STEM 2014

@UBC, CANADA

Communication between the Public and Museums

- Development of Lifelong Learning System to Foster Science Literacy -

13, July, 2014

Yoshikazu Ogawa

National Museum of Nature and Science

Sharing 3 Cs

- Contents
- Communication
- Context

Topics

1. Self introduction
2. Japanese trend of science education
3. Background of the project
4. Outline of the project
5. Effect expected from this project

1. Self Introduction

- Head of Education
- Discovery room
- U-M partnership
- Science Communicators

Training programs

- National Museum of Nature and Science, Tokyo
  = KAHAKU

国立科学博物館

National Museum of Nature and Science

KAHAKU

(National Museum of Nature and Science, Tokyo)

KAHAKU

(National Museum of Nature and Science, Tokyo)

国立科学博物館

National Museum of Nature and Science

Collection and Communication at KAHAKU

Mid-term Goals (within 5 years)

- **To Investigate Natural History, and Science and Technology Systems**
- **To Conserve and Preserve Specimens that Are Our Common Assets in Order to Build the National Collection**
- **To Design Effective Exhibition and Facilitate Audience Learning that Contributes to the Public Science Literacy**

Educational Operations at KAHAKU

Japan Gallery

Theater 36O

Science Café by Science Communicators

Science Discovery Classes

Structures of Communication Strategy at KAHAKU

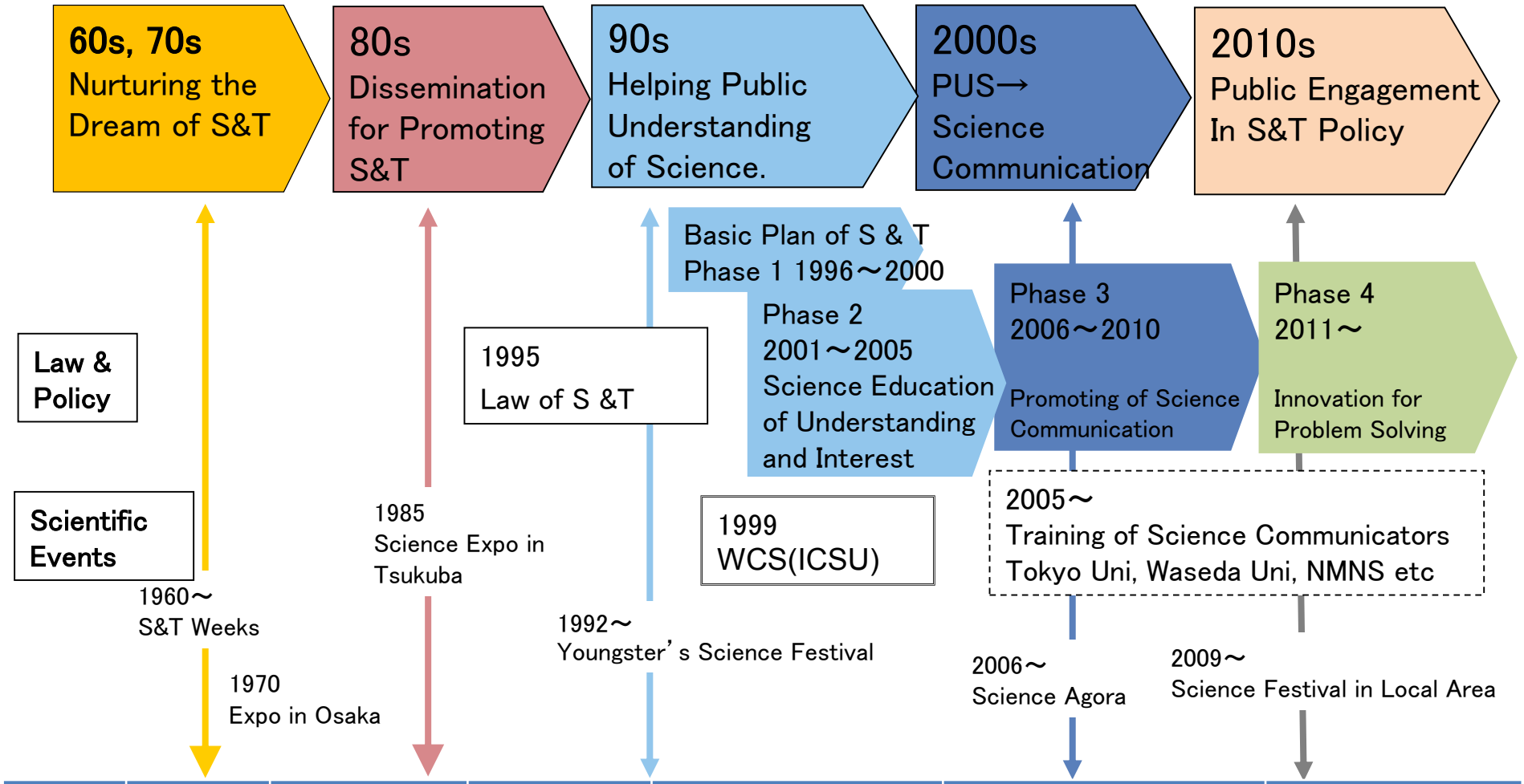
- Promoting Life-Long Learning (Sharing the Knowledge and Returning It to the Society)

  * Returning research outcomes：exhibition and learning support projects
  * Growing human resources who returns the knowledge to the society：Science Communicators Practical Training Program

