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AUTHOR   Rimor, Rikki; Kozminsky, Ely
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ABSTRACT
            In this study, 24 9th-grade students investigated several
issues related to modern Israeli society. In their investigation, students
were engaged in activities such as data search, data sorting, making
inquiries, project writing, and construction of a new computerized database
related to the subjects of their investigations. Students were encouraged to
write personal reflection notes after each session throughout the five-month
period of their work. Studying these reflections improves understanding of
the way students think about themselves as learners, about the task's
demands, and about strategies that are needed to deal with the demands. A
tool for analyzing the reflections based on Flavell's metacognitive
components is proposed. Replicas are analyzed according to 18 dimensions.
This tool enables comparison of different patterns of reflections among
students, as well as detection of dominant dimensions within the student's
own protocols of reflection. (Contains 14 references.) (Author/MES)

Learners' Reflections in Technological Learning Environments:
Why to Promote and How to Evaluate

Rikki Rimor
Department of Education
Ben-Gurion University of the Negev
Israel
moti@vms.huji.ac.il

Ely Kozminsky
Department of Education
Ben-Gurion University of the Negev
Israel
ely@bgumail.bgu.ac.il

Abstract: In the study reported here 24 ninth-grade students investigated several issues related to modern Israeli society. In their investigation students were engaged in activities such as data search, data sorting, and inquires, project writing and construction of a new computerized data-base related to the subjects of their investigations. Students were encouraged to write personal reflection notes after each session throughout the five months period of their work. Studying these reflections allows us to improve our understanding of the way students think about themselves as learners, about the task's demands and about strategies that are needed to deal with the demands. We propose a tool for analyzing the reflections based on Flavell's metacognitive components. Replicas are analyzed according to eighteen dimensions. This tool enables us to compare different patterns of reflections among students, as well as to detect dominant dimensions within the student's own protocols of reflection.

Theoretical Background

The aim of this study is to investigate the metacognitive process of students who reflect verbally on their learning experience in a data-base environment, and to introduce a tool for analyzing their reflections. The relationship between learning in information technology environments, such as databases, and metacognitive processes has not been documented enough yet. However it seems that learning in these environments entails metacognitive activities, such as reflecting on data search strategies and on their efficiency, as well as monitoring their impact (Butler & Winne, 1995).

The ability of individuals to reflect upon their own thinking is one of their unique characteristics as human beings. This capacity was termed by Flavell (1976) as Metacognition. Theoreticians have approached metacognition in different ways, but all of them relate the contribution of metacognitive processes to the enhancement of thinking and learning (Gange & Briggs 1974, Brown 1978, Brown, Bransford, Ferrara & Campione 1983, McCrindle &Christensen, 1995). The consent among researchers (e.g., Paris & Winograd, 1990) is that successful learners apply specific strategies while being aware to their own learning and thinking processes and that they practice it more efficiently and more frequently than less successful learners. Another consent among researchers in the field of metacognitive processes relates to their contribution to Self-Regulated Learning (Butler & Winne, 1995). Self-Regulated Learning (SRL) does not rely only on the development of regulation and monitoring skills, but also involves beliefs in one's competence as well as a self-conviction that learning is a tool to achieve personal goals.

In order to succeed in constructing knowledge in a technological environment that is flooded with information, one has to know how to select the most essential data. Students learning in a data base environment practice different strategies that bear on SRL, such as determining their path of data search, selecting and sorting relevant data, making inquiries and constructing their own data-base. However, learners differ in the extent of which they are capable of accepting responsibility for their own learning and by the extent of which they wish to be independent learners.

Recently, educators have come to realize that the educational system did not adequately enhance students' conception of self-responsibility and sense of autonomy, which are essential for SRL. The teacher's role has changed from being an infallible expert responsible for a final product, to being a guide who is more responsive to the context in which the learning is occurring. The new context that the educators are currently trying to promote stems from the Constructivist approach. This approach encourages learners to control their learning processes, reflect upon them and evaluate their results and progress in an open debugging procedure, which entails self reflection and peer dialogue.

