



Phase II
Ontology of GovtSchoolResourcesOfSargodhaDistrict

Submitted to:
Dr. Fahad Maqbool

SUBMITTED BY
Memoona Majeed BSCS51F20R004
Mehak Naeem BSCS51F20R005

1 Reuse:

Due to the fact that the search for ontology that covered, we focused on searching both ontological and non-ontological resources for each dimension. In this section, we present the non-ontological and ontological resources used to describe the mentioned dimensions.

1.1 HumanResources:

In the Human Resources module, we have analyzed the human resources within government schools. These resources encompass various roles such as clerks, naib qaisid, teachers, sweepers, principals, admission controllers, and security guards. Although we lack a specific ontology module tailored to our requirements, we have gathered statements from both ontological and non-ontological resources available on BioPortal[1]. Additionally, we have incorporated statements from the standard schema.org[2].

We utilized statements from the Gazetteer[3] and Gender, Sex, and Sexual Orientation Ontology[4], along with Logical Observation Identifier Names and Codes (LOINC)[5], all available on BioPortal. Furthermore, we utilized the National Cancer Institute Thesaurus (NCIT)[6] as a non-ontological resource to find relevant vocabulary and statements for concepts in our ontology. Some statements for classes and properties were also sourced from standard schema.org.

This approach has allowed us to create a comprehensive ontology for human resources within government schools, ensuring that we cover a wide range of concepts and their relationships.

1.2 Infrastructure:

In the Infrastructure module, we outline the infrastructure within government schools, which encompasses various components such as rooms, stories, staff rooms, store rooms, principal offices, kitchens, libraries, main gates, computer labs, biology labs, physics labs, chemistry labs, canteens, playgrounds, computers in labs, instruments in other labs, classes within a school, sections of each class, and toilets.

To ensure comprehensiveness, we gathered statements from both ontological and non-ontological resources available on BioPortal, along with statements from standard schema.org. We utilized ontological resources such as Schema, Environmental Ontology[7], The Ecosystem Ontology[8], Semantic Types Ontology[9], and Eagle-I Research Resource Ontology[10]. Additionally, we incorporated statements from the National Cancer Institute Thesaurus (NCIT) as a non-ontological resource.

1.3 Facilities:

In the Facilities module, we outline the various facilities available within government schools. This includes a wide range of components such as air conditioners, furniture, cupboards, desks, teacher chairs, teacher tables, printers, printing facilities, security measures, annual grants, printer specifications, electric fans, electric meters, first aid facilities, student and teacher furniture, student chairs, gas facilities, gas meters, photocopy machines, metal detectors, security cameras, sports facilities (including badminton, cricket, football, hockey, and table tennis), water facilities (such as water coolers), financial facilities, and course facilities (including course books and subjects).

To ensure comprehensiveness, we gathered statements from both ontological and non-ontological resources available on BioPortal, as well as standard schema.org. We utilized ontological resources like Schema, Environmental Ontology, SNOMED CT[11], and Medical Subject Headings[12]. Additionally, we incorporated statements from the National Cancer Institute Thesaurus (NCIT) as a non-ontological resource. This approach ensures that our Facilities module comprehensively covers all aspects of facilities within government schools.

1.4 Needs:

The Needs module, tasked with describing the resource and facility requirements for government schools in the Sargodha district. In cases where specific resources or statements were not found, we took the initiative to create our own categories, which include FacilityNeed, HumanResourcesNeed, and InfrastructureNeeds.

2 Ontology modules:

SargodhaGovtSchoolResources is divided in five modules aiming to describe several characteristics of the Resources of Govt School in District Sargodha. In the following, the key features of each module are presented.

2.1 HumanResources:

2.1.1 Description:

The HumanResources module is the cornerstone of the SargodhaGovtSchoolResources Ontology, designed to describe the human resources for government schools in the Sargodha district. These resources encompass various roles including clerks, naib qaisid, teachers, sweepers, principals, admission controllers, and security guards.

