E.S.F. – Short Visit Grant

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Reference Number: 4708

Scientific report

1. Purpose of the visit

Studies on handwriting have been asked about the role of copying tasks in order to acquire in a simultaneous way graphic norms and orthographic forms. However, the relationships between these two acquisitions have rarely been analysed in terms of cognitive load, according to the models regular/irregular orthography.

Cognitive load theory originated at UNSW. There, the School of Education is renowned for its publications and expertise in cognitive processes and instructional design, technology-enabled learning and teaching, language and literacy education. One of the research groups, called Cognitive Processes and Instructional Design works on projects designed to facilitate learning in writing and investigates the role of technology and multimedia learning and teaching.

2 and 3 Years of Primary School French children took part with us in experiments on copying isolated words. On the base of these works, we are thinking of assessing how can the ICTs (digitizers used in a private or school context, specific software programs) be used in order to reduce the cognitive load involved in the graphic norms and orthographic forms acquisition. To be more precise, we aim at creating a learning handwriting program able to consider the visual parameters necessarily involved in these two acquisitions by handwriting copying tasks (dynamic and interactive written models which allow children to get over in real time the different steps of their work (with, from the program, a ductus and final product evaluation).

2. Description of the work carried out during the visit

- Meetings with Pr. André Tricot (6 meetings), Pr. John Sweller (1 meeting), and Pr. Paul Ayres (1 meeting):
  - Discussing the results of case study about the influence of orthographic regularity and semantic familiarity on a dysgraphic children's written production in handwriting copying tasks.
  - Discussing an experiment carried out in order to compare children performances on a dictation task after 4 different pre-training conditions (analysing results in progress).
  - Designing with them the hypothesis, procedure and materials of two projected experiments (described below).
  - Beginning the design (defining the main specifications) of a learning handwriting software.

- First steps of modelling a cognitive model of copy tasks and dictation tasks.

3. Description of the main results obtained

- Two experiments designed:

  - Experiment 1
    - Aim: Comparing children performances on a dictation task according to 2 learning conditions (1) dictation task and (2) copy task.
    - Hypothesis: Performances in the dictation task should be better with copy during the learning session (condition 2) than with dictation during the learning session (condition 1).
    - Material:
      - Paper,
      - Graphic tablet *Intuos XL,*
      - Stylus *Intuos 4 Inking Pen* that left a trace,
      - Software *Eye and Pen.*
    - Linguistic material: sample of 28 words selected according to:
      - (1) Semantic familiarity with two modalities: familiar (S1) / unfamiliar (S2),
      - (2) Orthographic regularity with two modalities: regular (O1)/ irregular (O2).
        - An unfamiliar word is assumed to be unknown (not in LTM).
        - An irregular word is assumed to have an orthographic form difficult to retrieve from its phonological pattern.
    - Procedure:
      - Pre-test: session 0.
      - Learning sessions:
        - Words featuring S1O1: session 1.
        - Words featuring S2O1: session 2.
        - Words featuring S1O2: session 3.
        - Words featuring S2O2: session 4.
    - Participants: 20/30 Year 2.
    - Learning tasks: copy task *vs.* dictation task.
    - Measures: same measures for the learning sessions and the post-test.
      - Number of errors,
      - Number of pauses,
      - Duration of each pause,
      - Position of each pause,
      - Time to perform the task.

