A Project entitled

***Investigating Hong Kong teacher candidates'***

***application of critical thinking in information literacy education in General Studies***

Submitted by

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**Declaration**

I, *WONG, Hoi Ying*, declare that this research report represents my own work under the supervision of *Dr. Lam Bick Har*, and that it has not been submitted previously for examination to any tertiary institution.

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*15 April, 2021*

## Abstract

The purpose of the research study was to investigate Hong Kong teacher candidates' critical thinking (CT) knowledge, skills, attitude in relation to information literacy (IL) topics in General Studies, thus give suggestions that aid local teachers in providing critical thinking instruction more effectively in IL education. This study contained a questionnaire (self-evaluation test) concerning teacher candidates' subjective evaluation on their critical thinking knowledge, skills, attitude was adapted from Cottrell (2005), as well as a semi-structured interview concerning their conceptions, learning experience features CT and IL; as well as teaching experience and CT instruction strategies they would use for an IL lesson. 10 General Studies teacher candidates from the Education University of Hong Kong, who completed seven weeks of in-school placement, participated in the research. Research findings showed that participants had a considerable grasp of CT and IL concepts, as well as the awareness to CT instruction strategies, but showed some inadequacies on their application of CT instruction strategies. Findings also reflected that participants received insufficient and inconsistent university training to learn and apply CT instruction strategies confidently. Although local GS teachers have a fair CT understanding, uncertainty for an effective CT instruction and assessment was still expressed among most participants, in a way similar to the situation presented in Stapleton (2011)'s and Mok & Yuen (2016)'s studies. Limitations and ethical concerns of the study are covered. Implications concerning the benefits and development of CT education in Hong Kong are discussed.

# Table of Content

## 1. Introduction

Living in a technological era, information literacy (IL) and lifelong learning are inextricably intertwined (Philip, 2002). But when opinions or information on the internet can be faulty, distorted and biased, critical thinking (CT) becomes a crucial generic ability of our new generation in evaluating information effectively, ethically and self-directedly (The Education Bureau, 2018). In order to achieve a holistic competency of IL, Dyole (1994) believes that CT is vitally required in the process. By that, she highlights the importance of long-term curriculum plan where IL education should be deliberately merged with CT; Additionally, it should be done by teachers with proper training on CT instruction. In Hong Kong's General Studies (GS) curriculum, IL education need is addressed with the strand "Global Understanding and the Information Era", with CT is emphasized in this topic (The Curriculum Development Council, 2017). CT becomes an important trait of teachers where teachers' depth of CT understanding is an influential part in IL education. However, research observed that teachers were uncertain with the effectiveness of their CT instruction or paid insufficient attention to some dimension of CT. (Stapleton, 2011, Mok & Yuen, 2016). After a decade, this research aims to pinpoint whether the above situation has been improved and identifies the possible improvement for our education program for teacher candidates in GS.

Through the use of questionnaire and semi-structured interview, this research attempts to investigate teacher candidates' CT knowledge, skills, attitude related to information literacy topics in GS. By reviewing the teacher candidates' learning experience in school and their views towards CT instruction, this paper would like to provide suggestions that aid our future teachers to apply CT more effectively in IL education.

# 2. Literature Review

## 2.1 Critical thinking (CT)

### *2.1.1 Definitions and Application of CT*

The term "critical thinking" received more thousands year of discussion in academia. Based on the complexity, scope of application of this concept, one single definition of critical thinking is not able to conclude all its values, skills and qualities embedded beneath (Paul, Elder & Bartell 1997; O. Enciso, D. Enciso & Daza, 2017). The explanation of CT can be discussed from different perspectives such as philosophy, psychology and pedagogy (Lai, 2011).

In philosophical approach, philosophers focus on the qualities and characteristic of a critical thinker (Lai, 2011). Ennis (1985a)'s definition shows the analytical and reflective qualities of CT that it is a reasonable and reflective thinking for individual deciding their beliefs and behaviors.

In cognitive psychological approach, psychologists emphasize on observable behaviors of critical thinkers and categorize CT into series of steps (Lai, 2011). Halpern (1998) defined CT into two categories: cognitive skills and dispositions, that critical thinkers can use cognitive skills without hesitation in an appropriately time, with appropriate methods. In his words, CT includes the tendency of mind to use cognitive skills.

In pedagogic approach, educators believed that the flexibility of CT enable it to embed in any subject, content and problems (Paul & Elder, 2007). In education settings, taxonomy for information processing skills (1956) proposed by Benjamin Bloom are frequently used in teaching higher order thinking (Lai, 2011). Upon this hierarchical model, the three highest levels of

"analysis", "synthesis" and "evaluation" are commonly said to reflect CT skills. Pedagogic approach depends on long-term classroom experience and observations which differentiate it from philosophical and cognitive psychological approach. Nonetheless, Lai (2011) pointed out that this approach often lacks the clarity necessary to guide instruction and assessment in school settings. Lai (2011)'s observation justifies the problem raised by Stapleton (2011) in the research – local teachers are uncertain with limited guidance and support for instructing an effective CT-based teaching.

*2.1.2 CT Concepts*

Based on scholars' research, CT consists of three categories:

***Knowledge.*** Since critical thinking can be applied on any subject, Willingham (2007) believes that thinking process is inseparable with one's content of thought. Individual's knowledge understanding influences their choice of hypotheses, test methods and interpretation of data. This accounts for the variation of thought and depth of reasoning between an expert and a student upon any particular topic. The depth and accuracy of judgement significantly depends on one's domain knowledge. In this research, teacher candidates' prior knowledge on modern IL concepts is thereby a considering factor for effective teaching of CT in GS.

***Skills.*** CT is a complex process of deliberation which involves a range of ancillary skills (Cottrell, 2005). These skills are grouped differently among scholars. Dewey (1933) proposed five steps to CT, which included (1) Identify problems (2) Problem analysis, (3) Generate solutions, (4) Evaluate options (5) Test and Implement solution. In Ennis (1985a)'s idea, he identified 5 categories of CT abilities as followed:

(1) Elementary clarification (e.g. Focusing on a question)

(2) Basic support (e.g. judging the reliability of a source)

(3) Inference (e.g. Deducing, judging deductions, making value judgement)

(4) Advanced clarification (e.g. Identifying assumptions, defining terms.)

(5) Strategies and tactics (e.g. Deciding on an action, interacting with others)

While Dewey (1933)'s category is only designed for problem solving, Ennis (1985a)'s category can be applied on both problem solving and understanding a situation or knowledge, which is more suitable to be included in education settings.

***Attitude.*** In Chinese culture, the term "criticism" gives a negative impression among the majority. Some people may have mistaken as making negative comments which led to their reluctant on receiving criticism (Cottrell, 2005). Nonetheless, Ennis (1996b) pointed out that an open-minded attitude should be a crucial CT disposition, that a critical thinker should be open to any alternatives and avoid jumping to conclusions. He additionally other suggested dispositions such as objectivity, intellectual honesty, impartiality, a willingness to conform judgments and commitment to seek reasons (Siegel, as cited in Ennis, 1996b). In short, a critical attitude allows a person to be critical to others' view, at the same time, be humble to receive critics.

Among the theories of CT, self-awareness is often found as a common description, that individual knows when, where and how to use CT skills in different situations (Ennis, 1985a; Halpern, 1990; Willingham, 2007). From the author's view, self-awareness is also an essential trait for teachers when deciding when and how CT element can be embedded in subjects. In other words, when teachers are unaware of what and how to teach, uncertainty and confusion can be resulted;

and eventually affects students' learning outcome. It is therefore necessary to find out if local teacher candidates in GS are self-aware of applying their CT knowledge, skills and attitude in IL education. In Cottrell (2005)'s self-evaluation test, it focuses on participants' subjective feeling on their understanding of CT. Although CT is an abstract concept, Cottrell's test is able to conclude some important CT elements into several simple questions. Questions such as whether participants understand the meaning of a few commonly heard CT keywords "reasoning" and "argument" can help address participants depth of awareness on CT. Since the research aims to make recommendation for facilitating GS teachers' CT instruction in IL education, the test result helps provide a basis for the recommendation by giving a general pattern about teachers' confidence on their CT application. In conclusion, this research paper uses a self-evaluation test (See Appendix 1) to address participants' subjective awareness on applying CT, followed by a second interview (Appendix 2: Part A) to address teachers' difficulties and approaches in teaching IL topic with CT elements.

**2.2 Information literacy (IL)**

Information literacy (IL), a term stems from the concept "library skills", refers to the building of capacity to read, interpret, assess and use information in daily life (Kuhlthau, 1987). 吳美美 (1996) defined IL as an ability to understand and make meaningful communication with others. According to Doyle (1994) and Levitin (2016), an information literate person should be able to:

(1) Recognize the need for information

(2) Formulate questions based on information needs

(3) Access sources of information including computer-based and other technologies

(4) Evaluate source quality and credibility

(5) Organize information for practical application

However, the ability sets required for literacy may vary as the society proceed. With the adhere of an information era, IL involves newly formed ideas such as “fact-checking”, “pseudo facts”, which can be crucial literacy concepts for modern IL education. In addition, IL should not only be referred as an ability , but also individual’s responsibility for contributing, building ethnicity and shaping values in society (吳美美，1996).

As for Hong Kong education development, the Education Bureau (EDB) (2018) proposed eight information literacy areas (see figure 1) for developing students’ knowledge, skills and attitude, in which the ideas are combined with Doyle, Levitin and Wu’s interpretation.

Figure 1: eight information literacy areas proposed by the EDB (2018)

*Information Literacy for Hong Kong Students*

| **Category** | **Eight Literacy Areas** | |
|---|---|---|
| Effective and Ethical use of information for lifelong learning | 1 | Use, provide and communicate information **ethically and responsibly** |
| Generic IL Skills | 2 | **Identify** and **define** a need for information |
| | 3 | **Locate** and **access** relevant information |
| | 4 | **Evaluate** information and information providers, in terms of authority, credibility and current purpose |
| | 5 | **Extract** and **organise** information and **create** new ideas |
| Information World | 6 | Be able to **apply** IT skills in order to process information and produce user-generated content |
| | 7 | **Recognise** the roles and functions of information providers (e.g. libraries, museums, internet) in the society |
| | 8 | **Recognise** the conditions under which reliable information could be obtained |

### 2.3 Relationship between CT and IL

CT and IL have been discussed as distinct concepts and often put into comparison by professionals of different field. Both concepts share similar features in terms of seeking truth as goals, information evaluation skills and qualities such as creativity, open-mindedness to new information (Hollis, 2019). Scholars such as Doyle (1994) and Taylor (2008) suggested that IL instruction enhances CT whereas some provided a reverse order (Elmborg, 2012; Stemberg, as cited in Doyle, 1994; Ward, 2006).

Paul (1981), however, He proposed IL and CT as weak sense and strong sense conceptions. A weak sense conception (IL) is a narrowed category which built upon the basis of a strong sense conception (CT). If we consider IL elements (e.g. identifying information source, evaluating source) as extended explanation of a branch (competency in information) from CT, it accounts for their high similarities of elements. Similar to Willingham (2007)'s interpretation, IL might be a sub-type, or an application of CT with modern technological ideas while CT provides the theorical basis for the process. Therefore, students should acquire a solid understanding and application of CT in order to reach a competency in IL.

## 3. Research Questions

The purpose of this research is to investigate Hong Kong GS teacher candidates' understanding on CT, in addition to their mastery of the knowledge, skills, attitude in topics relevant to information literacy education and construct some recommendations in terms of teaching strategies, flow of teaching. To achieve the aim of the research, three research questions are illustrated below:

1. How do Hong Kong teacher candidates in GS evaluate their critical thinking ability?

2. Upon topics of Information Literacy, what pedagogical approaches do Hong Kong teacher candidates in GS use for enhancing students' critical thinking.

3. What difficulties do Hong Kong teacher candidates in GS encounter in critical thinking instruction?

## 4. Research Design

### 4.1 Sampling methods

This research adopted a mixed approach method with the use of self-evaluation test and interview. Quantitative approach aims at building understanding and creating insights of current phenomena whereas qualitative approach aims at investigating participants' perception (Fraenkel & Wallen, 2003; Maxwell, 2012). Since research question 1 (RQ1) requires a background understanding of how teacher candidates in GS evaluate their CT level, a questionnaire was provided where standardized data can be collected for comparing. For RQ2 and RQ3, it focuses on the opinions of the teachers in CT instruction. A few interview questions which based on the previous questionnaire questions were included for constructing recommendation in the later stage of the study.

### 4.2 Participants

Massa (2014) mentioned that teachers' beliefs should be considered since they are of utmost importance on the conceptualization of their work, decision making and the choice of teaching strategies. Since the research question is specified for the perspectives of the teacher candidates

in GS, the research adopts a purposive sampling in choosing specific participants. The final-year class of Bachelor of Education (Honours) (Primary)- General Studies of the Education University of Hong Kong (EduHK) (2016-2021) which had completed seven weeks of in-school placement were therefore chosen as a target group for recruiting 10 eligible participants. This enabled them to give adequate and in-depth ideas about CT instructions in interviews.

## 4.3 Instruments

### *4.3.1 Questionnaire*

According to Zohrabi (2013), the ambiguity and unclearness of questions may lead to inaccurate responses. The limitation can be reduced by having an in-person questionnaire distribution where the inquirer can explain the questions to participants. The questionnaire was referenced to a self-evaluation test of CT (see Appendix 1) in the book of "Critical Thinking Skills: Developing Effective Analysis and Argument" by Cottrell (2005). The test was in form of a 5-point Likert scale (from 0 Strongly disagree to 4 Strongly agree), with a total of 25 questions for measuring knowledge, skills and attitude, by participants' level of agreement against each item.

### *4.3.1 Interview*

A semi-structured interview was conducted individually after the self-evaluation test. It contained 11 open-ended questions related to the participants' conceptions, learning experience, teaching experience on CT and IL, as well as suggestions on relevant CT instruction strategies in this topic. (See Appendix 2). The interviews were videotaped and conducted in participants' mother language (Cantonese) for effective expression and transcribed in English.

## 4.4 Data collection

### *4.4.1 Research interview settings*

The individual interviews were conducted online using "Google Meet" with the duration of 120 minutes [1st Phase: 30 min; 2nd Phase: 90 min]. Google Meet is a video-communication service platform developed by Google which enable users to make video call and send massages to each other. For the online interview settings, the investigator held the Google Meeting alone in a non-transparent room where the entrance was locked and closed, headphones were used during the interview. There was no restriction for participants in choosing the place for online interview, but they were suggested to follow the online interview settings for the investigator to ensure their confidentiality in the interview.

### *4.4.2 Phases*

The study was separated into two phases through using the abovementioned instruments to collect data for RQ1, RQ2 and RQ3. Phase 1 was to answer RQ1. It is a self-evaluation test of CT adapted from Cottrell (2005) as mentioned in *Part 4.3.1*. The participants completed the test online using Google Form, which is an online questionnaire platform. The questionnaire link was sent to the participants through Google Meet. Once the participants completed the test, the validity of the link was deactivated by the investigator to ensure confidentiality of the research data. By the end of this phase, 10 responses were collected for analysis to find out a pattern on whether the participants have a high or low score of CT understanding.

