

Paper:

Development of a “Disaster Management Literacy Hub” for Collecting, Creating, and Transmitting Disaster Management Content to Increase Disaster Management Literacy

Reo Kimura^{*1,†}, Haruo Hayashi^{*2}, Kosuke Kobayashi^{*3},
Takahiro Nishino^{*4}, Kenshin Urabe^{*3}, and Satoshi Inoue^{*3}

^{*1}School of Human Science and Environment, University of Hyogo
1-1-12, Shinzaike-honcho, Himeji, Hyogo 670-0092, Japan

[†]Corresponding author, E-mail: rkimura@shse.u-hyogo.ac.jp

^{*2}National Research Institute for Earth Science and Disaster Resilience (NIED), Ibaraki, Japan

^{*3}GK Kyoto Inc., Kyoto, Japan

^{*4}R2 media solution Inc., Kyoto, Japan

[Received August 9, 2016; accepted January 9, 2017]

In this project, a “Disaster Management Literacy Hub” (DMLH) has been developed for collecting, creating, and transmitting various disaster management content over the Internet. The first screen of the DMLH lists disaster management content on tiles to allow users easily find relevant disaster management content using a keyword retrieval function. A user who registers an account can post disaster management content, create a first screen that is customized using the “favorite function,” and compile different disaster management content using the “binder function.” In addition to the “relay (hub) function” for disaster management content, a “creation function” was also implemented, such as the “message function” for posting short messages of approximately 200 letters and an image, and the “quiz creation function” for measuring the effects of disaster management literacy.

In the course of modifying the prototype Disaster Management Literacy Hub, the system was evaluated by university student users in July 2016, approximately one year after the fully-fledged operation came into effect in August 2015. The results yielded the following findings: 1) the DMLH is meaningful because by using specific keywords, users retrieved items that had been difficult to find by means of general Internet search sites; 2) statistically significant improvement was shown for 15 disaster management literacy items in the evaluation; the DMLH leads to a proposal to create effective disaster management literacy improvement because students recognized three disaster management literacy categories: cases of disasters and disaster management, responses of familiar agents such as themselves and people to one, and responses of agents in the environment, including local communities and governments.

Keywords: disaster management literacy hub (DMLH), competencies for disaster responses, education and training, instructional design (ID), learning objectives

1. Necessity and Current Circumstances of Disaster Management Literacy

Multiple disasters that will cause large-scale damage to and have enormous effects on Japanese society are expected to occur in the first half of the 21st century, such as a huge Nankai Trough earthquake, earthquakes that will occur directly beneath the Tokyo metropolitan area, and heavy rain and sediment disasters associated with global warming. In addition, crisis management for CBREN (chemical, biological, radiological, explosive, and nuclear) damage is required. The damage and effects of such natural and human-made disasters cannot be prevented only by disaster mitigation measures using structures (hardware measures). It is necessary to face disasters using the disaster preparedness measures (software measures) of personal and organizational disaster responses by properly addressing the damage and its effects.

This paper defines the capability required to face and overcome such disasters as “disaster management literacy.” “Literacy” is the capability to read and write, and acquire further knowledge and capability related to a certain field. So, “literacy rate” means the percentage of people who can read and write in the mother tongue in a country, whereas “computer literacy” means the capability to basically use a computer. Considering these usages, disaster management literacy can be described as the capability related to disaster management, and responses and can be defined as “the capability required to face and overcome disasters,” as mentioned above. In recent times, the term “disaster management literacy” has been used in Japan, and was found on some websites on the Internet. However, the definition of “disaster management lit-

eracy” has not been established, and the term has been translated into abstract phrases, such as “disaster management knowledge,” “disaster preparedness,” and “disaster mitigation power.” Some websites only mention “disaster management literacy” in relation to a certain disaster and a disaster management phenomenon, and there are few attempts to systematically clarify the entire structure of disaster management literacy.

The Fire and Disaster Management Agency of the Japanese Ministry of Internal Affairs and Communications [1] manages a website called “e-collage,” where disaster and crisis management can be learned using video files. However, the website emphasizes content for fire-fighters, fire station employees, and administrative officers involved in disaster management, and the content is provided rather than allowing for a discussion of systematic disaster management literacy and adding new disaster management knowledge to the website. Great Shake-Out Earthquake Drills [2] has developed the capability to protect lives in unified disaster management training in earthquake-prone countries around the world and specializes in activities to protect lives immediately after an earthquake, instead of providing disaster responses in later phases.

Therefore, this study has developed a system called the Disaster Management Literacy Hub (DMLH) that collects, creates, and transmits disaster management knowledge over the Internet to increase the disaster management literacy of general citizens and those involved in disaster responses. It proposes measures to improve disaster management literacy by describing how users collect and transmit disaster management knowledge using the system, how users use DMLH, and what kind of disaster management literacy is improved.

2. Conceptual Design and Development of the Disaster Management Literacy Hub

2.1. Conceptual Design of the Disaster Management Literacy Hub and Usage Scenarios

The Disaster Management Literacy Hub was proposed by Kimura et al. (2014) [3]. “Hub” means the center of activities. The word’s meaning was originally applied to the center of a wheel, to which is connected the shaft and spokes. A hub in a computer network connects computers and other network devices. Hub is a base which collects various things. In Japan, while the training results for disaster responses have been evaluated on an individual basis (e.g., Takemoto et al. (2010) [4], Masuzawa et al. (2014) [5]), systematic research on disaster management literacy has not been conducted. Therefore, Kimura et al. (2014) extracted the required capability for those involved in disaster responses in administrative offices or other organizations by analyzing “ICS All-Hazard Core Competencies” in the documents of the Federal Emergency Management Agency of the United States (FEMA) [6] to propose a prototype Disaster Management Literacy

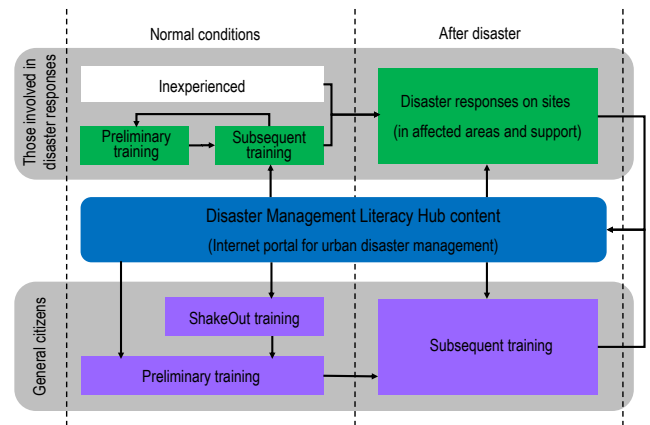


Fig. 1. Usage scenarios of the Disaster Management Literacy Hub.

Hub that would include a learning program for a life recovery support system using a victim ledger [7].

A Disaster Management Literacy Hub increases disaster literacy for those involved in disaster responses as well as for citizens in general. If the target region for the education is considered to be KSA (knowledge, skills, and attitudes) [8], disaster management literacy for citizens in local communities and volunteer disaster management organizations must provide “knowledge to be learned in disaster management and mitigation,” “the skills required in effective disaster responses,” and “basic capability and attitudes for disasters.” Such disaster management education and training programs, including superior ones, have been performed nationwide. However, little systematic disaster management knowledge has been provided. For example, when “disaster training” is retrieved using Google, Wikipedia entries, a disaster training guide for a city, disaster management training reports, and newspaper articles are found. Therefore, the Disaster Management Literacy Hub was developed with the aim of increasing the disaster management literacy of both general citizens and those involved in disaster responses, such as local community employees, by creating a system to collect cases and materials that would lead to disaster management literacy, putting them on the website in a standardized format, and allowing users to use and download them through the website.

