

Cited as: Siu, F.L.C., Chu, S.K.W. & Wong, R.L.Y. (2012). Scaffolding students' values and attitudes development in General Studies through online Inquiry project-based learning. Paper presented at Paper presented at *CITE Research Symposium 2011*, The University of Hong Kong, Hong Kong.

Development of values and attitudes in General Studies through online inquiry project-based learning

Felix L.C. Siu

Samuel K.W. Chu

Rosalind L.Y. Wong

Faculty of Education, The University of Hong Kong

Abstract

Reflection in learning has been regarded as a useful technique in education for promoting analytical skills in higher order thinking. However, the majority of research in this area concentrates on the cognitive aspects and rarely mentions the affective domain. This study examined the development of values and attitudes in General Studies through the use of Wiki, a Web 2.0 technology as a platform for the implementation of Inquiry project-based learning IPjBL among Primary Five students in Hong Kong. Four schools were recruited and students (n=420) were given a project to work on. In order to foster affective reflection in learning, students were encouraged to create written reflections on their projects online. Instructions were provided to the students on how to write their reflections based on the five levels of affective domain in Bloom's taxonomy. The outcomes were evaluated using the online survey, focused group interviews and content analysis of the written reflections. The findings illustrated that students, in general, had generated positive values and attitudes in their topics of research. Overall, this study showed that scaffoldings in reflection can be an effective way to enhance the development of values and attitudes in IPjBL.

Keywords: inquiry project-based learning, Web 2.0, Bloom's taxonomy, Affective domain, values, attitudes

1. Introduction

Reflection in learning is a pedagogical technique used to promote the higher order cognitive skills of analysis, synthesis, and evaluation that constitute the concept of critical thinking. According to Bloom's taxonomy of educational objectives, it consists of three domains, namely cognitive (*about knowing*), affective (*about attitudes, feelings*) and psychomotor (*about doing*). However, majority of research in this area concentrates on the cognitive aspects and rarely mentions the affective domain. With the Education Bureau in Hong Kong promoting online inquiry based learning in recent years, the effect of such online learning on the development of personal and social values and attitudes remains an unstudied area. With a view to provide a realistic picture of the effectiveness of developing such values and attitudes in current primary school students, this study aims to provide a credible and updated analysis through quantitative and qualitative methods based on a selected group of General Studies students at primary level.

2. Literature Review

According to Anderson & Sosniak (1994), Bloom's Taxonomy is widely cited for education on practical works or researches. In the Hong Kong educational context, a clear alignment of educational objectives with EDB standards is a necessity. Today's teachers must make tough decisions about how to spend their classroom time. Like pieces of a huge puzzle, everything must fit properly. The Bloom's Taxonomy Table clarifies the fit of each lesson plan's purpose, "essential question", goal or objective. In brief, Bloom's Taxonomy is very often integrated into school curriculums, teaching and assessing as it is 'a potential tool for helping practitioners state objectives, build curricula, and construct testing instruments and evaluation.' (NSSE, 1994)

Despite scholars' and educators' intense interest in Bloom's Taxonomy, the cognitive domain and, to a lesser extent, the psychomotor domain, have always been the centre of discussion. 'The cognitive domain was the domain most central to much of the test development work' and 'in which most of the work in curriculum development had taken place' (NSSE, 1994), as it deals primarily with knowledge which is what most teachers are concerned with. Anderson et. al. (2001) also places a significant focus on the cognitive process dimension, concentrating the discussion on knowledge and the subsequent categories and giving very little analysis on the affective and psychomotor domain. However, Anderson et. al. (2001) did agree that the emphasis on cognitive aspects of learning has compromised other aspects, particularly the affective domain aspect.

The affective domain has a hierarchy of five levels: receiving, responding, valuing, organization and characterization as illustrated in Table 1.

Receiving	is willing to notice a particular phenomenon
Responding	makes response, at first with compliance, later willingly and with satisfaction
Valuing	accepts worth of a thing
Organization	organizes values; determines inter-relationships; adapts behaviour to value system
Characterization	generalizes certain values into controlling tendencies; emphasis on internal consistency; later integrates these into a total philosophy of life or world view.

