

A Practical Project to Develop Teaching Materials for Japanese Primary School Home Economics Lessons in Collaboration with Local Businesses to Boost Risk Reduction and Resilience Education

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# A Practical Project to Develop Teaching Materials for Japanese Primary School Home Economics Lessons in Collaboration with Local Businesses to Boost Risk Reduction and Resilience Education

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# Abstract

The purpose of this paper is to report on a practical project to develop teaching materials for use in primary school home economics education, undertaken jointly by the authors and two local companies in Fukui Prefecture, Japan (Plus Jack Inc. and Technowarp Co., Ltd.).

This report highlights international trends and demands in Risk Reduction and Resilience Education (from the UN's Sendai Framework for Disaster Reduction 2015-2030 and the Global Alliance for Disaster Risk Reduction and Resilience in the Education Sector, specifically the Comprehensive School Safety Framework 2022-2030), and how these dovetail neatly with trends and demands in Japan (from government laws and documents, including the Course of Study for home economics). These frameworks constitute the theory on which the practical project was premised and then enacted, especially in terms of (1) fostering social capital that leads to enhanced resilience, and (2) passing on the lessons learnt from previous disasters, all through close collaboration with local companies. Thus, the value of developing home economics teaching materials in collaboration with local businesses is elucidated.

This paper details the process and progress of this collaborative project to create the teaching materials, including piloting them in experiments, first with university students and then with primary school students themselves.

As a result of the project, the 'yoji-yoji' retroreflective straps and the disaster prevention

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whistle 'Infinity' were developed as teaching materials for primary school home economics lessons. Beyond that, though, both teaching materials are intended to be used on a daily basis as disaster prevention tools/resources to protect children even after the end of the study. Future research will aim to develop further primary school home economics lessons using these and other teaching materials and evaluate the effectiveness of such teaching materials through thorough ongoing practical classroom research.

Keywords: Japanese Primary School Home Economics Lessons, Risk Reduction and Resilience Education, Teaching Materials, *Collaboration with Local Businesses* 

# Introduction

# I. Introduction

In recent years, disasters have become more frequent in all regions of the world due to the effects of climate change. Thus, there is growing concern about extreme events that cause unforeseen damage. Disasters cause extensive damage to entire societies, exacerbate inequalities between people and nations, and slow down the progress of sustainable development. The United Nations' Sendai Framework for Disaster Reduction 2015-2030 therefore states that, 'It is urgent and critical to anticipate, plan for and reduce disaster risk to more effectively protect persons, communities and countries, their livelihoods, health, cultural heritage, socioeconomic assets and ecosystems, and thus strengthen their resilience.'

Resilience is generally a concept encompassing multiple meanings, such as 'unwavering determination' and 'adaptability'. However, resilience in the field of disaster management is rather defined as: 'The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management' (UNDRR, 2017, p. 22). It is a concept that, together with Risk Reduction, has been increasingly emphasized in the field of disaster management in recent years, when there are grave concerns about the occurrence and recurrence of serious disasters in many parts of the world.

In this context, the Sendai Framework for Disaster Risk Reduction (SDRF) outlines sectoral and cross-sectoral actions at the local, national, regional and global levels under four 'priority actions' to be taken to reduce disaster risk and strengthen resilience. One of the actions listed under 'Priority Action 1: Understanding Disaster Risks' at the national and local levels is promoting education and training. Indeed, the Sendai Framework for Disaster Reduction stresses the need to: '(l) Promote the integration of knowledge on disaster risks, including prevention, mitigation, preparedness, emergency response, recovery and reconstruction, into formal and informal education, and civic and professional education and training at all levels'.

However, given the reality that once a natural disaster occurs, the risks in everyday life, such as poverty, hunger, persecution, accidents and incidents, become more serious, even education related to natural disaster risks will need to incorporate all risk perspectives. Therefore, as will be discussed below, the promotion of 'Risk Reduction and Resilience Education' for all risks, not just natural disasters, is a glocal and global challenge today.

In light of this pressing need, the authors worked on a project to develop teaching materials for use in primary-schools home economics education in collaboration with local companies in Fukui Prefecture (Japan), to promote practical Risk Reduction and Resilience Education in school education in Fukui Prefecture. Through this collaboration, the companies developed products for people to be prepared for, and to use, if/when disaster strikes. However, given recent trends in Risk Reduction and Resilience, this project has significance not only from the aspect of school education, but also from the aspect of fostering social capital, which is emphasized in disaster management (and defined as 'the web of interpersonal connections, social networks, cultural heritage, traditional knowledge, trust, and the institutional, arrangements, rules, norms and values that facilitate human interactions and cooperation between people,' Costanza, 2013, p. 1), and from the aspect of passing on lessons from disasters. This paper therefore aims to provide an understanding and practical examples of Risk Reduction and Resilience Education, based on recent trends both internationally and in Japan, and insight into related initiatives.

The flow of the paper is as follows: I. Introduction, II. About the project, III. Relationship between Risk Reduction and Resilience Education trends and the project, IV. Details of the development of the teaching materials, and V. Conclusion.

# II. About the project

# 1. Objectives and overview

The project aimed to promote Risk Reduction and Resilience Education in primary schools in Fukui Prefecture, through the collaboration of primary investigator (Suekawa, University of Fukui) with Plus Jack Inc. and Technowarp Corporation, from July 2021 to October 2022. The two are both local companies manufacturing disaster prevention products (among others) and, through the project, we developed teaching materials for learning about disaster prevention for use in home economics classes in primary schools.

The project also aimed to achieve two corollary goals that came with the initiative. One was to contribute to the building of social capital, leading to increased resilience through joint development

with local enterprises. The second was to link it to the content of Japanese home economics education so that children can apply lessons from disasters in their daily lives. In the following subsection, the value of co-development with local enterprises from the perspective of Risk Reduction and Resilience and the value of linking this to the curricular content of Japanese home economics education will be illuminated.