To ensure interoperability with other ontologies, we incorporated a City[13] class (a superclass of Sargodha) from schema.org. Sargodha[14], comprising of 8 tehsils, was described using statements from the Gazetteer ontology, except

for Kot-Momin and Behra-Tehsil where no resources were found. As our focus is on government schools in the Sargodha district, we designated Education-alOrganization[15] as a superclass of government schools (schema.org).

Govt-School[16] was further categorized into Boys School[17], Girl School[18] and Co-School[19]. While statements for girls' and boys' schools were sourced from the Sex and Sexual Orientation Ontology, we defined co-educational schools ourselves due to the lack of available resources.

To describe Clerk[20], Teacher[21], and Principal[22], we incorporated statements from the National Cancer Institute Thesaurus (NCIT) as there were no specific resources found for Sweeper, Naib-Qasid, and Admission-Controller, so we defined these classes ourselves. For categorizing teachers into Contract-based-Teacher[23], Permanent-Teacher[24], and Training-Teacher[25], we developed our classifications.

We also utilized properties from schema.org for qualification, gender, telephone, address, and name. We introduced additional properties such as hasStrength, isBEd, designation, hasGirlsStrength, hasBoysStrength, training period, contract period, date of posting, and scale, which we created based on our requirements.

2.1.2 Related Competency Questions:

The following competency questions are resolved with the HumanResources module:

- CQ01: SC001 is in which tehsil?
- CQ02: What is the educational level of SC001?
- CQ03: Is SC001 a girls' school?
- CQ04: Is SC001 a boys' school?
- CQ05: Is SC001 a co-educational school?
- CQ06: How many permanent teachers are there in SC001?
- CQ07: How many contract teachers are there in SC001?
- CQ08: How many training teachers are there in SC001?
- CQ09: How many clerks are available at SC001?
- CQ10: How many sweepers are available at SC001?
- CQ11: How many security guards are available at SC001?
- CQ12: How many naib qasids are available at SC001?
- CQ13: Who is the principal of SC001?
- CQ14: Who is the admission controller of SC001?

- CQ15: What is the address of SC001?
- CQ16: What is the telephone number of SC001?
- CQ17: What is the area of SC001?

Description: Person

Equivalent To [+](#)

- name exactly 1 xsd:string

Description: Govt_School

Equivalent To [+](#)

- (hasAdmissionController exactly 1 Admission_Controller)
and
(hasPrincipal exactly 1 Principal)
and
(name exactly 1 xsd:string)

Description: Security Guard

Equivalent To [+](#)

- dateOfPosting exactly 1 xsd:dateTime
- scale exactly 1 xsd:int

Asserted in: <http://www.semanticweb.org/pmyls/ontologies/2024/4/untitled-ontology-33>

SubClass Of [+](#)

- Person

General class axioms [+](#)

SubClass Of (Anonymous Ancestor)

- name exactly 1 xsd:string

Description: Sweeper

Equivalent To [+](#)

- scale exactly 1 xsd:int
- dateOfPosting exactly 1 xsd:dateTime

SubClass Of [+](#)

- Person

General class axioms [+](#)

SubClass Of (Anonymous Ancestor)

- name exactly 1 xsd:string

Description: Teacher

Equivalent To [+](#)

- dateOfPosting exactly 1 xsd:dateTime
- scale exactly 1 xsd:int

SubClass Of [+](#)

- Person

General class axioms [+](#)

SubClass Of (Anonymous Ancestor)

- name exactly 1 xsd:string

Figure 1: Human Resources Property Restriction

Description: Admission_Controller

- Equivalent To + scale exactly 1 xsd:int ? @ ✖ ○
- SubClass Of + Person ? @ ✖ ○
- General class axioms +
- SubClass Of (Anonymous Ancestor) name exactly 1 xsd:string ? @ ✖ ○

Description: Clerk

- Equivalent To + dateOfPosting exactly 1 xsd:dateTime ? @ ✖ ○
- scale exactly 1 xsd:int ? @ ✖ ○
- SubClass Of + Person ? @ ✖ ○
- General class axioms +
- SubClass Of (Anonymous Ancestor) name exactly 1 xsd:string ? @ ✖ ○

