TEACHING AND LEARNING INNOVATION EXPO 2021 - SHORT PAPERS

USEFUL LINKS

- Expo 2021 website: https://www.elearning.cuhk.edu.hk/expo2021
- Event programme: https://www.elearning.cuhk.edu.hk/expo2021-programme
- Event access: https://www.elearning.cuhk.edu.hk/expo2021-event-access *(access restricted to registered participants only)*

AREAS OF INTEREST

Curriculum/ Course Designs
Internationalization
Peer-Learning
Student Corner

Submission

4 Short Paper(s)

Talk: Why Incorporate Literary Theory in an ESP Course? (Submission 044)

Presented by

Mr Mike SEE, English Language Teaching Unit, The Chinese University of Hong Kong

Abstract

At the English Language Teaching Unit (ELTU), we often design courses with academic English courses which are tailor-made made for different faculties, departments and programmes. These courses are generally perceived to be unengaging, detached and not correlated to what they are doing. In the newly designed course ELTU2011, English through Literary Analysis, I tried to use Literary Theory as content to teach English. In this course, the three theories are Feminist, Marxist and Postcolonial, and the course was taught for its first time in 2021 January to April. As Culler (1997) put it:" If theory is defined by its practical effects, as what changes people's views, makes them think differently about their objects of study and their activities of studying them, what sort of effects are these? The main effect of theory is the disputing of 'common sense': common sense views about meaning, writing, literature, experience" (p.4). In this presentation, I would like to discuss why these three theories are relevant to Year Two students of the Faculty Arts and why literary theory is relevant even when they are neither English literature majors nor English majors.

Short Paper

Open

Session

28 July 2021 (Wednesday) 15:45- 17:00 Room A

Join the Meeting

Areas of Interest

Curriculum/ Course Designs

CUHK Teaching and Learning Innovation Expo 2021

Why incorporate literary theory in an English for Specific Purposes (ESP) course?

I.   Introduction & Background

In 2021, the CUHK ELTU introduced a new content language hybrid developed course entitled *ELTU2011: English through Literary Analysis* for Y2 general arts students.

First taught from January to April 2021, *ELTU2011* is a rehaul of the previous course *English for Arts Students*, a general course that included academic reading, academic writing and academic speaking.

II.   Rationale

Through the questionnaire survey, course evaluations and teaching evaluations, it was noted that over 60% of arts students did not require ESP support. Moreover, it was revealed that there was low interest from the students of the faculty of arts and sciences as they did not feel engagement or resonance with the previous course.

With the core ELTU team, we decided to solicit feedback from students taking the previous course, the associate dean of education as well as colleagues who had taught the course in order to re-design the course.

III.   Aims

As the main course writer, I took on the task of taking complex literary theories and broke them down into digestible literary themes and chapters that would be accessible to students who studied across various disciplines who weren't literature or arts majors.

The key aim was to combine the classic with the contemporary. In order to make the literature more accessible, I relied heavily on texts and excerpts from popular culture such as *the Handmaid's Tale* adaptation, excerpts from *Robinson Crusoe* and *1984,* songs from *Les Miserables*, introducing the concept of the Bechdel test in the television series *Dummy* as well as scenes from *Train to Busan, Love, Death and Robots, Two Sentence Horror Stories, The Yellow Paper* as well as *the Grimms' Fairy Tales*.

The texts were chosen in hopes to inspire students' interest, motivation and effort in understanding them, resulting in their own original and sophisticated analyses to produce criticality of thinking, sophisticated work and use of multiple angles in order to appreciate art and popular culture.

IV.   Content: The Case for Literary Theory in ESP Course

In the context of Hong Kong, it is important for students to understand the ways in which their daily lives are mirrored in literature and popular culture, making the case for studying literary theory and the relevant issues a pertinent area of study. It is linked to the foundations of society.

In addition to this, one pertinent and perennial challenge of universities is to strengthen critical thinking with students. Despite much talk of this topic, the model and applied execution of this criticality is vague. The attempt to use literary criticism as a model for critical thinking would allow for students to view storytelling and literature through different levels of thinking critically through the literary theory lens. Including this as a part of teaching ESP elements will allow room to discuss pertinent and riveting issues that are important to students.

More importantly, the studies and interests of faculty of arts students are linked to the humanities. It is thus important for these students to not only achieve a functional value of the English language, but to acquire it in order to discuss cultural values. An accessible way to do so is to understand fiction through the critical lens of literary theory: *the feminist lens, the marxist lens* and the *postcolonial lens*.

With regards to *feminist theory*, Hong Kong remains a relatively conservative city. Students may not think they can relate, however with their identity, one must understand that they either identify as male, female or binary. The concept of the 'non-binary' is often one that is foreign, confusing or non-existent to students. In addition to this, many in this society are unaware or turn a blind eye to the microaggressions or sexist undertones that exist.

To this day, it is important to note that out of the three genders, it is the male patriarchy that often comes up on top which consequently exploits, dismisses or takes advantage of the other genders. By understanding the different waves of feminism, the beginnings of understanding and de-stigmatization toward this subject can be introduced. The condemnation for incorrect moments should be criticized more, not excused and should be condemned. Critical reactions to sexist comments or expected gender roles should be continuously questioned and debated.

With regards to *Marxist literary theory*, it is widely known that Hong Kong is part of a capitalist system. The issues of income disparity and the city's deep roots and connection with capitalism come to play in understanding how societies assign the roles of the bourgeoisie or the proletariat in which such values and paradigms are reflected in literary works and popular culture.

Such representations of bourgeoisie and proletariat can be easily seen and extended in Hong Kong. Within a 15 minute walking distance, you have the affluent class living in luxurious apartments such as The Arch, and those in an underprivileged class living in caged homes. The huge disparity of living conditions, the wealth gap and large desires for consumerism is what is discussed as commodification in Marxist literary theory.

As students and citizens, it is important to understand, bring a critical eye as well as face such a society in their near future. Part of students' education in language is also involved in wielding the power of language to discuss, advocate and build their own identities. As they eventually become part of the workforce, it is important to be aware of such a system and how it works, with its benefits and challenges.

Moreover, there is an increased interest in dystopian literature and film in recent years. As part of the appreciation of arts, humanities and society, it is important for students to understand why there is such an interest and to attempt to discuss the parallels between life and fiction.

With regards to *postcolonial theory,* it is important to note that Hong Kong has a past as a former British colony. By extension, one can argue that Hong Kong has a postcolonial or post-colonial identity. Understanding the history and identity of Hong Kong is important to understand its past and links to colonialism.

The West (or the Occident) has been the main culture of the world. Whether directly or indirectly, it has led popular culture and pushed for and exported their version of the world. Much like other identities, Hong Kong is a place and identity that has been 'otherized' by others outside of the Occident. As a result, there is much bias and stereotypes brought over that students must bring a critical eye to.

We also live in a society where representation of cultures outside of the Occident greatly lacks diversity and understanding. Issues of lack of representation, appropriation and negative stereotypes are some of the challenging issues that we still tackle today. Such discussions will encourage students to acquire the English language while understanding and articulating meaningful arguments on prevalent topics of today.

It is also relevant to discuss the topics of negative stereotypes that were promoted in literature, film and popular culture in the past and present, such as in the works of Dr. Seuss, Disney or even recent adaptations in literature, film and popular culture.

V.   Teacher & Student Feedback

From the teachers' perspective of the course, it was very positive. They welcomed the hybrid nature of the course that involved the literary theory and the ESP components and appreciated the variety of texts. They also found the course enjoyable and found the difficulty level to be appropriate.

They also found the flow of the course to be fluid and easy to follow. They also noted that the content seemed to help students engage and interact with the EAP components and expressed increased students interest and enjoyment with their teaching. The teachers also found that there was an increase in sophisticated academic vocabulary used in the final assessments which enriched their coursework and learning immensely.

From the students' perspective of the course, the students found the literary theory and content topics to be very relevant, interesting and useful. They found the reading materials to be very interesting, with ample examples that related to their wide range of studies and have learned a lot from the course.

<u>Acknowledgements</u>

Mr. Mike See
B.Ed., M.A, M.A.
Lecturer at the English Language Teaching Unit (ELTU)

Ms. Elaine Chan
B.A.
Hong Kong Baptist University

Talk: Internationalization of "In Dialogue with Nature": Our Quest for a Better World (Submission 052)

Presented by

Dr WONG Wing Hung, Office of University General Education, The Chinese University of Hong Kong
Dr PANG Kam Moon, Office of University General Education, The Chinese University of Hong Kong

Abstract

Internationalization of the compulsory general education core-text course "In Dialogue with Nature" aims to enhance collaborative learning among students from different places and cultures via discussions on timely and tangible issues. The Sustainable Development Goals (SDGs) are a collection of global goals designed to be a blueprint to achieve a better and sustainable future, hence students' awareness of the SDGs is an essential ingredient for them to become 21st century global citizens. This talk will introduce how to "internationalize" this course by identifying and teaching the SDG elements in the core texts, and in addition, constructing a learning framework for students from CUHK and the National University of Singapore to work together in a joint project.

Short Paper

Open

Session

30 July 2021 (Friday) 13:00 - 13:45 Room B

Join the Meeting

Areas of Interest

Internationalization

Internationalization of "In Dialogue with Nature": Our Quest for a Better World

Wong Wing Hung and Pang Kam Moon
General Education Foundation Programme
Office of University General Education

Abstract

Internationalization of the compulsory general education core text course "In Dialogue with Nature" aims to enhance collaborative learning among students from different places and cultures via discussions on timely and tangible issues. The Sustainable Development Goals (SDGs) are a collection of global goals designed to be a blueprint to achieve a better and sustainable future, hence students' awareness of the SDGs is an essential ingredient for them to become 21st century global citizens. This paper will introduce how to "internationalize" this course by identifying and teaching the SDG elements in the core texts, and in addition, constructing a learning framework for students from The Chinese University of Hong Kong and the National University of Singapore to work together in a joint project.

