Implementation of Problem-Solving Instruction in a Global Education Course and Visualizing Japanese Undergraduate Students' Learning

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Abstract
The world has been globalized at an unprecedented speed in that everything from people to information moves across nations more quickly and intensely than ever before. In order to prepare the young to effectively and responsibly live in such a global society, global education was born in the U.S. in the late 1960s and has developed since then. Global education attempts to develop students' global perspectives consisting of six conceptualizations: perspective consciousness; cross-cultural learning and cross-cultural communication skills; global interdependence; global history; global issues; and participation in a global society. Despite the fact that a number of instructional approaches have been implemented, few have focused on a problem-solving process by applying all the conceptualizations. In order to fill this gap, the study aimed at designing and implementing a course to help Japanese undergraduate students to learn about global issues and how to solve the issues; and attempting to visualize their learning. The data were collected from a course, in which the author taught global education to 12 Japanese undergraduate students from April to July in 2016. The data such as teaching materials, students' academic work, and their reflective notes were analyzed to visualize how they acquired and utilized the conceptualizations. The results showed that the course provided the students with opportunities to develop all the six conceptualizations in global perspectives as it was planned and that visualizing the data was helpful to identify an overall picture of the students' learning.

Keywords: Global Education, Problem-Solving Instruction, Visualization

Introduction

The world has been globalized at an unprecedented speed in that everything from people to information moves across nations more quickly and intensely than ever before. Such global mobility has promoted interconnectedness of events, organizations, and people around the world politically, economically, culturally, ecologically, and technologically (Anderson, 1979). Also, various types of issues or problems such as global warming, overpopulation, and terrorism have become more obvious and serious (Abdullahi, 2010). In order to prepare the young to effectively and responsibly live in such a global society, global education was born in the U.S. in the late 1960s and has developed since then. Global education attempts to achieve this goal by developing students' global perspectives. Although different scholars and educators suggest different elements as components of global perspectives, the six conceptualizations: perspective consciousness; cross-cultural learning and cross-cultural communication skills; global interdependence; global history; global issues; and participation in a global society are the most common (Kasai, 2009). Each definition of the six conceptualizations is as follows:

1. Perspective Consciousness – The recognition that every individual has a perspective that is not universally shared, while the perspective can be continuously formed and reformed by influences over time (Hanvey, 1976).
2. Cross-cultural Learning and Cross-cultural Communication Skills – Knowledge about one's own culture and other cultures, and skills in effectively interacting with people from diverse cultures and countries (Merryfield & Subedi, 2001).
3. Global Interdependence – Interconnectedness of people, events, and issues linked to one another, and the ways in which they affect and are affected by other people, events, and issues (Pike & Selby, 1988).
4. Global History – A history that is interconnected across the world and it may also consist of interrelated regional histories (Anderson, 1979).
5. Global Issues – Persistent worldwide problems that cannot be solved by one nation alone (Alger & Harf, 1986). Global issues include human rights, pollution, poverty, ethnic conflicts, and population problems.
6. Participation in a Global Society – People's actions on a local scale to solve or ease global issues that they learn about (Alger, 1985).

Global education was introduced in the 1970s in Japan and has mainly been practiced in English and social studies courses since then (Ishimori, 2015). Currently it seems to be paid more attention in the education field than before due to the following two events. The first event was that the Global Human Resource Development Committee of the Industry-Academia Partnership for Human Resource Development (2011, June 22) suggested that higher education institutions should educate the young to become *gurobaru jinzai* (global human resources). The second one was that the Ministry of Education, Culture, Sports, Science and Technology (2015, October) strongly recommended higher education institutions to implement instruction enhancing students' active learning. The common goal of instruction for both purposes is to develop one's abilities to solve problems[1]. In this sense, global education can play a major role of achieving this goal. Thus, it is necessary to design a global education course for the purpose of developing students' problem-solving abilities.