- **Fostering Public Science Literacy**

2. Japanese Trend of Science Education

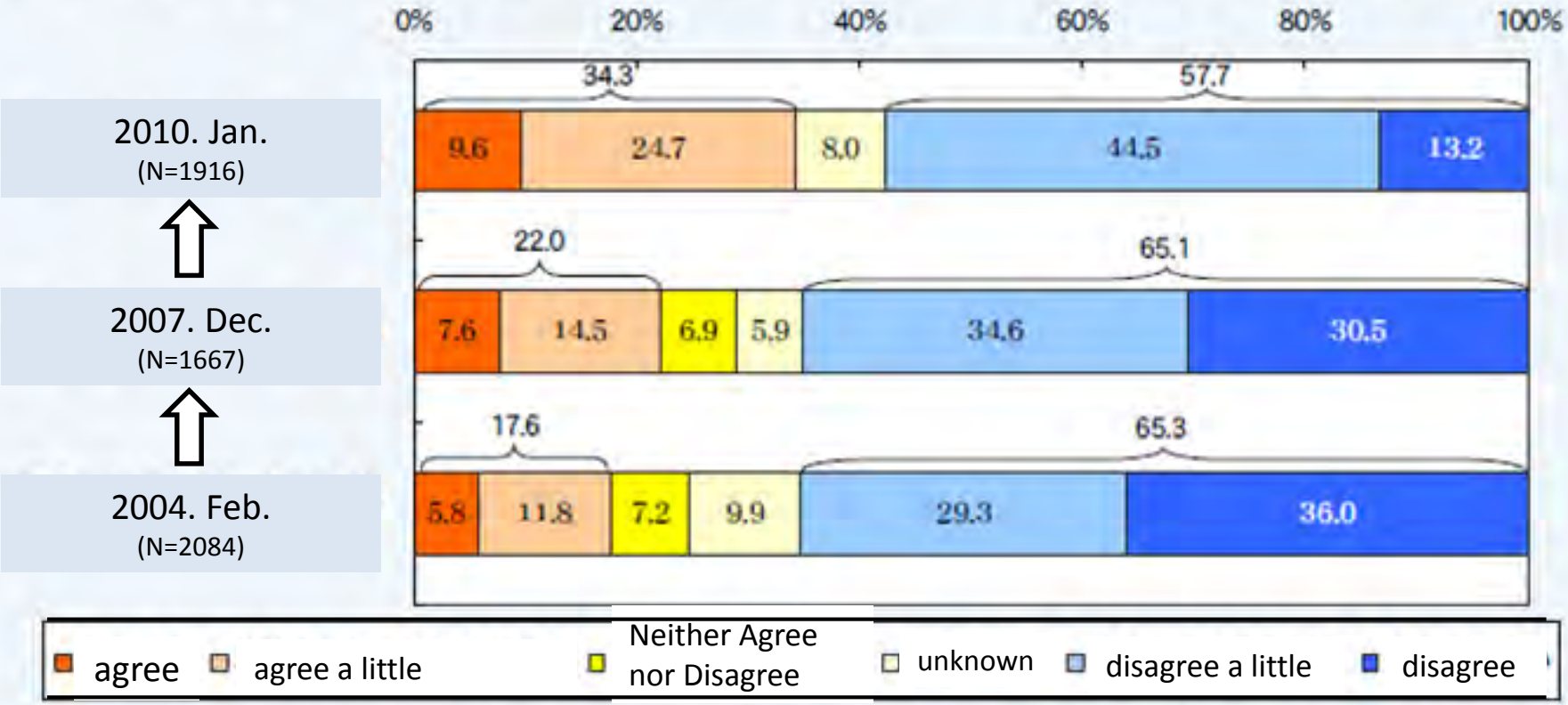
Trends of Science Communication and Course of Study in Japan



Course of Study	1958-60 Revision	1968-70 Revision	1977-78 Revision	1989 Revision	1998-99 Revision	2008-09 Revision
	Systematic learning	Modernization of Contents, Inquiry Learning	Education with Latitude	Life Environment Studies	"Zest for Life" "The Period for Integrated Studies" Careful selection of Contents	"Zest for Life" Thinking, Judgment, and Communication Skills

(Ogawa, 2012)

Q. Do you think that there are enough chances to deepen your understandings and interests of science and technology?



Cited from: **White Paper on Science and Technology 2011 (**Ministry of Education, Culture, Sports, Science and Technology**)**
http://www.mext.go.jp/b_menu/hakusho/html/hpaa201101/detail/1308357.htm

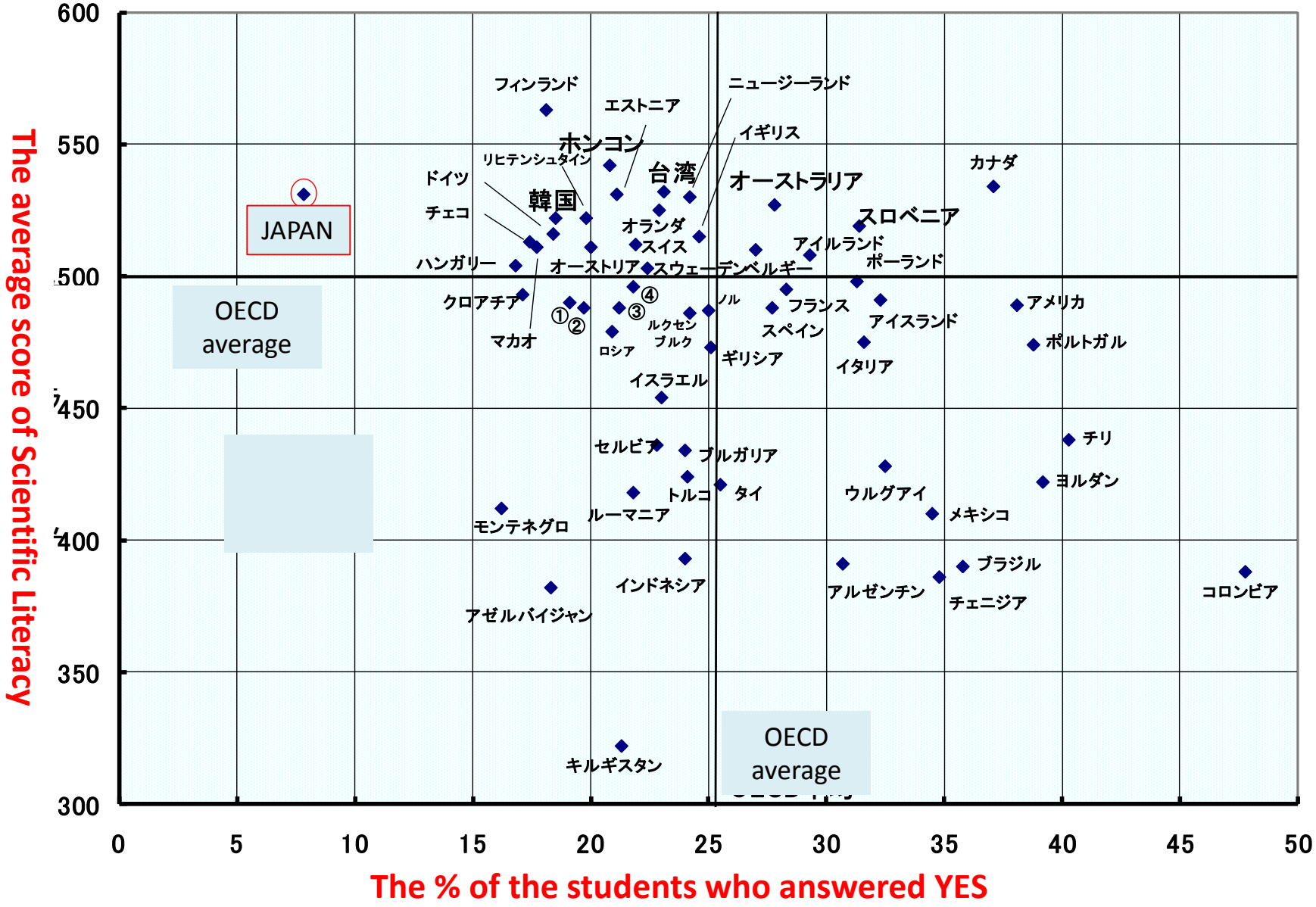
International Surveys on Academic Ability
TIMSS - school age -

Changes of the average score (JAPAN)

		1995	1999	2003	2007	2011
Elem. 4th.	Math	567 pt (3rd/26ctry)	(not tested)	NS → 565 pt (3th/25ctry)	NS → 568 pt (4th/36ctry)	S. INC → 585 pt (5th/50ctry)
	Science	553 pt (2nd/26ctry)	(not tested)	S. Red. → 543 pt (3th/25ctry)	NS → 548 pt (4th/36ctry)	S. INC → 559 pt (4th/50ctry)
J.H. 2nd.	Math	581 pt (3rd/41ctry)	NS → 597 pt (5th/38ctry)	S. Red. → 570 pt (5th/46ctry)	NS → 570 pt (5th/49ctry)	NS → 570 pt (5th/42ctry)
	Science	554 pt (3rd/41ctry)	NS → 550 pt (4th/38ctry)	NS → 552 pt (6th/46ctry)	NS → 554 pt (3th/49ctry)	NS → 558 pt (4th/42ctry)

Cited from: Trends in International Mathematics and Science Study (TIMSS) 2011
(Ministry of Education, Culture, Sports, Science and Technology)
http://www.mext.go.jp/component/a_menu/education/detail/__icsFiles/afieldfile/2012/12/13/1230782_01.pdf

Question to high school freshmen: **Do you think you will have a carrier in the Science and Technology related field when you are thirty years old?**



Cited from: PISA 2006 Results (OECD)
http://www.oecd.org/fr/education/scolaire/programmeinternationalpourlesuividesacquisdeselevespisa/pisa2006results.htm

Two Issues to Make Life More Meaningful in the 21st Century

1. **How Should Science Exist in the Current Society?**

Science is developing progressively.

