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''A Pierced Bottle leaks not!?'' the Heuristic-branched out e-model of animated ''Science School'' in Year 4

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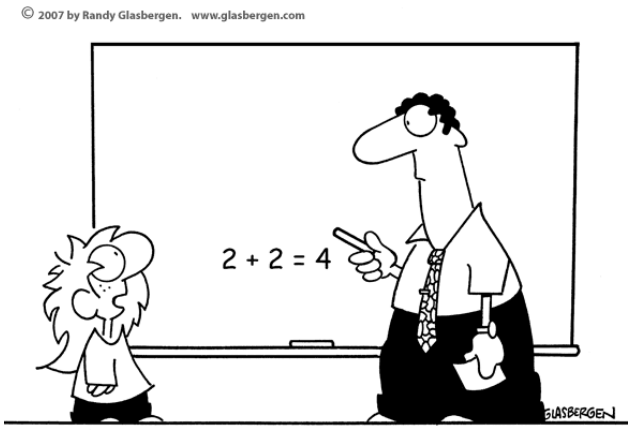
Abstract: *Animated learning types have proven their superiority over the traditional forms of learning. Do we know of any child who does not like to watch animated films? For such content one needs not to be further encouraged! In the same light, it is a rewarding form of learning in primary grades. If we upgrade this form of learning with direct manipulation of animated objects and we present it in the context of heuristic branched out e-model of learning, we can extend its educational purposes and its foundation. The purpose of this paper is to present the heuristic branched out e-model of learning applied to animated films with direct manipulation of animated content. Our assumption is that the presented example of an animated scientific task "Science School" will also encourage and develop pupils' functional thinking skills, and as a model (approach) it is also applicable to all curriculum areas in the first grades of primary school.*

Key words: *Animated film, heuristic branched out e-model of learning, direct manipulation with animated content, motivation + wide applicability, functional thinking skills.*

I. ''TODAYS SCHOOLS = BOREDOM!?''

"I am afraid that one day technology could outperform peoples' communicative skills.
The world shall see a generation of idiots if that ever happens."
(Albert Einstein)



"How can I trust your information when you're using such outdated technology?"

Children in todays schools in Serbia are looking forward to reforms because the educational framework that is in place at the moment is outdated and it frustrates many pupils. New and updated forms of learning are, as if, willingly or unwillingly bypassing the educational framework (?). In todays schools, pupils are getting bored - there are no challenges! And while all our scientists' ideas are implemented in other neighbouring countries (e.g. The founders of MENSA organization in Serbia have, with government support, successfully implemented approaches to learning, research informed and based on neuro-physiology in pedagogy and their programme is adopted across 14 European countries) our schools exist, as if, in "an enchanted circle"[1]. In the same vein, lifelong learning and professional development of teachers and educators must walk "hand in hand" with contemporary trends and tendencies and not to be left on an individual, his or her efforts and enthusiasm!

E-learning (educational games, animated films) have proven their educational, functional and motivational superiority over the more traditional forms of learning for which we find many research informed examples[2].

"Lesson objectives, if "clothed" in attractive animated films, have proven their superiority over the traditional and outdated forms of learning, and pupils exposed to such animated content need no encouragement to stay dedicated and engaged. On the webpages of a very popular software BrainPOP (www.brainpop.com) we see the results of experimental research and application effects of animated content in pupils' learning over the traditional approaches which have not involved such animated content." [3].

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"We are aware that most of our children love video games and researchers think they are a strong tool waiting to be used for learning." According to Black (2007) *"efficiency of learning through direct* **manipulation of animated** *content, is best reflected in examples that illustrate functional relationships among the objects. Pupils who have been exposed to such an approach, have achieved better results than their peers who have been exposed to photographs with captions, diagrams or films. Namely, the results show that what has been of crucial importance was pupils' activity, manipulation of animated parts and learning about its relationships, and not the "almighty" technology."* [4].

Should we want to provide an answer to a question: What does manipulation of animated content mean?, we can look at the fourth principle of "foreseeing". This is at the core of its meaning:

"Foreseeing in animation marks many threatening dangers – "accidents", which are announced through the numerous effects. So, the wide boggling eyes, sound effects etc. "annonce" some kind of threatening danger... Naturally, foreseeing can also be seen in some of the more ordinary tasks and operations, but which are as well "announced" for the benefit of overall effectiveness of the whole animated operation. However, if we connect this principle to the framework of interactive multimedia educational software, its meanings are directed to user's actions or steps taken in an interactive environment. Therefore, it demands of animators and programmers a careful preparation of many sequenced animations which would "cover" or act to a purpose of every step taken by the user of the application interface." [5, 6].

