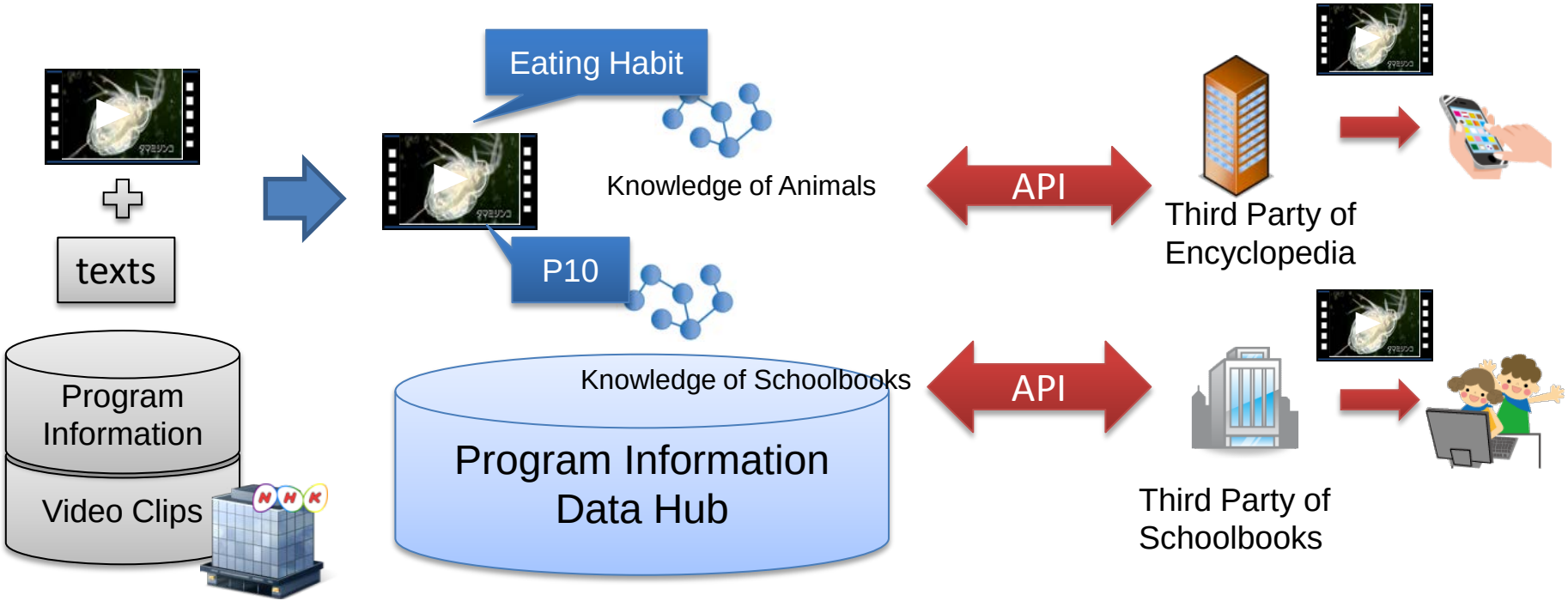
A study about the Organization of Video Contents based on the Educational Curriculum