People need to be aware it clearer

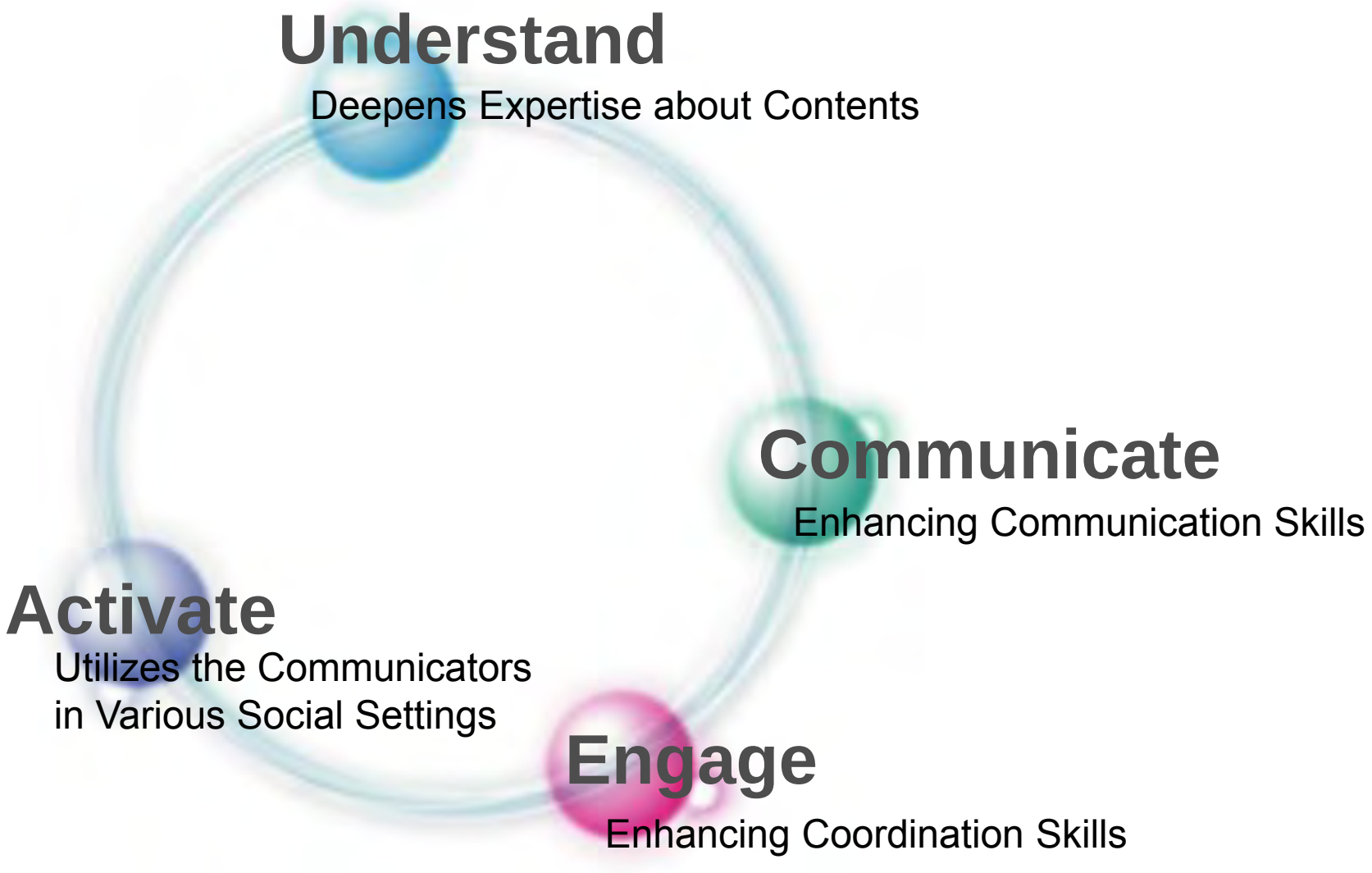
→Communications between Science and Society (Science Communication)

