

Action Research on Disaster Reduction Education: Building a “Community of Practice” through a Gaming Approach

Katsuya YAMORI*

*Disaster Prevention Research Institute, Kyoto University, Japan

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ABSTRACT

This paper reports a research study on disaster reduction education, at both a senior high school and in a local community in Japan. The research was guided mainly by the theory of “community of practice (CoP)” proposed by Lave and Wenger (1991). This theory provided a useful framework by which we achieved long-term and collaborative learning in disaster education, to deal with natural disasters with a long return period. A gaming approach was introduced in this year-long action research project, as a key medium to realize long-term and cogenerative learning by diverse stakeholders, ranging from high school students, local residents, local government workers, and disaster experts. This gaming approach covered the whole process, from co-planning, co-production, and co-dissemination of game-like education materials. The results suggested the clear superiority of cogenerative disaster education (along with a transformation of CoP structure) over conventional, knowledge internalization-oriented disaster education.

Keyword: disaster education, action research, community of practice, gaming, collaborative learning

1. Research Background

This paper reports an action research study on disaster reduction education in a local community in Japan. The research is guided mainly by the “community of practice (CoP)” theory proposed by Lave and Wenger (1991). This theory provides a useful framework by which we can achieve long-term, collaborative learning in disaster education, to deal with natural disasters with a long recurrence period of over 100 years. I begin this background section by summarizing the CoP theory. Next, I describe some of the disaster education issues Japanese society is now facing, and explain why the CoP theory is considered helpful as one approach to tackling these issues. Finally, I outline the potential of the gaming approach,

which is introduced in this study as the key medium to realize long-term and collaborative learning in a CoP.

1.1 The theory of “Community of Practice”

Lave & Wenger (1991) strongly reject the conventional view of learning processes, criticizing this view for its primary focus on learners’ internalization of knowledge or skill. The view depends mostly on a conventional teacher-learner framework, in which unilateral knowledge/skill transfer from the teacher side to the learner side is assumed. It is important to note that this assumption stays the same in this framework even if learners’ more positive participation in the learning process is considered important (Saeki, 1995; Wenger 1999).

Instead, they argue that learning should be characterized as a mixture of three components. The first component is learners' "internalization" of knowledge or skill. The second component is the formation and maintenance of a "community of practice (CoP)" that includes those who teach and learn. The third component is the "identity (re-)building" of those who become involved in the CoP. Learning is defined not only by the first conventional component, but also by integration and dynamic development across these three components.

The first component, "internalization," has been regarded as the major component of the learning process. However, this view is extremely narrow. This view assumes that a static knowledge store exists within teachers, and that one-way transfer of knowledge takes place between teachers and learners. This view of learning has been very dominant across various research fields. Disaster education is no exception. For example, when a schoolteacher gives a lecture on the concept of earthquake magnitude, or when local people learn how to use a fire extinguisher during a disaster drill, internalization is of central interest, even when they learn it in a participatory manner. Neither Lave & Wenger (1991) nor the present author neglects this component. However, different aspects of learning can be more important, particularly when we consider disaster education from a much broader and longer perspective.

The concept of the CoP is a major element in the theory of situated learning proposed by Lave & Wenger (1991). They propose that it is not sufficient to focus on one-way, temporary transfer of knowledge or skill. Forming and sustaining a CoP can count for more in the long run. Both those who teach "provisionally" and those who learn "provisionally" participate in the CoP. The community allows participants to engage in bilateral, or even multilateral, long-term mutual learning. The idea of the CoP closely parallels the cogenerative learning model proposed by Greenwood and Levin (2007). These researchers underscore the cogenerative construction of learning arenas, where outside experts and local stakeholders can co-generate knowledge. Greenwood and Levin (2007) emphasize the importance of a communicative learning platform for joint knowledge building rather than simple knowledge transfer, as is the case in the CoP.

When we apply these ideas to disaster education,

we can say that it is more important to create a CoP where all relevant stakeholders (disaster researchers, local government officials, and local residents) can participate in collaborative and cogenerative learning. Some of the recently developed participatory disaster education procedures, such as PAFRICS (Participatory Flood Risk Communication Support System) (Takeuchi & Suzuki, 2007), the Yonmenkaigi Workshop Method (Na, Okada, and Fang, 2009), a comprehensive disaster education curriculum developed at Maiko High School in Japan (Shiwaku & Shaw, 2008), and Crossroad: Kobe Gaming (Yamori, 2007), focus on this type of cogenerative learning.

Finally, Lave and Wenger (1991) emphasize that learning not only improves a person's intelligence or technical abilities, but also reshapes his/her whole identity. Flexible alterations and frequent role changes in a CoP are typical examples of identity reshaping. The word "provisionally" that I used above implies such identity reshuffling. Those who taught yesterday could be those who learn today, and vice versa. The cogenerative learning model supports a similar way of thinking. Greenwood and Levin (2007) argue that laypeople's more practical reasoning approach and experts' scientifically constructed knowledge should encounter each other cogeneratively. In cogenerative learning, neither local people nor professionals are in a superior and privileged position. Neither side should be locked into a particular status (i.e., local people in the position of learners and professionals in the position of teachers). Rather, both groups should be co-learners and co-teachers at the same time. Their relationship should be dialectical rather than unilateral, in order to create both new local knowledge and new scientific understanding. The distinction between teachers and learners may become quite blurred over the course of what is usually a lengthy, collaborative relationship in a CoP (Reason & Bradbury, 2006).

These arguments apply in the case of disaster education, as well. For example, disaster experts, who normally take the role of teacher or supervisor, sometimes need to learn much about local knowledge, specific conditions of local hazards, or local disaster lessons handed down from earlier generations, in order to make local disaster management more effective. In the same manner, local residents should not be completely content with the conventional identity of the passive learner. For example, local residents should

contribute to the further dissemination of what they have learned from experts, down to a wider range of local people. Local disaster education is neither solely an outside expert's issue nor solely a local people's one, but should be a joint focus of attention that is co-examined by the various parties involved in a CoP.