Description: Naib_Qasid

- Equivalent To + dateOfPosting exactly 1 xsd:dateTime ? @ ✖ ○
- scale exactly 1 xsd:int ? @ ✖ ○
- SubClass Of + Person ? @ ✖ ○
- General class axioms +
- SubClass Of (Anonymous Ancestor) name exactly 1 xsd:string ? @ ✖ ○

Description: Principal

- Equivalent To + scale exactly 1 xsd:int ? @ ✖ ○
- designation exactly 1 xsd:int ? @ ✖ ○
- dateOfPosting exactly 1 xsd:dateTime ? @ ✖ ○
- SubClass Of + Person ? @ ✖ ○
- General class axioms +
- SubClass Of (Anonymous Ancestor) name exactly 1 xsd:string ? @ ✖ ○

Figure 2: Human Resources Property Restriction

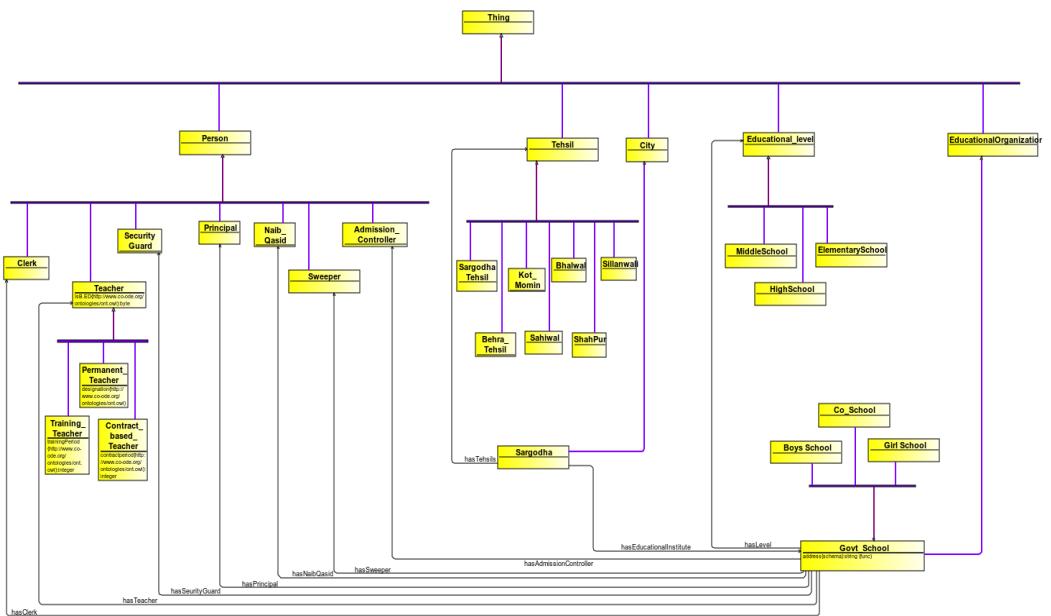


Figure 3: Human Resources OwlGrEd

2.2 Infrastructure:

2.2.1 Description:

The Infrastructure module in the SargodhaGovtSchoolResources Ontology is designed to outline the physical facilities available in government schools across the Sargodha district. It covers a wide range of aspects crucial for school operations, including rooms, staff rooms, libraries, playgrounds, and more. We've gathered information from various sources to ensure comprehensive coverage. For instance, we obtained details about Room[26] from schema.org, while information about Toilet[27] was sourced from the Environmental Ontology. Similarly, the NCIT Thesaurus provided insights into elements like Story[28] and Computer[29]. Some classes, like Plant[30] and Class[31], were derived from ontological resources such as The Ecosystem Ontology and Semantic Types Ontology, respectively. However, for components like Store-Room, Principal-Office, Section, and Labs (PhysicsLab, Biology-Lab, Chemistry-Lab, and Computer-Lab), along with the MainGate and ExamHall, we had to create our own descriptions as suitable resources weren't found. This approach ensures our ontology comprehensively covers the infrastructure of government schools in the Sargodha district.