# 2. Value of joint development with local enterprises: strengthening social resilience through teaching materials

(1) About the jointly developed enterprises

Technowarp Corporation and Plus Jack Inc. are both companies that not only manufacture and sell their products in Fukui Prefecture but also contribute to their local communities by supporting disaster prevention and crime prevention. Developing educational materials in collaboration with local companies has the potential to foster social capital that can function in disaster prevention, during disasters, and in the post-disaster recovery period. A fuller definition is provided above, but, in a nutshell, social capital is a network of people and organisations, and the concept of trust built into such a network is seen as social capital.

To gain a bird's-eye view of the interrelationships between disaster recovery, resilience, and public policy, Shimizu (2018), who made a basic conceptualisation based on previous studies on these issues, summarised the relationship between disaster prevention and resilience into five points, one of which is that resilience is deeply related to social capital. Here, Shimizu, building on Daniel P. Aldrich's view, indicates the need for investment in social capital, as well as physical infrastructure development, in the post-disaster recovery process.

For example, the Japanese government's 2014 White Paper on Disaster Reduction (Cabinet Office) stated that in the Great Hanshin-Awaji Earthquake (1995) and the Great East Japan Earthquake (2011), many people lost their lives as a result of damage to administrative institutions and delays in initial response. It was recognized that administrative agencies in Japan may not always function adequately in times of disaster because of the difficulties encountered in rescue operations due to sustaining unexpected damage (Limitations of Public Assistance). This has been confirmed by the reports of survivors who faced critical situations, such as being trapped under collapsed buildings or forced to live in evacuation centres due to the collapse of their homes, and were rescued not by official rescue teams but rather by family members or neighbors, or by people who had effectively adopted disaster prevention and mitigation measures in their daily lives. Therefore, in Japan today, people need to be prepared both at home (self-help) and at the community level (mutual aid) by building trusting relationships with people in the community. Thus, building trust-based relationships

in the community before a disaster strikes, through robust disaster management initiatives, can form the basis for cooperation during a disaster and during the recovery period, which in turn can lead to enhanced disaster resilience.

In light of this, the project intended to provide an opportunity to build trust-based relationships between a university and local enterprises (and, ultimately, local schools) and to strengthen cooperation in the field of disaster management. In addition, through the use of teaching materials produced by local companies, the project intended to provide an opportunity for teachers and children to learn about the collaborative disaster management efforts of a university and companies in Fukui Prefecture, thereby contributing to strengthening the overall resilience of Fukui Prefecture.

One of the advantages of developing educational materials in collaboration with local companies is that, even after initially using them as educational materials, children can then also continue to use them as disaster prevention and mitigation equipment to protect themselves in times of disaster. Even if children learn about disaster prevention in school, that learning will be meaningless if they do not actively engage in it in their own lives. Therefore, these two local companies were asked to cooperate in the development of teaching materials that are durable enough to continue to be used after the classroom lessons and that are backed by scientific evidence that they can protect lives in the event of a disaster, so that all children, regardless of gender or disability, can be prepared in their own lives.

(2) Technowarp Corporation (Sabae City, Fukui Prefecture) and its reflective ribbon initiative

Technowarp Corporation is a manufacturer of eco-friendly knitted fabrics for sportswear and automobiles, etc. The company manufactures accessories (sleeves, collars, and ribbon tapes) for school gymnastics uniforms, etc., in which it has used retroreflective materials. Retroreflective materials are 'surfaces or devices that, when irradiated from a certain direction, retroreflect a relatively large portion of the incident light (returning it in the direction of incidence)' (Japanese Ministry of Land, Infrastructure, Transport and Tourism, 2009) and are used on vehicles and traffic signs to prevent accidents. The company, in cooperation with the Fukui Prefectural Citizens' Safety Division and the Traffic Safety Association, has been developing products and holding events using colourful reflective ribbons manufactured in-house, to promote the use of reflective materials among pedestrians to prevent accidents at night. In particular, for children, events were held to produce straps by attaching the company's ribbons to wire-filled braid (like pipe cleaners) and transforming them into the desired shapes (as was reported in an article in the *Fukui Shimbun*, 8 October 2012 morning edition).

Based on these achievements, the project developed educational materials, using the reflective

ribbons manufactured by Technowarp Corporation, to help children learn the importance of ensuring their safety outdoors at night, including during disasters.

(3) Plus Jack Inc. (Sabae City, Fukui Prefecture) and its disaster prevention whistles

Plus Jack Inc. is a company that manufactures eyeglasses using cellulose acetate, a vegetablebased resin made mainly from cotton. However, the company also manufactures disaster prevention whistles using the same materials, technology and processes as for its spectacles. According to the company's website (https://plusjack.com/), the company was inspired to produce the disaster prevention whistle by a request from the Sabae City Hall Disaster Prevention Division. The department distributed metal whistles to residents after the Great Hanshin-Awaji Earthquake (1995), which killed many people who were trapped under buildings and other structures and thus often unable to call for help. However, although residents understood that the whistles would be useful in times of disaster, they did not carry them with them because it was difficult to match the metal whistles with their normal clothing. The department therefore commissioned the production of beautiful whistles made of cellulose acetate, the same material used in Plus Jack's eyeglasses, in a variety of vibrant colours, so that residents would want to carry the whistles with them.

The effectiveness of the non-electric whistle in times of disaster is that it never runs out of batteries and anyone can blow it to let people know where they are. Sound plays a very important role in rescue operations, and even if humans cannot hear the sound, rescue dogs and electronic detectors that can pick up small sounds can detect the sound and rescue can be carried out. However, there is no standard for a 'disaster prevention whistle' in Japan, so any whistle can be freely sold under that designation. After two years of trial and error, Plus Jack developed its whistle structure to ensure that the whistle it manufactures can play an effective role in times of disaster because it has: (1) a blowing port that is easy for children and the elderly to use, (2) an internal structure that allows the whistle to produce a sound even when the blower's lung capacity is low, and (3) a mechanism that allows water to enter the whistle but then be removed with just one swing. The company then spent three years scientifically researching the pitch of the sound of the whistle. The company's whistle produces a sound in the frequency range of 2 kHz to 5 kHz, which humans can hear, mainly at the high-frequency range of 4 kHz, which is said to be easily audible even through rubble, and above 20 kHz, which is the range that rescue dogs can hear. Following the above process, Plus Jack Inc. began to produce and sell the disaster prevention whistle 'effe'. The highly fashionable disaster prevention whistle has attracted attention from various quarters, including the press (for example, an-an magazine No.2177 27/11/2019, p. 13).

