

Meiji Restoration

Innovation in Pre-training Principle & Analysis of Open-ended Questions



Introduction

“Rote memorization and regurgitation of accepted facts and conclusions”¹(Savich, 2008) are often contents of complaints from students taking history classes. Indeed, the foundation of history is a pile of facts (“a sequence of past events”²). Nevertheless, the destination of learning history should lie in the cultivation of critical thinking manifested by using facts to generate their own argument(Structured-interview with History Instructor from the University of Colorado Denver). With these in mind and doing cognitive task analysis (three novices, two experts), we suggest the historical instruction should not pay attention to the historical facts and analysis at the same time. In other words, targeting the alignment of facts, skills, and analysis should be our primary goal for this project. Since the fact is the cornerstone, the principle aiming at improving memorization is essential and **the pre-training principle** should fit well in this category. According to our research, unsupervised pre-training guides the learning towards basins of attraction of minima that support better generalization from the training data set. Unsupervised pre-training adds

¹ Savich, C. (2008). Improving Critical Thinking Skills in History. *Online Submission*.

² Professor Alun Munslow (2001). "What History Is". History in Focus, Issue 2: What is History?. University of London. Retrieved 10 November 2008.

robustness to a deep architecture ³(Erhan et al., 2010). Pre-training makes it likely that your learners will have the prerequisite knowledge when they first walk in the door (Kohn, 2014). In addition, in order to test the transfer of fact, skills into the analysis, we quantified the analysis of open-ended using coding schemes. We have two versions differed by the involvement of pre-training principle (N= 20). *<can be changed according to the data>* It turns out that people who scored higher in the fact and skill section will performed better in the analysis part under the criteria of coding scheme. Also, pre-training facilitates the performance of fact memorization.

Learners

The target audience here is beginners to Japanese history. Specifically, the author finds challenges in the teaching process of undergraduate students, freshmen in China's international college Beijing in University of Colorado selected by National Entrance Examination based on my learning experiences in this program and interviews with teachers evidenced by overarching theoretical concepts (such as collectivism).

Students in international college Beijing are overall hardworking, self-motivated inferred from their good performances leading them into the university through harsh competition in National College Entrance Examination, nevertheless they are sensitive to being an outlier of a community and therefore may not voice out their disagreement to have a meaningful and profound discussion in history partly because of the influence of collectivism (Nisbett, 2003; Xu et al., 2004, Cited by Forbes et.al, 2009).

Goals

Big Picture

Following Bloom's taxonomy, considering the complexity and specificity, we divided our goals into the following three categories including:

- ❖ Factual knowledge

³ Erhan, D., Bengio, Y., Courville, A., Manzagol, P. A., Vincent, P., & Bengio, S. (2010). Why does unsupervised pre-training help deep learning?. *Journal of Machine Learning Research*, 11(Feb), 625-660.

- a. Terminology: Extraterritoriality, Daimyo, “Fukoku Kyohei”, Expansionism, Imperialism, Modernism
- b. Specific elements and details: Chapter Oath (1968); Tsudo Umeko; Fukuzawa Yukichi; Meiji Constitution(1889)
 - ❖ Conceptual knowledge
 - a. Principles and generalizations: modernism, colonialism, imperialism
 - ❖ Metacognitive knowledge
 - a. self-knowledge: awareness of one's identity when embracing changes.

	Goals	Assessment
Fact	<ul style="list-style-type: none"> ➤ Students could retrieve the basic facts of Meiji Restoration 	<ul style="list-style-type: none"> ➤ Kokutai ➤ FUKUZAWA YUKICHI ➤ Daimyo ➤ Extraterritoriality
Skill	<ul style="list-style-type: none"> ➤ Students are able to explain the changes and results of the Meiji Restoration of Japan. ➤ Students could articulate the reasons why Fukuzawa was influential... 	<ul style="list-style-type: none"> ➤ What changes did the Meiji Restoration brought about in Japan? ➤ Why was Fukuzawa Yukichi influential?
Analysis	<ul style="list-style-type: none"> ➤ Students should demonstrate their critical thinking about the balance of tradition and changes when encountering modernization by articulating the argument with historical facts supported by historical analysis theory. 	<ul style="list-style-type: none"> ➤ Is modernization a good thing for Japan Utilizing evidence(historical facts) to generate your argument; different aspects could help with your answer development(economic, political, cultural); there is no right or answer. What matters is that you generate your own argument with countable reasons.

