

“The Design of a Mixed-media Curriculum in the learning environment by using The CRONOS Education system”

Junko Sugimura*, Yoshiyori Urano* Tatsuhisa Miyano**

* Waseda University, Japan

**Editorial Engineering Laboratory, Japan

*junko@suou.waseda.jp urano@giti.waseda.ac.jp **miyano@eel.co.jp

ABSTRACT

We have designed mixed-media curriculum for history lessons in Japanese high schools. We (teachers and application developers) have understood the profound advantages of various media (Books, Videos, Internet, The CRONOS system) and have created lessons that use the most appropriate forms of media. In collaborative and interactive situations, students in the classroom could gradually develop the ability to look at historical events from various viewpoints. Through experiments, we have demonstrated that students could think about day-to-day situations to discover, to understand, to reconstruct, and finally to create new relationships between daily events.

Keywords

The CRONOS system, design experiments, mixed-media lesson, collaborates and interacts

1. INTRODUCTION

Traditionally, lessons are conducted by using textbooks and blackboards. Recently in Japan, various types of media, including videos and the Internet, are being recommended as support tools for learning. However, these tools are only used independently which result in few effective changes in learning environments. We have designed mixed-media curriculum which use various media in the most effective way.

2. The CRONOS system

The CRONOS system is a research and education system with “Crono-navigation”. The Editorial Engineering Laboratory (EEL) has developed what we called “CRONOS” system with more than 50,000 historical event data (“Crono objects”) based on a much-acclaimed book “History of Information,” written and edited by EEL. (CRONOS is named after the Greek god of time.) This was done as part of a large national project initiated by MITI (Ministry of International Trade and Industry) to enhance educational software systems.

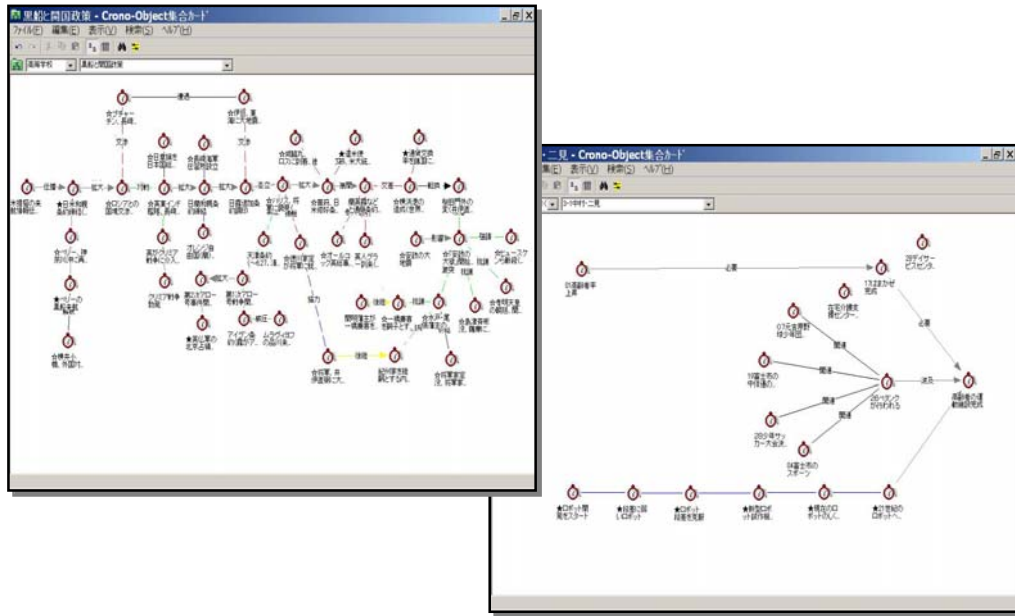


Figure2 Relationship data flow diagram use Co-set

厩象カード

20センター試験まじまる

項目名	値
• 年月日	1990年
• ページ	430
• テーマ	6
• ブロック	不明
• 種別	一般厩象
• 分類	教育の発展と教育...
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• 分類	

