

Teachers' Perception on Integrating Historical Vignettes in Teaching Science Concepts

Cheryll D. Guiao¹
Centro Escolar University
Manila, Philippines

Dennis G. Caballes²
Centro Escolar University
Manila, Philippines

Abstract:- This study focused on the teachers' perception on integrating historical vignettes in teaching science concepts. A total of 15 science teachers were purposively selected in a public science school in Caloocan City, Philippines. The study employed a combination of two methods, including structured interviews and surveys using Likert scale, to gather data. The researcher conducted individual interviews with participants using a pre-determined guide and analyzed the data using thematic analysis to identify patterns and themes. The study revealed two major categories that emerged from what their teaching philosophies have reflected: real-life approach and experimental and experiential approach. The integration of historical vignettes in teaching science improved the students' scientific literacy, critical thinking, learning, concept understanding and life skills. The results also suggest that this approach improved the teachers' pedagogical strategies. Additionally, it sparked an interest in students to become socially active and think like scientists capable of solving societal problems. Overall, the teachers were very satisfied with this approach as it helped them effectively teach science and develop research and problem-solving skills in their students.

Keywords:- Historical Vignettes, Science Concepts, Scientific Literacy, Interest and Motivation, Teaching Strategies.

I. INTRODUCTION

The past couple of years threw us in an unprecedented situation which greatly affected lives in every way and form. To this day, we are still in the process of winning the battle of the new normal that the pandemic had brought upon us. The Covid - 19 pandemic has installed the largest disruption in the education system.

First, schools ceased its usual onsite operations and shifted to distance learning. As many students learn from home, they are called upon to direct and manage their own studies. It has become very challenging and critical for the education system to develop skills and amplify pedagogical strategies that will improve quality of education. Second, the reopening of schools with new sets of protocols such as social distancing and limited mobility has brought another challenge for the academe. Teachers are innovators in their unique ways and their empowered pedagogical strategies

may ensure that learners will be equipped with literacy even with the new standard operating procedures put in place.

Considering these shifts, there are a number of methods and teaching strategies that may be used to develop learners' literacy particularly in scientific literacy. Science education deliberately ignites learners' interest and engagement with the things around them. However, because of recent events, this is not relevant anymore. Science education is no longer engaging; it has focused on discussing limited discoveries and memorizing concepts with no scientific impact.

The goal of science education to strengthen learners' scientific literacy faces a great difficulty. Scientific literacy as defined by the Programme for International Student Assessment [13] is the ability to engage with science-related issues and with the ideas of science, as a reflective citizen. A scientifically literate person, therefore, is willing to engage in reasoned discourse about science and technology which requires the competencies to explain phenomena scientifically, to evaluate and design scientific inquiry, and to interpret data and evidence scientifically.

A part of the teaching-learning process is the utilization of new variations of instructional tool [6]. One of these is the use of historical vignettes. Integration of historical vignettes particularly in science concepts will further develop learners' analysis, judgment and critical thinking and scientific literacy. In alignment with the international goal for science education, it is essential for students to improve their understanding of science and develop the ability to apply it to analyze, solve issues, and make choices regarding important worldwide issues [8]. Several studies pointed out that integration of historical vignettes fills the gaps in science concepts. According to Bellochi, Alberto [4], historical vignettes are interesting short stories which encapsulate a brief period of scientific history. These are believed to be useful tools in teaching the nature of science, as it allows students to embrace an understanding of the nature of science. If learners are immersed in historical vignettes, their ability to synthesize, analyze, and evaluate will be developed. Teaching and learning strategies have a strong impact upon students' self-efficacy, motivation, and scientific literacy. Many studies found out that using historical vignettes in discussing science topics encompasses a lot of advantages. Abareta and Mistades [1] revealed that using historical vignettes on physics topics allows the students to develop interest and engagement and increase their conceptual understanding on the topic. This is supported by Guler and

Unal [9] as they used historical vignettes in teaching physics topics when their results stated that it increases motivation scores and academic achievement of the students. Chang [5] also reported that using historical vignettes is an effective tool to use for the students to further understand the nature of science, and this tool has no negative effects on the student's science achievement. In addition, Kortam et al. [10] incorporated historical vignettes on chemistry topics, and they found out that using it adds humanistic flavor in teaching nature of science as it also allows students to develop better understanding on science, research, and its discovery. This advantage also motivates them to see that they also have the potential to contribute to scientific discoveries.

