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Applying Nearpod to 10th-Grade History Courses to Improve Teaching Efficiency

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ABSTRACT
A teacher set a 10th-grade historical course about Industrial Revolutions with an application called Nearpod during guided cognitive tasks' instruction. Here reports the pedagogical efficiency and high-cognitive receive on students' side of applying Nearpod in the course, enabled by the multi-dimensions' interactions to tools with technological affordance. The research reveals the functions by analysing the improvement of intelligence performance, impacts on learning residue, and its reorganizing view empowered to students, which originates from the results of activities on the lecture. This paper demonstrates that involving technologies in courses is necessary for effective communication in the learning context by comparing this setting with a scenario in which only traditional tools will be used. The work could facilitate the study of how technologies help for historical react and cross-time, cross-national historical empathy, which may lead to a new step of integrative comprehension and the personal exploration of the trace and fate of human civilizations.

Keywords: *Nearpod, Pedagogical Efficiency, History Course, Formative Assessment, Cross-national Historical Comprehension*

1. INTRODUCTION

Web 2.0 is an evolution of Web use from passive information absorb to more active interaction, cooperation, and personal feedback. The advent of Web2.0 postulates the potentiality of computer simulations and suggests Nearpod and its heuristics as an effective and viable pedagogy for teaching history with technology. By creating new venues, breaking down barriers associated with cultural and economic status, and inspecting conceptions and the relationship among numerous variables related to the global timeline, Nearpod makes virtual classroom work involving learners in comprehending, manipulating, producing or interacting in multi-ways of class activities, thus provide immediate formative assessments for teachers.

With the development of educational technology and the expansion of COVID-19, online learning has been important with using new educational tools. But there are few previous studies on the effect of Nearpod on students' cross-time and cross-national understanding in historical courses, which is a research gap. This research aims to design a historical course and see how Nearpod can help students conduct inquiry tasks and provide formative assessments.

2. METHODOLOGY

This research will be qualitative research that takes one 10th- grade class as an example to see how Nearpod can be designed as a flexible platform for active inquiry and self-exploration in class and how it can be used as an interactive tool to help reduce the understanding gap. This research will be used to help inform, and perhaps change, the teacher's teaching practice. Data sources collected mainly included classroom observation.

2.1. Participants and Setting

First, this research is conducted in a 10th-grade historical course where more than 90% of the students are eligible for using digital learning tools. Punya and Ntelioglou assert that merely introducing technology to the educational process is not enough. The question is what teachers need to know to improve teaching efficiency by appropriately incorporate technology into their teaching to achieve creative means of communication and historical compression [1]. Using Nearpod as an interactive app allows students to communicate through collaborative board, poll questions, and group discussions, and a flexible platform for students to explore inquiry tasks such as Coggle and Life

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simulation, which can deepen their understanding, thus cultivate historical compression abilities.

Eighteen students and one teacher participated in this research. According to the grade of a pre-assessment before the course, which reflects students' knowledge accumulation before, both the study group with the lowest and highest historical learning levels in the class were selected to participate. The teacher wants to see if there is a difference between students' cognitive comprehension between the groups' previous lowest and highest quiz grades, based on a quiz at the end of the course. Semi-structured self-exploration is conducted with the participants. These activities include a VR field trip to connect textbooks and reality, exploring Web content before drawing a concept map on Coggle in groups, and playing simulation games. Their presentation of their group works will be audio-recorded and transcribed. Using a constant comparison method described by Glaser and Strauss, the systematic, comprehensive comparison and contrast to two situations with Nearpod as a variable, which refers to the advantages and disadvantages of using Nearpod, a common theme can be found [2].

2.2. Theoretical Framework

TPCK (Technological Pedagogical Content Knowledge) was the guiding framework used in this research [3]. This model posits the overlapping role of technology, pedagogy, and content knowledge and highlights the multiple levels of intersections between technology and other two traditional components. According to the degree of technology integration, the lowest level is teacher use of technology as a presentation tool. The highest level is students' intuitive self-exploration or self-experiment based on the electronic inquiry. Thoughtful pedagogical uses of technology require developing a complex, situated form of knowledge, so three primary components of learning environments are inter-played in the TPCK framework. It is necessary for teachers to efficiently integrate these elements to achieve high cognitive levels. Also, in terms of teachers' preparation, the TPACK may provide a systematic and meaningful way to develop appropriate skills for using instructional technology to address the needs of all students [4].

Another theoretical model used in the research is intellectual amplification with, of, and through technology by Salomon and Perkins [5]. They purport the way technology speed up or fundamentally rebuild the cognitive process by referring to technologies as cognitive tools or as cognitive technologies. The sophisticated model predicts both positive and negative learning effects of cognitive offloading, depending on the specific relation between the external cognitive tool and the learning task, how technology affects the human intellect, and the effects of performance. The effect with, of, through technology, in concrete, can be represented as technology's enhance on intellectual performance; leave cognitive residues from technology that enhance performance even without the technology, while the technologies fundamentally reorganize functions to understanding except just enhancing performance.

