

Generative Learning Objects in Biomedical Informatics

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Approach



Generative Learning Object (GLO) Example

```
<?xml version="1.0" encoding="utf-8"?>
```

```
<test>
  <symbol szName="unit" szType="int">random(0,1,0);</symbol>
  <symbol szName="weightUnit" szType="string">v("unit") ? "Lb" : "kg";</symbol>
  <symbol szName="heightUnit" szType="string">v("unit") ? "in" : "cm";</symbol>
  <symbol szName="weight" szType="int">v("unit") ? 22+random(0,264,0) : 10+random(0,120,0);</symbol>
  <symbol szName="height" szType="int">v("unit") ? 27+random(1,51,0) : 70+random(0,130,0);</symbol>
  <symbol szName="k" szType="int">v("unit") ? 3.131 : 3.600;</symbol>
  <symbol szName="bsa" szType="int">Math.round(Math.sqrt(weight*height/v("k")));</symbol>
<Question type="MultipleResponse">
  <Content>If a patient weights <value name="weight"/> <value name="weightUnit"/> and
  is <value name="height"/> <value name="heightUnit"/> tall, the body surface area (BSA) is
  {MR <value name="bsa"/>} m^2.
</Content>
  <Feedback>square root (Lb x in/3131) or square root (kg x cm/3600)</Feedback>
</Question>
</test>
```

$$\sqrt{\frac{Lb \times in}{3131}} \text{ or } \sqrt{\frac{kg \times cm}{3600}}$$

GLO Model

- expressed as XML elements
- table of symbols: **names, types, values**
- initialization with mathematical expressions based on random variables
- several types: multiple responses, multi selection, single choice, ...

Conclusions

- GLO instances can be used to generate medical LOs
- Questions text and formulas can be modified or replaced in XML file
- JavaScript based prototype implementation

Case studies

Applied on pharmacology discipline for medical assistants to calculate:

- drug dosages (e.g. Young Formula, Clark Formula, Fried Formula)
- body surface area (BSA)
- child dosage using an adult dosage
- flow rate in mL/h or gtt/min
- converting from F to C and C to F

References

- [1] Sorina Nicoleta Cucuiet - Curs de farmacologie pt asistenti medicali generalisti Litografia U.M.F. Târgu-Mureș, 2006.
- [2] Germanna Community College Tutoring Services - How to Solve Drug Dosage Problems, <http://www.germannacommunitycollege.edu/tutor/Handouts/Nursing/Drug%20Dosage%20Calculation%20Packet.pdf>, August, 2012.