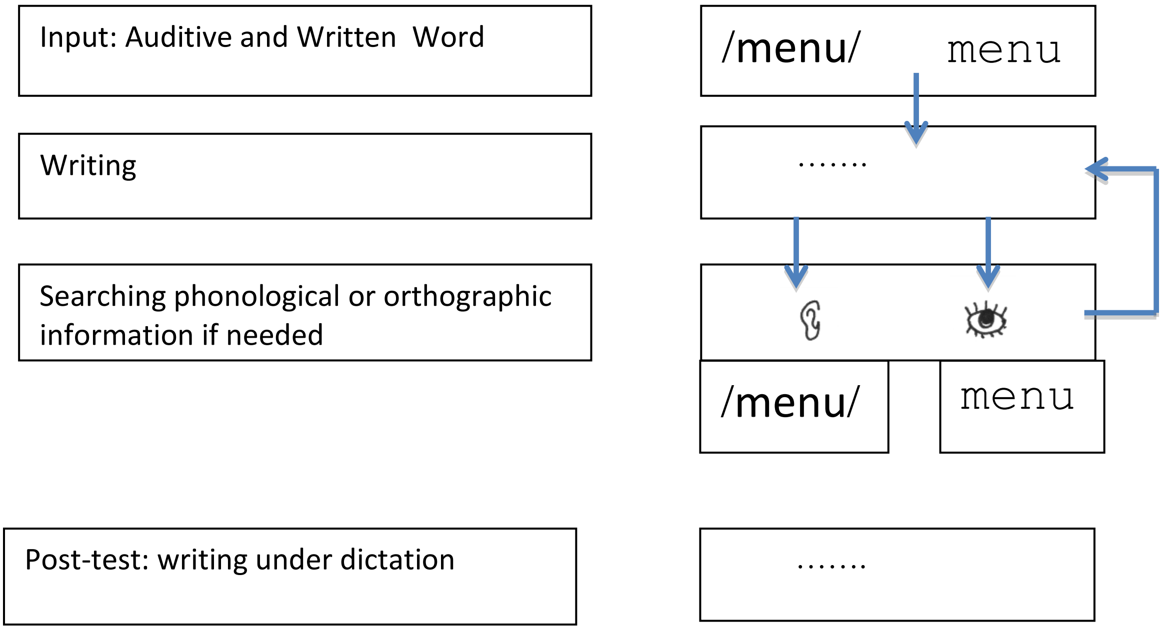
  - Experiment 2
    - Aim: In copy tasks, it is generally assumed that pauses correspond to the fact that the participants retrieve orthographic information from the written word. But

that's just an assumption: eye tracking should be necessary to check what participants are actually watching during the pauses.
It is also arguable that the participants look for orthographic form because it is available. What would happen if the phonological form was available?
Then, the aim of the Experiment 2 is to know what kind of information a handwriting learner is looking for in a writing task: phonological information (heard word) or orthographic information (read word)?

- Hypothesis: Searched information could depend on orthographic features of the words. The participants will search read word when the orthographic form is irregular (O2) more often than when the orthographic form is regular (O1).
  The participants will search more the both forms (read words and heard words) when the words are not familiar (S2) than when the words are familiar (S1).
- Material:
  - Paper and pen,
  - Software *Camstasia*,
  - Linguistic material:
    - 4 control words (4 letters S1O1),
    - 8 words featuring S1O1, S2O1, S1O2, S2O2 (randomly presented) but longer (12 letters), in order to load the Working Memory and make the information search necessary.

- Procedure:

(We realized a mock up of the material used in this Experiment).



- Participants: 30/40 Year 1 – 30/40 Year 2.
- Task: writing task.
- Measures:

- Number of clicks for each phonological information and orthographic information,
- Number of errors.

❖ Beginning the design (defining the main specifications) of learning handwriting software.

During the discussion, the following issues appeared to be answered before starting a more specific work around the software design:

- Learning scenario
  - Users,
  - Language material,
  - Sessions (tasks, duration, content, guidance),
  - Learning Progress,
  - Evaluation.
- Types of feed-back
  - Modalities,
  - Timeframe,
  - Timing.
- Integration strategies
  - Space constraints,
  - Time constraints,
  - Culture / Pedagogy constraints,
  - Technology constraints.

4. Projected publications / articles resulting or to result from the grant

Experiments discussed or projected could lead to the three following publications:

❖ Learning to write, contexts and cognitive structures: How do they interact?