1.2 Current Issues of Disaster Education in Japan

I will raise two current social issues that pertain to disaster education in Japan. It is important to note that these two issues are closely linked to the three components of the learning process that I discussed above.

The first issue is the remarkable shift that we find in the risk sense of Japanese people. Yamori (2007) shows that the concept of "risk" was virtually nonexistent until the late 1980s in Japan. Although the concept was imported from overseas as early as the 1960s, it remained almost unknown to the general public. It enjoyed limited usage in the finance and management professions. Since the late 1980s, however, the term has been gradually integrated into the common way of thinking among Japanese people. The term "disaster risk" also appeared in public discourses during this period.

It is also important to note that the basic attitude toward disaster risks changed drastically before and after the Great Hanshin-Awaji Earthquake in 1995. This earthquake was one of the most devastating in modern Japanese history, killing more than 6,400 people. Yamori (2007) describes the change in terms of a shift from the first mode to the second mode of risk sense. The first mode, pre-earthquake, was a passive one in which risk was treated in much the same way as the concept of "danger" in Luhmann's (1991) terminology. "Danger" is regarded as existing "out there," independent of human actions. Thus, dangers should be identified and managed exclusively through natural scientific efforts by disaster experts. People are not in an active position to deal with the risk, but are just expected to wait for the results of experts' risk assessments and risk control strategies. From this understanding, one-way communication from experts to laypeople is often considered enough. When experts provide data on risk to the public, the latter are not in a positive position to commit themselves to risk communication; they simply receive risk data passively as they are given and follow the instructions and sugges-

tions of the disaster experts.

After the earthquake in 1995, the second mode emerged, reflecting the lessons people learned from the earthquake. In this case, expert prediction was not correct. The earthquake hit an unpredicted region rather than the predicted and thus better-prepared regions. Citizens' trust in engineering-centered disaster mitigation was also greatly shaken when a number of large-scale engineered structures tragically collapsed. Although expert performance was disappointing, local residents were eagerly committed to helping each other within local communities. For the first time in Japanese history, voluntary and mutual assistance was so widespread and so successful that the year 1995 is often referred to as "The Year of the Renaissance of Voluntarism."

As a result of the 1995 earthquake, more people recognized the desperate need for active and participatory disaster risk management, and the significant distinction between "risk" and "danger" became apparent (Luhmann, 1991). "Risk" is what should be handled jointly by many stakeholders and is something that can be managed proactively, while "danger" is just "out there," waiting to be identified objectively. Thus, in the second mode of risk sense, a deeper commitment by citizens to risk assessment, evaluation, and management is highly emphasized. At this stage, public release of risk information is not sufficient, although it is still necessary as a part of the whole risk management process. This type of risk understanding emphasizes collaborative risk assessment and joint risk management requiring the participation of a more diverse set of stakeholders, including not only specialists but also local citizens.

It is obvious that what has been discussed so far is closely linked to the CoP theory and the cogenerative model of learning. The first risk sense goes very well with the first component of learning, "internalization," since it focuses on a one-way risk information flow from experts to citizens. In contrast, the second risk sense requires the second and third components of learning. For the second risk sense to develop, various stakeholders should participate in a CoP as equal risk-sharing partners. Their role identities in a CoP should not be fixed in any conventional sense but should be flexible, so that collaborative learning can continue for a longer period.

The second disaster education issue facing Japan

is how to keep the desirable results of education for a longer period. Japan must learn to deal with those disasters that have a long return period. It is true that Japan is now facing more frequent natural disaster threats that require preparation over a quicker time frame, such as floods and landslides; however, we also face threats that should be dealt with from a longer time perspective, such as trough-type earthquakes and tsunamis. These types of disaster have a very long recurrence time, much longer than their individual life span. It is clear that individual-oriented education is not so workable for this type of disaster. The valuable life lessons provided by disaster experts or by those who experienced the disasters may not span the long periods of stability between catastrophes, if we lack effective means and media to communicate those lessons beyond their original domain to the next generation.

As indicated by the CoP theory, building a community-based learning system is more significant than simply promoting knowledge internalization within each individual. Creating a lasting CoP is absolutely vital, whereas conducting short-term and unidirectional learning is not sufficient. For this reason, flexible and quick role identity change from learner to teacher and vice versa (role (re-)shaping) is a key to success. Role (re-)shaping guarantees long-term and cascading transfer of lessons from generation to generation and/or from community to community, when a CoP expands beyond the boundary of age groups and/or beyond local communities.

1.3 The Gaming Approach

The term “gaming” is used differently from the term “game” in this paper. Gaming is a more comprehensive and more dynamic concept than game. Gaming refers not only to the material tools used in a game, such as game boards and cards, game settings, rules, and procedures. The concept of gaming also encompasses the interactive actions among game participants and those between game participants and facilitators during a game session, participants’ retrospective after-talk about a game, and planning/creating by game producers. It is particularly important to note that planning and creating games is one of the critical components of the whole gaming process. When gaming is defined in this manner, we can claim that a gaming approach could help us to re-think di-

saster education in Japan from the viewpoint of CoP theory, for the following three reasons.

The first reason is the “multilogue” nature of gaming. As Duke (1974) stressed, gaming is a very effective context for realizing what he refers to as “multilogue,” a variety of interpersonal interactions (such as persuasion and negotiation) that occur quite naturally among game players. Thus, a game setting affords the opportunity to air multiple perspectives among participants. This aspect of gaming also expands to its production processes. If game creators wish to produce an impactful game that a wide range of stakeholders would consider worth playing, they must take into account rather broad perspectives and attitudes on the topic around which they want to create the game. “Multilogue” attention and consideration is required not only when a game is played but also when it is produced. Otherwise, a game would be single sided, monotonous, and boring.