Despite the fact that a number of instructional approaches have been implemented, few have focused on a problem-solving process by applying all the aforementioned conceptualizations in global perspectives. In order to fill this gap, the study has conducted to design and implement a course to help Japanese undergraduate students to learn about global issues and how to solve the issues; and attempted to visualize their learning. The data were collected from a 4-credit course (hereinafter called "the Course"), in which the author taught global education to 12 Japanese undergraduate students from April to July in 2016. The 30 lesson plans (90 minutes per lesson) of the Course (See Table 1.) included the contents of all the six conceptualizations in the following order: perspective consciousness, cross-cultural learning and cross-cultural communication skills, global interdependence, global history, global issues, and participation in a global society. The rationales for this instructional framework (See Figure 1) are that the first four conceptualizations overlap in terms of the learning contents and that they are also considered as prerequisite elements to learn about global issues and solutions to the issues. In short, perspective consciousness and cross-cultural learning and communication skills enable students to collect information about global issues from multiple sources including people and to critically analyze it, while global interdependence and global history help them to understand global issues as systems, in which all the issues are interconnected across time and space.

Lessons	Topics
Lessons 1-3	Introduction to Global Education
Lessons 4-7	Seeing the World from Multiple Perspectives (Perspective Consciousness)
Lessons 8-13	Cross-cultural Learning and Experiences (Cross-cultural Learning and Communication Skills)
Lessons 14-17	Global Interconnectedness across Space and Time (Global Interdependence & Global History)
Lessons 18-23	Global Issues (Global Issues)
Lessons 24-27	Think Globally Act Locally (Participation in a Global Society)
Lessons 28-30	Group Presentations

Table 1: 30 Lesson Plans of the Course

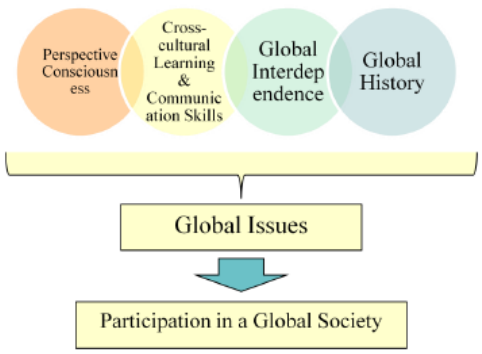


Figure 1: Instructional Framework for the Course

The data such as teaching materials as well as students' academic work were collected and coded based on the definitions of the conceptualizations in global perspectives with two types of qualitative data analysis software called NVivo 11 and KH coder[2].

Conclusion

At first, the effects of the Course on students' acquisition of the six conceptualizations in global perspectives were investigated. The reflective notes, in which students wrote about their learning, thoughts, or suggestions at the end of each lesson, were sorted out into the 27 learning activities and the activities were organized in a chronological order (from Lesson 2 to Lesson 30). Then, they were manually coded. The result (see Appendix 1) was illustrated in a 100 % stacked bar chart (Figure 2) and a contour graph (Figure 3). The 100 % stacked bar chart showed that students were able to learn all the six conceptualizations in global perspectives throughout the Course, while the contour graph demonstrated that they tended to learn the conceptualizations as the Course was planned.

