Using a Concept Map to Evaluate Exploratory Search

Yuka Egusa

National Institute for Educational Policy Research

Hitomi Saito

Aichi University of Education

Masao Takaku

National Institute for Materials Science

Hitoshi Terai

Nagoya University

Makiko Miwa

The Open University of Japan

Noriko Kando

National Institute of Informatics

http://cres.jpn.org

CRES

Cognitive Research for Exploratory Search

Background

- Previous studies on user-centered evaluations and exploratory search systems:
  - Can users *effectively seek information*?
  - Can they conduct Exploratory Search by *interaction with the systems*?
- Previous studies: What can users acquire from information sources found?

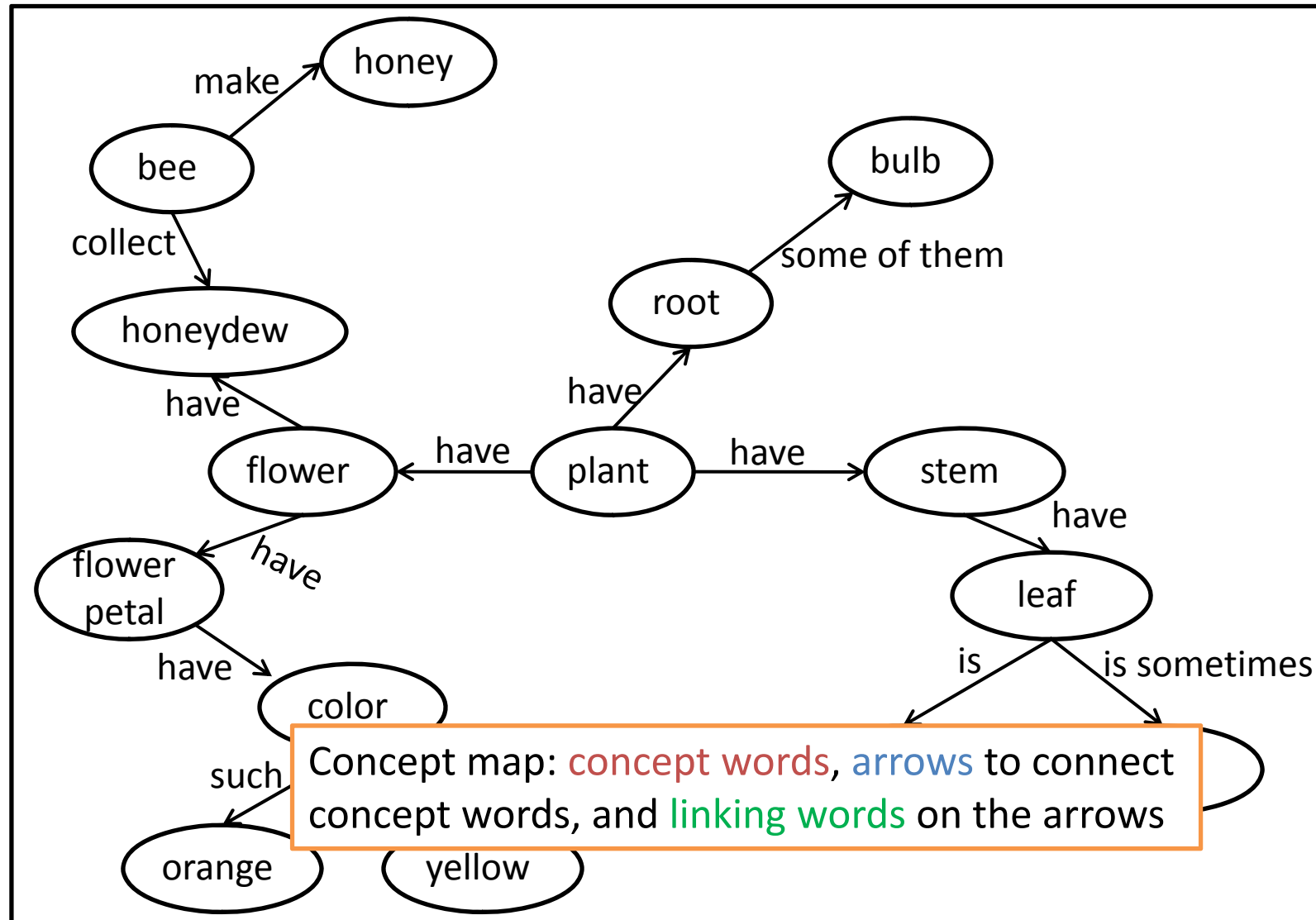- Our focus: *users' cognitive changes* during exploratory search

Objective

- User's cognitive changes by search:
- How can we measure changes in the user's knowledge structure, before/after Exploratory Search?

- Concept map
  - used in learning & education to describe learners' knowledge representations

Concept Map (Cmap)

Example of concept map about plants

Related Works – Concept Map

- Concept maps: introduced in educational fields
- In IR & IS context:
  - Cole et al., 2007; Halttunen and Järverin, 2005; Pennane and Vakkari, 2003
  - Used Concept maps to represent user's knowledge structures and their changes
- In our context:
  - A basic tool to analyze effectiveness of Exploratory Search supporting systems
    - Grater the effectiveness, grater the change in cmaps
  - Examine affects of topics for searching and affects of search task scenarios

Research Questions

- RQ1: What differences can be observed between pre- and post-search concept maps?

- RQ2: How do differences between topics, scenarios and browser types influence changes in user's concept maps?

➢ User Experiment

Experimental Design

Participants

- 35 undergraduate students
  - Ages: 18 – 28
  - Males: 17, Females: 18
  - Majors:

    literature, nursing science, pedagogics, engineering, political economics, jurisprudence, commercial science, science & engineering, etc.

 - No experience drawing concept maps

Search Task

- Information-gathering task
- Participants gather information on Web as preparation for writing a term paper on a topic
- Participants conducted two search tasks for different topics
  - *Topic* is an experimental factor

Factors in Experiment

1. Topics (within-subject factor)
   – Media topic
   – Politics topic
2. Scenarios (between-subjects factor)
   – Selective
   – As-Many-As
3. Browser types (within-subject factor)
   – Tab Browser
   – Non-tab Browser

1. Topics (within-subjects factor)

- Participants gather info on the Web for writing a term paper on Media or Politics topic

- Media:

  "The media's impact on the young adult population"

- Politics:

  "The influence of a change in government administrations"

- Not fact-finding topics

- Diverse discussions and opinions on the Web
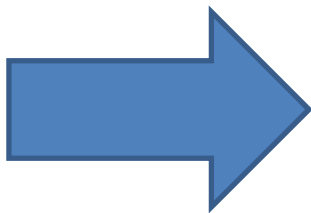
Participants must investigate discussions not only by looking for multiple opinions but also by comparing viewpoints.
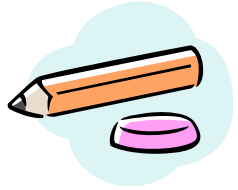
2. Scenarios (between-subjects factor)

- Selective scenario

  – Carefully select 10 or fewer Web pages

- As-Many-as scenario

  – Gather as many Web page as possible

3. Browser type (within-subjects factor)

- Web browser allowed:
  - Use of tabs (Tab Browser)
    - *or* –
  - Non-use of tabs (non-Tab Browser)

- Purpose : effect of interface
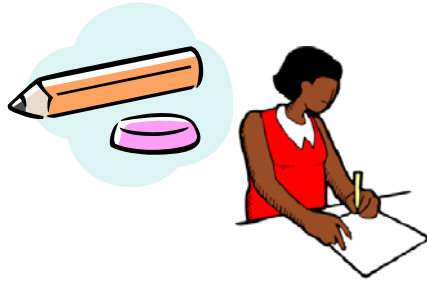 - Why: experienced users used tabs lots

Procedure

Preparation	Quizzes about Web, IR, and Writing	10 min.
	Search Experience Questionnaire	10 min.
	Instruction of Cmap	5 min.
	Practice of Cmap	5 min.
1st Search Task	Instruction of Task	5 min.
	Pre-Search Cmap for Topic	10 min.
	Search	15 min.
	Post-Search Cmap for Topic	10 min.
	Questionnaire for Task	10 min.
2nd Search Task	Instruction of Task	5 min.
	Pre-Search Cmap for Topic	10 min.
	Search	15 min.
	Post-Search Cmap for Topic	10 min.
	Questionnaire for Task	10 min.
Closing	Closing Questionnaire	10 min.

*Cmap: Concept Map

Procedure

Quizzes about Web, IR, and Writing	10 min.
Search Experience Questionnaire	10 min.
Instruction of Cmap	5 min.
Practice of Cmap	5 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.

1st task

Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.

2nd task

Closing Questionnaire	10 min.

Procedure

Quizzes about Web, IR, and Writing	10 min.
Search Experience Questionnaire	10 min.
Instruction of Cmap	5 min.
Practice of Cmap	5 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.
Closing Questionnaire	10 min.

1st task

2nd task

Procedure

Step	Time	Task
Quizzes about Web, IR, and Writing	10 min.	
Search Experience Questionnaire	10 min.	
Instruction of Cmap	5 min.	
Practice of Cmap	5 min.	
Instruction of Task	5 min.	1st task
Pre-Search Cmap for Topic	10 min.	1st task
Search	15 min.	1st task
Post-Search Cmap for Topic	10 min.	1st task
Questionnaire for Task	10 min.	1st task
Instruction of Task	5 min.	2nd task
Pre-Search Cmap for Topic	10 min.	2nd task
Search	15 min.	2nd task
Post-Search Cmap for Topic	10 min.	2nd task
Questionnaire for Task	10 min.	2nd task
Closing Questionnaire	10 min.	

Procedure

Quizzes about Web, IR, and Writing	10 min.
Search Experience Questionnaire	10 min.
Instruction of Cmap	5 min.
Practice of Cmap	5 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.
Closing Questionnaire	10 min.

1st task

2nd task

ID:_____ 参加者氏名:_____

【概念マップ作成の注意点】
・ きれいに書くことよりも、自分が持っている知識をできるだけ書き出すことを重視する
・ 関係が近い概念語は近くに配置するようにする
・ 矢印のラベルが思いつかないときは後回しにしてもよい
・ 矢印は後から新しく追加してもよい

【概念マップの練習】

それでは、簡単なもので練習をしてみたいと思います。以下に「地球温暖化」についての概念マップを作ってみてください。時間は５分です。

地球温暖化

Procedure

Quizzes about Web, IR, and Writing	10 min.
Search Experience Questionnaire	10 min.
Instruction of Cmap	5 min.
Practice of Cmap	5 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.
Closing Questionnaire	10 min.

1st task

2nd task

Procedure

Step	Time
Quizzes about Web, IR, and Writing	10 min.
Search Experience Questionnaire	10 min.
Instruction of Cmap	5 min.
Practice of Cmap	5 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.
Closing Questionnaire	10 min.

