



A Large Variety of Writing Instruments: Studying the Evolution of Technologies in Familiar Items

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Report of the Seminar Class
for 2nd year students of Faculty of Informatics
April to July, 2010 (1st semester):

90 minutes × 14 = 21 hrs. 10 students.

Students had no ideas on technology development nor TRIZ,
when they selected (or were assigned to) and started this Class.

==> A Class to learn important TRIZ/Technology concepts
without using any TRIZ terms/tools

Initial Wondering Situations before the Class

For what purpose this class handles
things like 'Writing instruments'?

Do they have any relationship with PCs or IT?

(1) List up different kinds of Writing Instruments, as much as you can think of !

- Show your own favorite writing instruments of everyday use,
and explain their good points!
- With the keyword of 'writing instruments',
list up as many examples as you can think of !
- Describe each item on a Post-It-Note, one after another !
- Instead of a commercial product name,
use more general name of the product !
- Put every item card on a big sheet of paper, and try to classify them !
- **Homework:** Visit stationery stores, convenience stores, home-centers,
stores of drawing materials, etc., and
survey various kinds of writing instruments !
Watch the products closely, take photos, and take notes of them !
Also study in libraries, on the Internet, in catalogues, etc.!

(2) Understand the Basic Mechanisms of Principal Writing Instruments !

Explain the mechanism/principle of writing/drawing with
each Writing Instrument !

Pencil: The graphite crystal (of the lead) leaves its fragments on the paper.

Ballpoint pen: The small metal ball rotates and transfers the ink (liquid) onto
the paper.

Pen: The slit of the pen tip transfers the ink (liquid) through little by little.

Felt pen: The porous part of the pen allows the ink (liquid) to go out little by little
onto the paper.

Classify the Writing Instruments with the mechanisms !

Pencil and **chalk** belong to a same group.

Crayon is similar, but slightly different.

Mechanical pencil is just a version of pencil made convenient. ...

(3) Writing Instruments and auxiliary tools for Writing /Drawing

Instruments for Writing/Drawing anything on something are members of Writing Instruments

Writing brush → Paintbrush → Brush → Roller → Spray → ...
 Wood stick to write on the ground → Spatula → Carving knife →
 Chisel for gold work → ...

==> We are interested in all the Methods for Writing/Drawing anything on something

Among stationery, there are various auxiliary instruments besides Writing Instruments.

E.g. Paper, Eraser, Ruler, Compasses, Drawing table, Templates, ...
 E.g. Lead refill, Ink, Paint, ...

==> Writing Instruments are at the core position of the system/environment for Writing/Drawing

(4) Descriptions of Various Writing Instruments

(A part of Joint Report by the Class members)

□ Drawing/Writing Instruments, where ink is applied with a soft porous end

● Felt Pen

- 油性フェルトペン (インクが油性であるもの)
- 水性フェルトペン (インクが水溶性であるもの) (耐水性の水溶性サインペン)

◇ 蛍光ペン

● 'Paman'

トラディオ・ブラマン (インキがなくなる最後までみずみずしく書けます。)
 画像参照: <http://www.pentel.co.jp/product/>



● 'Line Marker'

線引き用の筆記具。文字などの上にかがせるように線を引くと、その下の部分が透けて見えるような、さまざまな色のフェルトペン。)
 画像参照: <http://www.pentel.co.jp/product/>



● 'Bush-Pen'

筆先が尖っていて、筆先全体が柔軟な多孔質材料できている (墨とす墨の二色の筆ペン)
 画像参照: PILOTホームページ (http://www.pilot.co.jp/products/pen/sign_marker/fude_pen/futayaku_keityou/index.html)



● 'Color brush' [calligraphy-brush]

カラーブラッシュ(カリグラフィーブラッシュ) (みずみずしく鮮やかな発色のカラーインキと毛筆が一つになって柔らかな線の表現や水彩表現ができ、広い面もスムーズに塗れるカラー筆ペンです。)
 画像参照: <http://www.pentel.co.jp/product/>



● Roller (Drawing/Writing Instruments, where a cylindrical roller is turned while ink (or paint) is applied with its soft porous side material.)

□ Drawing/Writing Instruments, where ink/paint is applied with brush made of many thin hairs

● Paint brush (先端全体が細く尖ることはない)

● Brush (先端の毛が横幅広く揃えられていて、太く、広く、描く/書く)



(5) Table 1. Variety of Writing Instruments

(Classified with Mechanism) (Summary)

Mechanism	Mechanism in detail	Examples	Extensions
Gives a damage		Wood stick, Stone, Knife, Carving knife	Laser
Leaves a part of itself as a trace	solid (crystal/powder)	Chalk, Charcoal, Pencil, Mechanical pencil	'Kurutoga' mechanical pencil
	solid paste	Colour pencil, Crayon, Crayon pastel,	'Coopee'
Adds a solid/powder		Line marker on a tennis court	
Adds a fluid		Painting spatula, Painting brush, Roller	
Adds a liquid (ink, etc.)	Ink is applied with a solid end	Pen, Fountain pen, Drawing pen, Ball-point pen	Multiple colour ball-pint pen, Multi-function pen
	Ink is applied with a soft porous end	Felt pen, Brush pen, Roller	Oil-based ink felt pen, Water-based ink felt pen, Highlighter pen
	Ink is applied with a brush composed of many thin hairs	Painting brush, Brush, Writing brush	
Injects a material (powder/fluid/liquid/gas)	Injects a powder (solid) material		
	Injects a fluid material	Spray for wall painting	
	Injects a liquid material	Spray	
	Injects a gaseous material		Dry etching
Puts a material inside the medium			Glasswork

(6) Think of Various Usages of Writing Instruments !