Phase 2 was a qualitative phase for answering research RQ2 and RQ3. A semi-structured interview was then be conducted on each participant as mentioned in *Part 4.3.2*. The interview questions were sent to participants in the form of a Google Document as well as shown on screen

on the Google Meet. The investigator summarized the response for participants before moving to the next question if necessary. Responses of participants were collected in the form of video recording and notes taken by the investigator. The semi-structured interview was used to seek a deeper insight upon participants' opinions and difficulties in embedding CT in IL education by presenting their pedagogical decision in their teaching practices. The interview content was transcribed for coding and analysis. The details of the phases with references to the research questions are shown below:

| Research Question | Phases 1 | Phase 2 |
|---|---|---|
| 1: How do Hong Kong teacher candidates in GS evaluate their acquirement of knowledge, skills and attitude in critical thinking? | Self-evaluation Test | Individual interview<br>✧ Part A Q1-4 |
| 2: When it comes to topics related to information literacy, what approaches do Hong Kong teacher candidates in GS use for enhancing students' critical thinking. | | Individual interview<br>✧ Part C Q1-2<br>✧ Part D Q1 |
| 3: What difficulties do Hong Kong teacher candidates in GS encounter in critical thinking instruction | | Individual interview<br>✧ Part B Q1-3<br>✧ Part C Q3 |

**4.4 Ethical Concerns**

Prior to the test or interview, each participant will be informed of the research purpose and the handing of data as well as will be requested to sign a consent form representing their agreement

to participate in the research study. Each interview will be videotaped, transcribed and proofread. The transcribed raw data and email responses will then be coded into conceptual categories from which emerging themes will be developed and broader patterned relationships within data will be identified.

## 5. Findings

### 5.1 RQ1: How do Hong Kong teacher candidates in GS evaluate their critical thinking ability?

*5.1.1 Participants showed fair confidentiality on their CT*

*Figure 2*

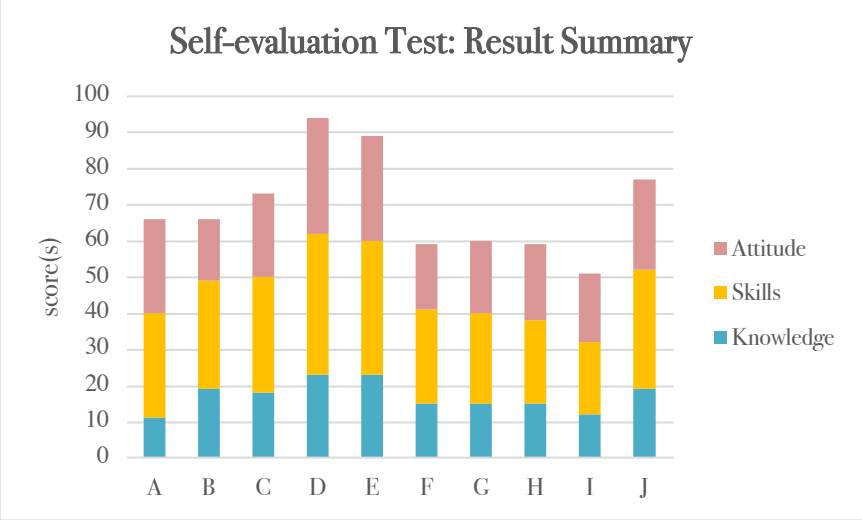



*Figure 3*

*Self-evaluation test: result summary*

| Participant(s) | Score percentage per category | | | Score(s) |
|---|---|---|---|---|
| | Knowledge | Skills | Attitude | |
| A | 46% | 66% | 81% | 66/100 |
| B | 79% | 68% | 53% | 66/100 |
| C | 75% | 73% | 72% | 73/100 |

| | | | | |
|---|---|---|---|---|
| D | 96% | 89% | 100% | 94/100 |
| E | 96% | 84% | 91% | 89/100 |
| F | 63% | 59% | 56% | 59/100 |
| G | 63% | 57% | 63% | 60/100 |
| H | 63% | 52% | 66% | 59/100 |
| I | 50% | 45% | 59% | 51/100 |
| J | 79% | 75% | 78% | 77/100 |
| Average score | 71% | 66.8% | 71.9% | 69.4/100 |

Regarding to Cottrell (2005), a score over 75 out of 100 in the evaluation test suggests that participant is very confident about his acquirement of CT while score under 45 shows the participant lack confidence and may require external assistance. In this study, the test findings were further refined by categorizing all questions into three groups (Knowledge, Skills and Attitude), with 11 Skills-related questions (44 marks in total), 6 Knowledge-related and 8 Attitude-related questions respectively (24 & 28 marks). The test summary includes the score percentage of these categories, in which a detailed view can be given on participants' confidence upon different aspects of CT.

Overall, participants were fairly confident in their grasp of CT ability, with an average score of 69.4. Participants were shown to be more confident in both knowledge and attitude category with a percentagewise of 71% and 71.9% respectively. Even participants received a relatively lower confidence on their CT skills, it was still of a considerable percentage (66.8%). In the individual interview, follow-up questions of part A which are based on participants 'response from the evaluation test, were given to examine their understanding on CT concepts.

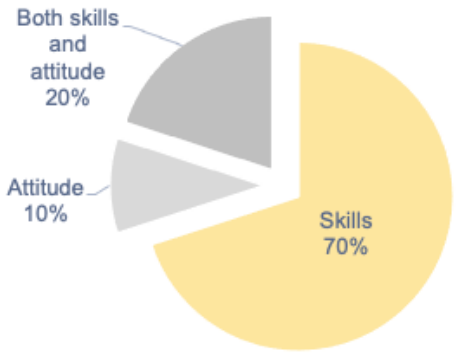
*5.1.2 Participants understanding on CT: skills as the major focus*

| *A1. What does "critical thinking" mean to you?* |
|---|

In the interview, participants were asked about the definition of CT. They were able to describe their perceptions of "critical thinking" by elaborating its functions and ways of application. Particular wordings such as "decision-making / judgment", "objective / not be basis", "constructing evidence" are found common among the answers. Despite participants received a relatively lower average score of confidence upon their CT skills, skills-based criterion was the main focus in their answers, with 70% participants clearly expressed that CT was a skillset.

*Figure 4*

*Participants' perceptions of CT grouped by skills and attitude*




*5.1.3 Confidence is not a definite factor influencing objective CT performance*

| *A2. What is your interpretation of "argument" and "a line of reasoning" in critical thinking?* |
|---|

For question A2, a simple definition of "argument" is referred as the use of reasons to support a point of view whereas "a line of reasoning" is the organization of our ideas in which our argument can be presented in a logical and understandable way (Cottrell, 2005).

For participant D and E, who received the most confidence in both knowledge category and overall CT ability, shared different level of CT understanding in terms of the depth and details. While D referred "argument" similar to the above definition, E suggested "argument" as "the topic

sentence of a statement" which was not its major function. Additionally, D was able to give a more structuralized definition by listing elements (stands, reasons, counter argument) for constructing an argument. On the other hand, participant I, who had the least confidence with the overall CT score, could also give basic and clear definition on "argument" and "line of reasoning" in a way similar to participants of high confidence. Therefore, confidence is not a definite factor influencing participants' objective CT performance.

## 5.2 RQ2 Teacher candidates' teaching approaches to develop students' CT skills in IL lessons

### *5.2.1 Teaching strategies*

Teaching strategies refer to class activities or deliberation skills which teacher used for the lessons. The content below shows a few teaching strategies frequently mentioned by participants.

***Group Discussion.*** Regarding Paul and Elder (2007), critical reasoning should not be restricted to a single point of view. According to participants, "group discussions" were found to be a prevalent strategy since it encouraged the exchange of knowledge and perspectives between students and thus extended their branches of thought for critical reasoning. They believed that frequent engagement in discussions helped students realize the existence of diverse opinions in society, which helped them nurture an open-minded and respecting attitude in receiving opinons. Additionally, many others suggested class activities such as ***in-class news analysis***, ***moral dilemma discussions*** and ***in-class peer evaluations*** that were also based on grouping, reflecting the significance of exchanging ideas to CT development.

***Students-centered learning.*** For CT skills are abstract concept to young learners, the ability to think critically requires one's both domain knowledge and constant practice (Willingham, 2007). Participants reflected that the opportunities for application were the key to achieve metacognition. in which students

receive the opportunity to explore a topic and make use of search engines were often mentioned. Participants believed that it allowed students apply learned IL skills and knowledge during research process, at the same time, allowed them access students' learning process and provide feedbacks for improvement. Instead of telling them what they should know, students are able to receive more of a sense of ownership over their learning and thus further achieve "learning to learn", as proposed by EDB (2017) in the GS curriculum.

***Role Play.*** Not only can CT be trained in regular teaching process, but also in situation-based topic and games such as logical puzzles, problem-solving games (張玉燕，2002). Role play which is considered as a preferrable teaching for children of an earlier cognitive development stage, was often suggested by participants. They mentioned that role play teaching allowed students to understand the cause and perspectives behind an action from an empathetic method, thus was a good choice in guiding students taking attitude into action.

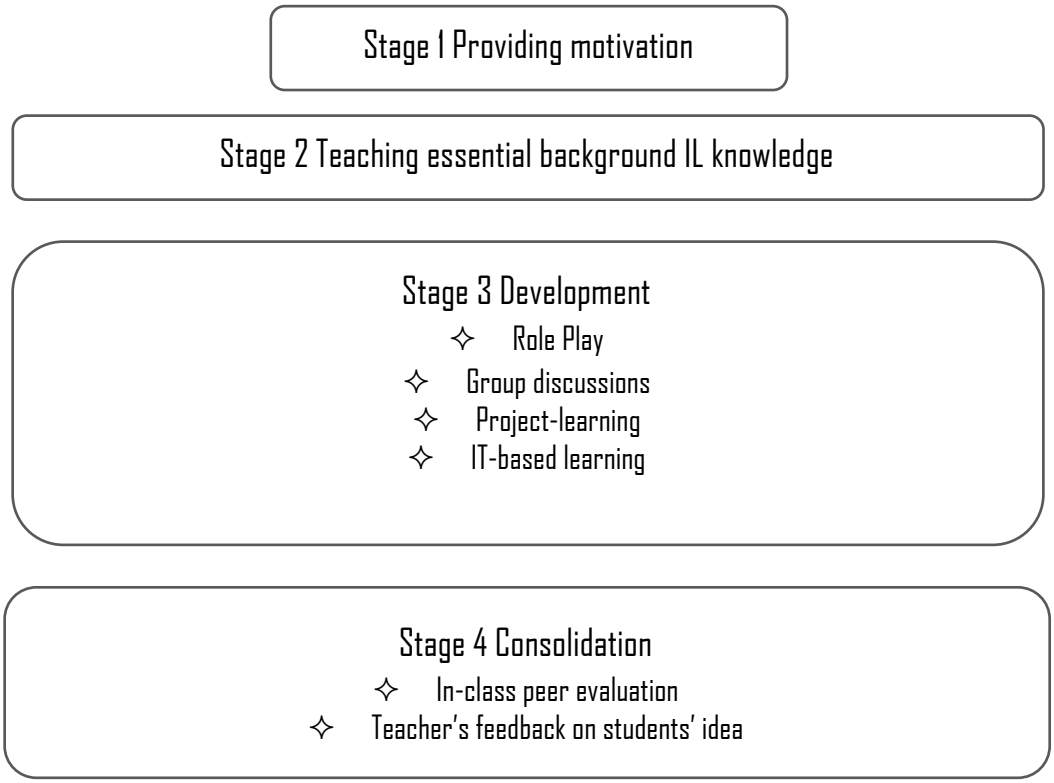
The abovementioned teaching strategies are experiential learning activities where children can engage with activities and learn by doing. As CT is learnt through doing, creating motivating activities that encourage students' investigation and turn their ideas into practices is therefore beneficial to CT development (Lewis and William, 1994). Comparing to the traditional content-based instruction, it is noticeable that modern teacher candidates seek experiential learning activities as common strategies for CT instruction. Part D of the interview was designed to see how participants arranged these CT-based activities for IL lessons.

*5.2.2 Teaching plan*

Teaching plan refers to the way teachers arrange the lesson. In part D, Participants were asked to brainstorm a teaching plan for enhancing students' CT skills in an IL lesson. The given lesson objective was "***reject and refuse*** to forward ***indecent and inaccurate information*** on

***communication and social network***". Since participants were all come from the same university, they share similar lesson planning structure as shown in figure 4. Nonetheless, they shared diversity in pedagogical approach which diverse some participants as an effective CT instructor.

*Figure 5*
*A summarized teaching plan suggested by participants*




***Communication and social network*** are considered as the domain knowledge required for discussion. Only a few participants (4/10) decided to address the definition of social network at stage 2 with mostly direct instruction. Direct instruction is generally used for progressing step by step in which teachers explicitly explain domain knowledge, learning objectives required for later discussion.

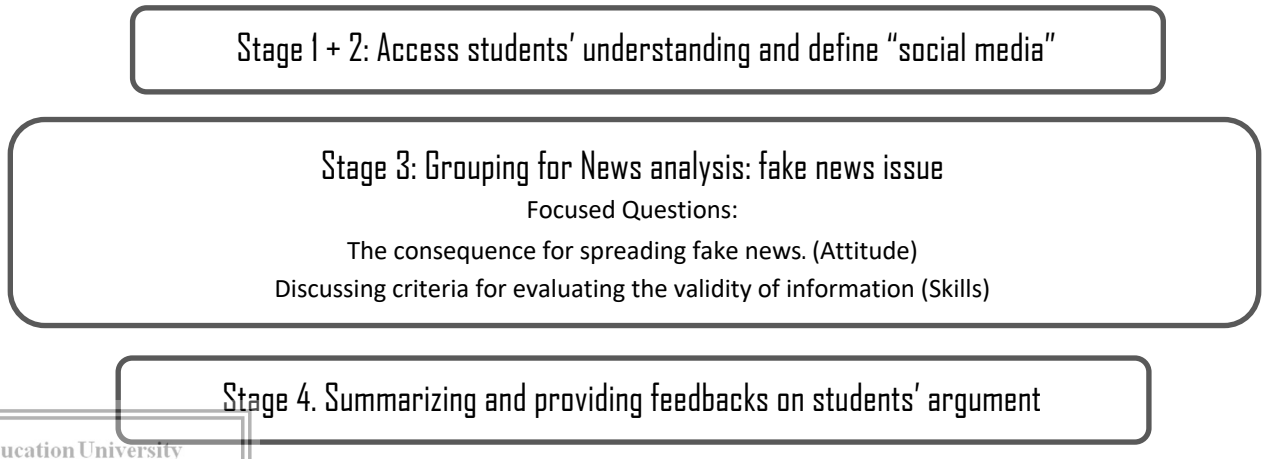
***Indecent and inaccurate information***, most participants (8/10) had the awareness to define abstract these concepts. Within that, half participants preferred using direct instruction for teaching

definition while half preferred inductive teaching where Ill-structured problems (activities that don't emphasis on right or wrong answer) were presented for brainstorming ideas, followed by a discussion-based activity (e.g. news analysis) to discuss the criteria for evaluating information.