2.2.2 Related Competency Questions:

The following competency questions are resolved with the Infrastructure module:

- CQ1: How many rooms are available for SC001?
- CQ2: How many classes are available for SC001?
- CQ3: How many toilets are available for SC001?
- CQ4: How many sections of class are there for C001?
- CQ5: How many computer labs are available for SC001?
- CQ6: How many computers are available for L001?
- CQ7: How many staff rooms are available for SC001?
- CQ8: Is the principal's office available for SC001?
- CQ9: How many storerooms are available for SC001?
- CQ10: How many kitchens are available for SC001?
- CQ11: How many physics labs are available for SC001?
- CQ12: How many biology labs are available for SC001?
- CQ13: How many chemistry labs are available for SC001?

- CQ14: Is there any exam hall available for SC001?
- CQ15: How many libraries are available for LIB001?
- CQ16: How many books are available for LIB001?
- CQ17: How many trees are there in SC001?
- CQ18: How many plants are there in SC001?

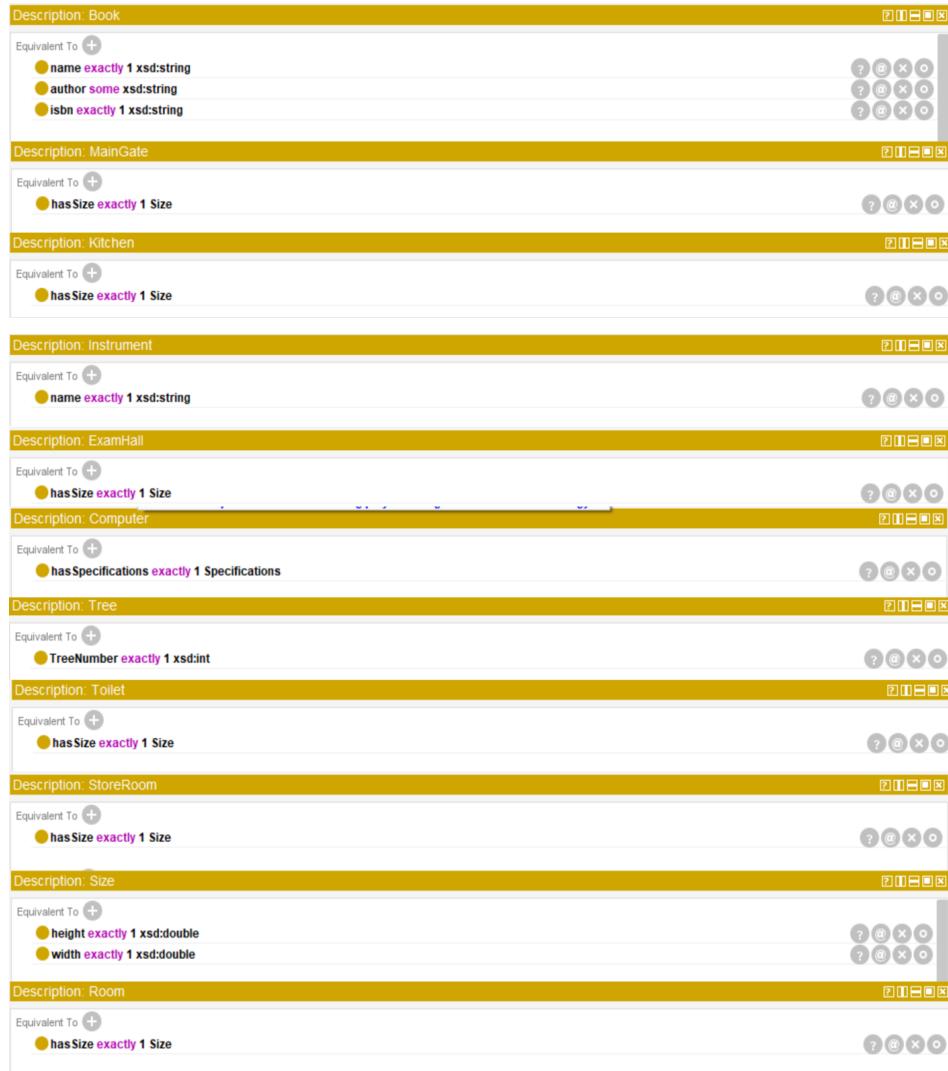


Figure 4: Infrastructure Property Restriction

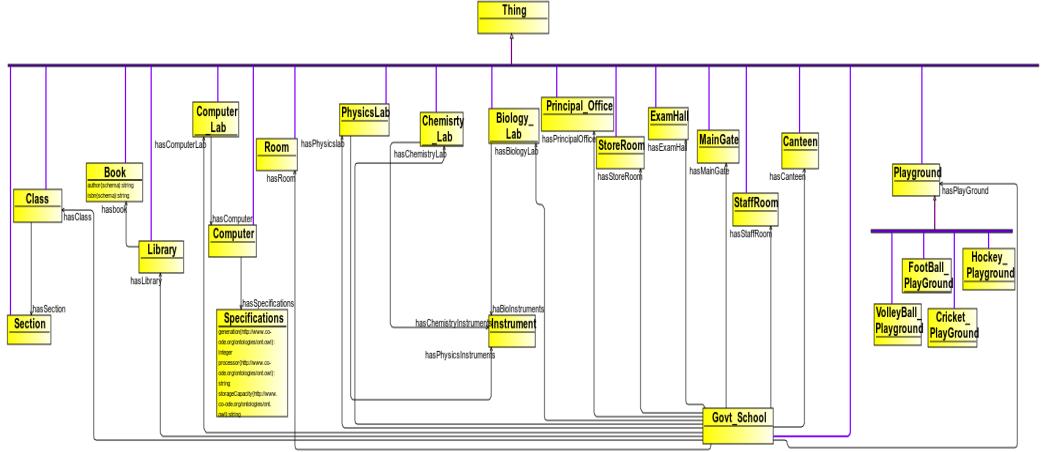


Figure 5: Infrastructure OwlGrEd

2.3 Facilities:

2.3.1 Description:

The Facilities module is the next part of the SargodhaGovtSchoolResources Ontology, aimed at describing the facilities available for government schools in the Sargodha district. We identified various resources for facilities from different sources: Air Conditional[32] from SNOMED CT, Furniture[33] from the Environmental Ontology, Cupboard[34] from the Environmental Ontology, Desk[35] from the Environmental Ontology, TeacherChair[36] from NCIT, Teacher-Table[37] from the Environmental Ontology, Printing[38] from Medical Subject Headings, Printer[39] from NCIT, Security[40] from NCIT, and Year[41] and Grant[42] from NCIT.