I. The GE course "In Dialogue with Nature"

The general-education course "In Dialogue with Nature", together with "In Dialogue with Humanity", form the skeleton of the General Education Foundation (GEF) Programme, which is compulsory for all undergraduate students of The Chinese University of Hong Kong (CUHK). Students are expected to finish the GEF Programme in the first two years of study. The courses are seminar-based. Students are divided into groups of 25 people each. Every week, they are required to read and discuss a text, which is excerpts from selected classics. There are three parts in the syllabus of "In Dialogue with Nature", namely (1) human exploration of the physical universe, (2) human exploration of the world of life, and (3) our understanding of human understanding. In the three parts, there are 3, 3 and 5 texts, respectively (see Appendix A for the list of texts).

Having read the texts, students reflect on big questions such as "What is life", "What is the beauty of nature" and "What limitations does science have". Here are some examples of selected excerpts and extended discussion topics:

- Chapters 1 and 2 of James Watson's *DNA: The Secret of Life* are about the discovery of the DNA structure and the scientific reasoning that guided the discoverers. Students are asked to ponder over some questions such as "Does the discovery mean science has taken over religion's role in explaining life" and "Is life just a matter of physics and chemistry".
- Chapter 6 of Rachel Carson's *Silent Spring* describe how humans' overuse and misuse of herbicides brought detrimental consequences to the natural habitat, and touches upon the controversy arising from the uncertainties in course of scientific investigations. Extended discussion includes "What is the beauty of nature" and "What is the nature of science".
- Newton's *Principia* introduces Newton's laws of motion and the law of gravitation. In the tutorial session, students reflect on the significance of the novel epistemological approach to understanding the universe, as well as the implication of the innovative idea about the clockwork universe.

II. SDGs: from big questions to semi-big questions

We adopt an approach that every discussion session consists of two steps. In the first step, students go through the main ideas of the core texts. In the second step, with an adequate understanding of the text, students discuss extension questions, which are usually big questions about meanings and values. Students cannot just give a "yes-or-no" answer to a big question but have to evaluate, prioritize and even to create some new ideas. However, big questions are usually ultimate that they are about something which are remote in space and time, for example, life and death, determinism and free will. They are also ideological that they might not have much to do with real life. Year 1 and Year 2 students may find it difficult to handle the big questions. Are there "semi-big" questions which are more down-to-earth but not too local in space and time so that students can still reflect on meanings and values?

In 2015, the United Nations adopted the 17 Sustainable Development Goals (SDGs). All countries and places are expected to work towards the goals to make the world develop in a sustainable manner. Connections can be found between the texts of "In Dialogue with Nature" and the SDGs. Below we will introduce an internationalization project of "In Dialogue with Nature" conducted in the spring term of 2020 – 2021. In the project, arrangements were made so that students could (1) think internationally and (2) learn internationally.

III. Thinking Internationally with SDGs

As mentioned previously, the extended discussions in this course involve big questions, such as "What is the beauty of nature" and "Why is biodiversity so important". However, big questions are usually about issues which are ideological. Those issues are remote from daily life that students may find it difficult to handle.

The SDGs provide a rich resource of "semi-big" questions which are only halfway to the ultimate issues. These international or global topics, which are more down-to-earth but not too local in space and time, still provided opportunities for students to reflect on meanings and values. We use *Silent Spring* as an example again. This text is related to SDG#15 (Life on Land). For this SDG, an issue is deforestation. We asked, "What is the 2030 target for the global forest area" and "What is the biggest threat to forests". One of the biggest threats to forests is doubtless agriculture. Farming, ranching, and urbanization are some major reasons for deforestation. Yet, excessive deforestation would reduce the resilience of human food systems and their capacity to adapt to future change that depends on biodiversity. Thus, this topic can serve as an international context and touches upon the importance of biodiversity, thus arousing students to think about the beauty of nature, which could be otherwise abstract.

Another example is an excerpt from Plato's *Republic*. The text is the beginning of Book 7, which is usually referred to as the allegory of the cave. Here Socrates and Glaucon discussed education. SDG#4 (Quality Education) can be the theme of discussion in the text concerned. On United Nations' webpage which is about SDG#4,[1] we can find the fact that "more than half of all children and adolescents worldwide are not meeting minimum proficiency standards in reading and mathematics." It also says a large number of children rely on school meals. We asked students "What qualities do reading, math and food provide for quality education" and "Do these qualities matter to Plato". SDGs provided an international context in which quality education was no longer an abstract topic.

IV. Learning Internationally

---

[1] https://www.un.org/sustainabledevelopment/education/

In the spring term of 2020 – 2021, we identified a sister course, "Re-examining the Deterministic World of Matter", at the National University of Singapore (NUS). The course was taught by Dr. Chan Chi Wang and taken by 25 students. There are similarities between the courses in content and pedagogies. With the advantage of a nearly complete overlap between the term times of CUHK and NUS, we created several matching points between the two courses so that students from the two universities could do joint projects via Zoom. Below we describe the whole process from the perspective of CUHK students:

1. January 2021 (the semester began): Students were required to complete two micro-modules. *Internationalization of UGFN1000* introduced how the timeless and idealistic topics mentioned in the texts can be connected to the timely and realistic problems, such as sustainable development. *SDGs for You and for Me* focused on the importance of a sustainable development of the world. In particular, the 17 SDGs were discussed. After each micro-modules study questions were given to students as assessment tool.

2. February 2021 (preparation for student projects): There were around 50 CUHK students and 25 NUS students. They formed 25 groups, in each were 2 CUHK students and 1 NUS student. Each group came up with a project topic from a list of 9 suggested project themes such as consciousness and dreams, dream babies, eugenics. A guiding document which is a comprehensive introduction to each project theme was provided to assist students in choosing a topic. In addition, some sample topics, such as "Under what circumstances genetic testing is advisable", "Discuss if your host country favors the concept of dream babies", were suggested upon students' request.

3. February-April 2021 (project period): Students from the two universities met and began literature review. They would meet several times and do the joint projects. In April, each group gave an online oral presentation of 20 minutes in a "student summit", which was an online student conference. After the student summit, every student was required to submit an individual reflection report on the project topic.

In the meantime, we invited Prof. Frederick Davis from Purdue University to give an online talk on "*Silent Spring* and determinism" in mid-March.[2] The talk has given students an excellent example of how to apply knowledge from controversial issues in the past to analyze the current issues related to the SDGs. From the joint projects, we could observe that students from Hong Kong and Singapore could bring together knowledge they learnt from the two courses, as well as come up with some new ideas from different perspectives towards the issues concerned. For example, students from CUHK and NUS had a different attitude towards dream babies. It opened up a dialogue on scientific developments and ethical values between students from different places. We could also observe that in the individual reports on the project, CUHK students could quite well summarize their contributions to and reflection on the project.

When grading students' oral presentations and written reports, measurement was mainly made on high-level thinking and presentation skills. In the joint projects, students in general also showed awareness of the SDGs and appreciation of diversities. In hindsight, we should have done more by setting learning objectives about students' awareness and appreciation. Below we look into the possibility of setting up a learning progression framework for the course of exploration and learning.

V. Construction of a Learning Progression Framework

With reference to the experience we gained in the international project mentioned

---

[2] Frederick Rowe Davis, the Department Head of the Purdue University, Professor of History, and the R. Mark Lubbers Chair in History of Science. https://cla.purdue.edu/directory/profiles/frederick-rowe-davis.html.

above, here we attempt to construct a learning progression framework (LPF). Such a construction is not only for the establishment of measurable goals for students, but also for the provision of educational support to students, hence helping the teacher make inferences about student growth towards the goals concerned in the course of learning. To help both the teacher and students gauge student growth, for each learning outcome, a learning ladder is established for students to climb from the starting point to the full attainment of the outcome.

In order to apply the idea of the LPF, the first step is to define the achievement goals in the course of students' learning:

G1: students acquire basic understanding of the SDGs;

G2: they are able to evaluate and integrate the SDG elements across the core texts; and

G3: they are able to establish insightful interpretations or perceptive reflections on the SDGs.

The achievement of the goals above calls for various levels of student thinking complexity. In the terminology of the Bloom's taxonomy, *G1* to *G3* are manifestations of different levels in the cognitive domain, from "understand" to "analysis" to "evaluation", and to "creation". Thus, student attainments in various stages of the project are also a measure of their growth in cognitive complexity.

As long as the goals have been defined, a list of learning activities and assessment tools were devised in accordance with the specific goals above. When setting appropriate assessments to measure student performance in achieving the goals, attention can be drawn to the following two guiding questions:

- Are the learning activities well-aligned to the goals? Are they written at the appropriate level of cognitive demand?
- Do the assessment tools allow for varied means for students to demonstrate their abilities? Are the rubrics written so as to minimize inter-rater variance?

Table 1 summarizes our attempt to put the existing assessment tools into the LPF, with each level corresponding to certain learning goals and cognitive components concerned. Note that student performance in higher cognitive levels is recognized only if the student has attained the lower ones. In tutorial discussion, for example, students are required to integrate and compare the SDG elements in different core texts, it doubtless calls for higher cognitive levels, such as "apply" and "analyze". Yet, students have to exhibit lower cognitive levels, such as "remember" and "understand", so that they are able to give an informed analysis of the question concerned. In addition, if a student did not understand the reading materials correctly, s/he would not be able to retrieve suitable information about the SDGs and give a balanced discussion on the issue concerned in oral presentations.

