

## Design thinking for virtual teaching of world history towards 21st century skills development

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### Abstract

The study explored the effectiveness of Design Thinking as a virtual method of teaching World History in developing the 21<sup>st</sup> century skills of critical thinking, communication, collaboration, and creativity. The study employed a quasi-experimental pretest-posttest two-group design among 40 students from San Jose National High School, Division of Bohol, which compares the changes that occur within the experimental and control group by measuring the variable at two time periods. The experimental group had undergone the Design Thinking process of empathizing, defining, ideating, prototyping, testing, and implementing; while the control group was taught using Lecture Discussion. Results confirmed that the implementation of Design Thinking in teaching yielded a significant effect to critical thinking, collaboration, communication and creativity among the respondents. Notwithstanding the fact that the experiment affected by the COVID-19 pandemic, the slow internet connection in the municipality, and the absence of a face-to-face interaction, it showed a significant difference in the test scores of the experimental group before and after the intervention was utilized in the 4Cs for the 21st century. A contextualized DT was crafted to serve as a guide to educators as regards to its proper use that fits the actual virtual teaching scenarios of a regular classroom in the Philippines.

**Keywords:** Design Thinking, 21st Century skills, world history, virtual teaching, Philippines

### Introduction

The metamorphosis of education is a spotlight of the nation's success. It is proper to note that one of the primary goals of education is to transform learners into the best versions of themselves. Teachers are expected to utilize appropriate methods of teaching that address learner diversity. Academic performance of learners is significantly related to the kind of teaching methods practiced by teachers (Ganyaupfu, 2013). Adunala (2011) supported the idea that teachers should have appropriate knowledge on varied teaching methods which can

be applicable to varied concepts of different subjects. With this varying degree of complexity, Social Studies, as one of the fundamental subjects, shapes civic competence among learners, and be given a priority. In the Philippines, Social Studies has been translated in Filipino (the National Language of the Philippines) and renamed as *Araling Panlipunan* (AP). In secondary education, AP is divided into 4 areas namely: (a) Asian Studies for Grade 7; (b) World History for Grade 8; (c) Economics for Grade 9; and (d) Contemporary Issues for Grade 10. The presence of AP in the curriculum signifies the importance of the subject especially in raising awareness of the world that is crucial in transforming students to become a better citizen (Dhandhania, 2016). The K to 12 programs in the Philippines mandated AP teachers to help the learners understand the importance of history and be able to convert these learnings to real life by exercising critical thinking, communication, collaboration, and creativity (4Cs) for 21st century skills. As a vital subject, it cannot be avoided that AP is often triggered by problems. One of the pressing concerns for AP teachers revolve around the confusion on how to effectively teach the subject to better benefit the student especially in *Kasaysayan ng Daigdig* (World History). This branch of AP is considered as one of the most content-loaded areas comprising the histories of the major civilizations and countries around the globe. Not only this, *Kasaysayan ng Daigdig* tackles not only for history but also important information like geography, politics, economics and the society as a whole in an integrative approach.

### **Background and rationale**

The Department of Education (DepEd) has created a curriculum which requires students to be taught with all the necessary skills like the 4Cs. Ironically, this goal is proven to be arduous, considering the kind of environment most Philippine public schools have. Schools are expected to have constant reports regarding student's progress and should ace the tests created by DepEd like the National Achievement Test which covers all the topics from the modules they provided. Low performance of the school has a drastic effect towards the financial support that is given by the government. With this scenario, teachers develop the mindset of teaching content first and often sacrifice all other skills like the 4Cs. Supported by Finkeldei (2016), who stated that with the vision to educate every child across the globe, the focus of the educative community has shifted from teaching students with life skills towards a more standardized form of measuring learning. According to Squire (2014), even though students do well in standardized test it has been proven that they lack important life skills and qualities which are important for survival.

Likewise, in the actual teaching scenario, AP teachers are bombarded with facts and content and usually stick to the traditional way of teaching in order to finish all the allotted topics. Due to the highly oriented contents of *Kasaysayan ng Daigdig* (World History), it is taught in a comprehensive manner, a struggle among many AP teachers on how and when to finish it. Feedbacks from learners prove to be an additional problem because they think that *Kasaysayan ng Daigdig* is uninteresting. AP teachers have the tendency to stick to what has been prescribed in the modules or books, failing to recognize the importance of student's experiences. For this reason, teachers handling the aforementioned subject should be attuned to different methods of teaching. They should be able to think of various ways to stimulate learning taking into consideration the interest of the students without sacrificing quality of content. One of the probable solutions to this concern is Project-Based Learning or PBL. PBL is a teaching method which allow students to be an active participant in the learning scenario and engage in real and meaningful projects. Through PBL, students work on a project which demonstrate their skills and knowledge in solving worthwhile societal questions. It is believed to develop student's knowledge as well as the 21<sup>st</sup> Century Skills commonly known as the 4Cs. Accessing the 4Cs is not merely making of projects per se because PBL is a vehicle

for teaching which contains and frames the curriculum and instruction to higher order thinking skill, rather than mere remembering of information (Duch *et al.*, 2001). Anchored from the principle of Project-Based Learning, comes the emergence of Design Thinking (DT) in education. DT emerges as a means to address the need for creativity and innovation in this era (Siang, 2019). According to Dunne and Martin (2006), Design Thinking is the ability to combine empathy with creativity and rational-thinking in order to find fitting solutions to any problem at hand. This term has been used by design schools but later on adapted into business. Similarly, with this trend, universities and colleges support the integration of design thinking in order to solve problems through a human-centered approach. This particular educational theory comprises of five stages namely: empathize, define, ideate, prototype, test, and implement (Dam and Siang, 2019).