The third theory is formative assessment theory by Black and William. It provides an analysis of conceptions and actions concluded as "one big idea and five key strategies," based on the substance of the mutual interactions, which can create a spontaneous and responsive environment. "Formal interaction" uses "moments" to provide new information for operating systems with immediate micro-genetic memory levels and spontaneous interaction between teachers and students. This is a unified framework for linking formative assessments with other teaching initiatives (particularly cognitive acceleration and dynamic assessments) and with existing literature on self-regulatory learning patterns and classroom discourse [6].

3. RESULTS

How can the Nearpod help teachers interact with students online? The class design and some examples are shown below.

3.1. Classroom Activities

3.1.1. VR Field Trip

At the beginning of the course, students are supposed to work with their desk mates on a VR field trip to see what kind of inventions might be related to the Industrial Revolution. The VR scene is a random daily street that contains cars, wires, traffic lights, building with lights, phones in pedestrians' hands, and other products that might exist in this scene though invisible. Nine out of eighteen students can find out more than 6 inventions, though two of them mistaken WIFI as the product of the Second Industrial Revolution. There are two benefits we see in this activity. First is the motivation of students' interests. SoriĆ and PalekčiĆ indicate that learning is a dynamic process whose natural core is interest. Interest is a necessary intuitive component and can be conceptualized as a result and predecessor of learning's cognitive aspects [7]. Secondly, because students probably have a faint image or knowledge accumulated in daily lives in terms of the first and second Industrial Revolution, even though without an academic, comprehensive, deep exploration to its horizontal connection and vertical contrast, the subject content has its speciality. So, after a very brief introduction given to students, aiming not to deliver new knowledge but to interoperate this terminology, "the Second Industrial Revolution," to awaken their previous memory, most students will more or less have something to share in the

fields trip activities to say. And the VR field trip activities amplify the potential intersection of technologies nowadays and those historical events on textbooks that seem far away, which stimulates substance of the mutual interactions which can create a spontaneous and responsive environment that students will not feel they are poured academic information but to learn daily around in a historical view. Arguably, when providing new information to the operating system that students are familiar with on the micro-genetic short-term memory level, they actively connect two information [8].

3.1.2. Coggle

Coggle is a concept mapping tool. Concept maps enable relational links to be made between relevant concepts. In the educational context, it is claimed that the best set of meaningful learning is by linking new concepts to existing knowledge [9]. The functions of concept mapping correspond to problems students mainly face when understanding substantive historical concepts. The problems include: 1) Substantive historical concepts are often abstract and theoretical. For example, cash nexus and capitalism do not refer to concrete objects in the past and are often given meaning in the context of related concepts. They cannot be explained by reference to a concrete object, person or event, but can only be explained through other, equally abstract concepts; 2) Some substantive historical concepts such as Utopian socialists and Luddism are very concrete and limited to specific eras. Such concepts are difficult to understand because there is only a limited opportunity to give meaning to them [10].

In this activity, students first need to analyze information and data from websites in 3 groups and explaining and identifying the similarities, differences, and connections among the four phases of the Industrial Revolution by drawing links among bubbles on the Coggle platform. They then are asked to examine the factors of social development and unrepeatable characteristic for a unique era and to comment on how and why this they thought before collaborating on a concept map. The result shows that students become active learners by

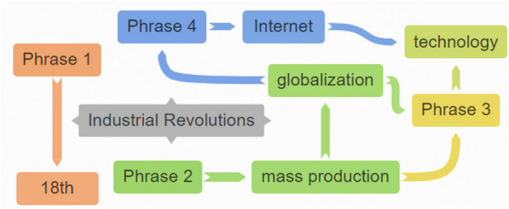

Figure 1. A concept map for Industrial Revolution

demonstrating their knowledge creatively and more interested in topics when they can share their ideas with their group members. All three groups closely look to the first stage to find what might be the causes of the Industrial Revolution and emphasize the linkage between mass production and social changes in their discussions. The figure above is an example of students works.

Concept mapping is a relational device. The aim of concept mapping is not to generate spontaneous associative elements but to outline relationships between ideas. Students' capacity to represent or manipulate a complex set of relationships in a diagram, to a large extent, corresponds to their ability to understand those relationships, remember them, and analyze their component parts [11]. Secondly, concept maps are also much easier to convey a short message than verbal or written descriptions [12]. Thirdly, map-making asks for active engagement in terms of the learner side, which contributes to high cognitive activities [13].