1st task: Instruction of Task through Questionnaire for Task

2nd task: Instruction of Task through Questionnaire for Task

2009年10月　　日　午前・午後　机:＿＿　参加者ID:＿＿＿＿　参加者氏名:＿＿＿＿＿＿＿＿＿＿　　事前

政権交代が
世の中に与える影響
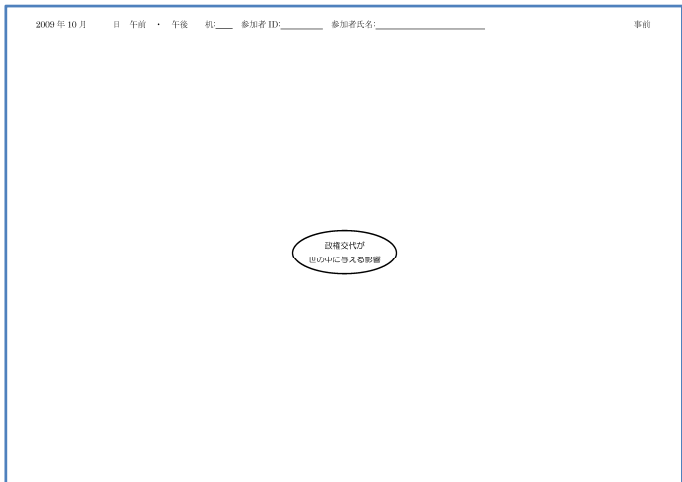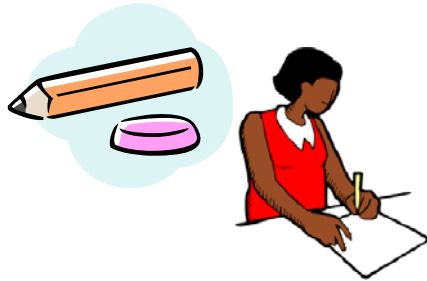
Procedure

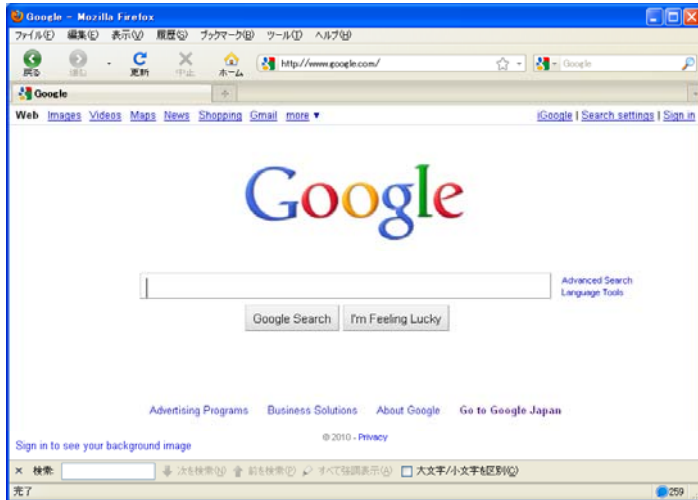|	
Quizzes about Web, IR, and Writing	10 min.
Search Experience Questionnaire	10 min.
Instruction of Cmap	5 min.
Practice of Cmap	5 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.
Closing Questionnaire	10 min.

1st task

2nd task

Procedure

Quizzes about Web, IR, and Writing	10 min.
Search Experience Questionnaire	10 min.
Instruction of Cmap	5 min.
Practice of Cmap	5 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.

1st task

Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.

2nd task

Closing Questionnaire	10 min.

2009 年 10 月   日 午前 ・ 午後   机:＿＿ 参加者 ID:＿＿＿ 参加者氏名:＿＿＿＿＿＿＿＿   事前
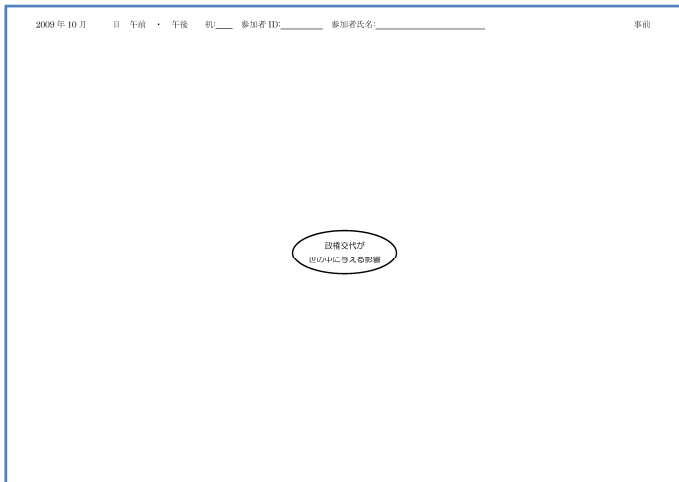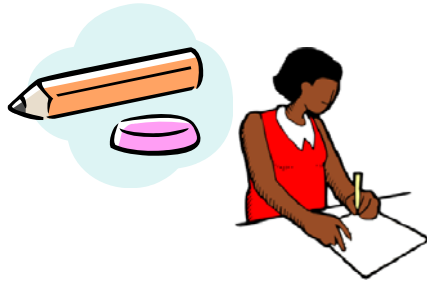
政権交代が
世の中に与える影響

Procedure

Quizzes about Web, IR, and Writing	10 min.
Search Experience Questionnaire	10 min.
Instruction of Cmap	5 min.
Practice of Cmap	5 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.

1st task

Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.

2nd task

Closing Questionnaire	10 min.

課題に関するアンケート - Mozilla Firefox

ファイル(F) 編集(E) 表示(V) 履歴(B) ブックマーク(B) ツール(T) ヘルプ(H)

google.com https://spreadsheets.google.com/formR

課題に関するアンケート

課題に関するアンケート

*必須

課題に関するアンケート
今の課題についてお聞きします。

氏名 *
姓と名の間にスペースをあけないでください。

Q1: 今終わったのは，何個目の課題ですか。 *
○ 1つ目の課題
○ 2つ目の課題

Q2-1: あなたはレポートのテーマについてよく知っていましたか。 *
○ まったく知らない
○ 少し知っている
○ よく知っている

× 検索   次を検索(N) 前を検索(P) すべて強調表示(A) □ 大文字/小文字を区別(C)

完了

Procedure

The second task followed the same sequence as the first task.
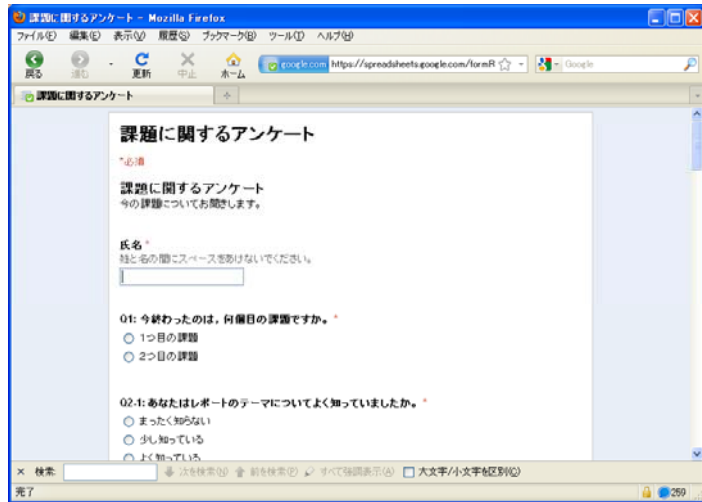
Quizzes about Web, IR, and Writing	10 min.
Search Experience Questionnaire	10 min.
Instruction of Cmap	5 min.
Practice of Cmap	5 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.

1st task

Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.

2nd task

Closing Questionnaire	10 min.

Procedure

Quizzes about Web, IR, and Writing	10 min.
Search Experience Questionnaire	10 min.
Instruction of Cmap	5 min.
Practice of Cmap	5 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.
Closing Questionnaire	10 min.

1st task

2nd task

2009 年 10 月　　日　午前　・　午後　　机:＿＿　参加者 ID:＿＿＿＿　参加者氏名:＿＿＿＿＿＿＿　　　　　　　事後
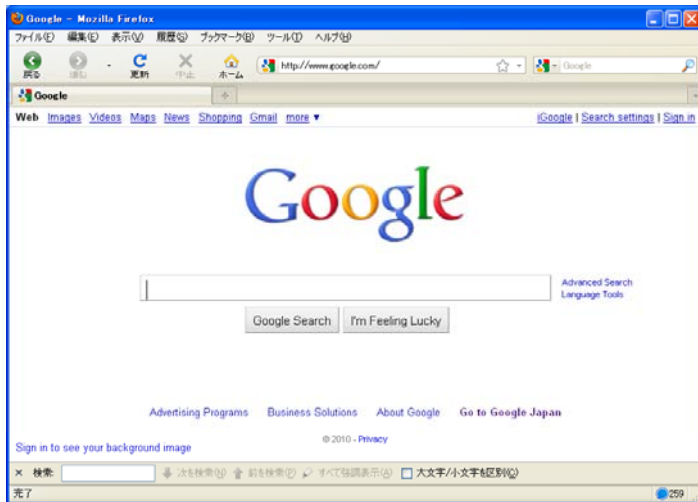
メディアが
若年層に与える影響

Procedure

Quizzes about Web, IR, and Writing	10 min.
Search Experience Questionnaire	10 min.
Instruction of Cmap	5 min.
Practice of Cmap	5 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.
Closing Questionnaire	10 min.

1st task

2nd task

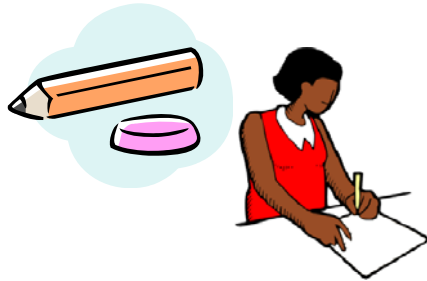# Procedure

Quizzes about Web, IR, and Writing	10 min.
Search Experience Questionnaire	10 min.
Instruction of Cmap	5 min.
Practice of Cmap	5 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.

1st task

Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.

2nd task

Closing Questionnaire	10 min.