Thus, gaming matches quite well our emphasis on the shift from a unilateral knowledge transfer paradigm to a cogenerative learning paradigm. It is true that gaming is sometimes used as a knowledge transfer medium through which learners’ internalization is promoted. However, it is not productive to limit gaming use to such a narrow context. Gaming shows more potential to consider different perspectives on the problem at hand than do many other types of media, such as mathematical language or computer simulation models. The “multilogue” nature of gaming is very helpful when we try to create disaster risk-sharing partnerships among a wider variety of stakeholders in a CoP.

Secondly, gaming is characterized by Duke (1974) as “the future’s language.” Game producers (as well as game players) can co-construct their future reality by co-producing and co-playing a game. Gaming is not merely a reflection of the pre-established world view of a particular person (an acknowledged authority, for example), but is rather a communication medium through which a feasible new social reality, and hopefully a solution to an immediate social issue, is co-examined and co-cogenerated. In other words, gaming has a reality-generative function as well as a reality-descriptive one. When we look at gaming from this holistic point of view, we can conclude that gaming can lead people to engage naturally in reality-co-constructing activities. Gaming is not a medium for

objective observation and evaluation for outsiders, but a medium for collaborative practice for insiders.

This aspect of gaming is also parallel to our understanding of the second mode of risk sense. Every stakeholder needs to be an inside risk partner who is expected to share equal responsibility when handling disaster risks. Nobody can just wait passively for the results of a risk assessment from outside experts. The future reality of risks does not come by simply following neutral predictions of natural phenomena made by outside risk experts, but rather, disaster risk should be co-constructed and co-handled by inside stakeholders in a CoP.

Finally, gaming is characterized by its visible and tangible nature. As I mentioned above, gaming is not composed of material tools alone. It is also important to recognize that gaming is not just a vehicle of abstract knowledge and ideas stored in the human mind but is normally by itself a concrete body of materials. Gaming contains concrete and solid material entities, before it functions as a medium for conveying something abstract and conceptual. This material feature is likely to direct our attention towards how we externalize knowledge rather than towards how we internalize it. This is especially the case in the production stage of gaming, since game creators have to make every effort to convert conceptual knowledge stored in human minds into more concrete game materials. This is entirely consistent with our anti-“internalization” understanding of learning.

Physical game materials contribute greatly to the achievement of our goal in another way. Since game materials are physical products rather than mental entities, they could potentially help disaster education efforts to survive for even longer than they would when we rely only on knowledge transfer on a person-to-person basis. Knowledge preserved within human minds could be miscommunicated and misunderstood unknowingly, and such knowledge could even be entirely lost with the death of the knowledge holder. However, material products could be preserved more easily and could be handed down more securely from generation to generation for a longer period with some intentional and careful modification as needed. This characteristic provides us with a great advantage when we must deal with natural disasters from a longer-term perspective.

2. Action Research

2.1 Topic and Participants

The argument presented above suggests that disaster education via going through a whole sequence of gaming is one promising way to deal with current disaster education issues in Japan. It was also suggested that creating a long-lasting CoP that includes diverse stakeholders is vital and that gaming could be a key medium for this purpose. With these basic ideas in mind, I conducted an action research study in which local citizens, local government workers, disaster relief NGO members, and disaster experts (including the present author) all became jointly involved.

The concrete topic that the author chose for this research was what emergency goods should be stored at home. There are two major reasons for this choice of topic. First, public awareness is now gradually growing toward what we in Japan call an “emergency kit.” This kit takes the form of a portable bag, generally a backpack, which contains some basic supplies for an emergency. It is strongly recommended that an emergency kit be prepared at home, given that Japan has been hit by natural disasters quite frequently since the mid 1990s. Emergency kit preparation is considered to be a basic first step towards disaster preparedness even for those who have done nothing so far. Hashimoto High School and Hashimoto City (with a population of around 50,000) in Wakayama Prefecture has a relatively lower level of disaster risk when compared with some other regions in Wakayama Prefecture, which are predicted to suffer severe damage from a large-scale earthquake or tsunami when the Tonankai and Nankai Earthquakes are predicted to occur in the early twenty-first century (Mie Prefecture Emergency Management Department, 2006). In this sense, emergency kit preparation is a good fit for a primary startup target in this project, which was conducted in the Hashimoto region.

Secondly, the Hashimoto region is at high risk of isolation from nearby regions should a major disaster occur because the region is located in a mountainous area and does not have many access roads. A landslide caused by an earthquake or by heavy rainfall might cut off the region from neighboring communities. This region could therefore be facing a difficult situation, despite predictions that the region is unlikely to be hit badly. If isolation does happen, the region must

survive on its own for several days without any aid from the outside. Intensive aid directed towards more severely hit areas might leave this region even more isolated. This is another reason that the present author selected emergency kit preparation as the target topic.

The participants in this action research were diverse. This was important because our goal was not to achieve a one-way learning activity in a teacher-learner paradigm, but rather to create a sustainable CoP. The participants were classified into the following four groups. The first, the core participants, were 10 students from Hashimoto High School, aged from 16 to 18. The students participated voluntarily in this project. Some school teachers also participated in the research, mostly serving as administrative gate keepers who bridged the students and the outside experts. The second group of participants was local residents living in the Hashimoto region, as well as some other areas in Wakayama Prefecture. The third group was the outside experts. They were “outsiders” from the students’ or local residents’ point of view. This group included both disaster and gaming experts. These experts also contributed to this research as coordinators who attempted to guarantee a collaborative arena for the diverse participants. Some disaster relief NGO staff who were familiar with emergency kits also joined as outside experts. The final category of participants constituted local government workers. These individuals work for a local government office, belonging to such departments as disaster management and school education. They took an important initiative mainly in the dissemination stage of the gaming process.

