Online assessments with parametric questions and automatic corrections: an improvement for MCTest using Google Forms and Sheets

Francisco de Assis Zampirolli, Valério Ramos Batista,
Edson Alex Arrázola Iriarte, Irineu Antunes Junior

Universidade Federal do ABC, Brasil

Simpósio Brasileiro de Informática na Educação
Natal, 2020

Work supported by São Paulo Research Foundation (FAPESP), Grant #2018/23561–1

Contents

Motivation

- How to generate exams for many students?
  - Using a web platform with databases of questions
  - We chose MCTest, a platform devoted to Education Systems
- How to minimize fraud?
  - An exam in which the questions are unique to each student.
- How to correct this exam automatically?
  - Using Google Forms and Sheets.

This site is available at:

- vision.ufabc.edu.br **in Portuguese**

Method: website

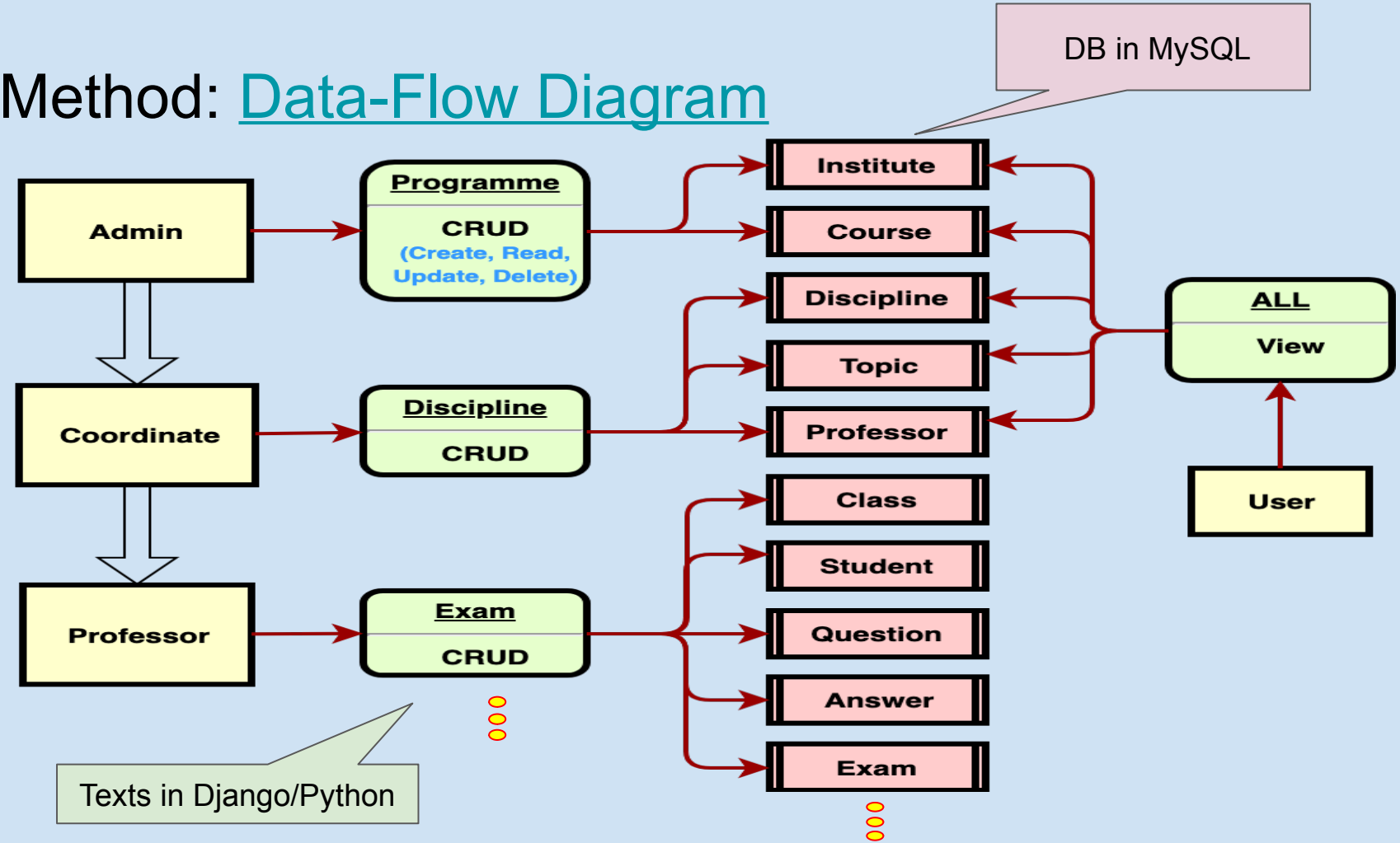
Conteúdo dinâmico

O MCTest tem os seguintes contadores (veja também ER1; ER2):

