Abstract

In the current Risk Society, each individual is required to obtain risk literacy for safe and secured everyday life. This study aims to conceptualize and examine the component of risk literacy for everyday life, and to construct the practical model and learning program to cultivate risk literacy. To achieve them, the authors designed the learning program for students based on the whole structure of risk literacy, then, composed a lecture that is based on the three components of risk literacy –the state of risk, risk perception and risk coping (risk management and risk communication). Fifty-one students at The Open University of Japan participated in that class; they are adult, full-fledged members of society. After the lecture, the authors performed a self-conducted questionnaire which obtains students' awareness related to risk literacy. Furthermore survey data were analyzed by text mining using with KeyGraph. Main results are as follows; (1) students realized through a lecture that they are the subject for the risk; also they noticed the significance and the methods of performing both risk management and risk communication, (2) students particularly showed strong interest in risk communication. It founds that students assumed conducting risk communication with the people who are their stakeholders in their daily life and the workplace. (3) Three components –state of risk, risk perception, risk coping seem adequate as the components which consists of the whole structure of risk literacy in everyday life, however, the device is necessary which inspires an independence will in students at the level of learning program.

Keywords: Risk literacy; risk perception; risk management; risk communication; learning program; self-conducted questionnaire; text mining

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1 Introduction: background and purpose of study

It is often said that Japan is one of the safest countries, however, various kinds of disasters, accidents, diseases etc. happened (are happening) in various parts of land. In any country, any region or any time, everyone is facing risks in everyday life. Risk is the possibility of undesirable outcome on the life, body, assets and environment of people. Individual ordinary people would suffer from the damage when risk actually materializes.

In the current Risk Society, risk is latent not only in just each individual’s living or activity, but also in the relations among many stakeholders including neighbours, experts, companies, municipalities, countries, and so on. In this sense, keeping continuous communication about risk between related stakeholders is essential. Risk should be coped with based on the risk management process; risk identification, risk evaluation, selecting and processing the countermeasure for risk treatment, and re-evaluation, in parallel to risk communication.

However, in actuality, there are many cases having difficulty in exchanging information about the risk between ordinary people and other stakeholders. It leads to risk management not being carried out appropriately. Moreover, in recent Japan, it is supposed self-help is much important, and risk should be coped with personal responsibility. Under such status quo, each individual is required to obtain risk literacy for the safety and security of its everyday life.

The significance and necessity of risk literacy are often pointed out in the both communities of politics and academia. For instance, in March, 2014, "A policy to promote risk communication" was generated by Ministry of Education, Culture, Sports, Science and Technology. In that policy, "improvement of the literacy of science and technology literacy as well as social literacy for coping with risk" is shown as a future important issue of nation. This policy is meaningful to be payed attention. However, in the policy statement, just indirect descriptions appear about various risks latent in daily life for living individual. There is not the well-organized description that focused on it.

As for the previous studies about risk literacy, they may be categorized into the following five. The first is the studies focus on the limited risk of each field. For example, Murakami (2008) deals with the literacy to discuss the problem of the ecosystem disturbance by foreign animals and plants\(^1\). Mizuno (2006) focuses on the literacy for consumers’ problem\(^2\), and so does Hino (2011) for food risks\(^3\). As the second category, there are some researches indicate the necessity to improve risk literacy for realizing better risk governance, such as the study of Nishizawa & Ikehata (2008)\(^4\). The third includes studies to examine the general concept or definition of risk literacy, for instance Shibata (2006)\(^5\), Nakayachi(2009)\(^6\), and Tanaka (2014)\(^7\). The fourth category is to make clear the components and relations of elements of risk literacy; this includes, for instance, Kusumi (2013)\(^8\) and Kusumi & Hirayama (2013)\(^9\).

As above, researches have been sophisticated related to the significance of risk literacy, conceptualization of risk literacy, and components and structure of risk literacy. Based on such studies, another type of research has been coming up which aims to develop and practice a learning program to cultivate risk literacy as well as to evaluate the effect of that program. For example, Tanaka et.al (2015) carried out a psychological experiment, which offered information related to risk literacy and measured the effect\(^10\). In this research, the effects are measured and analyzed statistically. Takeuchi and others (2005) also examined the effect of a learning support tool specialized in a flood risk with quantitative data statistically\(^11\).