2009 年10 月　　日　午前　・　午後：____　机：____　参加者 ID:_____　参加者氏名:_____　　　事後
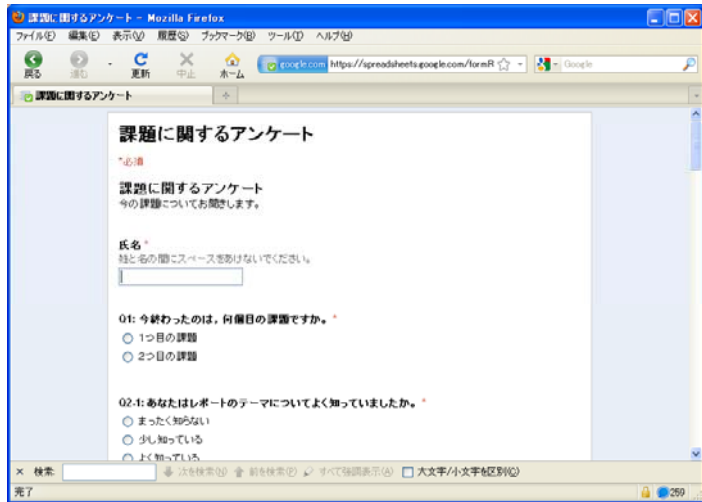
メディアが
若年層に与える影響

Procedure

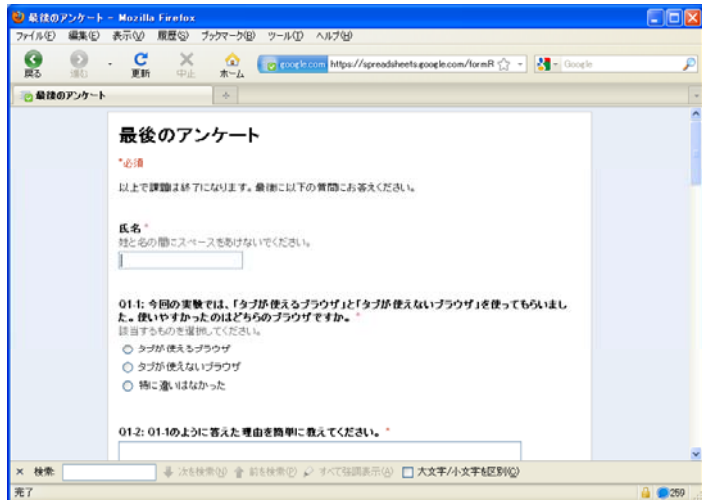|	
Quizzes about Web, IR, and Writing	10 min.
Search Experience Questionnaire	10 min.
Instruction of Cmap	5 min.
Practice of Cmap	5 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.
Closing Questionnaire	10 min.

1st task

2nd task

Procedure

Quizzes about Web, IR, and Writing	10 min.
Search Experience Questionnaire	10 min.
Instruction of Cmap	5 min.
Practice of Cmap	5 min.
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.

1st task

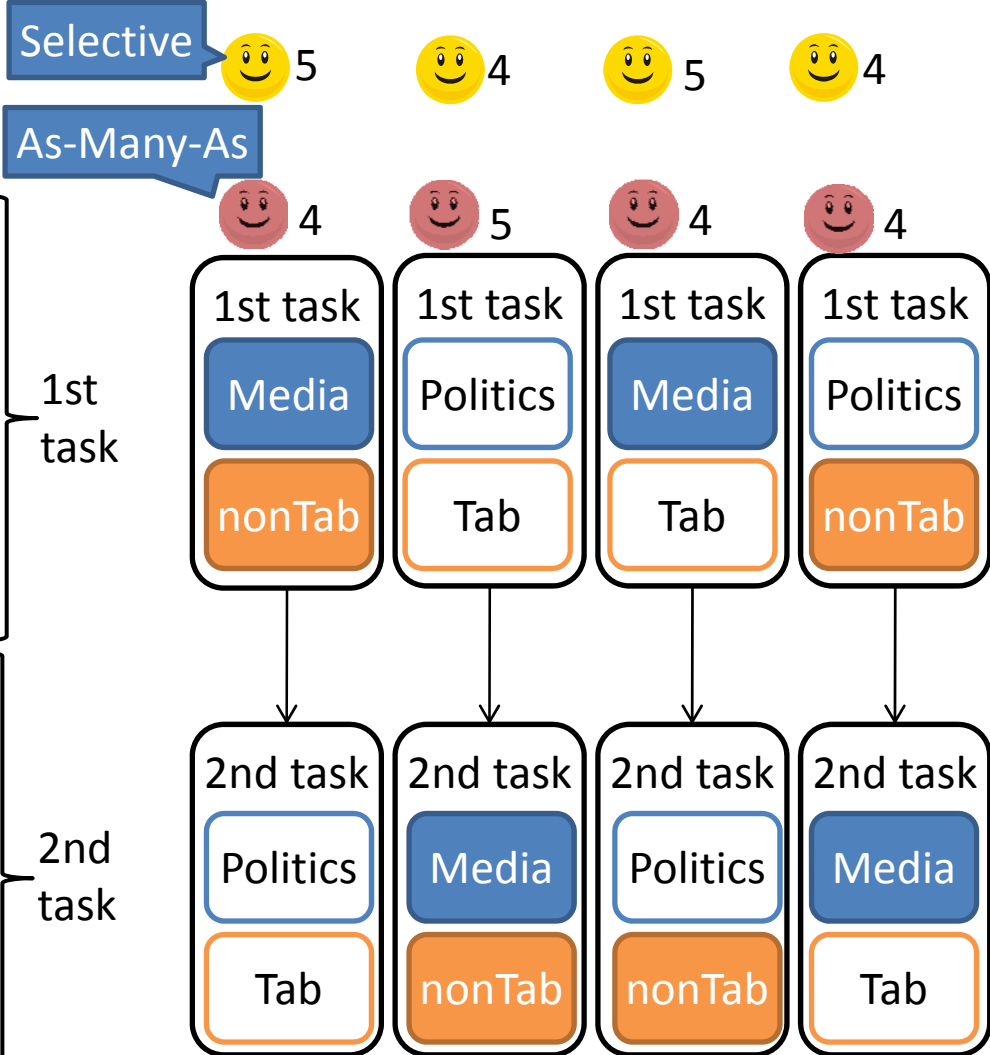|	
Instruction of Task	5 min.
Pre-Search Cmap for Topic	10 min.
Search	15 min.
Post-Search Cmap for Topic	10 min.
Questionnaire for Task	10 min.

2nd task

Closing Questionnaire	10 min.

Counter-balanced

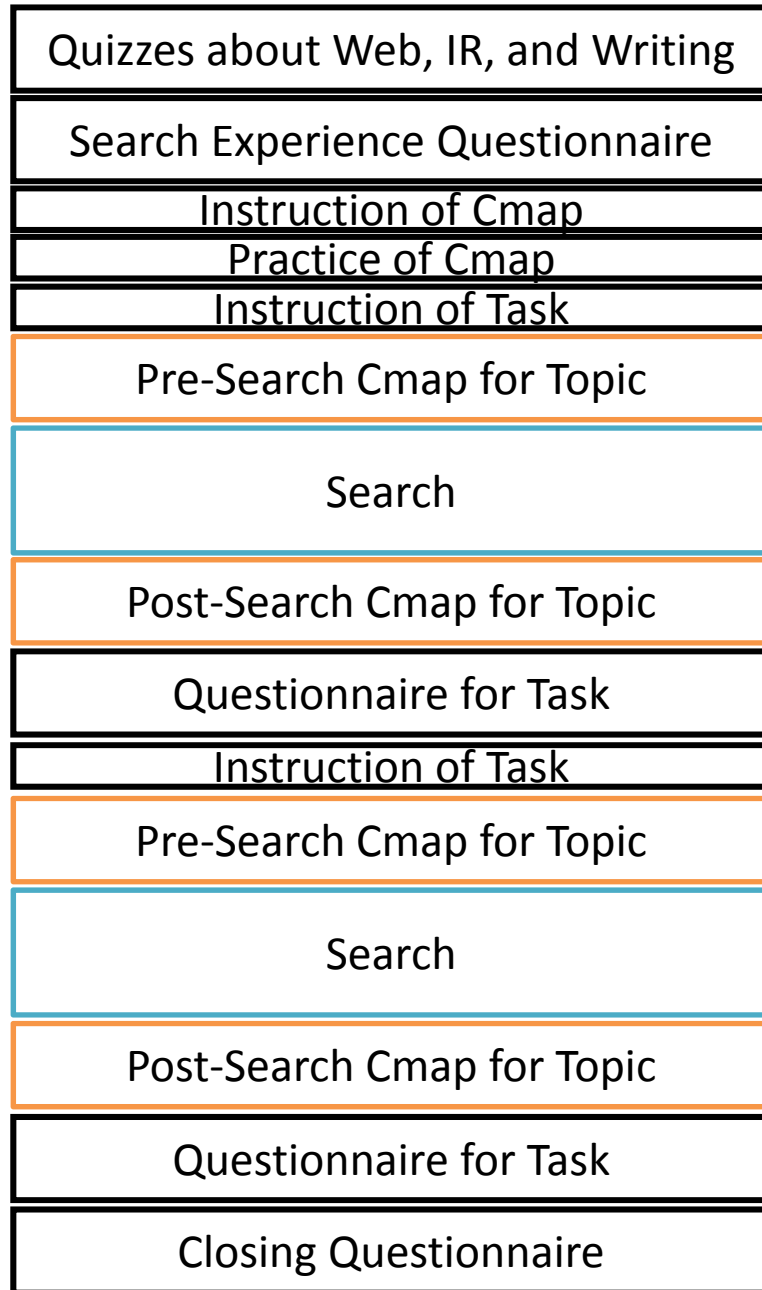Quizzes about Web, IR, and Writing

Search Experience Questionnaire

Instruction of Cmap

Practice of Cmap

Instruction of Task

Pre-Search Cmap for Topic

Search

Post-Search Cmap for Topic

Questionnaire for Task

1st task

Instruction of Task

Pre-Search Cmap for Topic

Search

Post-Search Cmap for Topic

Questionnaire for Task

2nd task

Closing Questionnaire

Selective 😊 5   😊 4   😊 5   😊 4

As-Many-As 😊 4   😊 5   😊 4   😊 4

1st task	1st task	1st task	1st task
Media	Politics	Media	Politics
nonTab	Tab	Tab	nonTab

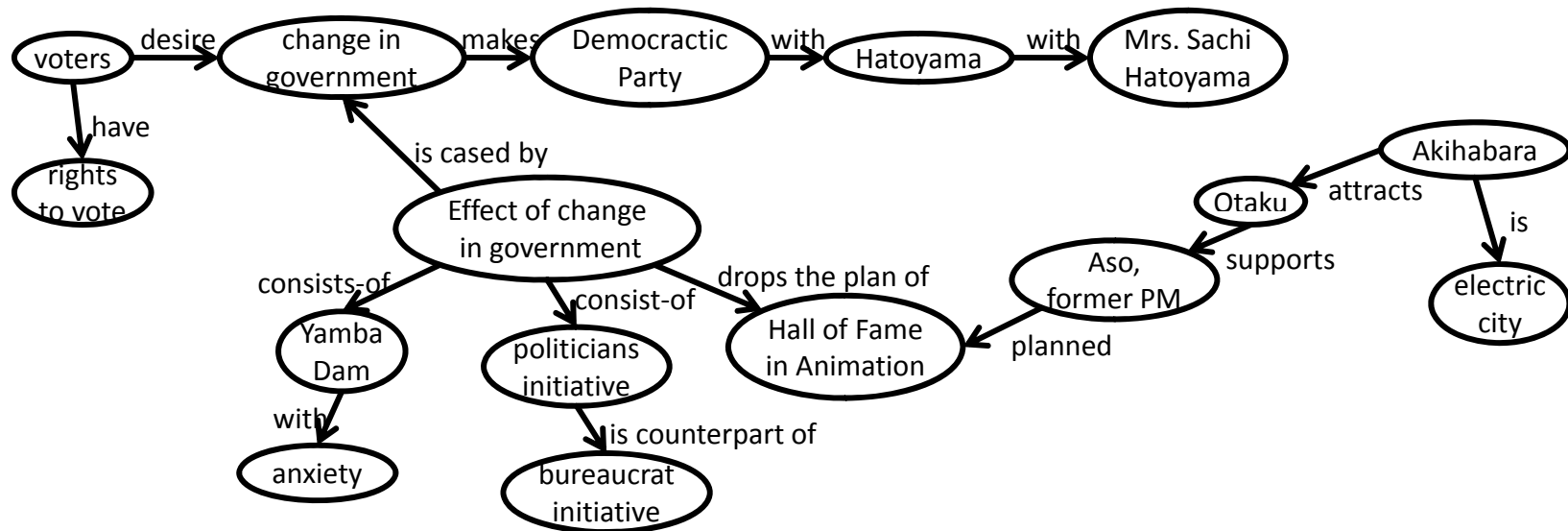| 2nd task	2nd task	2nd task	2nd task
Politics	Media	Politics	Media
Tab	nonTab	nonTab	Tab

