

Local Semantics with Global Meaning

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HZDR

2026-04-29

The Solutions

1. We want **FAIR** (Meta-)Data

Findable

Accessible

Interoperable

Reusable

The Solutions

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2. **Solution:**
RDFS
(Resource Description Framework
Schema),
Ontologies,
OWL

RDFS written in Turtle

```
thisSample a CellSample;  
            sampledBy "Peter";  
            mass "60grams"  
            organism "e-coli 632".  
CellSample owl:subclassof BioSample.
```



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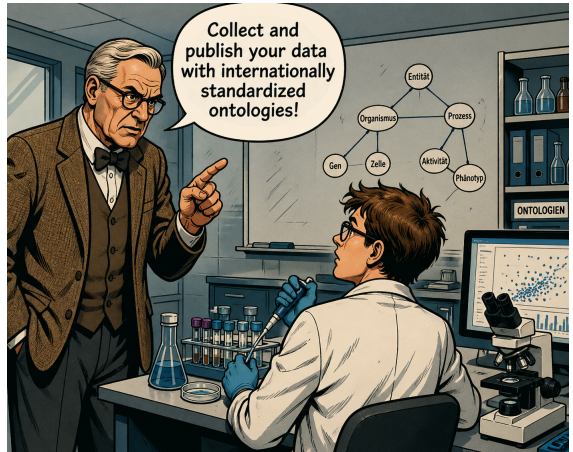
```
SELECT ?sample ?mass  
      WHERE {  
          ?sample a BioSample  
      }
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... making it **FAIR** if published with standardized terms.

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5. **Policy:** Everybody needs to publish RDF using globally standardized ontologies.

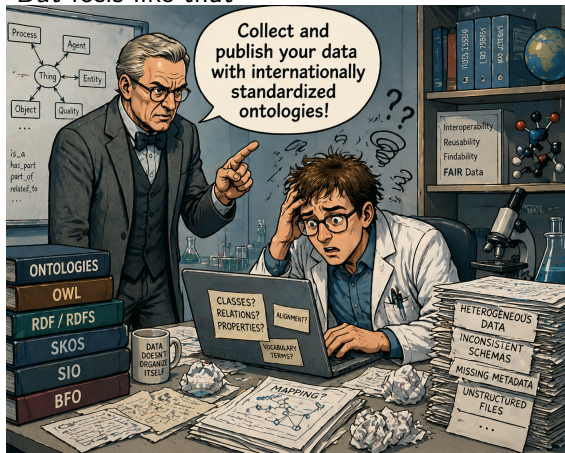
Sounds easy



The Solution The Problem

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But feels like that



The current “work with standardized ontologies” approach

1. Select the right standard ontologies for your experiment



2. Do experiments and collect the data using these ontologies



3. Upload your results to an archive

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- I have never worked with an ontology. How should I select the best one.



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- ▶ My experiment is new. There is no ontology that fits yet.

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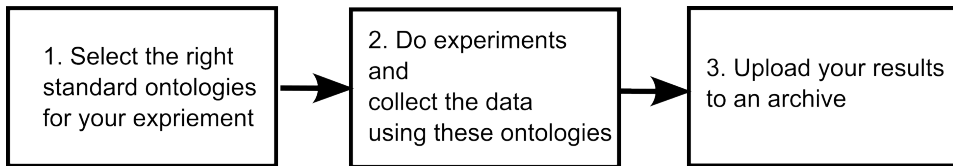
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The approach is not adopted.



What we ask the student to do before starting with the first experiment:

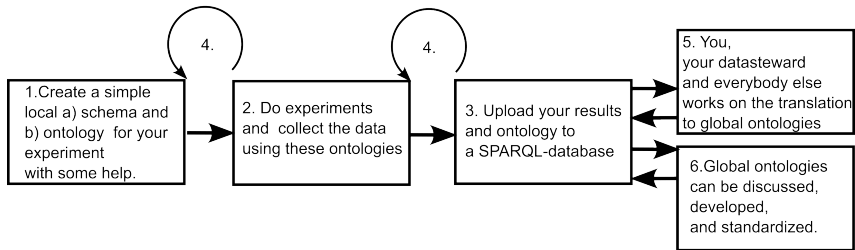
```
@base <http://idservice.hzdr.de/> .
@prefix rdf:      <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix EXP0:     <http://www.hozo.jp/owl/EXP0Apr19.xml>.
@prefix orcid:    <http://orcid.org/>
@prefix ror:      <https://ror.org/>

hzdrPersistentID745 a ???:CellcultureWeighingExperiment;
    EXP0:administrative_information [
        EXP0:title          "My first experiment";
        EXP0:organization   ror:01zy2cs03
        EXP0:author          orcid:0000-0003-4646-943X
    ];
.
.
.
```

How to solve this?

Split the task in smaller doable steps.

A local ontology first step by step approach...



Step 1a Define example Schema for data

```
@base <http://hzdr.de/peter01> .  
experimen01 a CellCultureWeighing  
    doneby          Peter;  
    massInGramm     500;  
    title           "Peter's first experiment";  
    sample          Sample001;  
    growthtimeInSeconds 3600.
```

Step 1b Ontology (What knowledge is required)