Based on the above achievements, the project piloted a newer disaster prevention whistle

especially for children in collaboration with Plus Jack Inc. in order to develop educational materials for children to protect themselves from danger in their daily lives after learning about response and prevention in the event of a disaster or other danger.

(Note that this project with Plus Jack Inc. has also been reported from the perspective of realising sustainable local communities [Suekawa, 2024]).

# 3. Value of developing teaching materials for home economics: lessons from disasters in Japan

(1) Lessons from disasters experienced in Japan and home economics

The value of Risk Reduction and Resilience Education in home economics is that the curriculum of home economics, which aims to equip students with the skills to live better as citizens in their family life and the community around them, can help meet the needs for disaster reduction in Japan as identified by learning from previous large-scale disasters. The Basic Law on Disaster Management (災害対策基本法) is an ongoing response to the need for disaster management in Japan identified by the tragic experiences of previous major disasters.

This law is designed to protect Japanese society and the lives of its citizens from disasters and is the basis for disaster-related laws and administrative measures in Japan. The law was formulated based on the lessons learned from the Ise Bay Typhoon (1959), the deadliest typhoon to hit Japan, and has since been revised every time a disaster occurs to improve resilience by revising the law based on the damage caused by each successive disaster. In particular, the Great Hanshin-Awaji Earthquake and the Great East Japan Earthquake, which were followed by secondary disasters such as fires, tsunamis and nuclear disasters, resulting in extensive and long-term damage, rendered major revisions of the law necessary. The revisions triggered by these disasters are characterised by the inclusion of content that encourages people to prepare themselves at home (self-help, 自助, *jijo*) and volunteer (mutual-help, 共助, *kyoujo*), in addition to the development of infrastructure and disaster prevention plans and other disaster countermeasures to be undertaken by the government (public assistance, 公助, *koujo*). Not only in the case of the revision of the law but also throughout Japan, it is becoming common knowledge that individuals, households, and communities need to work together to prepare for disasters, based on the lessons learnt from the events that occurred during the numerous previous disasters.

The curriculum of home economics, which has been designed to comprehensively address the activities of family life and to develop the ability of children, the future leaders of society, to lead a better life in cooperation with others as citizens, can respond to these needs for disaster preparedness in Japan.

# (2) Goals and content of home economics education in Japan

No two individuals, families or communities are the same. Therefore, it is difficult to standardise disaster reduction efforts, and for each individual and household to make the necessary preparations in cooperation with community stakeholders; a deep understanding of everyday life and the community, and the ability to act with the knowledge and skills related to disaster reduction, as well as to act with initiative, are required. In this context, reference to the Japanese home economics curriculum shows that home economics learning has high potential to contribute to the formation of a foundation for risk and disaster reduction. The objectives of primary school home economics are set out to develop the knowledge and skills, the ability to think, express and judge, and the ability to learn humanity for children to improve their own lives. The Course of Study (2017) for primary school home economics states that the goals are as follows (p. 12. This and all other translations of Japanese to English in this paper were done by the authors):

To develop the qualities and abilities to devise ways to improve their lives through practical and experiential activities related to food, clothing, shelter and other aspects of life, using their views and ideas related to the activities of daily life, as follows.

- (1) To develop a basic understanding of the family, home, food, clothing, shelter, consumption and the environment necessary for daily life, and to acquire the skills necessary for these areas.
- (2) Cultivate the ability to solve problems by finding problems in daily life, setting issues, thinking about various solutions, evaluating and improving practices, and expressing what they have thought.
- (3) Cultivate a practical attitude to cherish family life, think about relationships with family and community members, and devise ways to improve life as a member of the family.

In addition, the curriculum of Japanese home economics is designed to progress from primary school, junior high school, and high school, and to make learning at each developmental stage appropriate and consistent, with a central focus of 'views and ideas about the activities of daily life' being established. Specifically, the Courses of Study for each school type indicate the following (as stated in the primary school version, p. 12):

The concept of 'develop views and ideas on the activities of daily life' means that the students should be able to grasp the events of daily life related to the family and home, food, clothing, shelter, consumption and the environment, which are the subjects of home economics, from the perspective of

cooperation and collaboration, health, comfort and safety, the transmission and creation of lifestyle culture, the building of a sustainable society, etc., and to create a life of independence and togetherness throughout life. The curriculum is designed to help students to develop a better way of life.

Thus, the subject of study in Japanese home economics is the dignified life of each individual, including family and home, clothing, housing and food, consumer life and a sustainable environment. On this basis, Risk Reduction and Resilience embody the concept of 'safety', which is the basis of a dignified life. Therefore, learning the subjects of home economics (e.g. family communication plans in times of disaster, clothing for evacuation, disaster-resistant housing, health and nutrition in times of disaster, and bad business practices in times of disaster), together with the perspective of disaster prevention gleaned from the lessons of prior disasters, can lead to the improved resilience of individuals and families, which in turn can lead to the more robust resilience of society as a whole. Therefore, the project worked on the development of teaching materials for home economics.