II. The Heuristic Branched Out E-Model Of Animated ''Science School''

Our application, the presented model of an animated film, we have updated with **heuristic branched** out approach to learning.

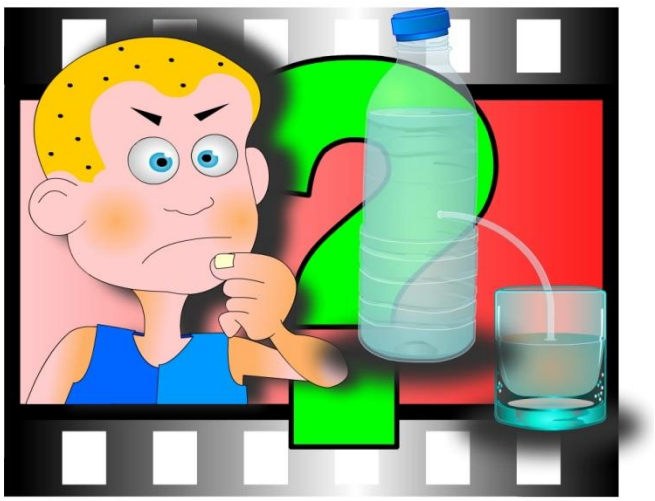
Therefore, in **structured learning**, all content is divided into interrelated but mutually connected parts which pupils cover successively, step by step. After each successful step, pupils review their comprehension and progresses individually, given the results of his background knowledge. Successful programming is possible in strongly related and structured parts of the curriculum which represent the foundation skills which pupils cover in the first grades of primary school. Programmed and structured learning can be **vertical** and **branched** out.

On the other hand, heuristics as a scientific discipline, deals with methods and principles of discovering new and innovative. Heuristic methods are used to speed up the process of discovery of good enough results in situations when proceeding with the detailed research is not practical. Examples of such methods, confirm usage of many general principles, informed hypothesising, **intuition and common sense** [7].

The elaborated example here is a presentation of a "scientific" task named: **''A Pierced Bottle Leaks Not!?''**, used in the primary elective school subject **Having Our Hands in Tests** [8, 9]. The model of heuristic branched out task, can be solved within a few animated steps, reminiscent of children's game hopscotch, which implicitly or explicitly embeds educational objectives. (figure no. 1)

Task instruction is as follows:

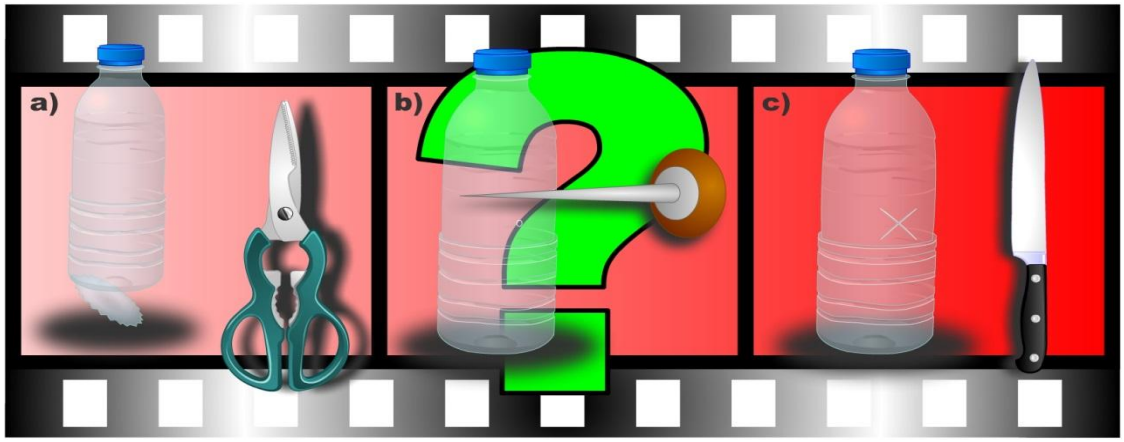
Can we have a pierced bottle that does not leak? Yes (no), prove it?!
Carefully select the given suggestions, and your selections record in your notebook!



