3 RQ.No.3 What kinds of content can make Multimedia

Learning become effective as pre-condition ?

What is Research question No.3's main topic

1

Here, <u>the research focuses on not presentation design</u> like screen and narration <u>but the content itself as pre-condition on which multimedia learning perform its</u> <u>effectiveness</u>. That is <u>content framework as pre-condition</u>, which cause effective knowledge gain when applying multimedia learning. To say with one words, it is conceptual design of Multimedia materials.

Again, "<u>Multimedia Learning</u>" totally rely its effectiveness on thoughtfully designed content to foster intellectual growth as premises. A relationship between the content quality and presentation format is so deep that they cannot break up.

Output

• Over view of research question RQ.3 structure Context

Strength of graphic Multimedia Graphic is good at Presentation expressing Complex, Influence Good effect abstract, highly imaginative information. on learners Or spatial and logical Content relationship which support multimedia presentation effect is Strength of Dual mode 1)What is cause-and-effect chain? Dual mode presentation is good when content has 2)Does it really work? Cause-and-effect chain 3)How to make (Mayer,2001) Cause-and-effect chain?

Effective content design principle for effective multimedia learning <u>lay in both</u> <u>strength of graphic and strength of dual mode.</u> So good content is the content which has information, which is easy to be expressed by graphic. For example, <u>complex</u>, <u>abstract highly imaginative information which has spatial and logical</u> <u>relationship</u>. Or good content is the content which has <u>cause-and-effect chain</u>. So in other words, <u>good content design principle is cause-and-effect chain</u>.

Benefit of Multimedia presentation is graphic and integrated presentation

Benefit of Multimedia presentation lay in graphic and integrated presentation.

Because these two are features that traditional lecture can't provide but multimedia lecture can.

That is, the desirable content is content which fit graphic(visual and spatial) and integrated presentation.(visual and verbal)

Design principle of content for multimedia learning

2 ~Graphic or multi presentation fit to content like this~Graphic

1)Graphic and symbol is good at expressing <u>complex information</u> or information which can be <u>expressed in graph</u> like frequency distributions, linear relationships or hypothesis testing.(Jong et al,1988). That is, it is good at showing <u>spatial or logical relationships or what something look like</u>.(Horton,1994)

2)Graphic map <u>fits a content or task which requires high imagination, in other</u> words, abstract content. See the figure 1, in which, detail information exist.

Research Question	Method	Result	
1) Is there any relationship	The learning phase when subjects learn	1) In high imagination task, map with anchor	
between the degree of	Where to go and the way to go.	pointing was most effective.	
imagery capacity and spatial	Giving a spatial task to subjects, and	And in low spatial task, static map or	
mental representation?	subjects learn the task with1)instruction	ction instruction of text and active map.	
2) learning from mapshould	of only 10 text sentences or	2) The phase learning the spatial task,	
lead more rapidly to	2) with only pictorial map or 3) with both.	instruction with text responded more	
construction of an accurate mental model than text	The Transfer phase when subject actually go toward the destination,	accurate answer than with map explained in landmarks.	
direct perspection.	Subjects are required to perform the task with map which is 1)Updated with	3) At the transfer task, the subject who use major update(Anchor) perform better than	
2) Which is better whether	moving background detail	those who use minor update(Deatail).	
updating with movement of	or 2)with moving anchor	4)Both transfer and learning phase, students	
anchor (Major Update) or	or 3) no update with static map.	given information of regionally-widespread	
updating with background detail information.(Minor Update)?	the evaluation phase, evaluating subject's "spatial model"	sign like river or rail way in order to modify the direction either text or map,outperform the subjects who given detail	

Figure 1. Richar Loew(2001),"Understanding Information Presented by Complex Animated Diagram"

When learning a meaning of a word, picture doesn't have any effective influence. The meaning of words are learned best with Definition and Sentence. Learning by sentence only is better learned than by sentence and picture. Evidence is that this data is the result of experiment.(Patricia, George and Chery,1990)

• Dual mode presentation

Musavi(1995) said that <u>dual mode (multimedia) presentation perform</u> its effectiveness on the <u>content like problem solving or example based study</u>. But Mayer and Moreno(1997,2000) said that multimedia presentation is <u>generally effective on the content which has cause-and-effect chain</u>.

Summary of suitable content of multimedia learning

 Graphic is suited for expressing <u>complex</u>, <u>abstract</u> and <u>imaginable</u> <u>information or spatial or logical relationships or what something look like</u>. And Graphic is not good at expressing meaning of words.

 Dual mode presentation is suited for problem solving and example-based learning. (Musavi,1995). It changed in five years, into more general rule.
 Multimedia learning generally gives good effects on <u>cause-and-effect chain</u>. So next, <u>what is the principle making cause-and-effect chain and how to make</u> <u>it.</u>(Mayer,2001)

3 What is design principle of cause-and-effect chain ?

• What is cause-and-effect chain?

It is things which has such structure like because of A, the result become B. In other words, it is the structure which provide the environment that learner can perform "Scientific reasoning". <u>Which is based on two problem spaces (an</u> <u>hypothesis space and an experiment space)</u>, that is, the process of Hypothesis generation, experimental design, and the evaluation of hypotheses

(Klahr, & Dunbar.1988)

• Cause-and-effect chain really has good effect on multimedia learning? Overview of this argument

	Outcome	Input	Casual path
Cause-and-	Cause-and-effect chain	A)Under condition, in which	Α
effect chain	influence on good	teacher provide help.	
is	effects of multimedia	Cognitive Apprenticeship	↓ ↓
Really good	learning.	theory(Collins et al,1989)	Good effect
For multimedia Learning?	Cause-and-effect chain inhibit multimedia learning.	B)Under no control	B ↓ Bad effect

Proposition;

Multimedia content which has cause-and-effect chain enhance self-directed learning

Pro-Evidence

The goal of Reasoning is to obtain/construct knowledge about a domain from the results of those experiments.