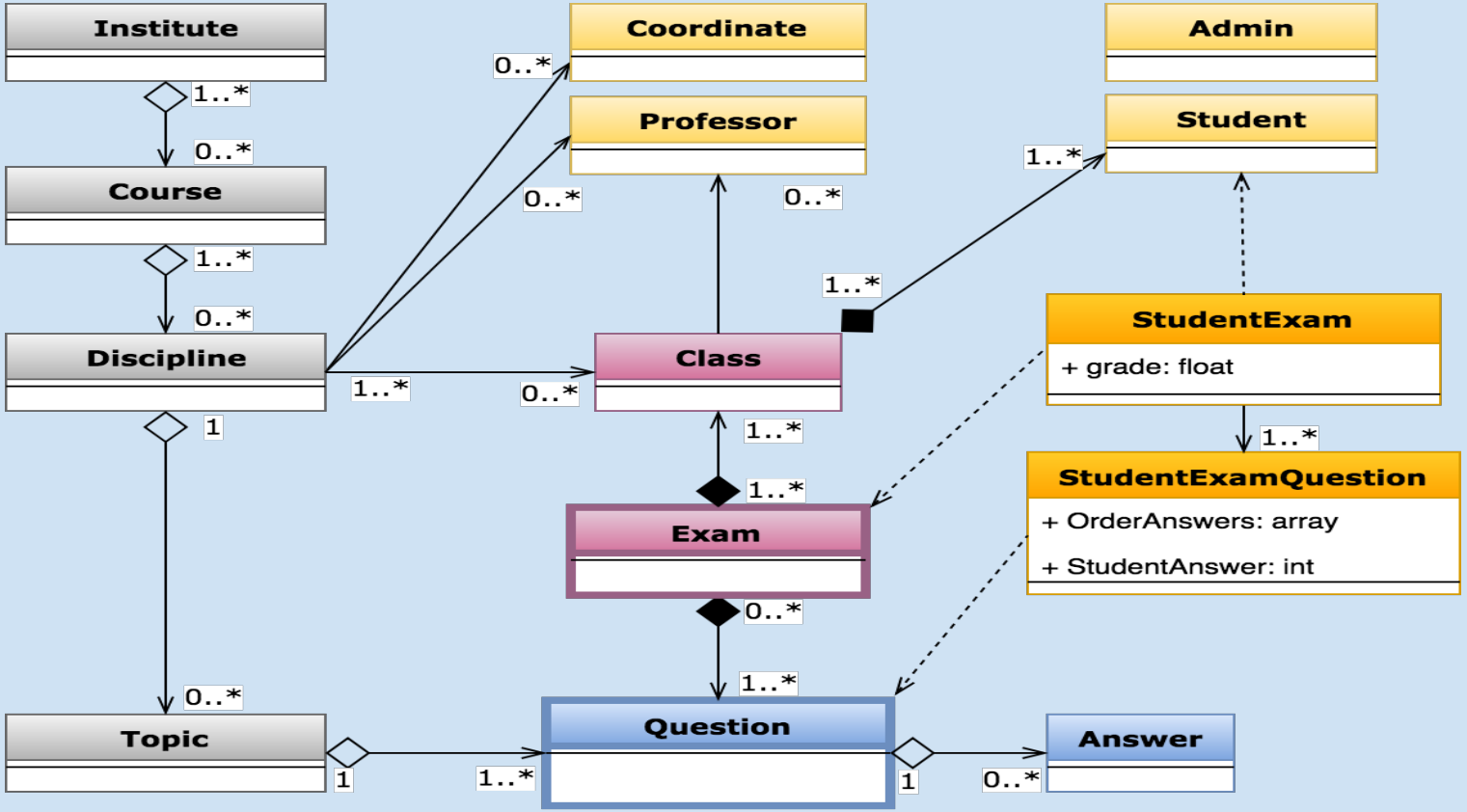
- **Institutos:** 2 [Instituto tem Cursos]
- **Cursos:** 9 [Curso tem Disciplinas]
- **Disciplinas:** 32 [Disciplina tem Tópicos, Turmas e Profs]
- **Turmas:** 88 [Turmas tem Exames, Profs e Estudantes]
- **Exames:** 48 [Exame tem Turmas e Questões] - motivações [ref18a]
- **Tópicos:** 118 [Tópico tem Questões]

- **Questões:** 1224 - motivações para o uso da taxonomia de bloom [ref17cap2; ref18b]
  - **Múltipla Escolha:** 1054
  - **Dissertativa:** 170
  - **Paramétrica:** 150 [ref19a; ref19b]
- **Usuários:** 42

Method: Data-Flow Diagram



Method: Class Diagram



Question Update

Create-PDF
See this question in PDF format

Save-Json
It will save all your questions to a file in json format

Choose Topic: [BCN0402]<Derivative>

Short Description: fuv2020 - q4

Group: Only one question per group will be sorted for each exam

Description:

```
$y=[[code:a0]]$, find $y'$:

[[def:
x = symbols('x')

# parametric part:
c0 = random.randrange(2, 8, 1) # integer between 2 e 7
c1 = random.randrange(2, 7, 1)
c2 = random.randrange(2, 7, 1)
e0 = random.randrange(2, 4, 1)
e1 = random.randrange(4, 6, 1)
e2 = random.randrange(3, 4, 1)

eq = (c2*x**e1 + c1*x**e2 + c0)**e2   # equation

a0 = latex(eq)    # return of latex syntax from the equation

# Validar alternativas
a1 = latex(diff(eq, x))    # correct answer
a2 = latex(diff(eq*x, x))
a3 = latex(diff(eq*2, x))
a4 = latex(diff(eq*3, x))
a5 = latex(diff(eq*4, x))
]]
```

Type: Multiple-Choice Question

Difficult: Very easy level question

Bloom Taxonomy: remember: recognizing, recalling

Parametric: Yes

Who Created: ---------

Last Update: 2020-04-18

Method: Create question

1. $y = \left(2x^4 + 6x^3 + 6\right)^3$, find y':

A.*4
$$4\left(24x^3 + 54x^2\right)\left(2x^4 + 6x^3 + 6\right)^2$$

B.*2
$$2\left(24x^3 + 54x^2\right)\left(2x^4 + 6x^3 + 6\right)^2$$

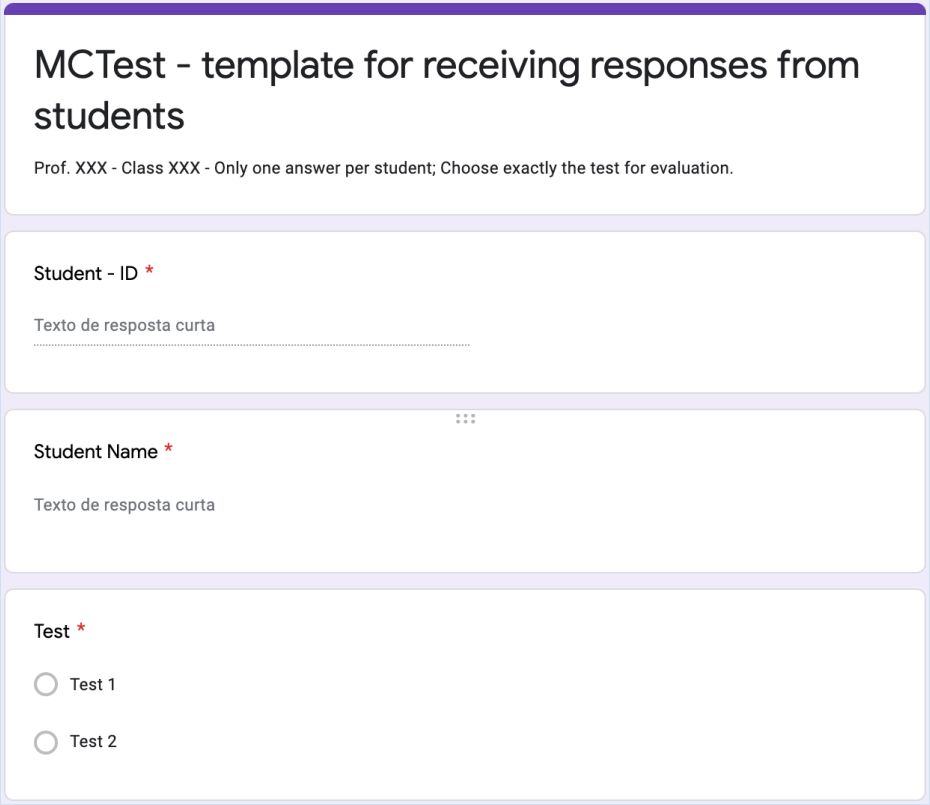
C.#0
$$\left(24x^3 + 54x^2\right)\left(2x^4 + 6x^3 + 6\right)^2$$

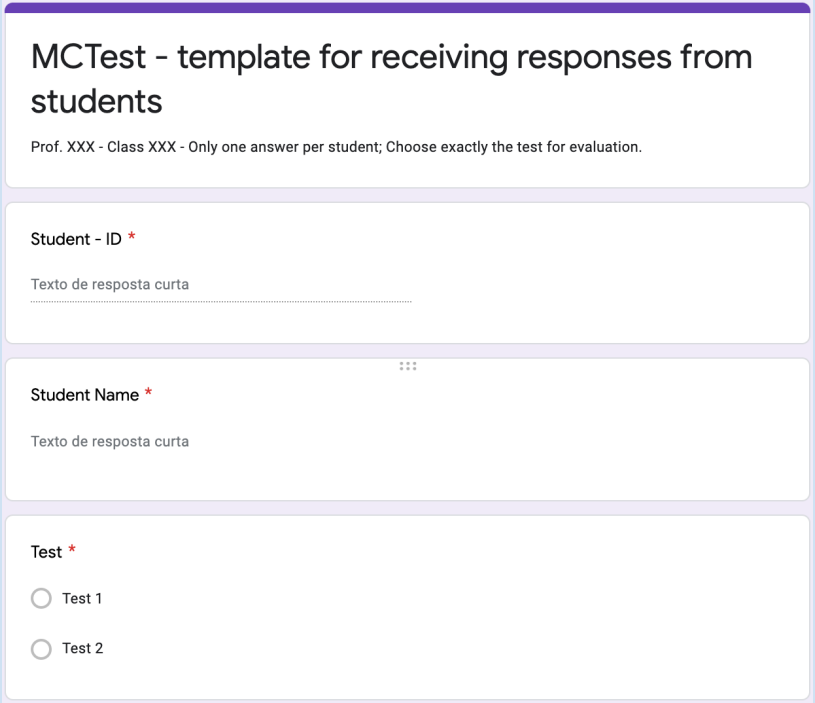
D.*1
$$x\left(24x^3 + 54x^2\right)\left(2x^4 + 6x^3 + 6\right)^2 + \left(2x^4 + 6x^3 + 6\right)^3$$

E.*3
$$3\left(24x^3 + 54x^2\right)\left(2x^4 + 6x^3 + 6\right)^2$$

Contents

Creating a Google Form





Creating a Google Form

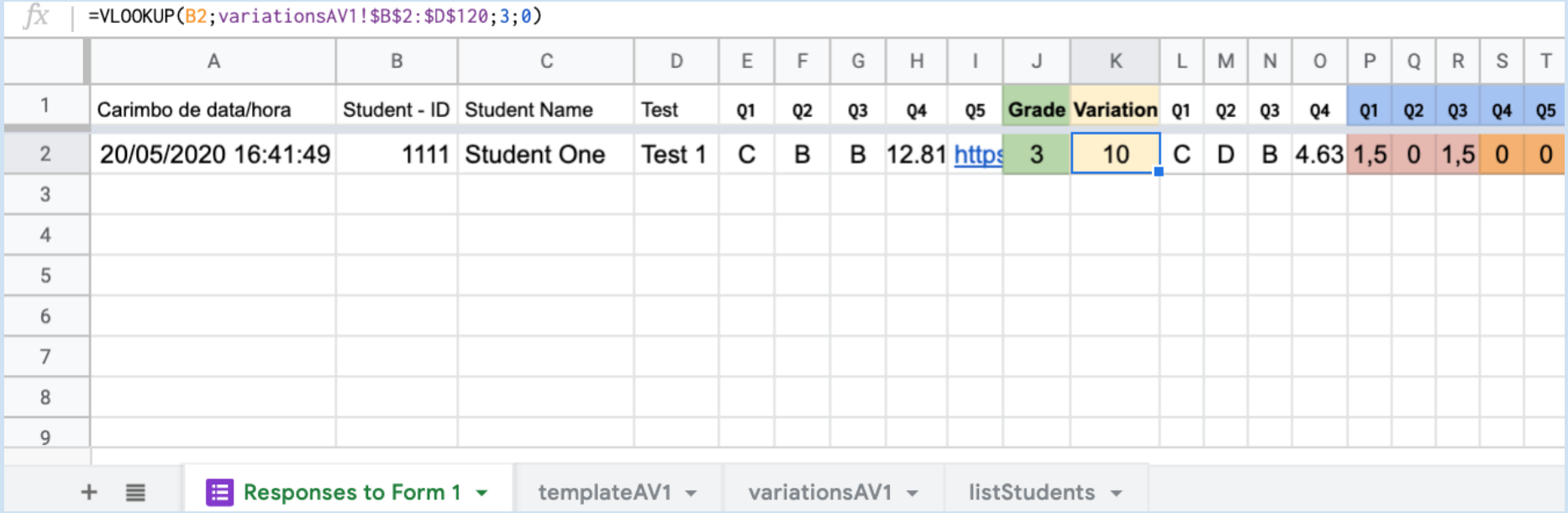
Question 4 - write the solution to this dissertation problem, with automatic correction *

Texto de resposta curta

Question 5 - Submit a photo with your handwritten response, including signature and student card *

Adicionar arquivo

Configuring Google Sheets



Configuring Google Sheets

	A	B	C	D	E	F
1	variation	Q1	Q2	Q3	Q4	Q5
2	1	C	E	D	3.47	
3	2	B	D	B	3.99	
4	3	A	B	C	4.07	
5	4	D	E	C	4.11	
6	5	E	B	A	4.29	
7	6	E	A	C	3.94	
8	7	B	B	D	3.56	
9	8	B	B	D	4.16	
10	9	B	E	B	3.73	
11	10	C	D	B	4.63	

	A	B	C	D
1	Room	ID	Name	Variation
2	Room1	1111	Student One	10
3	Room1	2222	Student Two	8

Adaptation of MCTest to dissertation questions

A **[[code:L0]]** meter long wire should be cut into 2 parts (left and right). With one of them to form a circle, with the other a square. How should the wire be cut so that the sum of the areas is minimal, considering that the left part is devoted to the figure of least area? (Use $\pi=3$). \textbf{NOTE:} The answer must be numeric with two decimals.

%%% Answer of a dissertation question to include in template
%%{ [[code:resp]] }%% <<< use exactly this syntax
[[def:
import random
L0 = random.randrange(80, 110, 1) / 10
pi = 3
resp = "%.2f" % (L0*pi/(4+pi))
]]

1. A 8.1 meter long wire should be cut into 2 parts (left and right). With one of them to form a circle, with the other a square. How should the wire be cut so that the sum of the areas is minimal, considering that the left part is devoted to the figure of least area? (Use $\pi = 3$). **NOTE:** The answer must be numeric with two decimals.

Contents

Experience report

- Context of the experiments
  - Functions of a Unique Variable (FUV) at UFABC
  - 2020.1 with 903 students in 10 classes
  - Four hours a week
  - Five weeks in classroom (before pandemic)
  - Seven completed as a distance learning course

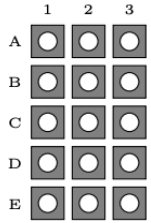
Experience report

†

Example Institute
Example Course
Discipline: Example Discipline
Classroom: Test Class **Room:** TC123
Exam: exame-template **Date:** 11-03-2020

Sig.: _____
Student: Student One **ID/RA:** 1

#135 - 2020-07-16 - 14:41:45



Instructions:

(a) Please complete this test on this link https://forms.gle/L8bdaTgStGs9WUPW6
(b) Form available until 8/may/2020;
(c) Only the first submission on the form will be accepted.

Multiple Choice Questions:

Experience report

- Experiments
  - 100 students in one classroom
  - During the pandemic:
    - Formative tests (Test1 and Test2)
    - Evaluation exams (Exam1, Exam2 and Exam3):

Table 1. Students' performance in Exams 1, 2 and 3. Notice the high average score in the multiple-choice part compared with the written response part.

Exam	Students	Multiple-Choice	Q4	Q5	Average	STDEV
1	74	86%	56.7%	59.5%	7.5	2.12
2	68	91.6%	39.7%	66.2%	7.7	2.01
3	65				5.1	1.89

Future Works

- Work as a bridge between eLearning systems
  - such as Moodle, Tidia, Blackboard, etc.
- Create students' access to their records (old corrected exams)
- Improve security, including facial and digital recognition through the QRCode

Thanks for Watching!

Questions will be answered in our Virtual Meeting to be scheduled between the 24th and the 28th of November, and also through e-mail:

{fzampirolli,valerio.batista,edson.iriarte,irineu.antunes}@ufabc.edu.br