Goals	Learning activities/ assessment tools	Cognitive domain
Ability to establish insightful interpretations or perceptive reflections on the SDGs.	Joint project/ the presentations and written reports	Create
		Evaluate
Ability to evaluate the SDG elements across the core-texts.	Teaching the SDG elements in the core-texts/ tutorial discussions questions	Analyze
		Apply
Students acquired basic understanding of the SDGs.	Micro-modules/ the relevant study questions	Understand
		Remember

Table 1: The implementation of learning activities and assessment tools at various stages of "student growth" in the project. The hierarchy of cognitive domain is adopted in "Bloom's Taxonomy". https://www.bloomstaxonomy.net/.

Briggs, *et al* (2015) has devised a more complete framework for assessing student growth towards some common goals. In addition to setting anchor levels of learning progression (the anchor levels, in our case, are similar to the levels of cognitive domain in Table 1), they put emphasis on the "growth" by the end of the instructional period. In other words, it measures how well (quantitatively) a student's performance is enhanced in a learning progression ladder during the period. All in all, this has given us insight into how to refine the implementation of this teaching project so as to optimize a learning environment for our students.

Acknowledgements

References
"Bloom's Taxonomy". https://www.bloomstaxonomy.net/
Derek C. Briggs, *et al.*, "Using a Learning Progression Framework to Assess and Evaluate Student Growth", April 2015. https://www.colorado.edu/education/sites/default/files/attached-files/CADRE.CFA-StudentGrowthReport-Final_0.pdf.

Appendix A: Texts for "In Dialogue with Nature"

Part I. Human Exploration of the Physical Universe
1a. Plato, *Republic*/translated by C.D.C. Reeve (Indianapolis: Hackett Publishing, 2004). [Book VII (Verses 514-517)]
1b. David C. Lindberg, *The Beginnings of Western Science*, 2nd edition (Chicago: University of Chicago Press, 2007). [Chapter 2 (Para. 28-39)]
2. David C. Lindberg, *The Beginnings of Western Science*, 2nd edition (Chicago: University of Chicago Press, 2007). [Chapter 3 (Para. 1-41), Chapter 12 (Para. 1-2, 33-55)]
3a. I. Bernard Cohen, *The Birth of a New Physics* (New York: W. W. Norton & Company,

1985). [Chapter 7 (Para. 1-25, 62-63)]

3b. Isaac Newton, *The Principia*/A new translation by I. Bernard Cohen and Anne Whitman (Berkeley: University of California Press, 1999). ["Definitions" 1-5, Para. 2 of p. 408, and "Axioms, or the Laws of Motion" Corollary 1]

Part II. Human Exploration of the World of Life

4. Charles Darwin, *The Origin of Species*, 1st Edition. (Full text available online: http://darwin-online.org.uk/) [Chapter 4 (Para. 1-6, 9-18, 39-46, 50-63, 68-71)]

5. James D. Watson with Andrew Berry, *DNA: The Secret of Life* (New York: Alfred A. Knopf, 2003). [Chapter 1 (Para. 1-36), Chapter 2 (whole)]

6. Rachel Carson, *Silent Spring* (Boston: Houghton Mifflin, 1962). [Chapter 6]

Part III. Our Understanding of Human Understanding

7. Henri Poincaré, *The Value of Science: Essential Writings of Henri Poincaré* (New York: Modern Library, 2001). [*Science and Method*, Chapters I and III]

8. Eric R. Kandel, *In Search of Memory: The Emergence of a New Science of Mind* (New York: W. W. Norton & Company, 2006). [Chapter 4 (Para. 1-9), Chapter 28 (whole)]

9. Joseph Needham, *The Shorter Science and Civilisation in China* Vol. 1 (Cambridge: Cambridge University Press, 1978). [Chapter 10 (Para. 1-3, 13-42)]

10a. Nathan Sivin, 'Why the Scientific Revolution Did Not Take Place in China – or Didn't it?' Web version: (revised 2005.8.24) http://ccat.sas.upenn.edu/~nsivin/scirev.pdf

10b. 沈括（著），胡道靜（校注），《新校正夢溪筆談》（香港：中華書局，1975）。 [304 節：「棋局都數」，307 節：「活版印刷」，357 節：「虹」，430 節：「海陸變遷」，437 節：「指南針」]

Shen Kua, *Brush Talks from Dream brook*, in Joseph Needham, *Science and Civilisation in China*, (Cambridge University Press, Vol. 3: 1959, Vol. 4: 1962, Vol. 5: 1985). ["Total Number of Possible Situations in Chess", "Movable Type Printing", "Transformation of the Land and the Sea", and "The Compass"]; Nathan Sivin, "The Rainbow", unpublished.

11a. William Dunham, *The Mathematical Universe: An Alphabetical Journey Through the Great Proofs, Problems, and Personalities* (New York: Wiley & Sons, 1994). [Chapter G]

11b. Euclid, *Elements* / translated by Thomas L. Heath. Web version: http://www.perseus.tufts.edu [Book 1: "Definitions", "Postulates", "Common Notions", and "Propositions" 1-5, 7-11, 13, 15-16, 18-20.]

Talk: Ensuring Mathematical Success for All Students using an Online Cooperative, Communication and Competitive-based Learning Platform (Submission 068)

Presented by
Dr Jeff Chak Fu WONG, Department of Mathematics, The Chinese University of Hong Kong

Abstract
This study is devoted to mathematics learning using an online cooperative, communication and competitive-based environment. When solving synthetic and real-life first year calculus problems, students learn from each other by switching between roles - teacher, peer and student - where these models are based on the dyadic and triadic interactions: Person-Computer, Person-Computer-Person, Group-Computer-Group and Person-Computer-Group. Students not only speak their minds about how to maximize their learning achievements using text messages and social media via Zoom, but also build up their social learning network, enhance their conversational intelligence and handle their emotional intelligence when facing a set of challenging problems. Demos for each model together with different examples will be presented and discussed. This project is funded by Courseware Development Grant Scheme (2019-22).

Short Paper

Open

Session
29 July 2021 (Thursday) 13:00 - 14:15 Room B

Join the Meeting

Areas of Interest
Peer-Learning

Ensuring Mathematical Success for All Students using an Online Cooperation, Communication and Competition-based Learning Platform

Peiqin LI and Jeff Chak-Fu WONG

Group members: Thomas AU, Hiu Ning CHAN, Rex Chiu Hong LO

Department of Mathematics, Chinese University of Hong Kong, Shatin, Hong Kong

Abstract:

This study is devoted to mathematics learning using an online cooperation, communication and competition-based environment. When solving synthetic and real-life first year calculus problems, students learn from each other by switching between roles – teacher, peer and student – where these models are based on dyadic and triadic interactions: Person-Computer, Group-Computer, Person-Computer-Person, Group-Computer-Group and Person-Computer-Group. Students not only speak their minds about how to maximize their learning achievements using text messages and social media via Zoom, but also build up their social learning network, enhance their conversational intelligence and handle their emotional intelligence when facing a set of challenging problems. Demos for each model together with different examples will be presented and discussed. This project is funded by Courseware Development Grant Scheme (2019-22).

Keywords

Cooperation, communication and competition-based learning; Kolb's learning cycle; Pólya's four-step problem strategies; Mason's effective questioning type strategies; Educational game theory

Introduction

Examining the effects of an online cooperation, communication and competition (CCC)-based environment for first year Calculus on student achievement and teacher-peer-student relationships is still in its infancy. This work builds the structures of CCC teaching/learning models and how to embed them in an online learning platform, where students either work in groups, work independently, or both to accomplish positive interdependent goals. The role of the computer is to act as a teacher-led learning delivery system to build a reciprocal relationship between students and teachers where students learn from each other by switching between the roles of teacher, peer and student, and they take part in a reciprocal peer-tutoring activity. Based on dyadic and triadic interactions, Person-Computer, Group-Computer, Person-Computer-Person, Group-Computer-Group and Person-Computer-Group models are designed.

The purpose of the present study is to use educational game (EE) strategies (e.g., [1], [2], [3], [4]) for accomplishing the dyadic and triadic interactions among teachers, peers and students. In what follows, we will describe a Kolb experiential learning cycle [5] from theoretical framework to conceptual framework, where these frameworks draw on EE strategies and principles and their relationship to online CCC-based environments. When constructing the CCC activity flow, Pólya's four-step problem strategies (Pólya's PSs) ([6], [7]) and Mason's effective questioning types (Mason's QTs) ([8], [9]) are used to model the problem. For illustrative purposes, we demonstrate the construction steps for how EE strategies can be used

in the first year Calculus courses. To measure the strength and the self-sustainability of the designed teaching/learning platform, we will draw conclusions based on temporal motivation theory. The links to five Calculus problems that serve as an illustrative demonstration are listed. Finally, we will provide suggestions for practice and further research.

From Theoretical framework to Conceptual framework

Applying the Kolb learning cycle as the framework of the behaviouristic, constructivist, psychological and sociological perspective was summarized by [10]. See also [11]. The Kolb cycle consists of four stages [10]:

Concrete experience – The first stage requires students to solve a set of tasks based on their prior knowledge and teachers to introduce students to the problem in the appropriate way, construct goals and principles and help them in identifying learning outcomes. By shifting these activities to the CCC-based platform, students form two groups and study a list of EE rules and decide which roles should they play, e.g., teachers, peers or students before answering any specific problems.

Reflective observation – The second stage gives students the chance to gain concrete experience by having them analysing the problems, interpreting them with reference to prior knowledge and searching for their meanings. It also allows teachers to encourage them to reflect deeply by asking them questions that will stimulate them to share their observations, insights and opinions. By shifting these activities to the CCC-based platform, online chat boxes and Zoom allow students to create an atmosphere of openness, trust and safety by exchanging their ideas in groups. In terms of mind mapping and SWOT (strengths, weaknesses, opportunities and threats) analysis, Pólya's PSs and Mason's QTs are used.