# III. Relationship between Risk Reduction and Resilience Education trends and the project1. Characteristics of the project from the perspective of Risk Reduction and Resilience Education

So far, we have described the value of developing teaching materials in collaboration with local companies from a broader Risk Reduction and Resilience perspective and the value of learning Risk Reduction and Resilience in home economics. Then, this subsection will focus on Risk Reduction and Resilience Education and list the following three features of the project:

Feature i: In line with the international trend whereby schools are required to implement Risk Reduction and Resilience Education in collaboration with various stakeholders, the project to develop teaching materials in collaboration with local companies is an example of how such collaboration can be achieved.

Feature ii: The project to develop teaching materials on Risk Reduction and Resilience for use in school education responds to the international need to promote Risk Reduction and Resilience Education.

Feature iii: The project to develop teaching materials for home economics will offer a practical response to the current situation in Japan, which requires the implementation of Risk Reduction and Resilience Education on natural disasters in each educational subject area.

To explain the above rationale, some international and Japanese trends regarding Risk Reduction and Resilience Education will be elucidated.

### 2. Characteristics from an international perspective

(1) What is the Comprehensive School Safety Framework?

The Comprehensive School Safety Framework 2022-2030 (hereafter, CSSF) is a framework for ensuring that people can continue to receive as safe, equitable and high-quality an education as possible in the event of threats such as disasters, conflicts and infectious diseases such as COVID-19. First developed in 2012, the CSSF was revised in 2016 and is now part of the Global Alliance for Disaster Risk Reduction and Resilience in the Education Sector (GADRRRES) and its regional affiliates in Asia-Pacific and Latin America and the Caribbean. It has led consultations that resulted in the development of the Comprehensive School Safety Framework 2022-2030 for Child Rights and Resilience in the Education Sector.

The document stated that, 'The purpose of the CSSF 2022-2030 is to provide strategic guidance to duty bearers and their partners to promote safe, equitable and continuous access to a quality education for all'. It then lists 'The Goals of Comprehensive School Safety' as follows (p. 3):

The goals of comprehensive school safety are to take a participatory risk-informed approach to:

- 1. protect learners, educators and staff from death, injury, violence and harm in schools and other learning spaces.
- plan for education and protection continuity, and limit disruptions to learning in the face of shocks, stresses, hazards and threats of all kinds.
- 3. promote knowledge and skills of learners and duty-bearers, to contribute to risk reduction, resilience building, and sustainable development.

The structure of the CSSF is based on 'Enabling Systems and Policies', with 'Pillar 1: Safer Learning Facilities', 'Pillar 2: School Safety and Educational Continuity Management', and 'Pillar 3: Risk Reduction and Resilience Education' (see Figure 1 below). The document further states (p. 3) that, 'The CSSF has four key components, including a cross-cutting foundation and three intersecting pillars. Each component is distinguished by specific scope, sets of actors, responsibilities, and strategies. In particular, Pillar 3: Risk Reduction and Resilience Education, which is most pertinent to this project, states its objectives as follows: 'Risk reduction and resilience education focuses on those measures aimed at creating content, processes and learning opportunities for children, staff and school communities (including parents) to develop individual and community-level resilience to the risks they face.'

# Figure 1

The Comprehensive School Safety Framework (p. 4)

# The Comprehensive School Safety Framework



• SDGs • SFDRR • The Paris Agreement • EVAC Safe to Learn • SS Declaration •

# (2) Background to Feature i.

Referring now to the Key Actors in Pillar 3: Risk Reduction and Resilience Education, the framework elucidates that it should comprise a broad-based alliance of individuals and organisations both directly and indirectly involved in school education (p. 12): 'Education sector leaders in public, private and faith-based organizations developing curriculum content at national and sub-national levels' and 'School principals, teacher trainers, teachers, youth movement leaders, learning activity facilitators and volunteers', as well as 'Community organizations such as child protection committees, Parent-Teacher Associations (PTAs), student clubs, government, youth-led organizations, peer educators, persons with disabilities organizations, and others' etc. In addition, in the area where Pillars 1 and 3 overlap, as indicated by 'Construction as an educational opportunity, with the community' (p. 14), the desired international policy for 'Risk Reduction and Resilience Education' shows that the whole community surrounding schools, and by extension the wider society as a whole, needs to be involved. Therefore, this project in collaboration with local companies is considered to provide knowledge and practical measures as a way of realising collaboration in the current situation, in which the implementation of Risk Reduction and Resilience Education in schools is required through working together with various stakeholders.

# (3) Background to Feature ii

Among the key responsibilities of CSSF Pillar 3: Risk Reduction and Resilience Education are to 'Develop quality teaching and learning materials for students and teachers related to life skills, risk reduction, safety, climate change action, health and hygiene, and social cohesion' and to 'Support peer-to-peer awareness-building, fostering leadership, cultural expression, and psychosocial support' (p. 13). Furthermore, the 'Recommended strategies' include the need to 'Ensure learning materials and key messages are accessible as widely as possible to overcome inequities and barriers for vulnerable groups (e.g., minority languages, for children with disabilities, etc.)' (p. 13). Thus, the development of materials that are easy to use for teachers and students, and for everyone, regardless of nationality, disability, etc., is an international need for the promotion of 'Risk Reduction and Resilience Education'. Therefore, this project to develop teaching materials for use in school education will promote Risk Reduction and Resilience Education by instantiating it and improving its quality.

# 3. Characteristics from the context of trends in Japan

(1) What is 'school safety' in Japan?

Based on the experience of large-scale wide-area disasters such as the Great Hanshin-Awaji

Earthquake and the Great East Japan Earthquake, as well as the situation concerning the safety of children and schools, including incidents and troubles involving children, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) has focused on various educational measures, especially since the early 2000s, to improve 'school safety'. In 2001, MEXT produced the 'School Safety Document: Safety Education in Schools to Develop the "Ability to Live" ( $\pm \& & \exists \end{pmatrix}$ ) which can be used by schools throughout Japan to enhance safety education and appropriate safety management in schools. This material was revised in 2010, and the 2019 edition is the latest, having been revised to reflect lessons learned from the Great East Japan Earthquake and other factors.

