THE USE OF COMPUTER BASED ASSESSMENT PISA 2012 ITEMS IN MATHEMATICS CLASS: STUDENTS' ACTIVITIES AND TEACHERS' PRACTICES

Maha ABBOUD, Franck SALLES, Nathalie SAYAC

LDAR; University Paris Diderot, franck.salles@education.gouv.fr

Until few years ago, the PISA assessment was paper based. Recently, the computer based test administration modality has been chosen for PISA' next cycles. How student mathematical performance measurement could be affected by this modality? WouldFrench teacherspractices,particularly assessment practices,change by consideringthe PISA's new framework, and if so, how? This poster presents the first exploratory steps of a thesis research project through analysing the mathematical task and students'activity at stake in a PISA 2012 CBA released items.

Assessment; TeachersPractices; Technology; Mathematics; PISA

PISA 2012 CBA ITEM « CD PRODUCTION » ANALYSIS RATIONALE

In 2012, OECD'S PISA proposed an optional assessment in Mathematics in a computer based environment (OECD, 2013). New itemswere specifically developed at this occasion. The "CD Production" is an example of such an item. Using Activity Theory and its development in the French sphere of didactics (Robert & Rogalski, 2005; Abboud-Blanchard & Vandebrouck, 2012) as theoretical background, we analysedthe mathematical task in this item by taking also into account the levels of mathematical knowledge operation (Roditi&Salles, 2015). Additionally, we identified how the item potentially explores students' Instrumental Genesis (Folcher, Rabardel, 2004) and how this affects the item's task performing. We will show how confronting the*a priori* analysis to actual students' responses, transcripts and mathematical work on the item,recorded during cognitive laboratory run with two 9 graders, guide us in our investigation of such items' affordances.

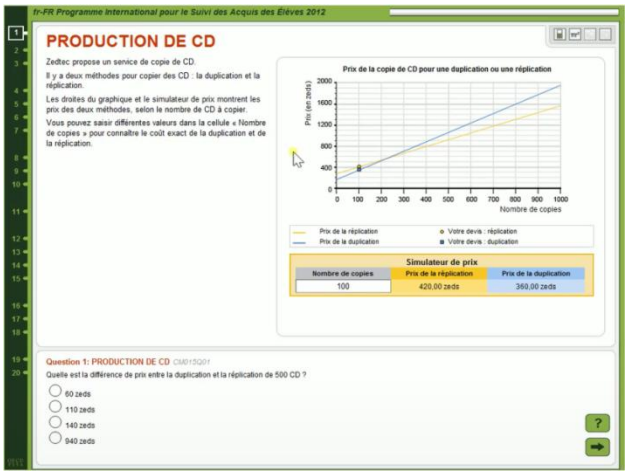

Figure 1. CD Production Question 01, French National version,MENESR, DEPP, OECD, PISA 2012

APRIORI MATHEMATICAL TASK ANALYSIS

This « real life » situation compares two different techniques used to copy CDs, more specifically their cost by the number of copies. Information is given in "hotlinked" numerical and graphical representations. Students can put in numbers of copies in a price calculator that outputs prices for both techniques. The task consists in working out the difference in prices for 500 copies. Response format is multiple choices. The operation at stake is a subtraction. However one has first to adapt the information given to find the values to operate. At this end, students can either use the graphical representation and work out an approximate difference or work in the numerical representation and use the price calculator to find exact costs for 500 copies before subtracting. The choice depends on the level of accuracy needed by the subject. The distractor 110 is close enough to the correct response (140) to allow approximate graphical values lead to a wrong answer, whereas the correct use of the price simulator leads to the correct answer only.

ABOUT THE TECHNOLOGY RICH SITUATION

The technological tools available to students in this item, a ready to use calculator as well as the embedded price simulator, release the "burden of computation". Hence, students can focus on the strategy and the structure of the given information. More specifically, dealing with both a graphical and a numerical representation of the relation between number of copies and price, is allowed and eased by the fact that representations are "hotlinked" (Stacey, Wiliam, 2013), as the graph displays the points from the coordinates entered in the price calculator. Besides, the price simulator can be instrumented(Folcher, Rabardel, 2004) by students to the finding of exact values.

AN EXAMPLE OF STUDENTS' ACTIVITIES WITH COGNITIVE LABORATORY RECORDINGS METHODOLOGY

Two grade 9 students have been audio and video recorded when performing this task in a collaborative way. The objective of such a cognitive laboratoryconsists in gathering as much information as possible regarding students' activity. Students are encouraged to collaborate and speak aloud during the process and a short interview is administered when finished.Results of observation give information on the time spent to solve, student's pointer moves on the screen, numbers entered and chosen responses, as well as an audio recording of their collaboration and of the interview with the researcher. Results show that the simulator has been instrumented, but this instrumentation was not straightforward for one of the two students. The graphical representation has quickly been abandoned to the profit of the numerical one. One of the students was familiar with a price simulator and she was at the initiative of using it which reveals the availability of using schemes (Folcher, Rabardel, 2004) at the service of the mathematical activity.

REFERENCES

Abboud-Blanchard, M. & Vandebrouck, F. (2012). Analysing teachers' practices in technology environments from an Activity Theoretical approach. *The International Journal for Technology in Mathematics Education*, vol 19.4, 159-164.

OECD (2013), PISA 2012 Assessment and Analytical Framework: Mathematics, Reading, Science, Problem Solving and Financial Literacy, pp. 43-44. OECD Publishing.

Robert, A. & Rogalski, J. (2005). A cross-analysis of the mathematics teacher's activity. An example in a French 10th grade class. *Educational Studies in Mathematics,59,* 269-298.

Roditi, E. & Salles, F. (2015) Nouvelles analyses de l'enquête PISA 2012 en mathématiques. Un autre regard sur les résultats In Education & Formations n° 86-87, pp.235-257, MENESR, DEPP

Folcher V., Rabardel P. (2004) Hommes-Artefacts- Activités : perspective instrumentale In P. Falzon (Eds) L 'ergonomie, (pp. 251-268) PUF.

Stacey, K.&WiliamD. (2013), "Technology and Assessment in Mathematics", in Clements M. A. (Ken), A. Bishop, C. Keitel, J. Kilpatrick and F. Leung (eds.), Third International Handbook of Mathematics Education, (pp. 721 – 752) Springer.