***Reject and refuse***, out of 10 participants, there were 3 who prioritized attitude building in the lesson, decided to use separated activity such as role play to nurture students' empathy. 4 participants decided to use thinking models such as Libra-thinking method, Consequentialism to let students reflect the reason and impact if inaccurate information is spread.

Overall speaking, modern teacher candidates nowadays are more open to students' centered learning and emphasized on teaching via process. They are aware of different teaching strategies for achieving CT objectives. However, it was found that a few participants often put serval time-consuming CT activities in one roll, which is not doable for a 35-min lesson. Among all participants, the lesson plan provided by participant D stood out. for D was the only one who was aware of addressing all three key learning elements within one lesson. Comparing to other participants, D focused more on the use of questioning and thinking models (e.g. consequentialism) instead of the choice of activities (see figure 6).

*Figure 6*
*A summarized teaching plan of participants D*



Due to the challenge time limitation, D's CT instruction plan is more suitable in Hong Kong classroom. CT is more about students' thinking instead of the form of activities. Although selecting suitable experiential activities can enhance CT instruction, providing suitable questioning techniques are more crucial for encouraging and guiding students' thinking.

### 5.3 RQ3 Difficulties encountered by teacher candidates in CT instruction upon IL topics

The difficulties encountered by participants concerns two main factors, (1) Learning experience, and (2) Instructional practice.

#### *5.3.1 Inconsistent learning experience on CT instruction*

Though most participants received a fair conception of CT, their learning experience on CT instruction were general and vague. CT has been considered as a generic skill in the university in which its training is immersed in tutorial discussion. When participants were asked to recall some CT-related content in their university courses, a few mentioned that they were not aware of the learning process and thus uncertain about the learnt CT content. Half of the participants raised concerns on university's infusion approach for CT training as followed:

> *"Lecturers usually do not mention CT concepts in an 'official' way, students often feel uncertain about what they have learnt about CT."*

> *"Since CT is not the main content in any tutorial (including major electives), discussion about CT concepts depends on some lecturers who want to provoke more time on it. In most cases, CT concepts we learnt in tutorials only scratched the surface."*

> *"University doesn't provide us any teaching course on CT instruction, and it happens a lot that I lack a precise direction on CT instruction. Even if I self-learnt CT instruction, I am not sure about the effectiveness of my instruction."*

Overall, agreement upon whether the university has provided CT-related training varied from participants for they had different expectation on course contentt. However, CT is a wide topic that can have so many meanings to teachers. Participants' learning experience on CT

instruction was inconsistent without a universal guidance, which further accounts for their uncertainty in designing a CT-based lesson and making proper assessment on their teaching performance.

### *5.3.2 Learning difference*

Another problem encountered by participants would be the learning difference in class, which is often caused by social-economic status of the students' family. Some students who receive earlier home education would have developed a better domain knowledge in IL and are more inquisitive. With students having a wide difference in CT development and knowledge understanding, student-teachers found it challenging to adjust lesson materials.

### *5.3.3 Unavailability of grouping*

As the study was done during COVID-19 pandemic when traditional face-to-face teaching was suspended, grouping was not available for class activities. One participant reflected that children themselves had limited ideas when worked on their own, especially in a class with a wide gap of learning difference. When exchange of perspectives is essential for developing high order thinking, the effectiveness of teaching falls without grouping activities.

### *5.3.4 Students lack critical spirit*

From Wilen& Phillips (1995)'s perspectives on metacognition approach in CT teaching, it requires leaners' consciousness to use their cognitive abilities in thinking. In the interview, 4 participants mentioned that students lack critical spirit to challenge authority that they tend to seek for model answers upon every question. Some shared their teaching experience:

*"Students often copy and paste from teachers and high-performing students, believing there is only one best answer for every question."*

*"When doing a research, students lack the awareness to identify reliable information source. Some believe that any website with the name "News website" is identifies as trustable source."*

In addition, participants also found that students lacked open-minded attitude to change when facing opposing ideas. Some students might have received a stand for a very long time and were eager to prove this right, thus might have biased thinking in discussion. A participant explained:

*"Students are reluctant to change stand for they have misperceived critical discussion as a fight, and it is embarrassing to lose it."*

### *5.3.5 Student-teachers lack confidence and direction upon CT assessment*

Assessment for CT is a challenging task because it does not necessarily emphasis on proving right from wrong, thus having model answer for CT task is often not encouraged among participants. Without a marking scheme, participants often found themselves unconfident to rate students' CT ability objectively, some elaborated:

*"Since CT instruction doesn't focus on model answer. It is time consuming to evaluate and discuss all perspectives. It is difficult to assess what students' learning process."*

*"When it comes with CT assessment, it is more than good or bad. So, it is hard to distinguish a student's CT ability in general with different answers in one discussion, especially when they are all done orally."*

## 6. Recommendation

Considering some teaching difficulties experienced by most participants, recommendations are made, with a few suggestions retrieved from participants.

**Involve CT objectives in lesson planning**

CT is a deposition with discipline-specific habits such as identifying problems, data evaluation which can be taught and learnt. For that, focused attention needs to be deployed on application, learning process, and assessment methods (Snyder, L. & Snyder, M.,2008). However, it was found that participants see CT objectives as a by-product from class activities. In most cases, CT objectives were only mentioned after participants planned their activities for lesson objectives. Without planning CT objectives, difficulty in assessing students' long term CT development increases. Instead of considering CT as a by-product of a lesson, teachers need to include CT in their lesson objectives so purposeful long-term CT instruction planning can be deployed.

Additionally, commonness was observed for the choice of activities in achieving specific CT elements among participants (e.g. role play is used for attitude building, news analysis is used for building evaluation skills etc.). Indeed, an appropriate selection of activities helps enhance the effectiveness of CT instruction. Still, it also poses potential risk that effectiveness of instruction falls when activities become too formulated. In fact, CT instruction can be achieved with any activities if guiding questions are planned well. For a critical lesson planning, Broadbear (2003) suggested that CT activities should be based on a structure involving four elements: "**ill-structured problems, criteria for assessing thinking, student assessment of thinking, and improvement of thinking**" (p.7). **Ill-structured problems** are activities that emphasis on logical reasoning instead of right or wrong answer. **Criteria for assessing thinking** is the thinking framework that help guide students think through the process. Then, providing them with feedbacks for **the assessment of thinking**. Finally, the **improvement of thinking** is when teachers

create an inquiry culture where students can refine their thinking processes and practice logical reasoning. In the interview, some participants naturally included the abovementioned elements throughout their lesson plan. It is also important for teacher candidates being aware of the planning process so that they can have a precise goal to work on. In short, CT instruction is not restricted to 1-2 activities or thinking models but should be actively involved with teachers' awareness to involve a critical lesson planning. It is convinced that Broadbear (2003)'s suggestion help guide teachers in planning CT instruction, at the same time, allow some room of diversity when planning CT activities.

**Provide introduction of CT / clear objectives before instruction**

Regarding to participants' experience, students' low awareness to the purpose of CT activities had caused some misperception that CT was model-answer-based or to criticize people negatively. Nevertheless, CT is more than about using skills for a particular situation, but also a disposition to recognize the needs of skills and the willingness to apply it (Halpern, 1998). To support this premise, it is of a prioritized role to raise awareness (open-minded attitude) and explain misconceptions before instructions so that learners are motivated to improve their thinking (Wilen& Phillips, 1995). It is suggested that teachers should first introduce appropriate CT attitude such as being open to alternatives, commitment to seek reasons, before engaging students in discussion.

As for CT skills, Willingham (2007) stresses the importance on making these abstract ideas explicit, and to proceed in steps. For the first time of instruction, teachers can introduce CT concepts, providing with some examples (mostly related to students' experiences). Then, label the

used CT strategy so students recognize it as a skill that can be applied on other scenarios, and demonstrate how it applies to the IL content. When it comes with in-class discussion or assignment, listing clear expectations also helps students receive a clearer goal to work on while teachers can have precise marking objectives.

**Providing writing practice to consolidate ideas**

While participants agreed that assessing learning outcomes were essential at the end of the lesson, most assessment were done orally within the lesson, with only 1-2 participants mentioned about writing assignment. Time limitation of each lesson can be a possible explanation for the uncommonness of providing written assignment since writing usually requires extra time and guidance for brainstorming ideas. Nevertheless, it is believed that teacher should actively involve writing practice during or after lesson.

CT is not just a habit of mind but also entails effective communication to express ideas in a logical sense. Writing is a way to keep track of our thinking pattern and thus allow us to seek room for improvement. Most participants recall essay writing as an effective practice in which their reasoning skills and critical spirit were developed then. Additionally, it is also proven to be beneficial to the development of CT in studies. Regarding to Emig (1977), the process of writing reinforces the cognitive cycle in the use of the brain, the hand and eyes, and thus helps us formulate, synthesize and connect idea. it is an active, engaging activity that is both a process of doing CT and a product communicating the outcomes of one's CT (Bean, 2011). In order to teach student CT, we should not restrict to oral instruction but involve a suitable amount of writing practices. In a critical writing assignment, Schmidt (1999) suggested that the content should be connected to a

given problem (usually related to the lesson topic). Secondly, the writing assignment needs to be divided in stages and involved with a feedback stage to the students via the process. Here are three types writing assignment that can fulfilled Schmidt's idea:

*Figure 7*
*Types of writing and related examples (Bean, 2011)*

| Types of writing | Examples |
|---|---|
| Exploratory writing | Article summaries<br>Journal<br>Mind map |
| Expository writing (academic writing based on thesis) | Problem-posing writing *(to suggest solutions)*<br>Thesis support writing *(to defend or attack a controversial issue)*<br>Data-provided writing *(to defend or attack a controversial issue based on data)* |
| Writing which creates new ways of "seeing" | |

Exploratory writing is an informal-styled writing which helps students brainstorm ideas without worries upon writing mechanics. Though it is not usually graded, it helps students expand and construct their thoughts and feelings, thus, can be used as a preliminary guide in a formal writing task. In contrast, the other two writing types mentioned are considered as formal-styled writing in which authors are expected to show ideas in a clear, logical and understandable way, thus are generally considered as the final draft of writing. Teachers can decide the types of writing and word requirement based on students' cognitive development to meet diverse needs of students and strive a balance between the time limitation problem and CT development. For example, GS teacher can provide lower leveled explanatory writing (e.g. mind map) which requires less time and allows students to demonstrate the understanding of IL topic; or provide higher leveled expository writing (e.g. show-your-opinion question) which requires students justify their thinking and can be provided as homework.

**Use of Information technology in facilitating teaching practice**

Participants reflected the learning difference upon students were usually coped with proper grouping mechanics (high performing students' group with low performing students). The reduce of grouping activities thus caused great impact on effectiveness of CT instruction. While face-to-face grouping activities are less likely available during pandemic, it stems with a rising trend of online learning, together with the increase of flipped classroom where students can engage in self-regulated learning before class. Teachers can make use of online platform such as ***Google classroom, Nearpod, Mentimeter*** in which pre-lesson videos can be provided for teaching students basic IL background information. Additionally, forum/blackboard functions where students can post their opinions in text or recording forms can also be used for exchanging perspective when developing CT skills and IL knowledge. As for students who lack IT experience and electronic devices to do home research, teachers can increase the amount of in-class demonstration (e.g. how to use search engine, access government website), thus allow students to have a brief idea on basic library skills.

**Provide a year-1 foundation course of CT introduction in education program**

Most participants mentioned that their CT awareness and skills had been improved through the discussion activities in courses, reflecting that a fair effectiveness on the university's infusion approach of CT training. Still, there were some opinions given by participants that a more CT focused lesson should be provided for deepening their overall understanding on CT and relevant instructional skills. Despite participants' university had provided a particular CT-focused course *(GEF1012: Truth and Falsity: Critical Thinking)* for their elective choice, 9 out of 10 participants did not notice this course, showing a low exposure of this course to most GS major students.

Even most participants had proven a fair understanding on CT concepts and related activities, CT is a broad topic that each teacher may perceive differently. In addition, participants' feedbacks on inadequate in-depth discussion about CT instruction also accounts for their uncertainty in planning a CT lesson. Considering the rising importance of CT education nowadays, it is suggested that a compulsory and universal CT introduction course can be arranged as a year-1 foundation course for the teacher training programs in the university, in purpose to help teacher candidates revise basic CT concepts, explain teachers' role as a critical planner, as well as how CT instruction can be planned explicitly and implicitly. As for CT instruction can be fused with different subjects, arranging a CT foundation course benefits not only GS students, but also students of other subject programs, thus encourage CT instruction in a comprehensive education setting.

## 7. Conclusion

The present findings only retrieved the views from a small percentage of GS teachers' candidates in Hong Kong and could not represent the overall population. Additionally, research tools (the questionnaire and interview) used in the study were insufficient to evaluate participants' CT ability, thus could not give convincing data for analysis. Nonetheless, the findings can be taken as indicators that CT education development in Hong Kong is progressing steadily, with students of GS education program having a considerable grasp of CT and IL concepts, as well as the awareness to CT instruction strategies. Although teacher candidates nowadays are more open to students' centered learning and emphasized on teaching via process, their application of CT instruction is liable to the following inadequacies: (1). Paid too much attention on the choice of activities instead of questioning technique, (2) Put too much time-consuming discussion-based activities in a lesson, (3) Lack strategies for CT assessment. After all, it is understandable to have inadequacies in each lesson plan and this study does not mean to criticize local GS teachers'

teaching performance. The analysis only suggests that the abovementioned inadequacies were common instructional challenges faced by local GS teachers, thus helps provide a few suggestions such as actively involving CT abilities as long-term lesson objectives, IT-based learning, writing assessment to assist local GS teachers in achieving a betterment of CT instructional practices in IL education. On the other hand, similar need was observed between participants of this study and those of Stapleton (2011)'s and Mok & Yuen (2016)'s studies. Although local GS teachers have a fair CT understanding, uncertainty for an effective CT instruction and assessment was still expressed among most participants. It is because CT is a broad concept that can be perceived differently by each person. When there is no learning benchmark or teaching guideline for references, understanding and direction of CT instruction as well as assessment can be inconsistent among teachers, thus increases the difficulty for assessing effectiveness of current CT education development from a political perspective.

Reviewing current education settings, students are no longer restricted to teachers' instruction as the only way to access knowledge. Instead of providing fixed textbook knowledge, it is more of a prioritized role to improve student's CT ability to reflect and evaluate their own understanding to tackle with the information flood nowadays. In addition to modern economic settings, which are driven by sectors such as information technology, customer services and globalization, employers nowadays prefer candidates with profound CT ability to make sound judgement in complex situation. It is convinced that CT are more than just abilities for learning, but a universal and professional capacity required in modern world. More resources are therefore worth allocating on CT education development for enhancing our students' overall competitiveness in economic, technological, scientific settings.

When training is required for achieving competency in CT, so does CT instruction. Though this study only focused on Hong Kong GS teachers' proficiency in CT-based IL education, it can provide wider implications that a more organized and long-term policy framework, ranging from standardizing teacher CT instruction training to CT learning benchmarks is indispensable for effective CT education development.

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## 9. Appendix

### Appendix 1 Self-evaluation questionnaire Sample

**Self-evaluation: critical thinking – knowledge, skills, attitude 15-30 min**

自我評估批判思考：知識、技巧與態度 自我評估 15-30 分鐘

For each of the following statements, rate your responses as outlined below.