The latest document states (p. 9) that the aim of school safety is 'to develop the qualities and abilities of pupils and students to act safely on their own and to contribute to the safety of others and society, and to create an environment that ensures the safety of pupils and students'. In Japan, school safety is classified into three areas: 'life safety', 'traffic safety', and 'disaster safety (synonymous with disaster prevention)'. Life safety deals with incidents and accidents that occur in daily life at school and at home. It also includes the prevention of criminal damage such as kidnapping and injury. Traffic safety covers hazards and safety in various traffic situations and accident prevention. Disaster safety encompasses natural disasters such as earthquake/tsunami disasters, volcanic eruptions, wind, water and snow damage, as well as fire and nuclear disasters.

In Japan, school safety is also classified in terms of activities. Activities related to school safety consist of 'safety education' and 'safety management', and the two need to be interrelated and organized. In particular, safety education aims to develop a practical understanding of the matters necessary to ensure safety in all aspects of daily life, to cultivate a foundation for a safe life throughout life based on respect for life and others, and to develop the qualities and abilities to willingly participate in and contribute to the creation of a safe and secure society. Therefore, based on the above classification in Japan, disaster prevention education can be explained as 'safety education' on 'disaster safety'. The Courses of Study indicate that such safety education is to be implemented throughout the entire educational activities of schools.

# (2) Background to Feature iii.

In the latest revision of the Courses of Study (2017), the basic policy of the revision was to enable each school in Japan to do more curriculum management in their schools based on the Courses of Study. It stated that 'to develop the qualities and abilities required in response to contemporary issues, it is necessary to enhance cross-curricular learning'. Therefore, the latest Courses of Study stipulate that

the actual conditions of children, schools and communities should be properly grasped, the

contents of education necessary to realise the aims and objectives of education should be formulated from a cross-curricular perspective, the implementation of the curriculum should be evaluated and improved, and the human and material systems necessary to implement the curriculum should be secured and improved.

Curriculum management is to systematically improve the quality of educational activities in each school based on the curriculum through such measures as evaluating the implementation of the curriculum and improving it, and ensuring the human and material resources necessary for the implementation of the curriculum (hereinafter referred to as 'curriculum management'). The Government of Japan also states that it will 'endeavour to improve the quality of educational activities in each school systematically based on the curriculum'. At the same time, as 'cross-curricular educational content to respond to contemporary issues', 13 examples of educational content were given, including 'education on safety including disaster prevention', and it urged schools to organise curricula that make the most of their particular characteristics, taking into account the actual conditions of children, schools and communities, and the stage of development of children.

The advantages of focusing on contemporary issues in each subject and across subjects include the ability to simultaneously study the basic content of subjects necessary for understanding contemporary issues, and the fact that the same theme can be dealt with in several subjects, leading to deeper learning. Therefore, this project to develop teaching materials for home economics can be seen as a response to the current needs in Japan, where the construction of Risk Reduction and Resilience, including disaster prevention, is recognised as a contemporary issue and requires implementation in each subject area.

# IV. Details of the development of teaching materials

### 1. Basic policy for development

In Japanese primary schools, home economics is introduced and taught in the fifth and sixth grades. The annual number of hours of lessons in home economics, as stipulated by the School Education Law Enforcement Regulations, is 60 hours in the fifth grade and 55 hours in the sixth grade, usually two credit hours per week in succession.

At present, the content of primary school home economics is broadly divided into: A. Family and home life, which relates to cooperation with family and community members; B. Food, clothing and shelter life, in which children learn about healthy, comfortable, safe and abundant food, clothing and housing; and, C. Consumer life and environment, which focuses on the familiar consumer environment to build a sustainable society. The children are supposed to learn the content items listed in Table 1 (below). In addition, a key feature of home economics is its emphasis on learning through experiential activities. Accordingly, learning activities are supposed to incorporate practical training and experiments, such as exchange meetings with local people, volunteer activities, cooking practice, clothing production and simulated shopping experience, along with traditional teacher instruction.

# Table 1

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A Family and home life	B Food, clothing and shelter life	C Consumer life and environment
<ol> <li>Personal development and family and home life</li> <li>Family life and work</li> <li>Relationships with family and community members</li> <li>Issues and practices regarding family and home life</li> </ol>	<ol> <li>(1) The role of food</li> <li>(2) Basics of cooking</li> <li>(3) Nutritional eating</li> <li>(4) Wearing and caring for clothing</li> <li>(5) Making with fabrics to enrich daily life</li> <li>(6) Comfortable living arrangements</li> </ol>	<ul><li>(1) On the use of things, money and shopping</li><li>(2) Environmentally friendly living</li></ul>

Note. Each item has a further sub-item, omitted here.

Based on the characteristics of primary school home economics described above, the following points were set as the basic principles for the development of each of the teaching materials described below:

- Develop teaching materials for use in primary school home economics classes. The teaching materials should be usable within two 45-minute periods, as home economics is taught for two consecutive credit hours (one credit hour is 45 minutes) in primary schools in Japan.

- The materials must be usable by children in their school life, including going to and from school, throughout primary, junior high, and senior high schools.

# 2. Reflective strap 'yoji-yoji'

(1) Development process

As an educational material for Risk Reduction and Resilience Education, the project aims to teach children that, based on the actual situation of traffic accidents at night, it is effective to wear reflective materials to reduce the occurrence of traffic accidents when it is dark outdoors, and that street lights and traffic lights may not be available in the event of a major disaster. To teach the children that it is effective to wear reflective materials to reduce the owar reflective materials to reduce the number of traffic accidents during dark hours outdoors, and to make it a habit to wear reflective materials, we developed and produced teaching materials using ribbons with reflective materials manufactured by Technowarp Co.

In the development process, the first prototype was devised after discussions with Technowarp Co. However, as a result of monitoring university students piloting its use, it was decided that it would

be difficult for primary school students to make that first prototype. Subsequently, a second idea was devised based on the method for making a bracelet with reflective material, which Technowarp Co. had previously created and sold in collaboration with an accessory artist. As with the first prototype, piloting was carried out with university students and, based on the results, the second prototype was adopted as the educational material for primary school students. The details of Prototypes 1 and 2 are described below.