The first stage of the original DT builds empathy towards the target environment. The students gain holistic understanding towards people through observation and be able to gain a fuller insight of the issue presented. The second defines the problem in which students combine and analyze all the significant information gathered from the empathize stage. The students then formulate a problem from the analysis of the observed situation. Afterwards, the students undergo the third step which is to ideate. In this stage, students are ready to generate ideas in order to solve the problem identified. The ideas are generated through brainstorming and students should think outside of the box. Next stage is to prototype which involves trying of the solutions generated from the ideate stage. Every solution generated is investigated within the prototypes and be accepted or rejected. By the end of the fourth stage, the students are able to have a clear view on the pros and cons of the solutions generated. The testing stage assesses the prototype made as regards to its efficacy. After testing, feedbacks will be transmitted to improve the overall solution in order to reach better results (Elmansy, 2018). To implement the tested prototype is the last stage in the design thinking process.

As stated by Carroll *et al.*, (2010), DT in the educative aspect is a process of learning by which students' creativity and confidence are developed through real experiences that cultivates empathy, innovation, self-awareness and problem-solving. To avoid unnecessary confusion, the mentioned definition is utilized throughout the duration of this study. Curriculum makers who applied DT in education supports the idea that this strategy can help students in developing the 4Cs (Kwek, 2011).

Notably, DT has already been used by some universities around the world. According to Shaheen (2010), economic competitiveness is one of the primary goals of varied countries and to be able to provide such productive citizens that can boost the economy, creativity is needed. Considering this, Europe, the United States of America, and Australia promulgated educational policies that gear towards development of innovation and creativity in schools. Thus, the utilization of DT in universities that offer business administration and entrepreneurship courses support these policies (Burton, 2012). Through the years, many teachers in the US have been interested to shift from the traditional discussions to DT. Classrooms are equipped with laboratories wherein the students brainstorm and find solutions to problems. Supported by Flannery (2018), students who actively engage in DT exhibits the necessary skills that is required for modern American employees. With the penetration of DT on the global arena, some researchers also note the downside of this strategy. Teachers who utilize DT have seen that the strategy is a long-term process therefore, this will take a lot of time upon its implementation and results will not be given instantly. Other than this, financial factor is also considered. Budgeting for the prototypes can be a problem for the teacher and the students as well.

Though DT received a considerable amount of attention, the Philippines is yet to recognize this in its educational system. Taking this in mind, the researcher wants to find out the effectiveness of DT if used as a method of teaching *Kasaysayan ng Daigdig* shifting the

original, which is time-consuming and costly, to a more teacher-friendly method of teaching, that is tailored to the Filipino classroom. Additionally, this research also aimed to identify the effectiveness of DT as a method of teaching instead of the usual teaching format used in the Philippines. With this being said, it is proper to note that the Department of Education already has formulated a format in the presentation of lessons termed as the 4As namely; (a) Activity, (b) Analysis, (c) Abstraction, and (d) Application, following Kolb's experiential learning. Under the Activity stage, students are given the opportunity to access prior knowledge and have a glimpse on the topic they are learning for the day. Next is the Analysis stage wherein the teachers ask questions to further process the knowledge of the students from the activity stage. The teacher becomes a facilitator rather than a mere lecturer. Third is the Abstraction stage which focuses on the in-depth presentation of the lesson. The teacher asks lead questions to further broaden the topics. Lastly is the Application stage that highlights the integration of the students' knowledge to real life scenarios (Fermin, 2014).

Upon application, the original DT process was transformed into a method of teaching that utilized these following steps which take into consideration the "new normal" condition of the Department of Education caused by COVID-19 pandemic; first, under the empathy stage the teacher provides the students with the materials that trickle their emotions and feelings. Empathy touches the affect world of the learners that need to be covered within the selected learning competency of the week. According to Priske (2018), reading improves emotional intelligence and empathy of children. With this, articles, journals and videos will be given to support the affect, knowledge, and understanding of the lesson in order for students to build empathy towards the learning competency selected. The teacher becomes the facilitator of knowledge at this level and will make sure that the necessary points will be covered before moving to the next stage. Directed readings can be done at home before the lesson in order to maximize the time for the activities.

After making sure that the students have understood and gained empathy towards the lesson, the Define stage follows. Under this stage, the class is divided into groups to perform the needed tasks. They are tasked to combine and analyze all the information that they gathered and define all the conflicts or issues about the topic that they found during brainstorming. Additionally, the group chooses one problem that represents all the issues that they have accumulated during this second step. Next is the Ideate stage. The teacher signals the group the start of the brainstorming for the solutions to the problem they identified. The students need to think outside of the box to mitigate the problem. The fourth step is the prototype stage. Under this stage, one group is partnered by another group. Then each group presents their solutions to the problem. One group serves as the critic of the other group. After the critiquing, the group returns to their own place and determines the best solution to the problem. The group proceeds to the making of a representation of their chosen solution. Last is the test stage wherein the groups present and test their formulated solution on the problem. This can be done outside the classroom and shown through a video or any creative medium. Scoring will be done through a rubric and observation. The result of this method will be considered also as a performance task. DT method will be used on a unit basis and not for every lesson. It is believed that these stages help in developing the learners' 4Cs.

San Jose National High School, the biggest school in the province of Bohol has continuously excelled in different areas but has been plague by the problem on developing the essential skills of students including the mastery of the different subject specifically in *Kasaysayan ng Daigdig*. Found on the results of the periodical examinations' frequency of error from 2017-2019, students have shown least mastery on the learning competencies. It is believed that DT can be utilized to fit into the learning competencies to address this low frequency of errors. Likewise, the listed competencies were utilized and tested for this particular research. Ultimately, this research focused on the effectiveness of DT as a method

of teaching of *Kasaysayan ng Daigdig* that addresses the development of 4Cs among the Grade 8 students of San Jose National High School.