2. **Issues of Science Education**

Scientific knowledge is not effectively utilized at the adult stage

→Fostering Science Literacy for public including adults

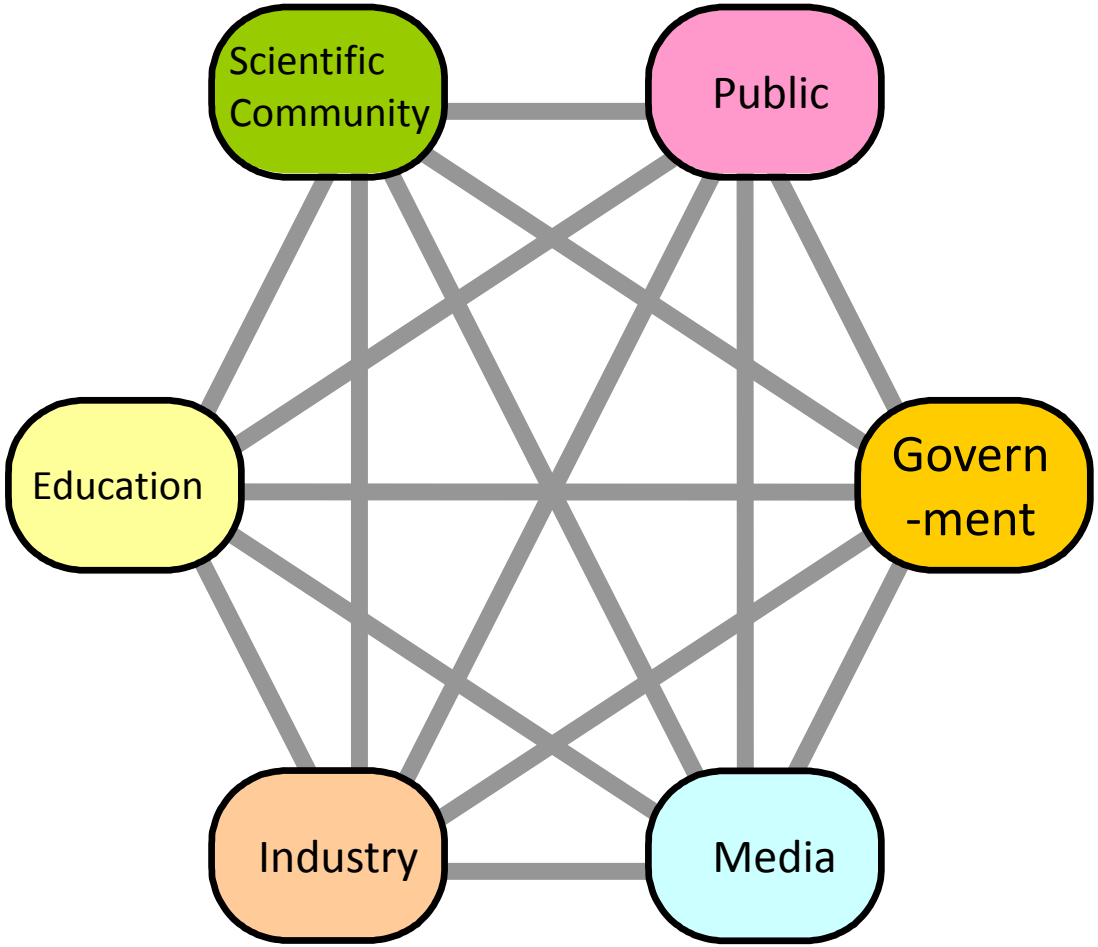
3. Background of the Project



Story 1 : Science Communication

- 2004-2006 Science Communication Research project(Grand in aid)
- 2005- University-Museum Partnership program(Business model)
- 2006- Science Communicator Training Program
- 2008- Agreement with University of Tsukuba (recognition of credit）
- 2011- SCA(Science Communication Association)

Science Communication in the Advanced Society



Ogawa, Y., and Kamei, O. Abilities and Skills expected for Possible Science Communicators: To aim at Creating Intelligence Connected to each other. Abstract for Japan Society for Educational Technology , 06-4, pp. 61-6 (2006)

Story 2: Science Literacy

2006- The Science and Technology Basic Plan Phase 3

2007-2010 Science Literacy Research project(Grand in aid)

2010- Development of an Educational Program Framework for Science Museums to Foster Public Science Literacy

What is “Science Literacy”?

a cluster of comprehensive abilities in science: that …

1. people possess appropriate knowledge and ways of thinking regarding science and technology
2. people deal with changes in natural world and human society
3. people make reasonable decisions and take actions

National Museum of Nature and Science, Tokyo. (The Advisory Council on Fostering Science Literacy 2010)

Goals of Fostering Science Literacy

Feel (Awe and appreciation toward nature)

A scientifically literate person facilitates curiosity and interest toward science and natural phenomena through hands-on activities.

Know (Understanding)

A scientifically literate person possesses broad knowledge and concepts in science through programs.

Think (Attitudes)

A scientifically literate person comprehends scientific phenomena and current social issues such as environmental problems, learns them by self, interpret and make judgments on them through identifying and analyzing questions, investigating the solution, and applying scientific knowledge for the daily life.

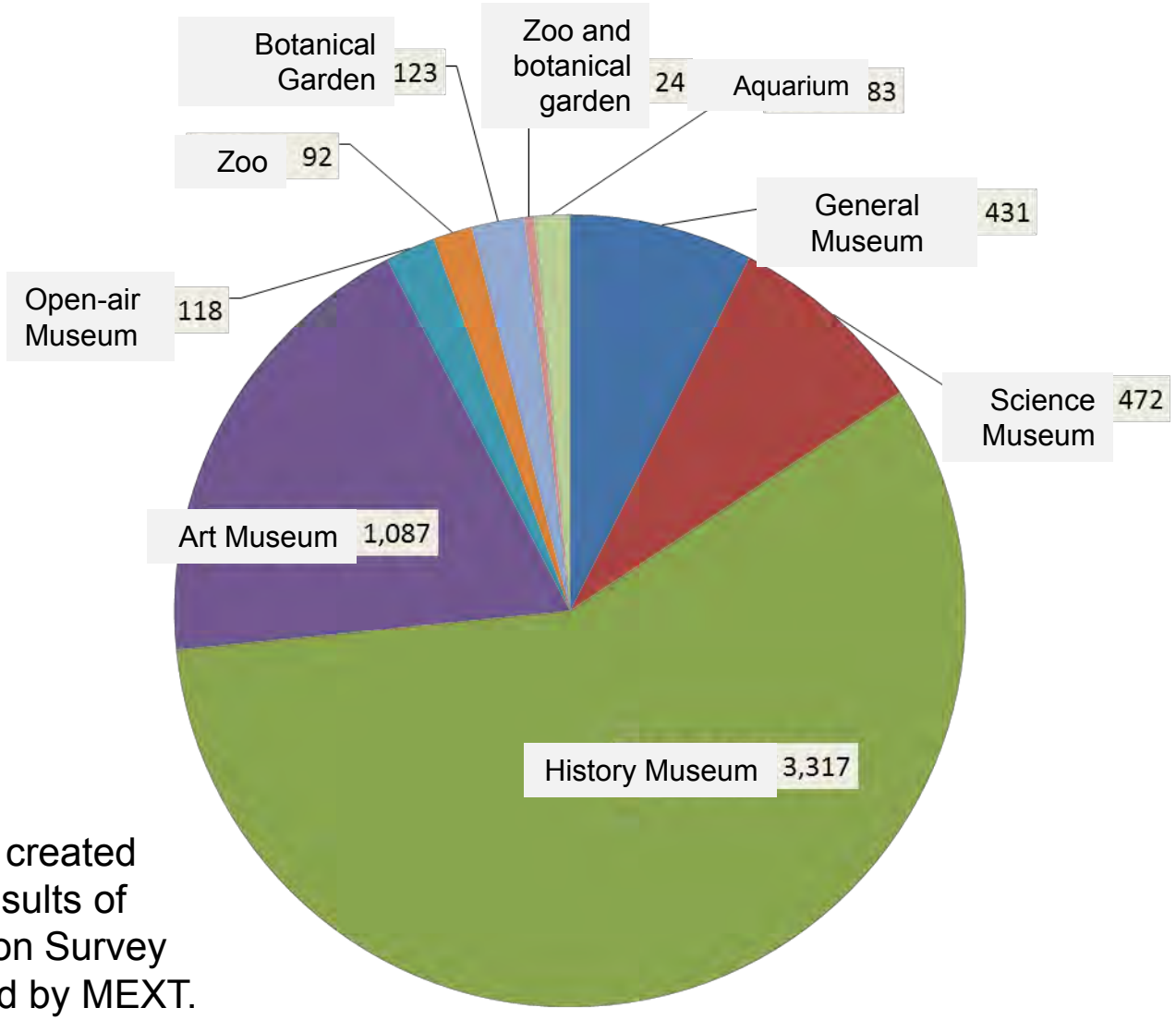
Act (Communication)

A scientifically literate person expresses appropriately what he/she learned to the other people. He/she makes decisions using scientific knowledge and attitudes in the social context. He/she conveys knowledge and skills to the next generation. He/she participates in developing a sustainable society by interacting with the social sectors.