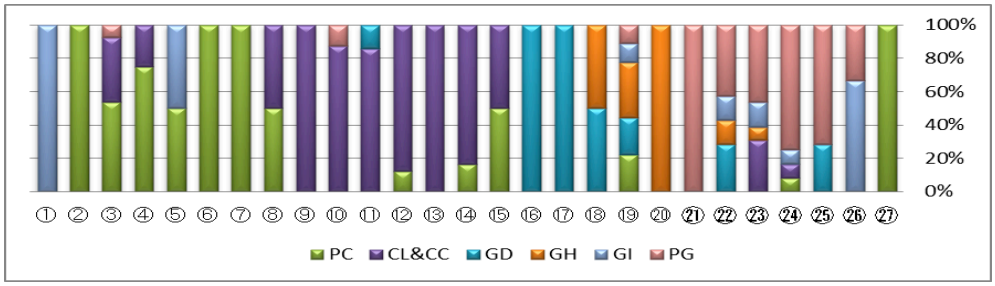


Figure 2: 100 % Stacked Bar Chart

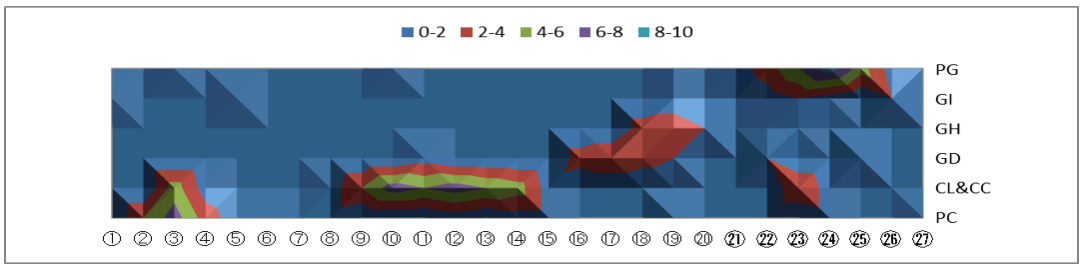


Figure 3: Contour Graph

In order to reconfirm the manually coded result above, the same data were automatically analyzed based on the coding rule[3]. The result was shown in a bubble plot chart (Figure 4). Both the contour graph (Figure 3) and the bubble plot chart (Figure 4) tended to show a similar tendency in terms of students' acquisition of the conceptualizations.

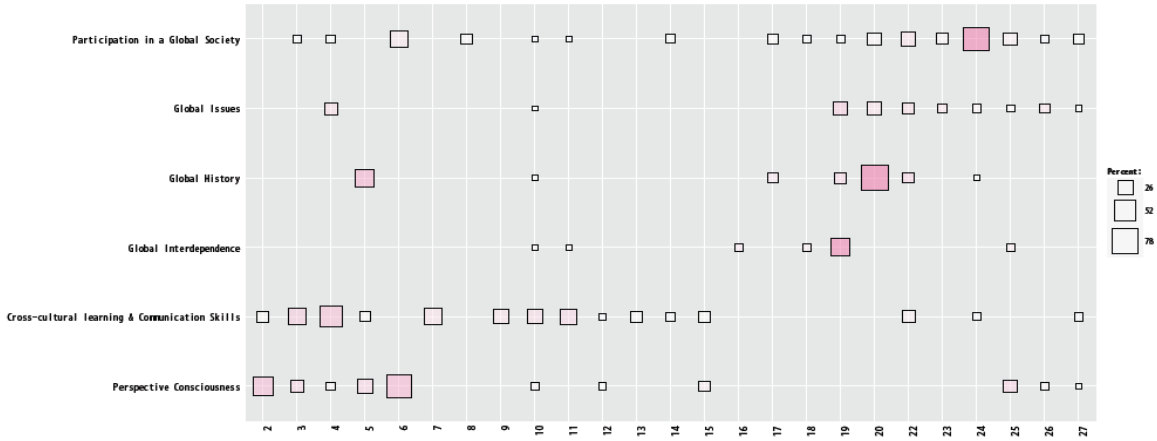
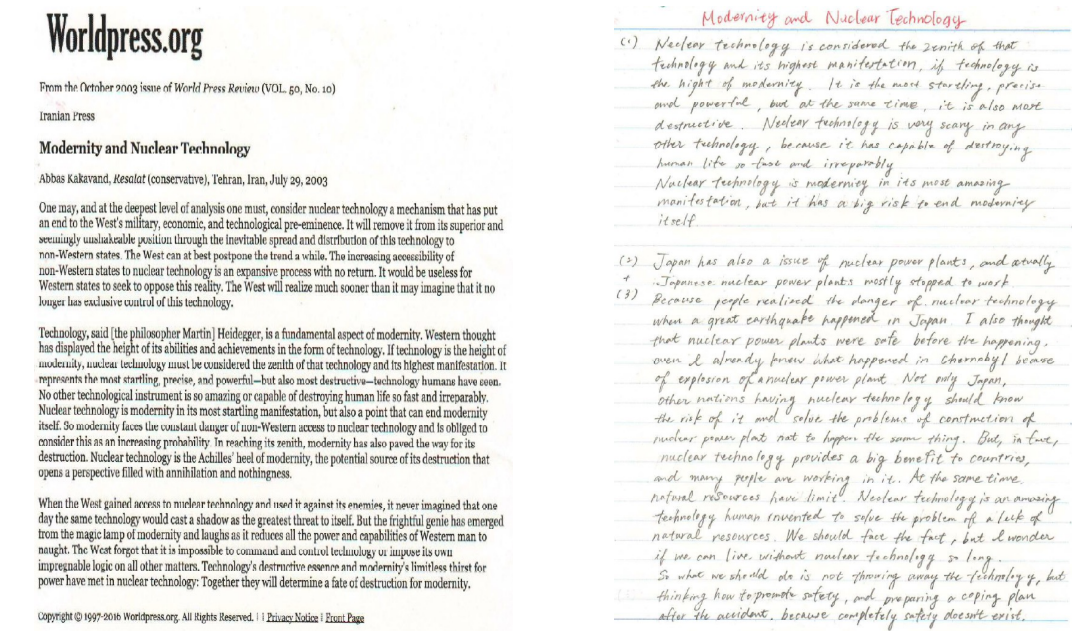