2.2 Procedure

This section provides an overview of the whole development of our action research program, from the planning, production, and playing to the disseminating stages of an emergency kit game (see Table 1). The research was conducted for more than a year, from August 2004 to November 2005. The year-long process was composed of the following four stages: the “internalization stage” (from around August 2004 to September 2004), the “modification stage” (from around October 2004 to November 2004), the “practice stage” (from around December 2004 to February 2005), and the “dissemination stage” (from around March 2005 to November 2005).

Table 1. Overview of Action Research

“Internalization Stage” (from around August 2004 to September 2004)
Aug 27, 2004: Recruitment of high school students as core participants in the action research
Sep 27, 2004: The 1st joint workshop: Briefing on the project’s objective and assigning homework
Oct 4, 2004: The 2nd joint workshop: Sorting and prioritizing more than 100 emergency goods

“Modification Stage” (from around October 2004 to November 2004)
Oct 6, 2004: Hearing from a member of the disaster relief NGO about item selection
Oct 25, 2004: The 3rd joint workshop: Completion of the “Primary Goods” part
Nov 8, 2004: The 4th joint workshop: A proposal by the students to add a “Personal Goods” part
Nov 22, 2004: The 5th joint workshop: Completion of the “Personal Goods” part

“Practice Stage” (from around December 2004 to February 2005)
Dec 13, 2004: The 6th joint workshop: A test run of the game with personally prepared kits
Feb 1, 2005: A study tour of the Disaster Reduction and Human Renovation Institution
Feb 22, 2005: Public announcement of the game on a school wall poster and in its web edition

“Dissemination Stage” (from around March 2005 to November 2005).
Mar 15, 2005: The 1st facilitation workshop by three students with 30 disaster aid volunteers
May 12, 2005: The 2nd facilitation workshop by two students with 100 local residents
Oct 25, 2005: The 3rd facilitation workshop by three students with some junior students
Oct 29, 2005: The 4th facilitation workshop by three students with 100 disaster management workers
Nov 5, 2005: The 5th facilitation workshop by three students with 30 local residents

It should be added, however, that the understanding of sequential progress via the four stages above is a tentative one, which might have to be changed later. Although the author considers this sequential understanding to be the best understanding at the present moment, especially when we take our theoretical background into consideration, it is normally quite difficult to specify the development of an action research project, even after the project seems to be reaching its goal. One of the reasons for this is that action research is ever changing; it is constantly co-

arranged and co-modified by a diverse set of participants, and is not planned and performed exclusively by a researcher in a privileged position. Another reason is that a goal itself is sometimes changed, or even reset in the course of development, so that the meaning of each one of the stages in a project might be changed, depending on further developments.

2.3 “Internalization Stage” (from around August 2004 to September 2004)

We call the first stage the internalization stage, since our focus was mainly centered on knowledge transfer from disaster experts to high school students, and knowledge internalization in the latter. The author recruited high school students as central participants at a public event organized by Wakayama Prefecture, which was aimed at raising local disaster awareness. At the first joint workshop with the students, the author explained the main objective of the study by stating that this attempt was aimed at promoting local disaster awareness, via a series of collaborative joint workshops attended by the students and some experts. I then disclosed a draft plan for producing game-type disaster education materials on emergency kits. This plan was basically supported by the students, although not all of the students showed strong motivation to participate in the project from its very beginning. This judgment is supported by some of the students’ remarks on the project shown later in Table 4.

We began our project by reviewing lessons obtained from past events. Although we do not place our primary focus on one-way transfer of pre-existing knowledge, it is not wise to totally neglect the large stock of knowledge accumulated by disaster experts and veterans. With regard to what we should pack in an emergency kit, experts (including researchers, government officers, and disaster relief NGO staff) provided us with several lists of recommended useful goods to have on hand under disaster conditions. We requested that the students gather such information as an initial step. This information is available on websites, in books, in disaster education brochures issued by some local governments, and in other sources. The specific request made of each individual student was to make a list of more than 50 emergency goods, at a minimum. After a few weeks, the students had identified more than 100 items in total, after all overlaps were eliminated. The most important finding here was

that different lists of recommended items had much in common and typically included things such as bottled drinking water, canned food, a knife with a can opener, towels, and so on.

2.4 “Modification Stage” (from around October 2004 to November 2004)

In this stage, the students classified and prioritized more than 100 items. These joint workshops were facilitated and supported by gaming and disaster experts, who came from a university and a disaster relief NGO. First, the 100 items obtained during the internalization stage were classified into subcategories, such as food, clothing, other goods needed for everyday living, and so on. The items were then prioritized, based on how helpful and essential each would be in an emergency. These ratings ranged from highly essential, to moderately essential, to less essential. As a result, 20 goods were selected as items that would appear on the list in the game. Eleven of the items were judged to be highly indispensable for an emergency kit, while the remaining nine items were categorized as helpful but less essential as compared to the 11 “must-haves.”

The 20 selected items appeared in the first part of the game, entitled the “Primary Goods” part. As shown in Table 2, the first part took the form of a quick quiz, in which respondents are shown the list of 20 items and are asked to classify them into two groups: highly or less essential. A player gains or loses one game point every time he or she makes a correct or wrong answer, so that in this part of the game, the top mark is 20 points. The more points a player gains, the better the prize he/she gets. The prizes could be candy, sweets, or daily necessities, for example.

The joint teams did not include food and water as items in this part of the game because in recent disaster scenarios, these were normally supplied quickly and sufficiently by public organizations. This means that food and water are not as essential as emergency goods stored personally at home, although these goods are taken into account (in a different form) in the second part of the game.