Abstract conceptualisation – The third stage gets students to move from a concrete experience to a more abstract level. Teachers help students to construct generalisations, draw conclusions, formulate general directives, principles, rules, and criteria, and discover mechanisms. Shifting these activities to the CCC-based platform enables students to reach the correct conclusions through analysis, matching and organizing of patterns and the use of graphical animations.

Active experimentation – The last stage requires teachers to support students, moderate their work and encourage them to practice their newly acquired knowledge. By shifting these activities to the CCC-based platform, self-regulated learning systems can be used to provide different levels of EE-based problems from easy to moderate to difficult.

Methodology

Educational game strategies

In connection with the relevance of EE strategies, the four major operational aspects of players, strategies, actions, and payoffs are usually illustrated by the payoff matrix as follows (e.g., [1]):

	Player B	
	Strategy 1	Strategy 2

Player A	Strategy 1	Action A1/B1: Payoff A1, Payoff B1	Action A1/B2: Payoff A1, Payoff B2
	Strategy 2	Action A2/B1: Payoff A2, Payoff B1	Action A2/B2: Payoff A2, Payoff B2

The roles of each aspect are described below:

Players – Require an interactive relationship between a pair of students and/or groups, e.g., Player A, Player B.

Strategies – Two groups can either choose Strategy 1 (cooperate with the other group) or Strategy 2 (compete with them). Based on the framework of a 2 by 2 game, four possible choices are: (cooperate, cooperate), (cooperate, compete), (compete, cooperate), and (compete, compete).

Actions – Refer to sequences of actions for solving various mathematical problems, e.g., Action A1, Action A2, Action B1 and Action B2, where each group will respond with specific pairs of the strategy choices.

Payoffs – Can be modelled by pure cooperation, pure competition, a hybrid mix of strategies or repeated game. The player that gets the highest score wins.

In terms of the EE of teaching and learning, as an example of game, we use the payoff matrix of the Prisoner's dilemma game (e.g., [1], [3], [4]) that is based on $t > r > p > s$, where mutual cooperation brings a reward (r) payoff to each player and mutual competition (defection) leads to a punishment (p) payoff. When one player defects (resp. the temptation (t) payoff) while the other cooperates, she/he gets the sucker (s) payoff. The condition $r > (t + s)/2$ is added so that mutual cooperation is better than coordinated alternation of cooperation. The payoff matrix is illustrated in the figure below.

		Players: Student B or Group B	
		Cooperate	Compete
Players: Student A or Group A	Cooperate	*r, r*	*s, t*
	Compete	*t, s*	*p, p*

The main goal of EE is to let players collect as many points as possible by playing a number of moves against a fixed opponent while simultaneously sharing the same information about problem sets in a sequential order. Before making any choices, group members in each group interactively exchange their thoughts and alternatively switch the roles of a leader, follower

and peer for the collaboration and the communication activities inside the group. Based on the order of preferences in the Prisoner's dilemma game, either the temptation payoff or the sucker payoff can be chosen by the two groups. In order to encourage the rise of a cooperative relationship, the cost of the punishment payoff gradually gets more severe.

The rules of the game are as follows:

Players – The Left Group (LG) and the Right Group (RG) find all the answers independently and simultaneously in a sequential format. Your group will know how the other group answers each question.

Strategies – For each group, attempts must be submitted before the time expires. Unlimited attempts are allowed for this question.

Before time expires, the four possible outcomes of the payoff strategies are:

- If both groups cooperate with each other, then both groups obtain 3 points.
- If both groups do not cooperate, then both groups obtain 2 points.
- If the LG cooperates but the RG does not cooperate, then the RG obtains 4 points but there is no penalty for the LG
- If the RG cooperates but the LG does not cooperate, then the LG obtains 4 points but there is no penalty for the RG.

After time expires, if you do not submit any answer then no matter which rule you chose, the score will be -1.

Outcomes – Any group that submits the correct answer will receive one point, while if you submit an incorrect answer, then the score will be -1.

Payoffs – If your final score is higher than that of the other group, you will get a free hint that can be used for subsequent questions. These accumulated hints can be used for any questions.

The time constraint, which refers to the time discount factor, is used to measure the effectiveness of the game model. Typically, based on temporal motivation theory, its time value indicates motivation in the EE strategies. Here, for each question, we set a specific time frame. Let $w \in (0,1)$ be the length of time the user needs to finish each problem. This scaled value will show a cooperation ratio, k, with the value of cooperation $\frac{r}{1-w}$ as the numerator and value of competition $t + \left(\frac{wp}{1-w}\right)$ as the denominator. When $k \geq 1$, then the designed game is worth playing and favors cooperation; when $k < 1$, then that game is not worth playing, but favors competition. In order to measure the incentive structure of the game, a strong contract, $w \geq \frac{t-r}{t-p}$, and a self-sustaining contract, $(r - p) \geq \frac{(1-w)(t-r)}{w}$, are required. If a game meets the two contract conditions, e.g., strong and sustainable, then the game is good. Finally, if a game is good and valuable, as defined by the acceptable cooperation ratio k, then the designed game is useful.

CCC activity flow

To enable us to improve the strategies of EE over time using first-year Calculus problems, we designed each problem based on Pólya's PSs and Mason's QTs. Table 1 summarizes how all the salient features of these two tools are applied. We use "Demo 3" as an illustrative example. The first column contains the four steps. The second column lists the definition of each step.

The third column explains how our Calculus problems, e.g., Taylor Series (e.g., [12], [13]), can be implemented and framed by these four steps. The last column illustrates which question and responding types are used and make a connection between the motivation and the achievement of EE strategies. Based on Mason's QTs, the six types used are as follows:

1. Enquiry-questions: a student has a gap in their knowledge and wants to find something out.
2. Controlling questions: used by the teacher when asking questions to students, in order to emphasize their control and power in the learning process.
3. Cloze technique: teachers pause at the end of a sentence and make the students fill in the missing word.
4. Genuine enquiry questions: when the teacher is genuinely interested in how a student finished their work, but the freshman assumes that if the teacher is asking them about their work, they must have done it wrong. This can lead to the student being defensive.
5. Meta-questions: the teacher guides students to ask questions about their own answer, through reflection, known as "scaffolding".
6. Open and closed questions: closed questions need a single correct answer, whereas open questions allow students to choose how much information they wish to disclose in their answer and there is no unique and correct response.

Table 1			
	Definition	Explanation of our problem	Question and response types
Understanding the problem	Students must understand the meaning of a problem statement; identify the known, the unknown, and the relationship between them; and recognize all underlying concepts that are needed for solving the problem.	Students must understand the definition of a compounded interest equation, where they are given an interest rate per year and the time period involved in years. The equation is written as a power function.	Enquiry-questions
Devising a plan	Students must clarify the relations between parts of the problem, combine previously learned knowledge to establish thoughts for solving a problem, and develop a plan.	Students must understand the relationship between input and output variables, the properties of logarithmic functions, know the applications of the Maclaurin polynomial and a partial fraction decomposition and derive a new mathematical polynomial.	Controlling questions

Carrying out the plan	Following the planned path, students execute all calculations previously identified in the plan.	Students will use different formulas to compute the best value of the time period and perform a comparative study.	Cloze technique and Genuine enquiry questions
Looking back	Students check the solution and carefully revise the course that they refer to in an attempt to see if other problem solving paths exist.	Students will conduct a number of sensitive tests from the selection of different parameters and re-examine the whole problems and calculations.	Meta-questions and Open and closed questions

Results

To bridge the gap between CCC learning activities, Demo 1 – Demo 4 are built as triadic interaction learning modes, e.g., Person-Computer-Person, Group-Computer-Group and Person-Computer-Group models, while Demo 5 is built as dyadic interaction modes, e.g., Person-Computer and Group-Computer models. Details of five demos are as follows:

	Types of payoff strategies	Calculus problems
Demo 1	Pure competition	Matching the given function with the Taylor series and the interval of convergence
Demo 2	Mixed strategy & repeated games	Compute the definite integral using Taylor series expansion and find its correct function form
Demo 3	Mixed strategy & repeated games	Apply the Taylor polynomial of order n based at a for solving a financial problem
Demo 4	Mixed strategy & repeated games	Compute the Taylor polynomial of order n based at a and obtain a good bound for the remainder for a Taylor polynomial of order n based at a

Salient features of the first four demos are:

- Graphical representations and animations using cursor buttons and sliding bars are provided for solidifying users' basic and deeper understanding of the concepts of selective Calculus topics.
- Users simply insert mathematical answers through an on-line system that is checked by the platform feedback system.
- Adaptive levels of problem difficulties are selected by the users before and after each demo starts and ends.
- Users are provided with text-, dialog- and action-based feedback in real-time mode. The platform allows users to track the status of an interaction or dialog as they talk to their members. Most importantly, they learn social and emotional skills from one another when facing different scenarios of EE strategies.

- Online tips, hints and guideline instructions are given based on a start-stop learning mode.
- A scoring system is provided for performance feedback based on different EE strategies.
- The time constraint box and the payoff matrix hashtag are provided for the user.

Finally, Demo 5 contains a series of iterative and reciprocal learning activities and fill in the gap between the skills people learn and the skills people need through the process of collaboration and communication. The two problem sets involve more extensive applications of the Taylor series (e.g., [14], [15]) than Demo 1 – Demo 4 and pave the way for further development of the project-based learning activities (e.g., [16]). Ill-structured, well-structured and unstructured problems are embedded in Demo 5 so that learners will have experimental, hands-on and student-centered learning.

For the descriptions, regulations and highlights of each demo, please click the link below:

http://47.243.51.134:5000/

Conclusions

In our alternative online approach for learning synthetic and real-life first year calculus problems, we proposed several dyadic and triadic interaction modes. We have built the CCC-based platform based on the frameworks of EE strategies, Pólya's PSs and Mason's QTs. The methodologies applied here can be used in different MATH courses, e.g., Linear Algebra and Differential Equations, etc., and will promote practical teaching activities in the classroom and use different aspects of Calculus courses in the future. Verification of whether game design will be useful will be addressed. Results of the data analysis on the student' survey and questionnaire using machine learning techniques will be reported and published elsewhere shortly.