Strongly agree=4 Agree=3 Sort of agree=2 Disagree=1 Strongly disagree=0

問卷共有 25 項敍述，請依照下方評分標準作答。

非常同意=4 同意＝3 有點同意＝2 不同意＝1 非常不同意=0

1. I feel comfortable pointing out potential weakness in the work of experts.

   當我向專家提出質疑時，仍能感到自在。

2. I can remain focused on the exact requirements of an activity.

   我能專心地針對項目裡的要求，不會離題。

3. I know the different meanings of the word ―argument in critical thinking.

   我知道論證在批判思考中所帶含的不同意思。

4. I can analysis the structure of an argument

   我能分析論證的結構。

5. I can offer criticism without feeling this makes me a bad person.

   即使我提出批評，亦不會為此產生罪疚感。

6. I know what is meant by a line of reasoning.

   我知道何謂「推論思路」。

7. I am aware of how my current beliefs might prejudice fair consideration of an issue.

   我意識到自身既有的觀念可能讓自己思考某些議題時，不夠公正持平。

8. I am patient in identifying the line of reasoning in an argument.

   我會耐心找出論證中的推論思路。

9. I am good at recognizing the signals used to indicate stages in an argument.

   在論證中會有一些用作標示不同論述階段的關鍵字，我擅長辨認那些關鍵字。

10. I find it easy to separate key points from other material.

    我能輕易地從一堆資料中找出重點。

11. I am very patient in going over facts in order to reach an accurate view.

    為了得到正確的觀點，我能很有耐心地審視各項資料。

12. I am good at identifying unfair techniques used to persuade readers.

    我擅長看出文章有沒有用不正當的花招來說服讀者。

13. I am good at reading between the lines.

    我擅長找出言外之意

14. I find it easy to evaluate the evidence to support a point of view.

    我能輕易地評估每項支持論點的證據。

15. I usually pay attention to small details.

    我經常留意不同細節。

16. I find it easy to weigh up different points of view fairly.

    我能輕易為不同的觀點作出公正持平的考量。

17. If I am not sure about something, I will research to find out more.

    當我不了解某些事情，會多做研究來增進了解。

18. I can present my own arguments clearly.

    我能清楚提出自己的論證。

19. I understand how to structure an argument.

我知道如何建立論證。

20. I can tell descriptive writing from analytical writing.

    我能說出敍述文和議論文的分別。

21. I can spot inconsistencies in an argument easily.

    我能輕易找出論證中的前後矛盾。

22. I am good at identifying patterns.

    我擅長看出事情的模式。

23. I am aware of how my own upbringing might prejudice fair consideration of an issue.

    我意識到自身的成長過程可能讓自己思考某些議題時，不夠公正持平。

24. I know how to evaluate source materials.

    我知道如何評估資料來源。

25. I understand why ambiguous language is often used in research papers.

    我明白研究報告中用詞傾向模稜兩可的原因。

Retrieved from Cottrell, S. (2005). *Critical thinking skills: Developing effective analysis and argument*, pp. 13 The United States: PALCRAVE MACMILLAN.

**Appendix 2 Interview Questions Sample**

個人訪談 60-90 分鐘

**Part A: Conceptions of critical thinking and information literacy**
**第一部分：有關對批判思考及資訊素養的認知**

1. What is the concept "critical thinking" meant to you?
   就你而言，批判思考是什麼意思？
2. What is your interpretation of "argument" and "a line of reasoning" in critical thinking?
   在批判思考中，你所認識的「論證」和「推論思路」是什麼意思？
3. What is the concept "information literacy" meant to you?
   就你而言，資訊素養是什麼意思？
4. Do you encourage critical thinking in information literacy education? Why?
   你鼓勵在資訊素養的課題推動批判思考嗎？

**Part B: Learning experience**
**第二部分：學習經驗**

1. Where did you learn the major knowledge, skills and deposition of critical thinking from?
   你從那些途徑學習有關批判思考的主要知識、技巧和態度？
2. Did the university provide relevant courses for training and teaching critical thinking? (If possible, please specify with the course, course content and time)
   就讀的大學有沒有提供任何增進批判思考和批判思考教學能力的相關課程？（如容許，請講解課程名稱、內容和就讀學期）
3. Did the university provide relevant teachers' training course on enhancing students' critical thinking under the topic of information literacy?
   就讀的大學有沒有提供任何專為資訊素養教育上增進學生批判思考的訓練？（如容許，請講解課程名稱、內容和就讀學期）

**Part C: Experience in teaching information literacy**
**第三部分：有關資訊素養的教學經驗**

1. Can you introduce your teaching experience related to information literacy?
   For instance, teaching content, key ideas for this topic etc.
   你能說說有關資訊素養的教學經驗嗎？ 如相關教學內容、教學重點等。

2. How do you do to develop students' critical thinking in this topic in terms of knowledge, skills and attitude? (e.g. The use of teaching strategies)
   在資訊素養的課題下，你會如何發展學生的批判思考的知識、能力和批判精神？（如使用什麼教學策略）

3. What difficulties have you encountered when teaching critical thinking in this topic? Do you have any solution for it?
   在資訊素養課題上，你在教授期間遇到什麼問題？有解決方法嗎？

**Part D: Suggestions on critical thinking instruction in information literacy**
**在資訊素養教育上增進學生批判思考的教學建議**

1. According to *General Studies Curriculum Guide for Primary Schools (Primary 1 – Primary 6) (2017),* primary students of key stage 2 are able to "reject and refuse to forward indecent and inaccurate information on communication and social network". One of the objectives is as followed: *To be able to develop appropriate criteria (e.g. clarity, accuracy, effectiveness, perspectives, relevance) to evaluate information.*

   Upon this objective, how will you plan your teaching for enhancing students "critical thinking skills" in terms of (a) Flow of teaching, (b) Teaching method

1. 根據《小學常識科課程指 引( 小一至小六) 》，學生於第二階段需學會「*在通訊網絡及社交媒體，拒絕接收或轉發不雅和不正確資訊*」。

   根據以上目標，你會如何處理 (a)教學流程 (b)教學法 來增進學生在這課題上的批判思考能力？下方是具體的教學目標：

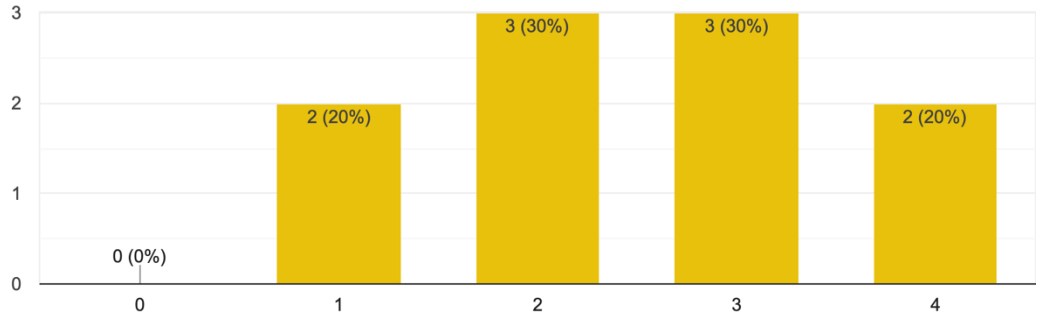
   - 能夠制定適當的標準（如清晰度、準確性、資料效用、相關性）來評估信息。

## Appendix 3 Critical Thinking Self-Evaluation Questionnaire: Test Summary

Knowledge

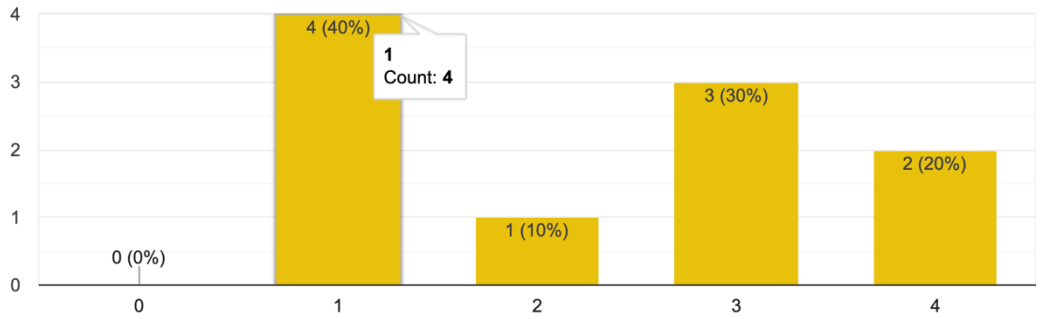
3. 我知道論證在批判思考中所帶含的不同意思。I know the different meanings of the word —argument in critical thinking.

10 responses



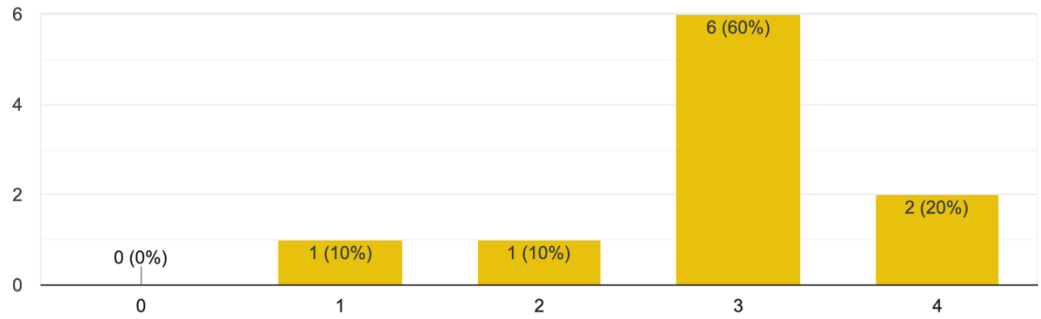

6. 我知道何謂「推論思路」。I know what is meant by a line of reasoning.

10 responses



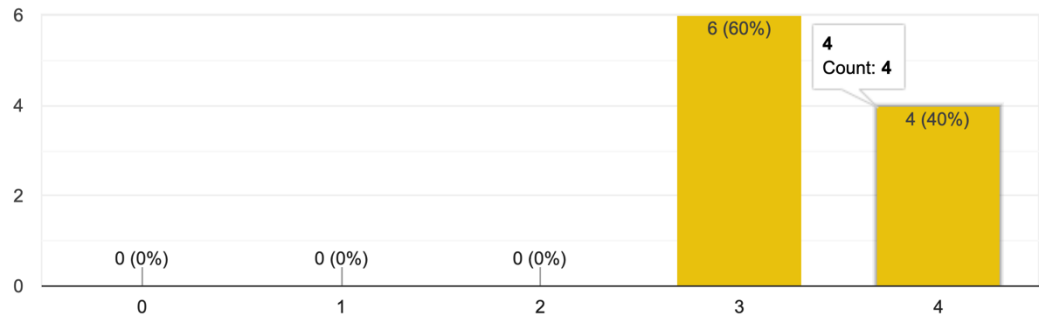
19. 我知道如何建立論證。I understand how to structure an argument.

10 responses



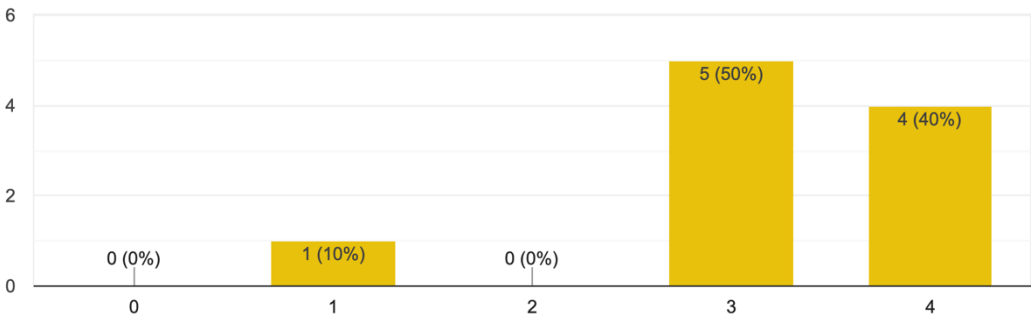

20. 我能說出敍述文和議論文的分別。I can tell descriptive writing from analytical writing.

10 responses



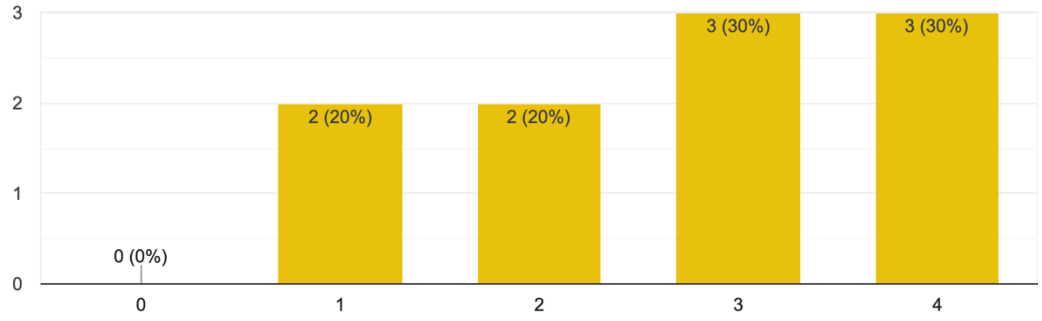

24. 我知道如何評估資料來源。I know how to evaluate source materials.

10 responses



25. 我明白研究報告中用詞傾向模稜兩可的原因。I understand why ambiguous language is often used in research papers.

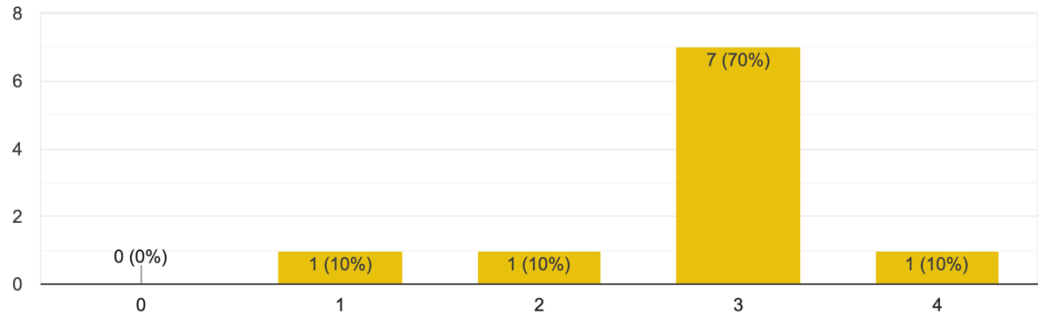
10 responses




Skills

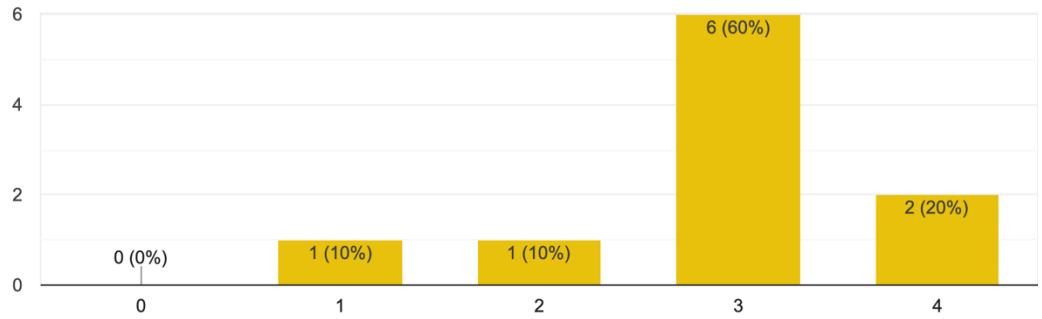
2. 在一件事情上，我能專心針對當中的要求，且不會離題。I can remain focused on the exact requirements of an activity.