Figure 1 shows the assumed usage scenarios of the Disaster Management Literacy Hub. The scenarios can be organized from the aspects of users (those involved in disaster responses or general citizens) and usage timing (normal conditions or after a disaster). Those involved in disaster responses are local community employees of prefectures and municipalities. They will not have much knowledge of disaster responses because they will just have been transferred to a disaster response department. They can be assumed to have used the system for preliminary research and subsequent training and that they immediately understand the elements required for operations as employees in affected areas. The content for citizens in general is basic disaster management and mit-

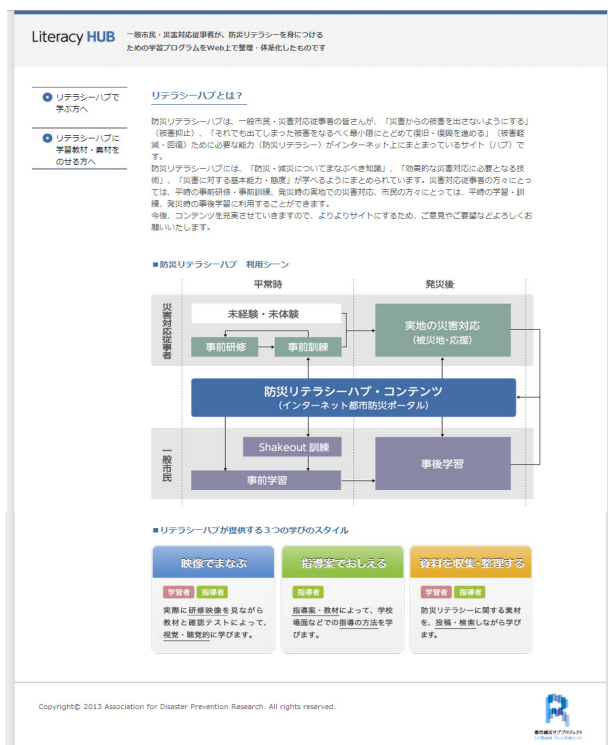


Fig. 2. First screen of the prototype disaster management literacy hub website.

igation knowledge through preliminary learning, disaster response activities, and issues about long-term life recovery through subsequent learning.

The Disaster Management Literacy Hub provides content and measures for such scenarios. Related knowledge can be retrieved using a “keyword search” from the content posted in the Disaster Management Literacy Hub for those involved in disaster responses and citizens in normal conditions when performing preliminary workshops, learning, and training for disaster and disaster management. In addition, when evaluating workshops, learning, and training, the quiz function can be used. Posted content can be learned using the “systematic learning” function. Those involved in school education can obtain guidance/teaching plans and worksheets required for learning using the “teaching with guidance/teaching plans” function. In emergencies, systematic and exhaustive knowledge can be obtained through the Internet from content posted using the “systematic learning” function before and after disasters as part of the disaster response support provided by those involved in disaster responses. Content that cannot be systematically organized on a website because of time restrictions can be transmitted using the “message posting” function as the latest information and comments. As such, the Disaster Management Literacy Hub is designed to increase disaster management literacy in various usage scenarios in normal conditions or after a disaster.

2.2. Design of First Screen of Website for Disaster Literacy Hub

The concept of the Disaster Management Literacy Hub clarified issues of display, search, editing, and register functions related to disaster management content: how material in relation to disaster management content on the Internet should be displayed and tabulated in a clear manner and how users should search and refine materials as needed.

The first screen of the website for the prototype Disaster Management Literacy Hub by Kimura et al. (2014) [3] includes the intent and usage scenarios of the Disaster Management Literacy Hub (**Fig. 1**) that allows users to select: 1) image learning (visual and hearing learning by watching workshop videos using materials and confirmation tests), 2) teaching with guidance/teaching plans (learning teaching methods in schools using guidance/teaching plans and materials), and 3) collecting and organizing materials (These are learning materials related to disaster management literacy by posting and searching for them. The Design Trend Press, described further down, requires individual accounts and a password to log in.). Therefore, the first screen of the Design Trend Press developed for No.3 (collecting and organizing materials) was included in the top screen of the Disaster Management Literacy Hub to enable users to easily browse and discover disaster management content. Meanwhile, the Design Trend Press was generally released and a browser and search functions were newly developed.

2.3. Collecting, Organizing, and Transmitting Disaster Management Knowledge from the First Screen of the Disaster Management Literacy Hub Website

Figure 3 shows the new first screen of the Disaster Management Literacy Hub¹. The description of the Disaster Management Literacy Hub that was indicated in the conventional first screen is displayed by clicking the “?” to the right of “Organizing and systematizing site for learning program to learn disaster management literacy” on the upper right of the screen ((1) of **Fig. 3**). To browse the first screen (Design Trend Press), an account and password were usually required, but now browsing and searching are generally allowed because scenarios for many users to browse have been established ((2) in **Fig. 3**). As of August 8, 2016, 2366 content postings related to disaster management knowledge have been put up. Each posting is displayed using tiles for the same subject area; users can browse content and comments by clicking a tile (e.g., **Fig. 4**). Note that content registration and advanced editing require a login using an individual account and password, as has been conventionally done.

The Design Trend Press was initially constructed as a function of the disaster management hub that provides a common site for users to post content helpful to improving disaster management literacy. This system allows posters to easily transmit and share even one image

1. <http://www.drs.dpri.kyoto-u.ac.jp/ur/hub/dtp/>

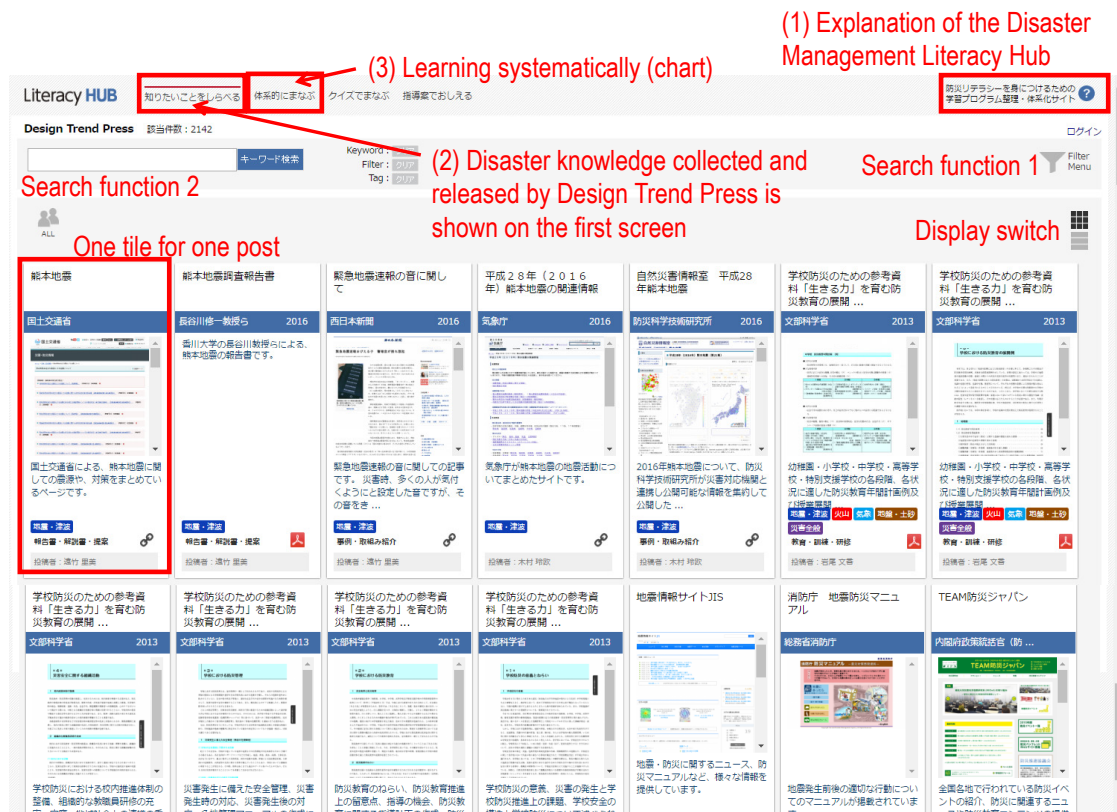


Fig. 3. Modified first screen of the Disaster Management Literacy Hub.