Based on the above situation, this study aims to construct the practical model and learning program to cultivate risk literacy for everyday life. To achieve this, the authors designed the learning program for students based on the whole structure of risk literacy, then, composed a lecture that is based on the three components of risk literacy—the state of risk, risk perception and risk coping (risk management and risk communication). In this study, the authors carried out class for the ordinary living people who are the main stakeholders to generalize the safe and secure society. Furthermore, the effects of this leaning program are examined with data obtained by the self-conducted questionnaire. Specifically, the author examined what students obtained and understand through a class and evaluate it. We examine the class evaluation, and then extract elements which should be feedback into future education. The effect measurement of the program for risk literacy improvement was carried out based on quantitative finding until now. In this study, the authors used not only quantitative but also qualitative material as the free description. We considered the effect with text-mining method to obtain underlying important points. These views and methodology may be original and significant.
In this paper, the authors especially focus on the class evaluation, i.e. the awareness of students related to risk literacy by taking a lecture. The whole purpose of our study and the part dealt in this thesis are shown in Fig.1. This article treats the part surrounded in a dotted line.

[1] Conceptualization of risk literacy for everyday life
- make clear the significant of risk literacy of everyday life
- extract the points of view to grasp risks in the modern society
- build the provisional structure of life risk literacy with the components corresponding to extracted points of view
- feedback the findings of [2] & [3]

[2] Examination of the concrete content of the life risk literacy
- reexamine “Science literary for all Japanese” and the findings of [1]
- feedback the findings of [3]
Points
  • understanding of the state of risk
  • understanding of risk perception
  • understanding and practicing risk coping

- develop the teaching materials based on the findings of [2]
- conduct class with teaching materials
  • object: students of The Open University of Japan participated in that class (adult, full-fledged members of society)
  • style of lecture: classroom session (schooling)
  • time volume: total 680 minutes for one classroom session (85minutes × 8)
Points
  • students’ awareness related to risk literacy
  • students’ needs related to risk literacy

Fig.1 The whole framework of study, the part dealt in this paper

2 Method

2.1 Conceptualization of risk literacy for everyday life

The authors carried out this study by the developing learning program and conducting class. In order to design the learning program for students, the concept and structure of risk literacy for everyday life examined beforehand. Nara (2015) had been made clear the significance of risk literacy for everyday life, extracted the points of view to grasp risks in the modern society, and built the provisional structure of life risk literacy.7,8

Risk literacy for everyday life is structured with three components; (1) understanding of the state of risk, (2) understanding of risk perception, and (3) understanding and practicing the risk coping (including both of risk management and risk communication). The literacy as (1) is the knowledge and understanding about peculiarity of risk and substantial state of risk with qualitative/quantitative data objectively. About the literacy of (2), human being does not perceive risk on the objective state. To be aware this fact is the second literacy. In other words, it is needed to understand the process of risk perception, the mechanism of perception gap, and the elements of perception gap. Furthermore, it is important literacy to understand how risk perception becomes various depending on each position, value, and society. These become the contents of the second risk literacy. About the literacy of (3) understanding and practice risk coping, is to obtain knowledge or technique about human activities to eliminate the objective level of risk (= risk management), as well as to exchange information and opinions about risk (= risk communication). Cultivating the ability to perform such activities in each everyday life is also required.

These (1), (2), (3) are supported by media literacy, science literacy, statistic (mathematics) literacy, and communication literacy. Fig.2 shows the structure of risk literacy of everyday life. This figure is still provisional model; the authors would reexamine by reflecting the findings of actual learning classroom session.
2.2 Construction of learning program

The practical model and learning program for risk literacy of everyday life were constructed based on Fig.2. The authors made resume and PowerPoint-slides for class based on it, and distributed them to students. The main contents of learning materials are corresponded to three components of risk literacy as follows.

(1) Understanding of the state of risk: definition of risk, uncertainty and risk, mechanism of damage occurrence (hazard, peril and risk), quantitative evaluation of risk (severity, frequency, exposure, endpoint), qualitative evaluation of risk (list of risk domains), method to express the level of risk (risk of death in annual, risk of death in lifetime).

(2) Understanding of risk perception: difference of objective risk and subjective risk, perception gap (mechanism and examples), heuristics, perception bias (mechanism and examples), risk acceptance, risk image.

(3) Understanding and practicing the risk coping: relations between risk management and risk communication, risk management process, risk communication process, techniques of risk management, techniques of risk communication, importance of trust, importance of coupling of in usual and in emergency, experiment of risk communication (cross-road game).

2.3 Conduction of classroom sessions

Actual class was held as follows.

- Subjects of class practice: Fifty-one students at The Open University of Japan (OUJ) participated in that class; they are adult, full-fledged members of society. The number of female is 25 (49%) and male 26...
(51%). Age: 20s is 2(4%), 30s 5(10%), 40s 12 (24%), 50s 12(24%), 60s 16(32%), and 70s and more 3(6%).