3.1.3. Life Simulation and Videos in the 20th Century

In the Life simulation games, students will also be divided into six groups. Each student in a group will have a specific game in terms of different aspects of lives in the Industrial Revolution, so later on, students can share what they feel about with others group members. The three games are *Workers: Factory Life, Who Wants to be a Cotton Millionaire, and Inventors: Power of Invention.*

By simulating a people's life in the late 20th century, students know the technology revolution "in real-time" and conduct re-enactment, in which simulation makes classroom work involves learners in comprehending, manipulating, producing or interacting in multi-ways of interaction with followers. It also suits the task of involving communicative interaction to the active acquisition process and collaborative task. Everyone can actively participate in negotiating roles, responsibilities, and outcomes when sharing their feelings.

Also, to be specific, a deep study of horizontal connection of the Revolution among different countries is possible to make when parallel historical images, such as photographs of machines' transformation, original documents about economic development, political cartoons from workers' rebellion, and records of pollutions to the environment. These sources are bridges that make another time and place accessed by students.

3.2. Formative Assessment

Hattie and Timperley proposed that classroom practice is formative to the extent that evidence about student accomplishment is elicited, evaluated, and used by teachers, learners, or peers to make judgments about the next stages in instruction that are likely to be better than those made in the absence of the evidence [14]. William and Thompson suggest three key processes in learning and teaching: 1) locate learners' position in learning steps 2) clear the direction they want to go 3)

arrange things that need to be done to meet the expectation. Traditionally, teachers have been held primarily responsible for all three, but the role of learners themselves and their peers cannot be ignored [15]. The three subjects work together to achieve consistency of short-term and long-term memory, thus improving pedagogical efficiency.

3.2.1. Poll

The three polls set before the formal lecture are for the teacher's previous assessment to students' knowledge. The feedback of students' previous knowledge influences the practice of instruction, of which the first step is to decide upon the aims and then to plan the activities through which these aims may be realized [16]. According to the students' foundation, teachers can promptly adjust subject content. For example, the third poll asks about their main images of the Industrial Revolution, as Industrial Revolution was based on innovations and led to exploitation. Students can choose one or more choices in this poll, and Figure 2 and Figure 3 below show the result. Six out of eighteen students vote for all four choices, and four students only agree with one of the choices. And for all 46 votes, 18 votes are for paving the way to modern society, and 17 votes are for pollution to nature and the environment. It shows that students generally comprehend both the positive and negative consequences of the Industrial Revolution but might be relatively less familiar with the social change aspect in the 20th century.

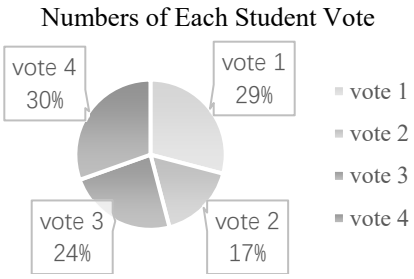

Figure 2. The number of votes

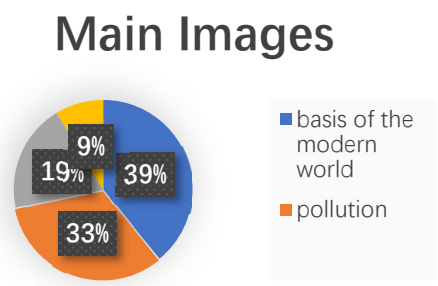

Figure 3. Result of students' main images to the Industrial Revolution

The result of the poll might also be shocked to some students that when they find their opinions are so divided to other classmates on the poll about the pros and cons of the Industrial Revolution and people's attitude to the sacrifice during social development. This might provide an opportunity to send the class away with a task that can also be referred to as an aim of this course: after learning more about the Industrial Revolution, will you change your opinion? With the primary and secondary sources, when students return to the classroom to discuss what evidence they found to support each of these two positions, arguments could be mustered, and some students might change their minds [17].

3.2.2. Quiz and Matching Games

Quiz and matching games are ways of teacher assessments to follow-up students understanding trace. From a teacher's perspective, formative assessment is concerned with the creation of, and capitalization upon, "moments of contingency" in instruction to regulate learning processes. These moments of contingency can be synchronous or asynchronous. During the research, the teacher inserts 3 matching games that serve as synchronous moments; in other words, "real-time" adjustments. After learning them, students can check their memory of the terminology, historical facts, and other relatively mechanic knowledge. Through the feedback, the teacher can check students' focus of the previous course, which to some extent might relate to students' interest, and then decide whether it is necessary to adjust their teaching plan. Figure 4 shows a matching game in which students need to link the right inventions for the First Industrial Revolution and the Second Industrial Revolution, respectively. More than 90 per cent of students can finish the game within 1 minute, and some students might do it in less than 30 seconds.