Figure 4. Bubble Plot Chart

When it comes to problem-solving instruction, four relevant learning activities were implemented in the Course: a scrap book journal assignment, a webbing activity, instruction on three alternative futures, and individual presentations. Scrap book journal assignment made the students find and read five English news articles about the global issues that they were interested in and write article summaries, self-reflections, and, if any, solutions suggested in the articles. The texts in the scrap book journals made it possible to identify how much they understood about the articles and what they learned about the global issues. The global issues that they selected were child labor, endangered species, gender issues, nuclear issues, refugees, population issues, poverty, technology issues, and terrorism. For example, student H chose nuclear issues and wrote scrap book journals based on the five relevant articles that she selected. Figure 4 below are an example article and its scrapbook journal. The article (http://worldpress.org/Mideast/1511.cfm) was written by Abbas Kakavand in 2003 and discussed that nuclear technology had been playing a major role of promoting modernity in western states; however, it would have a great potential for destroying the modernity. It was worth noting that in the self-reflection part of her journal she related the contents of this article to Japanese context by acknowledging that although Japanese people have enriched their lives with nuclear power, they have become more aware of its risk and danger since 2011, when there was a nuclear accident in the *Fukushima Daiichi* nuclear power plant and by concluding that we should think about how to promote its safety. At the same time; however, contrary to the instruction on this journal assignment she seemed to misunderstand what to write in a solution section and argue her own solutions to this issue.



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Iranian Press

Modernity and Nuclear Technology

Abbas Kakavand, *Kesalat* (conservative), Tehran, Iran, July 29, 2003

One may, and at the deepest level of analysis one must, consider nuclear technology a mechanism that has put an end to the West's military, economic, and technological pre-eminence. It will remove it from its superior and seemingly unshakeable position through the inevitable spread and distribution of this technology to non-Western states. The West can at best postpone the trend a while. The increasing accessibility of non-Western states to nuclear technology is an expansive process with no return. It would be useless for Western states to seek to oppose this reality. The West will realize much sooner than it may imagine that it no longer has exclusive control of this technology.

Technology, said [the philosopher Martin] Heidegger, is a fundamental aspect of modernity. Western thought has displayed the height of its abilities and achievements in the form of technology. If technology is the height of modernity, nuclear technology must be considered the zenith of that technology and its highest manifestation. It represents the most startling, precise, and powerful—but also most destructive—technology humans have seen. No other technological instrument is so amazing or capable of destroying human life so fast and irreparably. Nuclear technology is modernity in its most startling manifestation, but also a point that can end modernity itself. So modernity faces the constant danger of non-Western access to nuclear technology and is obliged to consider this as an increasing probability. In reaching its zenith, modernity has also paved the way for its destruction. Nuclear technology is the Achilles' heel of modernity, the potential source of its destruction that opens a perspective filled with annihilation and nothingness.

When the West gained access to nuclear technology and used it against its enemies, it never imagined that one day the same technology would cast a shadow as the greatest threat to itself. But the frightful genie has emerged from the magic lamp of modernity and laughs as it reduces all the power and capabilities of Western man to naught. The West forgot that it is impossible to command and control technology or impose its own impregnable logic on all other matters. Technology's destructive essence and modernity's limitless thirst for power have met in nuclear technology: Together they will determine a fate of destruction for modernity.

Modernity and Nuclear Technology

(1) Nuclear technology is considered the zenith of that technology and its highest manifestation, if technology is the hight of modernity. It is the most startling, precise and powerful, but at the same time, it is also more destructive. Nuclear technology is very scary in any other technology, because it has capable of destroying human life so fast and irreparably. Nuclear technology is modernity in its most amazing manifestation, but it has a big risk to end modernity itself.