(Figure no. 1: Beginning screen of the animated film, in our heuristic branched out "scientific school")[2]

[2] *All the drawings are independent creations on the platform by Macromedia Flash 8*

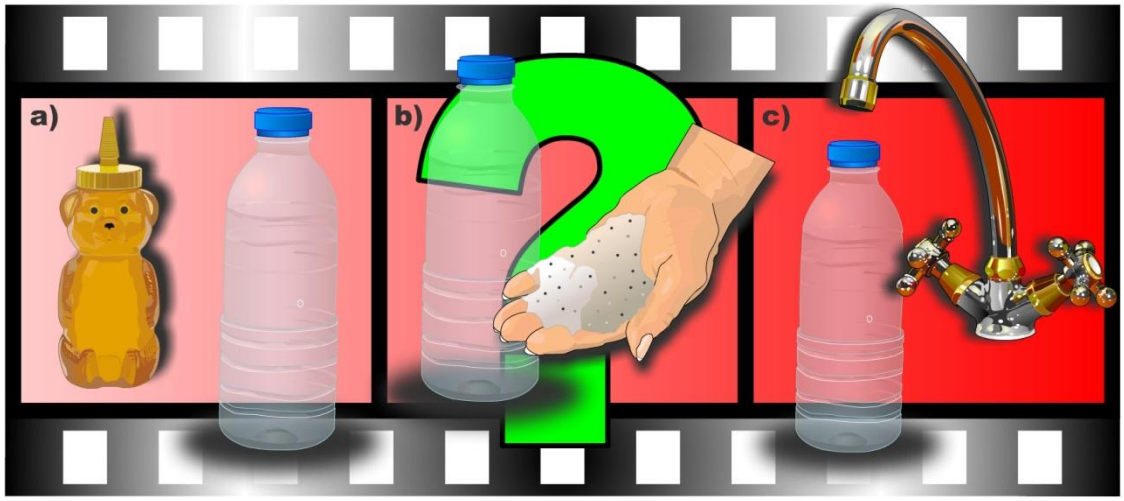
1. Step one. Think twice and then choose:
a) Use scissors to cut the bottom of the bottle
b) Use an awl to pierce the bottle wall or
c) Use a knife to cut through the bottle wall.



(Figure no. 2: Step one)

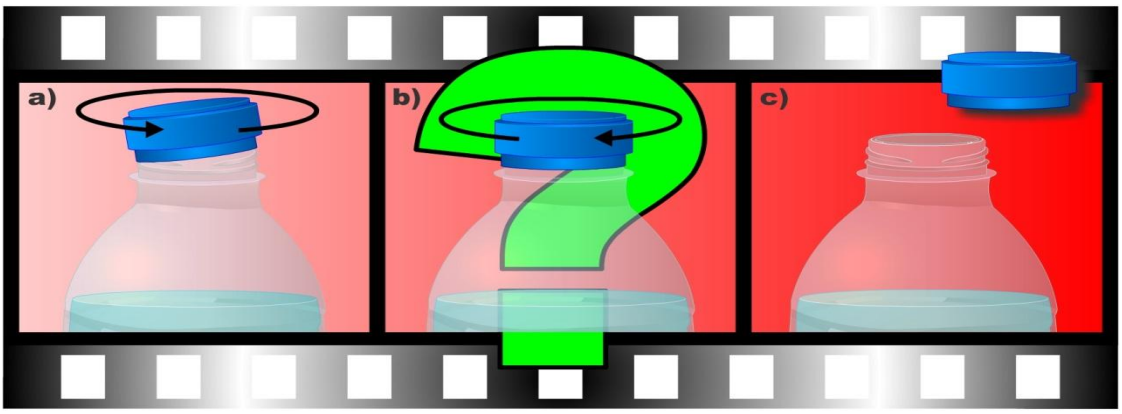
When presenting the algorithm, **the correct answer** is hidden from a reader. When the incorrect answer is selected, pupils are guided to a "dead end street" which is also animated, and than it guides him/her back to the previous step!