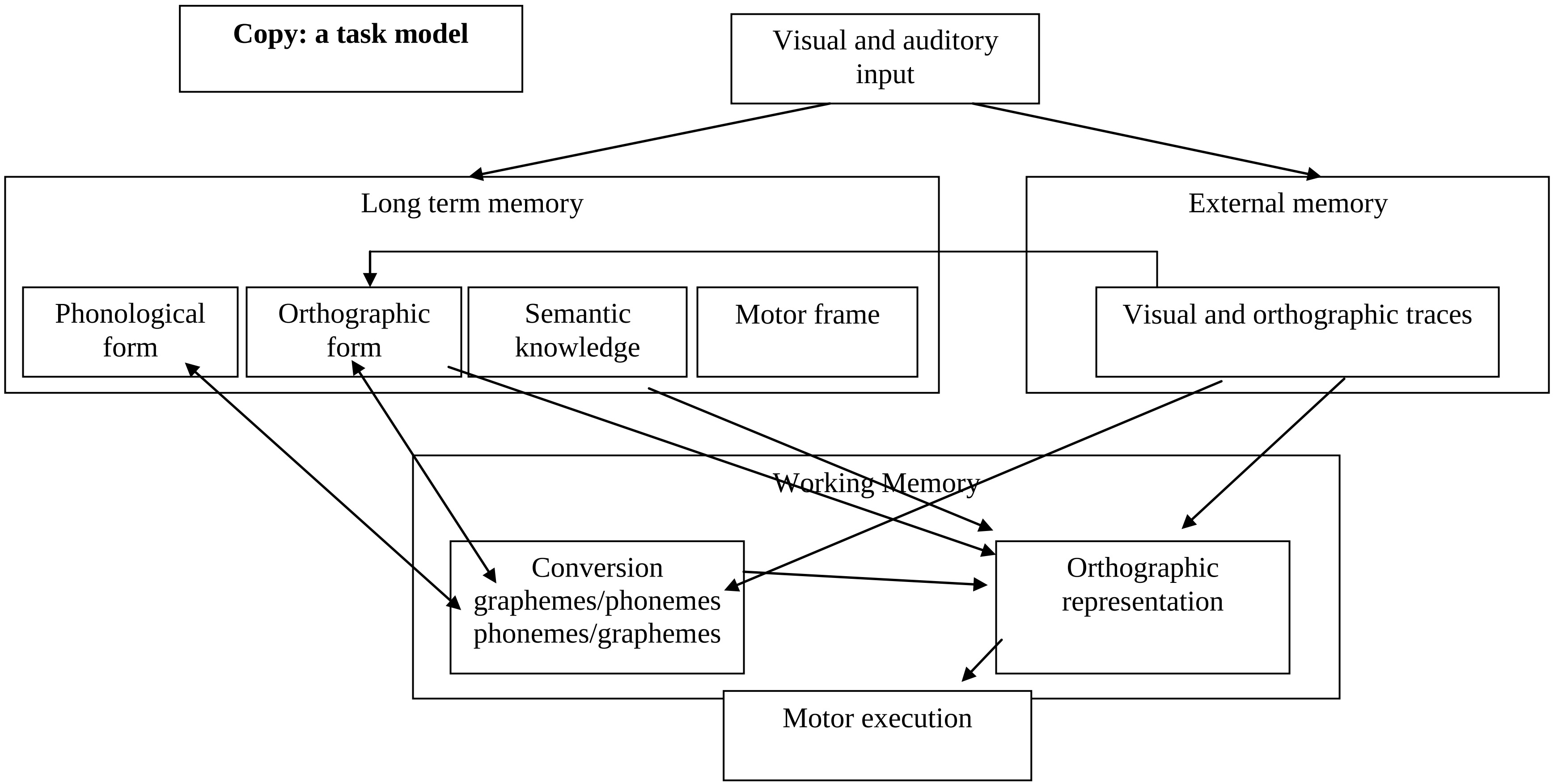
❖ Performances in a dictation task: How to prepare young learners to write isolated words?

❖ Writing isolated words: Do young learners prefer phonological or orthographic information?