```
@base <http://hzdr.de/michael01> .  
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .  
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .  
@prefix owl: <http://www.w3.org/2002/07/owl#> .  
@prefix xsd: <http://www.w3.org/2001/XMLSchema> .
```

Step 1b Ontology (Define the schema)

```
Peter          a Scientist.
CellCultureWeighting rdfs:subClassOf rdf:Thing.
Sample          rdfs:subClassOf rdf:Thing.
Scientist       rdfs:subClassOf rdf:Thing.
doneby          a owl:ObjectProperty;
                owl:range Scientist;
                rdfs:comment "The Scientist doing the experiment.".
sample          a owl:ObjectProperty;
                owl:range Sample.
title           a owl:DatatypeProperty;
                owl:range xsd:string.
massInGramm     a owl:DatatypeProperty;
                owl:range xsd:float.
growthtimeInSeconds a owl:DatatypeProperty;
                owl:range xsd:float.
```

Step 3 Publishing in a SPARQL endpoint

Upload the Turtle file to an URL url and than give a SPARQL command:

```
LOAD url INTO thegraph;
```

to a publically visible SPARQL server with a reasoner.

Step 5: map local to global ontologies

Discoveries on the way: EXPO, Dublin Core, ORCID,...

```
@prefix EXPO: <http://www.hozo.jp/owl/EXPOApr19.xml>.
CellCultureWeighting rdfs:subClassOf EXPO:ScientificExperiment.
title rdfs:subPropertyOf EXPO:administrative_information/EXPO:title.
doneby rdfs:subPropertyOf EXPO:administrative_information/EXPO:author.
...
@prefix dcterms: <http://purl.org/dc/terms/>.
doneby rdfs:subPropertyOf dcterms:author.
...
@prefix orcid: <http://orcid.org/>
Peter rdfs:sameAs orcid:0000-0003-4646-943X;
```

Most of that can be said in owl and than inferred by a reasoner...
...or constructed explicitly with SPARQL COMPOSE statements.

Step 4. Iteration (add flexibility and missing information)

Some owl to add Standards Of Procedures.(SOP)

```
SOP rdfs:subClassOf rdf:Thing.  
usingSOP a owl:ObjectProperty;  
         rdfs:range SOP.  
SOP1 a SOP.
```

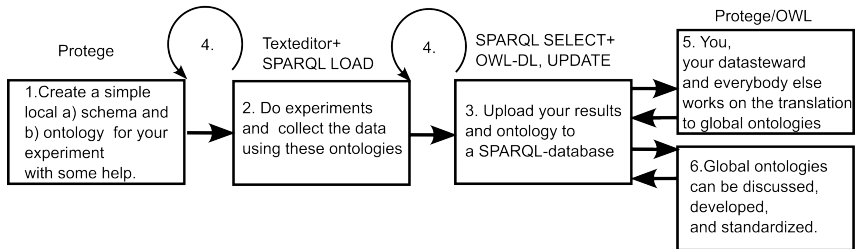
Some SPARQL to add it to all previous CellCultureWeighing-Experiments:

```
INSERT DATA {?experiment usingSOP SOP1.}  
WHERE {  
    ?experiment a CellCultureWeighing  
}
```

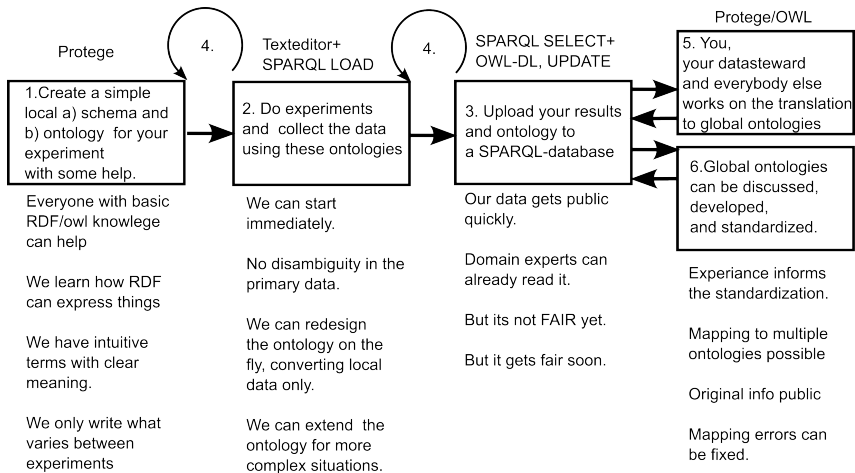
Some OWL to add the Institution ROR for the EXPO ontology:

```
SOP1      atInstitution ror:01zy2cs03.  
usingSOP/atInstitution rdfs:subPropertyOf  
                    EXPO:administrative_information/EXPO:organization.
```

Tools available for the local ontology first approach



Advantages of the local ontology first approach



My proposal

Let us

- ▶ Tell scientists to start with local ontologies.
- ▶ Support them in small steps.
- ▶ Help them to address standardisation and translation in an iterative process.



Conclusions

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- ▶ ...but about what we tell the humans.



Conclusions

- ▶ The key to adoption might not be new technology,...
- ▶ ...but about what we tell the humans.
- ▶ RDFS / OWL / SPARQL already provides the tools needed.



Picture Sources

The images featuring the Student or the Prof, where all created by ChatGPT at the request of the author. The graphics containing boxes and text, where drawn by the author using inkscape.