Table 1. The five levels of the affective domain in Bloom's Taxonomy. (Adapted from Krathwohl, 1973)

Inquiry project-based learning (IPjBL), having been indicated to provide students with thought-provoking problem solving opportunities (Thomas, 2000; Chu, 2009), was shown being more effective than traditional learning in a number of researches (Harada & Yoshina, 2004a; Hu, Kuh, & Li 2008). The Education Bureau in Hong Kong defined IPjBL as a student-centred approach that promotes the integration of skills, knowledge, and values in learning, and the students actively build their knowledge base (EDB, 2002).

As Puntambekar (2005) observed, with the increasing focus on project-based and design-based learning, the notion of scaffolding is now increasingly being used to describe the prompts and hints provided in tools to support learning. Scaffolding is now so much more than sole individual interactions between a tutor and a child (Bruner, 1975). Agent Question prompts (Wu and Looi 2012), Paper-and-pencil tools (Puntambekar & Kolodner, 2002), technology resources (Bell & Davis, 1996; Jackson, Krajcik, & Soloway, 1998), peer interactions (Lim and Swe 2004), educational games (Tsai et. al. 2013) or student and teacher questions (Kayi-Aydar 2013) are now all considered as useful elements in effective scaffolding.

Good scaffolding is said to facilitate higher levels of reflection among students (Whipp 2003), and is particularly helpful when online discussions are tailored with general questions from teacher educators and peers. Whipp (2003) elaborated that such supports can encourage a higher level of discussion that can, in turn, act as an additional and important scaffold for higher levels of reflection. Similarly, Davis (1998) explained that proper scaffolds, such as reflection prompts, are prerequisites for students to develop an improved conceptual understanding and an improved ability to think critically. By learning how to engage in reflection, Davis (1998) stressed that students may develop the propensity to continue linking ideas and evaluating views autonomously and even begin to take responsibility for their own learning. Reflection prompts scaffold the process of inquiry.

3. Methodology

Research Questions

This study aims to answer the following research questions:

- 1) How well did reflection prompts help students to scaffold their ideas?
- 2) Could positive values and attitudes be generated by students in the IPjBL?
- 3) Which levels of affective domain are more frequently expressed in the student reflections?

Participants and intervention program

The IPjBL with Wiki was introduced to Primary Five (P5) students from four local primary schools in Hong Kong (*FK*; $n_1=65$, *SP*; $n_2=129$, *HS*; $n_3=87$, *KSW*; $n_4=139$). Google Sites was used for this study. Each school was allocated a different topic in General Studies for their students to work on as a project which covered one year in their academic curriculum. Briefing to teachers on how to provide reflection prompts to scaffold students' reflection based on the five levels of affective domain was delivered before the project started. The students were encouraged to publish and upload their works onto their wikis only accessible to the corresponding school itself. Appropriate skills in information technology (IT) and reporting style were taught at the beginning of the program to ensure that students had the required skills to use the online technology.

Data collection and analysis

The outcomes of the project were assessed by an online survey of which all P5 students were invited to complete. The design of the survey was adapted from Bloom's taxonomy of educational objectives. The survey aimed to evaluate their attitudes and values towards the project in the five levels of affective domain: receiving, responding, valuing, organization, characterization (See Appendix I). Responses from all four schools were analyzed together as a whole.

Focus group interviews were also employed in all four schools to further document the findings. Students were invited to an interview which consisted of five questions in correspondence with the five levels of the affection domain.

Content analysis from the written reflections generated by different groups was collected from their written report in their Wiki sites. The written data are sorted by types of category, which correspond to the five levels of affective domain of Bloom's Taxonomy. These pieces of evidence are combined to obtain an overall picture of all P5 students.

4. Findings and Discussion

The following table provides a summary of the findings in the questionnaire.

Frequencies (Overall)

		Statistics					
		B1	B2	B3	B4	B5	B6
N	Valid	349	355	360	362	362	356
	Missing	39	33	28	26	26	32
Mean		3.14	3.15	3.22	3.28	3.23	3.10
Median		3.00	3.00	3.00	3.00	3.00	3.00
Mode		3	3	3	3	3	3
Std. Deviation		.758	.776	.682	.705	.671	.830

		Statistics			
		B7	B8	B9	B10
N	Valid	363	362	359	341
	Missing	25	26	29	47
Mean		3.09	3.12	3.20	3.15
Median		3.00	3.00	3.00	3.00
Mode		3	3	3	3
Std. Deviation		.826	.753	.764	.772

Table 2: Overall frequencies of data from the student questionnaires

4.1. First level: Receiving

In the questionnaire, the first two questions are about students' willingness to notice a particular phenomenon on receiving level. When asked about the potential increase in student's awareness and interest in the issue after going through the inquiry process (B1 and B2), 78.6-79.4% of the respondents (B1: 28.6% strongly agree, 50% agree; B2: 30.9% strongly agree, 48.5% agree) thought that there was an increase in both. Only 11.6-12.1% of the respondents disagree, while the rest were divided between unanswered and undecided, which was 9.8-8.5% (see Table 3.1).