5. First steps of modelling a cognitive model of copy tasks and dictation tasks.

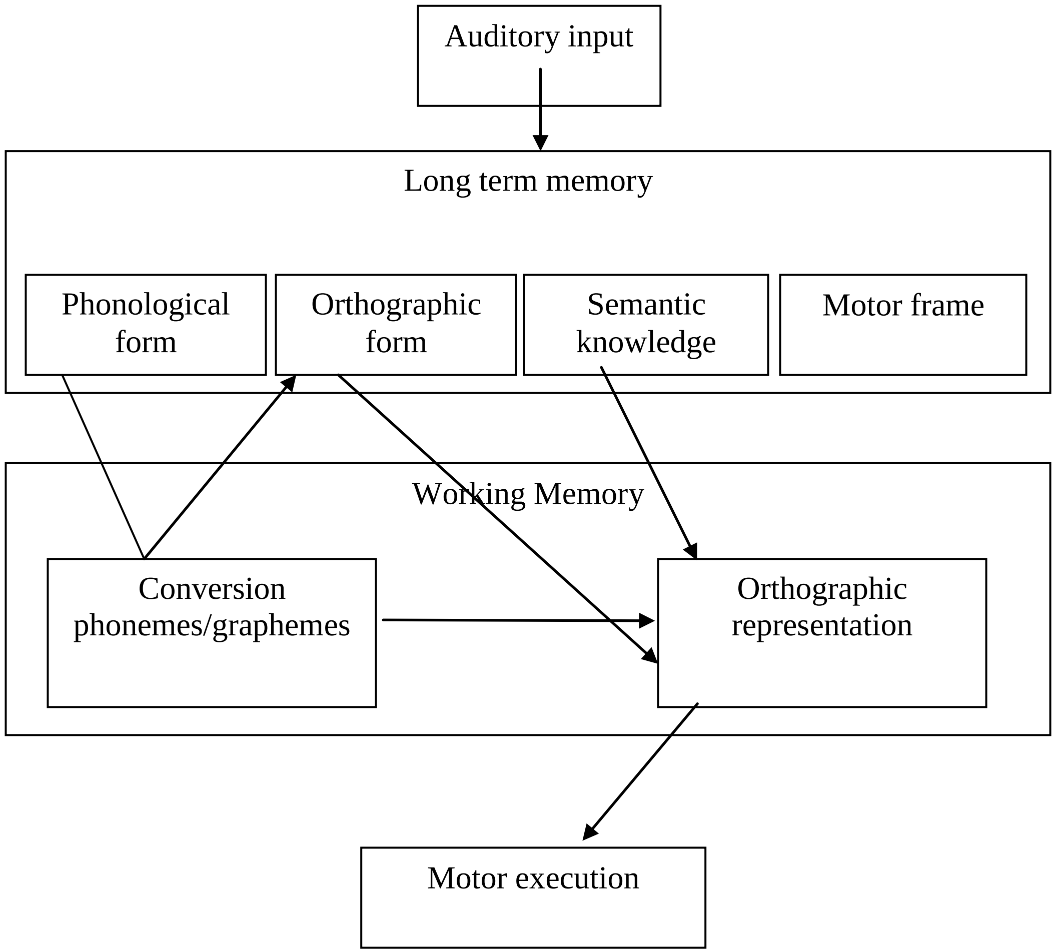
Presented in the two following pages.

Copy: a task model



If S1O1, the probable path is: orthographic form and semantic knowledge -> orthographic representation (external memory is almost not used)
If S2O1, the probable path is: orthographic form -> orthographic representation (external memory is almost not used)
If S1O2, the probable path is: semantic knowledge and orthographic form and phonological form -> Conversion G/P and P/G -> orthographic representation (external memory is used to control orthographic representation or to search orthographic trace)
If S2O2, the probable path is: orthographic form and phonological form -> Conversion G/P and P/G -> orthographic representation (external memory is used to control orthographic representation or to search orthographic trace)

Dictation: a task model



If S1O1, the probable path is: phonological form -> orthographic form and semantic knowledge -> orthographic representation
If S2O1, the probable path is: phonological form -> Conversion P/G -> orthographic representation (few orthographic errors)
If S1O2, the probable path is: phonological form -> semantic knowledge -> Conversion P/G -> orthographic representation OR direct activation of the orthographic representation based on semantic knowledge activation
Si S2O2, the probable path is: phonological form -> Conversion P/G -> orthographic representation (many orthographic errors)