NHK
Science & Technology Research Laboratories
Makoto Urakawa

Structured & dedicated Knowledge



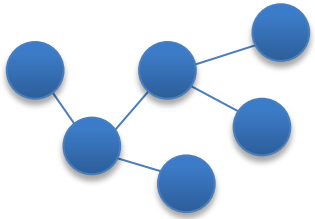
Structured & dedicated Knowledge

New Approach

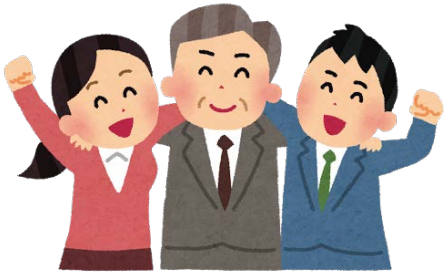
texts

Program Information

Video Clips



Trusted External Data



Agenda

1. Study about constructing ontology for education
2. Efforts toward putting it into practice

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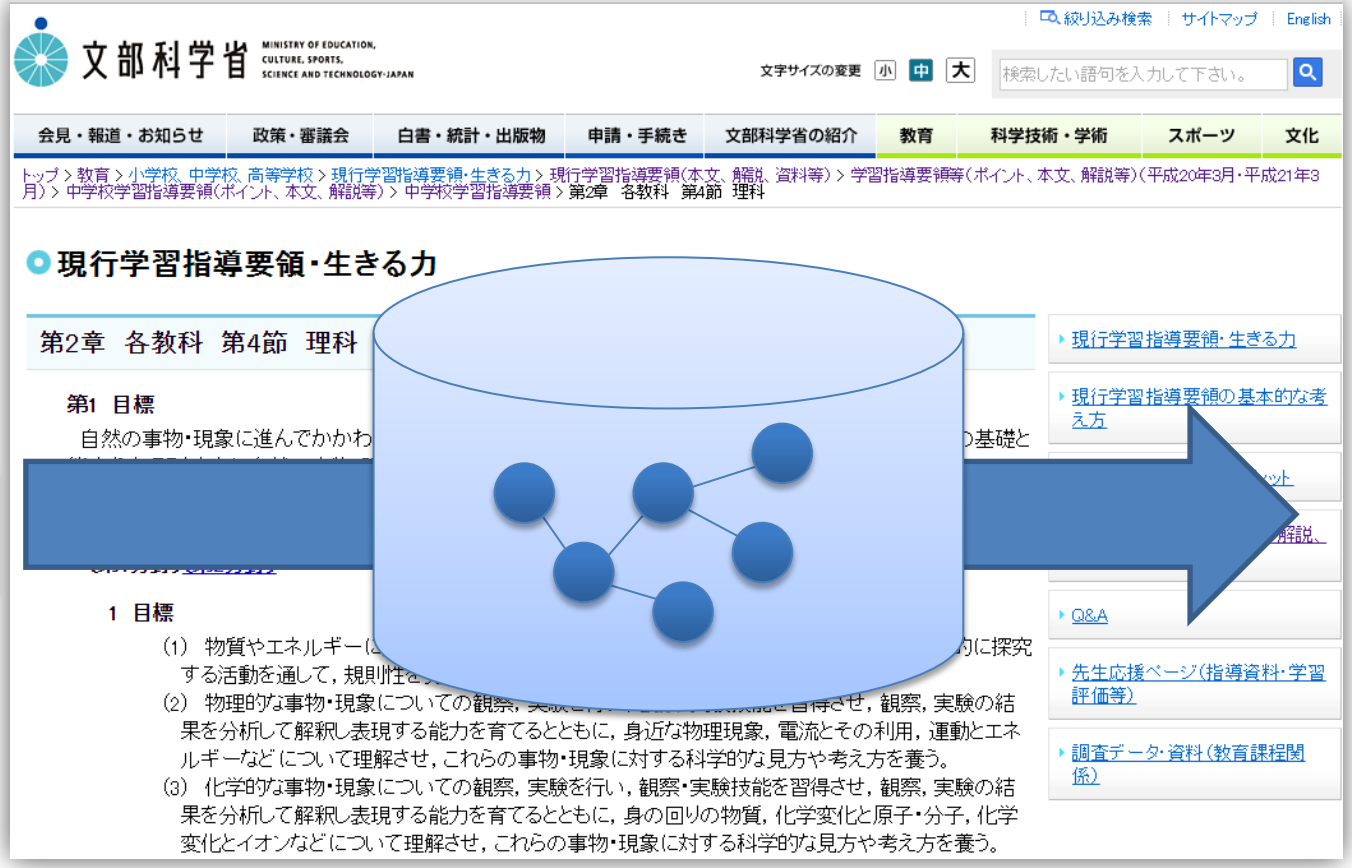
1. Study about constructing ontology for education
2. Efforts toward putting it into practice

Curriculum


絞り込み検索
サイトマップ
English
文部科学省
MINISTRY OF EDUCATION, CULTURE, SPORTS, SCIENCE AND TECHNOLOGY-JAPAN
文字サイズの変更 小 中 大
検索したい語句を入力して下さい。
会見・報道・お知らせ
政策・審議会
白書・統計・出版物
申請・手続き
文部科学省の紹介
教育
科学技術・学術
スポーツ
文化
トップ > 教育 > 小学校、中学校、高等学校 > 現行学習指導要領・生きる力 > 現行学習指導要領(本文、解説、資料等) > 学習指導要領等(ポイント、本文、解説等)(平成20年3月・平成21年3月) > 中学校学習指導要領(ポイント、本文、解説等) > 中学校学習指導要領 > 第2章 各教科 第4節 理科
現行学習指導要領・生きる力
第2章 各教科 第4節 理科
第1 目標
自然の事物・現象に進んでかかわ
の基礎と
1 目標
(1) 物質やエネルギー
的に探究
する活動を通して，規則性
(2) 物理的な事物・現象についての観察，実験
能を習得させ，観察，実験の結果を分析して解釈し表現する能力を育てるとともに，身近な物理現象，電流とその利用，運動とエネルギーなどについて理解させ，これらの事物・現象に対する科学的な見方や考え方を養う。
(3) 化学的な事物・現象についての観察，実験を行い，観察・実験技能を習得させ，観察，実験の結果を分析して解釈し表現する能力を育てるとともに，身の回りの物質，化学変化と原子・分子，化学変化とイオンなどについて理解させ，これらの事物・現象に対する科学的な見方や考え方を養う。
現行学習指導要領・生きる力
現行学習指導要領の基本的な考え方
Q&A
先生応援ページ(指導資料・学習評価等)
調査データ・資料(教育課程関係)