Generations / Goals	Pre-schooler ~ Lower Elementary School	Higher Elementary School ~ Junior High School	High School / High Education	Families, Prime	Middle and Old Ages
Feel Awe and Appreciation toward Nature	Feel beauty and wonder of phenomena through scientific activities.	Feel curiosity and interest as well as the relationship between science and the daily life through scientific activities.	Feel curiosity and interest in and usefulness of science through scientific activity.	Be aware of usefulness of science and necessity of science literacy in engaging in scientific activities with the children. Feel interest by engaging in museum exhibits and resources. Demonstrate curiosity and interest that is based on abundant information relating to science.	Feel interest when having a fun experience and interacting with museum exhibits and resources.
Know Understanding	Feel attainment of being able to understand and do.	Acquire scientific knowledge that directly relates to the daily life.	Broaden understanding of scientific concepts that relates to the daily life and the society.	Acquire scientific knowledge together with the children when engaging in learning. Deepen understanding of scientific knowledge that relates to the daily life and the society.	Deepen understanding of scientific knowledge that relates to the daily life and the society. Acquire scientific knowledge that would be useful to one's hobbies and the culture.
Think Attitudes	Engage in an activity by incorporating phenomena of one's interest.	Have curiosity and interest in natural world and the human society and find patterns and relationships between them.	Select reliable information and make judgments based on scientific knowledge and take actions according to the judgments	Select reliable information and make judgments based on scientific knowledge. Make judgments to solve daily and societal issues by utilizing what is learned as synthetic ability of science.	Make judgments to solve daily and societal issues by utilizing what is learned as synthetic ability of science. Utilize what is learned to one's hobbies.
Act Communication	Engage in an activity utilizing phenomena of one's interest in collaboration with people.	Express what is learned and convey it to people in the way easy to understand. Consider what is learned in relation to one's career development.	Apply knowledge and skills acquired to the daily life in the interaction with the society. Apply what is learned to one's career development.	Express what is learned and convey it to people. Identify issues of the local community and find the better solutions for them.	Identify issues of the local community and find the better solutions for them. Pass on the knowledge and the abilities appropriately to the next generation based on the social context.

Number of Museums in JAPAN

(including museum-like facilities)



This graph was created based on the results of "Social Education Survey 2011" conducted by MEXT.

Number of Educational Programs held at Science Centers and Science Museums (N=962)

Goals \ Generations	Pre-schooler ~ Lower Elementary School	Higher Elementary School ~ Junior High School	High School / High Education	Families, Prime	Middle and Old Ages
Feel	65%	75%	51%	48%	41%
Know	61%	72%	50%	52%	40%
Think	3%	9%	8%	10%	2%
Act	2%	7%	7%	4%	1%

Cited from: Yoshikazu OGAWA, (2011), working papers of "Action research about the systematizing and structuring of educational programs held at science related museums which contribute to the fostering of science literacy for the construction of knowledge circulating society"

4. Outline of the Project

Science Literacy Passport β

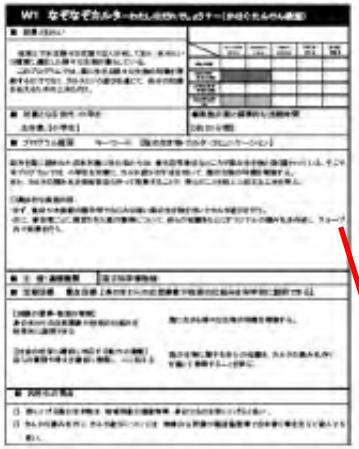
(PCALi Project)

What is “Science Literacy Passport β”?

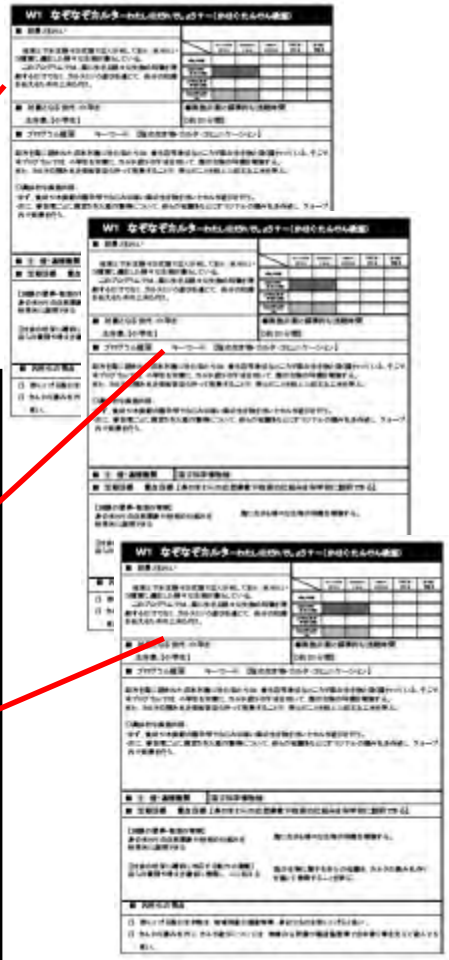
- It is an interactive online database system to build museum utilization model for lifelong learning.

- Target Users:
  1) the general citizens of all ages
  2) museum curators

Framework and Database



Information of Educational Programs and Meta data



Framework to Foster Science Literacy

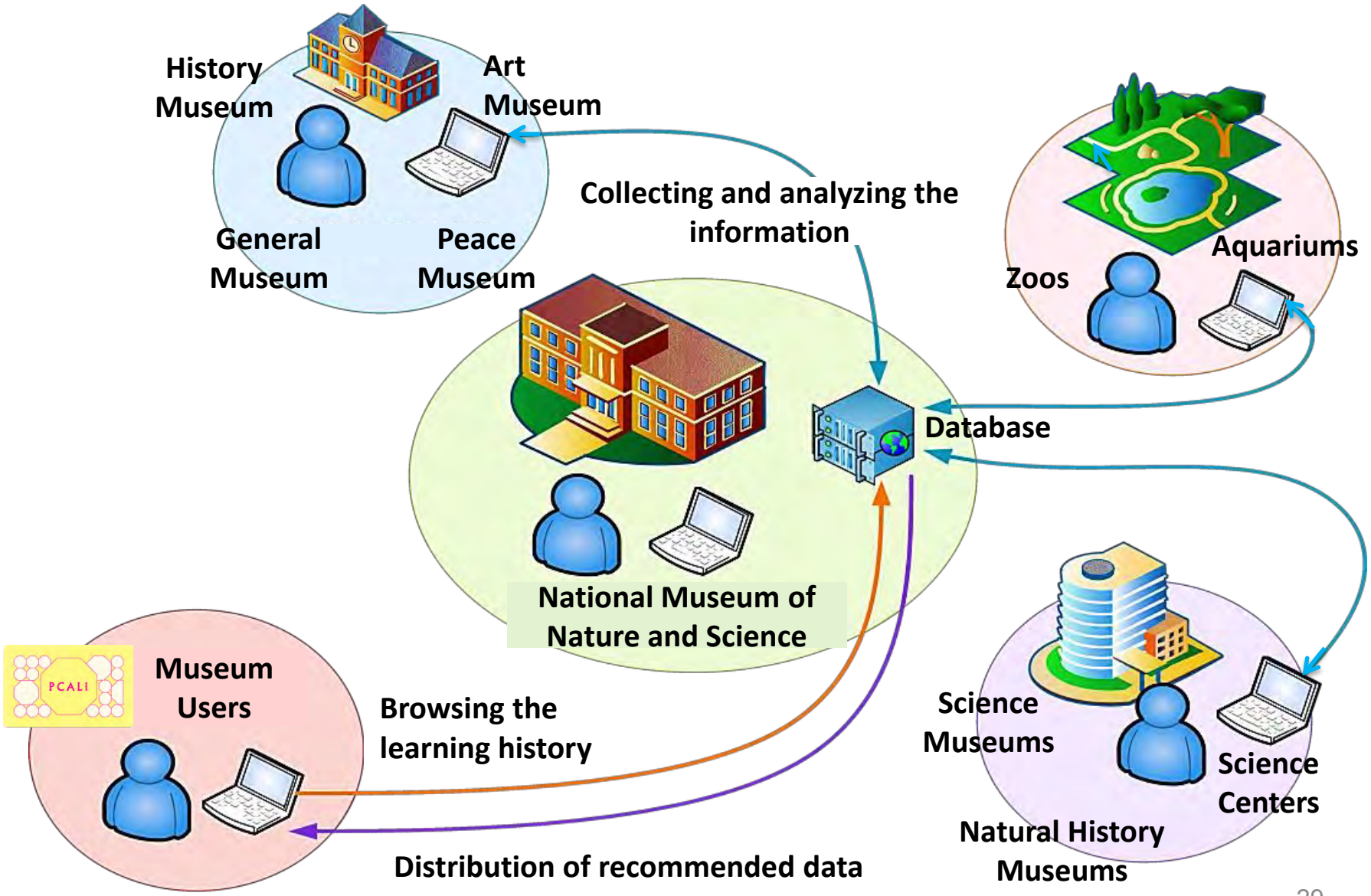
Goals \ Generations	Pre-schooler ~ Lower Elementary School	Higher Elementary School ~ Junior High School	High School / High Education	Families, Prime	Middle and Old Ages
Feel	.....	.....	.....	.....	.....
Know	.....	.....	.....	.....	.....
Think	.....	.....	.....	.....	.....
Act	.....	.....	.....	.....	.....