Table 2. “Primary Goods” Part

“Suppose you are hit by a major earthquake. You are forced to evacuate to a safer public emergency shelter to escape from aftershock risks. You will have food and drink supplied at the shelter, but why not prepare other necessities for survival on your own? Take a careful look at the 20 items listed below, and judge whether each item is essential or not as an emergency item you pack in your own “emergency kit.”

Item list: windbreaker*, mini sewing kit*, screwdriver, vinyl trash bag*, fire extinguisher, plastic wrap*, whistle, disposable camera, umbrella, backpack*, towel*, watch, cotton work gloves*, portable cooking stove, nail clippers, portable radio*, pen & notepad set*, army knife*, toothbrush, portable light*

The symbol * indicates 11 essential items for an emergency kit.

Much more importantly from our point of view, the students became active enough to propose a second part of the game, in addition to the first one. The students found that some of the pre-existing lists of recommended goods were too standardized and too similar to each other. Thus, they came up with the idea that individually unique necessities should be included in their game. For example, one student said that a hand mirror would be a must, to check her appearance even under disaster conditions! Another student wanted to have a portable music player to entertain himself and his friends. A few students said that they needed extra food in case they are not satisfied with the publicly available supply of food, and another female student needed a photo of her boyfriend.

Although such items had rarely been included in conventional lists, the disaster experts in our workshop favorably evaluated these ideas, given that it is true that different people need different supplies. Furthermore, specific personal needs are less likely to be met during a large-scale aid operation conducted mainly by public organizations; for example, special food needs for the elderly or babies, specially designed portable toilets for those with disabilities, and important information provided in different languages for non-Japanese speakers. This was actually one of the lessons that the Great Hanshin-Awaji Earthquake taught us. The Chuetsu Earthquake in 2004, the biggest earthquake to take place after that of 1995, also demonstrated that basic necessities such as food and drink are likely to be supplied quickly and that what

was still lacking were things that could give people more personalized convenience and individual comfort.

After such consideration, the team reached the final idea for the second part of the game, the “Personal Goods” part. In this part, the respondents are asked to add five more items to the 11 standard priority goods that were recommended in the first part (see Table 3). Respondents can include anything that they want to have in their emergency kit. It is important that there is no single correct answer for this part, unlike the first part. Unique items that meet personal needs and solve local issues more effectively are highly appreciated. In the actual procedure, a pair of game participants is requested to make a guess about what items the partner selected, based on the partner’s demographic attributes and what the partner had said earlier in the game. They then disclosed their own selections and exchanged their rationale behind the selections. The top mark that could be obtained in the second part was 10 points, since a player gets two points every time he/she makes a right guess. The winner with the most points took some prizes.

Table 3. “Personal Goods” Part

“In the ‘Primary Goods’ part, you learned some basic emergency necessities helpful for almost all people in a disaster situation. However, different people need different goods. For example, some might need a pair of glasses; others might need special food for their babies or elderly grandparents. With this in mind, freely select five of your own special necessities in this part. Please make a quick note of the reason that the item is necessary to you. Next, please guess your partner’s selection.”

2.5 “Practice Stage” (from around December 2004 to February 2005)

It is true that some are skeptical about the impact of a gaming experience. Some argue that a gaming experience might improve interpersonal actions among game participants within the gaming context, but that gaming is less likely to cause real attitude or behavioral change in participants in the actual world (Kolb, 1983). The author has to admit that this critical view is at least partially correct, especially when gaming is conceptualized in its most narrow sense, that is, when only the playing stage is taken into consideration.

However, when gaming is defined more broadly as I have done above, this concern will be mostly unwarranted. Gaming has sufficient power to cause actual attitude or behavior change in game participants when gaming is thoughtfully planned to have a close links with its implementation program, based on a more holistic understanding of the gaming process. With this understanding in mind, our joint team attempted to put what we had learned from the experience of game creation into practice, immediately. All the participants in this research, not only the students but also the experts and school teachers, prepared a personal emergency kit that included the basic supplies identified in the first part of the game. The core students also actually played the second part of the game. They prepared and disclosed their own selection of personal items, and discussed the reasons for these selections. Furthermore, as stated later, a larger number of high school students, their family members, and local community people actually prepared an emergency kit in the real world after playing the game. These actions provide evidence that gaming can have a positive impact in the “real world” that is not limited to the more narrow gaming context alone.

2.6 “Dissemination Stage” (from around March 2005 to November 2005)

At this stage, the schoolteachers and governmental officers, who were previously in a supporting role, took a leadership role. First, the teachers introduced the game to a larger number of students and their parents through school media. This effort was aimed at raising disaster awareness, and also at informing more students of what the core students had accomplished. The school also provided an opportunity for the core students to hand their experiences down to their junior peers.

Secondly, local government workers provided the team with some important chances to allow the students to take the role of game facilitator at disaster education events. By making full use of the self-made game-type educational materials, the students contributed much to efforts to boost public awareness of disaster preparedness through these public workshops. These workshops were official ones organized by the Wakayama Prefecture Office. One of the workshops was so successful and attracted so much public attention in a local community that it was aired on a local

TV station news program.

It is noteworthy that through dissemination efforts, the game the students produced was actually used in a local government’s education program. Some of the game participants did prepare real emergency kits at home after playing the game. Others talked about their game experience with nearby residents in a local community. These behaviors clearly show that the positive effect of gaming can extend beyond the initial game play setting.

3. Discussion

The direct goal of the present action research project was to plan and produce a game-type disaster education tool. In fact, multiple stakeholders participated in a series of joint workshops to co-produce a game-type disaster education material, which was later used in some official workshops on disaster education. However, as I stressed, the real goal of the present research was to build a sustainable CoP for disaster preparedness, where we could find all three of the major components of learning in harmonious balance. It should also be noted that the whole process of gaming played a key role in achieving this goal. In the following discussion, the author will first look back upon the entire sequence of the action research, and will then discuss three important points related to CoP formation. Finally, the author will discuss the implications of this action research for disaster education in general.