*Cmap: Concept Map

Results

Analysis Method: Overview (1)
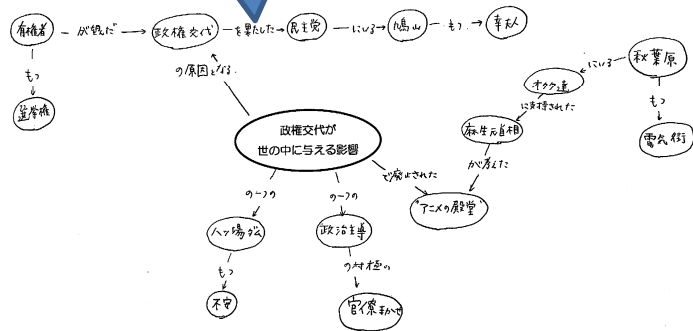# concept map → directed graph

- Using graph components:
  - Node
  - Link
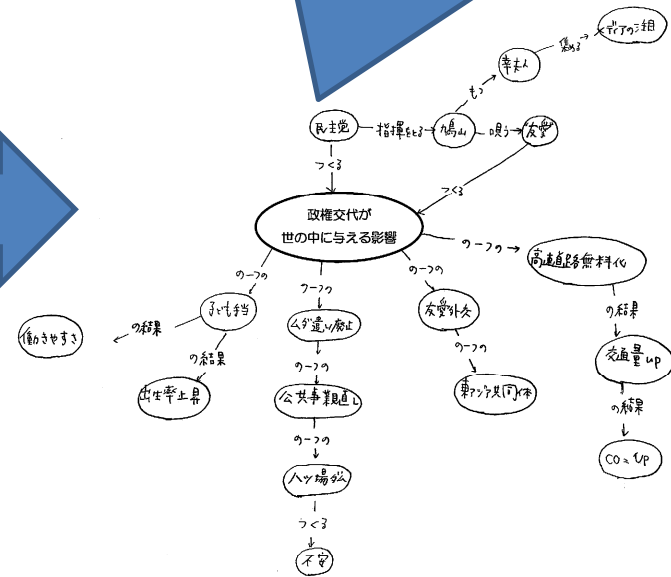 - Link label

Analysis Method: Overview (2)
Comparing pre- and post-search cmaps

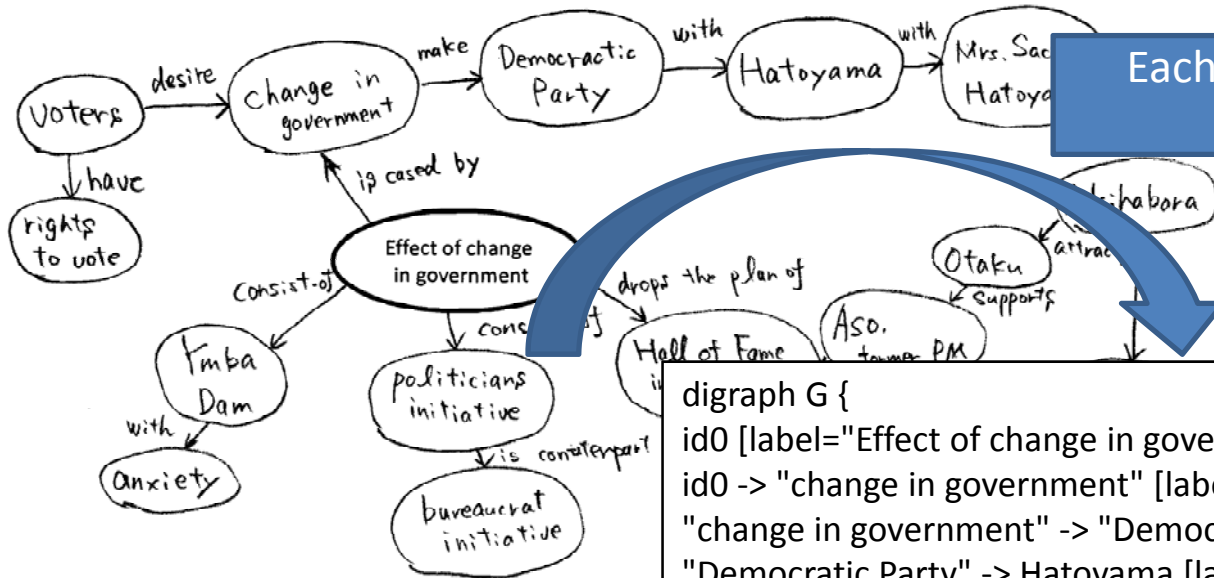Pre-search cmap:
drawn up *before* search task

Post-search cmap:
made *after* search task

What changed?

Data preparation

Each concept map transcribed
Into GraphViz format

Participants manually
draw concept maps
with a pencil

```
digraph G {
id0 [label="Effect of change in government"]
id0 -> "change in government" [label="is caused by"]
"change in government" -> "Democratic Party" [label="makes"]
"Democratic Party" -> Hatoyama [label="with"]
Hatoyama -> "Mrs. Sachi Hatoyama" [label="with"]
voters -> "change in government" [label="desire"]
voters -> "rights to vote" [label="have"]
id0 -> "Hall of Fame in Animation" [label="drops the plan of"]
Akihabara -> "electric city" [label="is"]
Akihabara -> Otaku [label="attracts"]
Otaku -> "Aso, former PM" [label="supports"]
"Aso, former PM" -> "Hall of Fame in Animation" [label="planned"]
id0 -> "politicians initiative" [label="consists-of"]
"politicians initiative" -> "bureaucratic initiative" [label="is counterpart of"]
id0 -> "Yamba Dam" [label="consists-of"]
"Yamba Dam" -> anxiety [label="with"]}
```

Example of concept map generated using GraphViz dot command
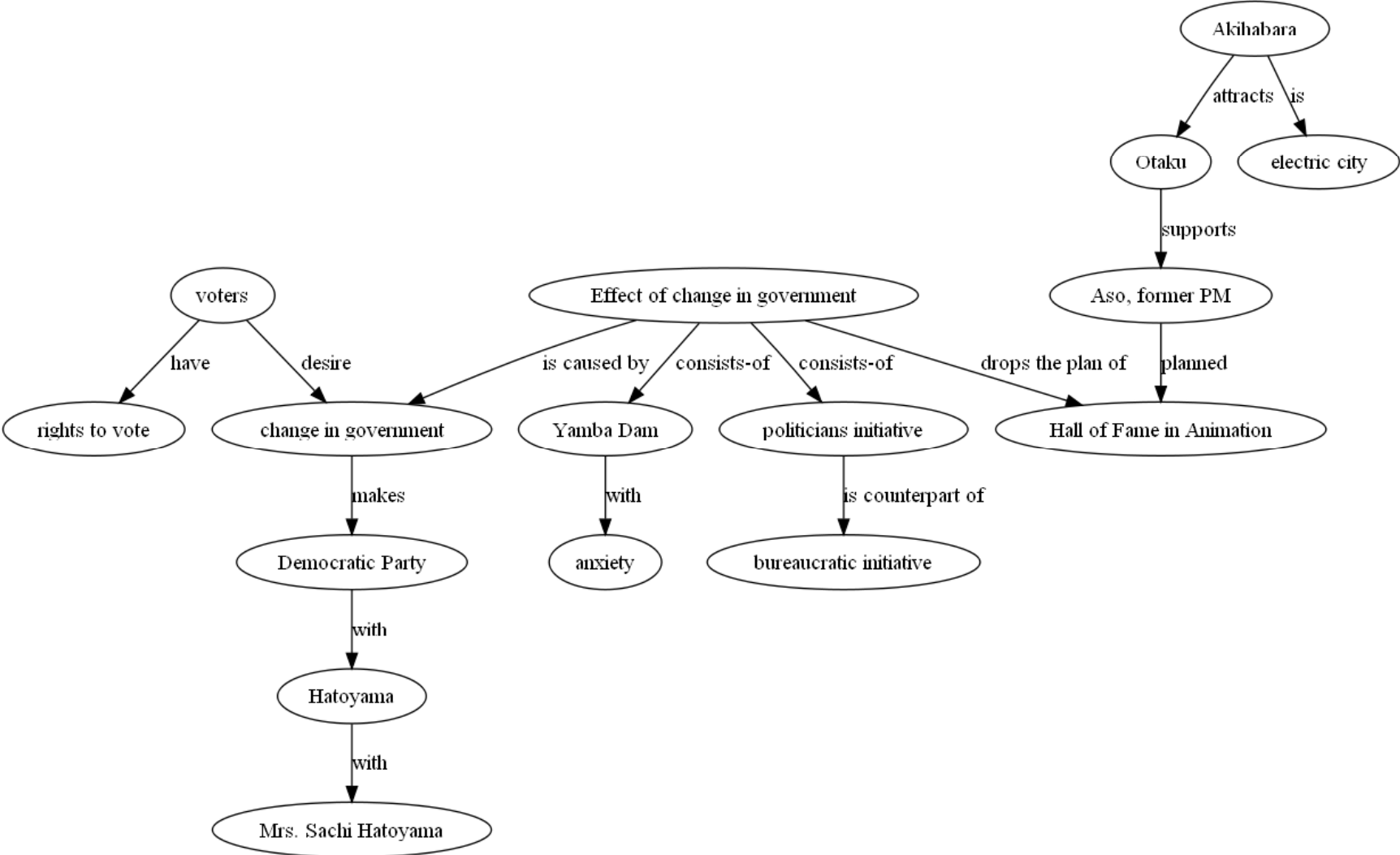
Numbers of nodes, links, and link labels

voters — desire → change in government — makes → Democractic Party — with → Hatoyama — with → Mrs. Sachi Hatoyama

voters — have → rights to vote

change in government — is cased by → Effect of change in government

Effect of change in government — consists-of → Yamba Dam

Effect of change in government — consist-of → politicians initiative

Effect of change in government — drops the plan of → Hall of Fame in Animation

Yamba Dam — with → anxiety

politicians initiative — is counterpart of → bureaucrat initiative

Hall of Fame in Animation — planned → Aso, former PM

Aso, former PM — supports → Otaku

Akihabara — attracts → Otaku

Akihabara — is → electric city

Analysis Results:
Number of nodes = 16
Number of links = 15
Number of link labels = 15