Reasoning also provides learner with reflective feedback

Research show that reasoning-based-learning requires learners to act a range of problems that can prevent successful learning. So in the process of reasoning, Learner solve the problem of their own learning by themselves. This is good for Learners to take responsibility for their own learning. It is proved by Horton(1994) that when reaching this stage, active learning occur to learners.

Con-position;

Multimedia content which has cause-and-effect chain inhibit self-directed learning

Con-evidence

Learners tend to prefer to learn by asking another person. Most avoid online tutorials, feeling they take too long. And they feel that it is boring and frustrating. Computer-based-learning is often lonely. They don't feel comfortable with self-directed reasoning. So learner can not reach at self-directed learning stage. (Dione,Daniel and Robert,1992)

Weighing con and pro; Pro-position win under the teacher's good instruction

It is true that under no control condition, without help of a teacher, learners tend not to reach active learning. But it can be easily solved with good instruction of teachers. <u>According to "Cognitive Apprenticeship theory"</u>(Collins et al,1989), the active role of the teacher in supporting the learner, the learner acts as an apprentice to the master craftsperson in the domain. <u>In this approach the teacher first provides a model of expert performance in the task.</u>

The learner observes the model to build up a conceptual picture of mature performance in the domain, and at the final stage, the learner to engage in independent problem solving in the domain.

that is , to bring out Learning by its well-designed concept and presentation,

In general, teachers have to guide to self-directed knowledge construction.

To do so, teacher should have specific objectives for instruction(Horton, 1994).

There are seven objectives of instruction(Cunningham et al, 1993)

- 1 Provide experience of the knowledge construction process
- 2 Provide experience in and appreciation of multiple perspectives
- 3 Embed learning in realistic and relevant contexts
- 4 Encourage ownership and voice in the learning process
- 5 <u>Embed learning in social experience</u>
- 6 Encourage the use of multiple modes of representation
- 7 Encourage self-awareness of the knowledge construction process

<u>These specific objectives make learners</u> take <u>responsibility for learning</u> and feel in control of the learning process, and think deeply about what they learn. <u>When learners get to this active pursuing stage, training become most effective</u>.

How to make cause-and-effect order in multimedia material?

• Known to unknown approach

This is major way of scaffolding. To ground the task in terms of familiar objects and relationship is all agreed on by researchers.

Over view of this argument; Summary first is really good cause-and-effect chain?

• Summary first approach

Topic is proceed from, General to specific and Whole to parts

	Outcome	Input	Casual path
Summary first approach Is	Bush-first approach result in better outcome of learning results	A) Learner can organizing it into a coherent representation.(Coherence principle of Mayer)	A ↓ Good effect
good?	Learning with detail result in better outcome than summary.	B) The more times, the same information is presented, more understanding occur,	B ↓ Bad effect

Pro-position

Students learn better with summary first approach.

Evidence

Learners actively make sense out of the presented material by selecting relevant information, organizing it into a coherent representation, and linking it with other knowledge. The summary greatly facilities this process

Because the key words are in the captions, they are presented in order, and they are presented near the corresponding illustration.

Thus, sense making can be facilitated by a clear and concise summary.

Con-position

Students learn better with full presentation than summary first .

Evidence

In case of full presentation, process or steps of theme is presented twice, picture and words.but in case of summery, the words describing the process and steps only once.

Weighing Pro and Con ;Pro-position won

Result of experience show that summary group perform much better in retention test and equivalent or better in transfer test than full version.

Implications

Detail should be presented after the learner has constructed a coherent mental representation of the basic cause-and-effect system.

For example, after a concise multimedia presentation helps the learner understand the major steps in the process of material order.

• We have to design cause-and-effect chain, taking out nature of reasoning into consideration

As long as we don't know the nature of our reasoning, we can't design good cause-and-effect chain. So next I summarize what is the nature of reasoning and its application of content design.

The book,"Exploring science" (Klarh,2001) answer the question.

This book is about the nature of Reasoning; Developmental tendency of Scientific Reasoning

When making cause-and-effect, we have to take the nature of reasoning into consideration, what is the nature of reasoning?

Tendency of reasoning	Application	
Tendency of reasoning at first stage Children usually use <u>"Positive test strategies"</u> to organize evidence at first stage. Like My theory is that A does X, so I write program Y, then B will do Z This is sensuous approach. People tend to design experiments, expecting the result which affirms their hypothesis. But it often fails. It tend to take long times for learner to generate next new hypothesis and when finding value in next new hypothesis, learners does not cling to prior one. It is easy for them to discard it.	 Two benefit of "positive test strategies" It prevent learners from holding wrong hypothesis and followed hypothesis which was introduced to support their own positive test strategies. It make learners new idea for next experiment. Positive test strategies is good for a first stage. Positive reasoning is good for helping learner's heuristic ways of learning. And next more valuable discovery. 	
Tendency the uncertain the hypothesis is, the longer it is held Certain hypothesis often is discarded but uncertain one often is held for a long time.	Uncertain problem which is good for thinking also should be provided as food of thought.	
Theoristetyden any dw Experimenterinterinty prethesis Chëdrestska cewthlosetheth avaya keep royechtypoits essis risiftä lacks eviderrol te and vides in the shypothesis. Experimenters are those who attach importance to	 Provide Wottenwtayey of opdoaviteing hypoteneses it is easy to deal with. 2) Almost nothing alternatives of experiments should be provided. 	
	 Among plausible reasons, field should give back distinguishable feedback. And comparing is the strongest hint. The evidence provided to them, should has the structure which make them occur reasonable explanation in their mind. 	