3.1 Development of Action Research

In the internalization stage of the project, high school students, the core participants in a joint workshop, concentrated mostly on mastery of previous knowledge. It was true that this process was absolutely necessary to serve as a platform for further development. However, the role identities of the students at this stage were firmly fixed as passive learners, like those in a conventional learning paradigm. They simply lacked the more positive attitudes that would be required to go beyond a passive learner’s role. It is seldom that high school students give new ideas or take leadership roles in a joint project. We can see this passive attitude clearly in the students’ statements from the open-ended questionnaire. The questionnaire survey was conducted in December 2005, asking the

core students to look back on what they had in mind about the project at each one of the four periods (no titles for each of the stages were shown). Remarks such as No. 1-1 and 1-2 shown in Table 4 clearly reflect the students' reactive feelings at this stage.

Table 4. Summary of High School Students' Remarks Obtained in an Open-ended Questionnaire

1. "Internalization Stage"

1-1. "I did not know what to do; I just did the assigned task passively."

1-2. "To be honest, I was not so inclined to join this project. This was because I had no experience of being hit by a major disaster, and because game production looked a very ambiguous goal to me at that time. But I gradually became interested after I got an outline picture of the game production project."

2. "Modification Stage"

2-1. "It was great to come up with the idea of the 'Personal Goods' part."

2-2. "Making a disaster game together gave me more enjoyment than just playing a game, but I felt everything was over after we finished producing the game."

2-3. "Since I did not hit upon a good idea of surprisingly or unexpectedly useful goods in an emergency, I felt a bit frustrated."

3. "Practice Stage"

3-1. "It was fun to gather primary and personal items, and I found how diverse personal goods are from person to person."

3-2. "I was more deeply committed to this project from this time point. One of the reasons was that I visited the Disaster Reduction Institute in Kobe and learned much about real disaster events. It was also nice to summarize what we learned in the report published in our school newspaper."

4. "Dissemination Stage"

4-1. "After I had a real experience of game facilitation, I became more interested and more excited. It was fascinating to consider how to attract participants' attention and how to encourage more participants to prepare an emergency kit at home."

4-2. "I felt that we had to study deeper and further when we had feedback from one of the participants who claimed that he appreciated our effort but it was sometimes very dangerous to offer one correct answer even in the 'Primary Goods' part. I was told that necessities could vary depending on factors such as predicted disaster impact, quality and quantity of disaster relief stocks at local government offices, and so on."

4-3. "I was happy to see local people showing strong interest and really enjoying the game. I also considered very seriously how the game could be improved."

However, we should also pay attention to a different side of the story during this stage. People in the Hashimoto region had never expected to experience direct contact between high school students and disaster experts, especially those coming from outside the region. This fact suggests that CoP building started as early as in this initial stage, although such developments were nevertheless slight at this stage, given that what happened at this time mostly depended on a conventional teacher-learner framework.

In the modification and practice stages, the students began to gradually change their role identities. The students not only learned unilaterally from outside experts but also showed more positive commitment, and actively used their own voices to make full use of their unique positions. The creation of the second part of the game was particularly indicative of more active collaboration between the students and other stakeholders. When we look at the students' attitude change from another perspective, we realize that the other participants (e.g., outside experts or local government officials) also changed their role identities in the CoP. They could no longer regard the students as passive learners but rather as equal partners in discussing local disaster risks, after they discovered different but unique creativity and thoughtful insights in the students' ideas.

It is useful here to recall the idea of a cogenerative learning arena. Greenwood and Levin (2007) stress the importance of taking advantage of the differences between parties in the arena. The asymmetry or gap in knowledge among a more diverse set of participants, in this case specifically between students and experts, is not an obstacle to action research, but is instead a driving force that promotes cogenerative learning. This view of learning is naturally required once we view learning as a dialectic process among diverse stakeholders rather than the unilateral and static flow of knowledge.

Nevertheless, we must conclude that a truly dynamic CoP does not yet emerge at these stages. It is true that the game production experience did have a more positive impact on the participants than simply

playing a game would have had. This is suggested by some of the students' commentaries, including No. 2-1, 3-1, and 3-2 (Table 4). However, other statements like No. 2-2 and 2-3 reveal some limitations at the same time. The author and his collaborators, at this stage, were not well prepared to show the students a clear future vision of the project. We should have provided the students with what would come next at each stage, earlier than we actually did in the present research. This is one of the points that should be borne in mind when future improvements are considered.

In contrast, when the team stepped into the "dissemination stage," significant transformation occurred in the basic structure of the CoP. First, the students took the role of instructor or facilitator when they disseminated what they had learned. The students handed down what they had learned to their followers in the high school, and at the same time contributed richly to local disaster education, in terms of taking a leading role in some of the official workshops with the participation of local people. Student remark No. 4-1 (Table 4) demonstrates this transformation.

It should also be noted that this role change was achieved not only via the students' isolated efforts, but also by the continuous assistance of other participants in the CoP. Specifically, the gaming experts requested that the school teachers and local government workers consider the possibility of using the game in disaster education, both in a school and in a local community. In response to this request, the teachers and officials set up opportunities for the students to facilitate game play in an official setting. This decision would never have been made if the author had simply made an abrupt request to do this without a preceding collaborative process in place. Had the local government officers not understood that the game was a reliable co-product of the students' sincere efforts and the experts' knowledge, the gaming process would have been terminated just after game production was over, without further development.

3.2 Structural Transformation in a CoP

The preceding analysis suggests the following three important points about the structural transformation of our CoP. Initially, transformation never occurs in a short period of time. Normally, it comes about slowly, with a gradual and interactive change in role identity configurations among those in a CoP.