• First, tell any instances of usage of Writing Instruments !

Taking a note, Writing a document, Drawing a picture, Writing one's name on a cloth, Drawing a cartoon, Decorating a glass window, Carrying around to take a note, ...

• Pick up any Writing Instrument and think 'What purpose was it made for?' !

• Write the various usages one by one on a Post-It-Note !

• Think how we can classify the various usages themselves !

==> What to write/draw? On Which to write/draw?

How to write/draw? ... these are the important aspects.

(7) Classify Various Usages of Writing Instruments !

- **What: Pictures, Drawings, Characters**

(In the human history: Pictures --> Drawings --> Characters)

(We say: Draw/paint a picture. <----> Write a character.

Draw/write/make a drawing.)

- **On Which: Ground, Wall, Board, Clothes, Paper, Stone, Ceramics, Glass, Metal, Plastics,**

These are arranged roughly in the historical order

- **How: How about the results:**

Multi-coloured, clear, in the same thickness, ...

How about the writing process:

Without getting tired, easy and convenient, without getting dirty, ...

(8) Table 2. Variety of Writing Instruments (classified with the Usage) (Summary)

On Which What	Ground	Wall	Board	Clothes	Paper	Stone	Ceramics	Glass	Metal	Plastics
Pictures	Wood stick, stone	Spray, Brush, Roller	Painting brush, Brush, Spray, Roller	Painting brush, Pattern printing, Dying	Painting brush, Crayon, Crayon pastel			Spray		
Drawings		Carving knife, Stone	Carving knife		Painting brush					
Characters	Wood stick	Brush	Chalk	Felt pen	Pencil, Mechanical pencil, Fountain pen, Felt pen, Ball-point pen			Spray	'Solid marker'	

(9) Evaluate Various Methods of Writing/Drawing for Different Usages !

On Which Methods	Ground	Wall	Board	Clothes	Paper	Stone	Ceramics	Glass	Steel	Plastics
Gives a damage	▲	▲	●	-	-	●	▲	▲	▲	▲
Leaves a part of itself as a trace	-	▲	●	▲	●	▲	▲	-	▲	▲
Adds a solid/powder	▲	▲	▲	▲	▲	-	▲	▲	▲	▲
Adds a fluid	-	●	●	▲	▲	▲	●	▲	●	●
Adds a liquid (ink, etc.)	-	●	●	●	■	▲	▲	-	▲	▲
Injects a material (powder/fluid/liquid/gas)	-	●	●	▲	●	▲	▲	▲	▲	▲
Puts a material inside the medium	-	▲	-	▲	-	-	▲	▲	-	▲

Evaluation levels : ■ ● ▲ -

Papers are especially highly developed among the media on which to write/draw.

(10) Think of 'Writing Instruments' in A Wider Sense !

- We have so far assumed (without knowing) the cases to write/draw something one by one.

- What do we use when we write/draw same elements or same things many times repetitively?

Seals, Personal seals, Rubber stamps, Block print, Printing, ...

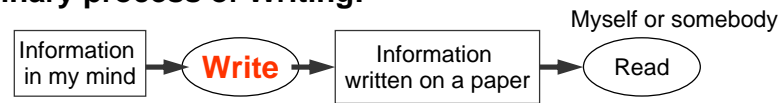
Types, Typewriter, Keyboard, Word processor, Personal Computer, ...

Carbon copy, Photograph, Copying, ...

==> Now you see a huge new areas of Evolution of Writing/Drawing Instruments !!!

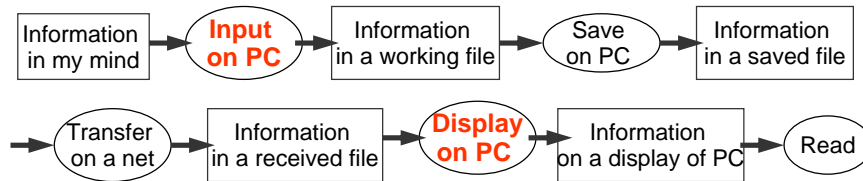
(11) Recognize the Process of Writing/Drawing !

Ordinary process of Writing:



==> Writing = Inputting and Outputting, simultaneously

Process of Writing with PC:



==> Writing Instruments are requested as both Input and Output devices, simultaneously.

(12) Resolution of the Initial Questions:

For what purpose this class handles things like 'Writing Instruments'?

- To study the evolution of technologies not through lectures given by words but through our own activities of studying familiar items.

Do they have any relationship with PCs or IT?

- PCs may be seen as far-extended Writing Instruments. Study of Writing Instruments may be useful when we think about Input and Output devices of PCs or IT. Basic concepts of Evolution of Technology are applicable to Information Technology (IT) as well as to Writing Instruments.

(13) Students Learned through This Class:

- Our images about Writing Instruments have changed/extended.
Formerly: Writing Instruments = Tools to write on papers.
- Things around us have hidden records of evolution of technologies.
Ex. An extension of pens was the invention of fountain pens.
The drawbacks of frequent shortage of ink triggered the invention.
- Clarifying needs and purposes inspires further development.
- Lessons learned with the cases of Writing Instruments will be useful in the study of IT and Informatics, and many other.

Various machines must have similar mechanisms of evolution of technology. Various methods which we learned and used in this class will be useful in our further study in IT and Informatics.

(14) Conclusion

- This is a model of teaching TRIZ concepts without using TRIZ terms and TRIZ tools.
- Attracting interests by using familiar items, and stimulating ideas about mechanisms, technology development, technology evolution, etc.
- No formal knowledge of systems, engineering, development process, etc. are assumed.

==> Practicable also for kids

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