

A Roadmap Towards Computer Based Assessment

IEA General Assembly
Lisbon, October 2013



INTERNATIONAL ASSOCIATION FOR THE EVALUATION OF EDUCATIONAL ACHIEVEMENT

DPC
IEA DATA PROCESSING
AND RESEARCH CENTER
HAMBURG
GERMANY

Content

- General remarks
- Where are we? Strengths and challenges in paper based assessment
- Computer based assessment: Motivation, strengths and challenges
- Concept of an IEA CBA system
- Next steps



General Remarks

- IEA doesn't start from scratch with CBA activities.
- Ample experience is available from IEA studies but also, through IEA DPC activities in the national context, from non-IEA studies
 - ICILS
 - Online Survey System (OSS)
 - PIAAC
 - Talis
 - National studies, e.g. CBA activities in the context of the National Panel study NEPS



General Remarks

- IEA also developed all kinds of IT systems to support studies: WinW3S for sampling, WinDEM for data entry and the CodingExpert for scoring.
- But:
CBA activities imply a serious financial burden.
Despite all advantages related to CBA, there are considerable risks and challenges related to this activity, both at national and international level.



Status

- Vast majority of IEA studies are paper and pencil based.
- They are accompanied by well-rehearsed quality controlled routines in all phases of the study
 - Sampling procedures are well established and documented.
 - Item production and piloting are functioning well.
 - Test assembly make use of rotated designs.
 - Well established translation procedures, now IT supported, are in use.



Status (continued)

- Well-proven field operation procedures are in place as can be seen in various manuals, software and trainings.
- International data processing and analysis routines are set up and running
 - Scaling
 - Analysis
- Reporting and data dissemination are following a strict protocol and timeline.



Strength of the Paper And Pencil Approach

- Rigid and proved and tested procedures ensure standardized comparable data.
- Security issues are taken care of:
 - Confidential material is kept to allow for trend measures
 - Closed and well protected environment



Challenges of Paper and Pencil Approach

- The tests are static. No provision for special groups of students is made.
- Adaptations possible, yet sometimes difficult to implement
 - Regional modules
 - International options
 - National options
- Relatively high costs for printing, scoring and data entry in countries



Transformations in Educational Systems

- Technology becomes intertwined with what and how students learn.
- Students use technology to collect, arrange and communicate information within and outside school.
- Technology can vary: PCs, laptops, tablets, smart phones...
- In order to keep pace with these developments, the means to measure achievement must be adapted.
- The use of computers for testing can be seen as a logical consequence.



Strength: Enhancing Assessment by Use of CBA

- New and more complex item formats can be administered (ICILS).
- Adaptive (targeted) testing can be used to get more precise measures in shorter testing time (ETLS).
- Skills needed to act efficiently in technology rich environments can only be assessed through CBA (ePIRLS)
- Para-data are available: timing, process information like sequence of actions, number of actions...
- Practical implications are: no costs for printing and data entry.



Challenges at International Level

- Can existing paper and pencil test be transformed to CBA? -> Construct validity, but also confounded technical and domain skills
- Complex item formats require elaborated scoring procedures -> Reliability can be an issue
- Can test security be guaranteed? -> Closed environment possible?
- How can countries not fully prepared to implement CBA be supported?
- All procedures need to be adapted in order to meet the new mode (ICILS).



Challenges at National Level

- Schools are differently equipped across and within school systems in terms of quantity and quality:
- Quantity
 - Computer lab with sufficient number of computers for a class
 - Small number of computers per classroom (found in primary education)
 - No applicable computers at all



Challenges at National Level (continued)

- Quality
 - PCs, laptops, tablets can be found
 - Screen size and resolutions vary
 - Memory can be an issue in old machines
 - Operating system (Windows, Mac, Linux, Android)
 - Different browser supporting varying features are installed
 - Access rights can be rather limited for student
 - Internet access and bandwidth
- Also to consider: poorly developed infrastructure in a system



Can Existing Paper and Pencil Tests be Transformed?