(2) Prototype 1.

i. Characteristics as a teaching material for home economics

Using ribbons with reflective material manufactured by Technowarp Corporation, a teaching material was devised that is produced by sewing together a ribbon with reflective material and cloth tape.

The curriculum for primary school home economics states that students should be able to understand and appropriately handle sewing methods and tools safely according to the purpose of hand or machine sewing. The first prototype was intended to be used as a teaching material for home

economics, to have students practise basic sewing techniques and threading at the beginning and end of sewing. In addition, the production time was set at 45 minutes, taking into account that the number of weekly class hours for home economics is 90 minutes (45 minutes per credit hour x 2 sessions).





# Table 2

Material.	Tools	Procedure
- Ribbon with reflective	- Adhesive tape	(1) Place the ribbon with reflective material in the centre of the
material, 20 cm	- Needle	fabric tape and fix it in several places with adhesive tape.
- Fabric tape, 20 cm	- Thread scissors	(Remove the adhesive tape as necessary while sewing).
- Thread	- Cutting scissors	(2) Take two strands of thread and tie them into a ball knot.
- Alligator string fasteners	- Pliers	(3) Sew the ribbon with reflective material onto the cloth tape in a
		parallel stitch. Attach the metal fittings (fasteners) using pliers.

Materials and methods of making the first prototype

- ii. Piloting by university students
- (i) Purpose and methods

A pilot experiment was conducted with university students to determine whether they could produce the devised teaching materials according to the procedure, and if so, whether they could finish within the allocated production time and whether other problems related to production might arise. The piloting was conducted on 21 November 2021 with 46 university students in a class on primary school home economics education methods. The method of implementation was to have the students start the production according to the procedure all together and then measure the total length of their stitching within 45 minutes. To find out whether they could finish within the production time, they were asked to record the results of their stitching measurements in a choice format in a Google Form. In addition, to identify any problems related to the production, the authors observed the production process and asked the subjects to record what difficulties they had felt during each stage of the production procedure as an open-ended response.

# (ii) Results and discussion.

The university students were asked to choose the total length of stitches they had sewn within 45 minutes from the following options: less than 5 cm, 5-10 cm, 10-15 cm, 15-19 cm and 20 cm. 97.8% (45 students) sewed more than 20 cm and 2.2% (1 subject) sewed between 15-19 cm.

However, many university students were observed to have expended a lot of effort in repeatedly removing the needles after sewing almost every single stitch. Looking at the free responses, the task set in step (iii), 'Sew a ribbon with reflective material onto the fabric tape using parallel stitches', was often answered to have been challenging due to the hardness of the material, such as 'We were sewing a hard material, so it was difficult to make the thread penetrate the material'. Many also mentioned challenges such as, 'It was difficult to sew straight because after each stich, I had to pull right out and thus only do one at a time'. Normally, when two or more pieces of cloth are sewn together by hand, a straight line is maintained by stitching two or three stitches at a time, but it was found that the stiffness of the material made it possible to sew only one stitch at a time. As a result, it was not possible to sew straight. Furthermore, step (iv), 'Attach the fittings with pliers', presented more challenges, such as, 'It is difficult for one person to attach the metal fittings because the fittings slip when they are clipped with the pliers'. Many of the issues raised were that it was difficult for one person alone to attach the metal fittings with pliers, such as 'It is hard, and if you don't fasten it firmly, it [the tape] will come loose', and that clipping the tape with the pliers while being careful not to let it come loose was difficult work.

Therefore, it was judged that, although the first prototype was not a problem in terms of the

production time as a teaching material, it would have been difficult to use as a teaching material for learning sewing for primary school students. It was also evident that the work of attaching the metal fittings should not be done by primary school students.

(3) Prototype 2

i. Characteristics as a teaching material for home economics

Technowarp Corporation had previously sold bracelets that also used ribbons with reflective material in collaboration with an accessory artist as part of a local road safety event. After discussions with the company, it was anticipated that this experience and product could be used as a teaching aid for the **Figure 3** *Prototype 2* 



home economics domain of 'family and community relations' to promote understanding of the need for cooperation with local people in order to live a safe and comfortable life.

The bracelets were made using the technique of braid weaving, which is also used in the weaving of the Hawaiian lei, an ornament worn around the neck. Based on this, as teaching materials, a 160-cm reflective ribbon was braided and a strap completed by attaching metal fittings, and an instruction manual and a video on how to braid were prepared. As with the first prototype, the production time was set at 45 minutes, taking into account that the number of weekly lesson hours for home economics is 90 minutes (45 minutes per credit hour x 2).

- ii. Piloting by university students
- (i) Purpose and method

A second pilot experiment was conducted with university students to verify whether they could produce the devised teaching materials in accordance with the procedures, whether they could finish within the allocated production time, and whether any other problems related to production might arise. The piloting was conducted on 28 July 2022 by 50 university students in a class on primary school home economics education methods.

Regarding the method of implementation, unfortunately in-person piloting was not possible due to the spread of the coronavirus. Therefore, ribbons with reflective material were distributed, and the students were asked to make their own straps at home by following a video and instructions uploaded to Google Classroom. The students were asked to measure the time taken to weave the ribbons, and to report on the production time, taking photographs of the completed straps and recording any other points they had noticed during the production process.

# (ii) Results and discussion

The time taken to make the straps varied from approximately 5 minutes (10%, 5 participants), 10 minutes (22%, 11 participants), 15 minutes (20%, 10 participants), 20 minutes (20%, 10 participants), 25 minutes (6%, 3 participants), and 30 minutes (22%, 11 participants), which was considerably quicker than the hard 45 minutes of the first prototype. This time, all pilot experiment participants finished knitting well within the 45 minutes allocated as the production time.