2. Step two. Think twice! You can fill up the bottle with:
a) Honey,
b) Sand or
c) Water.



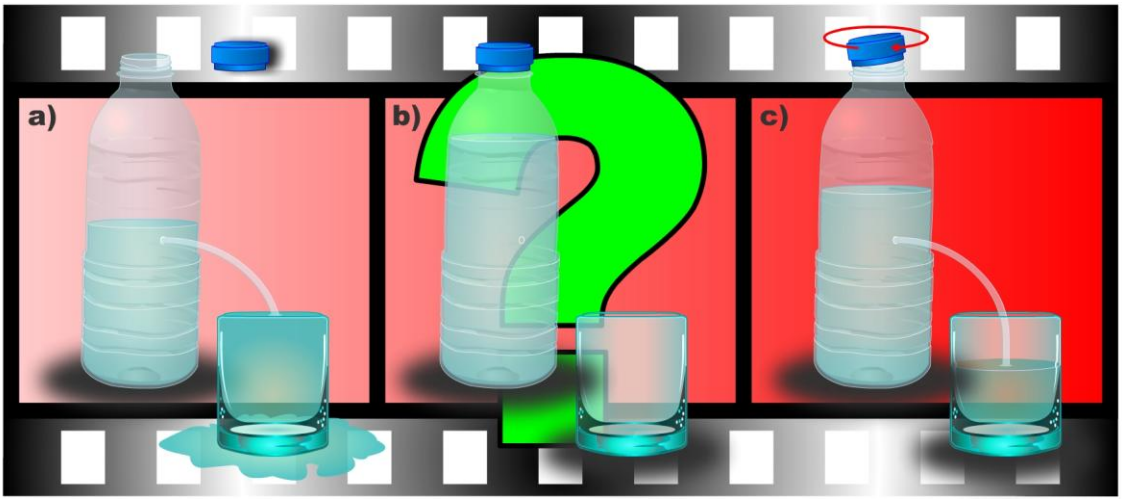
(Figure no. 3: Step two)

3. Step three. The bottle can should:
a) Unscrew to a middle point
b) Screw to the end or
c) Screw completely.



(Figure no. 4: Step three)

4. Step four. From the bottle with half unscrewed bottle cap, water will fill up the glass if:
a) immediately unscrew the bottle cap to the end,
b) immediately screw the bottle cap to the end,
c) immediately screw the bottle cap when the glass fills up.



(Figure no. 5: Step four)

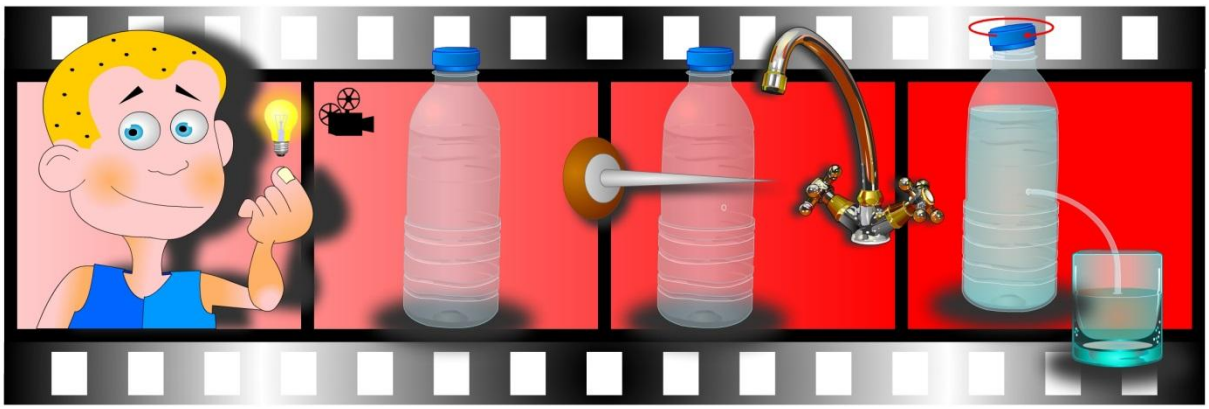
5. Step five. Careful! Carefully select the correct answer that will guide you to the solution of the puzzle:

a) Fantastic, you have made a "tap with adjustable spray!". So, if you partially unscrew the bottle cap on the bottle, water will run through the bottle opening. Whether we have screwed or unscrewed the bottle cap, water will continue to leak from bottle. Namely, the process we have started cannot be stopped!

b) Fantastic, you have made a "tap with adjustable spray!". So, if you partially unscrew the bottle cap on the bottle, water will run through the bottle opening. This happens because the atmospheric pressure impacts through the bottle opening and pushes out the water from the bottle. Whether we screw or unscrew the bottle cap, water will leak out completely!

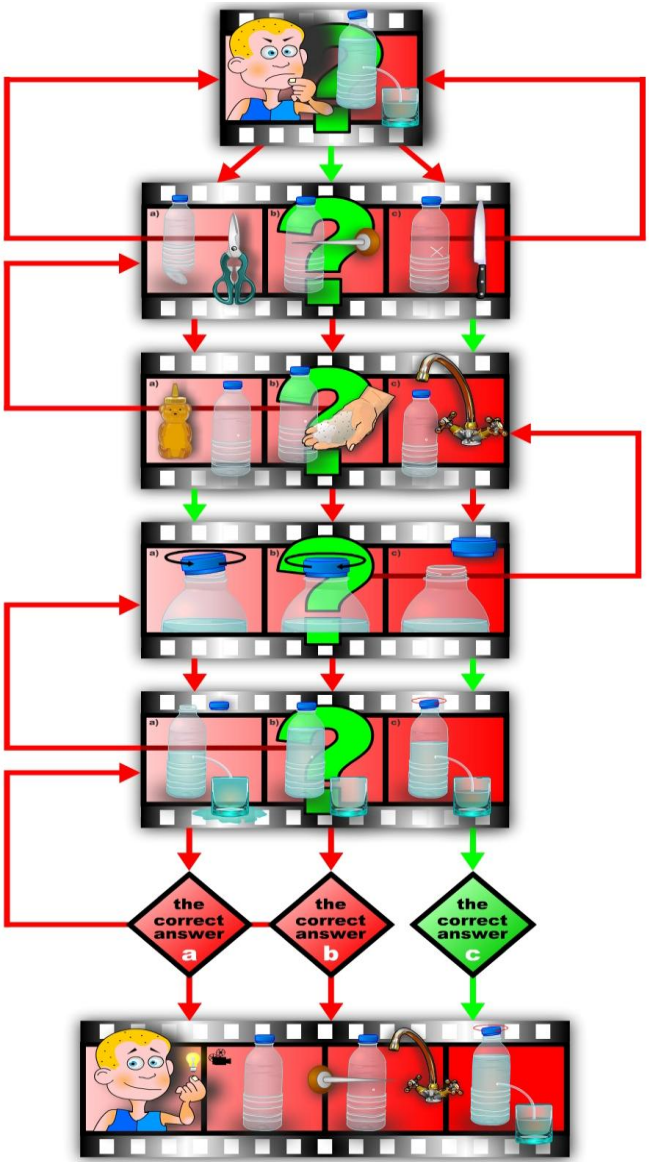
c) Fantastic, you have made a "tap with adjustable spray!". So, if you partially unscrew the bottle cap on the bottle, water will run through the bottle opening. When the glass fills up, the leaking will stop, if we screw the bottle cap completely. With respect to the extent we have unscrewed the bottle cap, the spray will be stronger or lighter. This is possible because the atmospheric pressure prevents the water to leak out through the bottle opening.

If the selected answer is correct, pupils get to see the whole process of "scientific hopscotch" - animated film, figure no. 6.



(Figure no. 6: Animated film: Presented puzzle solution of "scientific hopscotch").

Visual display of algorithm structure of our heuristic branched out "scientific hopscotch", graph no. 1:



(Graph. no. 1: Schematic algorithm display of the heuristic branched out "hopscotch" puzzle)

After the visual puzzle (task) is solved, pupils should be given an opportunity for practical-manipulative and experimental puzzle experience, which nourishes love and interest in science in children.

III. Conclusions Before Concluding

Our assumption is that the presented theoretical e-model of learning through direct manipulation of animated content embedded in the heuristic branched out animated film, is very encouraging and that it can be customized to individual progression of all pupils. To prove what we say, we should develop an application and test our application on selected pupils.

Furthermore, the e-model should facilitate functional thinking skills in pupils, and as such it is perfect for acquisition, revision and comprehension tests of content across the curriculum.

The displayed e-model is also facilitative for formation of *"successive frames"* of films which would compose one or more of theme areas. Such an approach and learning should be combined with practical-manipulative, experimental and other approaches and procedures of practical work which also is conditioned with methodological and financial-technological resources... while on the other hand, it saves on money, materials, space and time...

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