For components where no resources were found, we created them ourselves. These include PrinterSpecification, ElectricFan, ElectricMeter, First-Aid-Facility, Student-Furniture, Teacher-Furniture, StudentChair, Gas-Facility, Sui-Gas-Meter, PhotoCopy-Machine, Metal-Detector, Security-Camera, Sport-Facility (including Badminton-Facility, Cricket-Facility, FootBall-Facility, Hockey-Facility, and Table-Tennis-Facility), WaterFacility (such as WaterCooler), Financial-Facility, and CourseFacility (including CourseBooks and CourseSubject). This ensures that our Facilities module comprehensively covers all facilities available in government schools in the Sargodha district.

2.3.2 Related Competency Questions:

The following competency questions are resolved with the Facilities module:

- CQ01: How many desks are available?
- CQ02: How many cupboards are available?

- CQ03: How many printers are available?
- CQ04: How many teacher tables are available?
- CQ05: How many teacher chairs are available?
- CQ06: How many photocopy machines are available?
- CQ07: How many gas meters are available?
- CQ08: Is the sports facility available?
- CQ09: Is the electricity facility available?
- CQ10: How many fans are available?
- CQ11: How many air conditioners are available?
- CQ12: How many electric meters are available?
- CQ13: How many water coolers are available?
- CQ14: How many course books are available?
- CQ15: How many security cameras are available?