Summary: number of graph components in concept maps (n=70)

	Min.	Max.	Mean.	Median	SD
No. of nodes:					
Pre_Node	6	61	22.89	21	9.97
Post_Node	8	57	23.93	21	10.72
No. of links:					
Pre_Link	5	60	23.06	21	10.20
Post_Link	7	57	24.76	22	11.25
No. of link labels:					
Pre_LLabel	0	36	12.51	11	9.57
Post_LLabel	0	35	12.86	12	10.10

Similar tendencies

- Average number of nodes(22-23) and links(23 − 24)
- Numbers of nodes and links show similar tendencies
- Reason: nodes usually only have a single link

Summary: number of graph components in concept maps (n=70)

	Min.	Max.	Mean.	Median	SD
No. of nodes:					
Pre_Node	6	61	22.89	21	9.97
Post_Node	8	57	23.93	21	10.72
No. of links:					
Pre_Link	5	60	23.06	21	10.20
Post_Link	7	57	24.76	22	11.25
No. of link labels:					
Pre_LLabel	0	36	12.51	11	9.57
Post_LLabel	0	35	12.86	12	10.10

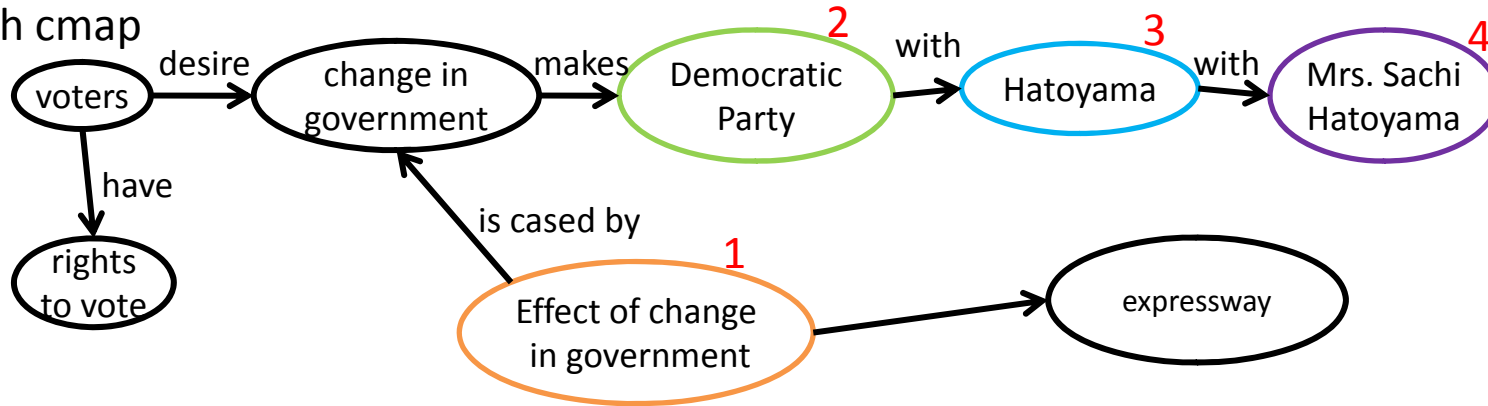Similar tendencies

Similar tendencies

Similar tendencies

Numbers of pre- and post-search graph components
show similar tendencies

Metrics of Difference between
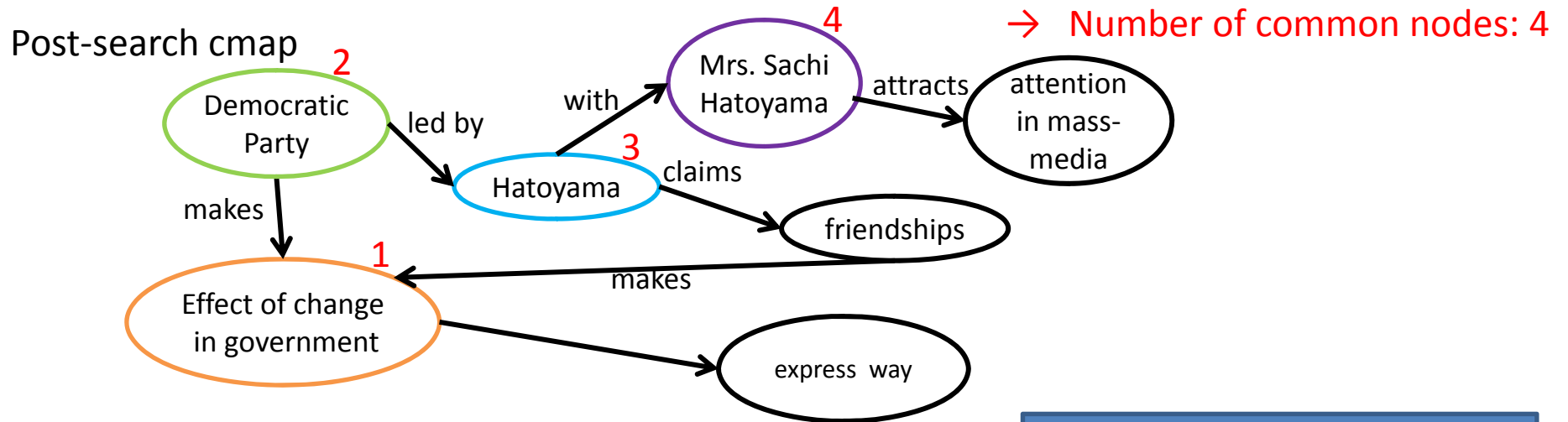# Pre- and Post-search Concept Maps

- Metrics of difference between pre- and post-search concept maps:
  - *Common*, *New*, and *Lost graph* components
- Analysis:
  - Numbers of common, new, and lost graph components
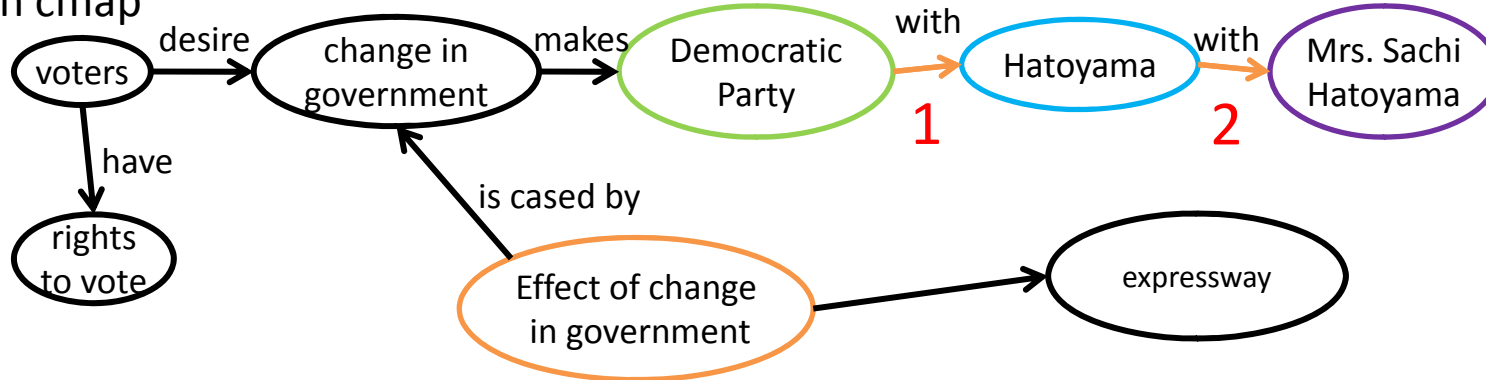
Common nodes

Pre-search cmap

voters —desire→ change in government —makes→ **Democratic Party** (2) —with→ **Hatoyama** (3) —with→ **Mrs. Sachi Hatoyama** (4)

voters —have→ rights to vote

Effect of change in government (1) —is cased by→ change in government

Effect of change in government (1) → expressway

Common nodes: those having the same label

Post-search cmap

Democratic Party (2) —led by→ **Hatoyama** (3) —with→ **Mrs. Sachi Hatoyama** (4) —attracts→ attention in mass-media

→ Number of common nodes: 4

Democratic Party (2) —makes→ **Effect of change in government** (1)

Hatoyama (3) —claims→ friendships

friendships —makes→ **Effect of change in government** (1)

Effect of change in government (1) → express way

By the same participant

Common links

Pre-search cmap

voters —desire→ change in government —makes→ Democratic Party —with→ Hatoyama —with→ Mrs. Sachi Hatoyama

1   **2**

voters —have→ rights to vote

Effect of change in government —is cased by→ change in government

Effect of change in government → expressway

Common links:
Source node and target node are common

Post-search cmap

→ Number of common links: 2

Democratic Party —led by→ Hatoyama —with→ Mrs. Sachi Hatoyama —attracts→ attention in mass-media

1   **2**

Democratic Party —makes→ Effect of change in government

Hatoyama —claims→ friendships

friendships —makes→ Effect of change in government

Effect of change in government → express way
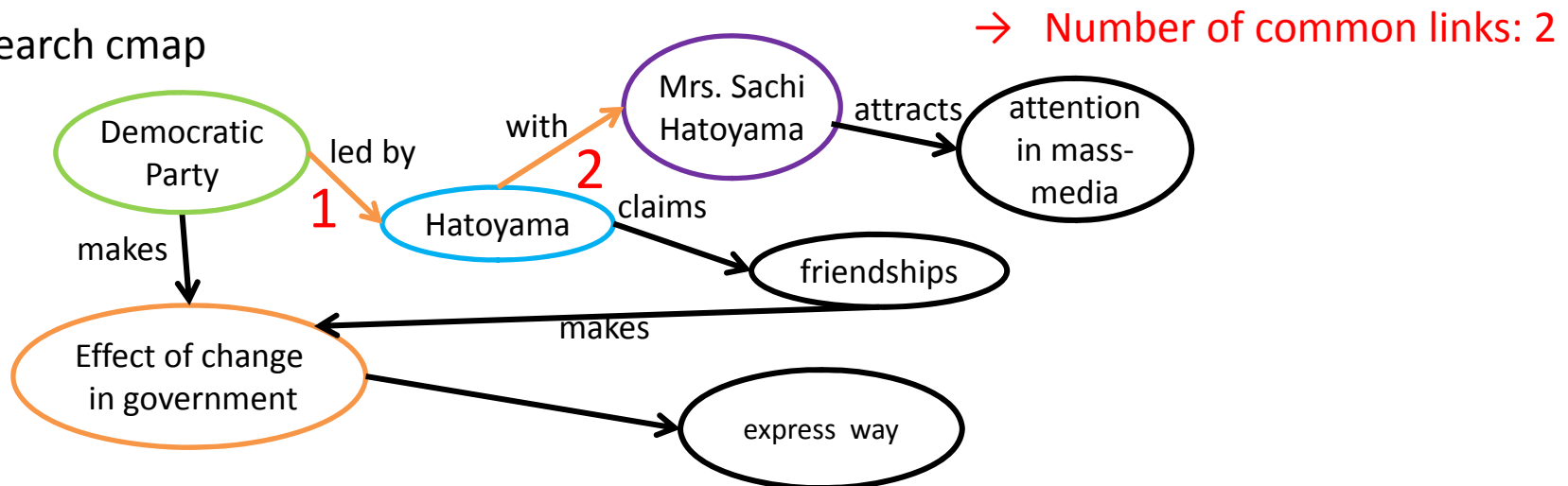
Common link labels

