

OpenACS/TCL Conf 2022, Vienna

The LEARN gradebook – an integrated approach to grading

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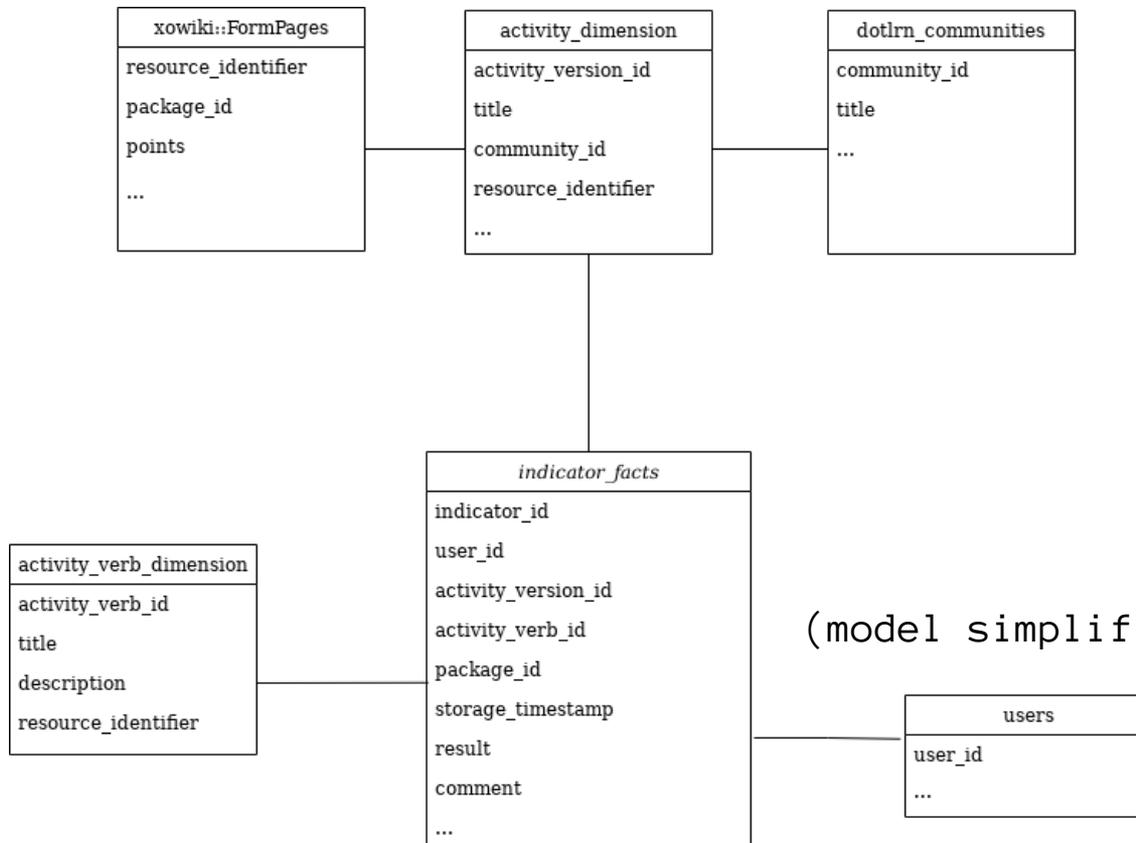
Markus Moser



- **Assessment** is a central point of any e-learning system.
- In a typical student's career, countless assessments are performed for different courses.
- How can this be managed for a large quantity of assessment records and students while maintaining performance and scalability?
- How can these assessments be connected, aggregated and meaningfully compared in complex learning analytics?
- Build upon OpenACS/XoTcl/XoWiki framework for one of Europe's largest e-learning platforms (learn.wu.ac.at).

Starting with a database model..

- ..in classic datawarehouse fashion following the standards of dimensional modelling with a fact table for **events** (grading user x for activity y) at the center complemented by **descriptive dimensions**.