Hence, this academic research aimed to understand the teachers' perception on incorporating historical vignettes in teaching science concepts. A qualitative descriptive approach was used in this study to assess the teacher's perception quantitatively and qualitatively. Qualitative descriptive approach allowed the researcher to observe teaching activities or strategies and assess it qualitatively. The collected data was categorized and analyzed through a structured interview by asking questions to the teachers while the interview was being recorded. Survey questionnaires was given to the teachers to assess their perceptions quantitatively. Some quotations from the subjects can be used for data collection and was categorized for description and interpretation [11]. The drafted questionnaires for the interview should be validated for initial content using Cronbach's Alpha value [6].

Furthermore, this study specifically aims to answer the following questions:

- What are the teachers' perceptions on using historical vignettes in science instruction or teaching?
- What are the teachers' levels of satisfaction in using historical vignettes in science education in terms of:
 - ✓ Developing students' scientific literacy?
 - ✓ Improving/Enhancing pedagogical strategy?
- What are the feedbacks of the teachers on the incorporation of historical vignettes in science teaching?

This study significantly contributed to the teachers as it suggests a new approach to teaching science concepts. It will help the teachers employ the foundation of knowledge and relate it to the topic so that the students will be able to synthesize its relevance in the discussion. It will serve as the teachers' scaffold in recognizing the learners' strength, weakness, and interest in the subject topic as they develop a historical perspective in understanding science concepts. School administrators and supervisors will also benefit in this study as it will help them to design a more efficient curriculum on science subjects that will help the students to deepen their science knowledge.

II. METHODOLOGY

This study utilized the descriptive qualitative research design to qualitatively and quantitatively explore the perspective and understanding of the science teachers on the importance of using historical vignettes in science teaching. This line of inquiry explores differences in the experience and

perception of some aspects of the world [7]. Additionally, it looks into a new pedagogical approach that will incorporate the use of historical vignettes in form of narrative texts, comic strips, and informative videos in teaching science topics.

A. Sample and Setting

The study purposely involved fifteen (15) science classroom teachers, twelve (12) females and three (3) males, from public science secondary schools in the Division of Caloocan City, Philippines. It is regulated by the Department of Education and offers both senior and junior high school programs.

The researchers selected the participants through a selection criterion which are: (a) regular public-school teacher; (b) teaching science subject in the senior/junior high school; and (c) in the service for at least three years. All participants filled out a waiver that includes the Data Privacy Act to ensure that all the information will remain confidential and will only be accessible to the researcher.

B. Instruments

This study consists of two approaches which used a structured interview for qualitative analysis and survey questionnaires using Likert scale for quantitative analysis. The researcher consulted science coordinators for the validation of the materials. The structured interview allows flexibility to investigate further the responses given by the participants for elucidation purposes [2]. Meanwhile, the survey questionnaire allows collection of responses in a more structured and quantitative approach.

➤ Qualitative Analysis: Structured Interview

A structured interview was scheduled with each participant according to their availability. It covered the profiling and questions on the use of historical vignettes in teaching science topics. The researcher conducted 10-15 minutes interview for each participant. The interview was recorded, and a transcript was created which was checked by the participants for validation and credibility. A thematic analysis was also conducted to interpret the answers of the participants. Each repeated code or words will be recorded and categorized into a theme through iterative comparison. The observed patterns from the answers of all participants were recorded as well as the unique answers given by them. Quotations from the interview was also collected and categorized for description and interpretation.

➤ Quantitative Analysis: Survey Questionnaire

A survey questionnaire was answered by the participants. It includes questions on the use of historical vignettes, developing scientific literacy, and pedagogical strategy. Likert scale was used as measurement of the choices. The drafted questionnaires for the survey were given to experts for initial content validation. After consolidation of all the suggestions and comments, the questionnaire was distributed to other science teachers who were not included in the study, this is to test the reliability of the questionnaire. The computed Cronbach's Alpha for the 4 – item assessment on the perception of the teachers on historical vignettes in terms of its utilization and developing scientific literacy was

0.897. This was used to know the internal consistency of the questions to know the reliability of the survey questionnaires [6].