## **Research objectives**

This study determined the effectiveness of Design Thinking as a method of teaching World History in developing the 21st century skills: collaboration, creativity, critical-thinking and communication. Specifically, the study sought to answer these questions: (1) What is the pre-post test scores of the control and experimental groups before and after the implementation of design thinking in terms of critical thinking; communication; collaboration; and creativity? (2) Is there a significant difference between the pre-post test results of the control group and the experimental group? (3) Is there a significant difference of the mean gain of the two groups?

## **Review of related literature**

### ***21st-century skills under the Philippine educational system***

Due to the rapid advances often attributed to globalization, complexity and challenges of daily living has increased in recent years. It can be noted that major changes have taken over the contemporary world, making every person vulnerable to greater expectations and risks. Similarly, due to the emphasis of technology and interconnectedness, people are expected to perform and embody new set of skills that has been neglected before. In the Philippines particularly DepEd has seen the importance of inculcating new set of skills needed in this milieu commonly called the 4Cs. Through the implementation of the Basic Education Sector Reform Agenda (BESRA), reforms have been made to inculcate the 21st century skills through the K-12 program. The 21st Century Skills are considered the core element of the K to 12 Basic Education Program shifting the environment and goal of education toward the holistic development of the learners in accordance to the need of this contemporary world.

Windschitl (2009) supported that in paving the way to the cultivation of the necessary skills in this contemporary time, learners should be given opportunity to take part in an active learning wherein they are able to create and experience real-life scenarios. This context enables the student to become an independent learner, who is capable of surviving in this challenging world. With this in mind, educational institutions should be the number one promoter of holistic development of the learners. This reform has been made due to the fact that there is a skill shortage among the manpower in the Philippines. In the report conducted by Aurelio (2020), the Philippines is in need for educational reforms and trainings to address the employment gap in the country involving 6 percent of the labor force. With this impending need, skill shortages may result to poor job performance among workers that plummet toward instability and less production for employers. With this, the educational sector holds the greatest role of mitigating this problem. It is important for schools to be at par with the new demands. However, the present practice in schools focuses on preparation of students for standardized testing which may greatly affect the labor force of the country.

The reality that the Philippine education system has been aiming to compete with other countries has reinforced the notion of providing quality strategies in teaching. Faced with varied problems, educators are left with no choice but to venture into new theories and strategies in teaching. In *Kasaysayan ng Daigdig*, it is already established that students are bombarded with factual information like dates and names of important historical figures. Aside from this, the lessons follow a chronological order and rote memorization plays a vital

part. With the adherence to standardized testing like the National Achievement Test, teachers have to consider finishing the topics presented in the textbook and along the way have the tendency to take for granted teaching children essential skills like the 4Cs. Indeed, educators are challenged as to how to teach meaning experiences to students as well as develop essential skills that will enable them to take part in the community in the future. Added by Booyse (2016), curriculum-makers neglected the significance of empathy and understanding the true needs of the end-users—the students. Supported by Gawthrop (2014), every government dream of producing graduates that are capable of uplifting the situation of the community but because most schools put weight on standardized testing, creativity and innovation has slowly been fading away, thus it is necessitates a newer approach to teaching and learning. In order to cope up with the various expectations and trends brought by globalization, assessing the existing skills of the students is deemed necessary. According to Chalkiadaki (2018), the four main component of the 21st century skills are communication, collaboration, creativity and critical-thinking. The aforementioned skills are the most important for survival in the world where integration of different races and culture has been seen to take the spotlight. The job of the educative institutions lies on the improvement and installation of these skills toward the future labor force of the country.

### ***Design thinking as a method of teaching towards the development of 21st century skills***

DT has growing popularity across the world but is considered as a fledging for the reason that this term is often attributed to the physical process of design (Kimbell, 2012). Recently, this term is considered as a problem-solving process that can be successfully done through practicing certain set of skills. According to literatures, DT instruction can help in providing students with a meaningful learning environment that can hone their talents and capabilities. In the study of Marks (2017), DT is a promising tool that can help students to realize the importance of effort and persistence in any given situation. This is through the idea that in coming up with a solution, students are faced with different obstacles and may often fail. This failure will teach them to try once again until the desired outcome has been achieved. With this idea, students would make use of every failure to never give up and thus persevere in whatever situation they may find themselves in. DT has the potential to change the negative connotation on failure and may increase persistence and engagement.

Though DT has recently been added to basic education standard, since the late 80s students where given the task to solve authentic problems. DT also supports the constructivist way of thinking for the reason that in constructivism, as a learner-centered theory, fully support the giving of importance to student created meaning and experiences. In this kind of environment, students are able to make their own realities and infer meanings out of these experiences which is one ingredient in succeeding in this 21st century work environment. With the use of DT, students are able to develop many of the 21st century skills as supported by a study conducted by Carroll *et al.* (2010), which showed that the use of DT can produce collaboration among students. With the use of DT, a culture of collaboration can be attained due to the fact that students work together in solving varied problems. Because of this mandatory grouping, in the long run, students build a culture of collaboration and thus learn how to be an effective member of society.

The same study by Carroll *et al.* (2010) evidently showed that after a month of utilizing DT, middle school students applied its steps in placing the need of the user as the center of one's projects. This goes to show that with the application of DT, students are able to understand and develop a heart that cares for the people around them in the process called empathy. Through empathy, students are able to understand the world around them in varied lenses and therefore be able to see the different needs and situation which may be different

from their own. If the society is composed of people who are willing to empathize, misunderstandings would surely be minimized if not totally eradicated. Moreover, DT also cultivates higher-order thinking skills (Barlex & Trebell, 2008). Their study showed that DT actually facilitated creativity and imagination among the Grade 9 respondents. The students were able to create various solutions to problems and actively participated in the lessons. The students also exhibited interest toward learning different lessons and are vigilant toward their own learning.