10 responses



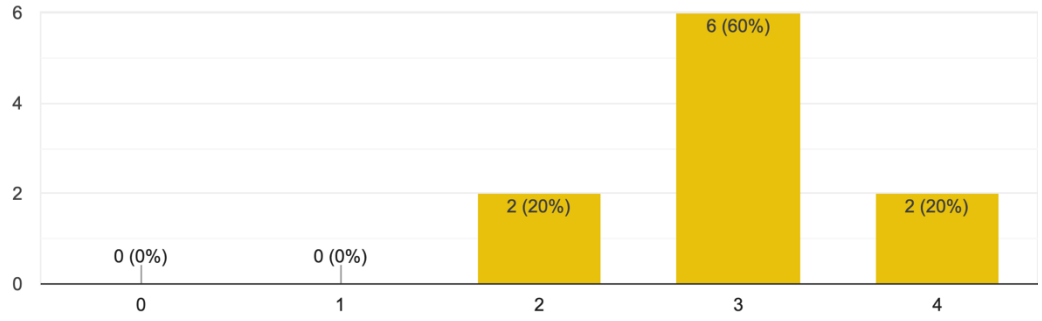

4. 我能分析論證的結構。 I can analyze the structure of an argument.

10 responses



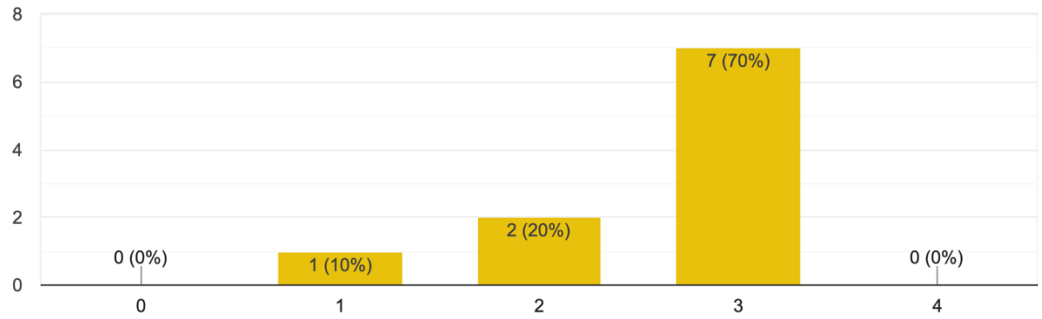
9. 在論證中會有用作標示不同論述階段的關鍵字，我擅長辨認那些關鍵字。I am good at recognizing the signals used to indicate stages in an argument.

10 responses



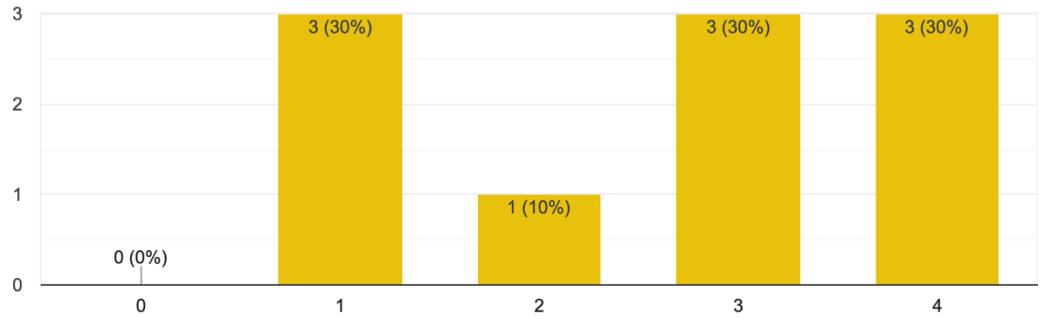

10.我能輕易地一堆資料中找出不同重點。I find it easy to separate key points from other material.

10 responses



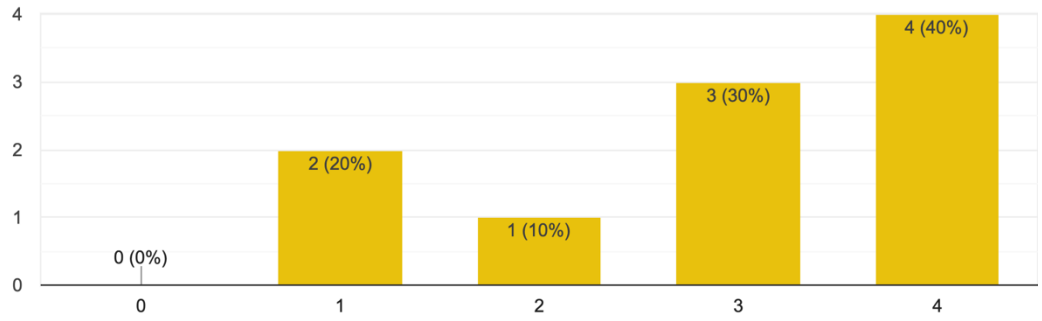

12. 我擅長看出文章有沒有用不正當的游說手法來說服讀者。I am good at identifying unfair techniques used to persuade readers.

10 responses



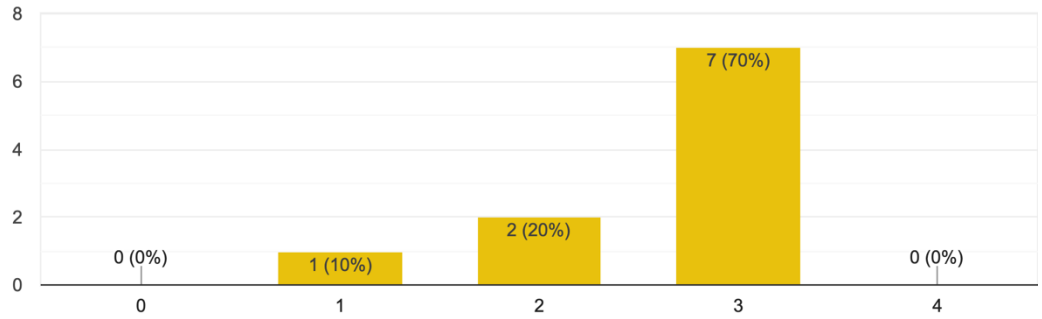
13. 我擅長從文句中看出言外之意。I am good at reading between the lines.

10 responses



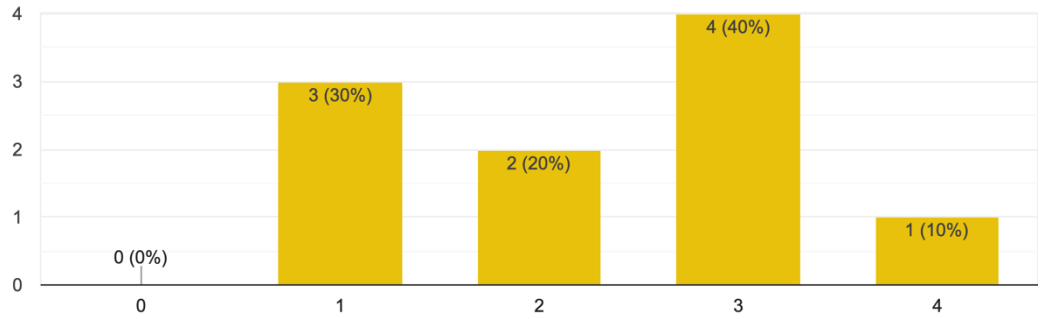

14. 我能輕易地評估每項支持論點的證據。I find it easy to evaluate the evidence to support a point of view.

10 responses



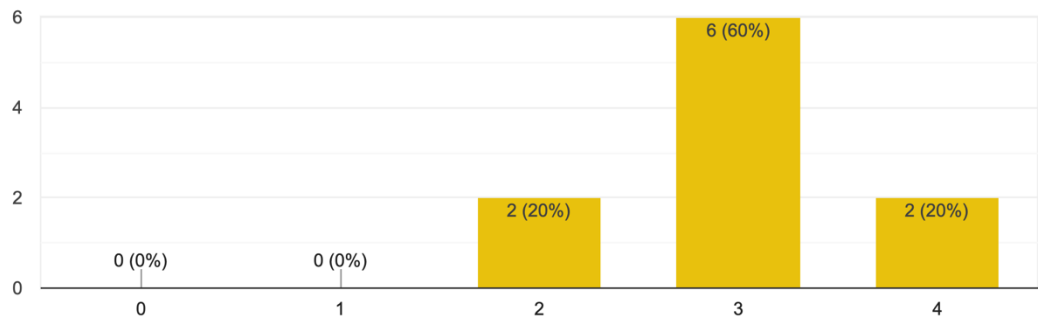

16. 我能輕易為不同的觀點作出公正持平的考量。I find it easy to weigh up different points of view fairly.

10 responses



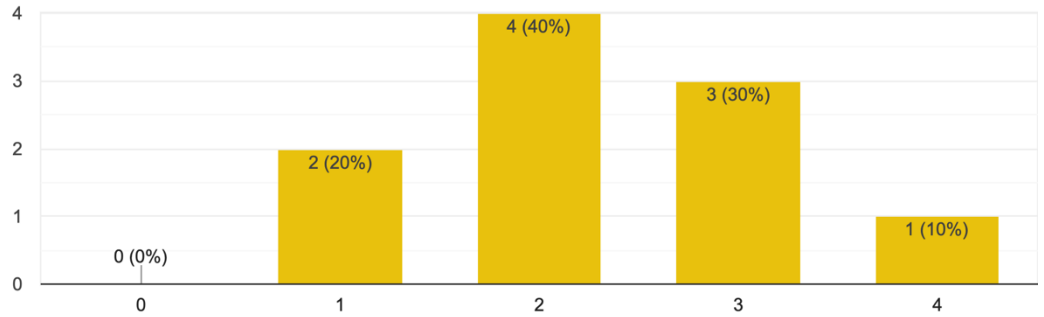
18. 我能清楚提出自己的論證。I can present my own arguments clearly.

10 responses



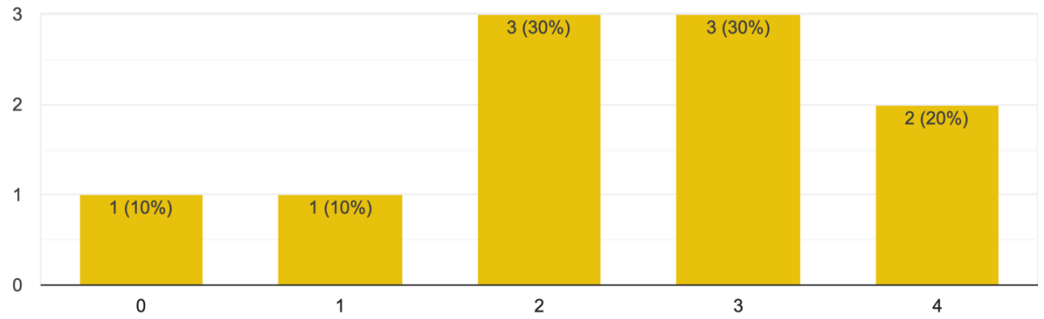

21. 我能輕易找出論證中的前後矛盾。I can spot inconsistencies in an argument easily.

10 responses




22. 我擅長看出事件的模式。I am good at identifying patterns.

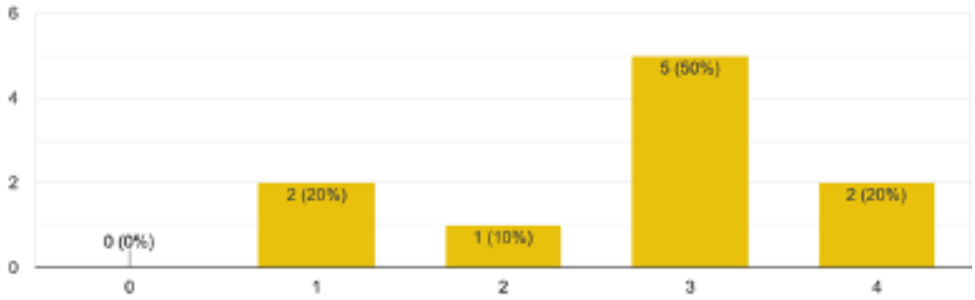
10 responses




Attitude

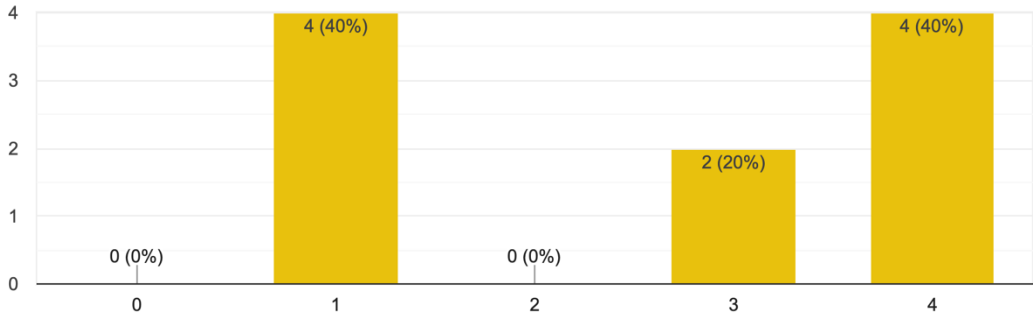
1. 當我向專家提出質疑時，仍能感到自在。I feel comfortable pointing out the potential weaknesses in the work of experts.

10 responses



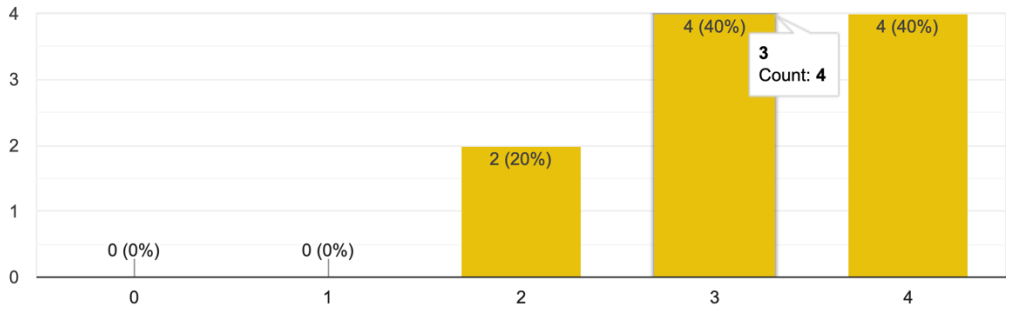

5. 即使我提出批評，亦不會為此產生罪疚感。I can offer criticism without feeling this makes me a bad person.