Pre-search cmap
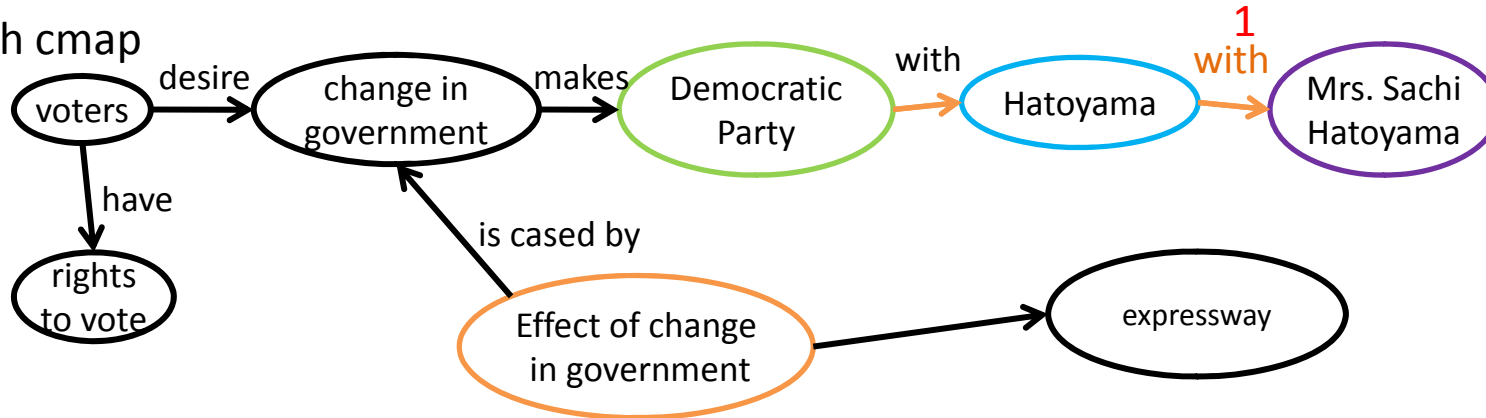
Common link labels:
common links with the same labels

Post-search cmap

→ Number of common link labels: 1
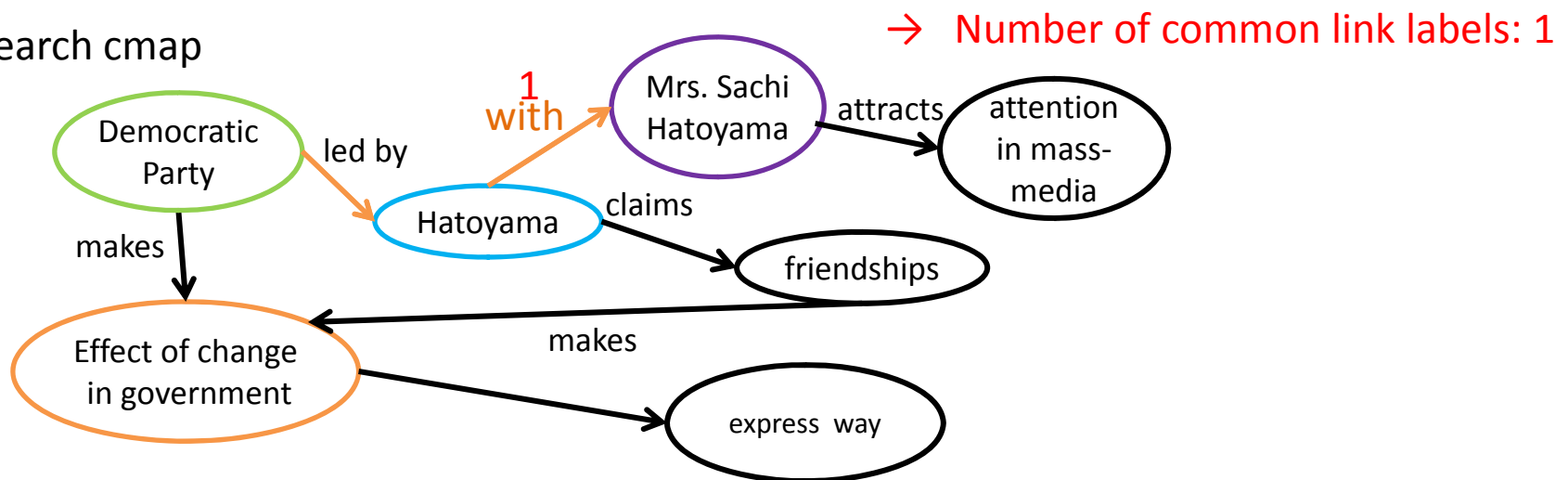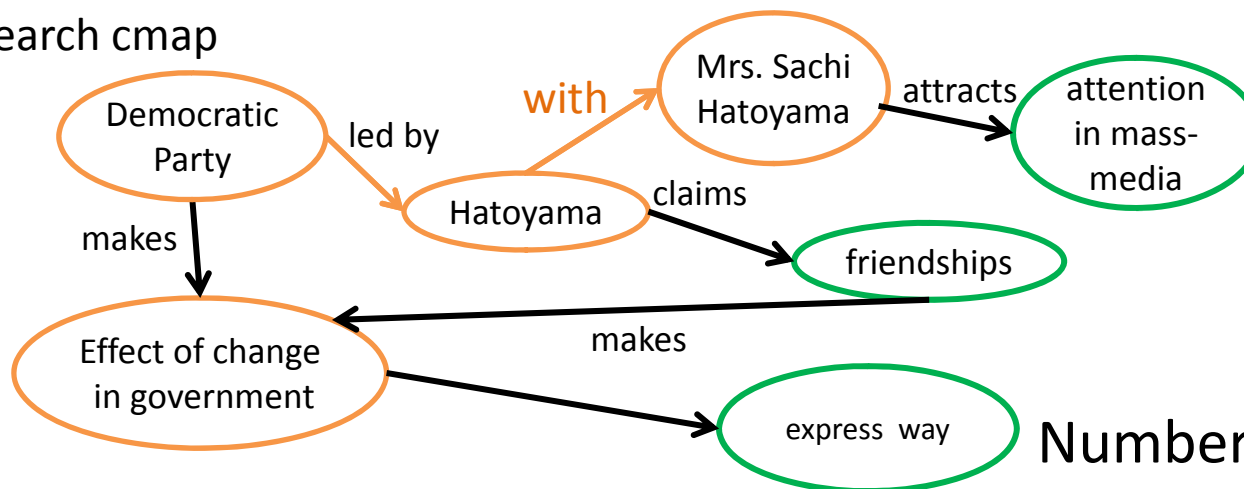
Lost nodes and new nodes

Pre-search cmap
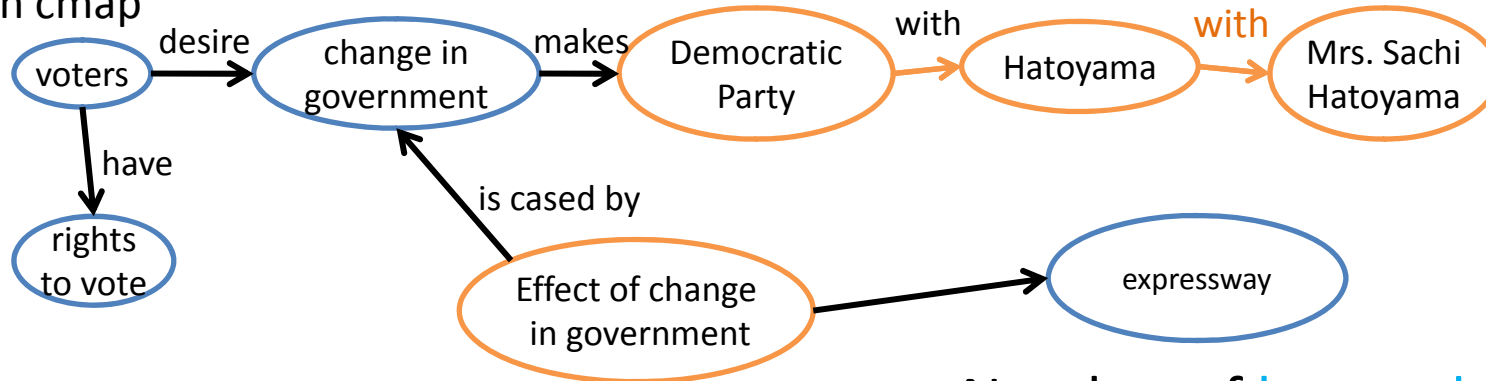
Number of lost nodes: 4

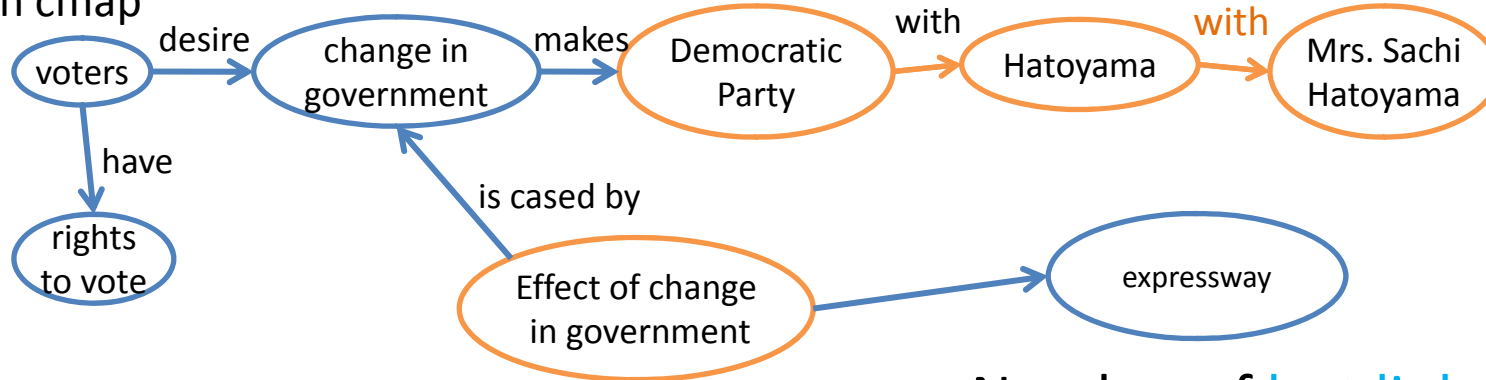Lost nodes: only in pre-search cmaps
New nodes: only in post-search cmaps

