Expressing adaptations to take into account in generator-based exercisers
An exploratory study about multiplication facts

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Research Background

- ✓ Technology-Enhanced Learning
- ✓ Serious Games
- ✓ Adaptation and Generation

Learning Context

- ✓ Training of declarative knowledge
- ✓ Repetition for memorization and generalization purposes
- ✓ Need for various adapted learning game activities generation

Research Problem

- ? How to design such complex generators?
- ? What models and techniques to use?
- ? What domain elements and rules to consider?

Research Objective

What — Explore how generation logic and elements are expressed from teacher's viewpoint
Game dimension not considered

How
- ✓ Interview-based exploratory study
- ✓ Case study about multiplication tables
- ✓ Analysis of qualitative data
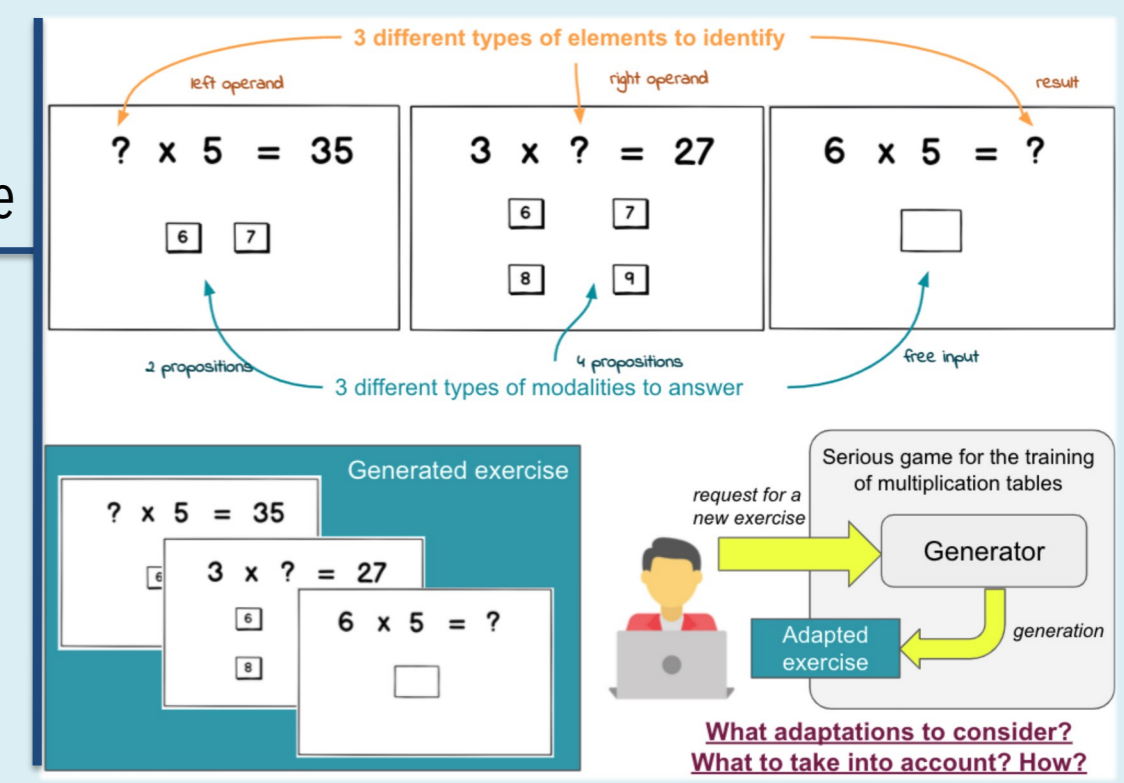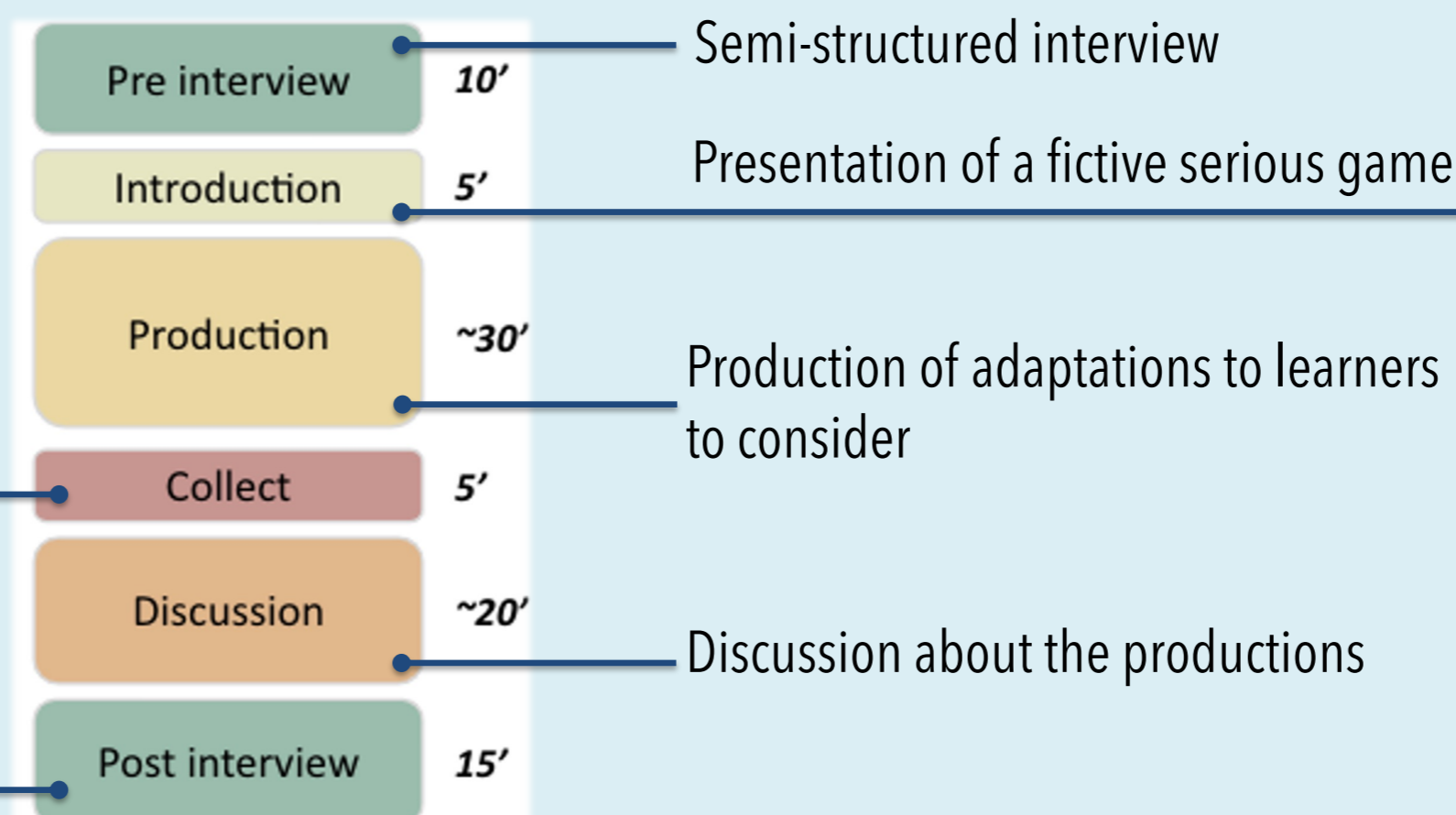- ✓ Formalization of these elements and logics