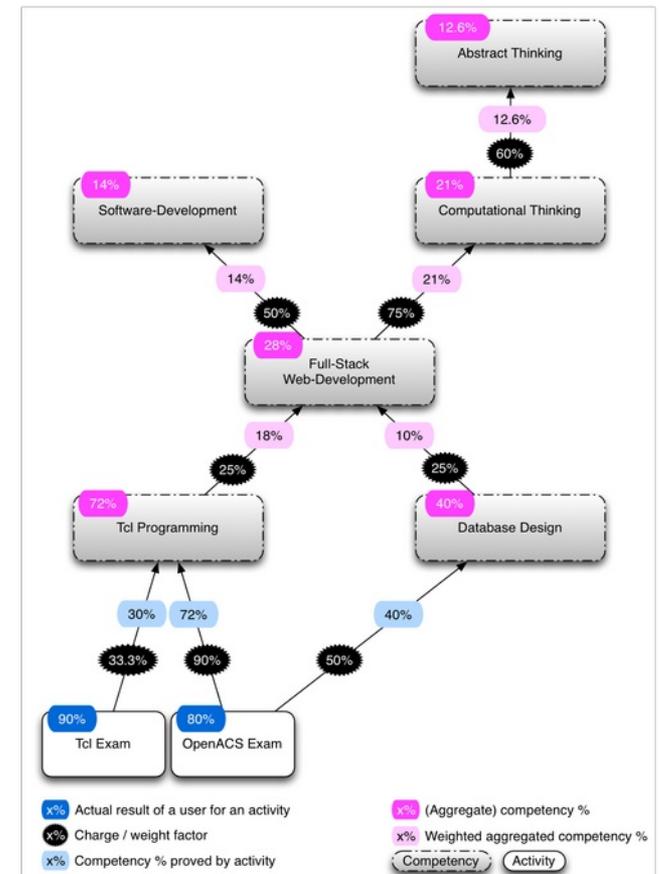
Provide Tcl-based abstraction

- The object relational database interface of XoTcl allows us to hide the complexity of CRUD operations and define the datamodel entirely in Tcl.
- Tcl API can be called inside applications performing grading operations
- Example: creating a new activity and inserting a score for user 2

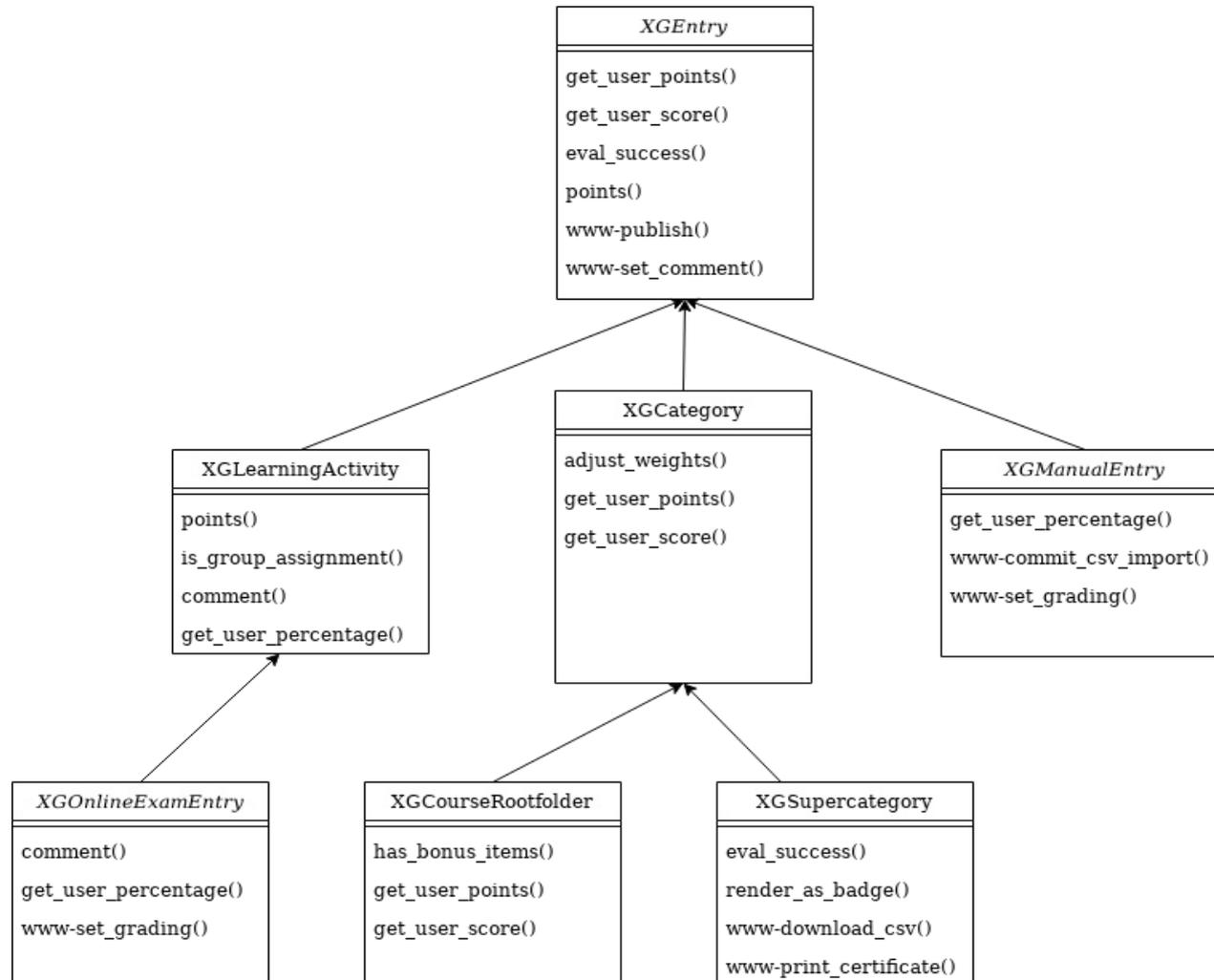
```
set exam_id [::xolp::Activity require \  
  -iri "http://myschool.example.com/2022/class1/course1/final-test" \  
  -title "Final test" \  
  -return id]  
set activity_verb_id [::xolp::ActivityVerb require \  
  -iri "http://dotlrn.org/xolp/activity-verbs/competed" \  
  -return id]  
  
::xolp::Indicator insert \  
  -user_id 2 \  
  -activity_version_id $exam_id \  
  -begin_timestamp "2022-12-20 09:00:20" \  
  -end_timestamp "2022-12-20 09:59:30" \  
  -result_numerator 60 \  
  -result_denominator 100
```