Cited from: Yoshikazu Ogawa, Development of an Educational Program Framework for Science Museum to Foster Public Science Literacy (PCST 2010)

What is “Science Literacy Passport β”?

- The data of museum educational programs are shared between all users.
- Based on the feedbacks from participants, the programs can be improved.

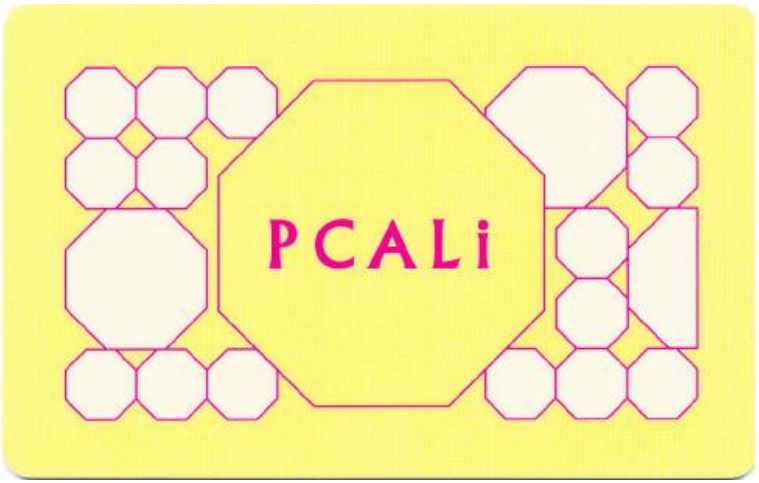
Science Literacy Passport β system



How is “Science Literacy Passport β” used?

- PCALi
  (Passport of Communication and Action for Literacy)

Front side



Back side

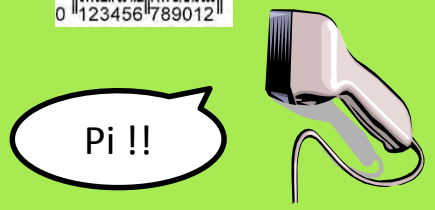
Search

(1) Find events on the on the web
http://literacy-pass.jp/

Experience

(2) Experience events at museums!!

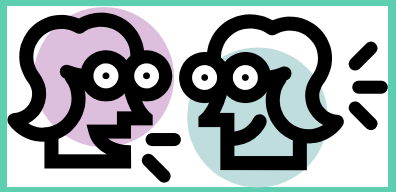
(3) Get your card's bar code scanned!!



Communication

(4) Check your participation records on your PCALi account!!

(5) Recommend museum events to your friends!!



How to Use PCALi.
Step (1)~(5)

My Profile

Edit

Name ゲスト 1号
Passport No. 9900000001
Month / Year 5 / 2013
Gender 男性
Live in 北海道

History of participation

2013-07-05 Shiga Peace Museum

2013-06-27 国立科学博物館

The history of the program which you participated and the questionnaire which you answered

Gen. / Obj.	Preschooler ~ Elementary School	Higher Elementary ~ Junior High School	High School High Education	Families Prime	Middle and old ages
Feel					
Know					
Think					
Act					

How to use the program table

1pt=Seed 2pt=Sprout 3pt=Stem 4pt=Bud 5pt=Flower

Program questionnaire	0 times
Periodic questionnaire	0 times
Extra questionnaire	0 times

How to use the questionnaire table

Program Example (1)

- Institution:
  Science Platform in Fukushima
- Theme: Radiation
- Object:
  1)To understand what radiation is through observation and experiment outside of school.
  2) To learn how to protect ourselves from radiation.
- Place:
  In Fukushima
  @ Space Park, Mushitec, community centers etc

Radiation dosimeter

Map making

Program Example (1)

< Discussion between users and curators >

A participant:
“I didn’t know that children are having this sort of education at school.”

A curator:
“We hope to prevent fading the memory of the radiation issue”

A participant:

I have been to many briefings done by scientists and was always fed up with them. They don’t tell us what we actually want to know.

Frame work to foster Science Literacy

Radiation

Science Literacy's Goal / Life-stage	Pre-schooler ~ Lower Elementary School	Higher Elementary School ~ Junior High School	High School / High Education	Families, Prime	Middle and Old Ages
Feel				◎	◎
Know				◎	◎
Think				◎	◎
Act				○	○

Yoshikazu OGAWA (PCST2010)

Program Example (2)

- Institution & place:
  Taman Pintar Science Park
  (Jogjakarta, INDONESIA)