➤ Data Collection

The answers of the participants were collected and analyzed by calculating the measure of central tendency (mean) and standard deviation using SPSS to summarize the answers and know the presence of variation, respectively. The researchers interpreted the numerical data and drew conclusions about the teacher's perception on using historical vignettes in teaching science concepts.

III. RESULTS AND DISCUSSION

All the data obtained from the surveys and interviews conducted were analyzed properly using qualitative and quantitative analysis.

A. Qualitative Analysis

➤ Profiling

When it comes to choosing education as the course, there were common reasons among the four respondents, which were categorized as teaching as an interest and teaching as a passion. ST3, ST6, and ST8 stated that *"I see that education is a way that I will be fond of to work with especially in the field of teaching."* The word *fond* in this statement falls under the category of passion for teaching. Moreover, part of ST4's response was *"I would like to share my knowledge and inspire the next generations,"* which also falls within this same category due to the nature of eagerness or love to do something. ST4's answer will also fall into the category of education as an interest. Stated in ST4's response is *"I took this course because I am very interested in teaching children,"* which clearly indicates the interest of the respondent towards the profession of teaching. These categories make sense because in the study conducted by Balyer and Ozcan [3], part of the primary reason why students chose to pursue education or teaching as a profession is because of the altruistic-intrinsic reasons where passion and interest qualify.

There were five (5) essential categories of reasons as to why the respondents chose science as their major in teaching. These are due to their personal passion, interest, curiosity, expertise, and due to others' influence. It was evident that most of the respondents ($n=11$) used their interest in science as their primary reason in pursuing this major in teaching. Some of the common statements obtained were *"I am interested in the topics that these subject covers"* and *"I've always been fascinated by science that's why I choose this as my specialization."* It was followed by their curiosity to the subject ($n=7$). One sample quotation is *"I choose science as my specialization for I am curious on how the world around us works."* This is followed by those who chose science for their passion ($n=3$). One sample quotation is *"Sharing that curiosity on understanding the world around us is what makes me fall in love with science."* For the expertise ($n=3$), a sample quotation is *"I choose science for my specialization because it is my expertise."* Lastly, majoring science due to

influence ($n=3$). One sample quotation from this category is *"I am inspired by my science teacher that's why I choose science for specialization."*

The average years of teaching expertise in science subject that the respondents have is around 4 to 5 years. Among the fifteen (15) respondents, three have worked for 3 years, three respondents have taught for 4 years, five have worked for about 5 years, one has served for 6 years, and the other three respondents have stayed for 7 years in public teaching. Twelve out of the 15 respondents have experienced teaching science in junior high school level, eight have experienced teaching in senior high school level, while five have experienced teaching in both junior and senior high school level.

➤ Use of Historical Vignettes

Each of the teaching philosophies of the respondents relates to progressivism and social reconstructionism teaching philosophy and is student-centered. The teaching philosophies were sorted out into two major categories: the real-life applications approach and the experimental and experiential approach. Among the fifteen (15) teachers who responded, five of them implied that they believe in the efficiency of exploration of science topics through real-life applications. Examples of responses under this category are *"Inquiry-based learning is a learning process that engages students by making real-world connections through exploration"* from ST3, ST6, ST8 and *"My teaching philosophy is to make learning more engaging through practical applications"* from ST10, ST14. On the other hand, for the experimental and experiential approach in exploring science topics, there were 10 responses that fall under this category. Some of the frequent responses are *"Constructivism/Student centered because the best for student to learn is through hands on activities"* from ST2, ST7, ST11 and *"My teaching philosophy is to make science fun and accessible to all students through simulations"* from ST9, ST12, ST13.

When asked about the type of historical vignettes they use in teaching science topics, thirteen out of 15 responded that they use video presentation most of the time. One of the primary sources of their video supplementation came from online sites such as YouTube. While most of the respondents use the internet to obtain video presentations to use as a supplemental material in teaching science topics, three of them use stories and narrative texts from the same source. Interestingly, all of them attained positive experiences regarding the usage of historical vignettes in class. To classify the main impacts of this application based on their responses, first category was sorted based in the behavioral aspect. This refers to the engagement activity of the students. The second category, on the other hand, pertains to the intellectual aspect of the students towards learning science concepts. This category refers to the critical thinking of the students. Twelve respondents claimed that upon the use of historical vignettes, their students have increased their engagement in class discussion, thus making them motivated to study and understand science topics more. The same is reflected by the responses made by ST9, ST12, and ST13 saying, *"It is*

engaging and makes science easier to understand”, which also relates to the responses of ST1, ST5, and ST15 saying *“It is engaging. It motivates the student more.”* Four answers fall under the second category which refers to the critical thinking of the students. To provide an example, ST 2, ST7, and ST11 stated that *“It develops students reasoning skills”*, and this quotation serves a clear indication that students have developed critical skills upon immersing in the historical vignettes provided by their teacher.