(2) Japan has also a issue of nuclear power plants, and actually + Japanese nuclear power plants mostly stopped to work
(3) Because people realized the danger of nuclear technology when a great earthquake happened in Japan. I also thought that nuclear power plants were safe before the happening. even I already know what happened in Chernobyl beause of explosion of a nuclear power plant. Not only Japan, other nations having nuclear technology should know the risk of it and solve the problems of construction of nuclear power plat not to happen the same thing. But, in fact, nuclear technology provides a big benefit to countries, and many people are working in it. At the same time natural resources have limit. Nuclear technology is an amazing technology human invented to solve the problem of a lack of natural resources. We should face the fact, but I wonder if we can live without nuclear technology so long.
So what we should do is not throwing away the technology, but thinking how to promote safety, and preparing a coping plan after the accident. because completely safety doesn't exist.

Figure 4: Student H's Chosen Article (left) and Its Scrap Book Journal (right)

Next, students made illustrations on causes and effects of global issues, which looked like a spider's web in a webbing activity. After that, the three alternative futures: preferable future, probable future, and possible future (Pike & Selby, 1988) were instructed and the students, then, drew diagrams on historical backgrounds of the manageable problems that they picked up from global issues. The students' webbing illustrations and diagrams with the three alternative futures visually showed their learning about global issues as systems interconnected across time and space. For instance, student H created a web illustration and a future diagram regarding nuclear issues (See Figure 5). In her web illustration she showed that possession of nuclear power would cause some issues such as nuclear disaster, conflicts with nuclear weapons, radiation sickness, desertification, and deforestation, while she presented the past, the present, and the futures of nuclear power plants in her future diagram. In spite of her excellent work, the problem under nuclear issues (an increasing number of nations possessing nuclear power) seemed to be beyond her control.

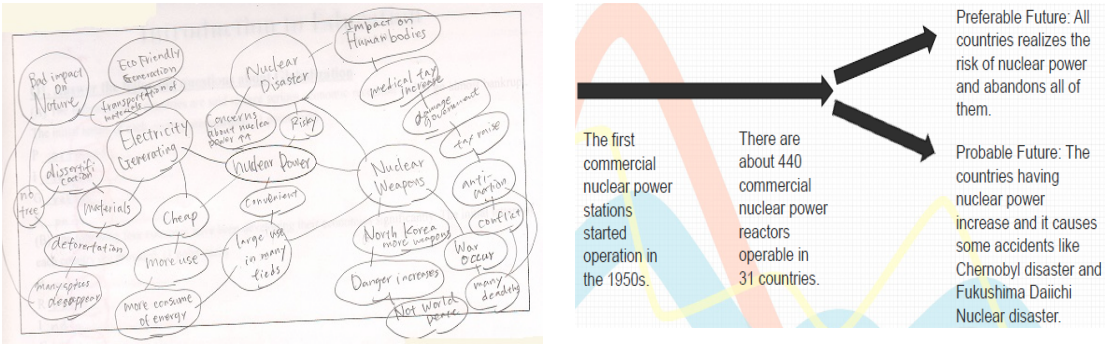

Figure 5: Student H's Web Illustration (left) and Future Diagram (right)

By utilizing what they learned from the previous three activities, they gave presentations about the global issues including solutions to the issues. The texts in their PowerPoint slides for individual presentations were analyzed to identify features of their solutions. The frequencies of the nouns as possible actors and the verbs as possible actions were analyzed and the 10 most frequently appeared nouns (See Table

2) and verbs (See Table 3) were found. These results were illustrated in word clouds (See Figure 6 and Figure 7). In the word clouds, the more frequently the words appeared, the bigger they were presented in size.

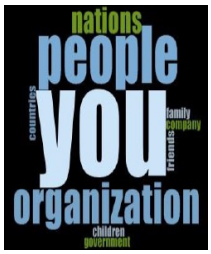

Figure 6: Word Cloud of 10 Most Frequently Appeared Nouns

Table 2: Frequencies of 10 Nouns

Verb	Frequency	Verb	Frequency
you	7	company	1
people	4	countries	1
organization	3	family	1
nations	1	friends	1
children	1	government	1

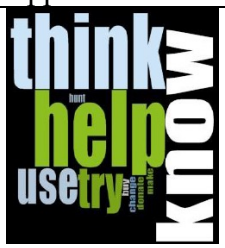

Figure 7: Word Cloud of 10 Most Frequently Appeared Verbs

Table 3: Frequencies of 10 Verbs

Verb	Frequency	Verb	Frequency
help	4	buy	2
know	4	change	2
think	4	donate	2
try	3	hunt	2
use	3	make	2