- Date: 23rd and 24th May 2015 at Ehime Study Center of OUJ, 31st Oct and 1st Nov 2015 at Nagano Study Center of OUJ.
- Time volume of each lecture: total 680 minutes for one classroom session (85minutes * 8).
- Style of class: classroom session, so called “schooling” although OUJ is mainly for long-distance education, it provides another style of education; classroom session. Lecturer and students can interact with face to face communication.
- Learning materials: resume (23 pages) and PowerPoint-slides (116 sheets).

2.4 Evaluation of learning program

After the class, the authors performed a pre-coded questionnaire and self-conducted questionnaire which obtains students' awareness related to risk literacy.

The pre-coded questions are as follows;

- Do you think the teaching material helpful? (“strongly Yes [5]”) - “not either [3]” - “strongly No [1]”
- Do you think the lecture was clear and easily understood? (“strongly Yes [5]”) - “not either [3]” - “strongly No [1]”
- Do you think you got more awareness and understanding about the state of risk? (“strongly Yes [4]” - “strongly No [1]”)
- Do you think you got more awareness and understanding about the risk perception? (“strongly Yes [4]” - “strongly No [1]”)
- Do you think you got more awareness and understanding about risk communication? (“strongly Yes [4]” - “strongly No [1]”)

The self-conducted question is as follow;

- Are there any contents in this lecture which you felt that "I knew it, but it is better to understand well" or "I did not know it (or I mistook it) before, but this lecture gives me knowledge"? What are such contents or points? Please write them concretely.

Self-conducted questionnaire data were analyzed by text mining system KeyGraph; which does not spoil an impression of narrative words securing objectivity to some extent. KeyGraph is an algorithm for extracting keywords representing the asserted main point in a document, designed by Yukio Ohsawa. KeyGraph is based on the segmentation of a graph, representing the co-occurrence between terms in a document, into clusters. It can visualize results as a network diagram, is intend to promote metacognition. KeyGraph has distinctive skill extracting some remarkable key words which occurs infrequently. These functions can realize expressing an underlying important matter and making correspondent the contents which lecturer intent to send and students received. From these points, KeyGraph is supposed one of the most suitable tools for the analysis plan of this study.

3 Results and discussions

3.1 Evaluation on lectures with the results of pre-coded questions

Results of pre-coded questions about lecture are shown in Table.1. Most of students answered that teaching materials were helpful, and the lecture was clear and easily understood. About each component of risk literacy, relatively high ratio of students thought that they got more awareness and understanding about the state of risk, risk perception and risk communication.
Table 1 Evaluation of lectures with pre-coded questions (n=51)

<table>
<thead>
<tr>
<th></th>
<th>strongly Yes (%)</th>
<th>somewhat Yes (%)</th>
<th>not either (%)</th>
<th>somewhat No (%)</th>
<th>strongly No (%)</th>
<th>max. means</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you think the teaching materials helpful?</td>
<td>88</td>
<td>10</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>4.86</td>
</tr>
<tr>
<td>Do you think the lecture was clear and easily understood?</td>
<td>86</td>
<td>10</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>4.82</td>
</tr>
<tr>
<td>Do you think you got more awareness and understanding about the state of risk?</td>
<td>70.6</td>
<td>29.4</td>
<td>—</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>3.71</td>
</tr>
<tr>
<td>Do you think you got more awareness and understanding about risk perception?</td>
<td>80.4</td>
<td>19.6</td>
<td>—</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>3.8</td>
</tr>
<tr>
<td>Do you think you got more awareness and understanding about risk communication?</td>
<td>80.4</td>
<td>17.6</td>
<td>—</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>3.78</td>
</tr>
</tbody>
</table>

3.2 Evaluation of lectures with the results of self-conducted question

The awareness of students related to risk literacy in classroom session

The answer for self-conducted question; ‘Are there any contents in this lecture which you felt that "I knew it, but it is better to understand well" or "I did not know it (or I mistook it) before, but this lecture gives me knowledge"? What are such contents? Please write them concretely’ was obtained with text data. Then it is analyzed using KeyGraph. Fig. 3 shows the output.

At the lower left part of this figure, it is observed that [risk management] and [risk communication] connect. The significant coupling of them was one of the most important subjects in this class, so this output made authors pleased.

There is a big cluster on the left side in this figure including the connection of [risk management] and [risk communication]. This cluster shows the following awareness of students; [risk] is [perceived (perception)] subjectively, so it is [important] to introduce both [risk management] and [risk communication] into their daily life, and each student ([myself]) commit all through the process of risk perception, risk management and risk communication.
As for the big cluster in the right side, many nodes including [before], [management], [workplace], [interdisciplinary] are connected to [this time]. This cluster shows students noticed various things that they have not known [before], and they got knowledge [this time (in this classroom session)]. Besides, from observing the connections between [this time] and [workplace], [management], [necessary], it is suggested that student would recognize the need of actual practice in own field including one's workplace based on risk literacy.