Likewise, in the study of Van Gompel (2019), DT enabled students to develop higher-order thinking skills due to the reason that it mandates students to think of potential solutions, lower-order thinking skills are oftentimes not utilized. Students are expected to think outside the status quo and be able to create meaningful ideas. As a method of teaching, DT highlights a human-centered approach to education. Unlike traditional teaching, DT gives students an avenue to design meaningful solutions to problems. Students in traditional classroom are considered as mere container of knowledge but in a DT classroom, students are perceived as innovators and global learners. According to Tschepe (2018), DT emphasizes human capabilities. This does not mean that the whole educational curricula would be changed especially those that work well but instead DT can supplement holistic education. As what Fadel (2015) reiterated, that DT can foster character building which is a crucial part in lifelong learning. As students are given the chance to create meaningful experiences and unique meanings, they are able to boost their creative confidence and awareness. Teacher role also has shifted from being the bearer of all the knowledge toward active facilitators of knowledge. Furthermore, teachers are able to uplift the interest of the students by engaging them in worthwhile lessons.

Despite this, there is also a growing criticism on DT in education. Argued by Morrison (2013), DT is not applicable in the K-12 education because of the fact that it requires mastery of knowledge which students nowadays lack. Supported by Korn and Silverman (2012), students are expected to know things or problems which may not be articulated yet making DT unfeasible. In conclusion, DT has a potential in mitigating the problems in the educational system if only given more attention. Majority of the aforementioned research are qualitative in nature and despite the fact that there is a growing adherence toward DT, only few empirical studies has been made to fill in the gap on DT as applied in education especially in experimental study designs (Razzouk & Shute, 2012). This initiative paves the way to fill in this gap and provide additional information on DT especially in the Philippine classroom setting.

## **Methodology**

### ***Research design***

The research utilized a quasi-experimental pretest-posttest two-group design to assess the effectiveness of design thinking as a method of teaching *Kasaysayan ng Daigdig*. This design compares the changes that occur within the experimental and control group by measuring the variable at two time periods, before and after introducing the intervention (Glen, 2014). This particular research design fits when analyzing if there is a change before and during the intervention has been implemented between the experimental and control group. The level of critical-thinking, collaboration, creativity and communication of each group was measured before the treatment and then measured again after the treatment which was compared to get the desired basis for analysis.

### ***Respondents of the study***

The respondents of the study were 40 Grade 8 students of San Jose National High School, Division of Bohol. The respondents were chosen through purposive sampling wherein the researcher chose the two pilot sections of the Grade 8 level and afterwards randomly assigning one group as the experimental group which received the treatment in this case the utilization of DT and another went to the control group which did not receive any treatment. Grade 8 students are chosen to be the participants because in the Philippine curriculum, they take the World History subject. Also, the respondents of the study are chosen since the researcher handles the said group of students. To avoid biases and Hawthorne effect, the respondents were oriented on the process of DT but they were not informed that they are made respondents of the study. Only 40 students were utilized for the reason that only a few students have access to the internet. Face-to-face classroom interaction is highly prohibited because of COVID-19 pandemic.

### ***Instrumentation***

In gathering the data of the study, the researcher utilized a semantic differential scale with thirty (30) items to measure the collaboration and communication skills of students on the first part. The researcher also prepared a Table of Specifications (TOS) and test under the third and fourth quarter topics in *Kasaysayan ng Daigdig* to test the critical-thinking of the respondents. The test was composed of six-parts with a total of fifty (50) test items. The different parts were a 50-item multiple choice test under critical-thinking with four alternatives for the respondents to choose from. The multiple-choice test was developed based on the Bloom's taxonomy from comprehension to creating only. To test the communication, collaboration, and creativity of the students, they had undergone Guilford's Alternative Uses Task (1967). In this test, students were given an everyday object wherein they were given a time limit to think of as many uses of that object as possible. Then the respondents were scored based on Guilford's 4 areas of analysis, namely: flexibility, fluency, originality and elaboration. This test has been chosen because of its consistency to the DT results. The test was administered by the experimental and control groups online. Since the Multiple-Choice test was a researcher-made, it went through a validation by a panel of experts. The lesson plans that were used in this study were also validated by the panel of experts

### ***Gathering of data***

Permission to conduct the study was asked from the School Principal. After permission was granted, the 40 Grade 8 students were identified as the respondents. They were divided into two groups, the experimental group where the intervention was implemented and the control group that received no treatment. The pretest was administered to both groups online and through a phone call. Before conducting the study, a letter of informed consent was signed by the participants. The profiles of the participants were held privately as to assure their safety. The participants were not forced to answer the questions. If they decided not to participate, then the researchers respected their decisions. Their participation was voluntary without disrupting their work and other related activities. The researcher did not intrude on the participants' personal privacy. The study did not affect in the emotional, psychological, spiritual and economic status of the participants.

Unnecessary elements such as biases and participation of other individuals not directly connected to the study including tutors and parents which may hamper the results were eradicated and controlled in order to ensure both groups receive similar environment except the intervention used. There were no rigid rules in order to make the students feel

comfortable. The teaching of the lessons under control group was done through the usual lecture-discussion method of teaching. For the experimental group, they undergone the 5 stages of DT as enumerated:

a.) Under the empathy stage the teacher provided the students with the materials needed to understand the topic to be covered. Directed readings were done at home before the lesson in order to maximize the time for the activities.

b.) After making sure that the students have understood and gained empathy toward the issue presented, the Define stage followed. Under this, the class was divided into groups. After proceeding to their group, they were tasked to combine and analyze all the information that they gathered and define all the conflicts or issues about the topic that they found during the brainstorming. Additionally, the group chose one problem that represents all the issues that they have accumulated during this second step.

c.) Next is the Ideate stage. The teacher signaled that the group brainstorms for solutions to the problem that they formulated. The students need to think out of the box to mitigate the problem.

d.) The fourth step was the Prototype stage. Under this stage one group was partnered by another group. Then each group presented their solutions to the problem. One group served as the critic of the other group. After the critiquing, the group returned to their own place and determine the best solution to the problem after the critiquing. The groups proceeded to the making of a representation of their chosen solution.

e.) Last is the Test stage wherein the groups presented and tested their formulated solution to the problem. This can be done outside the classroom and shown through a video or any creative medium.