Researchers have promoted the usage of reflections through writing and talking aloud techniques for learners in different learning environments (Cohen 1991, Di pardo 1990, Flower 1989, Graswohl 1989, Weiner 1986, Sarig & Folman 1990). Some interesting works were done about fostering reflections of students working with computers during science studies class (Beretier & Scardamalia, 1987, Taback et al. 1998). However, not enough effort has been invested yet in analyzing and characterizing reflections of students working with databases, as part of their social science studies. The importance of inducing a reflection process in data base environment should be emphasized since this environment is considered as ill defined learning environment. In this environment the learners need to select the desired data and organize it according to their own concepts of the investigated issue. The assumption here is that learning in less structured environment increases the need for reflection as a self-scaffolding and consequently improves learning.

Method

In the study reported here 24 ninth-grade students investigated during History classes several issues related to modern Israeli society. In their investigation they all started with a search for data using different resources such as books, fixed databases and dynamic data-base like the Internet. After the search students were engaged in construction of new databases, using Edubase software, and concluded with writing projects based on their investigation. In addition, students were engaged in activities such as data search, data sorting and categorization, data-base inquires and construction of an appropriate data-base related to the subjects of their investigations. They performed their task in pairs over a five months period, two hours a weekly session. Students were encouraged to write personal reflection notes after each session throughout the whole period of the study. The reflection notes included insights about the topic of their study, difficulties in achieving their plan, ways of solving the problem, new ideas, etc. They avoided writing when they felt that they did not have something to reflect upon. Their reflections were not graded, yet they expressed a keen motivation and a need to reflect upon their work. Students wrote between 1-14 reflections throughout the period of their investigations. The present analysis includes 24 students who wrote at least five reflections.

We attempt to answer two questions regarding students' reflections:
1. How do we evaluate reflections in a data-base environment?
2. What are the characteristics of learners' reflections?

In order to answer these questions we analyzed the reflections through the method of content analysis. We used Flavell's (1976). In their reflections students relate to the content of the task, to the activity involved, describing personal preferences and difficulties concerning the task, criticizing the task's demands, insights about the solution and more.

A Tool for Evaluating Metacognitive Components of Students Reflections (MCSR)

Students' written reflections were analyzed and classified according to components of metacognition: one's own knowledge about: his/her personal characteristics (P), the task requirements (T), strategies needed for accomplishing the task (S). Material within these three main categories was reread to identify subcategories. On the whole we identified 18 subcategories which became the tool dimensions. These dimensions represent students' notions and reflections about their actions during their work with the data-base. The dimensions of the metacognitive tool were coded and are identified in Table 1. Two independent judges performed the coding procedure. After the coding was completed differences were resolved in a conference.

Table 1: Dimensions of metacognitive components

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A. Personal Dimensions	Code	Descriptions
1. Personal traits	Pt	Insights about one's own character during the process of learning
2. Learning styles	Ps	Referring to preferences one has in regards to his/her own way of learning
3. Affective variables	Pa	Expressing emotions in relation to the learning process
4. Personal progress	Pp	Referring to one's own achievement, or sense of progress
B. Task dimensions		
1. Task's demands	Td	Monitoring the quality of the task requirements, reporting on the main goal and questions of the investigations
2. Task's relevance	Tr	Evaluating the relevance of the task in compare with the learner's goal or interest
3. Problems and difficulties	Tp	Describing difficulties and problems one encounters in performing the task
4. Task feasibility	Tf	monitoring time, space and resources needed to accomplish the task
5. Task contents	Tc	Describing content, data and materials of the task
6. Characteristics of data-base	Ts	Relating to structure and functions of data-base
C. Strategy dimensions		
1. Planning	Sp	Planning strategies for a specific task
2. Selecting and applying a strategy	Ss	Selecting and applying a strategy for data search and data-base construction
3. Solving problem	Sp	Solving problems concerned with the learning process and with the learning environment
4. Evaluating results	Se	Referring to results of data search and data-base construction
5. Monitoring and changing strategies of data search	Sm	Correcting the strategy used before and explain reason for the change
6. Articulating explanations	Sa	Providing a rational or an explanation to a description related to the learning process
7. Drawing conclusions and generalizations	Sg	Expressing generalized view about the content, or about the learning process
8. Asking for help	Sh	Describing situation where help of another person was needed

In order to provide examples of the various dimensions, we quoted replicas from three students' reflections:

Personal traits (Pt)
D: Deadlines are difficult for me. I feel pressured and I don't read the text profoundly and then forget what I have read (30/10/98)
Learning styles (Ps)
D: I realize that sometimes I can understand better from a picture or a caricature than from regular text (30/10/98)
Task relevance (Tr)
L: Today I searched for information in the library…I found some relevant pieces of information that I needed for my work (3/1/99)

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Task feasibility (Tf)
M: The same problem – Imbalance between the amount of data relating to the different women.. .We don't have enough material to start writing (26/3/99)
Problems and difficulties (Tp)
D: We could not connect to the Internet (8/1/99)
Characteristics of data-base (Ts)
L: The headings in the Tekuma data-base are misleading because the documents we found did not match our search (16/10/99)
N: we have learned how to connect between the data-base fields and to create quires (22/1/99)
Planning strategies (Sp)
M: We think it is clever to write the introduction at the end (19/2/99)
M: We decided to focus on specific topic (10/4/99)
Selecting and applying strategies (Ss)
M: we sorted the women list into categories (as: Politics, literature, poetry etc.)
Drawing conclusions and generalizations (Sg)
D: I learned that the difference between a great leader and an ordinary person is the ability to look forward and to vision future (31/10/99)
N: The most important thing is that I have learned to look at things from different perspectives and this is more important and more interesting (31/10/98)
Asking for help (Sh)
D: First we did not know how to import data from the Internet to our data-base. We had to ask Zehava for help and she demonstrated it for us (1/1/99).

Studying these reflections will allow us to improve our understanding of how and what students think about themselves as learners, about the task's demands and about strategies that are needed to deal with the demands. A comprehensive research can benefit from this kind of analysis by comparing different patterns of reflections among students, as well as analyzing dominant dimensions within the student own protocols of reflection. The following case example demonstrates the proposed method of reflections' analysis.

A Case Example

The following is an example of dimensions' analysis of reflections. The reflections were written by two 15 years old students: Michelle(f) and Lior(m). In order to demonstrate their reflections' pattern and to compare between them we selected two dimensions of the Strategy components: 1. Evaluating results (Se) 2. Articulating explanations (Sa). Analysis of these dimensions' frequencies (Table 2) yield a unique pattern for each student and allows a comparison between their reflections.

Table 2: Total Frequencies of Michelle's and Lior's strategy's dimensions

Student	Number of Reflections	Se	Sa
Michelle	14	6	13
Lior	10	8	2

Comparing the two dimensions within each student reveals that Michelle is engaged much more in articulating explanations then in evaluating results (6:13). Lior's reflections pattern is clearly dominated by evaluating results than by articulated explanations (2:8).
Comparison between the two students reveals that Michelle has a clear advantage (4.64 to 1, controlling for the total number of reflections) in accompany her descriptions with articulated explanations whereas Lior tends to evaluate his results more than Michelle does (1.87 to 1).