Fig. 4. Example of content after a tile is clicked (an overview of posted material and images automatically found on linked sites can be browsed).

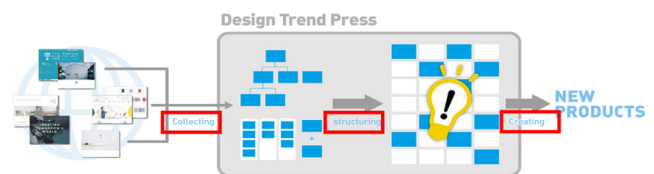


Fig. 5. Systematic conceptual diagram of design trend press.

instead of systematized disaster management knowledge (posting requires account registration). Posted content is tabulated on tiles within the same subject area. **Fig. 5** conceptualizes the significance of the system. Firstly, information related to disaster management is collected from information available in society. The information is then structured by classifying and organizing it. Then, by searching and comparing structured information, proper information and new findings are derived.

The search screen is displayed in vertically- or horizontally-long rectangular tiles based on feedback

from users. This can be switched using the “switch button on the right-hand side of the screen” (**Fig. 6**). In horizontally-long tiles, description texts are easily read because one line contains more letters and the effort on the eye is less when scrolling longer pieces of text because only two content postings are displayed at the same level (depending on screen resolution). On the other hand, in vertically long tiles, six content postings in a line can be tabulated and the whole picture is easily understood. Users can select either of the two ways based on their particular advantages. The content is best tabulated because the tiles have a uniform size.

Predetermined keywords were used as filters to assist searches (e.g., responses immediately after a disaster, safety confirmation, evacuation, shelters, temporary houses, housing, fire, extinguishing, ease of mind and body, volunteer, lifeline, infrastructure); users checked related keywords when posting content. Developers of the Disaster Management Literacy Hub predetermined keywords because they assumed that it might be diffi-

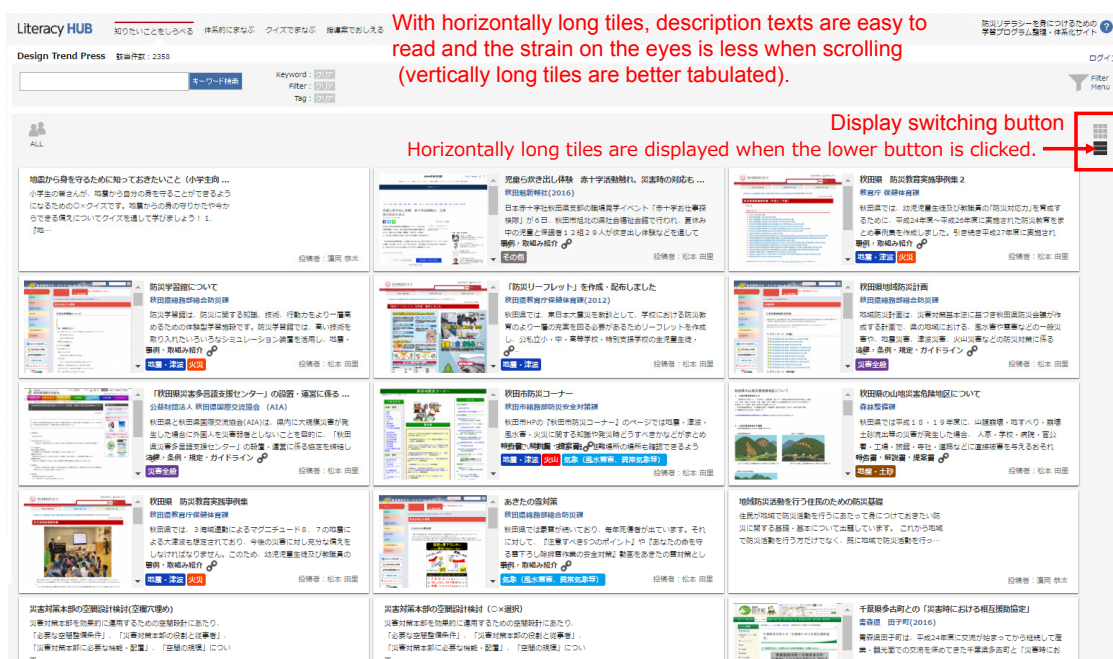


Fig. 6. Development of vertically- or horizontally-long tiles (horizontally long tiles shown).

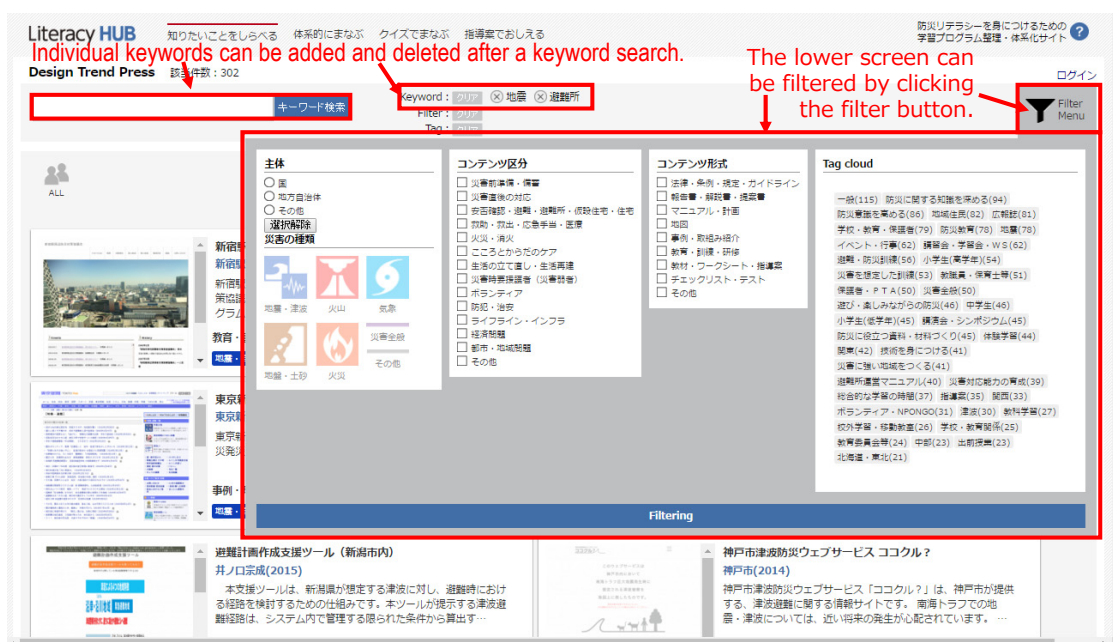


Fig. 7. Reinforced search function by keyword search and filter and tag search.

cult for users to enter freely conceived keywords without having any reference points. Keywords were selected referring to the basic disaster prevention plan and local disaster prevention plan (of Hyogo prefecture and Kobe city, where the first author is living and the Great Hanshin-Awaji Earthquake occurred). However, many users who searched and posted content made comments similar to the following: “It took time to consider what keywords correspond to the intended content although the keyword lists are useful when searching.” Abandoning the keyword list was considered, but some referred to

the list when no keywords were conceived when searching. Therefore, the filter button on the right of the screen (search function 1 in Fig. 3) was used for filtering retrieval. The screen shown in Fig. 7 appears when the filter button is clicked and users can select the relevant word.