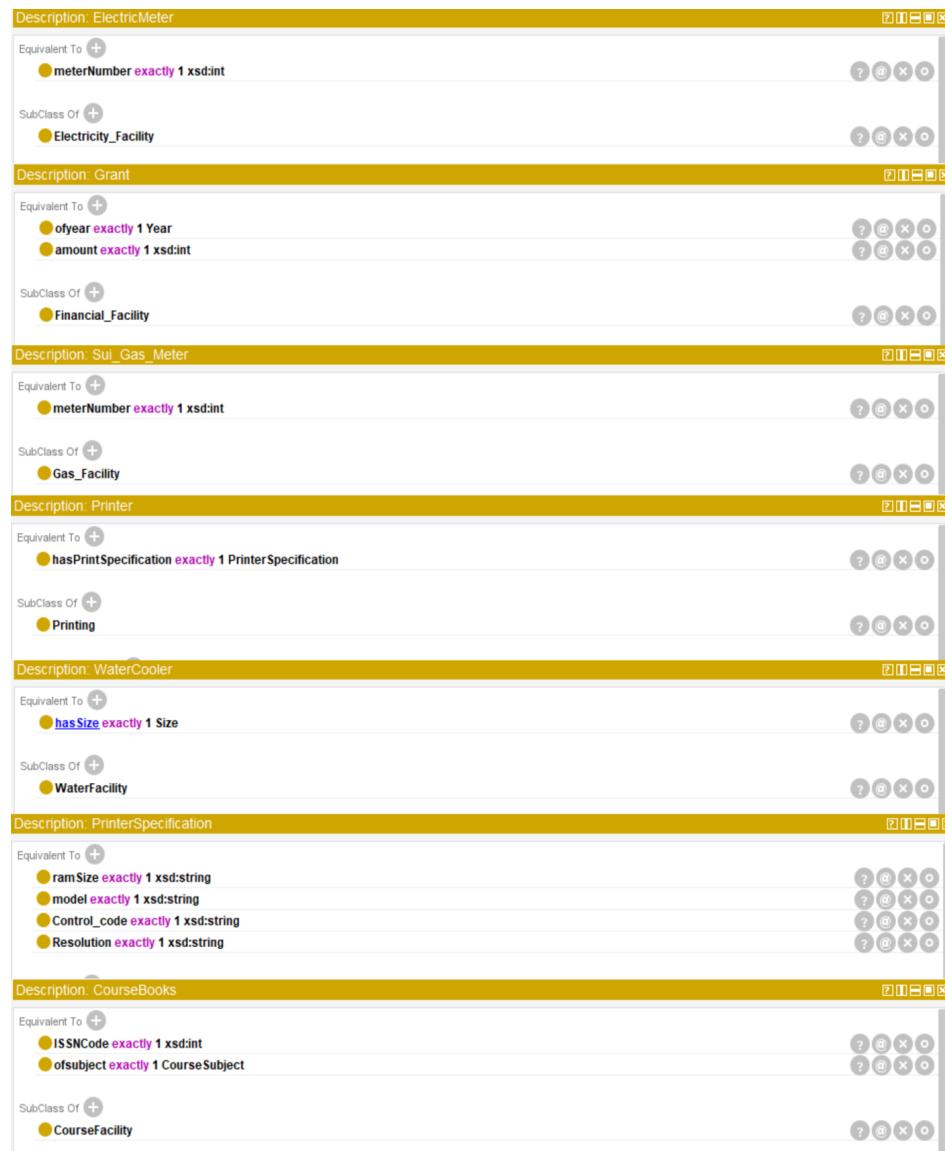


Figure 6: Facilities Property Restriction

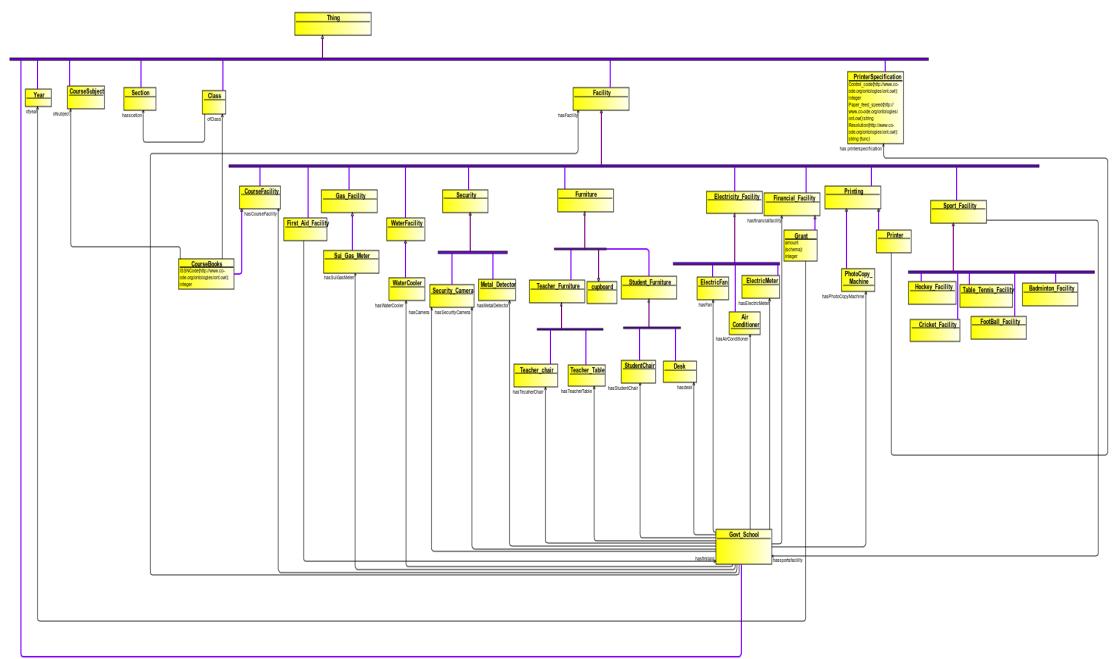


Figure 7: Facilities QwlGrEd

2.4 Needs:

2.4.1 Description:

The Needs module serves as the final component of the SargodhaGovtSchool-Resources Ontology, tasked with describing the resource and facility requirements for government schools in the Sargodha district. In cases where specific resources or statements were not found, we took the initiative to create our categories, which include FacilityNeed, HumanResourcesNeed, and InfrastructureNeeds.

2.4.2 Related Competency Questions:

The following competency questions are resolved with the Needs module:

- CQ01: What are the facility needs for SC001?
- CQ02: What are the human resource needs for SC001?
- CQ03: What are the infrastructure needs for SC001?



Figure 8: Needs Property Restriction

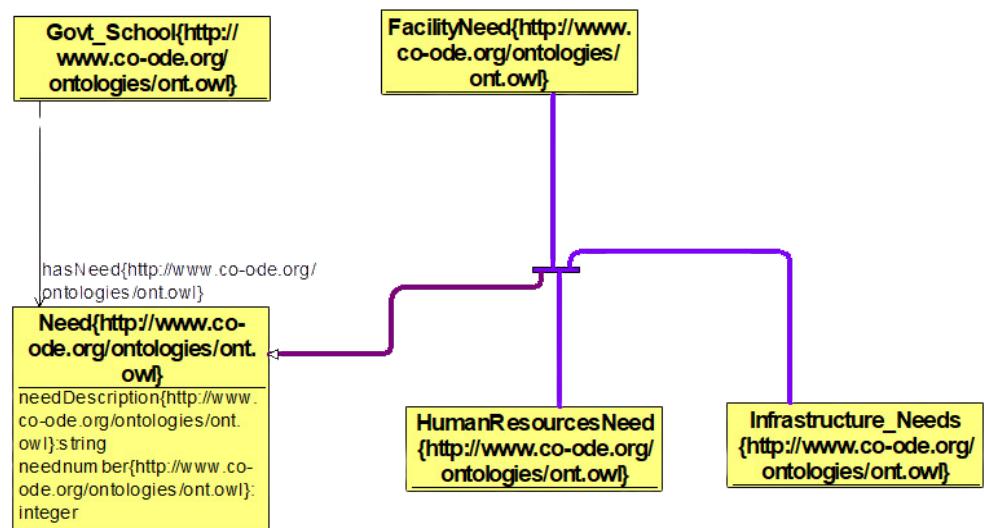


Figure 9: Needs OwlGred

3 References:

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12. <https://bioportal.bioontology.org/ontologies/MESH>
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15. <https://schema.org/EducationalOrganization>
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41. <http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#C29848>
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