The results of the frequencies showed that the solutions that the students presented seemed too much dependent upon others and ambiguous, which was congruent with the finding in the student H's future diagram above. To reconfirm this finding, the contents of the solution sections of their PowerPoint slides were manually examined. As a result, this finding was supported by students' solution statements such as "Many people should know the existence of child labor" "Participate in activities to help the developing countries," and "Let your friends or family know about the situation of poverty" to name a few.

In conclusion, the problem-solving instructional framework in the Course seemed to encourage the students to develop all the conceptualizations in global perspectives. In addition, it was possible to visualize the students' learning and the visualization was helpful to identify an overall picture of the students' learning in the Course. Then, one of the findings regarding their learning was that they had a difficulty in finding manageable problems and feasible solutions. Therefore, it is necessary to conduct a future research to find effective instructional approaches to help students to find out such problems and solutions. Furthermore, comparing the illustrations or diagrams visualized based on the same data in different analytic approaches (e.g., manual coding vs. automatic coding) was highly likely to enhance the trustworthiness of the research findings through triangulation. However, the study was limited in that the data were collected only from the Course taught in academic year 2016. Thus, further research for the same purpose needs to be conducted across academic years.

Acknowledgement

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Footnote

1. Global Human Resource Development Committee of the Industry-Academia Partnership for Human Resource Development suggested "willingness to find and solve problems" as one of the factors as global human resources (2011, June 22, p. 9), while Ministry of Education, Culture, Sports, Science and Technology defined that active learning "nurtures students' abilities to solve problems subjectively by cooperating with various people" (2015, October, p. 12).
2. NVivo 11 and KH are produced by QSR International Pty Ltd. (http://www.qsrinternational.com/) and Koichi Huguchi, associate professor of Social Sciences at Ritsumeikan University, Kyoto, Japan (http://khc.sourceforge.net/en/).
3. The coding rule was set up as follows.

Conceptualizations	Coding Words
PC	perspective | view | critical | power | multiple
CC	diverse | stereotype | prejudice | communicate | miscommunication | opinion | debate | discrimination | discuss
GD	connect | link | depend | rely | web
GH	future | cause | effect | result | consequence
GI	problem | issue | peace
PG	action | solve | change | participate | sort | cooperate

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Appendix 1. Frequency of Manually-Coded Conceptualizations in Learning Activities

No.	Learning Activities	PC	CL&CC	GD	GH	GI	PG
①	"A Village of 100 People" Activity					1	
②	“World Maps” Activity	4					
③	“What do I Value?” Activity	7	5				1
④	Debate	3	1				
⑤	Movie "Dreams"	1				1	
⑥	A Video “The Monkey Business Illusion”	1					
⑦	“Best World or Worst World” Activity	1					
⑧	A Video “Human Planet”	1	1				
⑨	A Video “Arthur in Africa”		4				
⑩	A Video “Eyes of Storm” (Jane Elliot)		7				1
⑪	“Our World” Book Activity		6	1			
⑫	“Multi-cultural Cinderella” Activity	1	7				
⑬	Silent Puzzling Game		6				
⑭	"Barnga" Card Game	1	5				
⑮	A Video “But We’re Speaking Japanese!”	1	1				
⑯	“My Glocal Connection” Activity			3			
⑰	“The World in Your Possessions” Activity			4			
⑱	"Products Made from Oil" Activity			3	3		
⑲	“Webbing” Activity	2		2	3	1	1
⑳	Lecture “Three Alternative Futures”				2		
㉑	A Video “Interview with Hibakusha”						1
㉒	A Video “Malala’s Speech”			2	1	1	3
㉓	Trading Game		4		1	2	6
㉔	“Sort Out” Activity	1	1			1	9
㉕	A Video “Ice Bucket Challenge”			2			5
㉖	Global Issues Presentation					2	1
㉗	Group Teaching Project	1					

PC=Perspective Consciousness, CL&CC= Cross-cultural Learning and Cross-cultural Communication Skills, GD=Global Interdependence, GH=Global History, GI=Global Issues, PG=Participation in a Global Society