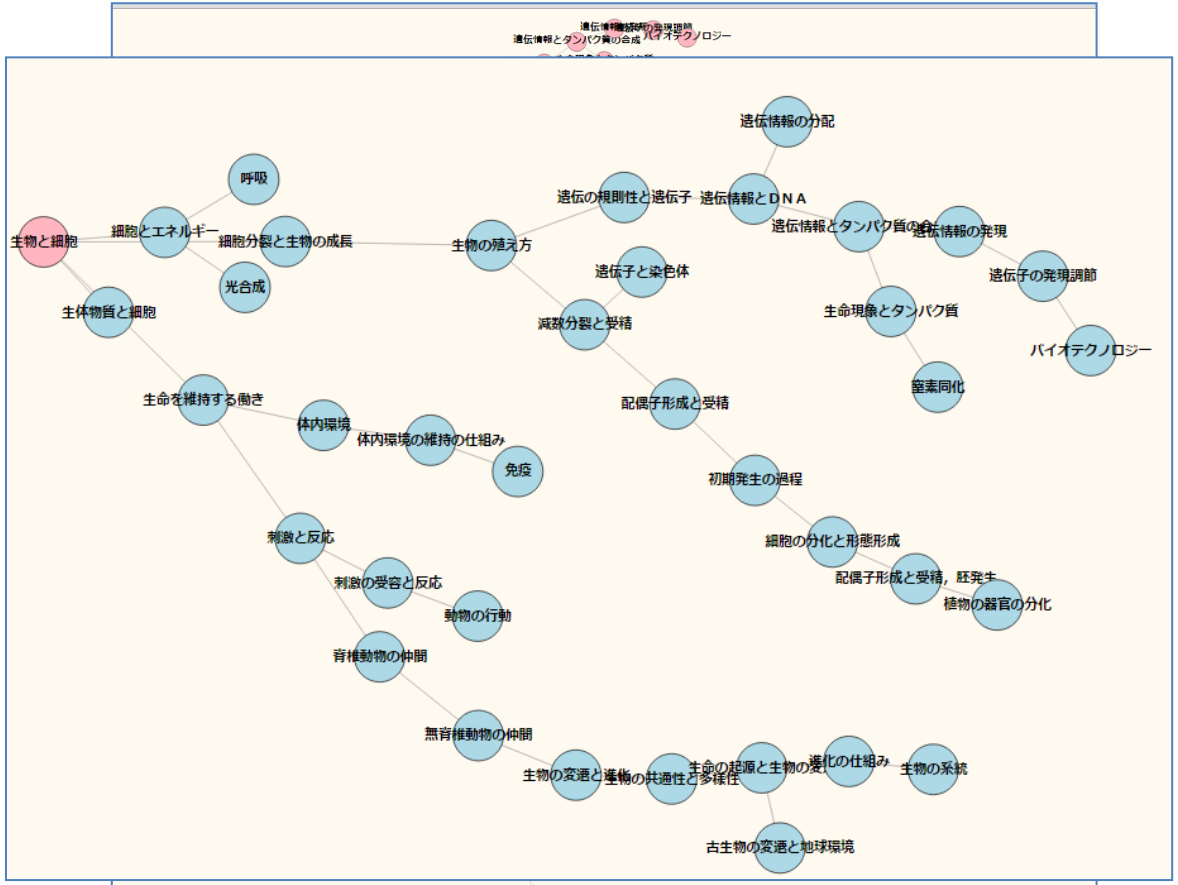
Study about Constructing Ontology for Educational Videos

[Challenge of Present Curriculum]
■doesn’t express the flow to acquire knowledge
■Isn’t accessible because of being published in PDF/HTML

[Objective]
■Making the knowledge graph from curriculum with RDF triples.

[Output]
■Constructing ontology
■Visualize learning path and Integrate videos with it

Output


遺伝情報とタンパク質の合成
バイオテクノロジー
遺伝情報の分配
呼吸
遺伝の規則性と遺伝子
遺伝情報とＤＮＡ
生物と細胞
細胞とエネルギー
細胞分裂と生物の成長
生物の殖え方
遺伝情報とタンパク質の合成
遺伝情報の発現
遺伝子の発現調節
光合成
遺伝子と染色体
生体物質と細胞
減数分裂と受精
生命現象とタンパク質
バイオテクノロジー
窒素同化
生命を維持する働き
体内環境
配偶子形成と受精
体内環境の維持の仕組み
免疫
初期発生の過程
刺激と反応
細胞の分化と形態形成
刺激の受容と反応
配偶子形成と受精，胚発生
植物の器官の分化
動物の行動
脊椎動物の仲間
無脊椎動物の仲間
生物の変遷と進化
生物の共通性と多様性
生命の起源と生物の進化の仕組み
生物の系統
古生物の変遷と地球環境
エネルギー資源
エネルギーとその利用

Curriculum

No.	TITLE	DETAIL
1	Reflection and refraction of light	To find the regularity when the light reflects and is refracted at a border surface of materials such as water or glass.
	(omission)	
12	Circuit and electrical current and voltage	To find the regularity between electrical current and voltage at some points of circuit.
	(omission)	
48	Creatures and cell	To find the cell's character of animals and plants, and creature bodies are made up of cells.
49	Function to maintain a life	To find a mechanism that body takes in and conveys substances to be needed for life.
	(omission)	
54	Weather observation	To find the relationship between weather and change of some elements such as temperature, air pressure and air humidity.
55	Generation of clouds	To understand and interrelate the generation of clouds to change of temperature, air pressure and air humidity.
	(omission)	
59	Cell division and growth of creatures	To confirm the process of cell division and to relate it to the growth of creatures.
60	The way of procreation	To find the difference between sexual reproduction and asexual one, and that children inherit parents' character.
	(omission)	
65	The movement of the moon	To relate the revolution of the moon to how the moon is seen from the earth.

Curriculum

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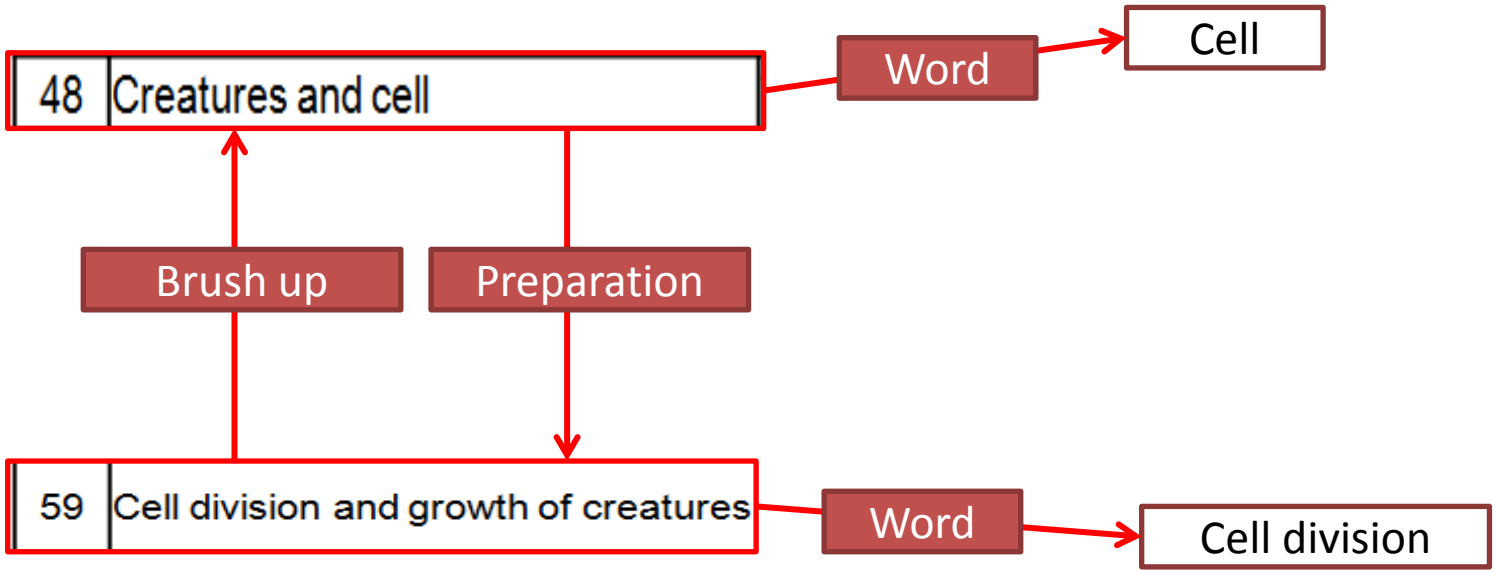
Item No.48 is good to brush up before moving on to No.59