昭和54年、国立大学の共通一次試験がスタートした。受験競争の緩和や難問、密告の排除が目的だったが、逆に偏差値による輪切り選抜が拡大し、大学の序列が顕在化する弊害を生んだ。また、5教科7科目の試験が受験生に大きな負担となり、国立大離れが進んだ。こうした結果をふまえて、平成2年に共通一次試験を廃止し、私立大学も参加できる共通テストとして「大学入試センター試験」がうまれた。

データベースから削除
閉じる

Figure 3 Crono-Card (plug-in video data)

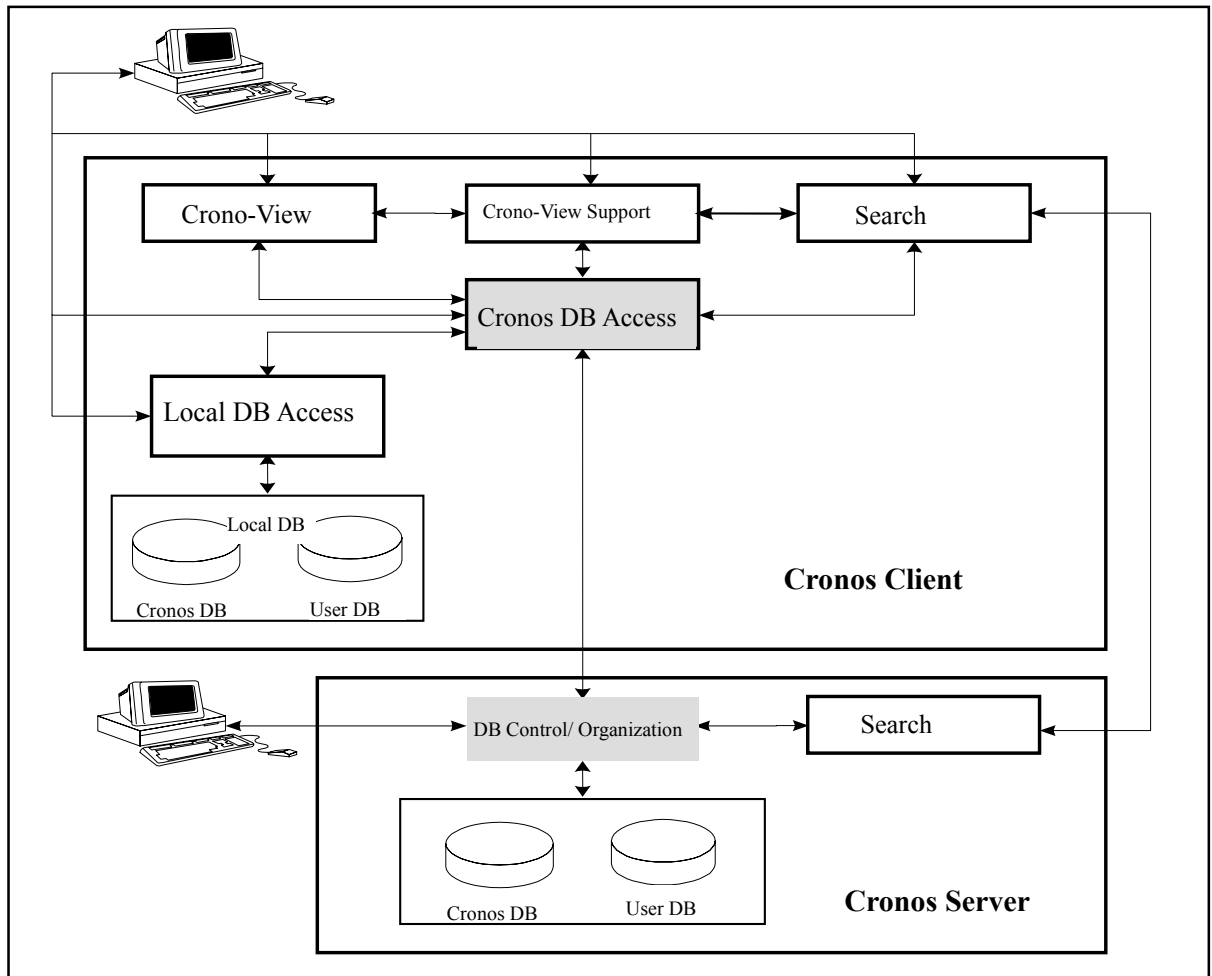


Figure4 The CRONOS system Component

3. Design Experiments as an Approach to Education

Designing learning environments involves many kinds of school activities.

We have to consider the total package of instructional input such as the classroom culture for studying, characteristics of teachers and students, curriculum contents, innovative technologies, and so on.

The crucial point in learning design is what kind of objectives students have in their mind while learning. The teacher sets a target for the class so as to help them acquire knowledge or skills. The students, however, do not necessarily share the teacher's intention. Bereiter and Scardamalia [1] give the example of a directed reading lesson to demonstrate this discrepancy between teacher

and student expectations. In the lesson, students read part of a text chosen by the teacher, and respond to the teacher's questions. What kind of cognitive activities are the students engaged in? It seems clear, on the surface, that training in reading skills is involved. If one examines the lesson more carefully, however, one finds that the teacher does all the important reading activities. The teacher picks out what is important in the text, determines what is difficult and what is easy to understand, points out which conclusion is most important, and evaluates the correctness of their interpretations. The major role of the students is to answer the teacher's questions. Thus, what is acquired in this lesson is likely to be no more than the skills or strategies needed in answering questions. As long as students consider the lesson as a task, their objective is likely to remain answering questions asked by someone else, and they will develop strategies to meet this objective.

In response to this kind of observation, Bereiter and Scardamalia developed the idea of "intentional learning". If students consider learning to be a task, no strategies can make learning more efficient. These strategies only serve to drive students away from real learning. The point is: how can we change students' view of "learning as task" to one of "learning as the construction of knowledge"

In the course of attempting to focus students' attention on the construction of knowledge itself in order to foster intentional learning, Bereiter, Scardamalia and their associates have concluded that the construction of knowledge is a social and not just an individual activity. "What is learning if it is not an individual activity?" is the key question which cognitive psychology is facing today.

Psychologists have tended to treat learning as a phenomenon occurring in individual minds, and have considered what is acquired as a result of learning only on the levels of knowledge and skills. This has led them to consider human beings as bundles of specific abilities. Specialists have further divided each kind of ability, e.g. linguistic or mathematical, into sub-categories. It was tacitly assumed that teaching history, for example, means improving students' ability to understand history from various viewpoints. For this reason, typical experiments in instruction/learning have measured outcomes of instruction by giving tests to check the acquisition of particular knowledge or skills. Learning was thought to consist of becoming able to answer a question which one was not able to answer previously, no more and no less.

We nowadays focus teachers' attention not so much on what and how we teach as on how the traditional view of learning can be outgrown and a new framework constructed. In recent years we have emphasized that we should view human beings in their entirety, and that learning should be seen as a form of enculturation that occurs in the context of each learner's relationship with the surrounding community. Learning is becoming a topic in sociology and anthropology rather than only in psychology.

In addition, we have to think about two sides of the intervention: first, contributions to learning theories and, second, practical feasibility. Researchers and application developers want to contribute to the learning community based on results from our design experiments. The consequences should be valuable to teachers as well. Researchers and application developers are allowed to learn from failures through design experiments, but teachers are not. Teachers need a promise that new attempts should be better than or at least not worse than their current practices. Further, output should be accountable for both sides [2]. Thus, the intimate collaboration between researchers and application developers and practitioners is necessary for learning design.

We have taken the practitioner-as-learner-centered approach to design. In our approach, we started with teachers' concerns with their practices in the classroom and their philosophical views on teaching and learning. Based on the lesson plan, we discuss what perspectives on student learning we are going to take in designing the curriculum and what we hope students do in their learning.

This type of collaborative design helps us to articulate problems with the design and attempt to solve the problems by using our research and practice-based expertise. [3]

4. Design Principles

In design experiments, we need principles. We have to integrate our expertise on learning into the curriculum design. This task is not just compiling all we have known on learning, but a very difficult work to blend expertise from different viewpoints. In our design, we have referred to the basic system of the community of learners (Figure.5) by Brown and Campione. [4] In the community of learners, the basic components are research (students-directed learning), information sharing, consequential tasks (i.e., students' recognition of their knowledge as applied to problem solving in the future), deep disciplinary contents (beyond textbook level), and students' reflection on their own activities.

(i.e., metacognition).[5]

In the framework, our challenge for the curriculum design was to appropriately use The CRONOS system to facilitate students' sharing of information and reflection on their learning activities.

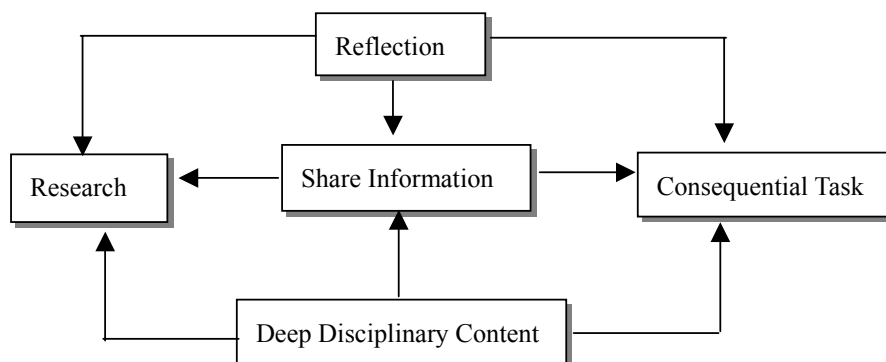


Figure5 The Basic System of the community of Learners

5. Mixed-media Design Experiment

Here is our designed mixed-media lesson plan. An instructional goal was to facilitate students' understanding and to get various focuses on daily experiences and observations. In addition, students' activities were expected enhance social construction of knowledge. They would be engaged in revising their thoughts in order to further understanding, and their thoughts would be considered and criticized collaboratively so that they have their understanding shared socially in the classroom.

4-1 Curriculum Goal

- (1) To create new historical stories (discover new historical relations and new perspectives)
- (2) To develop editing and organizing ability
- (3) To make effective use of various media (reedit the information from books and the Internet)

4-2 Students Activity Structure

A: Decide on historical theme

- A-1 Select some themes by using The CRONOS system database classification (Figure.8)
- A-2 Pick up a lot of keywords by using exercise sheet
- A-3 Map the keyword network
- A-4 Select their own historical theme

B: Edit historical data using various media (Books, Magazine, Video, the Internet etc.)

- B-1 Search and select various media related to historical theme
- B-2 Classification and layering of information
- B-3 Understand tree structure
(Tree structure refers to brainstorming chart created by the student)
- B-4 Make chronological event data by using text, pictures, video in the Crono-Card (Figure.3)

C: Create new historical story

C-1 Discover new relationship between Crono-object (event data) (time, category, area)

→ use Crono- view(Figure.1)

C-2 Make connections between historical events by using Co-set (Figure.2, Figure.7))

C-3 Create historical story by good use of event-data

(Structure any information and consider information contexts)