The experiment lasted for one month, 2 weeks for each grading. For the control group, they were taught using the conventional method of teaching which is lecture-discussion throughout the duration of the intervention. After the 4 weeks of the intervention, the posttest was given to both groups using the same test instrument. The results were analyzed through a statistical treatment.

### ***Data analysis***

In determining the effectiveness of DT as a method of teaching *Kasaysayan ng Daigdig* in developing Grade 8 students 21st century skills, a test questionnaire that covers 3rd and 4th grading topics and which utilizes critical-thinking was used. To test the communication, collaboration, and creativity of the students, Guilford's Alternative Uses Task (1967) was utilized and lastly a semantic differential scale to test student's level of communication and collaboration which was administered before and after the treatment has been implemented on both groups. The following statistical tools were used to arrive to the computation of the results: (1) To determine the 21st century skills level of experimental and control groups in the pretest and posttest, the descriptive mean and standard deviation was utilized; (2) To determine the difference on the pretest and posttest of every group, the t-test for dependent samples was utilized. (3) To determine the difference on the mean gains of pretest and posttest of experimental and control groups, the t-test of independent samples was used.

### **Findings and discussion**

***Pre-test and post-test scores of the control and experimental groups***

DT as a method of teaching has the primary goal to uplift the current situation of the Philippine education specifically in the teaching of *Kasaysayan ng Daigdig*. It has been seen that essential skills among students are slowly deteriorating as standardized testing takes the spotlight. Hence, DT was used.

Table 1 shows the pre-test and post-test of both the experimental and control group before and after the implementation of DT under critical-thinking skill.

**Table 1.** *The Pre-Test and Post-Test Scores of the Control and Experimental Groups for Critical-Thinking*

Groups	Pre-Test Scores			Post-Test Scores		
	Mean (SD)	Description	95% CI	Mean (SD)	Description	95% CI
<b>Control Group, n = 20</b>						
Critical Thinking	20.15 (6.88)	<b>Did Not Meet Expectation</b>	(16.93, 23.37)	32.35 (2.48)	<b>Fairly Satisfactory</b>	(31.19, 33.51)
<b>Experimental Group, n = 20</b>						
Critical Thinking	19.70 (5.67)	<b>Did Not Meet Expectation</b>	(17.05, 22.35)	33.85 (2.78)	<b>Fairly Satisfactory</b>	(32.55, 35.15)

*Legend:*

**Ranges**

*Below 30*  
 30.00 - 34.99  
 35.00 - 39.99  
 40.00 - 44.99  
 45.00 - 50.00

**Description for Critical Thinking**

*Did Not Meet expectation*  
*Fairly Satisfactory*  
*Satisfactory*  
*Very Satisfactory*  
*Outstanding*

As gleaned from Table 1, both the control and experimental groups got low scores for the pre-test under critical-thinking skills. The control group has a mean score of 20.15 which fall under the description of Did Not Meet Expectation. As for the experimental group, they garnered the mean score of 19.70 which is slightly lower than the control group but still fall under Did Not Meet Expectation. This means that for critical thinking, both groups are in the same level before the implementation of DT. This might be because the topics of the test were new and that the students have no prior knowledge regarding the questions. According to Rodrigo (2013), prior knowledge can be a great predictor of test results. Higher scores reflect more prior knowledge.

After the intervention, both groups undergone the same test and exhibited comparable results. The control group has a mean score of 32.35 with the SD of 2.48 and fall under Fairly Satisfactory while the experimental group has a mean score of 33.85 with the SD of 2.78 which is also considered under Fairly Satisfactory. Looking at the figures it provides an impression that the control group which was taught using the traditional discussion method and the experimental group which used the DT method have almost identical test results under critical-thinking. This shows that DT is comparable with the traditional lecture-discussion which focuses on content in terms of enhancing students' critical thinking skill. Although comparable in terms of their description (fairly satisfactory) in their average post-test results, the experimental group gained a higher mean than the control group.

Communication skill is one of the skills that DT aims to improve among the learners. Based on the data shown on Table 2, the control group has the mean score of 28.75 which has

the equivalency of *Bahayang Makipagpanayam* for the pre-test and a mean score of 30.00 with the equivalency of *Bahayang Makipagpanayam* for the post-test. Even though there is a slight increase with the scores before and after the intervention, it can be inferred that the control group chose to limit the observance of dialogue and communication when facing different situations.

This might be because they are not that confident to communicate with other people which hinders them to fully express themselves and participate in worthwhile activities. In the study conducted by Anggeraini (2019), many students who experience lack of self-confidence also lacks interpersonal communication skills for self-confidence is correlated with the ability of students to freely communicate with others. With this being said the students under control group are ready to communicate but not to highest extent.

**Table 2.** *The Pre-Test and Post-Test Scores of the Control and Experimental Groups for Communication Skill*

Groups	Pre-Test Scores			Post-Test Scores		
	Mean (SD)	Description	95% CI	Mean (SD)	Description	95% CI
<b>Control Group, n = 20</b>						
Communication	28.75 (7.22)	Bahayang Makipagpanayam	(25.37, 32.13)	30.00 (4.77)	Bahayang Makipagpanayam	(27.77, 32.23)
<b>Experimental Group, n = 20</b>						
Communication	27.40 (6.13)	Bahayang Makipagpanayam	(24.53, 30.27)	32.90 (8.88)	Lubusang Makipagpanayam	(28.74, 37.06)

Legend

Range		for Communication
-45.00	-	-32.15
-32.14	-	-19.30
-19.29	-	-6.44
-6.43	-	6.42
6.43	-	19.28
19.29	-	32.13
32.14	-	45.00