Table 1: *Examples for the alignment (goals and assessment)*

Cognitive Task Analysis

Theoretical model:

For example, our goal for students is to students will be able to explain the external and internal causing factors of Meiji Restoration. It targets at the skill. In order to answer this question, ideally, students should specify internal and external reasons including

stagnation of economic, feudal system, and blackship incident which are facts. Also, students should understand the interplay between the two. Specifically, the foreign push accelerated the modernization of Japan through intensifying the internal contradictions existing in Japan.

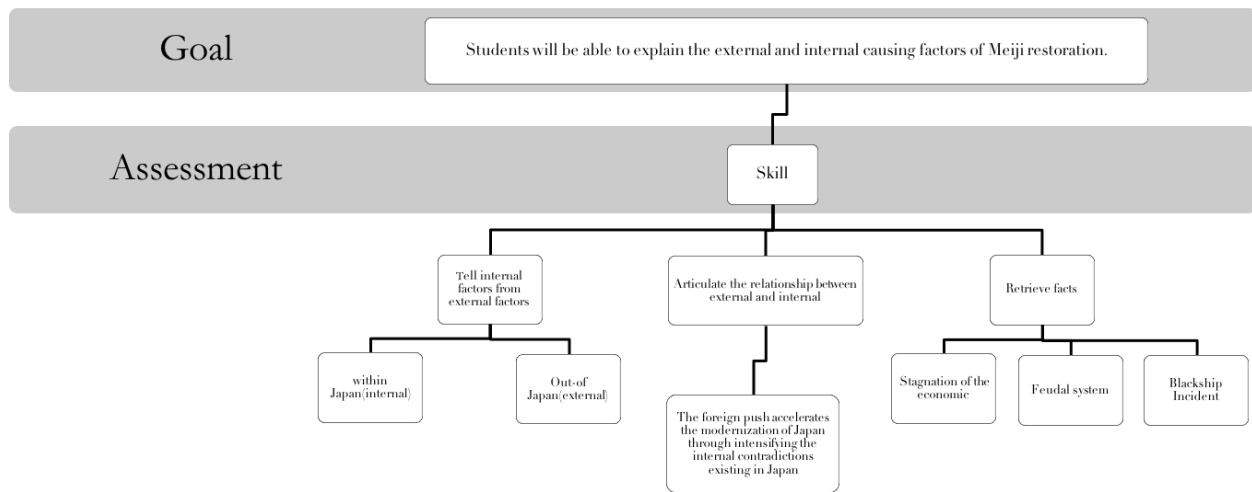
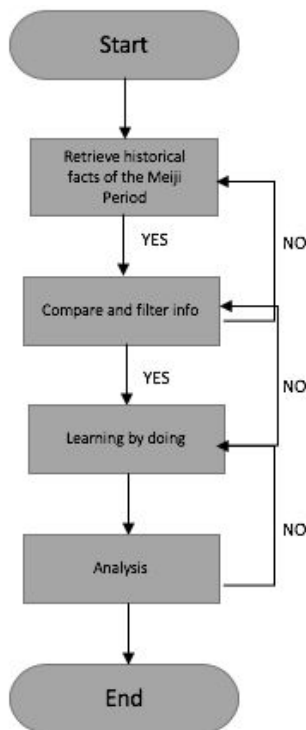


Figure one: [An example fitting into the theoretical model](#)



The rationale behind this example would be that in order to answer the question, foreign students should recall the facts, then compare and filter the info scaffolded by activities of learning-by-doing principle. In the end, students should generate their own argument with countable reasons and historical facts in history. In this sense, we can infer that students meet the expectations of the instructional design.

Figure two: *Theoretical model*

Empirical data (some):

He hands out to his students **challenge questions** after every class and all the challenge questions are **open-ended questions**. The purposes of challenge questions are not only providing samples for exams but help them organize materials and develop their critical thinking(Structure interview with Professor J).