It was evident that among the impacts of the usage of historical vignettes, learning critical thinking skills seems to be the most observed by the teacher respondents. It is followed by bridging the history and the present. Interestingly, this result is parallel to the results obtained from the impacts of historical vignettes since the critical thinking and engagement activity of the students combined are the main importance observed. Additionally, this finding is also supported by the findings of Abareta and Mistades [1] about how historical vignettes increase the student engagement and their ability to comprehend the lesson deeper.

In acquired results from the interview transcript analysis with regards to how historical vignettes influence the students’ motivation in learning science topics, it is observed that the greatest number of responses fell under the category of leading the students to become social mobilizers as a motivation to learn science ($n=4$), while the least influence in motivating the students to learn science was due to the ignition of values and passion category ($n=2$). This might be due to the idea that with the help of understanding the topics in science, students could have a notable contribution in solving the existing societal problems that the society has in the present. It is also interesting that through the use of historical vignettes, students are starting to be motivated to think and move like scientists, which is evident in the statement delivered by ST9, ST12, ST13 stating, *“Only through historical vignettes allows the learners to deeply understand the elements of scientific skills.”* Because of these obtained results, all the respondents were very satisfied with the benefits that they witnessed after integrating historical vignettes to their lesson delivery. In fact, integrating historical vignettes into science education leads to increased engagement from students and a higher quality of students produced. This is likely because incorporating historical context and real-world examples can make the material more relevant and interesting to students, which can improve their engagement and understanding of the subject matter. Additionally, incorporating historical vignettes into science education can help students develop critical thinking skills by encouraging them to consider the societal and cultural context in which scientific discoveries and advancements have occurred.

To complete the analysis of historical vignettes usage in teaching science topics, data was also gathered to show the essential skills that the students developed after incorporating historical vignettes. One of the vital skills that a person must possess is problem-solving ability because not only will it lead the student to resolve the problems they encounter, but it can also incorporate the use of critical thinking in finding

solutions to the existing problem. Aside from that, linking their ability to empower their imaginations to resolve the problem given will also make them productive scientifically. Furthermore, in the process of seeking solutions, part of critical thinking as well as problem-solving is comparing and contrasting which among the plausible solution is the most appropriate in a given situation. All these just basically means that incorporating historical vignettes in the teaching proper holistically improves the level of intelligence of the student in solving various simple and complicated problems they might encounter. Thus, achieving one of the primary goals of a science teacher, which is to lead their students become a problem solver [12].

B. Quantitative Analysis

The mean and standard deviations of the responses of the participants using Likert scale were summarized in the table presented below. *Table 1* shows the mean and standard deviations obtained from the responses of participants who were asked about the frequency of their usage of historical vignettes.

Table 1 Use of Historical Vignettes

Use of Historical Vignettes	Mean*	Standard Deviation*
Historical Narrative Texts	1.60	0.63
Historical Comic Strips	2.00	1.13
Historical Videos	1.47	0.83

*Note: $N=15$

Based on the summary of data from Table 1, it is evident that the use of historical narrative texts ($M=1.60$, $SD=0.63$) and historical videos ($M=1.47$, $SD=0.83$) are the only examples of historical vignettes that could be classified as highly recommended to be used as supplement material in the class discussion of science topics since they fall under the Likert scale equivalent to strongly agree. However, upon conducting One-Way ANOVA (*Table 2*), it was found out that at $\alpha=0.05$, the value of $p=0.244695$ and is not lower than $p=0.05$. Therefore, there was no significant difference on the frequency of integrative usage of historical narrative text ($M=1.60$, $SD=0.63$), historical comics strips ($M=2.00$, $SD=1.13$), and historical videos ($M=1.47$, $SD=0.83$) in teaching science topics in classes being taught by the respondents ($N=15$). This result is an indication that all the mentioned historical vignettes are widely used and are also effective in teaching science concepts, which is why these are strongly recommended by the respondents.

