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**NOTE TAKING BEHAVIORS STUDIED WITH THE HELP OF HYPERMEDIA**

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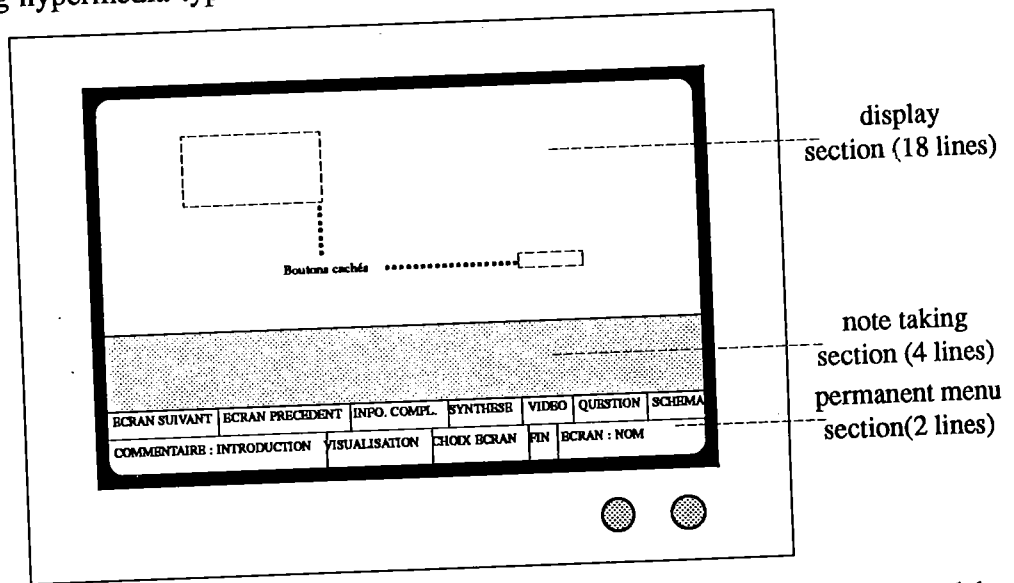
**A. The context : research on learning style**

The Service de Technologie de l'Education (STE) of the University of Liège (ULg) has undertaken a series of investigations on inter and intra personal variations in learning styles.

**B. The tool : DELIN**

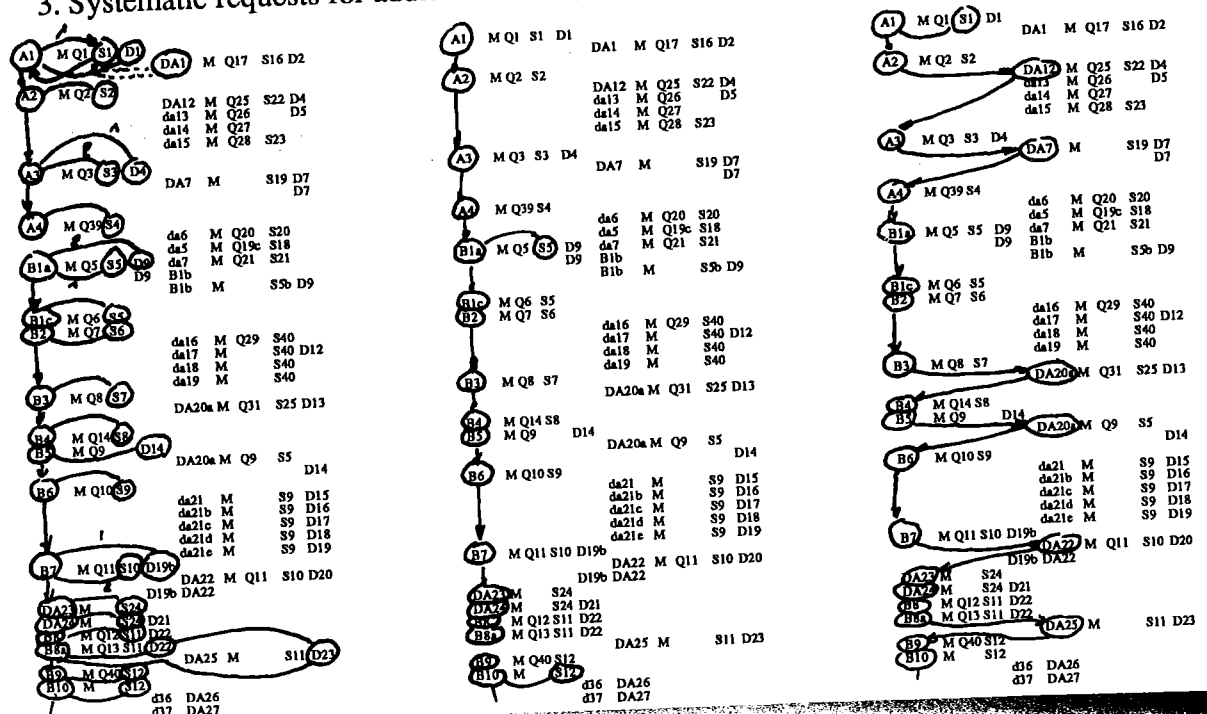
In a previous paper (LECLERCQ and PIERRET, 1989), a software shell called DELIN has been described. It helps creating hypermedia-type courseware. Figure 1 shows the three important parts of the screen, top-down cited :