Curriculum


48 Creatures and cell
Word
Cell
Brush up
Preparation
59 Cell division and growth of creatures
Word
Cell division

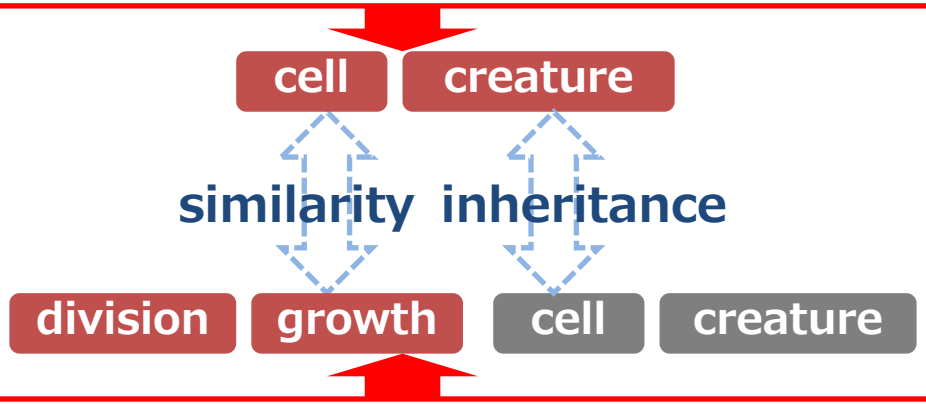
Generating Learning Path

Each item of curriculum has words emerging at the first time.
→Similarity based on words used in common is not useful for connecting each item
→Similarity and Inheritance of each word

Firstly Used Word(FUW)

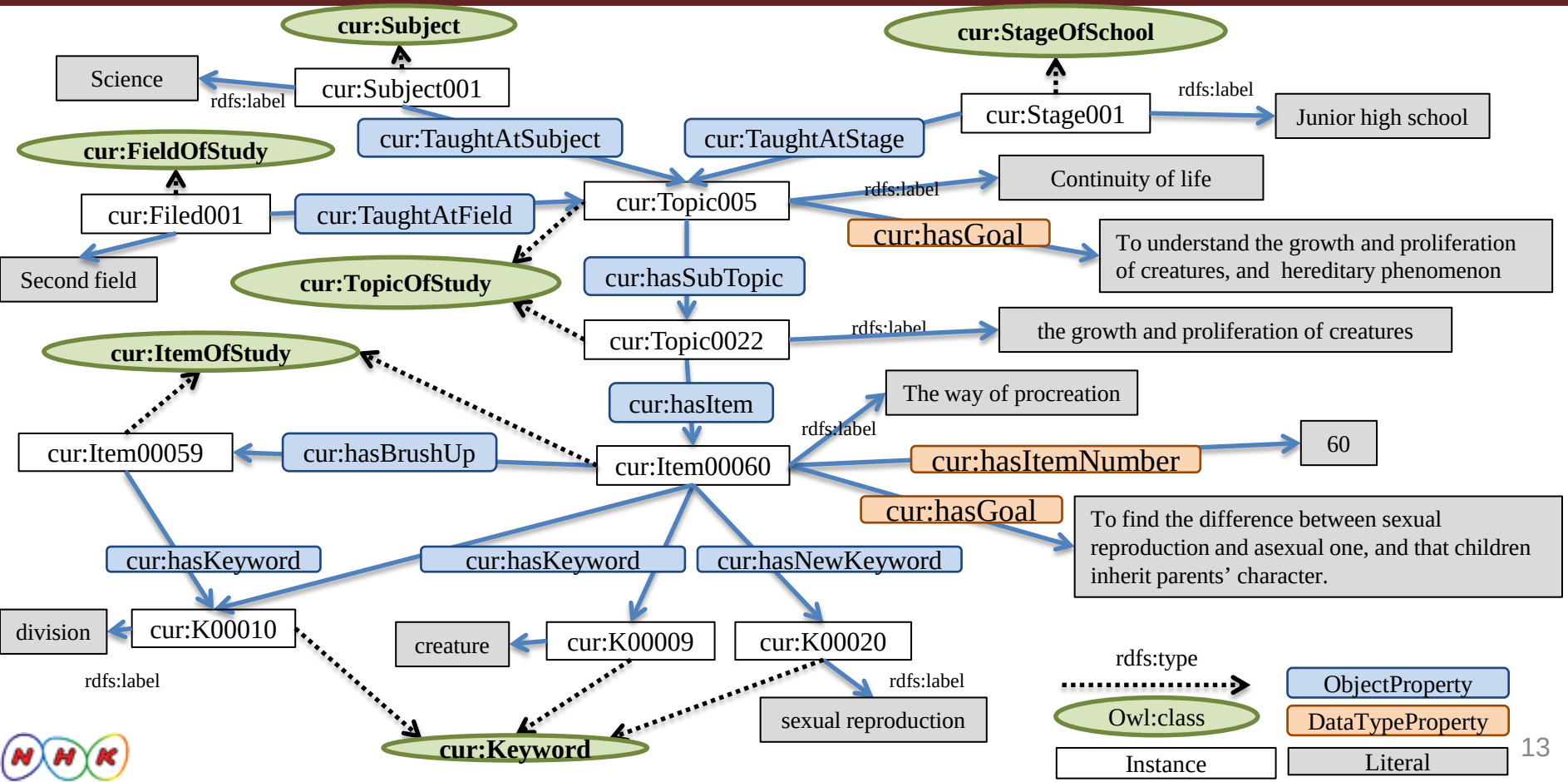
Previously Used Word(PUW)