Table 2 One-Way Analysis of Variance on the frequency of usage of historical vignettes in teaching science concepts

	Sum of Squares	df	Mean Squares	F	p-value
Between Groups	2.3111	2	1.1556	1.456	0.244695
Within Groups	33.3333	42	0.7937		
Total	35.6444	44			

*Note: if $p < 0.05$, then there is a significant difference

Table 3, on the other hand, shows the mean and standard deviations obtained from the responses of participants who were asked about the developing scientific literacy among students after incorporating the historical vignettes in teaching science concepts.

Table 3 Developing Scientific Literacy

Developing Scientific Literacy	Mean*	Standard Deviation*
Critical Thinking Skills	1.53	0.52
Learning Skills	1.47	0.52
Concept Understanding Skills	1.27	0.46
Life Skills	1.40	0.51

*Note: N=15

Evident in Table 3, the skills mentioned such as Critical Thinking Skills (M=1.53, SD=0.52), Learning Skills (M=1.47, SD=0.52), Concept Understanding Skills (M=1.27, SD=0.46), and Life Skills (M=1.40, SD=0.51) were all very satisfactorily met and developed among the students of the respondents. Furthermore, upon conducting One-Way ANOVA as reflected in Table 4, it was found that $\alpha=0.05$, the value of $p=0.51$ and is not lower than $p=0.05$. Therefore, there was no significant difference on the satisfactory rate among each of the skills developed by the students to obtain a scientific literacy. In short, when introduced with historical vignettes, the students have very satisfactorily and equally developed all the scientific literacy skills mentioned. These findings were also parallel to the findings stated by Forbes, Neumann, & Schiepe [8] and could also imply that once the essential scientific literacies are developed among individuals, this will elevate the person's capability to resolve various societal problems.

Table 4 One-Way Analysis of Variance on the satisfactory rate of scientific literacy development

	Sum of Squares	df	Mean Squares	F	p-value*
Between Groups	2.3111	2	1.1556	1.456	0.244695
Within Groups	33.3333	42	0.7937		
Total	35.6444	44			

When it comes to enhancing pedagogical strategies, Table 5 shows the mean and standard deviations obtained from the responses of participants. The first strategy (M=1.33, SD=0.49) allows the teacher to design a material that provides cross curriculum input that allows students to explore the subject in matters of depth. The second strategy (M=1.33, SD=0.49) enables the teachers to observe academic progress. The third strategy (M=1.27, SD=0.46) improves the overall quality of teaching by making the student more receptive during discussions. The fourth strategy (M=1.33, SD=0.49) enhances students' level of participation and contribution during learning classes. And the last strategy (M=1.27, SD=0.46) develops higher order thinking skills including analysis, synthesis, and evaluation. Based on the equivalent of the satisfaction of these values in Likert scale, all will fall under the higher rating which is strongly agree. This indicates that the integration of historical vignettes in

teaching science concepts evidently enhances the pedagogical strategy of the teacher, thus achieving their goal of improving the quality of educating the students in various science concepts.

Table 5 Enhancing Pedagogical Strategy

Enhancing Pedagogical Strategy	Mean*	Standard Deviation*
Strategy 1	1.33	0.49
Strategy 2	1.33	0.49
Strategy 3	1.27	0.46
Strategy 4	1.33	0.49
Strategy 5	1.27	0.46