10 responses



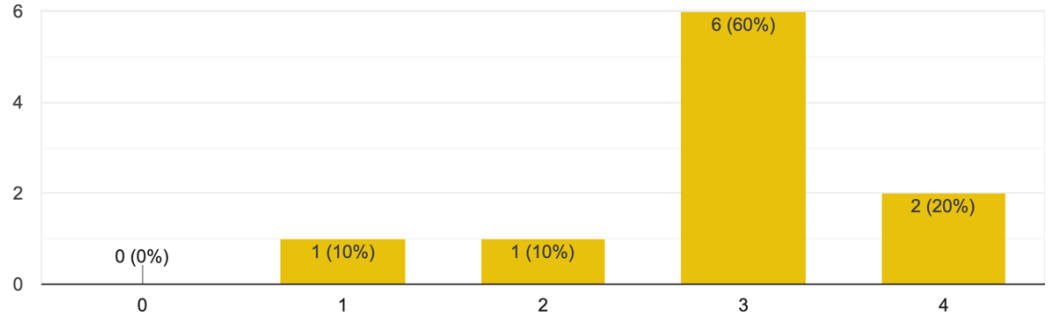

7. 我意識到自身既有的觀念可能讓自己思考某些議題時，不夠公正持平。I am aware of how my current beliefs might prejudice fair consideration of an issue.

10 responses



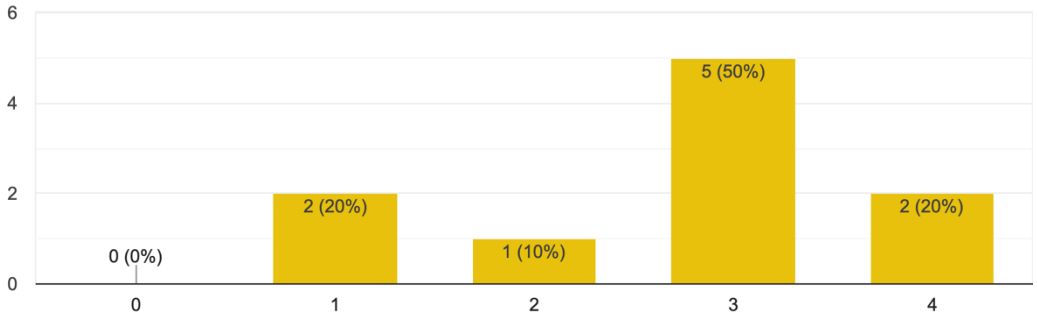
8. 我會耐心找出論證中的推論思路。I am patient in identifying the line of reasoning in an argument.

10 responses



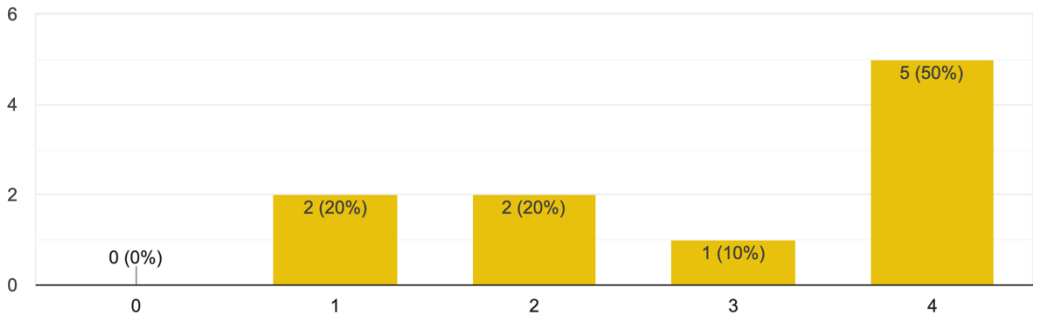

11. 為了得到準確的觀點，我能很有耐心地審視資料的真確。I am very patient in going over facts in order to reach an accurate view.

10 responses



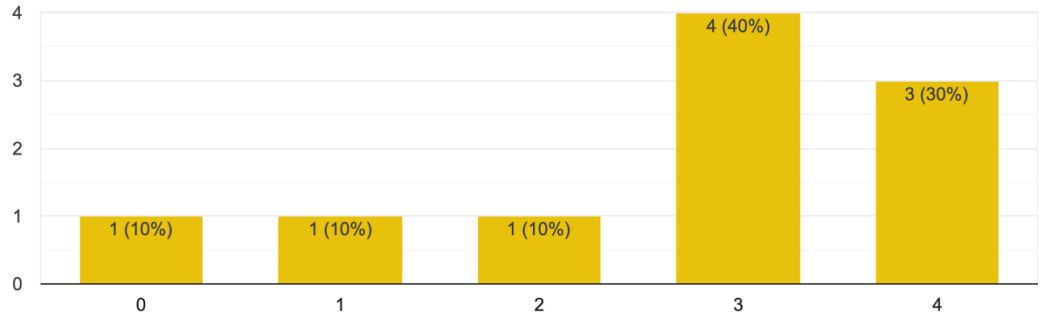

15. 我經常留意不同細節。I usually pay attention to small details.

10 responses



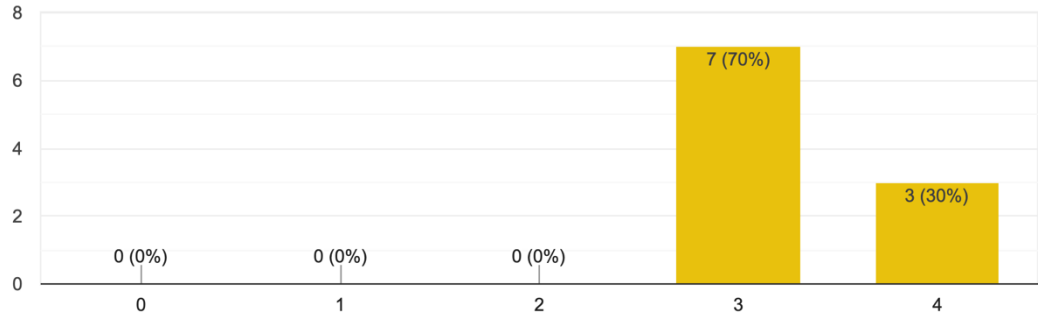
17. 當我不了解某些事情，會多做研究來增進了解。If I am not sure about something, I will research to find out more.

10 responses




23. 我意識到自身的成長過程可能讓自己思考某些議題時，不夠公正持平。I am aware of how my own upbringing might prejudice fair consideration of an issue.

10 responses



## Appendix 4 Interview Summary

| Part A: Conceptions of critical thinking and information literacy | | |
|---|---|---|
| **Questions** | | **Summary** |
| 1 | **What is the concept "critical thinking" meant to you?** | Participant A:<br>CT is the process of thought, and skills that are deliberately used for decision-making. In a way, it will eventually affect the goal and efficiency of a plan. |
| | | Participant B:<br>CT is the process of rationalized thinking.<br>With subjective feeling as a less dependable factor, critical thinker would consider objective factors and construct them into evidence for supporting an argument. |
| | | Participant C:<br>CT is a skill that allow individual to judge right from wrong via gathering data. |
| | | Participant D:<br>Some people often misunderstand CT as a negative criticism. Sometimes, we often jump to conclusion when we receive a stand on an issue. In fact, CT is a skill to let us think from different perspective and make objective reasoning without being biased upon an issue. So, CT is a thinking process that requires an open-mind attitude to respect different views. |
| | | Participant E:<br>CT refers to one's questioning skill to make judgement. It is a critical spirit to judge the logic and reason behind received information. |
| | | Participant F:<br>CT is a type of mind and attitude. A critical thinker tends to make judgment depends on their value and domain knowledge. |
| | | Participant G:<br>CT is a skill to gather evidence to if an information is right or wrong. |
| | | Participant H:<br>CT is the skills to make objective analysis. A critical thinker should not be basis and remain his neutrality upon a discussion. |
| | | Participant I:<br>CT is used for judging right from wrong via the gathering of objective and basis-free evidence. It can be applied on any subject. |

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| | | Participant J:<br>It is a 21st century generic skill. Nowadays, students are flooded with information of various quality. Thus, they have to acquire evaluation skill for constructing own opinion and distinguish right from wrong. |
| 2 | **What is your interpretation of "argument" and "a line of reasoning" in critical thinking?** | Participant A:<br>A line of reasoning is a thinking process of gathering evidence and data, and eventually constructs and support our argument.<br>Argument can either be a theoretical statement or a stand, with its content being sound and clear. |
| | | Participant B:<br>Argument is the reason of our thinking.<br>Line of reasoning is the process of explanation that support our argument. |
| | | Participant C:<br>Argument is a statement or a stand.<br>Line of reasoning is the process of organizing evidence, experience to support an argument. |
| | | Participant D:<br>Argument is the way we explain our stand.<br>Argument requires 3 elements:<br>✧ stand,<br>✧ reasons & evidence,<br>✧ and counter argument & explanation<br><br>Line of reasoning is the logical flow and the comparison of evidence for supporting our argument. There is no right or wrong for an argument. It allows us to think from multi-perspectives. |
| | | Participant E:<br>Argument is the topic sentence of a statement.<br>Line of reasoning is the experience, evidence for supporting the argument. |
| | | Participant F:<br>Argument is usually formed from a controversial issue where different stands can be occurred.<br>Line of reasoning are the examples, evidence and data that are used for supporting one's argument. |
| | | Participant G:<br>Argument is the evidence to present different stands.<br>Line of reasoning is a thinking process of multi-perspectives which support the argument. |

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| | | Participant H:<br>Argument is a stand with evidence-based elements.<br>Line of reasoning is the logical and step-by-step explanatory process for supporting an argument. |
| | | Participant I:<br>Argument is a stand or viewpoint which requires support from evidence.<br>Line of reasoning is the process of organizing evidence and eventually help construct our argument. |
| | | Participant J:<br>Argument is the presentation of thought, usually with evidence and clear conclusion.<br>Line of reasoning is the direction and step-by-step process for constructing an argument. |
| 3 | **What is the concept "information literacy" meant to you?** | Participant A:<br>IL refers to skills and attitude that we use for interpreting information. For skills, they are abilities to judge whether the information is logical and reasonable, or whether the information source is reliable and valid.<br>For attitude, we shall have a critical spirit and the tendency of fact-checking upon any new information instead of believing it in the first place.<br>As an internet citizen, we shall have the responsibility to avoid the spreading of faulty information. |
| | | Participant B:<br>IL refers to the attitude for evaluating information such as the awareness of fake news, responsibility of not spreading faulty information, rejection upon cyber bullying. |
| | | Participant C:<br>IL refers to a critical attitude and evaluation skills upon any received information (online or non-online). |
| | | Participant D:<br>IL is a generic skill and can be applied in different subjects.<br>For knowledge, IL is recognizing the need and types of information.<br>For skill, it is application of information such as organizing raw data, evaluating source.<br>For attitude, it is the awareness of applying and connect IL knowledge to daily life or subjects such as project-learning. |
| | | Participant E:<br>IL is an attitude that one has when receiving or spreading information. It can be either negative or positive. Anyway, it will be my own judgement. |
| | | Participant F:<br>IL is an attitude features how one would react when receiving new information.<br>It is a skill that allow one to look for information via several ways. |

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| | | Participant G:<br>IL features one's ability to recognize information need, source, and to use information. |
| | | Participant H:<br>IL is a skill for recognizing information need and evaluating information. This requires learning and application. |
| | | Participant I:<br>IL is about the attitude and awareness we have when using information tools and information. It has the skill sets on how to use information tool. For examples, cyber bullying and intellectual property. |
| | | Participant J:<br>IL is the skills for searching, organizing and evaluating information. It is about filtering accurate information from the faulty one. |
| 4 | **Do you encourage critical thinking in information literacy education? Why?** | Participant A:<br>**Strongly encourage.**<br>IL and CT are inseparably interconnected with each other.<br>Living in a generation with overloaded information, students need to acquire CT skills for distinguishing the legitimacy of the information via considering its validity, neutrality, logic. |
| | | Participant B:<br>**Strongly encourage.**<br>With the online anonymous features, internet nowadays is flooded with information of different quality. It depends one's awareness to filter what they receive and send. CT can facilitate the evaluation process. A critical receiver can avoid using faulty information whereas a critical sender can avoid spreading faulty information to others. |
| | | Participant C:<br>**Strongly encourage.**<br>I believe that IL and CT are related. In IL education, there could be some dilemma that requires students to choose and present their reasoning. CT skills are thereby important analytical tools for decision-making. |
| | | Participant D:<br>**Strongly encourage.**<br>In primary curriculum, it is commonplace for students having project-learning. Although primary students nowadays know how to search information online, they often lack the ability of organization and evaluation. It happens a lot where students just copy and paste what they saw online without acknowledging intellectual property. When it comes to research-related activity, CT is crucial in terms of reflection. Students have to aware if their method for searching information is legal. At the |

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| | | same time, they need CT to analyze the content and spread their thinking branch with the information given. That's why CT is needed upon IL education. |
| | | Participant E:<br>**Yes.** IL is about the evaluation and selection of information. Independent thinking which is encouraged in CT enhances one's IL competence such as organizing information and decision-making. |
| | | Participant F:<br>**Yes.** IL is becoming a common and trendy topic in modern society. Students nowadays have more opportunities to receive information from different channels. CT instruction can help students apply analytical skills when evaluating information. Considering students in the future may have to discuss IL topics, I believe it is better to teach them relevant concepts at an earlier stage. |
| | | Participant G:<br>**Yes.** I believe IL and CT is inseparable with each other.<br>IL allows student to find information whereas CT allows them to evaluate the accuracy of information. |
| | | Participant H:<br>**I think it's doable.** GS often has a lot of topics related to IL. They often require the search and use of information. So, it is a good thing to let students apply CT to evaluate information. |
| | | Participant I:<br>**Yes.** IL is becoming a common and trendy topic in modern world. Information sources are open up to everyone. CT is thereby important for students to evaluative the accuracy and validity of different information. |
| | | Participant J:<br>**Yes.** As I mentioned, evaluation skills are important for Z-generations. If students haven't acquired CT skills to evaluate information quality, inaccurate information will hinder their thinking. Besides, if students learn to criticize unknown knowledge and have inquiry learning, it will facilitate IL educations too. |

| **Part B: Learning experience** | | |
|---|---|---|
| **Questions** | | **Summary** |
| 1 | **Where did you learn the major knowledge, skills and deposition of critical thinking from?** | Participant A:<br>I wasn't really aware of the actual learning process of CT. In **secondary school**, I learnt most of my CT skills and knowledge such as constructing an argument and reasoning from Liberal Studies.<br>**Societal changes** (e.g. the increase of fake news) in these years have also made me develop a critical attitude upon new information. |

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| | | **Peer discussion** is another factor that increase my tendency to do fact-checking and critical analysis. |
| | | Participant B:<br>I believe that knowledge, skills and attitude are inseparable elements in CT development.<br><br>**School settings**<br>I've learnt most of my CT skills from **school settings**, especially secondary school. Every subject can be embedded with CT instruction such as argumentative writing, English speaking or discussion in Liberal Studies require our analytical skills and presentation of thoughts (e.g. use of mind maps). In university, it focuses on building up our critical attitude and start realizing its importance upon our thinking and learning.<br><br>**Discussion with elders and peers** also strengthen my CT. Elders and peers sometimes provide detailed observation or other perspectives upon social issues. I acquire some analytical skills and tent to reflect my own ideas via listening to their ideas. |
| | | Participant C:<br>**School settings**<br>Different education levels developed students' CT in varied phases. **Primary school** focuses on knowledge basis and the buildup of basic social norms via Yes-NO judgment. **Secondary school** focuses more on skills building such as developing **reasoning skills** via writing argumentative essay in Chinese, English, Liberal Studies. **In University,** students learn CT through project-learning and group discussion. Since we have already acquired basic knowledge in previous education settings, we can have more rooms for discussion in different issues, which help us to nurture a critical attitude.<br><br>**Social network.** There are controversial issues happening in our society in which everyone can have indifferent viewpoints. It is common to see certain experts and other stakeholders present an article upon social issues. Through reading these articles, I have been trained to think from multi-perspectives and critically. |
| | | Participant D:<br>**School Settings**<br>**Secondary School (Liberal studies)** For knowledge, LS provided us with various social issues. In LS, we were able to acquire domain knowledge and applied what we learnt into mass discussion. For skills, I've learnt some analytical skills such as 6-WH question. Since LS requires essay writing, I learnt my skills of constructing an argument at this stage. **University (General Studies Major)** In pedagogical courses in GS, it focuses on teaching student-teacher on CT instruction (thinking from different perspective).<br><br>**Self-motivated training**<br>Sometimes, I trained my CT via reading news articles. |
| | | Participant E:<br>**School settings (Associate Degree)** |

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| | | During that time, I had philological course that taught me CT skills in multidimensional thinking via reading famous philosophers' articles. Besides, I had social science course that allowed us to discuss a lot of social issue, which raised my awareness upon CT. |
| | | Participant F:<br>**Daily life**<br>I believe that minor issues can enact one's CT such as family affairs, politics. Therefore, it is hard for people to be aware of using CT. Through discussing with peers upon these issues, it helps develop my CT thinking.<br><br>**School settings (Secondary school)**<br>There are some subjects in secondary school that helps me become more aware of CT concepts. Chinese history and Liberal Studies taught me CT skills such as analyzing the consequences and reasoning. |
| | | Participant G:<br>If it's about CT knowledge, I did not learn it particularly.<br>**School settings**<br>**Secondary school: Liberal Studies**<br>Through writing essays in LS, it develops our CT skills for evaluating usable information for research.<br><br>**University**<br>I guess university has taught us some CT knowledge and attitude. But I don't remember it exactly. |
| | | Participant H:<br>**School Settings**<br>**Secondary School (Liberal studies)**<br>I mostly learnt my CT concepts and skills via writing LS essays such as constructing an argument and reasoning.<br><br>**University**<br>In university, we have learnt about evaluating essay which helps nurture our critical attitude.<br><br>**Daily application**<br>In daily life, we often receive much information of different topics online. While we are trying to evaluate the accuracy of information, we are using CT at the same time. |
| | | Participant I:<br>In fact, I don't learn it directly. I usually hear the term in GS major in which CT is slightly introduced as a generic skill.<br><br>**Secondary school (Liberal Studies)**<br>I learnt clear concepts of CT from LS in which we were taught about constructing an argument and organizing evidence for essays. |

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| | | Participant J:<br>**Primary school**<br>In GS, it is mostly about nurturing students' CT attitude with inquiry learning.<br>**Secondary school (Liberal Studies)**<br>In LS, I learn most of my CT skills via essay writing. |
| 2 | **Did the university provide relevant courses for training and teaching critical thinking? (If possible, please specify with the course, course content and time)** | Participant A:<br>**Yes, but** the content is only slightly introduced CT. For a year-4 course INS4012 (Model and Approaches in teaching General Studies), it had introduced CT thinking but only went through basic concepts (e.g. the clarity and validity of an argument) since CT was not a main topic of that course. |
| | | Participant B:<br>**There is not particular course for CT. CT training is embedded in lesson activities.**<br>A year-1 course PFS2013E (Philosophical and Social-cultural issues in Education). The lesson often presented a two-choice dilemma and allowed us to explain reasons behind our choices. It also provided arguments from other perspectives to facilitate our thinking. It helped train my critical attitude and analytical skills for deciding which is the best solution for all. |
| | | Participant C:<br>**Yes.**<br>**Project-learning and discussion**<br>In SSC2044C (Hong Kong Studies), I presented a project features if Hong Kong government is providing enough disabled friendly facilities. It is believed that more facilities refer to less discrimination. However, our teacher reminded us that if too many facilities were built for disables, it could lead to reverse discrimination. Project-learning and discussion help consolidate our knowledge and inspire us to rethink about a certain issue.<br><br>**Exchange of ideas with expert**<br>Sometimes, courses invited guests to the lecture and discuss course-related in depth. This helps refines our concept towards an issue.<br><br>**Steps-by-steps learning**<br>There was a course which taught us conceptual learning about the process of conflict. Through breaking the process of conflict into small steps, it helped me understand how argument form in a clearer way.<br><br>**CT training should be immersed with daily life**<br>Unlike secondary and primary school, university teachers won't emphasis CT on purpose since they expect university students have a well-understanding of CT. What they usually do are providing certain perspectives and information for our CT. I believe CT can be trained via discussing daily issues. |
| | | Participant D:<br>**Although there is not a particular course for CT, some social science courses have embedded with CT elements.** |

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| | | **Training on CT**<br>In SSC2044C (Hong Kong Studies), it separated social issues into categories of economy, society, politics. Teacher then would provide a specific topic for discussion and analysis.<br><br>In SSC3054E (Perspectives on Citizenship), it allows us to give definition upon concepts such as "citizenship", "identify" and give reasons behind its meaning (a line of reasoning). After all, teacher didn't give a model answer upon our discussion.<br><br>**Teaching about CT instruction**<br>A certain INS courses such as INS4011C (Interdisciplinary concepts and thinking), INS4012 (Model and Approaches in teaching General Studies) focused on CT instruction via discussing the design of a teaching plan and teaching strategies.<br><br>**Views on university CT course**<br>**Problem: Time limitation and lack of debate atmosphere**<br>In presentation, everyone has been rushing their time while audiences are not paying attention to what their present. I believe CT skills are hard to developed without the exchange of ideas and interaction.<br><br>**Solution:** Presentation should be arranged in a more interactive format such as each team is responsible for asking one question to the present team. |
| | | Participant E:<br>**Yes. But the content is not in-depth and adequate.**<br>In our major electives, PFS2013E (Philosophical and Social-cultural issues in Education) often presented both ancient and modern perspectives for our reflection. It is ashamed that it is only a short-term course appeared once in our year 1. I had another CT course in year 2. However, the lecture seemed not "qualified" enough for teaching CT. So, the ability of the teacher influenced the effectiveness of CT instruction. |
| | | Participant F:<br>**There is not a particular course for CT. Some courses however have embedded with CT elements.**<br>For some non-major electives such as national education and citizenship education, we learnt reasoning skills through discussing local issues.<br>For major course, the lecturer of INS3019C (Teaching General Studies) had brought us to the importance of the nurturance of CT attitude. |
| | | Participant G:<br>**Yes.** There was a particular lesson in INS4012 (Model and Approaches in teaching General Studies) which taught us something about CT instruction, but I did not remember. |
| | | Participant H:<br>**Yes, and there are a lot.** |

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| | | In a Chinese elective, there was a course where students would have to read Chinese ancient readings. The lecturer introduced us with different writers who had different interpretation upon the same ancient work. We were asked to evaluate and explain which writer had the best interpretation. This helped train my analytical skills in CT.<br><br>In INS3020E (Living in the information age), this course taught us on how to distinguish the validity of an information. I believe most courses in university have certain elements that can help us train CT. |
| | | Participant I:<br>**There is no particular or in-depth training course for CT or CT instruction.**<br>Lecturers did not mention CT concepts in an "official" way. It was only mentioned as one of the GILOS in courses. I guess it is because university teachers expect we learn CT in secondary schools so they usually don't spend time rephrasing it. |
| | | Participant J:<br>Yes. It is an elective from strand one General Education (GEF1012 Truth and Falsity: Critical Thinking). It introduced us with basic CT concepts and skills for evaluating, identifying argument. It provided a lot of discussion exercise for application. I believe attitude is not taught directly, but is to nurture via discussion. |
| 3 | **Did the university provide relevant training on enhancing students' critical thinking under the topic of information literacy? (If possible, please specify with the course, course content and time)** | Participant A:<br>Yes, the university currently provided us with INS3020E (Living in the information age) which taught us about background knowledge of IL (e.g. big data, intellectual property). However, there is not a particular major course that acquire us with certain CT/IL instruction skills. I believe that our university should provide a major course specify on CT [instruction], with IL included as one of the topics. |
| | | Participant B:<br>**No**. School does not provide any training specify on CT instruction. I self-learnt via participating in a campaign of cyber bullying in university. I learnt concepts about IL instruction via searching related information and teaching plans. |
| | | Participant C:<br>**Yes, but not enough.** In some pedagogical courses, they provided s dilemma to develop our critical spirit. Since IL and CT education were not the main focus in courses, the content wasn't enough for a comprehensive CT process. Also, CT cannot be learnt through one-way communication but application. It is hoped that the courses would provide more examples on CT instruction in IL. |
| | | Participant D:<br>**No. There is not a particular course for IL**. Even if so, IL would not be the main focus of the course.<br><br>**Views on university IL course**<br>**Problem: students lack library skills**<br>Even for university year-4/5 students, some still don't know how to use library search engine in our school or Google Scholars for research. Currently, it all depends on each professor's plan without an orderly designed IL instruction schedule. |

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| | | **Solution:** IL is a generic skill that should be embedded in different courses, instead of teaching it as a separated course. The course design should insert IL education that professor should have the responsibility to teach students a certain researching skill in each phase. |
| | | Participant E:<br>**Yes.** But most only focus on knowledge basis and content related to CT instruction is not emphasized.<br><br>**Problem: Course curriculum design**<br>CT can be embedded in any instruction and topics. Current courses do not provide enough opportunities for in-depth thinking and application on CT.<br><br>**Solution:**<br>Major course should be designed to immerse with current Primary curriculum.<br>More time should be devoted in discussion for advanced CT development. The process should be focused on reasoning instead of distinguishing right from wrong. |
| | | Participant F:<br>**No, but we have course teaching IL concepts.**<br>In INS3020E (Living in the information age), we learnt some IL knowledge about intellectual property and personal privacy. We discussed about some IL issues but I am not sure about if we had learnt any CT skills.<br><br>**Views on university CT course**<br>**Problems:**<br>**Major courses lack in-depth discussion about CT instruction**. Sometimes, lecturers taught us some basic CT concepts but rarely mentioned about CT instruction. Besides, CT instruction of the courses were too knowledge-based. They would first provide a case and then let us discuss about CT skills. Lecturers believed that inductive teaching method allowed us to understand CT more clearly. However, it made student teachers prone to become uncertain if they were learning about CT instruction.<br><br>**Solution: Make CT an independent course**<br>I understand that CT has been embedded in different course content. However, making it an independent course can allow CT to be the focused content and resolve student teachers' uncertainty when it comes with CT instruction. Lecturers should first brainstorm about CT knowledge first and then provide case for us to apply. |
| | | Participant G:<br>**Yes.** INS3020E (Living in the information age) introduced us the idea of Fake news. It included learning how to distinguish the validity of an information and CT skills on how to search information. |

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| | | **Views on university CT course**<br>**Problems: CT contents are not enough**<br>There isn't any particular course for CT. Even CT is mentioned in the course, it is not the main content. It really depends on some lecturer who would like to devote some time on CT.<br><br>**Solution: CT should become an independence course**<br>In such way, students can have the awareness of learning knowledge and skill about CT and put it into daily application. |
| | | Participant H:<br>In INS4010E (Trends and development in teaching GS), it had topic features IL but I hardly remembered the content.<br><br>**Views on university CT/IL course**<br>I think current content for CT is enough because most courses have CT application.<br>**Problems: IL topics are taught at a very late stage**<br>**Solution:** IL is becoming a new trend in education. Teaching IL at an early stage can help us learn and adapt faster for designing related instruction. |
| | | Participant I:<br>**No.** From my experience, most GS instruction courses depend on the lecturers' thought upon CT.<br><br>**Views on university CT course**<br>**Problems: Current GS major curriculum should connect to primary curriculum and textbook**<br>**Solution:** GS major electives are mostly knowledge-based and have inadequate content on instruction. University separates instruction and knowledge into two types of courses. It is hard for us applying what we learn immediately into instruction. It is hoped that they can immerse together.<br><br>**Problems: students lack awareness and knowledge for CT instruction**<br>**Solution:** Teachers can provide more discussion for our CT application and provide a clear concept about CT instruction. |
| | | Participant J:<br>Our school library provides voluntary workshops regularly for teaching students using their search engine in library which is a library skill.However, GS major doesn't have any relevant courses.<br><br>**Views on university CT course**<br>**Problems: CT are emphasized in modern education but not in university curriculum**<br>So far, CT course is not compulsory and not all student know about it. I believe CT is not only for the good for a student teacher, but also other subjects. |

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| | | **Solution:** I suggest making CT course as a compulsory foundation course for year 1 student so as to equip them with basic CT knowledge, skill and attitude. |

| **Part C: Experience in teaching information literacy** | | |
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| **Questions** | | **Summary** |
| 1 | **Can you introduce your teaching experience related to information literacy? For instance, teaching content, key ideas for this topic etc.** | Participant A:<br>I taught IL topics such as identifying different types (e.g. photos, words, video) and source types of information (e.g. News, internet, TV); and taught students the responsibility to refuse spreading faulty information. Considering the seriousness of fake news nowadays, the lesson usually focuses on word analysis such as developing criterion for valid information. |
| | | Participant B:<br>I've taught topics on evaluating information (e.g. fake news) and cyber bullying. In the lesson, I used news analysis and allowed students learnt to build awareness and analytical skills upon the choice of words (affective vocabularies) in an article; and avoid their argument to be affected by these factors. |
| | | Participant C:<br>I believe IL education can be done in different GS unit. I have taught a lesson related to "smoking" in which I had taught some IL elements. Students might have developed some misconception of smoking through movies, TV or internet. I allowed students to discuss among these concepts and made their judgement whether these concepts were true. |
| | | Participant D:<br>I've taught personal privacy and intellectual property. In intellectual property, I had explained this concept to students and provided some relevant legislation. Next, I would let students acknowledge their right to protect their intellectual property by giving examples of artists, writer and movie director.<br><br>In personal privacy, I would start with the consequence for the leak of personal information, thus letting them aware of its importance. Then, I taught them how to protect their personal privacy by telling them the way to set private icon on Facebook. As primary students may not have a clear bottom line to distinguish what should be filmed or recorded, teaching them responsibility for protecting others' privacy is thereby another important task. |
| | | Participant E:<br>Take sex education as an example, I would teach IL concepts about where and how students can obtain valid and reliable educational information about sex. |
| | | Participant F:<br>I taught about the use of information including the types of information tool, intellectual property, cyber security. In terms of attitude, I taught topics related to cyber bullying and internet addiction. |