In the group interview, Student A reported that he had little interest at the beginning, but after doing that project, he wanted to learn more about it. Student B noted that she knew about the topic only after she did the project. Student C said that he was greatly interested in the solar system because he wanted to conduct rocket and space research in the future.

Table 3.1. Student responses to receiving level in affective domain

Response(n=388)	Strongly Agree	Agree	Disagree	Strongly Disagree	Do not Know	Unanswered
Level 1: Receiving (is willing to notice a particular phenomenon)						
B1. I am now more alert to the issue.	28.6%	50.0%	7.2%	4.4%	9.0%	0.8%
B2. I have increased my interest towards the issue.	30.9%	48.5%	7.5%	4.6%	7.0%	1.5%

4.2. Second level: Responding

The third and fourth questions evaluate students' willingness to react to a particular phenomenon on responding level. When asked about the potential increase in student's acceptance and participation in the issue (B3 and B4), 83.5-83.8% of the respondents (B3: 31.7% strongly agree, 51.8% agree; B4: 38.4% strongly agree, 45.4% agree), thought that there was an increase in both after knowing more about the issues. Only 9.6-9.8% of the respondents disagree, while the rest were divided between unanswered and undecided, which was 6.9-6.4% (see Table 3.2).

In the group interview, Student D said that he knew that smoking not only affects one's image but also one's health. Student E reported that after finishing the project, she learnt a lot about the harm of solar storm which was closely related to human.

Table 3.2. Student responses to responding level in affective domain

Response(n=388)	Strongly Agree	Agree	Disagree	Strongly Disagree	Do not Know	Unanswered
Level 2: Responding (makes response, at first with compliance, later willingly and with)						
B3. I am willing to accept the importance of the concepts related to the issue.	31.7%	51.8%	7.5%	2.1%	5.9%	1.0%
B4. I would like to participate in related activities.	38.4%	45.4%	8.0%	1.8%	4.9%	1.5%

4.3. Third level: Valuing

The fifth and sixth questions measure students' understanding and action towards a particular phenomenon on valuing level. When asked about the potential increase in student's worthiness and value of the issue to their life (B5 and B6), 84-74.5% of the respondents (B5: 32.7% strongly agree, 51.3% agree; B6: 31.7% strongly agree, 42.8% agree) thought that there was an increase in both. Only 9.5-17.5% of the respondents disagree, while the rest were divided between unanswered and undecided, which was 6.4-7.9% (see Table 3.3).

In the group interview, Student A reported that they found that alcoholism, smoking and drug abuse, all have very bad impact on human health. People should always keep it in mind not to have those bad habits.

Table 3.3. Student responses to valuing level in affective domain

Response(n=388)	Strongly Agree	Agree	Disagree	Strongly Disagree	Do not Know	Unanswered
Level 3: Valuing (accepts worth of a thing)						
B5. I should treasure more about what we have learnt about the issue.	32.7%	51.3%	8.0%	1.5%	5.4%	1.0%
B6. I feel this study is valuable to my life.	31.7%	42.8%	12.6%	4.9%	6.4%	1.5%

4.4. Forth level: Organization

The seventh and eighth questions assess students' willingness to adapt behavior for a particular phenomenon on organization level. When asked about the potential increase in student's desire to further explore and adapt acceptable behavior in the issue (B7 and B8), 75.8-80.2% of the respondents (B7: 31.7% strongly agree, 44.1% agree; B8: 28.9% strongly agree, 51.3% agree) thought that there was an increase in both. Only 18-13.1% of the respondents disagree, while the rest were divided between unanswered and undecided, which was 6.2-6.7% (see Table 3.4).

In the group interview, Student F said that all planets in the space have different features. He wanted to find out how many planets are suitable for human to live in. Student G noted that after knowing the increasing number of people having the problem of drug abuse, he would stand firmer not to try it or break the law.