【No.48: Creatures and cell】
To find the cell's character of animals and plants, and creature bodies are made up of cells.



【No.59: Cell division and growth of creatures】
To confirm the process of cell division and to relate it to the growth of creatures.

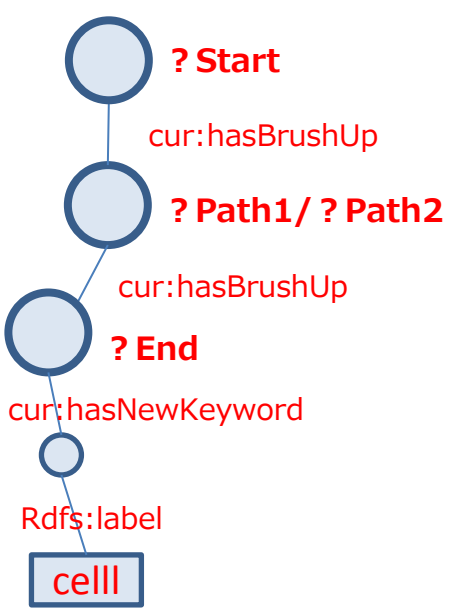
Individuals on Ontology



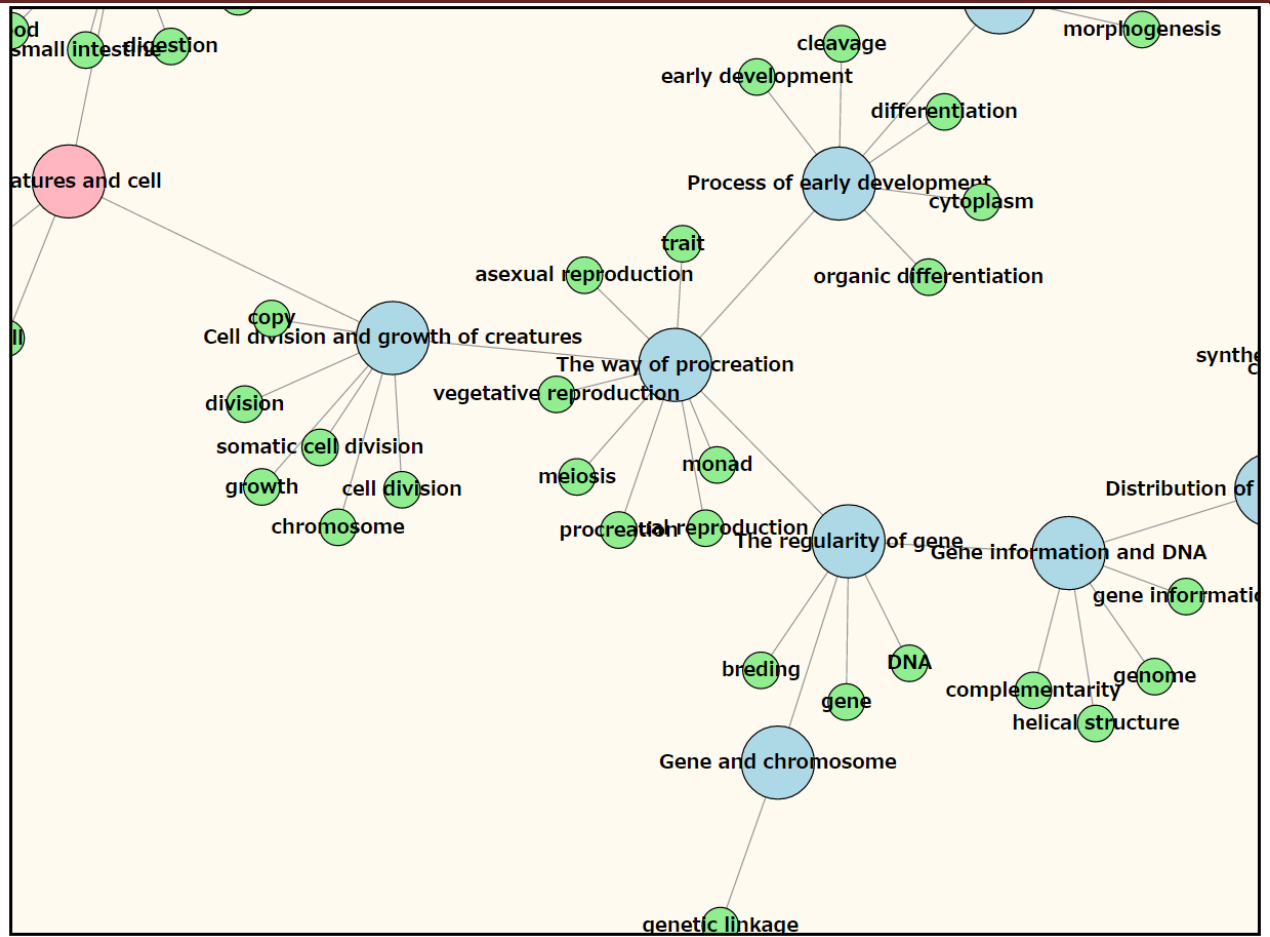
Query

Learning path from item having “cell” term as FUW

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX cur: <http://cur.nhk.or.jp/>