This means that CoP restructuring requires a longer-term strategy for orchestrating diverse changes in a variety of stakeholders. An action researcher needs to have a longer-term vision for possible change in diverse scenarios, as well as the capacity to make timely interventions. This contrasts sharply with what needs to be done when our focus is limited only to the internalization component. Knowledge internalization is achieved in a much shorter period of time, and we can check more easily and more quickly how well this goal is achieved compared to CoP transformation monitoring.

The second important point is that role identity change is not unidirectional but bidirectional. For example, the author has stressed that the students changed their position from learner to collaborative partner as the project progressed. However, the reality is not so simple. The project set the students free from being fixed in a conventional identity, that of the passive learner. Instead, their identities could change flexibly between that of learner and that of teacher. Internalization was not completed, but was in fact still ongoing even more profoundly after the students became workshop instructors during the dissemination stage. For example, the students received much advice on the game from the disaster management experts who had played the game earlier; the local citizens also gave the students straightforward feedback. Consequently, the students voluntarily improved how the game was facilitated. The game was converted from a plainer paper-and-pencil type to a more dynamic and interactive one, with actual emergency goods displayed just in front of the game participants. Some of the students' remarks, such as No. 4-2 and 4-3 (Table 4), confirm that internalization continued to occur more profoundly when their role identities were switched bilaterally than when they remained unchanged.

The final point is that role identity change is not an isolated individual attitude or behavioral change, but is instead a collective transformation of role configurations in a CoP. Not only the high school students but also the other contributors changed their identities over the course of the study, despite the magnitude or direction of the change. For example, the outside experts, who are likely to be fixed in supervising roles in more traditional approaches, were sometimes in a position to receive important input from the students.

The government officials also admitted afterward that they had never expected to play a supporting position, helping the students to facilitate official disaster education workshops. Furthermore, as shown in Table 5, some of the local residents were inspired to become better prepared for disasters after witnessing common high school students playing an unexpectedly important role in local disaster management efforts. Through this mobilization of the CoP structure, everybody was set free from previous roles and attained more flexible and multiple roles in the CoP.

Table 5. *Feedback Statements from Workshop Participants*

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1. "I vividly observed that participants really enjoyed the workshop and understood how everyday goods could be useful in disaster times. It was a very simple game, but it was very effective for knowledge building because of the interactive conversation among facilitators and other participants." (A local government worker)
 2. "I was strongly impressed to know that ordinary high school students facilitated the disaster education workshop very skillfully and even prepared a guidance manual, with the assistance of university professors. I really enjoy the workshop since it was in a game, not in a lecture, style." (A local resident)
 3. "I am acting as a volunteer worker in my community disaster management organization. I got some great hints from this workshop. Thank you very much." (A local resident)
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3.3 Implication for Disaster Education Research and Practice

In closing this paper, I would like to discuss how significant it is to establish a long-lasting and flexibly changing CoP when we deal with huge disasters over a longer time perspective. One of the points Lave and Wenger (1991) stressed in their theory is the notion of "full participation" in a CoP. We must distinguish "full participation" from "central participation." "Full participation" means the collective status of a CoP where diverse participants have diverse ways of participation and make diverse contributions. For example, some may play a central role as leader, but others could show just slight commitment as a passive follower. Some might be expected to provide a community with professional knowledge or skill, while others might be expected to contribute in other forms. Some may be leaving a community, but others will be joining

instead. And much more importantly, some who used to be a central position could be moving toward a peripheral position. Movement in the opposite direction can happen as well.

Obviously, it is not appropriate to urge everybody to show full commitment in order to achieve unanimous "central participation." This type of community might function efficiently over a very short period of time, but not in the longer term. What needs to be done is to create a CoP with diversity and flexibility inside, enough to gain solid power for securing its sustainability against outside or inside fluctuations. This point is particularly important when it comes to disaster preparedness education, focused on huge disasters with an extremely long recurrence time. Our discussion suggests that a real threat is not a temporary decrease or loss in people's awareness or knowledge, but immobilization of the CoP structure. We should be fully aware that internalization-centered disaster education might result in gains over the short term. However, too much focus on internalization risks makes a CoP inactive and immobile, especially when performed only in a rigid teacher-learner paradigm.

From this point of view, common concerns about low disaster awareness, frequently shown in nationwide survey statistics like those reported by the Japanese Cabinet Office (2003), should be looked upon differently. Lower awareness and less knowledge about natural disasters might not be exclusively attributable to matters of personal attitude and behavior. Rather, this might also be a matter of the collective structure of a CoP. Dangerous indifference and risky optimism regarding disasters, shown by the majority with peripheral identities in a CoP, might be maintained and even strengthened when these peripheral identities are coupled with their counterparts, the minorities whose role identities are rigidly fixed in a central and leading position in a CoP. Such minorities often present attitudes such as "I am a disaster expert, so everybody should listen to me," "I am more serious about disaster risk than anyone else in my community, and I have a mission to enlighten people," or "I am doing so much about local disaster management, but very few appreciate it." These complaints are justifiable to some extent, but we should also acknowledge that it might be exactly these kinds of overly paternalistic attitudes that leave the majority in peripheral

status positions, and that prevent the majority's "full participation" in a CoP.

For a truly sustainable disaster education approach, a CoP must be transformable enough to allow all participants to alter their roles frequently, adaptable enough to cope with big or slight changes in natural or social conditions, and also wide open enough to encourage outsiders to enter. When this is actually realized, we need not be so concerned about short-term fluctuations in people's interest in and preparedness for natural disasters, since we can expect that a CoP could solve the issue in the long run. A CoP has the potential to convert currently uninterested outsiders into inside members, to convert temporarily peripheral members into more central ones, or to convert a present leadership role into a more relaxed position, with his/her responsibilities to be transferred to the next leader.