Table 3.4. Student responses to organization level in affective domain

Response(n=388)	Strongly Agree	Agree	Disagree	Strongly Disagree	Do not Know	Unanswered
Level 4: Organization (adapts behaviour to value system)						
B7. I have continuing desire to explore more about the issue	31.7%	44.1%	13.1%	4.9%	4.9%	1.3%
B8. After this study, I would form judgement towards the issue.	28.9%	51.3%	9.0%	4.1%	5.7%	1.0%

4.5. Fifth level: Characterization

The last two questionnaires measure students' willingness to generalize values in a particular phenomenon on characterization level. When asked about the potential increase in student's responsibility and proper approach in the issue (B9 and B10), 81.5-75.5% of the respondents (B9: 33.8% strongly agree, 47.7% agree; B10: 29.6% strongly agree, 45.9% agree) thought that there was an increase in both. Only 11.3-12.3% of the respondents disagree, while the rest were divided between unanswered and undecided, which was 7.2-12.1% (see Table 3.5).

In the group interview, Student A asserted that if anyone asks him to have drugs, he would take the chance to tell them not to take drug. Student H expressed that after doing the projects, he learnt how to say no to those who ask him to smoke and he knew how to argue with them and also guide them to the right path. Student D expressed that after doing the project, they not only knew a lot about that topic, but also understood more about each other. It was a valuable opportunity to work collaboratively online.

Table 3.5. Student responses to characterisation level in affective domain

Response(n=388)	Strongly Agree	Agree	Disagree	Strongly Disagree	Do not Know	Unanswered
Level 5: Characterisation (generalises certain values into controlling tendencies)						
B9. I am responsible to apply what I have learnt in daily life.	33.8%	47.7%	7.2%	4.1%	5.7%	1.5%
B10. After this study, my approach or view to this topic would be more realistic.	29.6%	45.9%	8.2%	4.1%	9.5%	2.6%

4.6. Overall Data from student questionnaires

Judging from the means (3.17) of the findings, it is well above the average of 2.5. On average over 80% of the students did strongly agree to each level of the five levels of affective domain learning objectives. This is a reflection of students' responses to questions such as whether they wish to participate in and be aware of social affairs events for the valuing domain, whether they could identify one kind of behavior exercised by a responsible citizen for the organization domain, and whether they would take the initiative in participating in social affairs for the characterization domain.

4.7 Overall findings from focus group interview

Data from interview was collected to get a deeper understanding of students' reflection. Students were invited to an interview which consisted of five questions in correspondence with the five levels of the affection domain. Majority of the students showed a positive value and attitude towards the project experience. For receiving level, students were asked whether they have spotted the effect of smoking, alcoholism and drug abuse on self-development after project. There was widespread relief that 100% students realized the bad effect involved. As to responding level, the question whether the students know more about the topic after project was referred to. It has shown

that majority of the students made it clear that they had knowledge enriched, and they would devote themselves to encourage others to get rid of smoking, alcoholism and drug abuse if they had the opportunities.

4.8 Overall findings from student's websites

The outcome of students' group project has been shown on Google Sites, which facilitate us to understand in depth what kind of content was taking place and what kind of reflection had come out. Most of the groups were actively involved in the project. For example: Group A described the various kinds of cigarettes, alcoholic drink and drug, as well as the reasons why people addicted to them. At the receiving level, Group A realized the bad effect of cigarettes, alcoholic drink and drug. At the responding level, Group A gave their confirmation that their knowledge has increased. At the characterization level, Group A was setting a good example to avoid the bad behavior and would advise people to get rid of smoking and alcoholic habits.

From the overall frequencies of data from the student's wiki content in Table 4, category 5 on characterization with 88% of the respondents had the most responses written on the wiki, whereas category 1, on receiving level and category 4, on organization level, both with 65% of the respondents had the least responses written on the wiki.