SELECT DISTINCT
 (STR(?Num_Path2) AS ?Item_No1)
 (STR(?label_Path2) AS ?ItemOfStudy1)
 (STR(?Num_Path1) AS ?Item_No2)
 (STR(?label_Path1) AS ?ItemOfStudy2)
WHERE {
  VALUES ?e { cur:hasBrushUp }
  ?Start (cur:hasBrushUp)* ?Path1 .
  ?Path1 ?e ?Path2 .
  ?Path2 (cur:hasBrushUp)* ?End .
  MINUS{?x cur:hasBrushUp ?Start}.

  ?End cur:hasNewKeyword / rdfs:label ?Keyword_End.
  FILTER(?Keyword_End = “cell”^^rdfs:Literal)

  ?Path1 rdfs:label ?label_Path1.
  ?Path2 rdfs:label ?label_Path2.
  ?Path1 cur:hasItemNumber ?Num_Path1.
  ?Path2 cur:hasItemNumber ?Num_Path2.
}ORDER BY ?Num_Path1
```



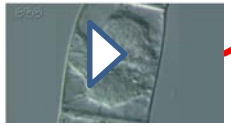
Visualization of Learning path

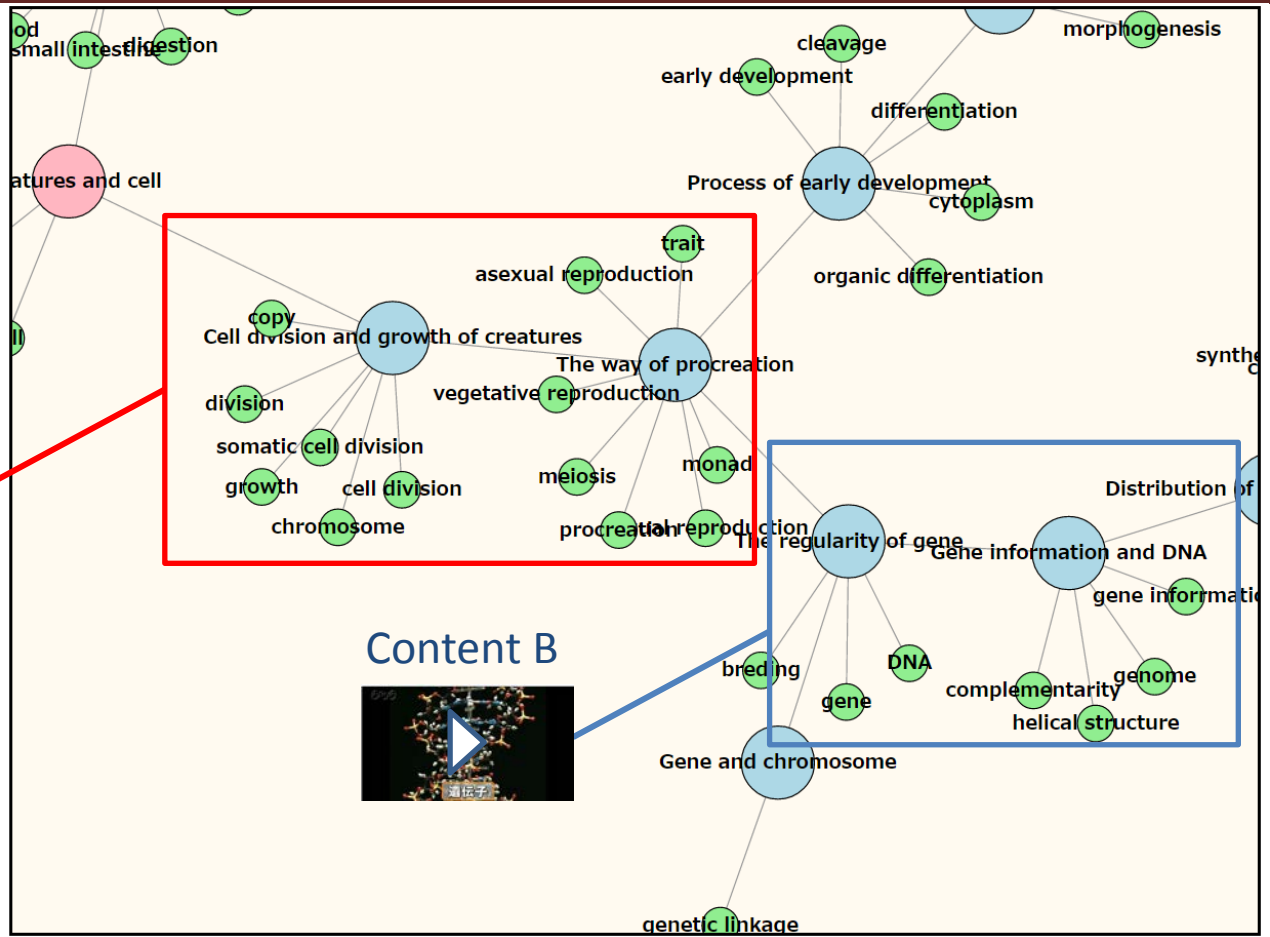


Videos for School

Videos on the Learning path

Content A

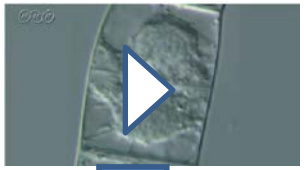




Content B

Videos on the Learning path

Content A「cell division and its growth」

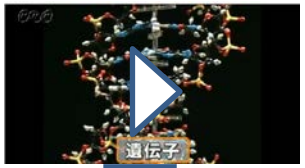


Cell Division | Fertilized egg | Cell | Embryo | Nucleus

(1)extract items having these words

48 | 59

Content B「gene and inheritance」



Cell | Gene information | DNA | Strand

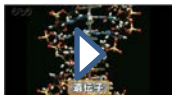
(1)extract items having these words

61 | 162 | 163

RDF store

(2) Sum up the brush-up score by calculating relation of each item

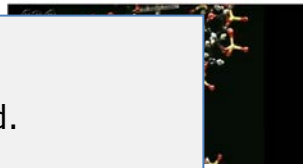
should be provided before



Videos on the Learning path

Content A「cell division and its growth」

Content B「gene and inheritance」