Interview-based exploratory study

- ✓ 11 participants

| #1	6th grade retired teacher
#2	Middle maths teacher
#3	Maths division pedagogical advisor
#4	2nd Grade teacher in a priority education zone
#5	Recently graduated of a primary school teaching Master diploma
#6	2nd Grade teacher
#7	5th Grade teacher
#8	5th Grade teacher in a priority education zone
#9	Instructor about teaching adaptations for children with Autism Syndrom Disorder
#10	2nd Grade teacher
#11	Maths assistant professor in College

Gathering participants' notes

Semi-structured interview about how adaptations have been identified

Pre interview	10'	— Semi-structured interview
Introduction	5'	— Presentation of a fictive serious game
Production	~30'	— Production of adaptations to learners to consider
Collect	5'	
Discussion	~20'	— Discussion about the productions
Post interview	15'	

Analysis

- ✓ <u>Didactic</u> viewpoint of the generation of adapted exercises
- ✓ <u>Top-down</u> approach from learning paths of objectives and activities for most learners to dedicated paths for groups or single learner
- ✓ <u>No</u> explicit specific adaptation or generation <u>rules</u> **BUT** an implicit and shared generation logic can be identified
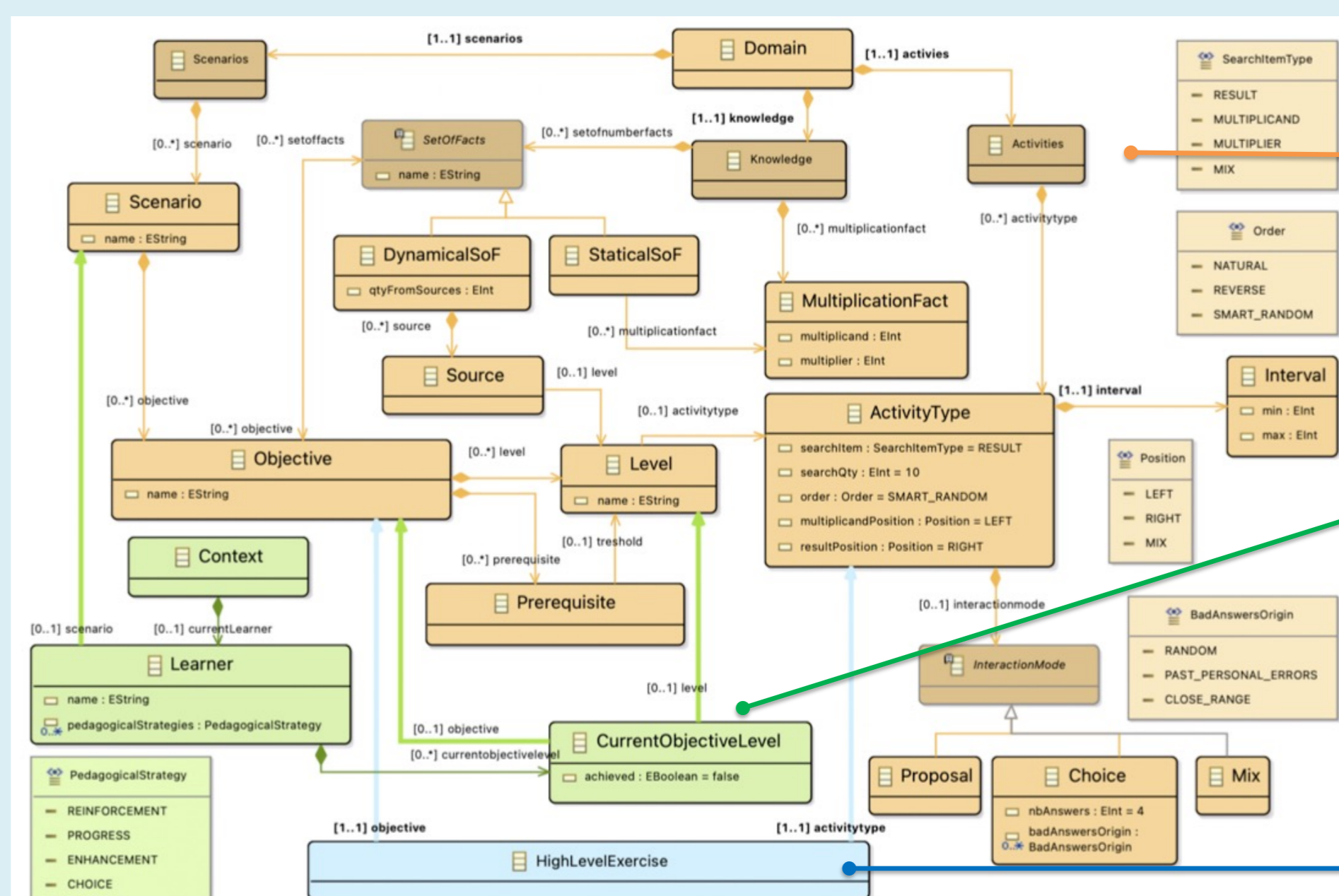