References

1. Taylor, M., Taylor, M. (1987). The possibility of cooperation. Cambridge: Cambridge University Press.
2. Elstad, E. (2002). Towards a model of strategic actions in the classroom: games theory as research heuristic, Scandinavian Journal of Educational Research, 46:1, 65–81. DOI: 10.1080/00313830120115615
3. Hardy, R. (2015). Can game theory techniques can be used to model classroom interactions? Mathematics Teaching, (245), 22–26.
4. Raadt, J. S. (2017). The game of learning: using game theory for educational research, presented at Southwest Educational Research Association. San Antonio, TX.
5. Kolb, A.Y. and Kolb, D.A. (2009). Experiential learning theory: a dynamic, holistic approach to management learning, education and development. In S.J. Armstrong and C.V., Fukami (Eds.), The SAGE Handbook of Management Learning, Education and Development, (pp. 42–68). SAGE Publications Ltd., Thousand Oaks.
6. Pólya, G. (1957). How to solve it: A new aspect of mathematical method. Princeton, N.J: Princeton University Press.
7. Chadli, A., Tranvouez, E., Bendella, F. (2019). Learning word problem solving process in primary school students: an attempt to combine serious game and Polya's problem solving model. In A. Tlili, M. Chang (Eds.), Data Analytics Approaches in Educational Games and Gamification Systems, Smart Computing and Intelligence (139–163). Springer Nature.

8. Mason, J., Johnston-Wilder, S. (2004). Fundamental constructs in mathematics education. London: RoutledgeFalmer.
9. Mason, J. (2021 2nd edition). Effective Questioning and Responding in the Mathematics Classroom. In G. Ineson & H. Povey (Eds.), Debates in Mathematics Education (pp. 131–142).
10. Wach-Kakolewicz, A. (2016). Constructivist approach in teaching in higher education. In A. Wach Kakolewicz & R. Muffoletto (Eds.), Perspectives on Computer Gaming in Higher Education (pp. 11–20). Poznan: Bogucki Wydawnictwo Naukowe.
11. Zimmerman, B. J., Schunk, D. H. (2003). Educational Psychology: A Century of Contributions. Mahwah, NJ: Lawrence Erlbaum.
12. Varberg, D., Purcell, E., Rigdon, S. (2007). Calculus, 9th Edition, Prentice Hall. 2007.
13. Rogawski, J., Adams, C. (2015). Calculus: early transcendentals, 3rd Edition, W. H. Freeman.
14. Goode, S. W., Annin, S. A. (2014). Differential equations and linear algebra, 3rd Edition, Prentice Hall.
15. Zill, D. G. (2017). A first course in differential equations with modeling applications, 11th Edition, Cengage Learning.
16. Condliffe, B., Quint, J., Visher, M. G., Bangser, M. R., Drohojowska, S., Saco, L., & Nelson, E. (2017). Project-based learning: A literature review (Working Paper). New York, NY: MDRC. Retrieved from https://s3-us-west-1.amazonaws.com/ler/MDRC+PBL+Literature+Review.pdf

P40: The Power of Touch - The Case of Dyslexia and Museum Education in the United Kingdom

Presented by

Ms Hiu Tung MOK, Postgraduate Diploma in Education Programme (Major in History), The Chinese University of Hong Kong

Abstract

In the United Kingdom, museums act as an extended classroom for formal teaching, especially in history. A one-day visit is often characterized by gallery trails, games, crafts, object handling, and more. The interactive and multi-sensory nature of museum education attracts teachers to use museums as a medium to connect students with history, culture, and art. In particular, object handling activities provide first-hand experiences for students of all ages to 'do history'. Such nature is also helpful for students with special education needs. Theoretically speaking, the multi-sensory element of museum education goes very well with the unique learning styles of students with dyslexia. With quantitative and qualitative studies from dyslexic adults, UK teachers, and UK museum practitioners, this research shows the successes and challenges in the role museums play in the learning of students with dyslexia. What can we, as teachers in Hong Kong, learn from the case of the United Kingdom? What are the potentials in developing Hong Kong museums to be extended classrooms, benefiting both SEN and non-SEN students? Note: This is an extension of a dissertation completed in 2018 at Durham University for the MA International Cultural Heritage Management. The data was collected in 2018; permission would be acquired from institutions to reuse it for this conference. The author has just completed her PGDE in history, has had two years of teaching experience and three years of experience working in museums in the UK and Hong Kong.

Video Stream

Video

Short Paper

Open

Session

Breakout 2: 28 July 13:25 - 14:00

Join the Meeting

Areas of Interest

Student Corner

The Power of Touch - The Case of Dyslexia and Museum Education in the United Kingdom

MOK, Hiu Tung (Amber), MA, PGDE(History)
hiutungmok1@gmail.com
Independent researcher; current student of PGDE (history) in The Chinese University of Hong Kong

Introduction

In the United Kingdom, museums act as an extended classroom for formal teaching of primary and secondary schools. The interactive and multi-sensory nature of museum education attracts teachers to use museums as a medium to connect students with history, culture, and art. This approach is also useful for students with special education needs. With quantitative and qualitative data from adults with dyslexic, teachers and museum practitioners from the United Kingdom, this research shows the prominent role of museums in the learning of students with dyslexia. On a concluding remark, the possibility to adopt this model in Hong Kong is discussed. It is hoped that the research would prompt museums and schools to re-examine their relationship.

Museums as an Extended Classroom in the United Kingdom

As museum education in Hong Kong differs from its counterpart in the United Kingdom, it is essential to define its nature. Workshops delivered by the Oriental Museum, Durham are examined (Interviewee 1, 2021, personal communication, 21 June). Their workshops provide primary and secondary school students tactile, experiential learning to 'do history'[1]. University students, regardless of degree subjects, were often invited to be a part of these workshops as helpers. Examples of activities in the workshops are object handling[2], arts and craft[3], gallery trail[4], games[5], and gallery tour. All activities are collection-based: this allows students to learn through artefacts. Meanwhile, teachers have an observing and supporting role while museum educators carry out the workshops. Schools pay a fee to book workshops in advance.

Staff at the Oriental Museum expressed that all their workshops are closely linked to the curriculum. Taking advantage of the multi-sensory atmosphere in museums and heritage sites, teachers utilise museums as an extended classroom. This model is applicable to an array of museums in the United Kingdom, which would not be explored as it is not the major purpose of this paper.

Museum Education and Special Education Needs (SEN)

There is a growing discussion on how museum education can benefit SEN students (Ambrose and Paine, 2018). Weisen (2008, p.43) believed that strategies such as "multi-

---

- This paper is an extension of the dissertation done at Durham University under MA International Cultural Heritage management in 2018. Permission to re-use the data has been obtained by parties involved in June 2021. The author has had 3 years of experiences in teaching and 3 years of such in museums.

[1] Workshops with primary school students were more frequent as scheduling would be more flexible.

[2] Students are formed into groups, and they are given a box of artefacts. The artefacts are non-displayed, most likely deaccessioned, education collection but very relevant to the theme of the day. WH-questions are posed to students to examine the artefacts. It would thus prompt students to apply the knowledge learned in the classroom.

[3] For example, in a workshop Chinese history, students are formed into groups to make parts of a terracotta warrior using air-dry clay to understand the mechanism of these artefacts/replicas from the museum.

[4] Using clues from the captions in the exhibition, students answer questions on a worksheet about the artefacts.

[5] Examples of games include a role-play about the story of the zodiac animals or the mummification process; a quick question and answer about the artefacts in the exhibition; and a game to introduce the colours in Japan.

sensory experiences, storytelling, drama and creative activities" in museum education are effective for SEN students. In the 2010s, there was much spotlight on how museum education could support SEN students, especially students with autism spectrum disorder. This includes best practices (Freed-Brown, 2010), program design and planning (Holser, 2015; Cho and Jolley, 2016). This research focused on the relationship between dyslexia and museum education as it had been explored less.

Effects of Museum Education on Students with Dyslexia in the United Kingdom

Overall Methodology

Both quantitative and qualitative data were acquired to provide a service providers' and users' perspective of what role museum education plays to assist students with dyslexia to learn in the United Kingdom. A qualitative approach had been adopted to acquire data from museum educators from two heritage organisations, namely Durham University Library and Collections (DULC) and Tyne & Wear Archives & Museums (TWAM). Meanwhile, a quantitative approach was adopted to obtain data from the users – teachers and adults with dyslexia. All of such were anonymous. The data was obtained from May to July 2018.

From the Perspective of Adults with Dyslexia

To understand the effects of museum education on students with dyslexia, adults with dyslexia were surveyed to recall their memories of visits. This was inspired by Fink's (1996) research which interviewed adults with dyslexia about how they overcame reading struggles. With a similar rationale, the survey prompted respondents to recall museum visits and reflect on whether and how it helped their studies. Over three weeks in June and July 2018, the survey was posted on 8 Facebook groups about dyslexia, with 26 responses recorded[6].

