1. DEVELOPING EXERCISES WITH THE DATASET

Implementing the dataset in an actual database allows us to create exercises to form part of the learning material. Exercises can be developed objectively at several levels of the Bloom taxonomy of learning (Anderson et al., 2001). As a proof of concept, we present three levels of complexity of exercises developed using the implementation setup and dataset. The first two levels are illustrated with simple examples.

The most basic exercise addresses the base (knowledge) and second (comprehension) tiers of the Bloom cognitive model. The student is asked to draw the UML instance diagrams for a given scenario and to identify the UML class of each object in the diagram. For example:

1. Consider the following situation: "Monique has ownership rights to a plot".
   1. Draw a UML instance diagram depicting this situation in the LADM model.
   2. Indicate for each object in your diagram, which UML class it belongs to.
   3. For each object, attribute data must be collected to comply with the LADM standard – please list the attribute names for each object.
   4. For each association, indicate the association's name if it is explicitly given in the LADM standard.

Diagram

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Diagram

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This exercise assesses how the student has assimilated the core LADM classes and the idea that a class represents a group of objects of the same kind such as a party. It also shows that the student can use the core LADM classes to describe a specific scenario. The solution to problem 1.a. would look exactly like the bottom row of boxes in Figure 18 (a) or (b), except the class of each object would be included in the diagram or as a separate descriptive text. It should be noted that from this initial problem, questions related with other knowledge areas such as model representation in relational database tables, basic SQL query syntax or and spatial representations may be derived.

A student who answers all basic problems such as problem 1 correctly would be ready to tackle more challenging problems involving the application of the knowledge to several different scenarios not directly presented in the examples. This is where the concept of country profile becomes a useful teaching tool as it provides real-world land administration models. Consider the problem presented below

1. Given the initial scenario shown in Figure 17, where Monique owns an apartment, laundry room, and parking space in an apartment complex (as depicted in Figure 4),
   1. redraw the instance diagram where a single entity, Galaxy Properties, buys out the entire property. In the new scenario Galaxy Properties now owns both the land and all the structures on the residential complex.
   2. Write the SQL queries required to update the data to reflect the new scenario.

Timeline

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Figure 17. Scenario presented for exercise question 2

This kind of question assesses the ability of the students to apply what they have learned about the LADM to a new scenario. That includes upstream information related to BAU14 not being affected by the changes. The student must understand the way multiplicities are used in UML and be able to crosscheck the validity of their answer with respect to the LADM.

Diagram

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Figure 18. Possible answers for exercise 2. (a) transfer of ownership rights by shifting only the reference to the right and therefore anything that follows-on, (b) the ownership rights are transferred by moving each spatial under a Basic Administrative Unit over

Figure 18 shows the two possible solutions for problem 2.a. Both answers are admissible within LADM but either might or might not conform to a particular country profile. Problem 2.b. assumes that the student has already developed or has been provided with the corresponding database schema.

The third and most advanced level of exercises would address the 5th level competences in Bloom's hierarchy which involve the capacity to synthesise the learned knowledge and create new ideas or structures from it. An example of such a competence is when a student can model a previously unknown tenure arrangements in a way that captures their semantics as well as possible.

The section below demonstrates how local land tenure arrangements that do not follow the statutory tenure system can be modelled within the LADM. This, of course, is an advanced topic that is best dealt with after students have mastered the basics of LADM modelling.