Formalization of teachers' viewpoint
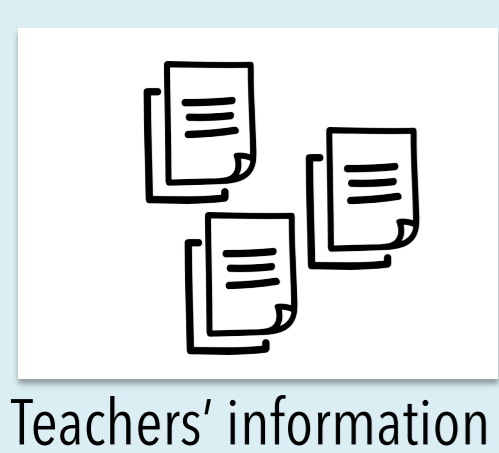
Teachers' information
- invariants → **Metamodels**
- variants → **Models** (conformed to)
- implicit rules → **Algorithm** handling the metamodels to drive the generation of target model from the source models
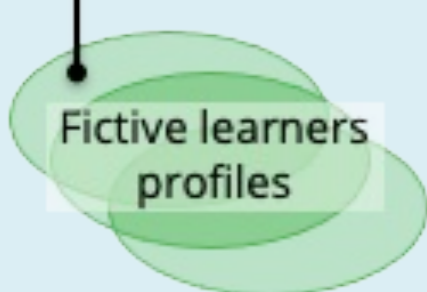

Domain metamodel
Objectives, learning paths, prerequisites, activities parameters…

Learner metamodel
progress, learning path…

High generation metamodel
Selected objective & activity parameters

Simulating high-level generations

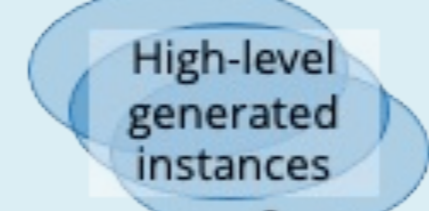Multiple test cases identified from the metamodel's cardinalities and boundaries

Domain instance — From 2 in-depth interviews

Fictive learners profiles → **High-level generation** *i.e. no low-level exercise with real questions, choices…* → High-level generated instances

Domain-independant algorithm

Verification of relativeness

Perspectives

- ✓ Deal with the **low-level generation**
  responsible for the production of an exercise as a list of questionable facts with potential answer proposals…
- ✓ Consider more the **learning dimension**
  feedbacks, prompts, guidance…
- ✓ Consider the **gaming dimension**
  gameplay, mechanics, rules, aesthetics…