Results In terms of how museum education contributed to their learning at school, the majority (57.9%) gave scores of 4 or 5 out of 5 (very positive), meaning that they believed that museum education could help with their learning.
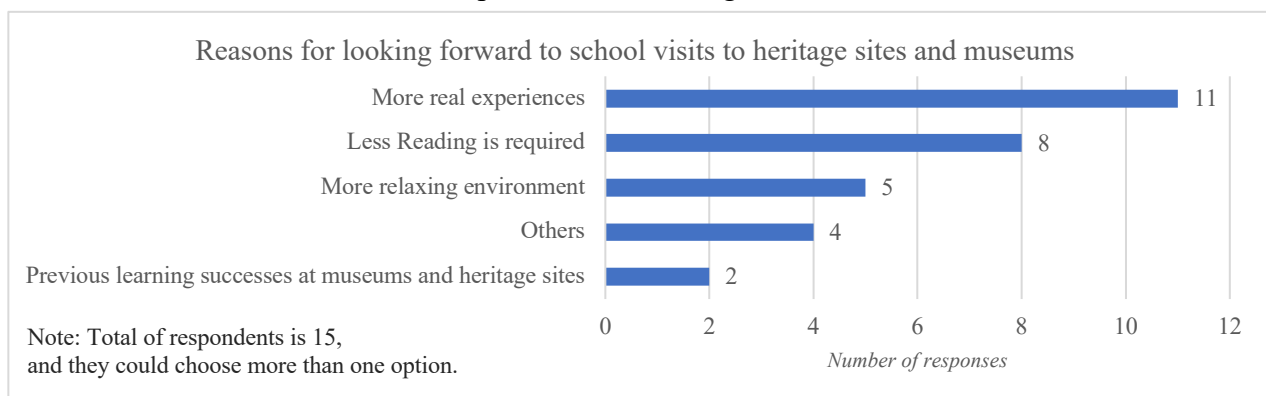

Reasons for looking forward to school visits to heritage sites and museums

Category	Number of responses
More real experiences	11
Less Reading is required	8
More relaxing environment	5
Others	4
Previous learning successes at museums and heritage sites	2

Note: Total of respondents is 15, and they could choose more than one option.

Number of responses

Figure 1 Bar graph showing reasons for looking forward to visits

This survey asked whether respondents looked forward to school visits to museums and heritage sites. The majority (78.9%) answered yes, of whom 73.3% thought that it was because museum education provides "more real experiences" followed by "less reading is required" (53.3%), as shown in figure 1. One respondent elaborated further, stating that "I was, and am, very interested in history so always viewed it as a treat", reflecting that museum was an enjoyable extension of the curriculum from the user perspective.

---

[6] Although the 8 groups had a combined 18550 users in 2018, it is justifiable to gain only 26 responses for the following reasons. Some users may be inactive. People in these groups may not be dyslexic but parents, scholars or teachers, and some groups are not exclusively about dyslexia. Therefore, the number of collected responses is adequate to show the learning experiences of people with dyslexia.
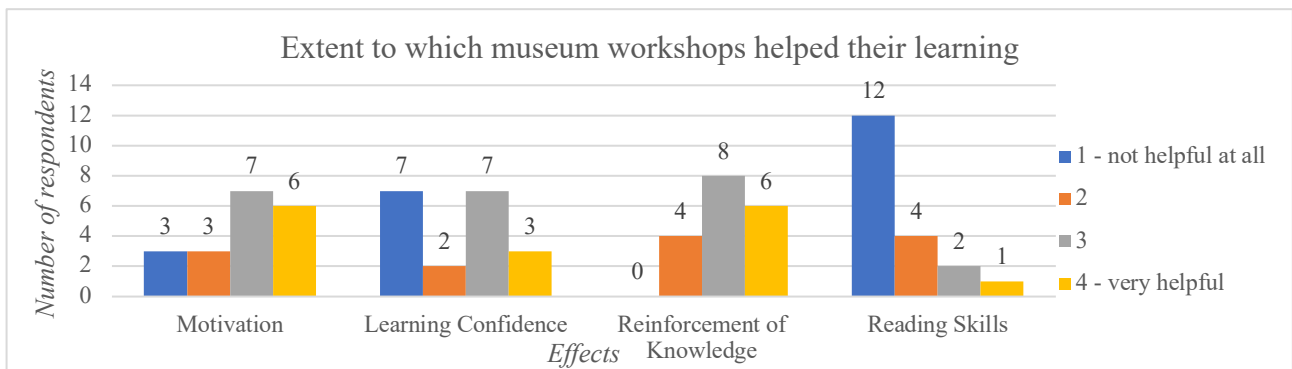
Figure 2 Bar graphs showing how museum workshops helped adults with dyslexia learn when they were students

Referring to figure 2, the survey also asked the extent to which respondents believed that learning in museums and heritage sites boosted their learning motivation, learning confidence, and reinforcement of knowledge and reading skills. A majority (68.4%) of respondents were inclined to see museums as helpful or very helpful for enhancing motivation and reinforcing their knowledge, while there was a mixed response about learning confidence. Nonetheless, 63.2% agreed that the visits were "not helpful at all" for their reading skills, which was expected because this is not an objective of museum education.
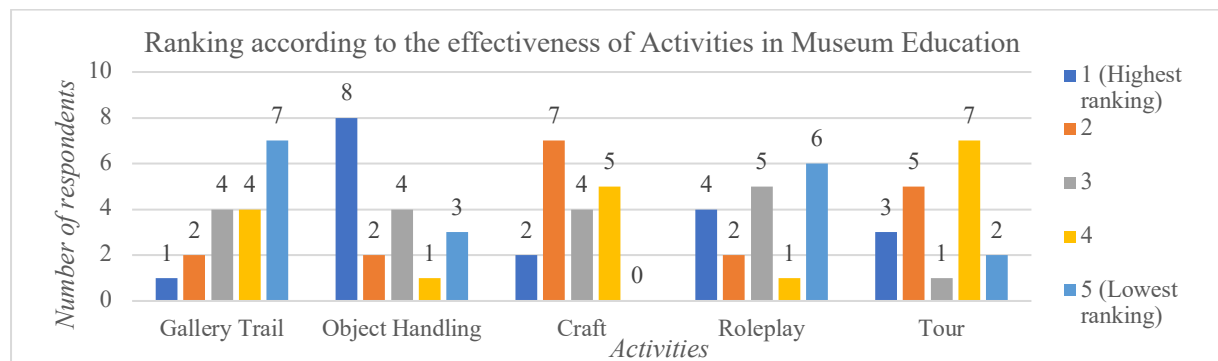
Figure 3 Bar graphs showing respondents' view on the effectiveness of 5 activities in workshops. Note: only 18 answered.

Respondents were then asked to rank the effectiveness of various activities in museum education, with 1 being the highest and 5 being the lowest. Referring to figure 3, object handling was ranked the highest (44.4%), while gallery trails were ranked lowest (33.3%). This hints that respondents valued hands-on contact with artefacts. Using the correlation coefficient between the ranking of activities in workshops and the effects of workshops on respondents' learning confidence and motivation, there is a negative relationship between the effects and the ranking of activities that have direct engagement with the collections[7]. Respondents who believed museum learning could enhance their learning confidence and motivation favoured activities directly engaging with collections, especially object handling. The same pattern exists in measuring the relationship between learning confidence or motivation, with the ranking of activities.

From the perspective of people with dyslexia, activities that possibly have a greater engagement with collections are inferred to be more favourable in terms of enhancing their learning confidence and motivation. This implies that object handling is associated with helping respondents' learning confidence and motivation because respondents tended to rank it higher and provided a more positive answer for the effects. The survey shows that adults with dyslexia remember a largely positive learning experience during school workshops while expressing some difficulties in gallery trails which was ranked the lowest. Nonetheless,

---

[7] Since the view on effects has 5 as the biggest on the scale and the ranking has 1 as the highest on the scale, a negative relationship implies that respondents who believe that museum learning helped them in said ways tend to rank a particular activity higher, thereby implying an association between these two variables.

the correlation between effectiveness and ranking of activities reflects that direct engagement with collections is valued. This prompts one to consider focusing on using museums to build motivation of students with dyslexia to learn history.

From UK Teachers' Perspective

It is essential to understand the perspective of teachers to investigate the behaviour of students with dyslexia during workshops. Judgment sampling was used to locate possible respondents[8]. A total of 67 schools were chosen from a total of 87 schools listed in the register of The Council for the Registration of Schools Teaching Dyslexic Pupils (CReSTeD, 2016). In total, 9 responses were recorded[9].

Results The survey prompted respondents to recount their most memorable visits to a heritage site or museum with a class among whom are dyslexic. The majority of respondents' students (71.4%) were around 11-14 years old[10].
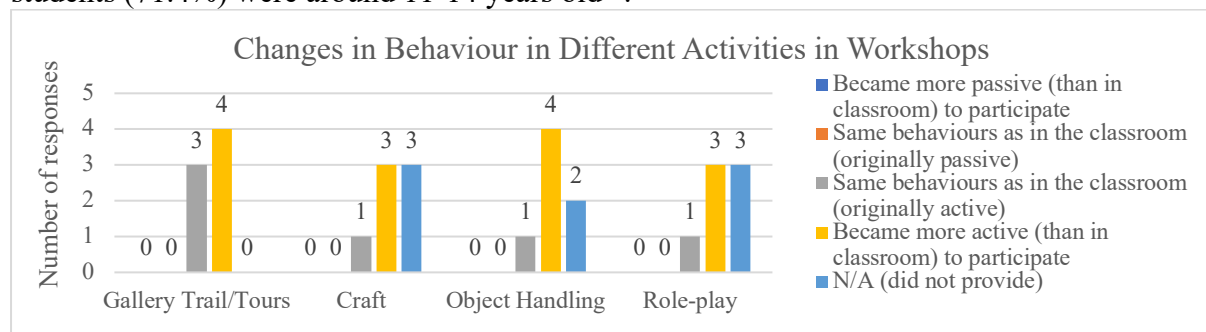
Figure 4 Changes in Behaviour in Different Activities in workshops offered by museums and heritage sites