"I can generally know the learning goals and some knowledge components, but I feel confused about many **Japanese terms**".(Think-aloud of novice S)

Assessments

Based on the goals and CTAs, we devised our assessment type. The most feasible ways of quantifying and testing the principle would in the format of quiz. We decide to have the same pre and post test in order to tell the effectiveness of our pre-training principle. In addition, we decide to walk students through the fact-skill-analysis in the testing part. The following table includes some of the specific questions we asked in the test.

Students could memorize and understand the basic facts of the Meiji Period.	Kokutai; Tenno-Sei; NATSUME SOSEKI; SAIGO TAKEMORI; YAMAGATA ARITOMO; FUKUZAWA YUKICHI; TSUDO UMEKO; Emperor; Fukoku Kyohei; Shogun; Daimyo; Samurai; Ronin; Extraterritoriality
Students could know the changes and results of the Meiji Restoration of Japan.	What changes did the Meiji Restoration brought about in Japan? What was a direct result of the Meiji Restoration in Japan?
Students could generate the result of the samurai class being abolished based on existing evidence.	What was a result of the samurai class being abolished?

<p>Students can infer the major social impact of the Meiji Restoration.</p>	<p>During the Meiji Restoration, while suits were popular, kimono was preserved as the most magnificent dress. While pubs are popular in Japan, teahouses are still leisure places for Japanese people. Although western operas were introduced into Japan, kabuki also continued to prevail in Japanese society. What do these comparisons reveal about Japan at the time?</p>
<p>Students could compare and contrast China's strengthening movement and Meiji Restoration.</p>	<p>In the process of learning from the west in the middle and late 19th century, the Japanese reformists put forward the concept of "Japanese spirit with Western learning" and the Chinese westernization group put forward the concept of "Westernized Chinese style." as a result, one successful and one failed. What is the main reason causing this result?</p>
<p>Students will infer possible reasons for the rising of Japanese feminism during the Meiji Restoration based on facts.</p>	<p>Women's social status also changed after the Meiji Restoration. Before the restoration, women can only assist their husbands and take care of their children at home. After that, they started to work outside the home rather than at home, also stopped their absolute obedience to their husbands. What are the reasons for the changes in women's roles? Select all possible answers:</p>
<p>Students will recall the basic historical facts of Charter Oath.</p>	<p>In 1868, Japan announced Charter Oath (more literally, the Oath in Five Articles) which is considered the first constitution of modern Japan. Which of the following five options is not included in the Charter Oath?</p>
<p>Students could articulate the reasons why Fukuzawa was influential.</p>	<p>Why was Fukuzawa Yukichi influential?</p>
<p>Students should identify the features of the Tokugawa period.</p>	<p>Which of the following statements is wrong about the Tokugawa period in Japan:</p>
<p>Students could use evidence to generate logic flow to back up his/her point for the influence brought by modernization.</p>	<p>Is modernization a good thing for Japan ? Utilizing evidence(historical facts) to generate your argument; different aspects could help with your answer development(economic, political, cultural); there is no right or answer. What matters is that you generate your own argument with countable reasons.</p>

Table 2: Alignment in Tests (goals and assessment)

The attached are the pretest and post test quizzes.

Pre(B):

https://docs.google.com/forms/d/e/1FAIpQLSeAqxgW-TMVBDqocNSpUBo3Vskzm6k1AxNTKLDLbBD2UoD0uQ/viewform?usp=sf_link

Post(B):

https://docs.google.com/forms/d/e/1FAIpQLSeRx5OeEub0Gy7et4tZFJPFml5vhFcAV4cKqCyYFaI7JICQPw/viewform?usp=sf_link

Instruction

Using the thinking of backward design, our instruction is rooted in the assessment. The delivery platform of our instruction would be Canvas⁴ (online teaching and learning system). Contents of Meiji Restoration is an adaptation of existing learning materials given by the expert we have been interviewed before. The pre-training principle is utilized in the term explanation before every narration of a past event or explanation of causal relationships.

Instruction slides:

https://drive.google.com/file/d/1qKo9Aw420rhLLBP32yG7FoBF_Qn7arZ/view?usp=sharing

⁴ <https://www.instructure.com/canvas/>



Figure 3: *Illustration of Pre-training principles.*

In addition to the pre-training principles, we also utilize three learning principles including segmenting (used the continue button to afford students with the control of their learning pace), multimedia principle(a clip of the Last Samurai video aiming at emotionally engage students and ranking activities for students to understand the causes and effects of historical events), and learning by doing principle(some open-ended questions followed by each knowledge component to let students have a self-explanation after learning the materials that we provided).