- Theme:
  Batik Making

- Object:
  Introducing the Batik making process to the younger generation

Batik : wax-resist textile

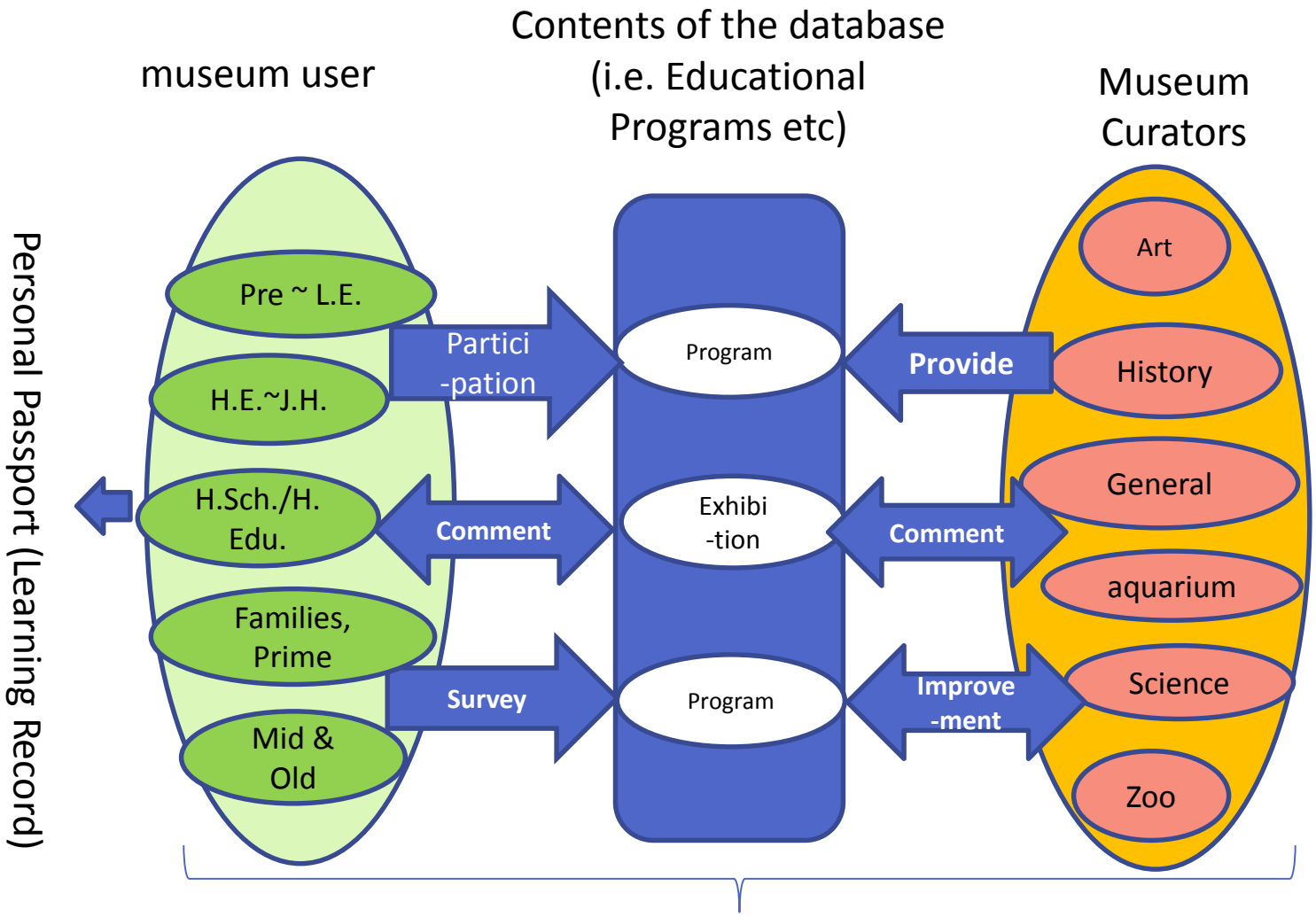
Frame work to foster Science Literacy

Batik

Science Literacy's Goal / Life-stage	Pre-schooler ~ Lower Elementary School	Higher Elementary School ~ Junior High School	High School / High Education	Families, Prime	Middle and Old Ages
Feel		◎			
Know		◎			
Think		◎			
Act		◎			

Yoshikazu OGAWA (PCST2010)

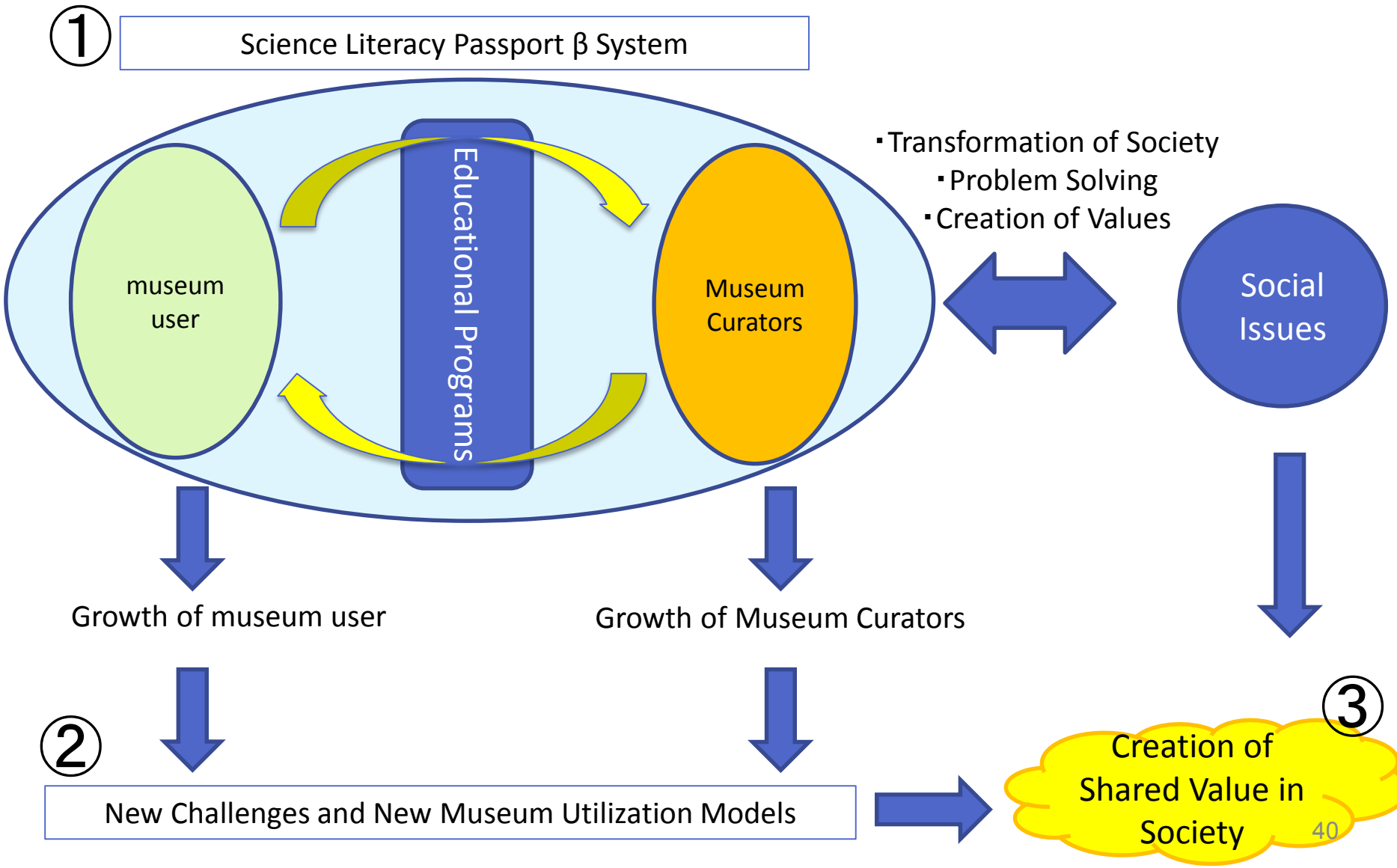
5. Effect expected from this project



Yoshikazu Ogawa (JMMA 2013)

Social Impact of this system:

Yoshikazu Ogawa
(JMMA 2013)