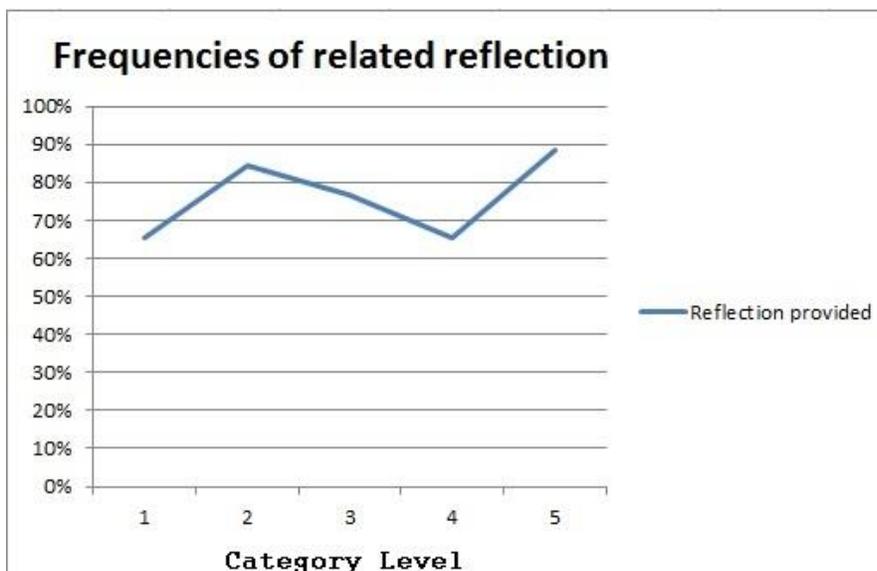


Table 4: Overall frequencies of data from the students' wiki content

5. Conclusion

From the analysis of the responses and content, majority of the students, at all five levels, showed a positive attitude towards various personal and social issues which is indicative of the presence of development of such values and attitudes.

The Bloom's Taxonomy proved to be a good measurement tool that evaluates the quality of students' reflection and collaboration in this project. Various characteristics that are otherwise difficult to evaluate were studied under the scope of the affective domain under Bloom's Taxonomy.

Future research projects may utilize the Blooms Taxonomy when investigating intangible qualities such observation, engagement, assumed responsibility, judgement and approach.

This study demonstrated that the reflection process among students could be significantly enhanced should they be supported by structured scaffolding. Among the many methods of scaffolding, the five levels of the affective domain in Bloom's Taxonomy could assist teachers in planning the scaffolding process for students. In turn, the quality and amount of self-reflection would be substantially enhanced.

IPjBL is also shown to be an effective tool in facilitating learning, motivation and groups interactions. Educators may utilize IPjBL to help students build interest in a learning topic, and therefore encourage students to read, research and investigate new knowledge. This is also a great stimulation for group interactions and discussions. In general, the values and attitudes towards the learning topic would be reinforced.

6. Limitations and Directions for Future Research

While this study provides us insight into the relationship between the affective domain and online inquiry project-based learning, this study is not without limitations. It should be taken into account that most of the information collected are self-reports that inevitably consists of subjective opinions, therefore limiting the accuracy of the research outcome. To enhance the objectiveness of future studies, it is suggested that students' course grades and in-class observation could be included. Teacher evaluations, teacher surveys and interviews would also provide researchers with a second perspective to the study.

Another limitation of this paper is the lack of longitude designs. The survey was only administered at one point in time. Further research could utilize longitudinal designs where students could be assessed about their views on wiki at different points in time. Due to the relatively small scale of this study, only 4 schools were involved in this study. The measurement of the outcome would be more reflective, accurate and representative if bigger scale of a similar study could be conducted in the future.

More future studies are needed to investigate the affective domain in relation to learning. It is hoped that this study serves as an introduction to the research area.