Activities are connected

- Activities don't exist in a void: they are connected to other activities allowing us to calculate aggregates (eg sum, average, sum of best n values...).
- The connection between activities can be represented as a directed acyclic competency graph.
- This allows us to easily query for things like:
 - Students' overall points for this course
 - Successful completion of a superactivity or this course



Different activity classes supported by the gradebook app (simplified class diagram)



Gradebook Frontend Perspective: admin/lecturer

Gradebook

Search for students:

Student ID / Name

Submit query

Custom
weights
 $\Sigma=1$

Enables:

- custom weights
- Creating/importing assessment items
- multi-level structuring

Gradebook > New > Score > Actions >				
Title	Type	Max. points	Weight (%)	Actions
<input type="checkbox"/> 1 Recaps + -	Sum	25.00	<input type="text" value="20.00"/>	  
<input type="checkbox"/> 1.1 Recap Unit 1	Regular Score	5.00		   
<input type="checkbox"/> 1.2 Recap Unit 2	Regular Score	5.00		   
<input type="checkbox"/> 1.3 Recap Unit 3	Regular Score	5.00		   
<input type="checkbox"/> 1.4 Recap Unit 4	Regular Score	5.00		   
<input type="checkbox"/> 1.5 Recap Unit 5	Regular Score	5.00		   
<input type="checkbox"/> 2 Referat	Regular Score	15.00	<input type="text" value="15.00"/>	   
<input type="checkbox"/> 3 Mitarbeit	Regular Score	5.00	<input type="text" value="5.00"/>	   
<input type="checkbox"/> 4 Final Exam	Required score (Min. points 30)	60.00	<input type="text" value="60.00"/>	   
<input type="checkbox"/> 5 Bonus: Video research	Bonus score	5.00		   
Total:		105.00	100.00	
			Weight: Save Reset The total sum of weights must be exactly 100%.	
Total (with bonus points):		110.00		

Students' perspective

Title	Type	Max. points	Weight (%)	Points achieved	Score (points)	Score (%)
1 Recaps	Sum	25.00	20.00	22.00	18.48	17.60
1.1 Recap Unit 1	Regular Score	5.00		5.00		
1.2 Recap Unit 2	Regular Score	5.00		4.00		
1.3 Recap Unit 3	Regular Score	5.00		3.00		
1.4 Recap Unit 4	Regular Score	5.00		5.00		
1.5 Recap Unit 5	Regular Score	5.00		5.00		
2 Referat	Regular Score	15.00	15.00	15.00	15.75	15.00
3 Mitarbeit	Regular Score	5.00	5.00	4.00	4.20	4.00
4 Final Exam	Required score (Min. points 30)	60.00	60.00	51.00	53.55	51.00
5 Bonus: Video research	Bonus score	5.00		5.00	5.00	4.76
Total		105.00	100.00	92.00	91.98	87.60
Total (with bonus points)		110.00		97.00	96.98	92.36

Grade: 1
Grade key:
1 - 87.5 %
2 - 75 %
3 - 62.5 %
4 - 50 %

[Course statistics](#)

Example: certify completion of a MOOC course on LearnPublic

- Gamification/reward approach:
- A user who completed all assessment items inside a course with a minimum score is rewarded with a **badge**.
- Badges are downloadable **svg** files containing **json** metadata conforming to the *Mozilla Open Badges* standard.
- Completion of several badges rewards the user with a **certificate**.
- <https://learnpublic.wu.ac.at>



THEMENBEREICH
Verträge

BADGE HERUNTERLADEN

Outlook and potential future work

- Personal **competence graph / knowledge graph** for each student.
- Using specific **ontologies** for educational context → Map educational resources (eg courses) to competencies.
- Collect all competencies acquired during a student's university lifecycle and make them visible as a graph.
- Allow students to share/export/reference their competence graphs.
- Enable comparability between graphs: eg the same set of competencies can be acquired through different courses.

Thanks for listening. Questions?



VIENNA UNIVERSITY OF
ECONOMICS AND BUSINESS

**Institute for Information Systems and New
Media**

Welthandelsplatz 1, 1020 Vienna, Austria

Markus Moser

markus.moser@wu.ac.at

www.wu.ac.at

The author would like to express special thanks to Michael Aram for developing the initial version of the datawarehouse model and Felix Mödritscher for a draft version of the gradebook application.