C-4 Presentation and discussion of the stories

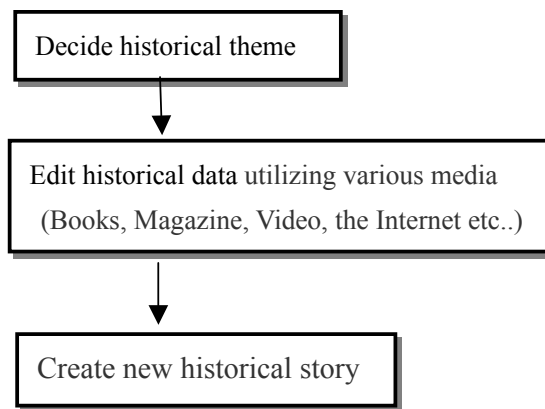


Figure.6 Curriculum Flow

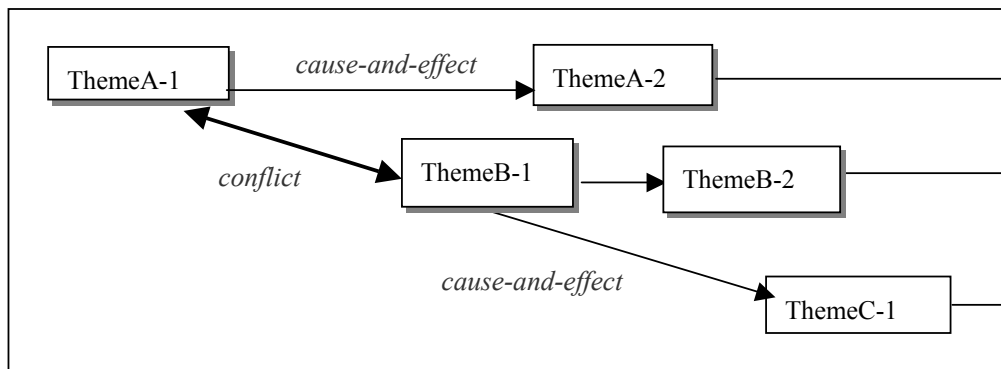


Figure.7 Create relation by using Co-set (a part of Co-set sheet)

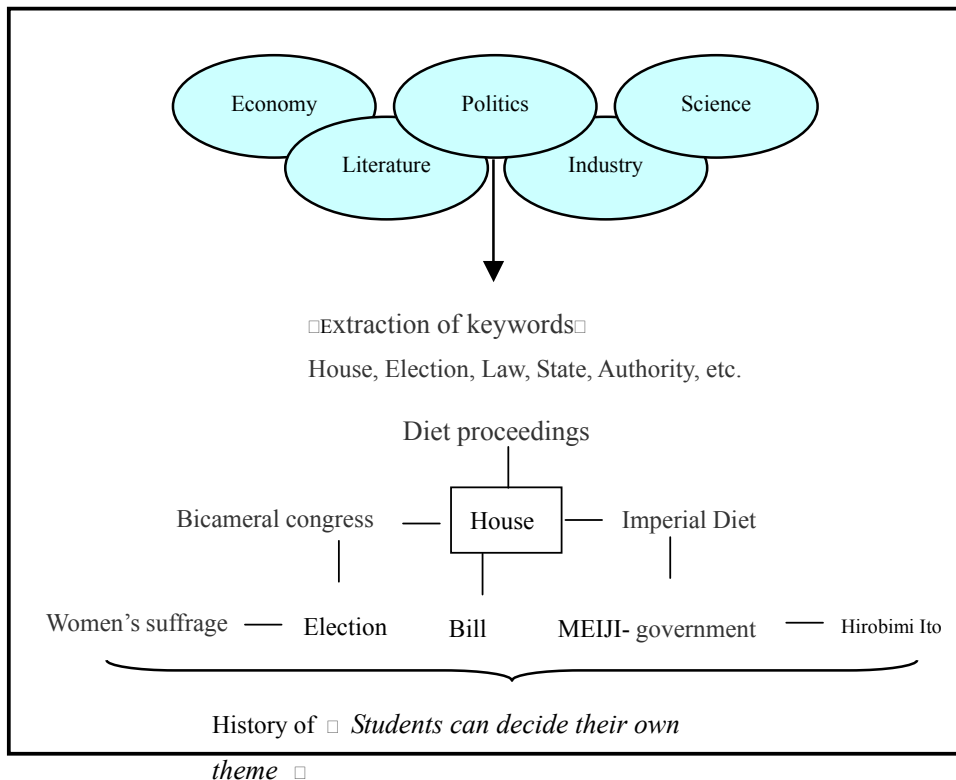


Figure8 Activity of deciding historical theme

6. Evaluation of the mixed-media effect

Before, we tried two practices through the use of this type of curriculum.