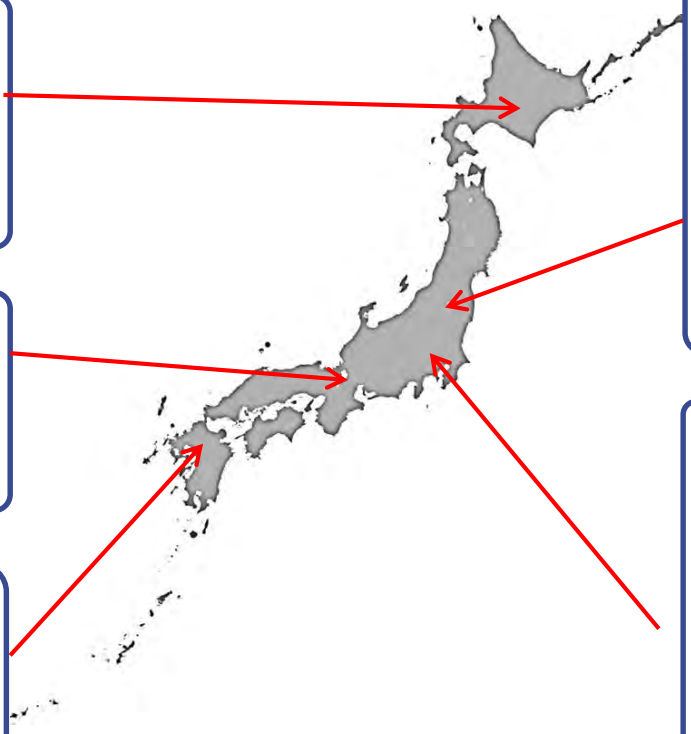
Partner Institutions

Hokkaido Area
- Asahiyama Zoo
- Asahikawa city museum
- Asahikawa Science Center

Kansai Area
- Lake Biwa Museum
- Shiga Peace Museum

Kyushu Area
- MARINE WORLD Umino-nakamichi
- The Kyushu University Museum
- Museum of Kyushu Sangyo University
- CLC Works

Jogjakarta（Indonesia)
- Taman Pintar Science Park



Tohoku Area
- Fukushima University Science Platform in Fukushima
- Koriyama City Fureai Science Center
- Mushitec-fukushima

Kanto Area
- Natural History Museum and Institute, Chiba
- Ibaraki Nature Museum
- Kanagawa Prefectural Museum of Natural History
- Science Museum
- Chiba City Museum of Science
- Tokyo Metropolitan Art Museum
- National Museum of Nature and Science, Tokyo

As of June 2014.
New institutions are added at all times.

Science Literacy Passport β Project

History Museum

General Museum

Zoo

Art Museum

Aquarium

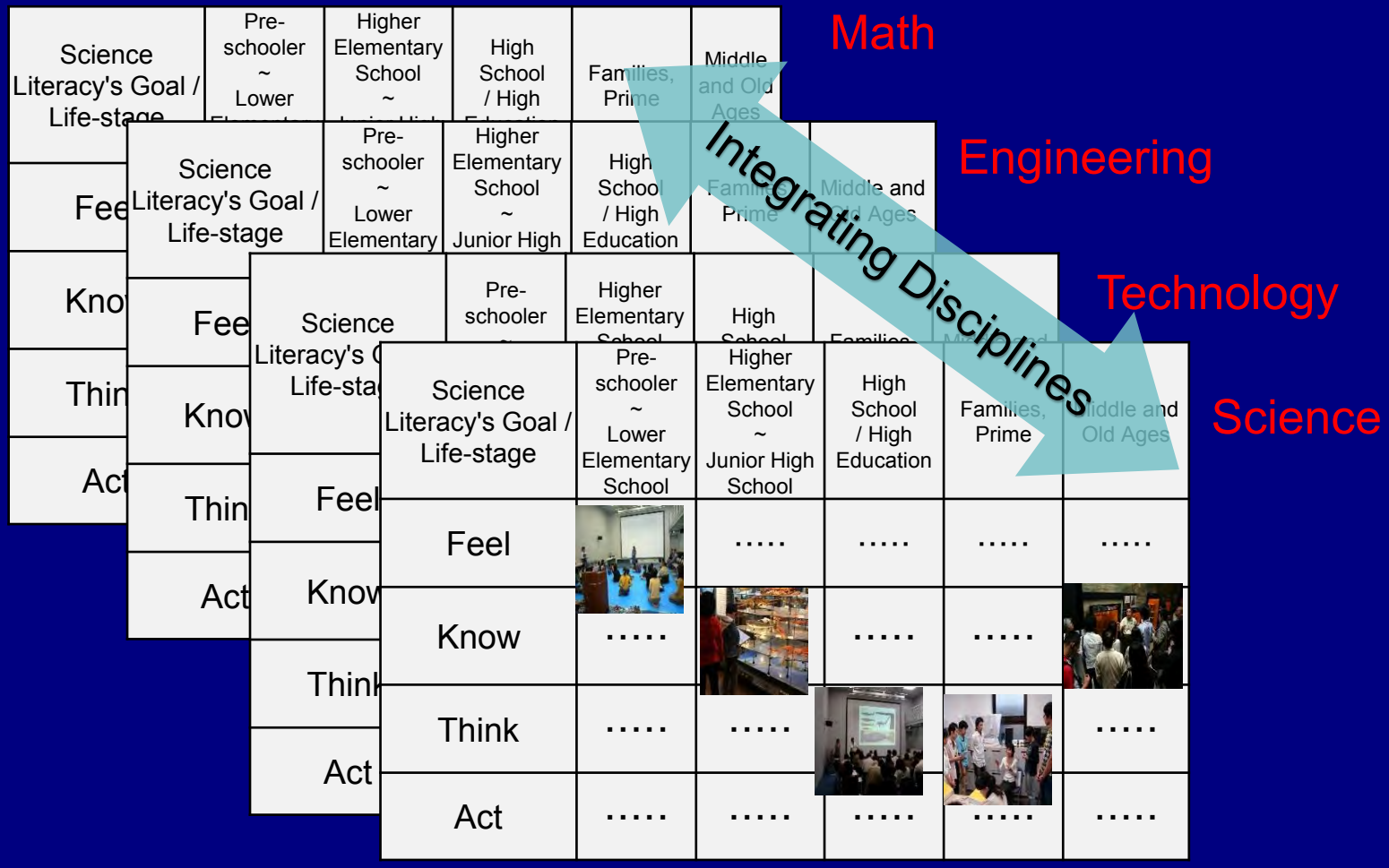
Science Museum

Integrating Disciplines
Learning Pathways

Science Literacy's Goal / Life-stage	Pre-schooler ~ Lower Elementary School	Higher Elementary School ~ Junior High School	High School / High Education	Families, Prime	Middle and Old Ages
Feel	.....	.....	.....	.....	.....
Know	.....	.....	.....	.....	.....
Think	.....	.....	.....	.....	.....
Act	.....	.....	.....	.....	.....

STEM in Science Literacy Framework

Science, Technology, Engineering and Math



Sharing 3 Cs

- Contents
- Communication
- Context

Thank you.

Contact information: **kaken-s-info@kahaku.go.jp**

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Title: A Basic Study on Development of an Interactive Life-long Learning System between Public and Museums in a Knowledge-Circulating Society
Research representative: Dr. Yoshikazu Ogawa, National Museum of Nature and Science