References

- Anderson, Lorin W. & Soniak, Lauren A. (1994). *Bloom's taxonomy: A forty-year retrospective*. Chicago: NSSE.
- Anderson, L. W. and David R. Krathwohl, D. R., et al (Eds.) (2001) *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. Allyn & Bacon. Boston, MA (Pearson Education Group)
- Bell, P., & Davis, E. A. (1996, April 8–14). Designing an activity in the Knowledge Integration Environment. Paper presented at the *Annual Meeting of the American Educational Research Association (AERA)*, New York.
- Bloom, B.S. (1956). *Taxonomy of educational objectives. Handbook I: The cognitive domain*. New York, NY: McKay.
- Bloom, B.S. (Ed.) (1969). *Taxonomy of educational objectives. Handbook II: Affective domain* (2nded.). New York, NY: Longman, McKay.
- Bruner, J. S. (1975). From communication to language: A psychological perspective. *Cognition*, 3, 255–287.
- Chu (2009). JASIST
- Davis, E.A. (1998). *Scaffolding Students' Reflection for Science Learning*.
- Education Bureau. (2001). *Learning to learn – the way forward in curriculum*. Retrieved January 30, 2012, from <http://www.edb.gov.hk/index.aspx?langno=1&nodeID=2877>
- Geoff Isaacs (1996). *Bloom's taxonomy of educational objectives*. Teaching and Educational Development Institute, The University of Queensland.
- Jackson, S., Krajcik, J., & Soloway, E. (1998). The design of guided learner-adaptable scaffolding in interactive learning environments. In Proceedings of the *Conference on Human Factors in Computing Systems* (pp. 187–194). Los Angeles, CA: ACM.
- Krathwohl, D.R., Bloom, B.S., & Masia, B.B. (1973). Taxonomy of Educational Objectives, the Classification of Educational Goal. *Handbook II: Affective domain*. New York, David McKayCo., Inc.
- Lim Cher, P., & Swe, K. (2004). Engaging junior college students in computer-mediated lessons using scaffolding strategies. *Journal Of Educational Media*, 29(2), 97-112. doi:10.1080/1358165042000253276
- Harada, V.H., & Yoshina, J.K. (2004a). Moving from rote to inquiry: Creating learning that counts. *Library Media Connection*, 23, 22-24.

Hu, S., Kuh, G., & Li, S. (2008). The effects of engagement in inquiry-oriented activities on student learning and personal development. *Innovative Higher Education*, 33, 71-81.

Kayi-Aydar, H. (2013). Scaffolding language learning in an academic ESL classroom. *ELT Journal: English Language Teachers Journal*, 67(3), 324-335.

National Society for the Study of Education (1994). *Bloom's Taxonomy- a Forty-year retrospective*. Chicago, US: The University of Chicago Press.

Puntambekar, S., Nagel, K., Hübscher, R., Guzdial, M., & Kolodner, J. L. (1997). *Intragroup and intergroup: An exploration of learning with complementary collaboration tools*. In R. Hall, N.

Miyake, & N. Enyedy (Eds.), *Proceedings of the 2nd International Conference on Computer Support for Collaborative Learning* (pp. 207–215). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Puntambekar, S., & Kolodner, J. L. (2005). Distributed scaffolding: Helping students learn science by design. *Journal of Research in Science Teaching*, 42.

Thomas, J.W. (2000). *A review of research on project-based learning*. San Rafael, CA: Auto desk Foundation.

Tsai, F., Kinzer, C., Hung, K., Chen, C., & Hsu, I. (2013). The importance and use of targeted content knowledge with scaffolding aid in educational simulation games. *Interactive Learning Environments*, 21(2), 116-128. doi:10.1080/10494820.2012.705852

Whipp, J.L. (2003). Scaffolding Critical Reflection in Online Discussions: Helping Prospective Teachers Think Deeply about Field Experiences in Urban Schools. *Journal of Teacher Education*. September 2003 54: 321-333, doi:10.1177/0022487103255010

Longkai, W., & Looi, C. (2012). Agent Prompts: Scaffolding for Productive Reflection in an Intelligent Learning Environment. *Journal Of Educational Technology & Society*, 15(1), 339-353.

Appendix I: Online Survey

Questions

Level 1: *Receiving (Awareness)*

- B1. I am now more alert to the issue. (你對於這題目的注意度比以前要高)
- B2. I have increased my interest towards the issue. (你對所學的事物或概念有更濃厚的興趣)

Level 2: *Responding (React)*

- B3. I am willing to accept the importance of the concepts related to the issue. (你願意接受或認同所學的事物或概念之重要性)
- B4. I would like to participate in related activities. (你願意參與和這題目有關的活動)

Level 3: *Valuing (Understand and Act)*

- B5. I would treasure more about what we have learnt about the issue. (你會更珍惜所學的事物或概念)
- B6. I feel this study is valuable to my life. (這次研習的經驗對我的生活很有價值)

Level 4: *Organization (adapt behaviour)*

- B7. I have continuing desire to explore more about the issue (你會渴望繼續探究這題目)
- B8. After this study, I would form judgement towards the issue. (在這次研習後，令你知道如何作出適當的行為)

Level 5: *Characterization (generalizes values)*

- B9. I am responsible to apply what I have learnt in daily life.(你認為自己有責任將所學的知識應用於日常生活)
 - B10. After this study, my approach or view to this topic would be more realistic. (在這次研習後，你的行為或態度有所改善)
-