*Note: N=15

IV. CONCLUSION

To conclude, historical vignettes played a vital and critical role in science instruction among the students in high school level. Demographically speaking, the respondents chose their profession as science teachers due to their personal interest in the career and their interest in science. All the respondents believed in progressivism and social constructionism teaching philosophies, and this was reflected in their student-centered approach in their lesson delivery. Relating to this were the two major categories that emerged from what their teaching philosophies have reflected: real-life approach and experimental and experiential approach, where majority of the responses fall into. This just implies how the teachers give importance in providing the students the quality of learning they need. To supplement that finding, thirteen out of 15 respondents declared that they use supplemental videos obtained from the internet as the historical vignette, while three uses narrative texts from online sources. This is also parallel with the quantitative analysis done among the type of historical vignettes that the teachers prefer to use, which are historical videos (M=1.47, SD=0.83) and historical narrative texts (M=1.60, SD=0.63). With the help of incorporating historical vignettes in teaching science topics, they observed some of its impacts to the students such as attaining critical thinking skills and increasing the engagement activity of the students, which are also important because these influences learners more interested to learn and to understand the lessons deeper. Furthermore, when it comes to the developing scientific literacy, Critical Thinking Skills, Learning Skills, Concept Understanding Skills, and Life Skills were all very satisfactorily met among the students. In relation to these developed scientific literacy among the students, results obtained are also indicative of an improved pedagogical strategy done by the teachers. Reflecting from the impacts of integrating historical vignettes in teaching science topics, interestingly, it also influenced them to have an initiative to become social mobilizers and think more like a scientist who is capable of solving various societal problems. Because of all these findings, all the respondents gave a very satisfactory remark since they attained their goal of teaching science topics more efficiently, and they remarkably led the students to develop research and problem-solving skills because they incorporated historical vignettes in their science lessons.

REFERENCES

<https://www.oecd.org/pisa/pisa-for-development/10-How-PISA-D-measures-science-literacy.pdf>.

- [1]. Abareta, J., & Mistades, V. (2021). Integration of historical physics vignettes in teaching kinematics. 2021 3rd International Conference on Modern Educational Technology. <https://doi.org/10.1145/3468978.3469003>
- [2]. Abulon, E. L., & Balagtas, M. (2016). A phenomenographic inquiry on the concept of competence among Filipino teachers. *International Journal of Research Studies in Education*, 5(3), 91-104
- [3]. Balyer, A., & Ozcan, K. (2014). Choosing Teaching Profession as a Career: Student's Reasons. *International Education Studies*, 7(5). doi:10.5539/ies. v7n5p104
- [4]. Bellocchi, A. (2004). Designing and using historical vignettes in science teaching: A personal account. *Teaching Science*, 50(2), pp. 14-17.
- [5]. Chang, K.-S. (2000). The impact of infusing the interactive historical vignettes into 10th-grade high school science instruction in Taiwan on student understanding of the nature of science and science achievement. The University of Texas at Austin ProQuest Dissertations Publishing.
- [6]. Delos Reyes, F. J. F., & Caballes, D. G. (2020). The Application of Collegial Supervision in Teaching History and Philosophy of Science Using Comic Strips, 12(2). [https://doi.org/ISSN 0974-9667/CIIT-IJ-7934/06/\\$20/\\$100](https://doi.org/ISSN 0974-9667/CIIT-IJ-7934/06/$20/$100)
- [7]. Dollete, L. F. (2021). Significance of history and Philosophy of Science in instruction: A phenomenographic inquiry. *The Normal Lights*, 15(1). <https://doi.org/10.56278/tnl.v15i1.1738>
- [8]. Forbes, C. T., Neumann, K., & Schiepe-Tiska, A. (2020). Patterns of inquiry-based Science Instruction and student science achievement in Pisa 2015. *International Journal of Science Education*, 42(5), 783–806. <https://doi.org/10.1080/09500693.2020.1730017>
- [9]. Güler, M., & Ünal, S. (2021). Tell me a story, professor! the effect of historical science stories on academic achievement and motivation in a physics class. *Research in Science & Technological Education*, 1–18. <https://doi.org/10.1080/02635143.2021.1928046>
- [10]. Kortam, N., Hugerat, M. & Mamlok-Naaman, R. (2021). The story behind the discovery: integrating short historical stories in science teaching. *Chemistry Teacher International*, 3(1), 1-8. <https://doi.org/10.1515/cti-2019-0016>
- [11]. Lam, H. C. (2018). The phenomenography tradition in the study of classroom teaching. *International Journal of Research & Method in Education*, 42(5), 513–524. <https://doi.org/10.1080/1743727x.2018.1518417>
- [12]. Mukhopadhyay, R. (2013). Problem Solving in Science Learning- Some Important Considerations of a Teacher. *IOSR Journal of Humanities and Social Science*, 8(6), 21-25. Retrieved from <https://iosrjournals.org/iosr-jhss/papers/Vol8-issue6/C0862125.pdf>
- [13]. PISA. (2017). How Does PISA for Development Measure Scientific Literacy. Retrieved from