Data Analysis

Raw data: <https://drive.google.com/open?id=10qfYa0LiE5jKQtFsIHL8RYr0a8vwMquK>

As for the data analysis of our design, we divided into three parts which are overall scores for pre and post tests for diff versions. Then, we analyzed the ranking questions. In the end, we utilized the coding scheme to quantify and interpret the open-ended questions.

Pre-training principles

In order to compare the learning gaps between different student groups, we used pre training principle as our innovative principle. The A version instruction implemented pertaining principle by adding an overview of key Japanese terms, while B version does not include the pre training principle. We recruited 20 participants to do our pre- and post-test with the same questions. All participants are novices to Japanese history and were randomly assigned to each group. After the data analysis of pre- and post-test results, we found the difference between different groups. Figure 1 shows the results of no pre training intervention.

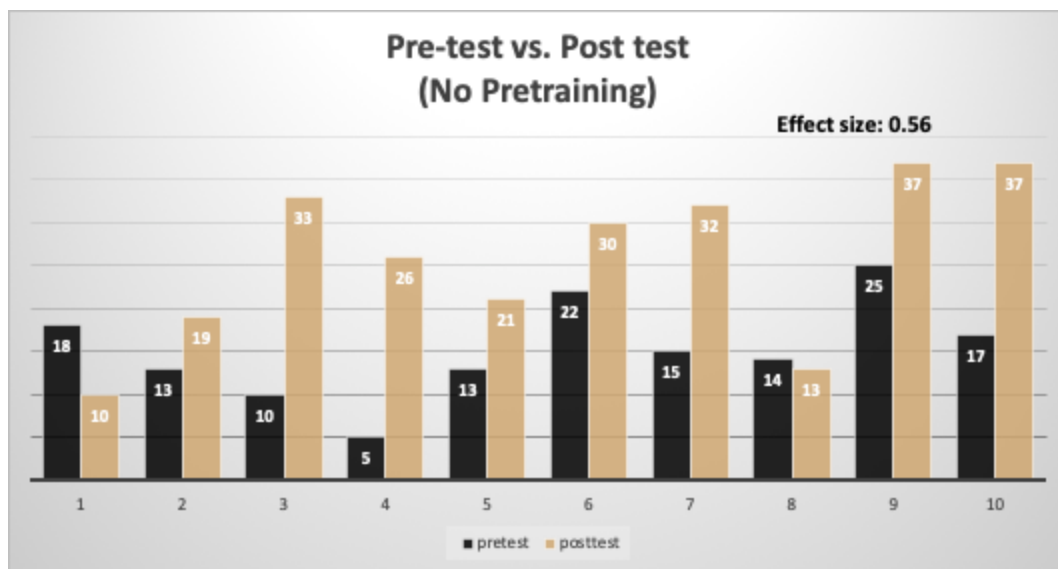


Figure 4. *Pretest vs. Posttest without pre training principle*

Students in the control (no pre-training) group shows an overall increase after the instructional events. The average pretest score of students in the control group is 15.2 out of 40, while the post-test score is 25.8 out of 40, with an approximately 10 points increase. The effect size of students in the control group is 0.56, which shows a practical significance of our instructional methods.

In the treatment (with pre-training) group (shown in Figure 2), we can see there is a growing trend in the results of post-test and some results show a significantly increase. The average pretest score of students in the treatment group is 14.7, compared with the average of 15.2 in the control group, it explains a relatively lower prior knowledge level of students in the

treatment group than students in the control group. However, the average post-test scores for the treatment group is 25.9, which has an approximately 11 points of increase. The effect size of the treatment group is 0.64, that is, instructional methods with pre training have been shown to boost the learning score. Beside, the *p-value* of the treatment group is 0.0087, which demonstrates a statistically significant that students made due to the effective instructions.