Many reported that, although the knitting was difficult at the beginning, after repeating the same process over and over again, it became fun and beautiful, such as, 'It was easier than I had expected, so once I got the hang of it, it was easy to do in a short time'.

Therefore, it was found that the second prototype was not a problem as a teaching material in terms of production time. It was also concluded that, although it was not clear whether primary school students would be able to produce the second prototype as quickly and effectively as university students, they would nevertheless enjoy handling the materials and learning about disaster prevention.

# 3. Disaster prevention whistle Infinity

*Note*. Although Suekawa (2024) presented the characteristics of this disaster prevention whistle (Infinity), the subsection below additionally explains the development process and its usage as a teaching aid for home economics.

- (1) Development process
- i. Design study (July-September 2021)

Figure 4 Disaster prevention whistle Infinity



The disaster prevention whistle began with the primary investigator (Suekawa) designing the exterior of the whistle based on both children's lifestyles and the home economics curriculum. At the design stage, the primary investigator considered that the shapes of the disaster prevention whistles (necklace and keychain types) already being manufactured and sold by Plus Jack Inc., probably could not be adopted for use by primary school students. One of the reasons why the necklace-type whistle could not be adopted was that it posed a choking hazard if someone were to yank the necklace or if it got caught on something. In addition, most schools in Japan have rules prohibiting the wearing of jewellery. Then, the reason for not adopting the key-holder type is that students use school bags (rucksack type) for going to and from school, and if a key-holder type whistle were attached to the bag, students may not always be able to reach it, depending on their clothing and the place where the

whistle is attached. In addition, students could be separated from their bags (e.g. in P.E. class) when disaster strikes, and the possibility cannot be ruled out that the disaster prevention whistle may not be replaced if the bag is changed. Based on these considerations, a new, clip-type disaster prevention whistle, 'Infinity', was designed.

# ii. Comparing prospective designs and selection of materials (Oct 2021 - Apr 2022)

Based on Suekawa's design, Plus Jack Inc created several CG drawings of prospective designs of the final product. After discussions, the diagram with the most rounded cross section (i.e. with the fewest jagged edges) was adopted, taking into account safety when used by children.

At the same time, the clips attached to the emergency whistle were discussed. The discussions centred on whether to use a clip with a silicon magnet or a clip like those used as necktie pins. As there was a risk of infants accidentally pinching their fingers with a magnet, the necktie-pin-type clip was adopted.

# iii. Completion of samples (Apr-Jul 2022)

Most of the cellulose acetate used to make the glasses for Plus Jack Co. comes from an Italian manufacturer In April 2022, seven of the approximately 500 samples were selected as materials for the disaster prevention whistle. In June 2022, the materials arrived from Italy and the samples were completed over a period of approximately one month.

# (2) Characteristics of Risk Reduction and Resilience Education materials in home economics

Three patterns were devised as lessons using the disaster prevention whistle 'Infinity', all of which closely correspond to the key tenets of Risk Reduction and Resilience Education and the Japanese home economics curriculum. In the following subsections, the functions of the 'Infinity' disaster prevention whistle, its features as a teaching material for home economics, and its aspects as a teaching material for Risk Reduction and Resilience Education will be elucidated.

i. As a teaching aid for learning about 'wearing and caring for clothes'.

A function of the 'Infinity' disaster prevention whistle is to make it easy for children to carry the whistle, even when they change their clothes according to the season or situation, by designing it with a clip.

The Japanese primary schools' home economics curriculum mandates that lessons on 'wearing and caring for clothes' should be conducted so that children can come to 'understand the main functions of clothes and how to wear everyday clothes comfortably according to the season and situation'. Therefore, as teaching material for home economics, students should be asked to think about how to coordinate their clothing with a disaster prevention whistle according to the changing seasons and situations.

Relatedly, as teaching material for Risk Reduction and Resilience Education, students should learn what types of disasters occur in different seasons and situations.

ii. As teaching materials for learning about 'how to use things and money and shopping'

Although the rationale was explained above for deciding that the necklace- and keychain-type disaster prevention whistles already being manufactured and sold by Plus Jack Inc. were not suitable as teaching materials, given the daily lifestyles of children in Japan, the authors still want students to see those designs and assess them through comparison with the new Infinity type, thus utilising all designs as teaching materials for learning about consumer life in home economics classes.

In such future classes, students would be asked to compare the 'Infinity' whistle with the company's whistle designs already on the market and other available whistles from various perspectives, such as price, quality, safety, and when they would use them, and then to evaluate which whistle is more suitable for their life and make a purchase plan.

Accordingly, also as teaching materials for Risk Reduction and Resilience Education, the children would first learn that in Japan, where there is concern about the frequent occurrence of disasters, a wide range of disaster prevention products is available and that they must choose the particular products that are best suited to their own lives. Then, based on the sad fact that many people died in the Great Hanshin-Awaji Earthquake and the Great East Japan Earthquake because they had been unable to call for help, it is necessary to have them understand why a whistle is useful in times of disaster.

iii. As teaching materials to promote understanding of diversity among individuals

The latest Course of Study guidelines require that learning should be optimised for each student, not only in home economics but in all subjects across the curriculum. In addition, throughout school education, it is necessary to recognise, nurture, and utilise the individuality of pupils and encourage them to work with a diverse range of people. Dovetailing with that, all of the pedagogical content of home economics is geared towards empowering everyone to realise a

**Figure 5** *Works by primary school children* 



[Example of success]



[Example of work not up to specimen]

better life, based on the diversity of individuals and families.

To help make people aware that each individual has unique and unlimited potential, the disaster prevention whistle was designed in the shape of ' $\infty$ ' and named 'Infinity', with the meaning of protecting children with unlimited potential from danger. To help children understand the need for a society that recognizes, accepts, and celebrates individual diversity, seven colours representing the rainbow (a universal symbol of diversity) were provided as colour options for the disaster prevention whistle. As a teaching material for home economics, all of the above meanings are conveyed, and the students are asked to choose a whistle.

