ASSESSING THE PROCESS OF THINKING USING QTI

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Large-scale assessment programmes in France (K12)

Sample-based national LSA
- School subjects cycles
- Common Core
- 21st century skills
- Longitudinal
- Policy evaluation

Census-based national LSA
- Grades 1 & 2
- Grade 6
- Grade 10
- Army Day

Sample-based international LSA
- PISA
- PIRLS
- TIMSS
- ICILS
- ICCS

DEPP, Department of Statistics of the Ministry of Education, leads many standardised assessment programmes

Classroom level
- to provide standardised tools to teachers in order to improve pedagogical interventions

Local level
- to provide indicators to educational managers in order to monitor pedagogical actions

National level
- to provide national results, trends and international comparisons in order to evaluate the education system

The Future of Assessment and Feedback
International association: FLIP+ e-assessment community

FLIP+ motto: sharing!
Open source / open standards

More than 20 non-profit institutions
Question & Test Interoperability Specification

Enables the exchange of

- item and test content
- results data

between

- authoring tools
- item banks
- test construction tools
- learning platforms
- assessment delivery systems
- scoring/analytics engines

Various item/interaction types

Graphic Interactions

- Hotspot
- Order
- Associate

Common Interactions

- Choice
- Order
- Associate
- Match
- Hottext
- Gap Match
- Slider
- Extended Text
- File Upload
- Média
Usual Item Samples
Use Portable Custom Interactions (PCI) to build performance tasks:
• Reproduce classroom activities
• Increase learner engagement
• Measure 21st Century skills
• Collect rich process data
Example PCIs: Mathematics

Geometry tool (with Vreta)

Area and perimeter (with Vreta)

Spreadsheet tool (with Vreta)

Solving equations tool (with Numworx)

Cube building (with Numworx)

Probabilities (with Vreta)
Example PCIs: Science
Example PCIs: Creativity and Collaboration

Chatbot (with Wiquid)

C'est parti!

Consigne à écouter

Avec Glips, vous allez devoir être créatifs ! Il va falloir faire preuve d'imagination, mais sans écrire n'importe quoi !…

Text timer (in-house)

- Proposition n°1
- Proposition n°2
- Proposition n°3
- Proposition n°4

Ajouter une nouvelle proposition

Temps restant: 4min 47s
Example PCIs: Digital skills

File explorer (with Wiquid)

Computational thinking (SNAP, with Wiquid)
Example PCIs: Literacy and Numeracy

Lexical decision (in-house)

Appuyez sur la touche "Q" pour pièce et sur la touche "M" pour mot.

Cliquez ici pour commencer

Number line (with Vretta)
Reporting on students’ processes
To what extend can process data inform on students cognitive processes?
Holistic approach

UX Methods
- Classroom observation, Eye tracking, Video, Cognitive interviews

Technology
- Software development, standards

Didactics
- Conceptions, possible strategies

Analytics
- Machine learning

Inform on students’ cognitive processes
Didactical analysis framework

Deux graines d'arbres sont plantées au même moment : un chêne et un sapin de Douglas.
En entrant dans la première colonne, l'âge (en mois) des arbres, on obtient leur hauteur (en mètre) dans les deuxième et troisième colonnes.
Les points correspondants s'affichent sur le graphique : en orange le chêne, en bleu le sapin.

A quel âge (ou entre 0 mois) ont-ils la même hauteur?

L'âge est de  
mois

<table>
<thead>
<tr>
<th>Âge (mois)</th>
<th>Chêne</th>
<th>Sapin de Douglas</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>25.20</td>
<td>20</td>
</tr>
<tr>
<td>500</td>
<td>83.75</td>
<td>80</td>
</tr>
<tr>
<td>800</td>
<td>91.5</td>
<td>80</td>
</tr>
</tbody>
</table>

Conceptions at stake
Use of digital tools
Interactions with environment
Solving strategies
Variables of interest
Reporting on students’ processes

**Operational conception**
Functions = input/output relationships

**Related strategy:** Trial and error

Iterations of:
- input value,
- compare with target and previous,
- decide on next value

**Structural conception**
Functions = math objects with properties

**Related strategy:**
- Reducing the area of interest,
- Adding continuous representations,
- Trial and error for accuracy
## Variables of didactical interest

<table>
<thead>
<tr>
<th>Variables</th>
<th>Operational conception</th>
<th>Structural conception</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of tested values</td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td>Number of alternations</td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td>Duration</td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td>First value between 200 and 600</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Gap btwn 1st value and target value</td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td>Standard deviation of tested values</td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td>Use of pencil</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Correct response</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>
Results

France, 2017, Grade 9 student sample, N = 3000

Estimated number of clusters: 4

Correct response

Operational conception

Incorrect response

Structural conception

Average proportion of value per Label

- Value 396 tested
- Correct response
- Number of tested values
- Standard deviation of tested values
- Number of alternations
- Gap between the 2nd value and the target value
- Use of pencil

The Future of Assessment and Feedback
Discussion

✓ Large scalability
✓ Holistic approach => validity of process data interpretations
✓ Didactical findings: actionable with teachers

- Exploratory item by item analysis to be extended to groups of items
- Need for standardization of process data
- Relationship with performance to explore
Thank you!

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To learn more: