Parametric variation of a moodle quiz

MoodleMoot, Thessaloniki
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Problem description

- Variation is desirable for
    - Deter students from copying ready solutions
    - Understanding concepts - methodologies
    - Re-usability of quiz questions

- Two-fold problem
    - Manual variation (limited in diversity, time-consuming, labor intensive)
    - Can't edit offline in simple text based formats

- New methodology:
    - Greater variation
    - Automatic
    - Reproducible
    - Compressible

Current status

- "Calculated question" provided by moodle
  - + Adds diversity
  - + Formula based approach
  - − Limited to simple algebraic expressions, not for complex and text problems
  - − Web based interface is a bottleneck for proficient users
  - − Lack of an offline mode
- LaTeX module in the CTAN repository
  - + Offline mode
  - + Text based editing
  - + Easy way to view and proof-read
  - − No variations

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GIFT moodle format

Given the binary number `0x``DF``, what is the decimal value?
{=223}

```
Given the binary number `0x{{hex}}`, what is the decimal value?
{ ={{decimal}} }
```

```
<!–– csv
hex, decimal
DF , 223
––>
Given the binary number `0x{{hex}}`, what is the decimal value?
{ ={{decimal}} }
```
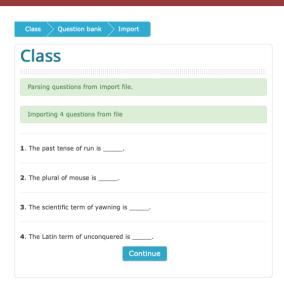
```
<!-- csv
hex,decimal
DF ,223
FB ,251
F7 ,247
9A ,154
36 ,54
1D ,29
-->
Given the binary number `0x{{hex}}`, what is the decimal value?
{ ={{decimal}} }
```

Our solution: Text substitution example

```
<!-- csv
form          , word          , answer
past tense    , run           , ran
plural        , mouse         , mice
scientific term, yawning      , oscitancy
Latin term    , unconquered, invicta
-->
The {{form}} of {{word}} is { ={{answer}} }
```

Our solution: Statistics example

```
<!-- csv
statord, observations, answer
average, [1 4 5 6 2] , 3.6
std    , [2 1 4 5]   , 1.82574
median , [1 5 5 6 7] , 5
-->
The {{statord}} of the observations:

{{observations}}

is {#={{answer}}:0.1 }
```
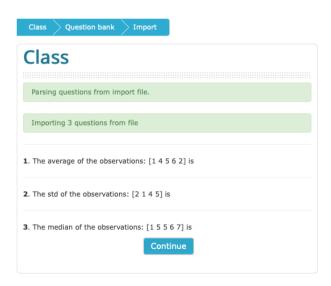
Class

Parsing questions from import file.

Importing 3 questions from file

1. The average of the observations: [1 4 5 6 2] is

2. The std of the observations: [2 1 4 5] is

3. The median of the observations: [1 5 5 6 7] is

Continue

Our solution: Automatic generation of the variation table

```
<!-- csv
@

toCSV = []
for j in range(5):
  list = [random.randint(1,9) for i in range(random.randint(4,8))]
  toCSV.append({"statord": "average",
                "observations": list,
                "answer": statistics.mean(list) })
dict2csv(dictcsv)
-->
The {{statord}} of the observations:

{{observations}}

is {#={{answer}}:0.1 }
```

```
<!-- csv
@
result = subprocess.check_output("""
  matlab -r "pageFaults(40,20,6); exit()"
""", shell=True)
print(result.decode("utf-8"))
-->
```

264 lines   11 question types   2,095 lines   188 questions

`https://github.com/laserscout/moodle-ribbon`

Parametric variation with automation

- Enhanced quiz quality
- Indefinite variations with code-generated variations
- Offline authoring using markdown
- Exportable PDF for review
- Question backups in case the moodle service fails

In use for 6 months and ~800 students.

We thank Prof. *Xiaobai Sun* of Duke University for her critical comments