was **optional**:
  - ◆ At the **school** level - Schools could choose to participate in the CBT experiment.
  - ◆ At the **student** level - In these schools students could choose the CBT or the paper & pencil version.
- ◆ This experiment was accompanied by an **evaluation research**.

# Evaluation Tools

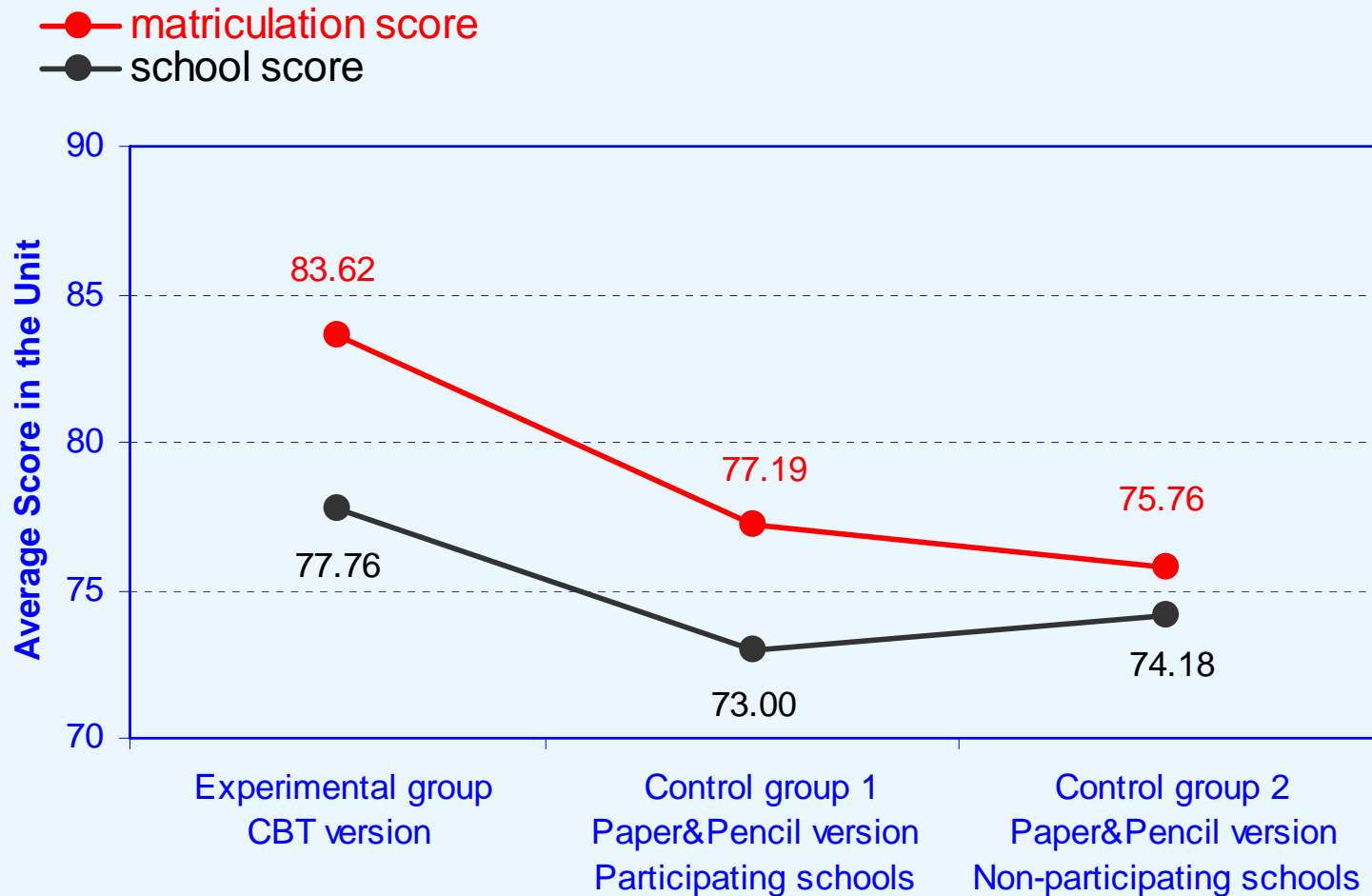
- ◆ **External matriculation exams and internal evaluation**
  - ◆ Scores from both sources of all students tested in this subject in that session.
- ◆ **Questionnaires** for students, teachers and IT coordinators
  - ◆ At all schools that participated in the experiment.
- ◆ **Observations**
  - ◆ At a sample of schools that participated in the experiment.