The keyword search function was newly featured on the upper left of the screen; this enabled users to search content using free words (search function 2 in Fig. 3). The range of data to be searched using keyword searches is all text information entered by posters and filter tag information. For keyword searches, “and” search using two-byte

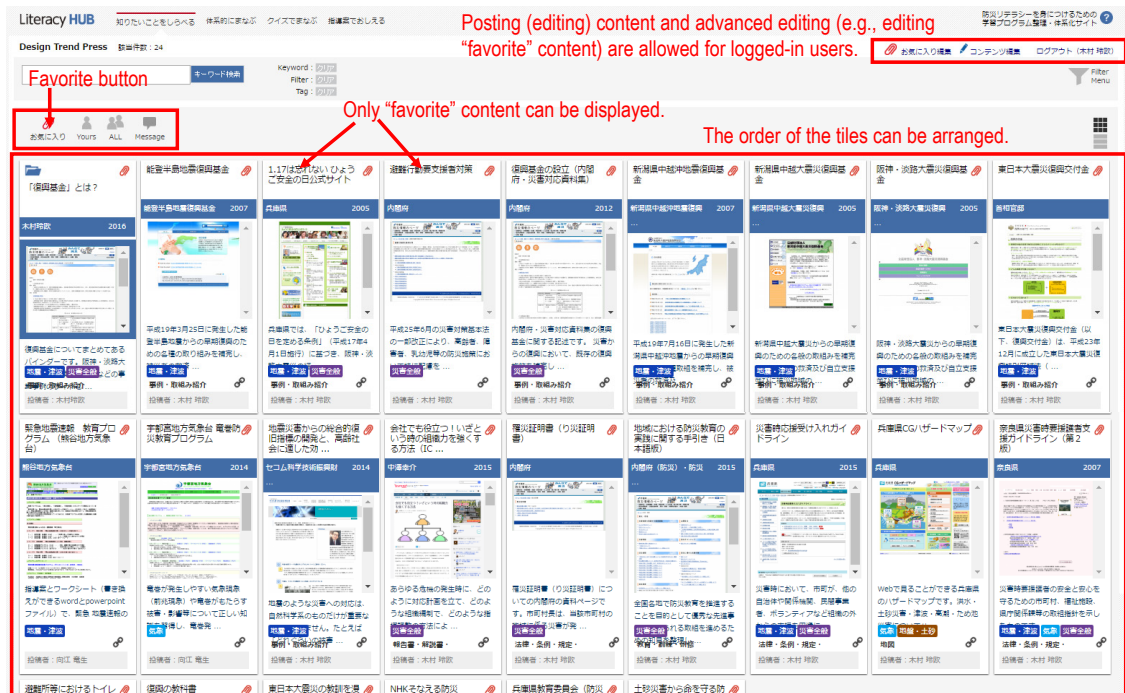


Fig. 8. Content edition using the “favorite” function.



Fig. 9. New content posting screen after logging in.

and one-byte spaces is provided and search keywords can be added and deleted in a column on the right (Fig. 7).

2.4. Use of Design Trend Press After Login (Posting Function and Binder Function)

Users can log in using the login button when an individual account is obtained. Logged-in users can post content and use the advanced edit function. Fig. 8 shows a screen for logged-in users.

The screen shown in Fig. 9 appears when a “new posting” in the Design Trend Press menu is clicked. This appears when “contents editing” on the upper right of the first screen is clicked. The new screen enables users to newly post content by inputting URLs, material, the content classification, and outlines of the information.

After users are logged in, all content (“All” on the left in Fig. 8) and content posted by their own (“Yours” on the left in Fig. 8) can be switched. Only favorite content can be displayed by clicking a clip (a “favorite”) on the upper right of each content tile that appears when logged in (a “favorite” function using the clip mark on the left of the first screen). The “favorite” screen can freely be changed by dragging and dropping tiles because the screen is unique to each user. The change remains even after a user is logged in again.

Moreover, “favorite” content can be compiled in a binder (folder), and the binder can be posted using the “editing favorite” function on the upper right of the first screen. For example, content related to recovery funds is compiled using the binder creating function of “editing favorite” (left side of Fig. 10), and the binder can be posted as a piece of content (general users can use that binder). “What are recovery funds?” on the left of the content shown on the upper right in Fig. 10 is a posted binder. Content compiled by a binder of recovery funds can be browsed by clicking the tile (lower right in Fig. 10). The “favorite” function allows users to collect disaster management content and structure classified and organized information.

2.5. Use of Design Trend Press After Login (Message Posting Function)

Demand for easily creating and transmitting content instead of collecting and transmitting it over the Internet has arisen during the operation of the Disaster Management Literacy Hub. Conventionally, users posted a URL after creating a website or created a separate link group, as shown in Fig. 11, by clicking “systematic learning” ((3)



Fig. 10. Binder creation function in “favorite editing” (left) and content of posted binder (upper right, first page; lower right, when content is clicked).



Fig. 11. Systematically learning (linking to academic content of a certain size).



Fig. 12. Message creation and posting screen.

in Fig. 3) in the first screen of the Disaster Management Literacy Hub for academic content of a certain size. However, because it was difficult to transmit messages due to multiple content, effort, techniques were required to create an own separate website. Therefore, a function was created to easily create and post messages and images on the website of the Disaster Management Literacy Hub. As such, a “creation” function has been put on the Disaster Management Literacy Hub in addition to the “relay” (hub) function.

The message title, a message (300 letters at a maximum), and an image (in JPEG format) can be posted, as shown in Fig. 12, when “posting message” is clicked in the content edit screen after logging in. The created and posted message is displayed in a tile as other content in

the first screen of the Disaster Management Literacy Hub. An orange bar is used to indicate messages instead of a blue bar for general content (Fig. 13). Fig. 14 shows a message screen after a message tile is clicked. The posted message and image are shown. There is a “message” button on the left of the first screen that appears after logging in (Fig. 8); only messages from posted content are displayed if the “message” button is clicked.

2.6. Use of Design Trend Press After Login (Quiz Creation Function)

In the operation of the Disaster Management Literacy Hub, there was a demand for measuring the degree

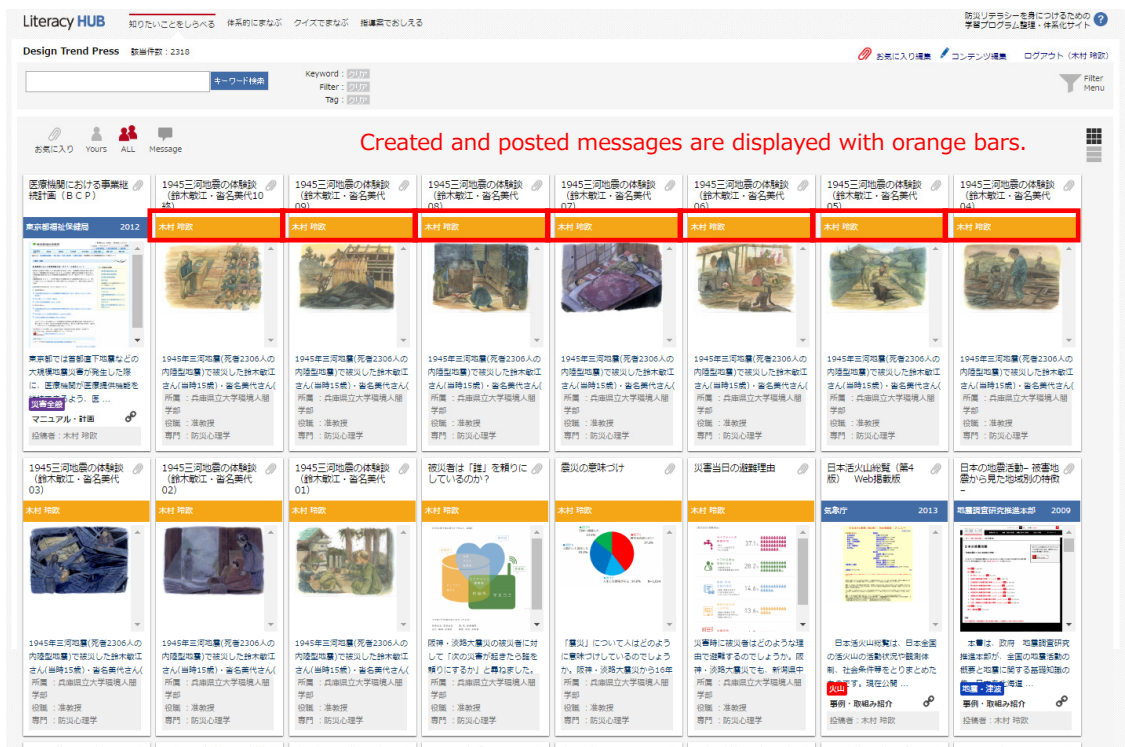


Fig. 13. Messages posted on the first screen of the Disaster Management Literacy Hub.