Post-search cmap

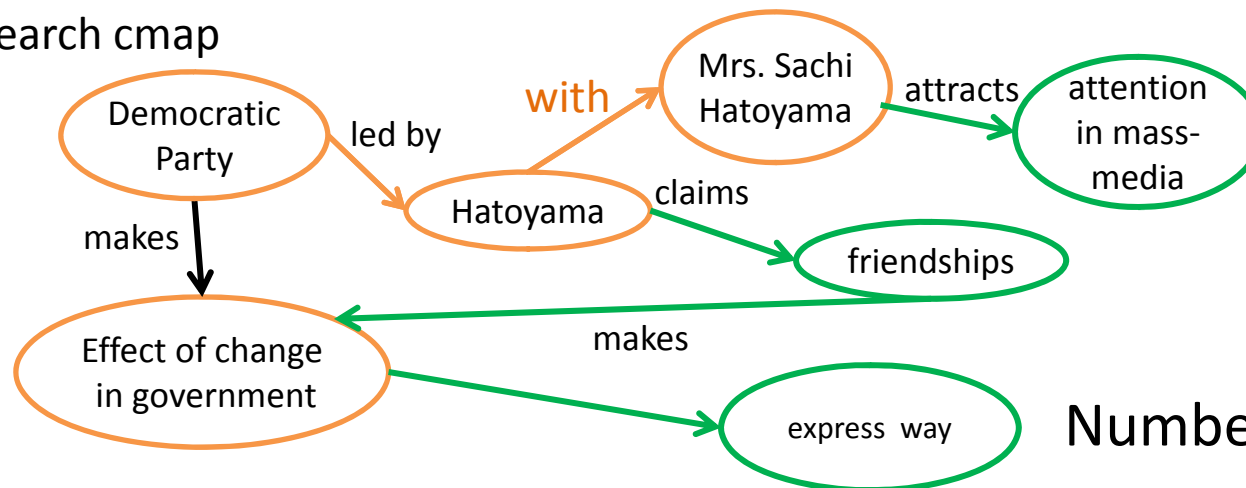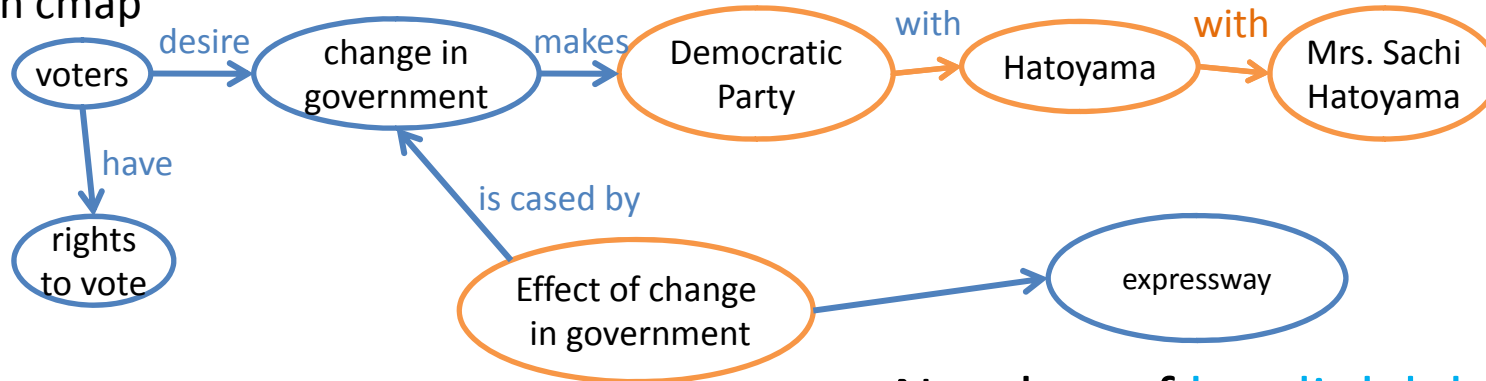Number of new nodes: 3

Lost links and New links

Pre-search cmap

voters —desire→ change in government —makes→ Democratic Party —with→ Hatoyama —with→ Mrs. Sachi Hatoyama

voters —have→ rights to vote

Effect of change in government —is cased by→ change in government

Effect of change in government → expressway

Number of lost links: 5

Lost links: only in pre-search cmaps

New links: only in post-search cmaps

Post-search cmap

Democratic Party —led by→ Hatoyama —with→ Mrs. Sachi Hatoyama —attracts→ attention in mass-media

Democratic Party —makes→ Effect of change in government

Hatoyama —claims→ friendships

friendships —makes→ Effect of change in government

Effect of change in government → express way

Number of new links: 4

Lost link labels and New link labels

Pre-search cmap

voters — desire → change in government — makes → Democratic Party — with → Hatoyama — with → Mrs. Sachi Hatoyama

voters — have → rights to vote

Effect of change in government — is cased by → change in government
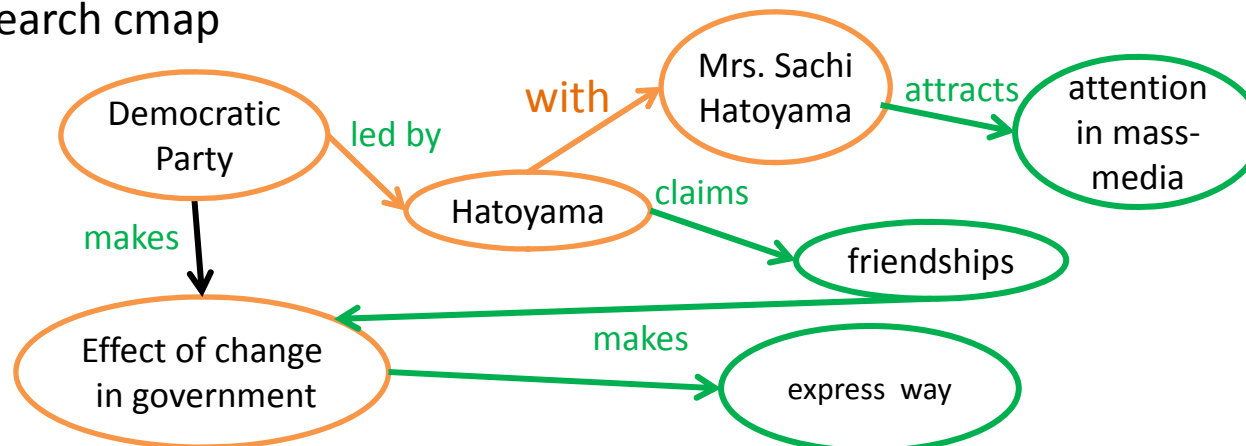
Effect of change in government → expressway

Number of lost link labels: 5

Lost link labels: only in pre-search cmaps

New link labels: only in post-search cmaps

Post-search cmap

Democratic Party — led by → Hatoyama

Hatoyama — with → Mrs. Sachi Hatoyama — attracts → attention in mass-media

Hatoyama — claims → friendships

Democratic Party — makes → Effect of change in government

friendships → Effect of change in government

Effect of change in government — makes → express way

Number of new link labels: 5

VizCMaps

Combined concept map of pre- and post- search concept map with common, new, lost graph components.
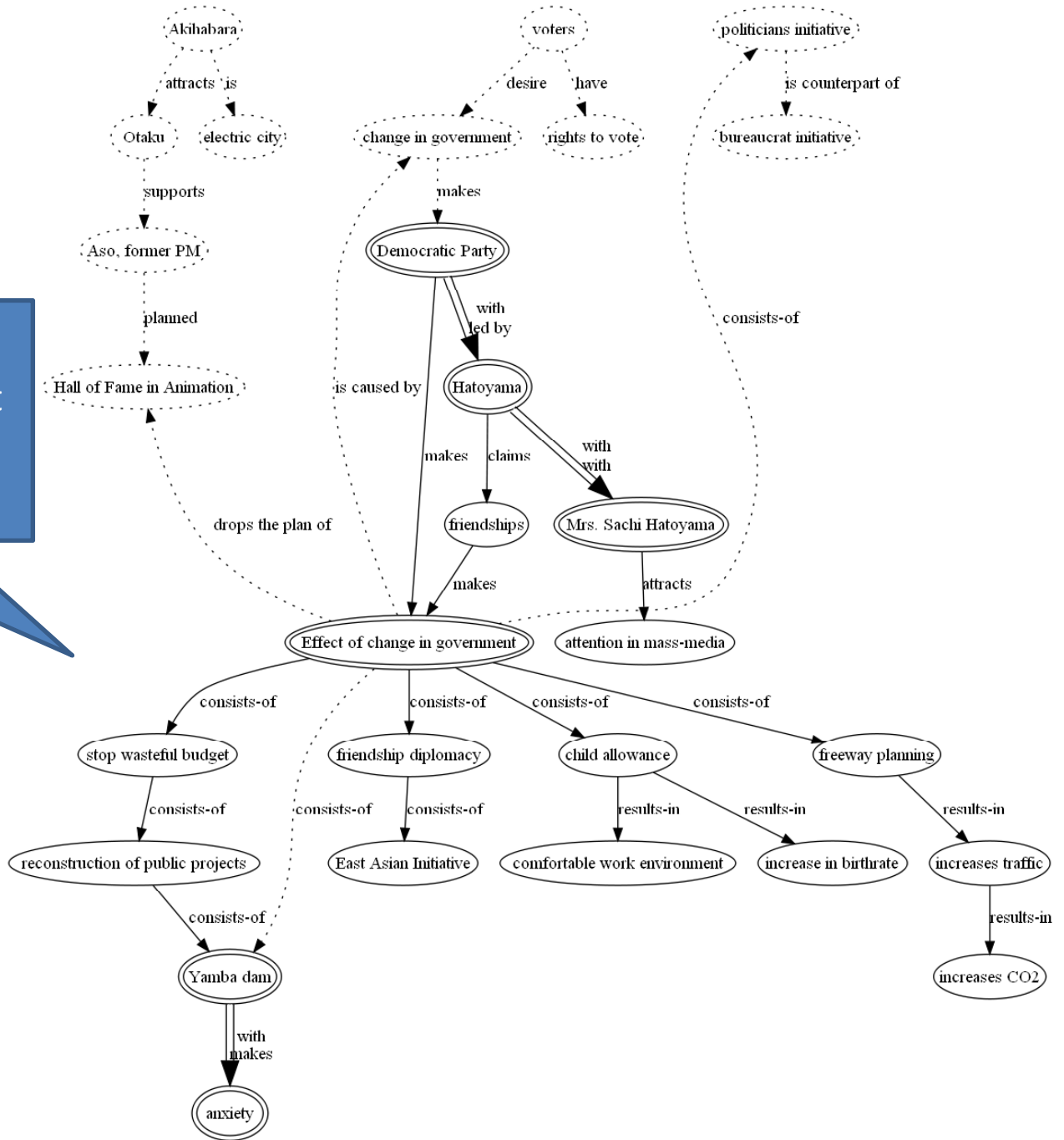
Legend:
- ⬯ (double solid ellipse): Common
- ⬭ (dashed ellipse): Lost
- ⬮ (solid ellipse): New