# Research Design

- ◆ **Experimental group:** Students who chose the CBT version (523 students), teachers (35) and IT coordinators (31).
- ◆ **Control group 1:** Students at the participating schools who chose the paper & pencil version (621 students).
- ◆ **Control group 2:** Students at non-participating schools, but are similar to the participating ones (792 students).

# Main Findings (1)

Student scores on exam:



# Main Findings (2)

## Analysis

1

The scores on this unit were significantly higher among students in the experimental group than those of their peers in the two control groups.

2

The advantage of the students in the experimental group can also be found in their school scores and in those achieved in other units of the subject.



3

**Students in the experimental group were "stronger" students than their peers in both control groups.**

# Main Findings (3)

## In-depth analysis

The **group** to which the student belonged and the **type** of score had a **significant interaction**: The **largest** difference between matriculation scores and school scores was found in the experimental group, and the **lowest** in control group 2 (although the difference here was also statistically significant).



**Possible explanations** for the difference between matriculation vs. school scores:

- **Test version**: The CBT version contributed to a better performance of the examinees.
- **Readiness of students** for the test situation: Students who chose the CBT version underwent more efficient preparation prior to the test (both in quality and quantity).
- **Participation of school**: The participating schools placed heavier emphasis on this subject, leading to better preparation of the students in both versions.
- **Bias of assessors**: The assessors were identified with the innovative process and gave higher scores to the CBT examinees.

## Main Findings (4)

### Preparation of the schools and students:

- ◆ **Satisfaction of the school staff:** 94% of the teachers were satisfied with the school's decision to participate.
- ◆ **Preparation of the students:** 80% of the students were satisfied with the preparation process leading up to the CBT.
- ◆ **Technological infrastructures:** 87% of the IT coordinators did not have any technology problems prior, during and at the end of the test.

**All in all, there was general satisfaction with the preparations for the CBT.**

## Main Findings (5)

### Implications of CBT - Teachers' opinions on:

- ◆ Teaching, learning and assessment in a computerized environment: 80% of them expressed positive opinions.
- ◆ Integration of ICT in teaching: The CBT motivated 60% of them to a higher integration of ICT in the specific subject, but only 31% reported higher integration in other subjects.
- ◆ Opinions on status of the profession: 83% of them felt that the CBT contributes to their professional status and enhances the prestige of the subject.
- ◆ Teachers self-efficacy: 86% of them felt capable while preparing their students for the CBT.

**All in all, teachers had positive opinions on the implications of the CBT.**

## Main Findings (6)

### Implications of CBT - Students' opinions on:

- ◆ Teaching, learning and assessment in a computerized environment: 50% of them expressed positive opinions.
- ◆ Status of the subject: The CBT contributed to the prestige of the subject in the eyes of 35% of them.
- ◆ Students self-efficacy: 75% of them felt capable while performing on the CBT.

**All in all, students had positive opinions on the implications of the CBT.**

Thank you for your time!



# Questions for Discussion

1. Is it recommended to use computerized assessment although the teaching-learning process does not involve use of computers ?
2. How to harness the computerized environment for the implementation of new types of items?
3. Is a computerized item really equivalent to a paper & pencil item even if both of them ask literally the same question ?
4. How to assure survivability of a computerized assessment system in case of an internet disconnection ?
5. How to prevent cheating using the Web-based environment ?