- Online Survey System (OSS) could handle this.
- Few adaptations with respect to the inclusion of pictures and graphics are necessary
- BUT:
 - Since the OSS works in the internet and no provision is made for security measures as needed in IEA studies, this is not an option.
 - And: there is limited added value



Consequence

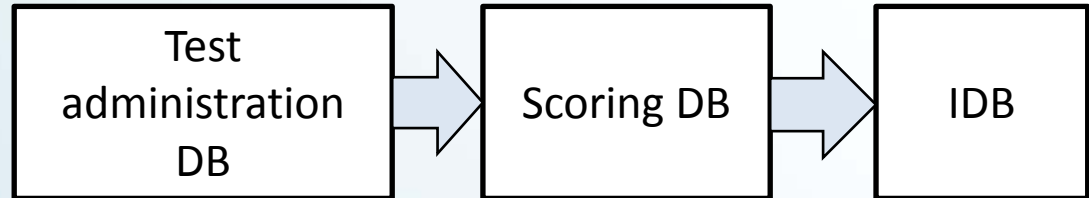
- IEA is developing a CBA system.
- IEA may look for strategic partners in the field of CBA.
- The system to be implemented should be as flexible as possible in order to cope with future development especially in the area of online testing.
- Commercial companies may not be advisable due to dependencies in the future
 - No ownership rights
 - Support question
 - Integration of necessary tools in future may be subject to unpredictable costs



Concept of a CBA System

Test development phase

- Item builder
- Translation
- Test assembly



Item data base

Test delivery phase

- Test rendering/delivery
- Data integration
- Scoring
- Data processing

Test Development: Item Builder

- Item authoring system used by item developers.
- No programming skills should be required to work with the system.
- A Graphical user interface is advisable.
- Also a preview function is necessary
- Versioning system should also be implemented.
- **Status:** Unsure, probably not worthwhile the investment.
- In on-going projects only too few items had to be included. Complex items could not be handled. This did not justify an investment in an item builder.



Test Development: Translation

- Translators can enter their texts for various elements of the CBA system, not only classical text fields but also all sorts of control elements and texts in graphics, e.g. labeling in maps (Polar bear in ePIRLS).
- Translation verification process will be controlled and conducted through the translation component.
- Memory function is desirable.
- Preview function required -> length of translated text can vary considerably from source version.
- **Status:** Currently under development.



Test Development: Test Assembly

- Business logic of the CBA systems: rule system
- It is controlling the configuration of the test
 - Sequence of items or block of items
 - Rotation
 - Selection rules for targeted testing. However, targeted testing requires immediate scoring of student responses.
- **Status:** Currently under development



Test Delivery: Rendering System

- Merge of test assembly system and sampling information. Students are allocated to tests.
- Different delivery modes are possible:
 - Test delivered via USB-stick (ICILS, ePIRLS)
 - Challenge: Operating systems and access rights ->school readiness tool prior to testing
 - Server laptop hooked into school network
 - Challenge: technical expertise required from test administrators
 - Carry-in laptops
 - Challenge: logistics and money (rent and transport)
- **Status:** Currently under development



Internet Based Delivery?

- At present not under development:
- Test security difficult to achieve: Test administrators need to pay extra attention.
- Students may use other internet resources to complete the test - >blocking of other pages is needed.
- Necessary bandwidth may not be available in schools.
- Servers may fail. Risk reduction can be achieved through redundant systems.
- However: components currently under development are created in a way, that they can also be used for an internet based testing environment.
- **If test security issues and technical shortcomings can be resolved, internet based testing will be a serious option.**



... and Tablet Computers?

- Server – tablet solution could be possible.
- Stand alone program on tablets also possible, e.g. to record children behavior in early childhood setting.
- All challenges mentioned for internet based testing do also apply.
- In addition, issues related to operating systems, screen size and interfaces also need to be considered (use of mechanical keyboard and mouse).
- Finally, familiarity with these new devices can't be universally assumed.



Test Delivery: Data Integration and Subsequent Steps

- Scoring tool “Coding Expert” already exists and can be integrated.
- Programs are already developed and can be used in the CBA environment.



Next Steps

- Development of CBA - components for ePIRLS
 - Translation
 - Test assembly
 - Test rendering/delivery

thereby drawing upon experiences from previous CBA activities.

- Integration of existing components for all steps following after testing.



Not an Option...



Thank you



INTERNATIONAL ASSOCIATION FOR THE EVALUATION OF EDUCATIONAL ACHIEVEMENT

DPC

IEA DATA PROCESSING
AND RESEARCH CENTER

H A M B U R G
G E R M A N Y