One practice used books. Another used The CRONOS system. We compared the number of events-data and relationship lines of Co-set. (Figure.9, Figure.10).

Mixed-media lesson students could select various types of event data, but as shown in Figure.9, did not select so many historical events.

Figure.10 demonstrates that the number of relationship lines between events in classes with mixed-media lessons is far greater than in classes using books.

As we expected, Co-set created by students in classes using only books utilized almost entirely their own theme and events data.

But using CRONO-view, they could collaborate with other students' data and discover new relationships between other events related to their theme.

For example, one student researched "The history of the development of the computer". Others' themes were "The history of telecommunication" or "The history of audio equipment".

If they researched using only books, they never considered another theme's events and

relationships. But when all students' data in the classroom was collected on CRONO-view, they could find new relations of cause and effect from the events data. So they created a lot of relationship lines from one event.

Furthermore, we believe, when students collaborated with others, they could create new historical stories from their theme.

The results, we think, suggest that the mixed-media lesson design was more successful than before. We cannot directly compare results because students selected different themes. Even if they selected the same theme, everyone has different perceptions and viewpoints. We still, however, conclude that the mixed-media curriculum design was better for the following reasons: the lesson concepts were prepared based on the characteristics of various media, and students' activities went step by step. Therefore the presentations that the students created were evaluated by many teachers. We believe more students in mixed-media classes attained a deeper conceptual understanding of the historical events.

By providing students with scaffolds in their editing activities, the CRONOS system made the mixed-media class crucially different from the class using only books. A difference we should pay attention to is that students in mixed-media class could create reasonable relationships between events data. We interpret this difference as follows: first, CRONO-matrix view's 3D interfaces provide students with a historical time tunnel.

Students could perceive historical events' background, temporally, geographically, visually, so they could integrate the categories. Secondary, students could get other data and various viewpoints collaboratively in CRONO-matrix view. They could find out new historical data, which they might not have noticed on their own. Finally, the result of the analysis of their historical stories is that they were able to gain a deeper understanding and increased awareness of history. They communicated in a more socially cognitive manner.

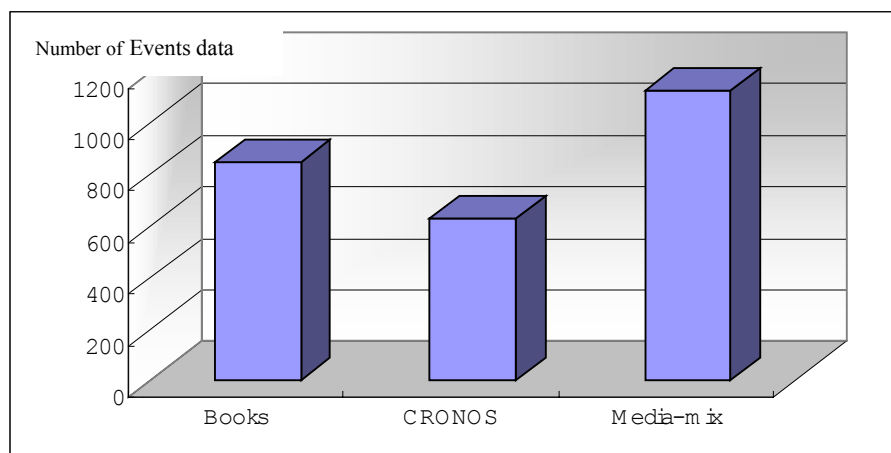


Figure9 Compare numbers of total events-data
 (40students in classroom, have researched data for 20years (1980-2000))