Meanwhile, the experimental group has a mean of 27.40 with the equivalency of *Bahayang Makipagpanayam* for the pre-test and a mean score of 32.90 and equivalency of *Lubusang Makipagpanayam* for the post-test. These figures show that there is an increase on the mean of the scores before and after DT's implementation. DT highlights the importance of increasing the confidence of the students in expressing themselves through various means. This is supported by the test result of the experimental group. It is good to note that from *Bahayang Makipagpanayam*, the experimental group moved to *Lubusang Makipagpanayam* which highlights the importance of total communication in solving problems. The result implies that after the intervention, the experimental group are more open in terms of communicating. This might be because during the intervention, they were tasked to find solution to varied problems through meeting and conversing with other people. They are more aware of the importance of communication as a whole. Based on the study conducted by Sugito (2017), giving problems for students to solve and presentation of solution greatly

enhance the ability of students in terms of communication skills, confidence, and responsibility.

Next skill that is highlighted by DT is collaboration skill. Gleaned from Table 3, the control group has garnered the mean score of 29.00 which falls under *Bahagyang Makipagtulungan* for the pre-test and a mean score of 29.10 with the equivalency of *Bahagyang Makipagtulungan* for the post-test. It can be inferred from the data that there is slight difference between the pre-test and post-test scores of the control group but remains under *Bahagyang Makipagtulungan*. This means that the mindset of the control group towards collaboration has remained the same after the discussions using the traditional method. One factor that might have affected this is the fact that these learners were not given the chance to practice collaboration in a real-life scenario during the pandemic. The learners were given contents and theories about the importance of collaboration in history but were not able to transpose those theories in real-life situations.

**Table 3.** The Pre-Test and Post-Test Scores of the Control and Experimental Groups for Collaboration Skill

Groups	Pre-Test Scores			Post-Test Scores		
	Mean (SD)	Description	95% CI	Mean (SD)	Description	95% CI
<b>Control Group, n = 20</b>						
Collaboration	29.00 (5.06)	Bahagyang Makipagtulungan	(26.63, 31.37)	29.10 (4.45)	Bahagyang Makipagtulungan	(27.02, 31.18)
<b>Experimental Group, n = 20</b>						
Collaboration	33.35 (6.43)	Lubusang Makipagtulungan	(30.34, 36.36)	35.90 (4.93)	Lubusang Makipagtulungan	(33.59, 38.21)

*Legend*

-45.00- -32.15  
 -32.14- -19.30  
 -19.29 - -6.44  
 -6.43 - 6.42  
 6.43 - 19.28  
 19.29- 32.13  
 32.14- 45.00

**For Collaboration**

Lubusang Hindi Makialam  
 Bahagyang Hindi Makialam  
 Hindi Makialam  
 Walang kinikilingan  
 Makipagtulungan  
 Bahagyang Makipagtulungan  
 Lubusang Makipagtulungan

On the other hand, the experimental group gained a mean score of 33.35 which falls on *Lubusang Makipagtulungan* for the pre-test and a mean score of 35.90 and falls under *Lubusang Makipagtulungan* for the post-test. Based on the data, it can be deduced that the experimental group already have a high visualization towards collaboration and was intensified after the application of DT. This means that the experimental group value collaboration before the intervention and was enhanced afterwards. The increase of the scores might be because the experimental group developed appreciation towards collaboration as they practiced the skill during the intervention. The students under the experimental group were given the chance to collaborate with different people in order to come up with projects that will solve societal problems. Stated by Burns (2018), learning becomes deeper when students are provided with active, collaborative and engaging learning experiences. This is one of the tenets of DT, which was applied to the experimental group.

**Table 4.** The Pre-Test and Post-Test Scores of the Control and Experimental Groups for Creativity Skill

Groups	Pre-Test Scores			Post-Test Scores		
	Mean (SD)	Description	95% CI	Mean (SD)	Description	95% CI
<b>Control Group, n = 20</b>						
Creativity	5.75 (3.29)	Low	(4.21, 7.29)	7.55 (4.20)	Middle	(5.58, 9.52)
<b>Experimental Group, n = 20</b>						
Creativity	5.65 (3.41)	Low	(4.05, 7.25)	7.65 (4.22)	Middle	(5.68, 9.63)

**Ranges**

0-6  
 7-12  
 13-18  
 19 or more

**Description**

Low  
 Middle  
 Good  
 High

Reflected from Table 4 under creativity skills, the control group garnered a mean of 5.75 with the equivalency of Low for the pre-test and a mean of 7.55 with the equivalency of Middle for the post-test. This implies that there is an increase of the scores garnered by the students under the control group during the pre-test and post-test with the use of lecture discussion. This can be attributed to the fact that as students undergo the discussion, they were able to grasp new learnings that increase the capacity of their minds to think for new ideas. As the students undergo the process of learning, they can connect previous knowledge to new knowledge (Stenger, 2017). Other factor that might have affected the result lies on the capability of the student to think under pressure. Guilford’s Test of Alternative Uses adheres to a strict time limit. Students under the control group might have been affected by the time limit being set.

Meanwhile the experimental group gained a mean score of 5.65 (low) for the pre-test and 7.65 (Middle) for the post-test. It can be seen from the results that there is an increase of the mean from the pre-test to the post-test scores of the experimental group. Though the control group also garnered an increase of the scores, the experimental group gained a higher mean with a difference of 0.1. The increase of the experimental group can be attributed factors like constant brainstorming of ideas during the conduct of DT. The experimental group practiced constant sharing of ideas among members in formulating solutions and worthwhile projects though conversations were affected due to the internet connection in the municipality where the research has been done.