figure 1



The content (Human Visual Perception) is supported by 200 different screens, structured by a "central itinerary" and additional branches of various depth. Figure 2 shows three different users' personal pathway :

1. Continuous requests of synthesis (S) and drawings (D) = visual approach
2. Superficial (global) exploration to get rapidly a general view = holist approach
3. Systematic requests for additional data (DA) = serialist approach



### C. The experiment : Note taking behavior

We wanted to study the behavior consisting in "taking notes in order to help further consultation of the document", just as one usually does when reading reference books (inserting pieces of paper between 2 pages, folding corners, writing signs in margins, etc.) or when viewing video (noting number count and key words to help remembering sequences).

Graduate school students were asked to learn the content, using freely the possible itineraries and taking notes (on the 4 available lines) with the help of the keyboard. They were told that two weeks after, they would be asked to answer a MCQ test, their electronic notes being made available to them.

### D. The test : MCQS and confidence

The test contains 15 MCQs, 8 of which been usual (the correct answer is one of the printed alternatives), the 7 others been "general implicit solutions" (See BOXUS, 1988), i.e. either code 6 (None is correct), 7 (They are all correct), 8 (Lack of data to decide) or 9 (An absurdity in the stem makes the whole question meaningless).

In addition, the students had to provide a confidence degree for each of their questions, on a 6 levels scale (See LECLERCQ, 1982 and 1988). Tarifs are computed according to decision theory so that students are interested in telling the truth (express their subjectively estimated confidence without faking or "bluffing"). Tarifs range from -20 to +20 for each question. Mean students scores will be expressed on a 20 points scale, averaged over the 15 questions.

A maximum of 15 screens could be consulted in the testing phase.

### E. The subjects : 50 students

The 50 students can be described as follows :

- Sex: boys (13), girls (37),
- Familiar(28)/non familiar(22) with MCQs,
- Familiar(39)/non familiar(11) with computers,
- With negative(39)/neutral(11) attitude towards computers,
- Have(4)/have not (46) read a booklet on the content between the exposure and the test (cheating/non cheating).
- Previous (13) knowledge of content or not (37)

### F. The results

#### 1. Anoted screens

Number of screens noted by students during the learning phase vary from 6 to 48, with a mean of 25 (26 by girls, 23 by boys).

Anoted screens are "central screens" (72 %), deepening (15 %), synthesis (10 %), schemata (1,5 %) and questions (1,5 %).

#### 2. Students' opinion

The majority (47 out of 50) of the students commented that the conditions (only four lines, keyboard, severe restriction on characters,...) made this note taking situation unusual.