In this regard, we should notice a fine but remarkable line between cogenerative disaster education with CoP transformation and participatory disaster management in general. These two are never equal. The latter is just a part of, or strictly, a necessary condition for, the former. Recently, disaster researchers and practitioners have paid more attention to participatory disaster management, under the titles of "community-based disaster risk management" (World Bank Institute, 2005) and "citizenry-based disaster management" (Heijmara & Victoria, 2001), to name but two examples. It is true that these kinds of efforts have much in common with our own attempt that concerns a basic orientation. However, the author would suggest that not a few such programs still fall within the framework of the conventional teacher-learner paradigm. Although they are fully aware that a traditional approach to public enlightenment led by authoritative experts is not so effective, participatory procedures are sometimes introduced as more user-friendly or as more generally appealing communication media. However, we should draw a sharp line between unilateral knowledge/skill transfer in a participatory atmosphere with a user-friendly communication medium and cogenerative and collaborative co-learning in its true sense with a substantial structural change in communities of practice. We also should note that, in the worst case, a participatory procedure is introduced merely for form's sake and without any substantial interaction among diverse stakeholders,

just as an ineffective response to stronger social demands for citizens' involvement.

On the other hand, we can find in recent developments of disaster education in Japan a few research approaches and praxes that share exactly the same line of thinking as ours. For example, Yamori (2007; 2008) reports a disaster awareness-raising attempt in which a CoP is cogenerated by many stakeholders, using the same medium used in the present research, a game called "Crossroad: Kobe." Yamori & Funaki (2008) discuss a case study on disaster education in which diverse stakeholders across three generations (elderly disaster victims who experienced the Great Hanshin-Awaji Earthquake in 1995, university students who are learning about disaster education, and primary school kids in a community) participated in a CoP. Watanabe (1999) provides another impressive example of the revitalization of local disaster education efforts, in which school children were converted from passive learners to active investigators of their own community risks. These challenges suggest that the present study is not an isolated case without any related empirical evidence to support the validity of CoP-based disaster education. The present action research, although a small attempt, is a model case where we can successfully create a truly participative, cogenerative, and sustainable CoP for disaster education.

References

- Duke, R., 1974. *Gaming: The future's language*. New York: Sage Publications.
- Greenwood, D. J. & Levin, M., 2007. *Introduction to action research: Social research for social change*. Thousand Oaks: Sage Publications.
- Heijmans, A. and Victoria, L. P., 2001. *Citizenry-based & development-oriented disaster response*. Center for Disaster Preparedness, the Philippines.
- Japanese Cabinet Office, 2003. 2003 White paper on disaster prevention (in Japanese) [Heisei 15 nen-ban bosai hakusho]. Retrieved January 10, 2008, from <http://www.bousai.go.jp/hakusho/h15/>
- Kolb, D., 1983. *Experiential learning: Experience as the source of learning and development*. NJ: Prentice Hall.
- Lave, J. & Wenger, E., 1991. *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.

- Luhmann, N., 1991. Risk: Sociological theory. New Brunswick, NJ: Transaction Publishers.
- Mie Prefecture Emergency Management Department, 2006. Protect yourself from earthquake: A reference guide for earthquake emergencies. Retrieved January 10, 2008, from <http://www.pref.mie.jp/kokusai/hp/jisinbousai%20guidebook/guidebook/eigo-panf-new.pdf>
- Na, J., Okada, N. and Fang, L., 2009. A collaborative action development approach to improving community disaster reduction by the Yonmenkaigi workshop method. *Journal of Natural Disaster Science* 30, 57-69.
- Reason, P. and Bradbury, H., 2006. Handbook of action research: concise paperback edition. London: Sage Publications.
- Saeki, Y., 1995. The meaning of learning. Tokyo: Iwanami Shoten (in Japanese) [Manbu toiku koto no imi].
- Shiwaku, R. and Shaw, R. 2008. "Proactive co-learning: A new paradigm in disaster education." *Disaster Prevention and Management* 17, 183-198.
- Takeuchi, Y. and Suzuki, I. 2007. "Food-risk information communication with PAFRICS: A better integrated governance of disaster (flood) risks – Toward resilient society to emerging disaster risks in mega-cities." *National Research Institute for Earth Science and Disaster Prevention (NIED). TERRAPUB*, 213-224.
- Watanabe, T., 1999. Preventing disaster without saying disaster prevention: A case study of disaster prevention program in Japan. World Bank Institute Distance Learning. Retrieved January 10, 2008, from <http://info.worldbank.org/etools/docs/library/230352/Session-3/CaseStudy3.doc>
- Wenger, W., 1999. *Communities of Practice: Learning, Meaning, and Identity*. Cambridge: Cambridge University Press.
- World Bank Institute, 2005. Community-based disaster risk management course. World Bank Institute Distance Learning. Retrieved January 10, 2008, from http://info.worldbank.org/etools/docs/library/181705/course%204%20eng%20Community_rev.pdf
- Yamori, K., 2007. "Disaster risk sense in Japan and gaming approach to risk communication." *International Journal of Mass Emergency and Natural Disaster* 25, 101-131.
- Yamori, K., 2008. "Narrative mode of thought in disaster damage reduction: A crossroad of narrative and gaming approach." In Sugiman, T., Gergen, K., Wagner, W., and Yamada, Y. (eds.) *Meaning in Action: Constructions, Narratives and Representations*. Tokyo: Springer-Verlag, 241-252.
- Yamori, K. & Funaki, N., 2008. "Dialogic relationship between story-tellers and audiences: Action research on a voluntary story-teller's group of disaster victims." *Japanese Journal of Qualitative Psychology* 7, 48-62 (in Japanese) [Kataribe katsudo ni okeru katarite to kikite no taiwateki kankei: Shinsai kataribe gurupu ni okeru akushon risachi].