**Comparative analysis between pre-test and post-test scores of the control and experimental groups**

**Table 5.** Comparative Analysis between Pre-Test and Post-Test Scores of the Control and Experimental Groups, n = 40

Groups	Pre-Test Scores	Post-Test Scores	Paired Difference	T-Value	P-Value
<b>Control Group, n = 20</b>					
Critical Thinking	20.15 (6.88)	32.35 (2.48)	12.20 (6.35)	8.59	0.000**
Communication	28.75 (7.22)	30.00 (4.77)	1.25 (4.77)	1.17	0.255
Collaboration	29.00 (5.06)	29.10 (4.45)	0.10 (1.94)	0.23	0.821
Creativity	5.75 (3.29)	7.55 (4.20)	1.80 (2.48)	3.24	0.004**
<b>Experimental Group, n = 20</b>					

Critical Thinking	19.70 (5.67)	33.85 (2.78)	14.15 (4.73)	13.39	0.000**
Communication	27.40 (6.13)	32.90 (8.88)	5.50 (7.40)	3.32	0.004**
Collaboration	33.35 (6.43)	35.90 (4.93)	2.55 (3.14)	3.64	0.002**
Creativity	5.65 (3.41)	7.65 (4.22)	2.00 (2.99)	2.99	0.008**

\*\* Significant at 0.05; Values are presented as Mean (Standard Deviation)

Table 5 shows the comparison between the pre-test and post-test scores of the control and experimental groups. For the pre-test, the control group garnered a mean score of 20.15 (did not meet expectation) while a mean score of 32.35 (fairly satisfactory) for the post-test under critical thinking. On the other hand, the control group gained a mean score of 5.75 (low) for the pre-test and a mean score of 7.55 (low) for the post-test under creativity. At 0.05 significant level, statistics revealed that there is a significant difference in the pre-test and post-test scores in critical thinking with a t-value of 8.59 and creativity with a t-value of 3.24 in the control group. The analyzed data reject the null hypothesis on critical thinking and creativity. The mean values suggest that there is an increase in the post-test scores in these areas. It unveiled that even with the use of the traditional lecture-discussion method, the control group was able to answer the test correctly. This might be due to the fact that the students gained additional knowledge of the content during the discussion. This finding implies that any of teaching strategy like a lecture-discussion can be utilized to improve the critical thinking of the students as long as it is properly administered. For creativity, though there is a significant difference, the descriptive value still lies on low level.

Meanwhile, for the communication skills, the control group has a mean score of 28.78 for the pre-test and mean score of 30.00 for the post-test. The paired difference of the pre-test and post-test equals to 1.25 which is statistically comparable. This means that the results of both tests are roughly similar. Considering this, it can be deduced that lecture-discussion does not improve the communication skills of the students. One reason might be due to the fact that for this teaching method, learning is passive and communication is one way. This is to say that the teacher has the sole ownership over the course of learning. Learners are allowed to talk but is limited to asking and answering questions rather than formulating one's ideas.

Similarly, the result for the collaboration skill is comparable to that of the communication skill. The control group accumulated the mean score of 29.00 for the pre-test and 29.10 for the post-test which roughly results to .10 paired difference. The data shows that there is no significant difference on the pre-test and post-test scores of the control group. It means that even after learning through lecture-discussion, the control group was not able to increase their collaboration skills. One factor that caused this, i.e. similar to that of the communication skills, is the reality that lecture discussion limits the active participation of students. This method lacks activities which promote experiential learning to students. According to Kelly (2019), lecture-discussion does not allow wider student involvement. In other words, learners were not able to practice their collaboration skill in the conduct of lecture discussion method.

Meanwhile, for the experimental group, data show that there is a significant difference in the pre-test and post-test scores in all areas being studied. The mean values suggest that there is an increase in the post-test scores in all areas. For critical thinking, the experimental group gained a mean score of 19.70 for the pre-test and 33.85 for the post-test with a paired difference of 14.15. Though the control group also has a significant difference, it can be seen that the increase of the scores by the experimental group is higher than that of the control group. This increase is a result of the application of DT that specializes creating an avenue for students to think, experience and solve challenges. This is supported by Facione (2001) who stated that critical thinking is more than just information gathering rather it is an avenue to analyze, synthesize and evaluate useful information in order to make effective decisions.

Considering this, during the intervention, the experimental group was tasked to analyze scenarios on their own which in effect develop critical thinking among them without the usual lecture. The group was able to make sense of new information independently. The teacher served as a facilitator to guide the flow of learning without interference.

Furthermore, for the communication skill, the experimental group gained a mean score of 27.40 for the pre-test and a mean score of 32.90 for the post-test. The paired difference for this skill equals to 5.50 which makes the pre-test and post-test scores significantly different. Similarly, for the collaboration skill, the experimental group has a mean of 33.35 for the pre-test and a mean score of 35.90 for the post-test with a paired difference of 2.55. Based on the aforementioned data, the mean value also suggests that there is a significant difference between the pre-test and post-test in these areas. Thus, the null hypothesis is rejected for collaboration and communication skills. Notably, this result is unlike the control group as mentioned above. This means that DT method yields better result than the lecture discussion in building communication and collaboration among the learners. Focusing on the ideas surrounding DT, the main mission of this method of teaching is to enable an educative environment that foster communication among different people with varied ideas, collaboration to mitigate societal challenges, enhance critical thinking that paved toward demonstrable knowledge for effective decision making and creativity that nurture innovation of the learners, all of which were done by the experimental group during the conduct of the intervention.