Figure 4 shows that object handling was deemed the most effective in motivating students to be more active, as 57.1% of respondents agreed that they had observed more active behaviour in students during object handling than in classrooms. The data also showed that, if offered, craft and role-play were also deemed effective in enhancing students' enthusiasm. Both tasks are of a learning-by-doing nature and, as the question asked for a comparison with behaviour in the classroom, the results imply that teachers view experiential tasks in museums as being effective for students with dyslexia. This implies that museums could have a level playing field for students as its nature helps students with dyslexia excel just as well.
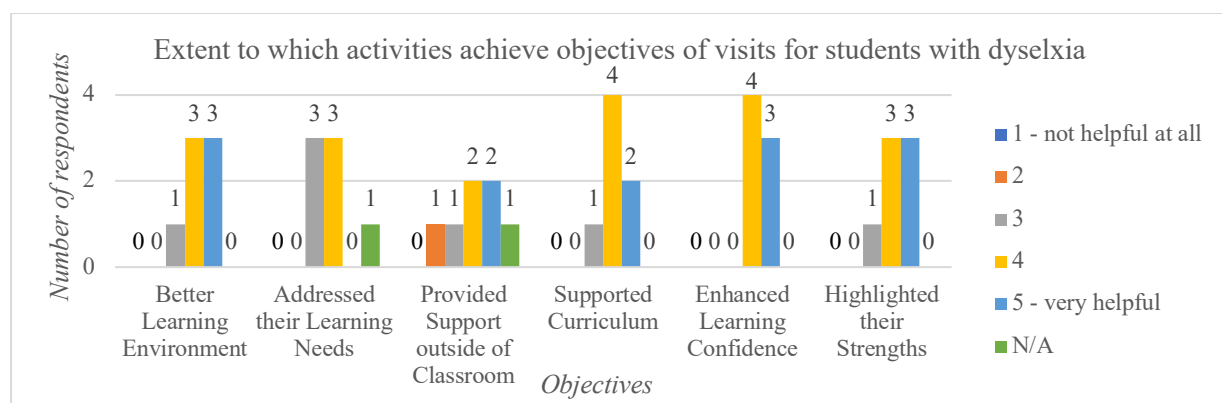

Figure 5 Bar graphs showing the extent to which activities achieve objectives of visits for students with dyslexia

---

[8] If schools had photos of the visit in the news section, they were sent the survey.

[9] Although a larger sample size would have been preferred, there were several constraints in finding respondents in this context. For example, teachers who were responsible for taking students may not be fully aware of their needs. Thus, the sample size acquired is adequate to show the trends of teachers' attitudes towards the issue.

[10] This also explains the low response rate as it is more frequent for primary school to attend the workshops but dyslexia is often discovered at a later age.

Referring to figure 5, the survey asked respondents to rate whether museum workshops were able to help students with dyslexia to achieve their learning objectives. As facilitators, teachers could observe the behaviour of students and notice changes since they were already familiar with the strengths and weaknesses of their students. Teachers agreed that museum education can highlight strengths of students with dyslexia. Some respondents elaborated further and mentioned that it was a "visual learning" experience, which "helped (them) understand the era" by having "spatial interaction with the heritage site." Another respondent believed that the learning experience was "practical" and hence could "allow them to engage."

Hence, teachers in the United Kingdom recognised the importance of museums in providing support for students with dyslexia. This survey shows that museums are a learning tool which could offer a unique learning tool when it offers object handling and other opportunities to engage with the collection directly.

From Museum Practitioners' Perspective

Two interviews were conducted with staff from DULC and TWAM in May and June 2018, which examined approaches to assisting students with dyslexia in museum workshops for schools. DULC is a department of Durham University that manages three accredited museums, the World Heritage Visitor Centre, Palace Green Library, and other collections. Meanwhile, TWAM manages nine museums and galleries in Tyneside. Both interviewees are under the learning team which carries out workshops using collections of the museums.

Both interviewees from DULC and TWAM agreed that the nature of museum education benefits students with dyslexia. This is because museum workshops are less "reading and writing-based" but more tactile and experiential (Interviewee 2, 2018, personal communication, 21 May; Leslie Palanker, 2018, personal communication, 12 June). Palanker explained that most of the workshops at TWAM were more interactive and inquiry-based, apart from when students needed to read labels in exhibitions for information. Furthermore, Interviewee 2 from DULC stated that the short-term contact in museum education may boost the learning confidence of students with dyslexia because there are no assumptions about students' abilities. This addresses the commonly lacking academic confidence in students with dyslexia by providing a new learning environment in which previous negative experiences could be temporarily forgotten (Thomson, 2007).

As teachers know about the strengths of their students better, staff from DULC and TWAM recognise the importance of cooperating with teachers to maximise the effects of programmes for students with dyslexia to build on the strengths of students with dyslexia. Palanker demonstrated that heritage sites can act as platforms for students with dyslexia to perform well. She recalled that in a literacy-curriculum-linked workshop, one student who was thought to have dyslexia "wrote the most beautiful poem and the workshop was set up in such a way that it really supported her" (Leslie Palanker, 2018, personal communication, 12 June). This happened in conjunction with classroom interventions as the workshop was only a stepping stone for her to display her progress from working with teachers at school, thus reflecting the importance of museum-school partnership.

Case study: Tyne & Wear Archives & Museums – Long-term Programmes with SEN Schools Leslie Palanker developed an Arts Award programme with a local SEN school using collections in Arbeia Roman Fort. She had been working with the school for nearly five years by 2018, acting as an extension of the curriculum. Every year, the workshops ran four or five times, thus providing opportunities for SEN students to learn through heritage.

Using multi-sensory approaches, Palanker prompted students to engage with the museum's collections and write poems motivated by interactive pre-tasks. When asked about the poetry-writing tasks in the workshop, she expressed that the help from both hers and

teachers was sufficient in motivating students with dyslexia to complete the tasks well. As it was a long-term programme, it was possible to detect the progress enabled by museum education in these students. She had seen an improvement in the self-esteem and learning motivation of students. This highlights the importance of long-term commitment when working with SEN students so that their needs are better understood, and supported by strong communication with schools (Leslie Palanker, 2018, personal communication, 12 June).
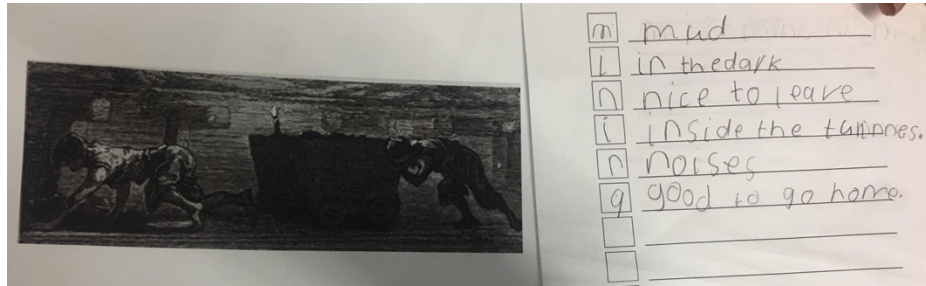
Figure 6 Picture of a poem written by a participant in Palanker's SEN workshop. Using their collections as an accelerator, she was able to motivate SEN students in her workshops to make a good attempt at composing poetry. This is something that they might struggle with because some of them were dyslexic but they were motivated because of the museum workshops. Image source: Leslie Palanker, 2018.

Discussion

All three sets of data show that museum education helps students with dyslexia, through multi-sensory hands-on learning, boosting their learning confidence and motivation. Views from museum educators illustrate how these learning experiences are delivered for students with dyslexia, while positive responses from teachers and adults with dyslexia mirror this view. All parties agreed that museum workshops include fewer reading and writing-based tasks, and can provide an interactive learning experience for students with dyslexia, especially with object handling. The way museum education influences students with dyslexia slightly varied according to teachers and adults with dyslexia. Although there were some similarities, for instance, object handling was deemed the most effective by both parties, adults with dyslexia tended to see a stronger connection between engagement with collections and enhancing their learning motivation and confidence. Since the survey for adults with dyslexia asked respondents to recall general memories of visits, museum education workshops could vary significantly. Therefore, this hints at the accumulative and long-term effect of museum workshops in different formats.

Conclusion – What Hong Kong can learn

After examining the role of museums in assisting special education needs, one shall look back on how this experience could help the case of Hong Kong. Museums create a level playing field for a tactile, multi-sensory learning experience in an inclusive classroom. However, as illustrated above, this requires communication between schools and museums. This relationship was not perfect in the United Kingdom either as the original dissertation shows the limitation in access requirement reporting. However, what Hong Kong needs to evaluate may be more primal than the issue in the United Kingdom.

What Schools need to do

Although this paper has its limitation to define the challenges of Hong Kong teachers in using museums as an effective learning resource, the exam-oriented nature of the curriculum in Hong Kong is perhaps self-explanatory in hinting at some challenges. While further research is needed in this aspect, both primary and secondary teachers are advised to examine their perception of what roles museums play. If teachers view trips to museums as

an extra-curricular or post-exam activity, there are obstacles before museums could be viewed as an extended classroom just as the case of the United Kingdom. Indeed, there are some differences between the curriculum in the UK and Hong Kong which could affect the feasibility of adopting such model. As it is more common for primary school teachers in the UK to use museums as an extended history classroom, it may be quite difficult for those in Hong Kong as history only counts as part of the curriculum in General Knowledge. Yet, the interdisciplinary nature of museums could prompt teachers and museum practitioners to consider how to maximise the potential of museums.

As this paper illustrates the effects of museum education for students with dyslexia, schools in Hong Kong could consider whether the research implies that museums could be used as a resource to accommodate and enhance the learning of students with special education needs. There is much potential in maximising the effects of museums in acting as a level playing field for both students with or without SEN. If this model could be adopted, it is projected that museums could be used as an extended classroom to apply and reinforce (historical) knowledge, and to boost students' confidence.

What Museums need to do

As the case of the UK shows, the uniqueness of museums lies in the power of touch and the authenticity of objects that can strengthen the connection between students and history. Since this research demonstrates the effectiveness of having a handling collection to maximise the effects of museum education on students with special education needs, museums in Hong Kong should consider deaccessioning some of their collections for educational workshops. The next step is to consider the structure of workshops. Under the rising popularity of virtual learning, museums could consider scanning the objects and engaging students through applications and augmented reality.

