Assessing Developmental Aspects of Dynamic Problem Solving
The tendencies in educational assessment

- shifting of emphasis from curricular content to the measurement of cross-curricular competencies (PS)
- complexity, real-life, real-time problems – indicates the shift from PP->CB
- Possibilities of measuring problem solving in CBA environment:
  - to provide rich stimulus material
  - new item formats, enables measuring new constructs, new areas, assessing dynamic
  - rises new issues in assessment – EDM
The tendencies in educational assessment

- National and international projects (PIAAC, PISA, NAEP, DIPF TBA project ets.)
- focus on one measurement point vs. from a developmental perspective
Measuring development

• Tests – assess skills – students of a certain age range
• broad age range => different tests - common anchor items
• IRT models – express the results on the same scale
• Rasch model - for scaling the data, PV - compare the achievements of the age groups
Aims of the analysis

• to compare students’ achievements in tests that assess different dimensions of PS;
• to compare sub-groups of the samples,
• to establish problem solving competency scales in all of the dimensions of PS by IRT;
• to place the scaling into a developmental context, by expressing the achievements of the different age groups on the same scale; and
• to place the results into international context.
Methods

• March and April, 2011
• Grade 3-11 (9-to 17 year-old student)
• ca. 500 students in each cohort – total number – 5000
• Instruments of the study:
  – Inductive reasoning test - CB
  – Inteligenztest - PP
  – Static complex problem solving test – PP
  – Dynamic PS – CB
  – Background questionnaire – CB
• PP and CB mode as well
### Structure of the survey

<table>
<thead>
<tr>
<th>Test</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamic PS</td>
<td>6 7 8 9 10 11</td>
</tr>
<tr>
<td>Static CPS</td>
<td>3 4 5 6 7 8 9 10 11</td>
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<tr>
<td>Ind. reasoning</td>
<td>3 4 5 6 7 8 9 10 11</td>
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<tr>
<td>Inteligenzt.</td>
<td>3 5 7 8 9 10</td>
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<tr>
<td>Questionnaire</td>
<td>3 4 5 6 7 8 9 10 11</td>
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</tbody>
</table>

(Grade 3 = 9 year-old student...grade 11= 17 year-old student)
(Grade 3-8: primary school, grade 9-11: secondary school)
General abilities dimension of PS (ind. reasoning)

- Grade 3-11; CBA; TAO
- Common anchor items

<table>
<thead>
<tr>
<th>Grade</th>
<th>Items</th>
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<tbody>
<tr>
<td>3</td>
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<td>4</td>
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<td>11</td>
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</tbody>
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(Grade 3 = 9 year-old student...grade 11= 17 year-old student)  
(Grade 3-8: primary school, grade 9-11: secondary school)
Inductive – lower grades

18) \[\begin{array}{cc}
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18) (a) (b) (c) (d) (e)

23) (a) (b) (c) (d) (e)

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Inductive – higher grades

\[ a) \ 20 \rightarrow 32 \ :: \ 8 \rightarrow 20 \ :: \ 11 \rightarrow \_\_\_\_\_ \]

\[ \text{SZÉK : BÚTOR} = \text{KUTYA : ?} \]

- MACSKA
- ÁLLAT
- TACSKÓ
- RÓKA
- KUTYAÖL

3 6 11 14 19 22 ____ ____
General abilities dimension of PS (inteligenztest)

- CFT-20
- Grade 3, 5, 7-10
- 2 versions: Grade 3, 5 – subtest
- Common anchor items
- PP

(Grade 3 = 9 year-old student...grade 11= 17 year-old student)
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Literacy dimension of PS

- Dynamic PS test – adapted test
- CBA
- 1 test – all grades (6-11)

(Grade 3 = 9 year-old student...grade 11= 17 year-old student)
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Expertise dimension - Static CPS test

- CPS in real-life situations - integrating transfer and knowledge application
- Tasks - novel, complex, semantically rich, knowledge intensive, intransparent and similar to real-life problems
- Crucial questions:
  - how pupils transfer knowledge to new, real-life contexts
  - how they use their problem solving strategies in unusual situations
Static CPS test

• According the amount of information 3 types of problems
  – Everything is given
  – Incomplete problems (missing information learnt at school – National curricula)
  – Incomplete problems (information needed from real-life)

• broad age range => different tests - common anchor items
Structure of the static CPS surveys

Grade | Items
--- | ---
3     | Level 1
4     | Level 2
5     | Level 3
6     |
7     |
8     |
9     |
10    |
11    |

(Grade 3 = 9 year-old student...grade 11= 17 year-old student)
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Másnap délelőtt átjött négy haverom, 11-kor már nagyon éhesek voltunk, rendeltünk egy-egy pizzát. Anna és Juli közösen kértek egy sonkás pizzát, a fiúk pedig egy-egy kicsi gombásat, és egy közepes mexikói-t. Ez vajon mennyibe kerülhetett?

A: 3360Ft  B: 3570Ft  C: 3780Ft  D: 2460Ft

Miután megérkezett a pizzánk, olyan jó illata volt, hogy anyuék is úgy döntöttek, ők is pizzát esznek ebédre. Apa beült a kocsiba és hozott magának egy nagyobb Erdő kapitánya pizzát, anyának pedig egy kicsit kisebb ananászos pizzát. Mennyi pénzt kellett apunak legalább vinni a pizzériába?

A: 1700Ft  B: 2100Ft  C: 2500Ft  D: 2900Ft
Problems - limitations

- faced several technological challenges
- the required technological parameters given in advance
- several technological means available in schools diversity, compatibility require further considerations
- Trouble with Internet connections – speed, monitor resolution...
Thank you for your kind attention!

http://www.staff.u-szeged.hu/~gymolnar