Fig. 14. Message screen.

of achievement of set learning objectives and the degree of improvement for disaster management literacy in a disaster management education and training program. The Disaster Management Literacy Hub is based on the

concept of instructional design (ID), and learning theory drawn from pedagogy, psychology, and educational technology. Instructional design is a field where frameworks for training and workshops for effectively promoting in-

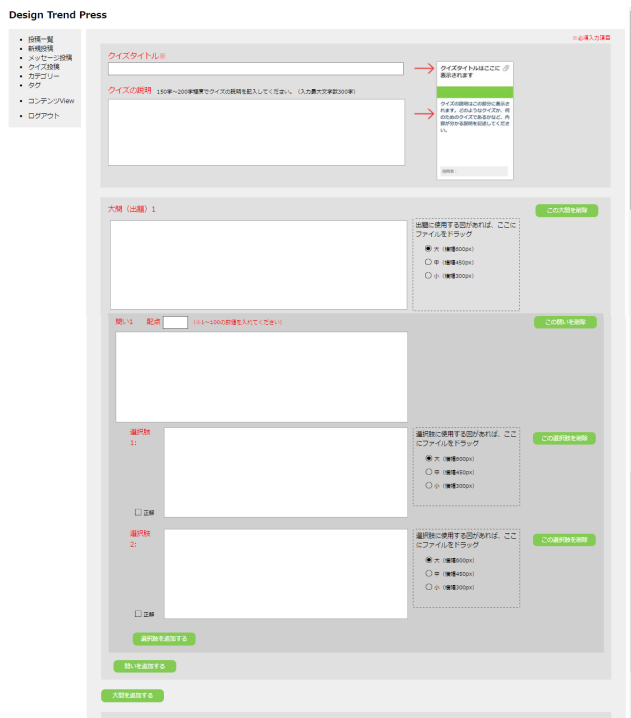


Fig. 15. Quiz creation and posting screen.

tentional learning are studied. It emphasizes supporting learning processes instead of teaching processes. Robert M. Gagne, a key ID researcher, focused on the concept of learning objectives (acquired competency of learners after the learning and training program is completed). He considered that a program based on the learning objectives of learners (what competency the learner wants to attain) must be designed and evaluated by the degree of achievement of the learning objectives (Gagne et al., 2004) [9]. In the development of a Disaster Management Literacy Hub, what kind of disaster management literacy is improved by browsing content has to be checked or the extent to which disaster management literacy is improved by implementing a disaster management education and training program has to be measured. The authors have considered incorporating such functions into the system.

Therefore, a function to easily create and post a quiz that measures the degree of achievement of learning objectives was considered. A screen for creating and posting a quiz on the website appears when the “posting quiz” is clicked in the content editing screen after login, as shown in Fig. 15. The quiz title, description, questions and chart, options, scoring can be entered. The created and posted quiz is displayed in the first screen of the Disaster Management Literacy Hub in tiles as other content. Green bars are used for quizzes, blue bars for general content, and orange bars for messages (Fig. 16). Fig. 17 shows a screen for a quiz after a quiz tile is clicked. Users can answer a quiz by clicking the “quiz start” button after reading the title and descriptions.

3. Evaluation of Disaster Management Literacy Hub

3.1. Preliminary and Subsequent Evaluation with University Students

The Disaster Management Literacy Hub started its prototype operation in 2013 and as a fully-fledged operation with a new first screen in August 2015. In response to the demands of users, it was continually modified. A total of 2366 content items have been posted as of August 8, 2016; many people have used it partly because PR activities were conducted for general citizens, educators, and local community officers. In Internet search sites such as Google, the website appears on the top or immediately below the term explanation if the phrase “disaster management literacy hub” or “disaster management literacy” is used.

The Disaster Management Literacy Hub has just been implemented, and it must be comprehensively evaluated from a long-term perspective. However, the authors wanted to simply measure what kind of disaster management literacy had improved by using the Disaster Management Literacy Hub, so they asked university student to evaluate the hub. Target respondents were students who took “disaster information theory,” a selective course for sophomore students in a university to which one of the authors is attached. Respondents were asked to complete a questionnaire related to disaster management literacy, and then to use the disaster management hub for more than 30 minutes and complete another questionnaire related to the Disaster Management Literacy Hub. Respondents first used the Disaster Management Literacy Hub. The questionnaire clearly stated that answers would be statistically processed and that no person would be identified. Students were asked to participate in the survey until the end of July. As a result, 102 students responded.

3.2. What Did Students Search for Using the Disaster Management Literacy Hub?

Respondents were asked to list actually searched keywords when using the keyword search function of the Disaster Management Literacy Hub in the subsequent evaluation after using it for more than 30 minutes. As a result, a total of 530 keywords (228 types) were obtained from 102 respondents. One respondent used 5.2 words on average. Seven respondents listed more than ten keywords, with 18 keywords being the maximum used: elementary school, evacuation training, earthquake, SNS, community, disaster management, evacuation, elderly citizens, people from overseas, shelter, management, typhoon, crisis management, Great Hanshin-Awaji Earthquake, disaster management education, risk evaluation, affected areas, and false rumor.

Figure 18 summarizes the keywords listed by many respondents. “Earthquake” ($n = 40$) and “tsunami” ($n = 30$) were used by more than 30% of students, followed by “disaster management” ($n = 17$), “volunteer” ($n = 15$), “evacuation” ($n = 14$), “shelter” ($n = 13$), “the Great East

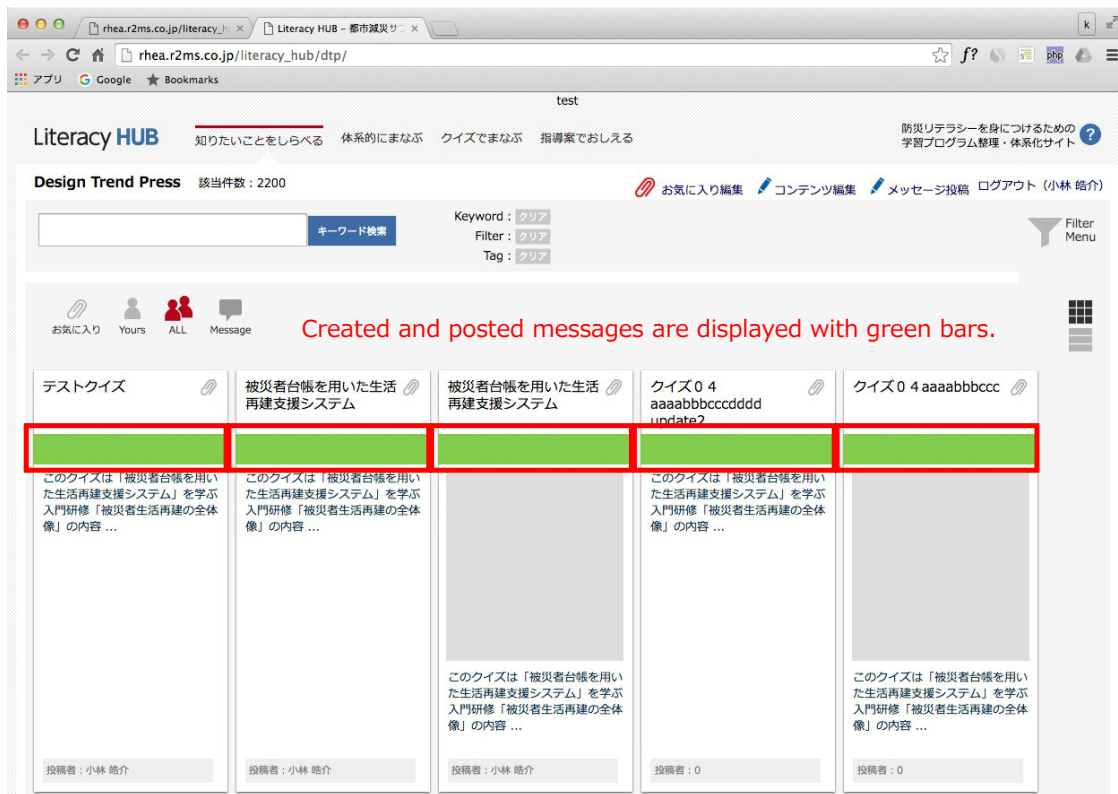


Fig. 16. Quiz posted on the first screen of the Disaster Management Literacy Hub.