Summary: common, new, and lost graph components(n=70)

|	Min.	Max.	Mean.	Median	SD
No. of nodes:					
Common_Node	1	30	6.1	5	4.9
New_Node	6	53	17.8	15.5	
Lost_Node	3	51	16.7	15	8.7
No. of links:					
Common_Link	0	15	2.7	2	3.2
New_Link	7	57	22.0	20	
Lost_Link	4	56	20.3	19.5	9.8
No. of link labels:					
Common_LLabel	0	8	1.4	0	2.0
New_LLabel	0	31	11.5	11	
Lost_LLabel	0	34	11.1	10	8.8

Common < new, lost

- Numbers of common components smaller than numbers of new & lost components
- ➤ Post-search cmaps are greatly modified from pre-search cmaps
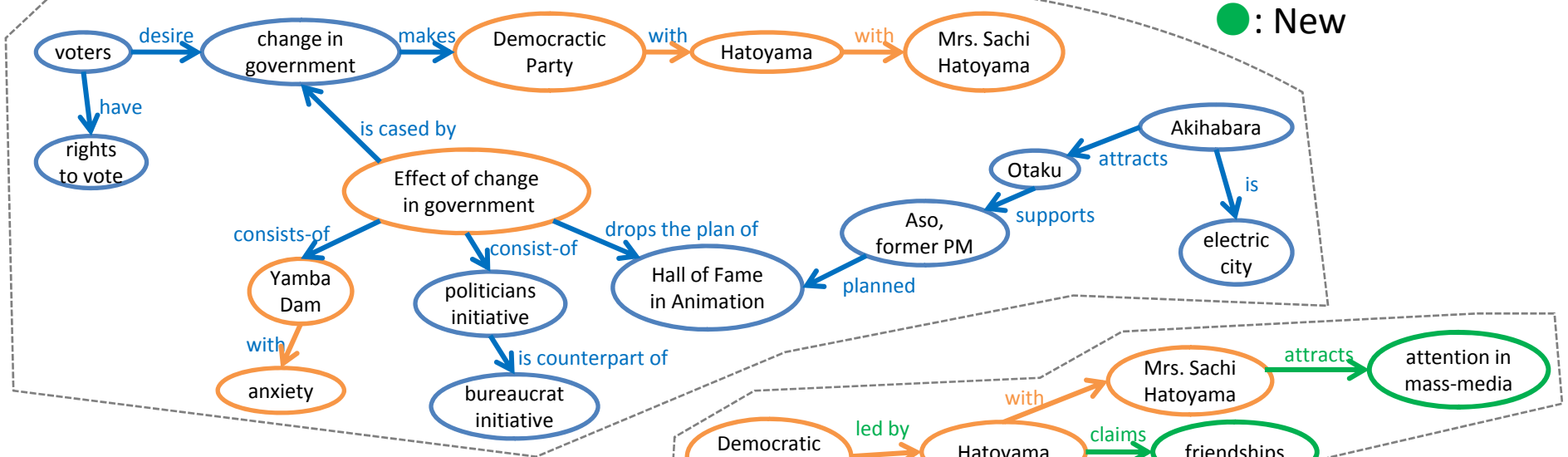
Pre-concept map

Concept maps greatly changed
After web searching

Post-search cmap

Legend:
- : Common
- : Lost
- : New
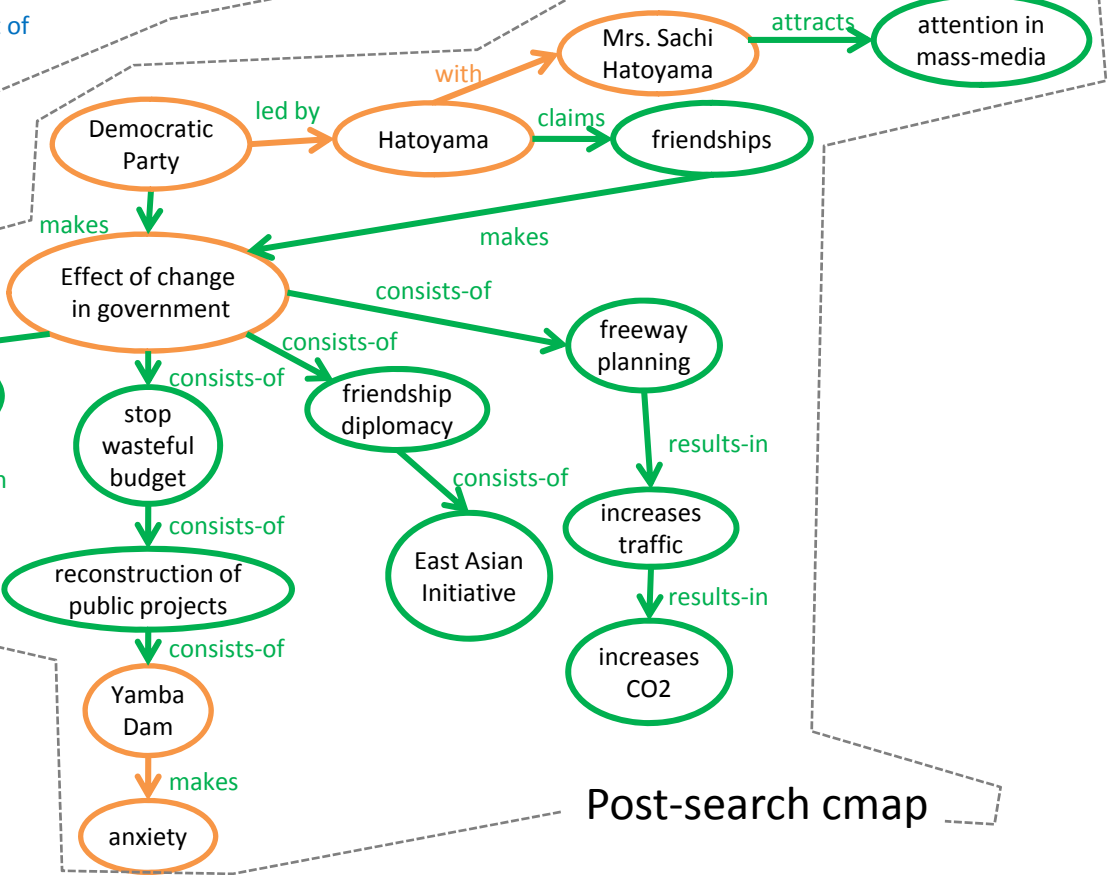
Influences of experimental factors: Topics, scenarios, and browser types

- ANOVA analysis: number of common, new, lost graph components and three experimental factors
  - Significant differences in only common nodes and common link labels between scenario factors

Common nodes and common link labels: Selective > As-Many-As

+ p < .10

Common node

Common link label
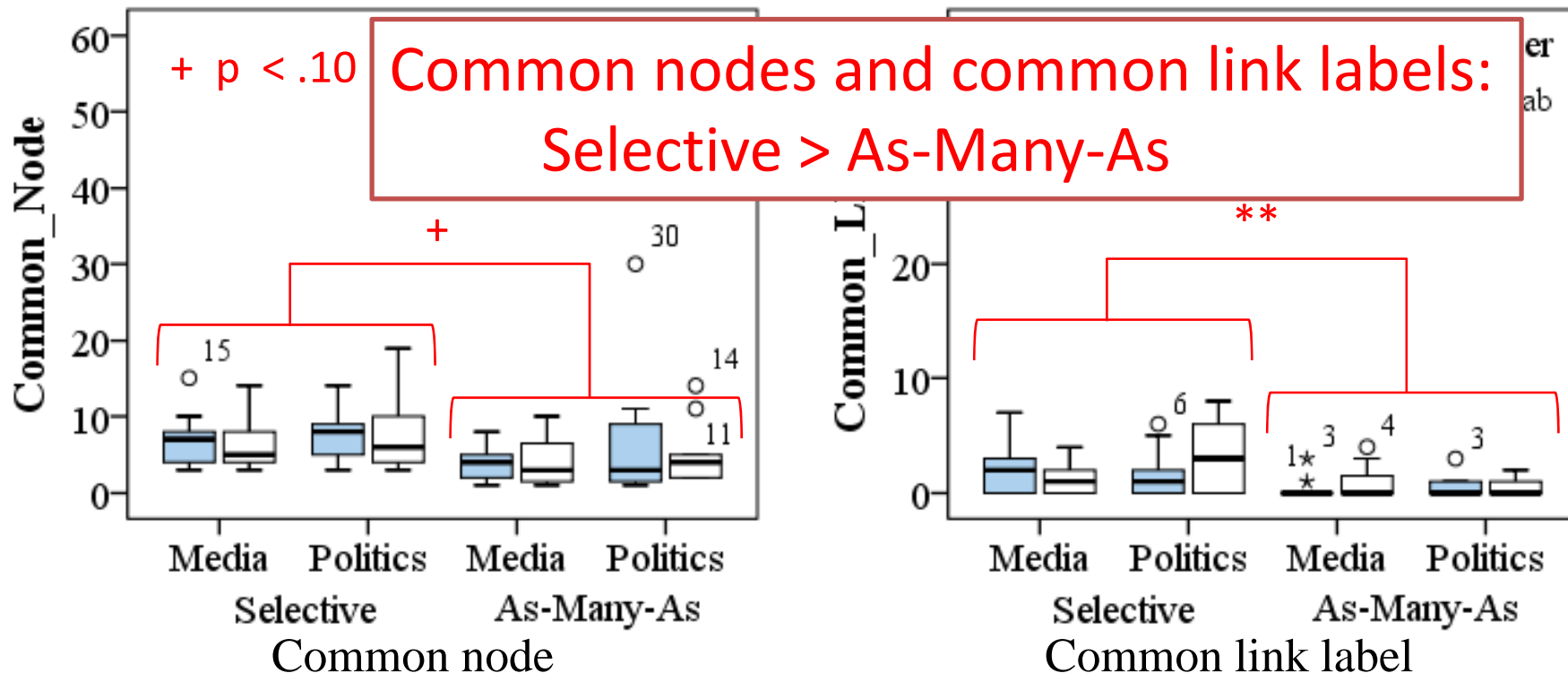
Summary of Results (1)

- RQ1: What differences observed between pre- and post-search cmaps?
  - Analysis: Major changes between concept maps before and after exploratory search tasks
  - Many graph components in pre-search concept maps were lost
  - Many new components appeared in post-search concept maps

Summary of Results (2)

- RQ2: How do differences between topics, scenarios and browser types influence changes in user's concept map?

    – No differences: Topic and Browser type

    – Scenario factor: Numbers of both common nodes and link labels in As-Many-As scenario smaller than in Selective scenario

Conclusions

- Concept maps: evaluated how users change knowledge structure after exploratory search

- User experiment:
  - Task: Information-gathering
  - Factors: topic, scenario, browser type

- Analysis: concept maps as directed graphs
  - Metrics: Common, new, and lost graph components

- Results:
  - Concept maps greatly changed after web search
  - Fewer common nodes and link labels in As-Many-As scenario than in Selective scenario

Thank you!

For more details,
please visit our Web site:
http://cres.jpn.org

Hitomi   Hitoshi   Yuka

Masao   Noriko   Makiko