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Choice of a visual programming language in a level 3 introductory computing course

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In the level 3 module "Introduction to Computing Technology", the assignment asked students to implement a control program displaying random numbers in a diode display. Students could choose to implement in one of two visual programming languages: Logicator Flowchart (LF) or PICAXE Blockly (PB). LF is a logical representation of a program's execution, whereas PB is a graphical representation of program code. In addition to the program, students were asked to explain their choice and discuss their experience in a report.

This poster describes the thinking behind creating the assignment in this way, elaborates on encountered difficulties, and discusses output, feedback and views of the students as expressed in their submission and their report.

RATIONALE

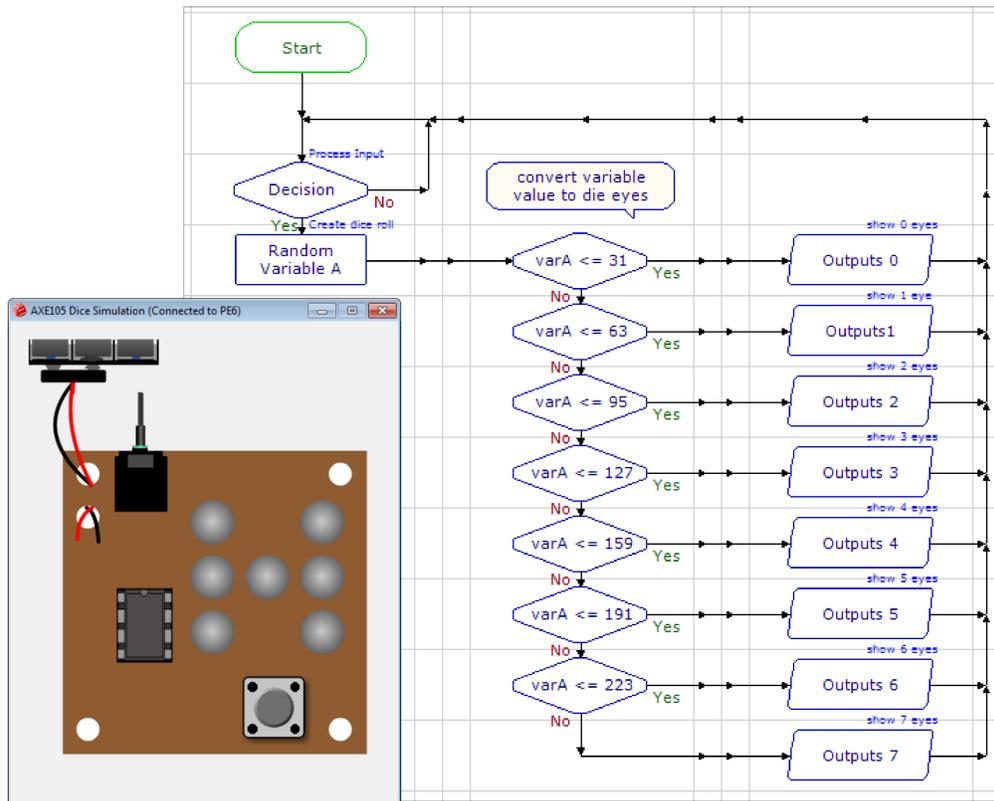
- Take the sting out of a dreaded topic, i.e. programming
- Increase student engagement
- ⇒ Increase student retention
- ⇒ Increase learning success

OBSTACLES

- Teaching two tools instead of one takes up time
- Required increased genericity of marking criteria to be applicable to different solutions

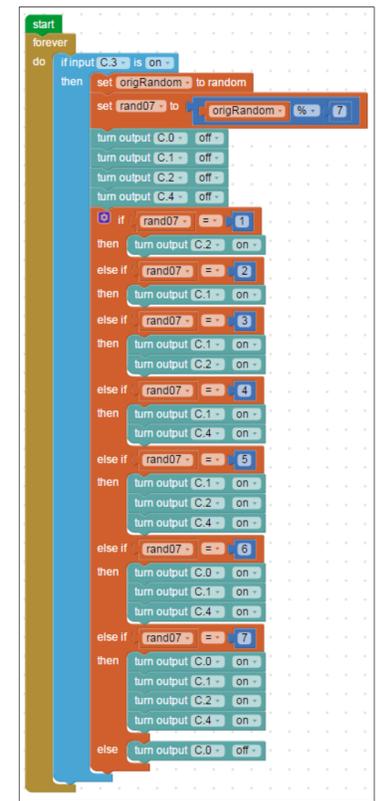
LESSONS LEARNED

- Check if the choice forms part of the task?
- Consider a "test run" of solutions for grading



Diode Display (off)

Logicator Flowchart (LF) solution



PICAXE Blockly (PB) solution

FLIP-FLOP-BLUES

A few students did not stick with their choice, but switched later. This was generally unproblematic except in one case, where one student completed a very good solution in PB during the seminar, but apparently out of boredom started over and ended up submitting a second solution in LF with some errors in it.

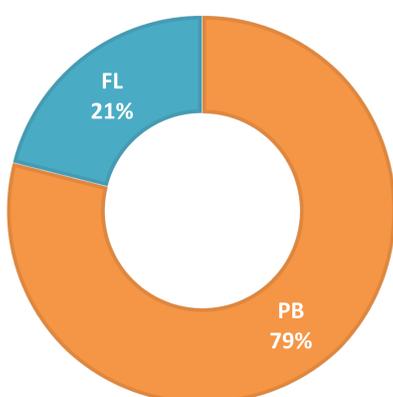
JUSTIFICATION TROUBLES

Many students seemed to struggle with making and justifying a choice in an area that was new to them (see choice justification stats). In hindsight, asking for a justification increased complexity of the assignment and added a task (making a technology choice) to the assignment that students had received no instructions for during the module.

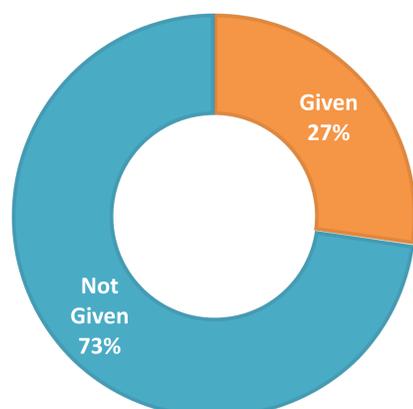
LF-PB INEQUIVALENCY EXAMPLE

Among others, the program needed to convert the result of the random number generator into a random number ranging from 0-7. In LF, this must be solved structurally through an if-else statement. In PB, this can be done structurally, or operationally through the use of the modulo operator (%).

CHOICE



CHOICE JUSTIFICATION



STUDENT COMMENTS

"The advantage of Blockly is that commands are colour-coded for feature, brightness and easy recognition."

"I preferred flowchart because it seemed to be less complicated and more self-explanatory."

"I used Blockly because I found it very easy to drag and drop and stack the blocks to operate."

"I chose Blockly for its similarity to programming languages such as Python or Java, which I already knew."

Bibliography:

- Haines, (2016) *Student Engagement Through Choice*. <https://www.nais.org/magazine/independent-teacher/fall-2016/student-engagement-through-choice/>.
- Findley (2016) *Increase Motivation, Engagement, and Mastery with Student Choice*. <http://teachingtoinspire.com/2016/03/using-choice-boards-to-increase-motivation-engagement-and-mastery.html>.