Relatedly, as teaching materials for Risk Reduction and Resilience Education, the United Nations has also included a section on the need for a 'more people-centred' precautionary approach in the Sendai Framework for Disaster Reduction. It specifies that societies around the world are expected to 'involve relevant stakeholders, such as women, children and youth, the disabled, the poor, migrants, Indigenous peoples, volunteers, practitioners, the elderly, etc., in the planning and implementation of policies, plans and standards'. Thus, through these proposed home economics classes, children can be made aware of the need for inclusivity and always to respect diverse individuals and family lifestyles in society as a whole, including in times of disaster. As part of the classes, students would thus also be asked to conduct an exercise to come up with a disaster management plan for a hypothetical community made up of diverse people.

# 4. Piloting by school children

# (1) Methods

As the final stage of development, a pilot experiment was conducted with both primary and junior high school students to assess and determine the safety and suitability of the two final products as teaching materials for primary school home economics classes.

The pilot experiment was conducted using the university course 'Life and Disaster Prevention — From the Perspective of Home Economics' (October 2022), which the primary investigator (Suekawa) was in charge of. It was one of the courses offered by the University of Fukui Faculty of Education for primary and junior high school students in 2022 as part of the Japan Science and Technology Agency's (JST) 'Junior Doctor Training School' project (Saturday, 1 October 2022, 13:00-15:00), with the time allocation shown in Table 3. Observations were conducted by Suekawa and four assistants (two university students and two course organisers) and recorded with a video camera, digital camera and handwritten notes. The results and discussion of the pilot experiment were synthesised based on these records.

# Table 3

# 'Junior Doctor Training School' Project. (Saturday, 1 October 2022, 13:00-15:00)

Process	時間	Main activities for children
Lessons	13:00- 13:25	1) Listen to a lesson on life and disaster prevention
Manufacture	13:25- 14:10	<ol> <li>Choose the colour they want to weave from among 10 colours of ribbons with reflective material and receive a ribbon with reflective material from an assistant.</li> <li>Select the colour they want from among the seven colours of the Infinity disaster prevention whistle.</li> <li>After listening to the class leader 's explanation, weave the reflective ribbons while watching the production video (about 3 minutes).</li> <li>When they have finished weaving, have an assistant attach the metal fittings.</li> </ol>
Experiments	14:20- 15:00	<ol> <li>Decide whether to conduct the experiment indoors or outdoors.</li> <li>Record how far the sound of the whistle can be heard and under what conditions by actually blowing the whistle.</li> </ol>

# (2) Results and discussion

The detailed objectives, results, and discussion of the pilot experiment follow below.

i. Safety during the production of straps with reflective material 'yoji-yoji'

To check whether there were any injuries or near-miss behaviours that could lead to injury when primary and junior high school students were making the reflective strap 'yoji-yoji', the children were observed before, during, and after making the strap. Based on the pilot experiment with university students, the metal fittings of the straps were attached by assistants. Except for that final stage, the children practically produced the straps themselves through the weaving process ('*yoji-yoji*' is Japanese onomatopoeia that translates to something like 'twisty-twisty' in English.).

As a result, no behaviour leading to injury while weaving the ribbons with reflective material was observed. However, during the distribution of the materials, one child caught a reflective ribbon, which had not yet been woven, on a projecting part of a chair and almost fell. Therefore, when using the materials as teaching aids in primary school home economics classes, children should be warned not to snag the reflective ribbons on anything, and teachers should also be vigilant about things like that.

ii. Suitability of the reflective material-containing strap 'yoji-yoji' as a teaching aid for primary school children

To determine the suitability of the reflective strap 'yoji-yoji' as a teaching aid for primary

school children, we checked whether the children could knit the strap within the production time (45 minutes).

Children who could not finish within the production time were going to be allowed to finish making the strap after the end of the class and have the metal fittings attached, but, in fact, all children finished within the allocated production time. This confirmed that the reflective strap 'yoji-yoji' was a teaching material that could be used in a one-hour lesson at primary school. However, a comparison of the completed straps showed a general difference in the degree of completion compared to the university students in the pilot experiment. Thus, it can be said that the reflective strap 'yoji-yoji' is suitable from the point of view of the time required for its production. However, in terms of the skills required for production, there is some variation in the developmental stages of primary school children, and teachers need to bear this in mind and adjust the progression of lessons and evaluation criteria according to the children.

iii. Confirmation of safety when using the disaster prevention whistle Infinity

Likewise, we also checked whether there were any hazards such as injuries or near-miss behaviours when primary and junior high school students were using the disaster prevention whistle Infinity. No particular hazards occurred during the 'experiments' listed in Table 3. Therefore, it is considered that the disaster prevention whistle Infinity can be used safely as a teaching aid for primary school home economics as well as for other regular classes.

# V. Conclusion

This paper has reported on a practical project to develop teaching materials for use in primary school home economics education, undertaken jointly by the authors and two local companies in Fukui Prefecture. Based on both international and Japanese trends and demands in Risk Reduction and Resilience Education, this report has aimed to elucidate the value of developing home economics teaching materials in collaboration with local companies from the perspective of fostering social capital that leads to enhanced resilience, and from the perspective of passing on the lessons learnt from previous disasters.

Through the project, two teaching materials for primary school home economics were developed and piloted. One is an item that children can make by weaving reflective ribbons made by Technowarp Co.: the 'yoji-yoji' strap. The other is the disaster prevention whistle 'Infinity', which teaches the effectiveness of using the whistle in times of disaster, as well as how to 'wear and care for clothes', and how to use things and money and shopping' for goods (which are core components of Japan's home economics curriculum). Both materials were intended to be used on a daily basis

as disaster prevention items to protect children after the study. In future research, we would like to develop further primary school home economics lessons using these and other teaching materials and to evaluate the effectiveness of such teaching materials through thorough ongoing practical classroom research.

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