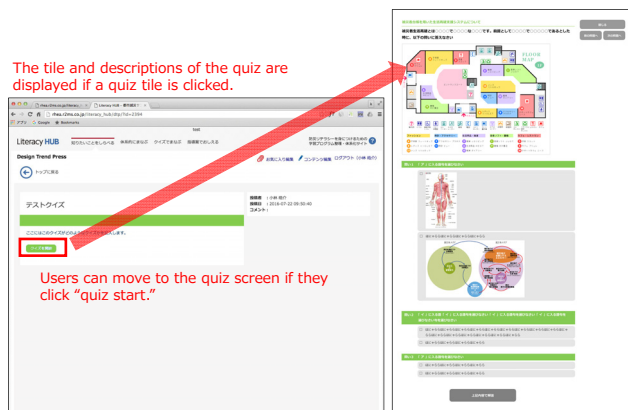


Fig. 17. Quiz screen.

Japan Earthquake,” “Nankai trough,” “emergency food,” and “disaster management education” ($n = 11$). On the other hand, 159 keywords were searched by only one respondent (69.7% of all 228 keywords). These included “allergy,” “storage reservoir,” “network,” “risk evaluation,” “fun,” “lonely death,” “disaster response headquarters,” “the young,” “what the young should do,” “expectant and nursing mothers,” “farm village,” “fear,” “lightning strike,” “rumor,” and “travel.” Some respondents searched specific place names. Respondents were interested in various specific phenomena regarding disasters. Note that many search keywords had been dealt with in the “disaster information theory” that all respondents had

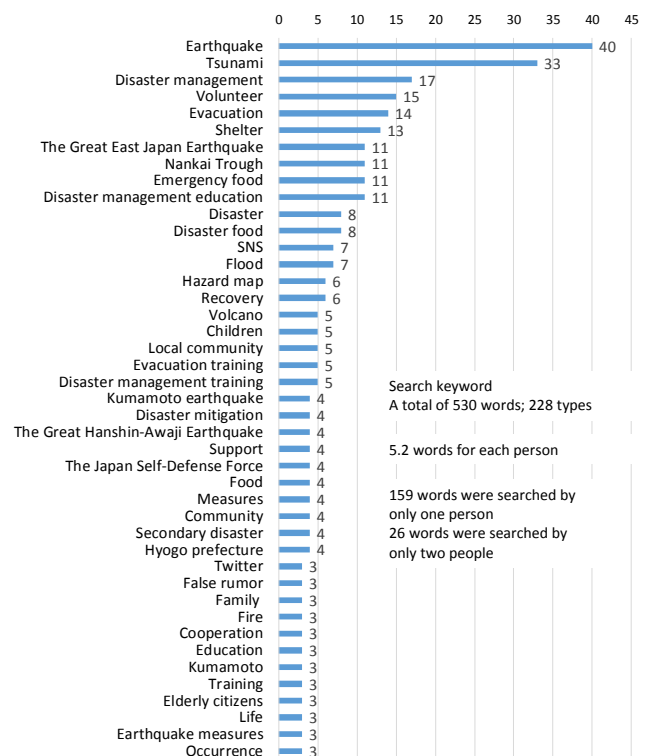


Fig. 18. Keywords searched in the Disaster Management Literacy Hub ($n = 530$).

taken part in. However, half of the keywords searched by one respondent had not been used in the course, and these included words and phrases such as amenity, allergy, game, storage reservoir, network, risk assessment, rescue food, temporary residence, people from overseas, management, females, diet, seismic risks, and expectant and nursing mothers. Respondents searched disaster phenomena according to their interest.

3.3. What Kind of Disaster Management Literacy Did Students Improve on?

In addition, this study performed preliminary self-evaluation on a five-point scale, and this included “earthquake,” “tsunami,” and other words associated with “disaster management.” It is assumed that these words tended to be used for searches in the sense that it is natural for many respondents to use “earthquake” and “tsunami” in such searches. However, a wide variety of words were used, such as those used by one person only, as shown in **Fig. 18**. One of the significant aims of the Disaster Management Literacy Hub is to provide specific content that is difficult to access using general Internet search engines.

Students were asked to evaluate 15 items related to disaster management literacy on a five-point scale, I know well (five points), I know a little (four points), I cannot tell either (three points), I slightly don't know (two points), and I don't know (one point), before and after using the Disaster Management Literacy Hub. **Fig. 19** summarizes the results. All 15 items show a significant increase at the 1% level, including six items that had been rated as “I slightly don't know” in the preliminary evaluation. As described in Section 2.6, the Disaster Management Literacy Hub is effective from the perspective of an instructional design that evaluates educational materials through the evaluation of learners. The present evaluation method conducted a preliminary self-evaluation on a five-point scale using a questionnaire containing 15 items related to disaster management literacy. Therefore, respondents could use the system with the 15 items in mind. However, the Disaster Management Literacy Hub has been proven to contribute to effective learning by the fact that a significant increase at the 1% level is shown in all 15 items of disaster management literacy when used for approximately 30 minutes.

The following items showed a significant increase: knowing various cases in the manual (Item 12), knowing specific methods to recover lives after a disaster (Item 5), being aware that disasters affect the respondents themselves (Item 15), knowing what local organizations should do after a disaster occurs (Item 10), knowing various cases of the damage and effect of past disasters (Item 3), and knowing what affected communities should do after a disaster occurs (Item 11). The Disaster Management Literacy Hub allows students to imagine the responses of administrative and local organizations, long-term life recovery methods, and past disaster cases, increasing the awareness that “disasters affect you.”

3.4. What Kind of Disaster Management Literacy Did Students Develop Through the Disaster Management Literacy Hub

Factor analysis (a maximum-likelihood method and promax rotation) was performed to clarify the relationship of the 15 disaster management literacy items used in the present evaluation from the response tendency. As a result, a total of three factors were extracted (**Fig. 20**). Note that different results were obtained in the factor analysis using the 15 items in the preliminary evaluation. The first factor is promoting understanding of cases. This factor includes understanding of cases of disaster management training, disaster management education, administrative disaster response plans and manuals, and damage caused and effect of past disasters. The second factor is promoting an understanding of response actions by respondents and surrounding people. This factor includes an understanding of what respondents, family members, and significant others should do, what people should do to protect life, measures to prevent human and physical damage (damage inhibition measures), and measures to minimize human and physical damage (damage mitigation measures). The third factor is promoting an understanding of response activities by local organizations and affected communities. This factor involved what local organizations and affected communities should do.

The results show respondents recognized 3 types of 15 disaster management literacy items used in the evaluation. It is considered that disaster management literacy is effectively increased by providing organized education and disaster management content in the forms of disaster and disaster management cases, the responses of familiar agencies, including respondents themselves and significant others, and the responses of local and administrative agents around the respondents.