In addition, the connection with [interdisciplinary] shows the awareness that risk is the object of not only practices but also science. Similar relation is seen in the upper part of the figure. There is connection of [safety], [security], [everyday] and [research]. This indicates students found out that both aspects of spoiling and realizing [safety] and [security] depend on the both [everyday] and [research].

In addition, [method] ties the right big cluster and the left big one. This indicates students understood the significance of recognizing, managing and communicating about risks with appropriate [method] developed by science and practices. Furthermore, it deserves our attention that [person] and [everyday life] bridge the right cluster and left one. This bridging suggests that students grasped risk issues as their own matters by this classroom session.

The tangible and latent structure of learning material

The concrete contents of learning materials have already been explained in 2.2. Here we analyze them using with resume (23pages) and KeyGraph so that we can grasp not only tangible structure of classroom session but also latent structure which combined with contextual elements of materials.

Fig. 4  Graph of nouns, verbs and adjectives of learning material related to risk literacy used in classroom session

Fig. 4 is the graph of nouns, verbs and adjectives for the resume used in lecture of classroom session. At least three clusters can be shown surrounding [risk] which is the hub word. [Risk communication] is key concept to solve [problem] between [person] and person in [society], [data] and [trust] are also key elements for successful risk communication. Another cluster in the lower part has significant connection between [perception] and [bias] as well as [management], [objective] and [state]. This cluster means that [objective] data and analysis on the [state] of risk is essential for successful risk management, however, it is also indispensable to consider the effect of risk [perception]. There is a small cluster just right side; it consists of [judgement], [evaluation], [value] and [person]. It is interesting
for the authors because we did not expect the connection of these words. KeyGraph extracted this significant connection; [value] is the essential element for [person] when he makes any judgement or evaluation.

The corresponding between students’ awareness and learning material

In order to examine the corresponding between students’ awareness and learning material, we put Fig. 3 on Fig. 4 forming two layers of seats. The same node of two seats is displayed at the same position, therefore, it can be confirmed the common and different nodes of two on one piece of seat. The result is shown in Fig. 5.

Overlapping nodes of students’ awareness and learning program resume are [information], [person], [risk communication], [risk], [perception] and [research]. These nodes are commonly reflected both of the message lecturer sent and the awareness students got in class. It is suggested that the importance of [person] as the subject of dairy life and [information], knowledge and significance about [perception] of [risk] and [risk communication] were sent in class session, and students received them. All these words are basic terms for understanding and coping with everyday life risk. In classroom session, the lecturer introduced various [research] on risk, and explained knowledge based on these studies. Then students selected the word of [research] in their report. It is supposed students noticed this fact itself, at the same time they would connect the findings of academic research to their real field.

The learning contents depended on the provisional model as we mentioned in 2.1 and 2.2. These results in Table 1 and three figures indicate this model seems adequate to some extent with elements and components to obtain risk literacy.

![Overlapping nodes](image)

**Fig. 5** Graph of overlapping nodes of students’ awareness and learning material

4 Conclusions

The authors have been trying to examine the component of risk literacy of everyday life, and to construct the practical model and learning program to cultivate risk literacy. To achieve them, this paper designed the learning
program for students based on the whole structure of risk literacy, then, composed a lecture that is based on the three components of risk literacy. Fifty-one students of OUJ participated in that class. Survey data of students’ awareness related to risk with self-conducted questionnaire were analyzed by text mining.

As a result, students realized through a lecture that they are the subject for the risk; also they noticed the significance and the methods of performing both risk management and risk communication. Students particularly showed strong interest in risk communication. It founds that students assumed conducting risk communication with the people who are their stakeholders in their daily life and the workplace. Three components—the state of risk, risk perception, risk coping (risk management and risk communication) seem adequate as the components which consists of the whole structure of risk literacy in everyday life.

In this paper we discussed about the evaluation of learning program using with students’ awareness data, and it is suggested that three components and substantial contents seems adequate to obtain risk literacy for everyday life. However, more future works are needed. In order to improve program more effectively, students’ needs for class have to be examined. For instance, what kind of knowledge related to risk students want and deepen have to be grasped and analyzed. The authors are willing to discuss about this in another paper. Furthermore, this thesis treated only fifty-one students’ data of twice classroom sessions. We have plans to give more lectures reflecting the results of this study, and obtain more data. Through such works, we are going to perform construction of practical program, and reconceptualization life risk literacy.

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