In addition, after undergoing the Guilford's Alternative Uses Task (1967), the experimental group was able to obtain the mean score of 5.65 for the pre-test and 7.65 for the post-test. The paired difference for this skill is 2.00 with a t-value of 2.99. This result implies that there is a significant difference between the result of the tests before and after the intervention. It can be observed that the difference for creativity is considerably small but is statistically significant. This increase shows that DT has affected the experimental group considerably. As explained before, DT encourages learners to formulate, adapt, and innovate through thinking outside of the box. Considering this, during the intervention, the experimental group was tasked to develop solutions which are uncommon but relevant. It cannot be denied that due to the pandemic certain limitations were observed during the intervention. Face to face interaction is not allowed and because of this, the experimental group's outputs were not tested on a face-to-face basis which is supposedly ideal for DT. The small increase of the scores of the experimental group can be attributed to the time constraints during the test because they were only given a few minutes to formulate ideas which may turn into timed test anxiety. This is supported by a study conducted by Caviola (2017) wherein students if faced with pressure such as time, oftentimes experience a phenomenon termed as "choking under pressure". In this phenomenon, students produce worst output than their level of ability.

Ultimately, these results show that the control group taught in the traditional lecture-discussion gained a significant difference on the pre-test and post-test for the two skills namely: critical thinking and creativity while collaboration and communication pre-test and post-test results are similar. Meanwhile for the experimental group, there is a significant difference in pre-test and post-test scores in all areas namely: critical thinking, communication, collaboration and creativity thus rejecting the null hypothesis. Hence, it can be said that DT is more effective in improving the 4Cs than the traditional lecture-discussion based on the mean scores of the pre-test and post-test gained by both groups.

### *Comparative analysis of the mean gain between the control and experimental groups*

**Table 6.** Comparative Analysis of the Mean Gain between the Control and Experimental Groups, n = 40

	Control Group, n = 20			Experimental Group, n = 20			T-Value	P-Value
	Pre-Test Scores	Post-Test Scores	Gain	Pre-Test Scores	Post-Test Scores	Gain		
Critical Thinking	20.15 (6.88)	32.35 (2.48)	12.20 (6.35)	19.70 (5.67)	33.85 (2.78)	14.15 (4.73)	-1.10	0.278
Communication	28.75 (7.22)	30.00 (4.77)	1.25 (4.77)	27.40 (6.13)	32.90 (8.88)	5.50 (7.40)	-2.16	0.038**
Collaboration	29.00 (5.06)	29.10 (4.45)	0.10 (1.94)	33.35 (6.43)	35.90 (4.93)	2.55 (3.14)	-2.97	0.006**
Creativity	5.75 (3.29)	7.55 (4.20)	1.80 (2.48)	5.65 (3.41)	7.65 (4.22)	2.00 (2.99)	-0.23	0.819

\*\* Significant at 0.05; Values are presented as Mean (Standard Deviation)

It is shown in Table 6 that the experimental group has a mean gain of 5.50 for communication skill and 2.55 mean gain for collaboration. Whereas the control group has a mean gain of 1.25 for communication skills and 0.10 for collaboration skills. It can be seen that there is a significant difference of the mean gains in Communication and Collaboration thus rejecting the null hypothesis for these skills. The experimental group appears to have higher gain than the control group in these two areas. This means that DT is more effective in enhancing collaboration and communication than the traditional lecture discussion method. As mentioned in the previous sections, DT emphasizes the importance of collaborative method in formulating ideas as well as a smooth flowing communication between people. Moreover, during the intervention, the experimental group was trained to empathize with different situations as presented by the first step of DT which is empathy. They attuned with the different needs of people and scenarios which oftentimes highlights the importance of collaborative work and harmonious communication. In effect, they were able to take the perspective of other people which in turn made them aware of how to properly communicate ideas for the betterment of everyone. This is the reason why the experimental group has more appreciation towards the importance of collaboration and communication as reflected on their test scores. This is supported by Markham (2016) who emphasized that empathy is considered as the umbrella of the 21<sup>st</sup> century skills for it is the basis for teamwork, communication and collaboration in this diverse society.

However, for critical thinking and creativity, the mean gains are comparable between the control and experimental groups. For the control group, the main gain for critical thinking is 12.20 while for the experimental groups is 14.15. The t-value for the critical thinking skill for each group is -1.10 at 0.05 level of significance. This shows that DT and the traditional lecture discussion have both the capacity to enrich critical thinking among students. Though the two groups are comparable, it is valid to note that the increase gained by the experimental group is slightly higher than that of the control group.

Similarly, for creativity, the control group has a mean gain of 1.80 and the experimental group at 2.00 with a t-value of -0.23 at 0.05 level of significance. This means that the results of both groups are statistically similar and has no significant difference. Like the result of critical thinking skill, the experimental group has a slightly higher mean gain than the control group but is not enough to overpower the control group. This result implies that

DT affects the creativity of the students but still requires additional measures that will make it suitable for every learning environment may it be an actual face-to-face class or online. Additionally, it has been seen that even through lecture discussion there has been significant effects that has taken place in the students' learning, but if supplemented with DT Strategy, learning may improve even more. There are varied possibilities that may have interfered with the result of the tests. One of which is the fact that the intervention was done online and no actual face-to-face interaction between the learners and the teacher. The slow internet connection limited the full experience and potential of DT. This might have affected the overall experience of the students while learning through DT.

### **Conclusions and recommendations**

The implementation of DT in teaching of World History yielded a significant effect to 4C skills among the Grade 8 students of San Jose National High School. Notwithstanding the fact that the experiment affected by the COVID-19 pandemic, the slow internet connection in the municipality, and the absence of a face-to-face interaction among the respondents, there was a significant difference in the test scores of the experimental group before and after the intervention was utilized in all 4C skills. This supported the claim that DT is one of the methods of teaching that can enhance the development of the 21st century skills of the learners. DT can either be used as a stand-alone teaching method or a supplement to other time-tested teaching methods. Based on the findings of the study, the following are the needed recommendations: (1) DT will be utilized to supplement other tested teaching strategies, (2) Schools can test DT as an actual limited face-to-face classes with the observance of the minimum health protocols, (3) perception of students and teachers toward DT can be studied in order for this method be tailored to the other needs of the educative community that the researchers failed to recognize, and (4) further research will be conducted using other forms of test to gauge the effectivity of DT in other subjects.

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