#### 3. Recognizing one's notes

Just before the test, the students were invited to retrieve THEIR own notes among a series of 10 others (all computer printed); 47 students out of 50 were able to recognize their personal notes from the other ones, on the basis of the (declared) following cues : "my abbreviations" (15), "my writing style" (5), "the content" (5), "structure and highlighting" (5), "itinerary" (4), "spelling errors" (sic) (4).

#### 4. Overall test achievement

Pretest and post-test questions were strictly identical. Mean scores (computed with confidence marking tariffs) are :

PRETEST	8,03
POST-TEST	11,82
GAIN	+3,81

#### 5. Facilities of groups of questions

For each kind of questions, the objective facility (percentage of correct answers) and subjective facility (average confidence degree) indices were as follows (NQ = number of questions):

	NQ	OBJECTIVE FACILITY			SUBJECTIVE FACILITY		
		PRE	POST	GAIN	PRE	POST	GAIN
Usual	(8)	34	62	+28	47	69	+22
New Reject	(2)	22	58	+36	45	73	+28
All	(2)	52	66	+14	52	78	+26
Lack	(2)	23	30	+7	55	70	+15
Absurdity	(1)	52	64	+12	51	69	+18
Average	(15)	34	58	+24	49	71	+22

#### 6. Students performances according to their characteristics :

##### Familiarity with MCQs

	NQ	PRE	POST	GAIN
Familiar	(28)	8,07	12,81	4,73
Non familiar	(22)	7,90	10,54	2,64

Familiarity advantages.

##### Previous knowledge on the content

	NQ	PRE	POST	GAIN
Yes	(13)	9,10	11,60	2,59
No	(37)	7,41	11,60	4,19

Previous knowledge gives advantages only at start.

##### Attitude towards computers

	NQ	PRE	POST	GAIN
Negative	(11)	6,70	9,11	2,41
Neutral	(39)	7,30	12,57	5,27

Negativity lowers the achievement.

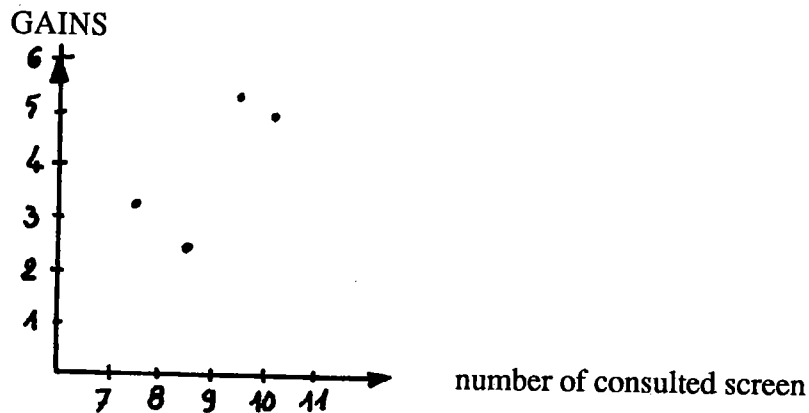
##### Have read (cheat) booklet before test

	NQ	PRE	POST	GAIN
Yes	(4)	10,2	14,42	4,22
No	(46)	7,85	11,63	3,78

Cheating favors achievement, but in students who already knew more about the content.

### 7. Screen annotation and gain

Relations between number of screens annotated (or consulted during testing) and GAIN are as follows:



Consulting annotated screens improves mean number of correct answers for 43 students out of 50 (86 %). Screens have been consulted in 35 % of time for a correct answer (on PRETEST) and 65 % for an incorrect answer.

### 8. Screen consultation and lack of confidence

The relation between the confidence degree (on PRETEST) and the frequency of consulting screen at post-test is as follows :

When confidence degree was	rate of consulting has been
0 (low)	61 %
1	52 %
2	63 %
3	58 %
4	48 %
5 (high)	26 %

## CONCLUSIONS

As has been seen, students' behaviours are influenced by a series of variables. Knowing the effect of each of them helps interpreting the fundamental variables under study. DELIN appears to be a very powerful tool to observe learning behaviors.

## REFERENCES

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