```
SELECT DISTINCT *
WHERE {
?Item cur:hasNewKeyword / rdfs:label ?NewKeyword.
FILTER
(?NewKeyword
IN(“cell”^^rdfs:Literal,“embryo”^^rdfs:Literal,“nucleus”^^rdfs:
Literal,
“fertilized egg"^^rdfs:Literal,“cell division"^^rdfs:Literal))
?Item rdfs:label ?label_Item.
?Item cur:hasItemNumber ?Num_Item.}
```

Cell Division

Cell

Embryo

information

(1)extract items having these words

(1)extract items having these words

RDF store

48

59

61

162

163

```
SELECT COUNT(*)
WHERE {
?Item1 cur:hasBrushUp* ?Item2.
?Item1 cur:hasItemNumber ?Item1_No.
?Item2 cur:hasItemNumber  ?Item2_No.
FILTER(?Item1_No=“162"^^xsd:decimal)
FILTER(?Item2_No="48"^^xsd:decimal)}
```

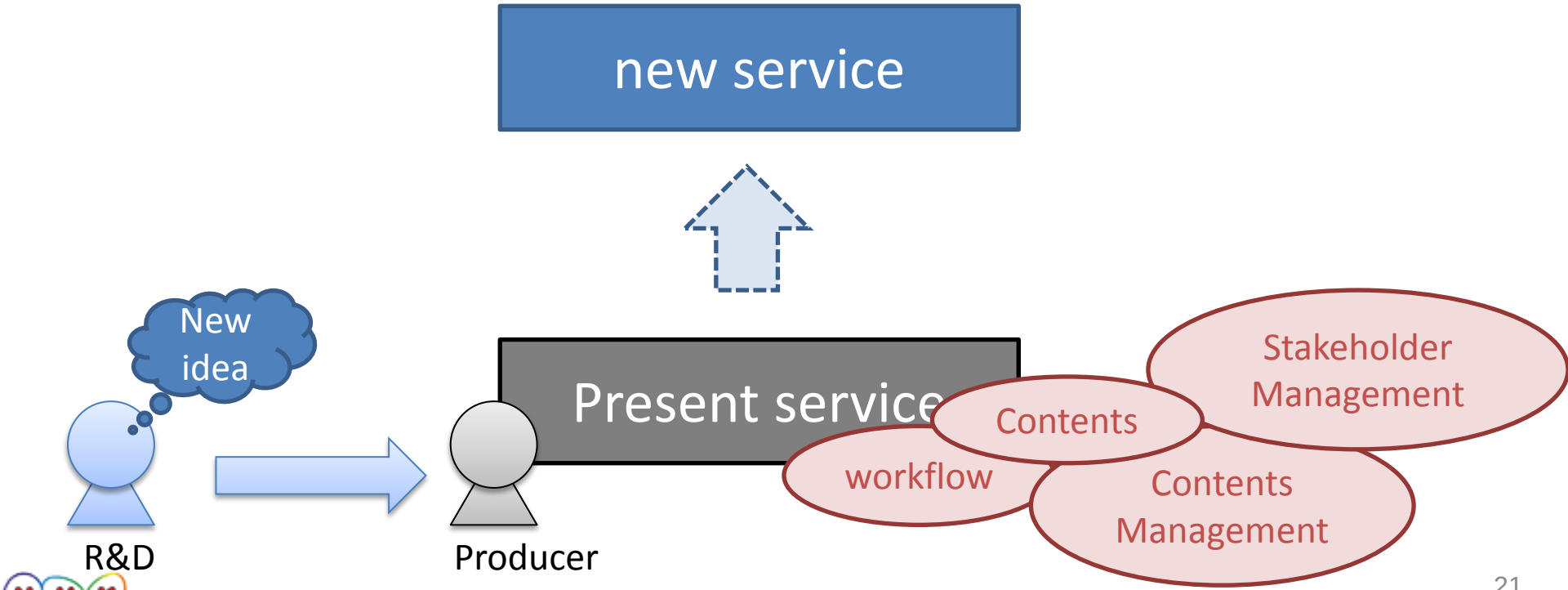
(2) S

tem

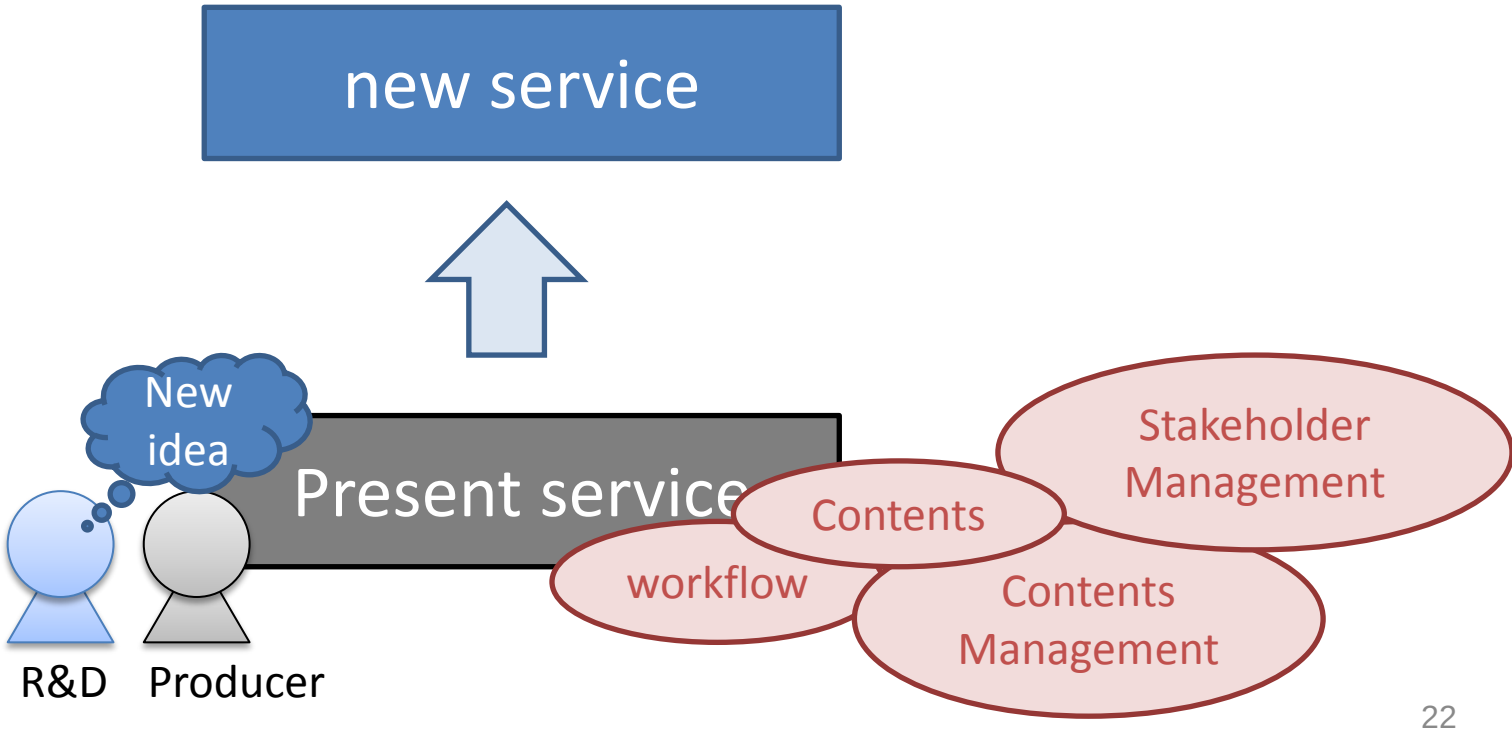
Agenda

1. Study about constructing ontology for education
2. Efforts toward putting it into practice

Implementation



Implementation



Be a Member of Production

- I belonged to the production department for 2 months.
  - Becoming a member of operators inputting metadata.