Figure 4. A matching game of clarifying inventions in different eras

Quiz serves as asynchronous examples include teachers' feedback through grading practices made at the end of a lesson. In the research, students have a short quiz with five questions at the end of the course. Questions range from periods, impacts to difference comparison cognition. To take the fifth question as an example, students need to select one or more choices in terms of which of the following statements is false when comparing the Industrial Revolution with the Agricultural Revolution. The result shows students might make more mistakes when they need to recall some information learned from the previous course, which on the other hand, reflect the importance of review.

3.2.3. Collaborative Board

A collaborative board is a kind of metacognition that is regarded as a higher-level psychological process. At the end of the course, students can share their ideas about what they learned or felt on a collaborative board with some simple words or pictures. The results show students are very active in this activity, and some students might have more than one idea to upload. The process of comparing with others' answers or ideas is an elicit and unconscious way to make students' challenging themselves and thus reflect on their own opinions. A key feature of the programs is that students must learn through dialogue with others, again following Vygotsky's principle that ideas appear first in the external "social" plane, then become internalized by the individual [18].

4. DISCUSSIONS

Compared with previous traditional teaching tools and Nearpod in this class to see what their differences are. Based on the amplification theory of Salomon and Perkins [5], this question can be divided into three levels: 1) Effects with technology: How the use of Nearpod enhances intellectual performance? 2) Technology Effect: How may using Nearpod leave cognitive residues that enhance performance even without the technology? 3) Effect through technology: How technology does not just enhance performance but fundamentally reorganizes it?

In terms of the amplification of the intellectual performance, the obvious benefit bought by Nearpod is it combines the resources that can be used as historical reenactments, including images, videos, life simulation games, and website contents, which are necessary for improving students' comprehension. Nearpod changes the learning model in a classroom. In a traditional class, content and pedagogy are two main elements, and students receive information either directly from textbooks readings or pedagogical output from teachers. While technology helps build a personal design, flexible, and active learning environment when different students can respond to various materials in their own exploration, according to teachers' instruction. Historical re-enactments are fraught with epistemological and methodological issues. They are conjectural and fictive. Teachers should involve and digest epistemological problems and turn them into a central trunk for class discussion. Rather than delegitimize the simulation, these issues can be used to introduce students to post-modern critiques of history writing in general [18]. In addition, those digital resources are immersive and require less budget. The vivid visual presentation and high-interactive pedagogical model will promote student engagement and stimulate active self-learning.

Nearpod also supports cross-national and global education and history empathy, two not ignoble aspects for new generations' cultivation. Firstly, the Nearpod platform includes many applications that may be used to help students brainstorm after viewing lots of materials and create historical timelines that reflect their understandings. For example, by facilitating global linkages, Coggle concept maps assist students in analyzing information and data, make educated decisions, and explain and identify how events shape history. When students get access to cultural imagery from another time and place, such as photographs, original source papers, and political cartoons, they can better understand the subject. [19]. By comparing the differences and similarities among stages of the Industrial Revolution and differences in the process and execution of one Industrial Revolution in different countries, students might reorganize the way they look at one historical event. Secondly, through life simulations, students can study concrete history, conduct research, make meaning of what they experience, and then apply their understandings by annotating the reasons for their choices and behaviors if they were put in historical context. These annotations could contain historical context, links to today's Internet Revolution, and historical empathy cues for what abstract words show and signify. Students can start a dialogue by sharing their work with their peers and observing and considering many perspectives on a given topic due to this conversation.

5. CONCLUSION

The efficiency of using Nearpod in history courses have been presented by revealing the assumed results of involving high cognitive and interactive classroom activities and the difference between traditional and digital learning tools. We suppose Nearpod is very helpful for online classroom interactions for some perspectives, such as 1) Students can do high-level cognitive tasks. Provide non-algorithmic and sophisticated thinking. Allow children to investigate and comprehend concepts, processes, or relationships. And it necessitates self-awareness of and control over one's own mental processes. Require pupils to use their relevant knowledge and experiences to complete the task; 2) Teachers can easily follow up students' thinking and promptly reduce

misunderstanding; 3) They can create a conversation, which enables students to view and consider multiple perspectives on a historical event; 4) The potential intersection of technologies nowadays and those historical events on textbooks which seems far away, which stimulates substance of the mutual interactions which can create a spontaneous and responsive environment that students will not feel they are poured academic information but to learn daily around in a historical view.

It is a qualitative study that does not contain any data, but this data has its representative meaning. In the future, history study will not be trapped by limited physical experience and a great investment of time to learn, but become intuitive compassion of human civilization' development cross time and space. By implementing more timely and up-to-date materials and forms which are both taught and discovered in a way that empowers the learners, a microscopic study of how technology improve pedagogy efficiency, including the correspondence of intellectual performance, the cognitive residue extracted from history learning originally but in verse reorganize the critical thinking is within reach.

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