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| | | Participant G:<br>I taught topics on how to use information for learning and distinguishing the accuracy of information. |
| | | Participant H:<br>**Project Learning / News analysis**<br>In project learning, I had taught students some library skills. Students nowadays tend to use internet for search news and information. But they don't have the awareness and knowledge to evaluate source and identify reliable websites for research. So, it is important for teachers to give instructions at the first place. |
| | | Participant I:<br>I taught topics on how to use information and the attitude for using it. For example, cyber bullying and intellectual property. |
| | | Participant J:<br>I taught P3 student on personal privacy and how to distinguish inaccurate information such as fact check before forwarding message. For cyber bullying, I focused on value building. |
| 2 | **How are you going to enhance students' critical thinking in this topic in terms of knowledge, skills and attitude? (e.g. The use of teaching strategies)** | Participant A:<br>**<u>News analysis and Comparison</u>**<br>I prefer news analysis and comparison. I usually provide news of two different medias, with both news reporting the same issue. 6-WH questions is used for analyzing the issue. Comparing the use of vocabularies, perspectives in the news help students realize their understanding of the information can be varied with different distribution.<br><br>**<u>Grouping</u>**<br>Also, I prefer grouping activities for enhancing CT. Similar to our society, students have to realize that not everyone has the same perspective and stand. Through their debate and exchange of idea, I hope students can develop an open-minded attitude for accepting different views; and seek for the best solution with proper communication and reasoning. |
| | | Participant B:<br>I believe inquiry elements play a significant role in CT development. Students must not passively acquire every knowledge and skills from teachers' instruction.<br><br>**Project-learning in IL**<br>For inquiry activity, students can construct a research question (e.g. The impact of fake news). In the process, they would need to search information, present their views and construct solution. Through the project learning, it helps consolidate their line of reasoning and apply learnt knowledge.<br><br>**Role play**<br>Role play is a way to build attitude upon IL. For example, students can role-play different characters in a scene about cyber bullying. Teachers would ask how they feel from their characters in cyber bullying. It helps students to realize the effect of cyber bullying form different perspectives and learn to reject it. |

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| | | Participant C:<br>**News analysis and Inductive reasoning**<br>I would share news and issues for discussion. I will ask students to interpret the reasons behind an argument of a stakeholder to train their line of reasoning. |
| | | Participant D:<br>**Students-centered learning**<br>One cannot acquire CT by listening to teachers, I would prefer inquiry learning via news analysis. When discussing daily life issues, I would provide leading questions for guiding students' thinking. |
| | | Participant E:<br>**Discussion / Questioning**<br>Discussion and questioning allow one to construct their ideas in a more organized way. |
| | | Participant F:<br>**Inductive teaching method and consequentialism**<br>Take internet addition as an example, I will use inductive and consequentialism-based teaching method. I will ask students about some consequences of internet addiction (no right or wrong will be emphasized), thus followed by letting them know it is not good to be addicted to internet addiction. |
| | | Participant G:<br>I will use the strategy of problem-solving which is to give a difficult question and solve together in class. |
| | | Participant H:<br>**Peer evaluation via discussion / inquiry learning**<br>Take news analysis as an example, I usually prefer inquiry learning instead of giving direct feedback to students. I will present students' work in class and let everyone give critical feedback upon their peers' work, which helps nurture their own CT. |
| | | Participant I:<br>**Role-play and discussion**<br>Take cyber bullying as an example, students will role play as the bullies and the victims. It helps nurture students' empathy and attitude to refuse bullying. |
| | | Participant J:<br>**Situation scenario and news analysis** can help students put themselves into a situation when it comes with unknown and abstract concepts such as cyber bullying.<br><br>**IT teaching** is involved for teaching library skills and allow students know where to find reliable sources. For example, I will google HKO website for students so they can know where to find reliable weather information before spreading unconfirmed message related to weather. |

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| 3 | **What difficulties have you encountered when teaching critical thinking in this topic? Do you have any solution for it?** | Participant A:<br>**<u>Grouping is not available during the pandemic</u>**<br>Students have limited ideas if they worked on their own. When it comes to high order thinking activities such as news analysis and CT development, grouping is thereby very important for the exchange of ideas.<br><br>**<u>Learning differences</u>**<br>Students tend to do "copy and paste" from teachers and high-performing students on homework when presenting their own thoughts. It is therefore a challenging task for teachers to keep track of their CT development.<br><br>**<u>Assessment for CT is a challenging task</u>**<br>With different family backgrounds, students may have different level of CT development and some students may take longer time for achieving high order thinking. |
| | | Participant B:<br>**Effectiveness of CT instruction falls with reduced teachers' autonomy**<br>IL is highly dependable on information received in daily life. Politics issues have become a popular topic among students, and they may ask questions about it. For teachers, we usually avoid these topics or only allowed to discuss vaguely. It undoubtedly reduces students' learning opportunity or motivation to apply n IL from another topics.<br><br>**Inadequate training on CT instruction**<br>Sometimes, I may not acquire a full CT awareness upon every knowledge I received. This may affect how I distribute CT knowledge and skills to students (e.g. questioning). University doesn't provide us teaching course on CT instruction and it happens a lot that I lack a precise direction on CT instruction. Even if I self-learnt CT instruction, I am not sure about the effectiveness of my instruction. |
| | | Participant C:<br>**Students have low critical spirt towards authority**<br>Teachers are often treated as authority to students. I usually let the students give ideas and I will help summarize their thinking when it comes with free discussion.<br>**Learning differences**<br>Low performing students may lack direction to start discussion. So, I would provide certain perspectives or steps-by-steps worksheet as a starter and let each group choose one perspective to think about. After a few times, I would let them to do discussion without my help.<br>**Students lack an open-minded attitude**<br>Students may receive their own stand for a long period of time. Their believe may cause biased thinking during discussion. Teachers should develop students an open-minded attitude to different opinions and should encourage students to give their line of reasoning upon their stand. |

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| | | Participant D:<br>**Students lack IL knowledge for discussion**<br>Topics found in IL such as intellectual property are new to students. It might take some time for students to learn the topic before having actual discussion.<br><br>**Students lack awareness to criticize authority**<br>Students often just copy and paste information without evaluation which requires teachers remind them.<br><br>**Students lack open-mined attitude to change**<br>Students are reluctant to change their stand because they think it is embarrassing to lose a "fight". It is crucial for teachers reminding them the aim of a critical analysis is not a competition nor a negative criticism, but to gather and think from different perspectives. |
| | | Participant E:<br>**Students lack domain knowledge**<br>CT requires domain knowledge for in-depth discussion. Students who lack domain knowledge about IL concepts may take more time to build up constructive arguments.<br><br>**Students lack open-minded value**<br>Some students have already developed their own stands and thus tend to insert biased thinking when constructing an argument.<br><br>**Difficult to evaluate one' CT**<br>Since CT instruction doesn't focus on model answer. It is time consuming to evaluate and discuss all perspectives. It is difficult to assess what students' learning process. |
| | | Participant F:<br>**Students lack domain knowledge**<br>Some IL concepts are new to students and they may not know what to discuss at the first place. Even if they have learnt some after one lesson, they may not able to discuss IL issues in depth.<br><br>**Learning difference caused by diverse family background**<br>Some students may come from well-educated or wealthy family that allowed them to have more pre-school learning resources. This creates learning difference within the class where some students are able to give many ideas, but some cannot.<br><br>**Generalized Topic**<br>To tackle with learning differences, I usually choose generalized topic and common social issues for the lessons. |

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| | | Participant G:<br>**Teachers may lack autonomy**<br>Sometimes, students' parents may have indifferent value teaching approach with teachers. For instance, sometimes students are taught to watch stolen movie online for free. Teachers have to clarify that they may violate someone's intellectual property. However, they may experience difficulty to point out that their parents are teaching the wrong concepts.<br><br>**Assessment for CT**<br>When it comes with CT assessment, it is more than good or bad. It is hard to distinguish a student's CT ability in general with different answers in one discussion, especially when they are all done orally. |
| | | Participant H:<br>**Students lack awareness of source quality**<br>Students don't have the awareness and knowledge to evaluate source and identify reliable websites for research.<br><br>**Time limitation**<br>GS's topics are densely packed together so we don't have time to have in-depth discussion. Secondly, we have to understand that students are at their early cognitive stage and may not be able to give clear idea and direction. It sometimes requires teachers to provide hints. |
| | | Participant I:<br>**Students lack domain knowledge**<br>Since some families restrict children from using computer/phone too much, some students may not have experience about online searching. Thus, they have not received any knowledge before and may not be aware of how common and crucial IL can be. |
| | | Participant J:<br>**Different family background**<br>Some students are not allowed to use phones or wifi due to family rules. So, they are not able to give ideas and discuss.<br><br>**Solution: IT teaching in the lesson**<br>So, I usually avoid letting them explore IT knowledge at home. I will demonstrate the searching in class. If it is allowed, I would ask them search news in the computer room during the lesson. The use of real examples also helps facilitate their IL awareness. |

## Part D: Suggestions on critical thinking instruction in information literacy

### Question 1

According to *General Studies Curriculum Guide for Primary Schools (Primary 1 – Primary 6) (2017),* primary students of key stage 2 are able to "reject and refuse to forward indecent and inaccurate information on communication and social network". Upon this objective, how will you plan your teaching for enhancing students "critical thinking skills" in terms of

(a) Flow of teaching
(b) Teaching method

A suggested objective is as followed:

*To be able to develop appropriate criteria (e.g. clarity, accuracy, effectiveness, perspectives, relevance) to evaluate information.*

### Summary

Participant A:

**Daily-life based questions as starter**

For introduction, I will start with daily-life questions. For example, if you just read a news topic about pandemic on Facebook, would you forward it instantly? It is purposed to let students realize there is a possibility that it is a faulty information; and spreading it may have negative consequences.

**Spiral curriculum for learning**

Upon IL education and CT development, they have different level of breadth and depth. My objectives of CT instruction depend on students' thinking abilities. I can either expect low-performing students to make basic moral judgment upon the spreading of indecent/inaccurate information; or letting high-performing students to construct their own argument and explain it with reasoning skills; and develop definition for "inaccurate" and "indecent".

Participant B:

**News analysis as starter**

I will first present news about how people affect by fake news and make wrong decision. My first objective is to build students awareness about the existence of faulty information and its consequence when we decide not to evaluate it. For development, students will develop certain definition on "indecent" and "inaccurate". Then, they will analyze different news in groups and share their thoughts in front of the class.

Upon knowledge, skills and attitude in CT development, I believe attitude will be prioritized element. Outsides school, it requires students' self-awareness and discipline to avoid spreading indecent and inaccurate information. If they acquire an attitude upon IL, they will have a higher tendency to take action in evaluating information or promoting IL in their daily life.

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| **Grouping for news analysis and Roleplay**<br>Roleplaying allows the students to experience feeling from different perspectives while grouping is for students exchange their ideas and analysis. News analysis is a way to train students in applying CT and IL knowledge in daily incident. |
| Participant C:<br>**Provide definition on "indecent" and "inaccurate"**<br>Before News analysis, I will first define "indecent and inaccurate" with students. Criterion will be made such as the accuracy and reliability of source.<br>**Interactive activity**<br>I will allow students to come out and share their ideas on how to reject spreading or receiving that information. I believe interactive activities are crucial to create impression to students. |
| Participant D:<br>**Make Definition and understand students' habit**<br>I will first define the keywords "social media" via sharing the types of social media students know nowadays. I will ask about their aims, habits, attitude for using those media.<br>**Grouping for news analysis**<br>I will separate students into 4 groups, with every 2 groups sharing the same news article. I hope this kind of grouping can allow the exchange of ideas for developing their CT skills.<br>**Consequentialism**<br>In terms of attitude, I would use consequential teaching such as asking what consequence can be resulted with inaccurate information.<br>**Source evaluation skills**<br>We will later discuss some criterion for evaluating if an information is correct.<br>**Leading questions**<br>In the lesson, I would use follow-up questions for guiding students to construct their line of reasoning and argument. |
| Participant E:<br>**Flipped classroom / Project-learning**<br>Since CT is a big topic for discussion, I will ask students search for related news about this IL topic. If it is allowed, I will make it a project-learning topic and ask students to form their research questions. |

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| **Make Definition**<br>I will ask students to define the keywords “indecent” and “inaccurate”. |
| Participant F:<br>**Choice-based situation as a starter**<br>Information is immersed in our daily life. To let student experience such idea, I will provide a situation where student receive a message from peer about certain issues. Students have to put themselves in this situation and decide whether they should forward the message or not. This ice-breaking activity also allows me to access their IL attitude.<br>**News analysis: Fake news**<br>I will then provide news related to fake news and its consequences. Students would be asked to analyze the reasons behind people’s behavior in spreading faulty messages. Attitude and skills will be focused.<br>**Role Play: develop criteria for evaluating information**<br>I would provide some role play scenario related to the spreading of inaccurate information and let the students decide the ending. It allows the development of attitude via putting students in a role and situation. Also, it helps students think about consequences from multi-perspectives and construct the criteria for evaluating information. In the end, I will summarize students’ idea and made them today’s learning. |
| Participant G:<br>**Brainstorming the concept of Social media**<br>I will first ask students if they are using any social media. Then, I will present a message and ask if they want to forward it. Students need to explain their reasons of choices.<br>**Libra thinking method (consequentialism)**<br>I will let students divide their choices into two consequences. It flavors the line of reasoning and attitude building. |
| Participant H:<br>**Inquiry learning / Inductive learning: better for CT**<br>I will first give them classify “indecent” and “inaccurate” information in a bunch of examples. It is important that we should provide enough time for them to think. So, I will not give them answers at the start of the lesson.<br>**Provide discussion and application after teaching basic domain knowledge** |

I will then introduce basic knowledge about the good and bad of social media. After learning domain knowledge, students will have to discuss upon the examples they classified at the start of the lesson. They are allowed to change their answers and give explanations.

**IL topics should be immersed with computation learning**

I believe IL instruction will be done in a more effective way by letting students do online research during lessons. On one hand, students can apply what they learn immediately, and teachers can make immediate assessment on their research skills.

Participant I:

**Worksheet: write down consequences of different choices**

First, I would use a scenario-based question about student receiving an unknown message. Then, they will write down both consequences of forwarding or not forwarding the message. Finally, they will decide which consequences are more critical and make final decision.

**Discussion: analyze the reason behind choices**

Then, they will have a discussion for summarizing different factors for people making these decisions such as curiosity, insecurity. They will learn CT via the process of considering between consequences.

Participant J:

**Brainstorm fundamental knowledge and definition**

First, I will teach them basic concepts about "social media" such as their uses, ways to use and reason to use. I will define "inaccurate" and "indecent" before giving them examples. Then I will teach them IL skills on finding reliable social media such as government website.

**Common situation should be prioritized and taught first**

I believe IL education should be focused on teaching situation where students are at high possibly to encounter with such as receiving unconfirmed knowledge. So, the lesson order of this unit will be "fake news > internet privacy > cyber bullying". While **Leading questions** is important to guide students' thinking from basic to in-depth perspectives, **real-life examples** also help facilitate students' CT application.

**END OF THE RESEARCH**