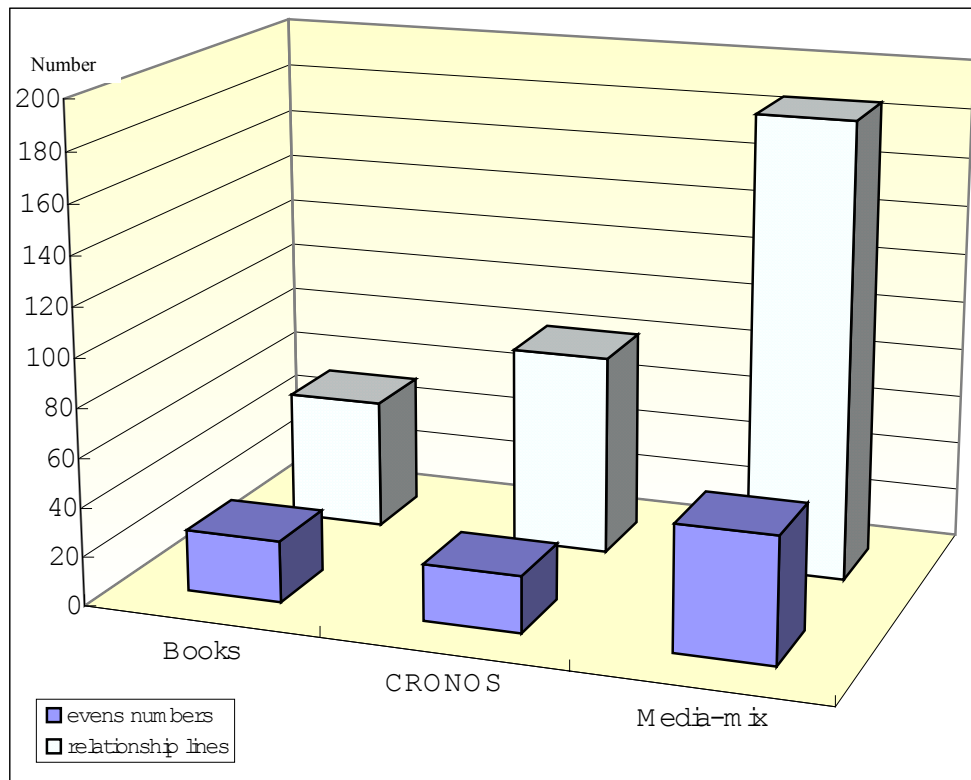


Figure10 Compare numbers of event-data and relationship line in Co-set
 (Average of 40students historical events and relationship line in one Co-set sheet)

7. Conclusion

We reported about our Mixed-media design experiments in Japanese high schools. We found that using various media based on these characteristics, students could evaluate historical events with a deeper understanding and could improve their reediting ability. Reediting ability means that students could not only recognize new relationships between

historical events but also gain a clearer understanding of those events. In addition, students could collaborate and share new points of view as a result of a mixed-media curriculum.

Finally, by using visual reminder technologies like The CRONOS system, students have a more comprehensive and deeper insight into history than by using only textbooks.

References

- [1] Bereiter, C & Scardamalia, M.(1989). Intentional learning as a goal of instruction in Resnick, L. (Ed.). *Knowing, Learning, and Instruction*. Hillsdale, NJ. LEA.

- [2] Bransford, J.D., Brown, A.L., & Cocking, R.R. (1999). "How People Learn: Brain, Mind, Experience, and School". Washington, DC: National Academy Press

- [3] Sugimura, J., Miyanohara, T., Urano Y., (2001) "The development of the learning curriculum to step up self-expression" *Proceedings of the 17th Japan Society for Educational Technology* pp

- [4] Brown, A. L., & Campione, J.C. (1996) "Psychological theory and design of innovative learning environments: On procedures, principles, and systems. In L. Shauble & R. Glaser (Eds.), *Innovation in learning: New Environments for Education* (pp.289-325). Mahwah, NJ: Lawrence Erlbaum.

- [5] Oshima, J., Oshima, R., Murayama, I., Inagaki, I., Nakayama H., Yamaguchi, E & Takenaka, M., (2002) "Design Experiments for Integrating a CSCL Technology into Japanese Elementary Science Education" *Proceedings of CSCL2002*