4. Future Plan

This study developed a Disaster Management Literacy Hub that collects, creates, and transmits disaster management content and studies the system evaluation by university student users. In the future, a Disaster Management Literacy Hub will be developed with an emphasis on: 1) a reinforced user interface, 2) reinforced information creation functions, and 3) systematized disaster management literacy. Regarding 1) a reinforced user interface, a “how to use” guide will have to be developed and designed with a graphical user interface (GUI) after some local administrative staff and elderly citizens commented that they did not know how to use the system. It will also allow university students to judge what to do from keyword searches and the first screen of the content display. In addition, simple manuals and a GUI have to be prepared to allow more users to use the posting screen after inputting the login that is currently used by developers and relevant people.

Regarding the 2) reinforced information creation func-

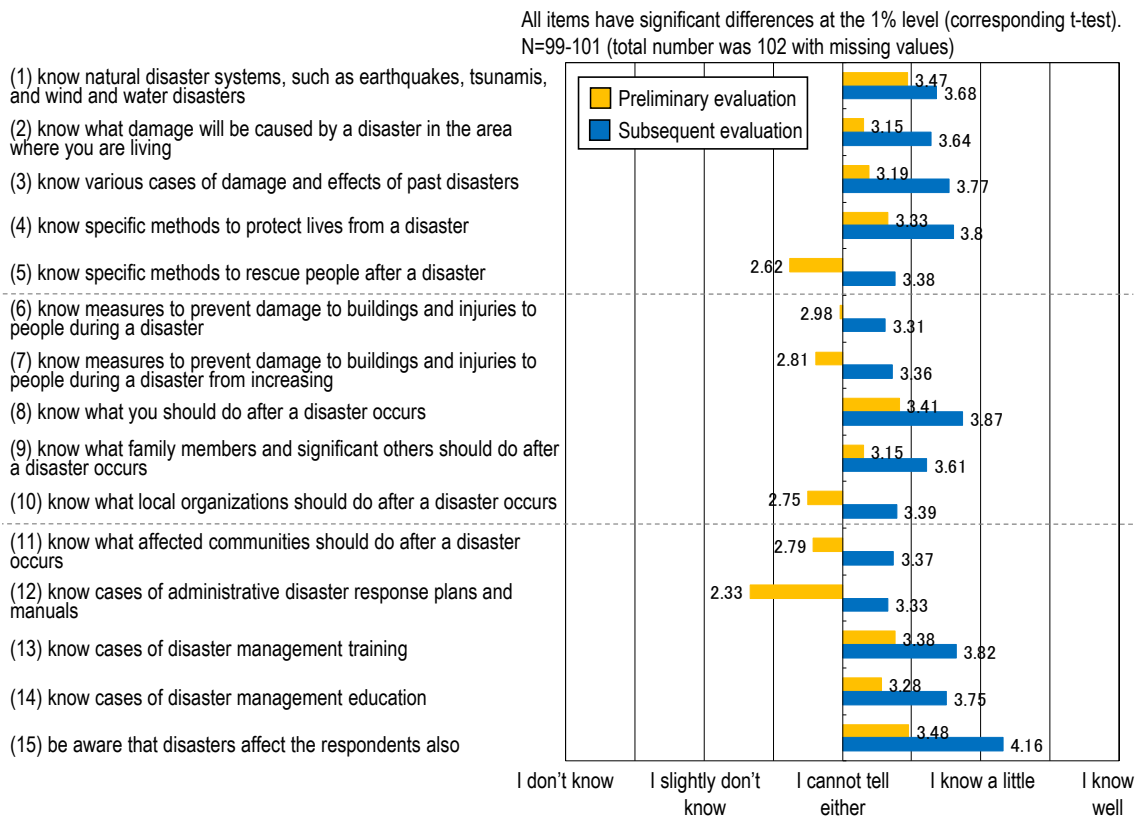


Fig. 19. Evaluation of disaster literacy hub from the perspective of disaster management literacy increasing for users.

	factor loading			communality
	factor 1	factor 2	factor 3	
(13) know cases of disaster management training	.99	-.06	-.14	.77
(14) know cases of disaster management education	.91	-.07	-.13	.64
(12) know cases of administrative disaster response plans and manuals.	.51	-.07	.29	.47
(3) know various cases of damage and effects of past disasters	.50	-.04	.22	.41
(1) know natural disaster systems, such as earthquakes, tsunamis, and wind and water disaster	.38	.04	.06	.20
(5) know specific methods to rescue people after a disaster	.38	.21	.15	.41
(15) be aware that disasters affect the respondents also	.23	.20	.00	.14
(8) know what you should do after a disaster occurs	-.07	.92	-.12	.68
(9) know what family members and significant others should do after a disaster occurs	-.12	.81	-.03	.54
(7) know measures to prevent damage to buildings and injuries to people during a disaster from increasing	.23	.38	.22	.51
(4) know specific methods to protect lives from a disaster	.23	.37	.22	.47
(6) know measures to prevent damage to buildings and injuries to people during a disaster	.26	.29	.15	.36
(2) know what damage will be caused by a disaster in the area where you are living	.14	.25	.17	.23
(10) know what local organizations should do after a disaster occurs	-.06	-.05	.99	.83
(11) know what affected communities should do after a disaster occurs	-.05	-.04	.92	.75
Eigenvalue	5.6	0.9	0.9	7.4
% Common Variance	37.2	6.3	5.9	49.4

a maximum-likelihood method and promax rotation

Fig. 20. Factor analysis result of disaster management literacy items.

tions, two information creation functions (message creation (2.5) and quiz creation (2.6)) have been implemented. A function to create and display a comprehensive knowledge group by gathering various bits of content of the Disaster Management Literacy Hub is to be studied because only the binder function can create comprehensive content (with a capacity of approximately one website page).

Regarding 3) systematized disaster management literacy, it is important to systematize disaster management literacy using disaster management content and develop and reinforce Disaster Management Literacy Hub functions to effectively increase the disaster management literacy of users. In the future, disaster management literacy will be systematized by collecting further disaster management content, repeating the preliminary and subsequent evaluation of users using the Disaster Management Literacy Hub because required disaster management literacy differs depending on users such as general citizens and local administrative officials.

Acknowledgements

The authors gratefully acknowledge MEXT for the financial support provided for this study under the Special Project for Reducing Vulnerability in Urban Mega Earthquake Disasters, and JSPS/MEXT KAKENHI Grant Numbers JP25220202, JP26242031, and JP25560167.

References:

- [1] Fire and Disaster Management Agency of the Ministry of Internal Affairs and Communications, Risk and Disaster Management E-College, <http://open.fdma.go.jp/e-college/index.html> [accessed August 8, 2016, in Japanese]
- [2] The Great Japan ShakeOut Advocacy Council, The Great Japan ShakeOut <http://www.shakeout.jp/> [accessed August 8, 2016, in Japanese]
- [3] R. Kimura, H. Hayashi, S. Suzuki, K. Kobayashi, K. Urabe, S. Inoue, and T. Nishino, "Systematization and Sharing of Disaster Management Literacy by DMLH," *J. of Disaster Research*, Vol.9, No.2, pp. 176-187, 2014.
- [4] K. Takemoto, Y. Motoya, and R. Kimura, "Proposal for Effective Emergency Training and Exercise Program to Improve Competence for Disaster Response of Disaster Responders," *J. of Disaster Research*, Vol.5, No.2, pp. 197-207, 2010.
- [5] Y. Masuzawa, Y. Hisada, M. Murakami, J. Shindo, M. Miyamura, H. Suwa, S. Tanaka, K. Mizukoshi, and Y. Nakajima, "Practice on an Education and Training Program to Development of Response Literacy to Earthquake Disaster in a Central Business District in Japan," *J. of Disaster Research*, Vol.9, No.2, pp. 216-236, 2014.
- [6] FEMA, "ICS All-Hazard Core Competencies-Final," 2007 (last updated), http://www.fema.gov/media-library-data/20130726-1617-20490-3897/ics_core_competencies_sep07.pdf [accessed August 8, 2016]
- [7] M. Inoguchi, K. Tamura, and H. Hayashi, "Realization of Effective Disaster Victim Support Through Development of Victim Master Database with Geo-Reference – A Case Study of 2007 Niigataken Chuetsu-Okai Earthquake –," *J. of Disaster Research*, Vol.5, No.1, pp. 12-21, 2010.
- [8] B.S. Bloom, M.D. Engelhart, E.J. Furst, W.H. Hill, and D.R. Krathwohl (Eds.), "Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain," New York: David McKay, 1956.
- [9] R.M. Gagne, W.W. Wager, K.C. Golas, and J.M. Keller, "Principles of Instructional Design (5th Ed.)," Wadsworth Publishing, 2004.



