Use of Explicit Instruction is helpful in Reducing Program Reasoning Fallacies in Elementary Level Students

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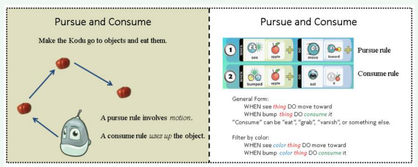
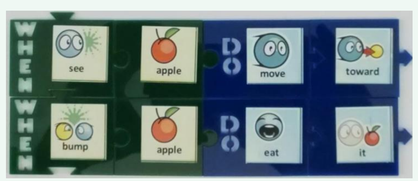
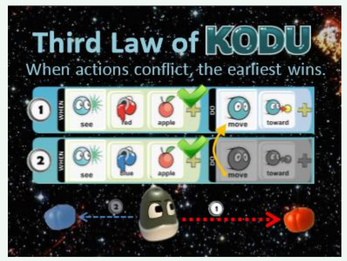




Kodu Curriculum

Laws of Kodu

Second Law of Kodu



Third Law of Kodu

Summary

This poster presents results from a study which analyzed the role of explicit instruction in the form of 'laws of computation' in cultivating elementary school (4th and 5th graders) students' ability to reason about programs using Microsoft Kodu Game Lab.

We used pre-tests to record students' default models of reasoning about programs and then used post-tests to measure the effectiveness of intervention by noting students' reasoning responses on a similar program.

Our findings indicate that by default students reason sequentially about program execution which can be incorrect in situations like parallel rule execution. We also found that the use of explicit instruction in the form of 'laws' is helpful for students to refine their understanding of program execution and to improve their reasoning ability.

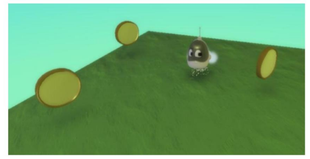
Highlights

- Students actively apply analogical reasoning models accumulated through their day-to-day experience in reasoning about programs.
- While students cannot be prevented from using analogical reasoning, the use of explicit instruction can help in molding a student's reasoning wherever analogies do not hold true.

Study Design

- Mixed method research
- Pre and post assessments, think-aloud interviews used to study reasoning
- 18 participants, 4th and 5th grade students (12 boys and 6 girls)
- 16 out of 18 students indicated that they had prior programming experience

Week - 2



Kodu World

Q2. In the world above, what would the Kodu do with the given rules?

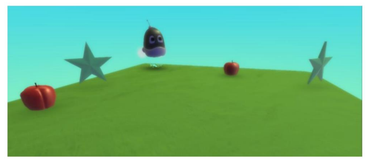
A) Kodu will not move as the consume rule is above the pursue rule
B) Kodu will bump the coin first and then pursue the nearest coin
C) Kodu will pursue and consume all the coins as the order of pursue and consume does not matter
D) Kodu will do random stuff

Results

	A	B	C	D
Pre	11	3	**2**	0
Post	0	0	**15**	1

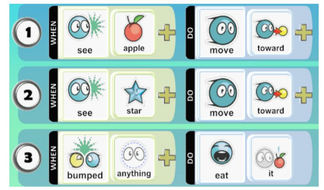
Pre and Post assessment results in Week-2

Week - 3



Kodu World

Q. When will the kodu eats its first star?



A) Right after no-apples left
B) Right after it eats its first apple
C) It will never look for a star; it will keep looking for apples
D) It will only eat a star if it bumps into one by accident

	A	B	C	D	0
Pre	**0**	9	1	1	6
Post	**10**	4	1	1	1

Pre and Post assessment results in Week-3

Conclusion

- Students have analogical mental models for reasoning about programs
- Use of laws is effective in correcting program reasoning
- Students referred the laws explicitly while reasoning about the execution of the programs

Poster Design: https://derekcrowe.net/butterposter