Innovation is to create, but it is also to examine what we already have in a new light. It is high time that museums and schools in Hong Kong considered what we could do to engage students. If we could harness the power of touch, there is endless potential in the effectiveness of museum education to create an inclusive classroom.

Reference

Ambrose, T.,& Paine, C. (2018). Museum Basics. Oxon: Routledge.

Cho, H., & Jolley, A. (2016). Museum Education for Children with Disabilities: Development of the Nature Senses Traveling Trunk. *Journal of Museum Education*, 41 (3), 220-229.

CReSTeD. (2016). *The Register of Schools*. https://crested.org.uk/documents/register-of-school-nov-2016.pdf.

Fink, R. (1995-6). A Constructivist Study of Passionate Interest Reading. *Journal of Adolescent & Adult Literacy,* 39 (4), 268-280.

Freed-Brown, E. A. (2010). *A Different Mind: Developing Museum Programs for Children with Autism*. Seton Hall University. https://scholarship.shu.edu/cgi/viewcontent.cgi?article=1014&context=theses.

Hosler, A. (2015). Engagement and Access. In J. Decker (Ed.), *Innovative Approaches for Museums* (pp. 27-34)*.* Lanham: Rowman & Littlefield.

Thomson, M. (2007). *Supporting Dyslexic Pupils in the Secondary Curriculum.* Dyslexia Scotland.

Weisen, M. (2008). Learning Curve. *Museum Practice,* 42, 42-45.

Appendix 01: Sample Survey for Adults with Dyslexia

1. **When were you diagnosed with dyslexia?** *
Mark only one oval.

- ( ) Nursery or earlier
- ( ) Key Stages 1-2
- ( ) Key Stages 3-5
- ( ) University
- ( ) Other: _____

2. **When you were at school, have you been taken on field trips to history museums and/or heritage sites?** *
Mark only one oval.

- ( ) Yes   *Skip to question 3.*
- ( ) No   *Stop filling out this form.*

Experience at History Museums and Heritage Sites

3. **What subjects were related in those school visits?** *
Mark only one oval.

- ( ) History
- ( ) Literacy
- ( ) Sciences
- ( ) Interdisciplinary
- ( ) Not sure
- ( ) Other: _____

4. **What were some emotions you experienced during these visits? (Can choose more than or**
Check all that apply.

- [ ] Curious
- [ ] Nervous
- [ ] Excited
- [ ] Happy
- [ ] Sad
- [ ] Relaxed
- [ ] Other: _____

5. **To what extent were the school visits to museums/heritage sites positive or negative experiences?** *
Mark only one oval.

	1	2	3	4	5	
Very negative	( )	( )	( )	( )	( )	Very positive

6. **Did you look forward to school field trips at museums and/or heritage sites?** *
Mark only one oval.

- ( ) Yes   *Skip to question 7.*
- ( ) No   *Skip to question 8.*
- ( ) Neutral   *Skip to question 9.*
- ( ) Other: _____

Yes, I looked forward to field trips to museums and heritage sites.

7. **If you answered yes, why so? (can choose more than one)** *
Check all that apply.

- [ ] Less reading is needed
- [ ] More relaxing environment
- [ ] More real experiences
- [ ] Previous learning success at museums and heritage sites
- [ ] Other: _____

Skip to question 9.

No, I did not look forward to field trips at museums and heritage sites.

8. **If you answered no, why so? (can choose more than one)** *
Check all that apply.

- [ ] Demanding learning experience
- [ ] No interest
- [ ] Nervous to new environment
- [ ] Previous negative experiences at museums or heritage sites
- [ ] Other: _____

Skip to question 9.

Experiences at history museums and heritage sites

9. **To what extent did these school visits, i.e. experiences in museums and heritage sites, help you learn?** *
Mark only one oval per row.

	1 - Not helpful at all	2	3	4 - Very helpful
Motivation to learn	( )	( )	( )	( )
Learning confidence	( )	( )	( )	( )
Reinforcement of knowledge	( )	( )	( )	( )
Reading skills	( )	( )	( )	( )

10. **Please rank the following activities during school visits at heritage sites/museums according to their effectiveness for your learning.**
Mark only one oval per row.

	1 (Highest)	2	3	4	5 (Lowest)
Gallery Trail	( )	( )	( )	( )	( )
Object Handling	( )	( )	( )	( )	( )
Craft	( )	( )	( )	( )	( )
Roleplay	( )	( )	( )	( )	( )
Tour	( )	( )	( )	( )	( )

11. **Do you agree that learning in museums and heritage sites were able to help with your condition of dyslexia?** *
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	( )	( )	( )	( )	( )	Strongly agree

12. **On the whole, how do you think heritage and museum education contribute to your learning at school?** *
Mark only one oval.

	1	2	3	4	5	
Very negatively	( )	( )	( )	( )	( )	Very positively

Personal Information

Please be noted that these would be used ONLY for the dissertation to understand the demographics of the respondents and would be DISPOSED after the dissertation is submitted.

13. **Gender** *
Mark only one oval.

- ( ) Female
- ( ) Male
- ( ) Prefer not to say

14. **Age** *
Mark only one oval.

- ( ) 15 or below
- ( ) 15-24
- ( ) 25-34
- ( ) 35-44
- ( ) 45-44
- ( ) 55-64
- ( ) 65 or above

15. **Occupation**

_____

16. **Are you a frequent museum-goer?** *
Mark only one oval.

- ( ) 1-2 times a year
- ( ) 3-4 times a year
- ( ) At least once a month
- ( ) At least once a week
- ( ) no

Appendix 02: Sample survey for teachers

1. Have you taught or are you currently teaching students with dyslexia? *

Mark only one oval.

◯ Yes

◯ No

◯ Not sure

2. Is your school specialised in educating students with dyslexia or special needs education? *

Mark only one oval.

◯ Yes

◯ No

◯ Other: _____

3. Are you specialized in special education needs? *

Mark only one oval.

◯ Yes

◯ No

4. Have you brought students with dyslexia or students who might have dyslexia on a school field trip to a heritage site or a history museum? *

Mark only one oval.

◯ Yes   *Skip to question 5.*

◯ No   *Stop filling out this form.*

Heritage Education and Dyslexia

5. Before these school visits, would you usually notify heritage/museum staff that there are students with dyslexia in your class? *

Mark only one oval.

◯ Yes   *Skip to question 6.*

◯ No   *Skip to question 8.*

Yes - I would usually notify about cases on Dyslexia

6. Why would you usually notify about cases on Dyslexia?

Check all that apply.

☐ To get particular support for dyslexic students

☐ To follow school's policies

☐ It was prompted by museum/heritage staff

☐ Other: _____

7. What were museums' staff reactions? *

Mark only one oval.

◯ Communicated further to tailor the program

◯ Provided on-day assistance to cater to the needs of dyslexic students

◯ Took note but did not take further actions

◯ Rejected application

◯ Other: _____

Skip to question 9.

No - I would usually not notify about cases on Dyslexia

8. Why not? *

Check all that apply.

☐ Undiagnosed cases

☐ Forgot to do so/not necessary to do so

☐ Afraid of being turned down

☐ Did not know what assistance for dyslexia is available

☐ Other: _____

Skip to question 9.

Please recount your most MEMORABLE visit (could be positive or negative) to a heritage site/museum with your class, among whom are or may be dyslexic.

9. What key stage was your class in? *

Mark only one oval.

◯ Key stage 0

◯ Key stage 1

◯ Key stage 2

◯ Key stage 3

◯ Key stage 4

◯ Key stage 5

10. What was the major area of subject focus? (can choose more than 1) *

Check all that apply.

☐ Literacy/Languages

☐ History

☐ Geography

☐ Sciences

☐ Mathematics

☐ Art and/or Music

☐ Other: _____

11. How many dyslexic students were there in your class during the visit? *

_____

12. What was the specific support provided by heritage/museum staff?

_____

13. During the activities, what were the behaviours of dyslexic students? *

Mark only one oval per row.

	Became more passive (than in classroom) to participate	Same behaviours as in the classroom (originally passive)	Same behaviours as in the classroom (originally active)	Became more active (than in classroom) to participate	N/A
Gallery Trail/Tours	◯	◯	◯	◯	◯
Craft	◯	◯	◯	◯	◯
Object Handling	◯	◯	◯	◯	◯
Role-play	◯	◯	◯	◯	◯
Others	◯	◯	◯	◯	◯

14. During the activities, how well did dyslexic students progress? *

Mark only one oval.

◯ Constantly fell behind when compared with other students' progress

◯ Sometimes fell behind when compared with other students' progress

◯ Similar to other students

◯ Sometimes faster than other students' progress

◯ Constantly faster than other students' progress

15. To what extend did the performance of dyslexic students change (when compared to in the classroom) during the activities? *

Mark only one oval.

	1	2	3	4	5	
Changed very negatively	◯	◯	◯	◯	◯	Changed very positively

16. How did the activities achieve your objective of the visit for dyslexic students? *

Mark only one oval per row.

	1 - Not helpful at all	2	3	4	5 - Very helpful	N/A
Better learning environment	◯	◯	◯	◯	◯	◯
Addressed their learning needs	◯	◯	◯	◯	◯	◯
Provided support outside of classroom	◯	◯	◯	◯	◯	◯
Supported curriculum	◯	◯	◯	◯	◯	◯
Enhanced learning confidence	◯	◯	◯	◯	◯	◯
Highlighted their strengths	◯	◯	◯	◯	◯	◯

17. Did the program provide any other particular positive effects for dyslexic students? Please elaborate if any.

_____

_____

_____

_____

18. How did the program fail to address the needs of dyslexic students? *

_____

_____

_____

_____