Name:

Reo Kimura

Affiliation:

Associate Professor, Ph.D., School and Graduate School of Human Science and Environment, University of Hyogo

Address:

1-1-12 Shinzaik-honcho, Himeji, Hyogo 670-0092, Japan

Brief Career:

1994-1998 School of Human Science, Waseda University
 1998-2003 Graduate School of Informatics, Kyoto University
 2003-2009 Assistant Professor, Graduate School of Environmental Studies, Nagoya University
 2009-2011 Associate Professor, Graduate school of Environmental and Disaster Research, Fuji Tokoha University

Selected Publications:

- "Recovery and Reconstruction Calendar," *Journal of Disaster Research*, Vol.2, No.6, pp. 465-474, 2007.
 - "Implementation and Operation of a Cloud-Based Participatory Damage Recognition System to Obtain a Common Operational Picture that Supports a Quick Disaster Response," *International Journal for Infonomics (IJ)*, Special Issue Volume 1, Issue 1, pp. 834-840, 2013.
 - "Current Status and Issues of Life Recovery Process Three Years After the Great East Japan Earthquake Questionnaire Based on Subjective Estimate of Victims Using Life Recovery Calendar Method," *Journal of Disaster Research*, Vol.9, No.sp (special edition), pp. 673-689, 2014.
 - "Comparison Between the Life Recovery Processes After the Mid-Niigata Earthquake and the Chuetsu-Okai Earthquake – Results of a Random Sampled Social Survey Using the Life Recovery Calendar and GIS-Based Spatiotemporal Analysis," *Journal of Disaster Research*, Vol.10, No.2, pp. 196-203, 2015.
 - "Issues Facing Voluntary Evacuees from the Fukushima Daiichi Nuclear Power Plant Accident Based on the Collection and Analysis of Cases of Voluntary Evacuation," *Journal of Disaster Research*, Vol.10, No.sp (special edition), pp. 755-769, 2015.
 - "Organizational Structure and Institutions for Disaster Prevention: Research on the 1995 Great Hanshin-Awaji Earthquake in Kobe City," *Journal of Disaster Research*, Vol.10, No.6, pp. 1051-1066, 2015.
 - "Proposal for Development Cooperation to Enhance the Capacity on Disaster Emergency Response in Developing Countries : A Case Study of Curriculum Development in the People's Republic of China," *Journal of Disaster Research*, Vol.11, No.2, pp. 341-353, 2016.
- ### Academic Societies & Scientific Organizations:
- Japan Institute of Social Safety Science (JISSS)
 - Japan Society for Natural Disaster Science (JSNDS)
 - Japanese Psychological Association (JPA)
 - Japanese Society of Social Psychology (JSSP)
 - Japan Sociological Society (JSS)
 - Seismological Society of Japan (SSJ)
 - Japan Society of Civil Engineering (JSCE)



Name:
Haruo Hayashi

Affiliation:
President, Ph.D. (UCLA), National Research Institute for Earth Science and Disaster Resilience

Address:
3-1 Tennodai, Tsukuba, Ibaraki 305-0006, Japan

Brief Career:
1994-1996 Associate Professor, Disaster Prevention Research Institute, Kyoto University
1996- Professor, Disaster Prevention Research Institute, Kyoto University
2015- President, National Research Institute for Earth Science and Disaster Resilience

Selected Publications:
• Kyoto University/NTT Resilience Joint Research Group (H. Hayashi et al.), “Trial for the Disaster Resilience Society – Come over the Great East Japan Earthquake Disaster,” Nikkei BP Consulting, Inc., ISBN: 9784901823975, 2012 (in Japanese).
• H. Hayashi et al., “Effective method for disaster prevention, ‘Disaster Ethnography’ – unrevealed witnesses of Hanshin-Awaji Great Earthquake,” ISBN: 9784140814055, Japan Broadcast Publishing Co., Ltd, 2009 (in Japanese).

Academic Societies & Scientific Organizations:

- Institute for Social Safety Science (ISSS)
- Japan Society for Natural Disaster Science (JSNDS)
- Japan Emergency Management Association (JEMA)



Name:
Kosuke Kobayashi

Affiliation:
Designer, GK Kyoto Inc.

Address:
657 Higashi-Monzen-Cho, Shokokuji, Kamigyo-ku, Kyoto 602-0898, Japan

Brief Career:
2007- Naris Cosmetics Co., LTD.
2010- GK Kyoto Inc.

Selected Publications:
• “Systematization and Sharing of Disaster Management Literacy by DMLH,” J. of Disaster Research, pp. 176-187, Vol.9, No.2, Feb., 2014.



Name:
Takahiro Nishino

Affiliation:
Managing Director, R2 media solution Inc.

Address:
3F Unoda bldg., 472-2 Hinokuchi-cho, Nakagyo-ku, Kyoto, Japan

Brief Career:
1989- B.A., Kyushu Institute of Design.
1991- M.Eng., Kyoto Institute of Technology
1997- R2 media solution Inc.

Selected Publications:
• “Systematization and Sharing of Disaster Management Literacy by DMLH,” J. of Disaster Research, pp. 176-187, Vol.9, No.2, Feb., 2014.

Academic Societies & Scientific Organizations:

- Alliance for Disaster reduction Designs (ADD), Japan



Name:
Kenshin Urabe

Affiliation:
Designer, GK Kyoto Inc.

Address:
657 Higashi-Monzen-Cho, Shokokuji, Kamigyo-ku, Kyoto 602-0898, Japan

Brief Career:
1993- Graduated from Department of Design, Faculty of Art Studies, Osaka University of Arts
1993- GK Kyoto Inc. Design Department

Selected Publications:
• “Design Principles for Visualization of Public Information for Effective Disaster Reduction,” J. of Disaster Research, Vol.5, No.1, pp. 31-44, Jan., 2010.
• “Consideration of Methodology for Improving Message Transmission Capability by Tsunami Signboard System : A Case Study in Osaka Prefecture Southern Coast Region,” Procs. of the annual conference of the Institute of Social Safety Science, No.18, pp. 99-102, May, 2006 (in Japanese).
• “Nigemasho,” K.K.Kyodo News, 2013. (in Japanese)
• “Visualization of public information and design of prevention of disasters information transmission,” AXIS Magazine, Vol.120 (Disaster countermeasures and design), Axis Inc., Apr., 2006 (in Japanese).
• “Systematization and Sharing of Disaster Management Literacy by DMLH,” J. of Disaster Research, Vol.9, No.2, pp. 176-187, Feb., 2014.

Academic Societies & Scientific Organizations:

- Institute of Social Safety Science, Japan (ISSS)
- Alliance for Disaster reduction Designs (ADD), Japan

**Name:**

Satoshi Inoue

Affiliation:

Designer, GK Kyoto Inc.

Address:

657 Higashi-Monzen-Cho, Shokokuji, Kamigyo-ku, Kyoto 602-0898,
Japan

Brief Career:

1983- Siu Graphica Inc.

1988- GK Kyoto Inc.

Selected Publications:

- “Commonality and Uniqueness of Sign System for Tsunamis Disaster Reduction : A Case Study Based on Tsunami Pictogram 2004,” Procs. of the annual conference of the Institute of Social Safety Science, No.16, pp. 83-86, May, 2005 (in Japanese).
- “Systematization and Sharing of Disaster Management Literacy by DMLH,” J. of Disaster Research, pp. 176-187, Vol.9, No.2, Feb., 2014.

Academic Societies & Scientific Organizations:

- Alliance for Disaster Reduction Designs (ADD), Japan
-