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Another aspect of analyzing the reflections is to evaluate the various dimensions in a qualitative approach. This approach is aimed at evaluating the richness of the dimension rather than its frequency. The following replicas are used to demonstrate a qualitative analysis of the strategy dimension of Articulating explanation (Sa): Michelle: we think it was a smart idea to write the introduction at the end of our project since we have already resumed the work and we had conclusions and a general view, so it was easier to explain our research question. Lior: We agreed to split the work between us. Yotam who understands better Edubase was responsible on creating the data-base's fields.Lior: ...today we were supposed to finish the project and to submit it, but because of technical problems with Edubase we needed to...

Analysis of the three replicas above suggest that Michelle's explanations are better articulated, detailed and explicit than Lior's. His first explanation is implicit and rather short and the second replica is missing any information to identify the technical problems he claimed. Michelle's replica has also an argumentative structure that includes a claim and proofs and a conclusion, which Lior's replicas are missing. Based on this analysis we can claim that her articulation is qualitatively richer than Lior's.

Conclusions

It seems evident that by encouraging students to practice reflections we may increase and foster their ability and practice to do it. The contributions of reflection to learning in general and to learning in data-base environment specifically, were discussed earlier in this paper. Analysis of learners' reflections can serve teachers as a prism to get a real time view of their teaching process and as an authentic tool for evaluation of their students learning. Further analyses are performed in order to study gender differences, as well as to examine changes in dominance of various dimensions, along the time course of the intervention.

References

Bereiter, C., & Scardamalia, M. (1989). Intentional learning as a goal of instruction. In: L.B. Resnick (Ed.). *Knowing, learning and instruction: Essays in honor of Robert Glazer*. Hillsdale NJ: Lawrence Erlbaum Associates.

Brown, A. (1987). Metacognition, executive control, self-regulation, and other more mysterious mechanisms. In F. Weinert & R.Kluwe (Eds.), *Metacognition, motivation and understanding* (pp.65-116). Hillsdale, NJ. Erlbaum.

Brown, A.L., Bransford, J.D., Ferrara, R.A. & Campione, J.C. (1983). Learning, remembering and understanding. In J.H. Flavell & E.M. Markman (Ed.), *Handbook of child psychology:* vol. 3 *Cognitive development* (pp.77-166). New York: Wiley.

Butler, D.L., & winne, P.H. (1995). Feedback and self-regulated learning: A theoretical synthesis. *Review of Educational Research*, 65, 245-281.

Cohen, A.D. (1991). Feedback on writing: The use of verbal report. *SLLA*, 13, (pp.133-159).

Di Pardo, A. (1990). Narrative knowers, expository knowledge. *Written Communication*, 7, 59-95

Flower, L., et al. (1989). *Reading-to-write Reports*. The Center for the Study of Writing, Pittsburg, PA & Berkeley, CA.

Gange, R.M. & Briggs, L.J. (1974). *Principles of instructional design*. New York: Holt, Rinehart and Winston.

Gradwohl, J.M., & Schumacher, G. M. (1989). Writing-to-read: *Do some writing tasks facilitate more learning than others?* Paper presented at the American Educational Research Association Conference, Chicago, IL.

McCrindle, A. & Christensen, C. (1995). The impact of learning journals on metacognitive and cognitive processes and learning performance. *Learning and Instruction*, 5, 167-185.

Paris, S.G., & Winograd, P.W. (1991). How metacognition can promote academic learning and instruction. In B.J. Jones and L. Idol (Eds.) *Dimensions of thinking and cognitive instruction*. Hillsdale, NJ: Erlbaum.

Sarig, G., & Folman, S. (1990). Metacognitive awareness and theoretical knowledge in coherence production. In M. Spoelders (ed.), *Literacy acquisition*. Van In.

Tabak, I., Sandoval, W.A., Smith, B.K., Steinmuller, F. & Reiser, B.J. (1998). Reflection as a vehicle towards local and global understanding. *Paper presented at the annual meeting of the American Educational Research Association*, San Diego, CA, April 1998.

Weiner, W.F. (1986). When the process of writing becomes a tool for learning. *English Journal, 75,* 73-75.

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NOTICE

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