  - Keeping explaining the effectiveness of graph structure.
  - Considering and discussing the new workflow to handle with new data structure.
- I launched a project to put it into practice with production department.

Conclusion

[Objective]

■Making the knowledge graph from curriculum with RDF triples.

[Output]

■Constructing ontology

■Visualize learning path and Integrate videos with ontology

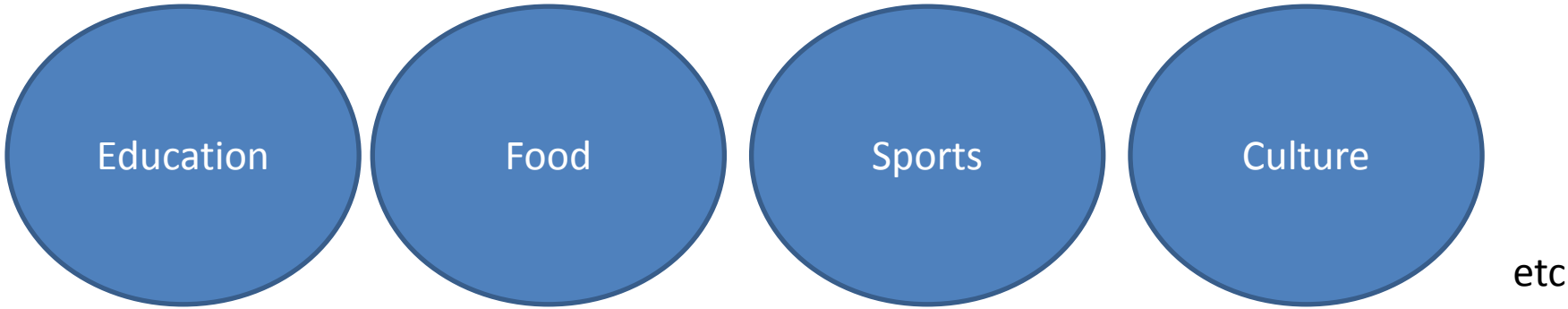
Install this graph into NHK’s service

Future Work

- Research
  - Developing the way of integrating videos directly with the learning path.
- Service
  - Putting the learning path into NHK’s services
    - Design of UI/UX
    - Introduction of RDF store
    - Repair of the existing system for the current workflow
  - Furthermore
    - Linking this knowledge graph with other contents like News, Science and so on

Future Work

- Expand data structure into other genres



Conclusion

Service Oriented Data

Structure of data should be tailored to the service

Thank you!

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