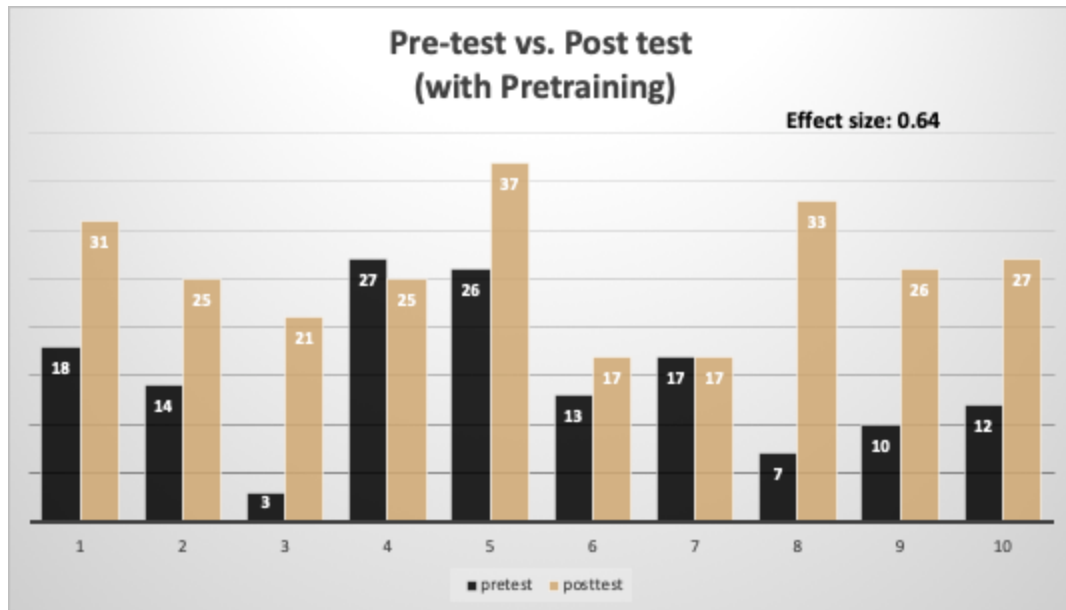


Figure 5. Pretest vs. Posttest with pre training principle

Analysis of open-ended questions (in progress)

We see that pretraining works. However, because this is the whole score covering multiple levels, we decide to further break down and analyze ranking questions which connects the fact and skill. In order to answer this question, the equipment of historical facts is essential. The score of this question can manifest students' facts level, which indirectly measure the effectiveness of pre-training principle. However, in terms of score in this, AB version has the same result. We feel like this could be a point that could be explored further in the future. (A: (with pre-training): 4/10 B: 4/10).

A domain like history, not only analysis of input above is important, output showing critical thinking is also important. Referring to critical thinking and discussion analysis theory and Junhui's past experiences, we use this coding scheme to quantify the data. Because of the

time constraint, we just did one for inter-coder reliability and the other one for suggestions for future analysis.

$$\text{CT Index} = (\text{positive indicator} - \text{negative indicator}) / (\text{positive indicator} + \text{negative indicator})$$

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R+-	R+	Relevance statements to the issue discussed
Relevance	R-	Totally irrelevant statements to the issue discussed
N+	N+	Provide new information, ideas, or solutions that have never been mentioned (even they are not important or useful)
Novelty		
A+	A+	Awareness of quoting information from the discussion material
Awareness		
J+-	J+	A statement of opinion, agreement, or disagreement with supporting reasons/examples/justifications/proof.
Justification	J-	A statement with simple agreement, disagreement, or alternative opinions without elaboration.
L+-	L+	Logic statement

Logic	L-	Illogical statement
C+-	C+	Reasonable connection to one's own precious statements/reflections or others' contributions toward the issue.
Connection	C-	Unreasonable connection to one's own precious statements /reflections or others' contributions toward the issue.

Inter-coder reliability: 22/29=75.86%

Table 3: Coding Scheme⁵

Acknowledgements

We would like to take this chance to thank all the people who helped us along the way. Professor Ken, Mimi, and our dear fellow cohorts participating in this process.

⁵ Junhui, Pedagogical Methods through the Lens of Communication: Examining the Relationship between Critical Thinking and Asynchronous Discussion in Chinese Cultural Context, adapt Yang and colleagues (2005)'s coding scheme.