

Are Schools (Cognitively) Nutritive for Children's Complex Thinking?

Today we host a very stimulating essay on the importance of problem-solving and encouraging complex game-playing for children's complete "cognitive nutrition". Enjoy!

Children's Complex Thinking

-- By Tom O'Brien and Christine Wallach

Pop over to your neighborhood school and visit some classrooms. Is what's happening **cognitively nutritive**? That is, does it satisfy present needs and provide nourishment for the future health and development of children's thinking?

Or is it punitive, with little concern for present nourishment and future health and development?

The Genevan psychologist and researcher Hermina Sinclair said,

All of us concerned with education should view children as wearing signboards saying 'Under Construction'. No, wait a moment. I didn't say that strongly enough. All of us should look at people as wearing signboards saying, 'Under Construction--Self Employed'. (See Reference 1.)

We are in the fifth year of research, work which sheds light on Sinclair's claim, shows that present educational goals for children are often trivial, and which suggests that current methods of causing learning to take place should be re-thought.

The work shows that children at grades 1-5 are capable of stunningly complex thinking and that this goal can be achieved with no direct teaching, but rather by posing problems for the children to solve.

Our work involves casual logical games created by O'Brien. Reports on the research appear in Reference 2.

The games are available for Palm pdas through OS 5 at Handango.com under the title Treasure Hunt. See Reference 3.

The games involve a search for jewels on a 4 by 4 grid.

In all games, players ask for information and then assess the consequences of the information to locate the jewel(s) with logical necessity. The issue is inference: the deriving of new information (conclusions) from old information (data).

In all games, two levels are available: 1) search for 1 jewel and 2) search for 2 jewels.

In one game, Find the Emerald, an emerald is hidden at random and the player chooses a box (in this case, A-2.)The distance from A-2 to the mystery jewel is 2. The distance is left-right and up-down, not diagonal. So if a child asked about A-2 and if the feedback were 2, the Emerald would have to be in B-1, C-2, B-3, or A-4. Which box would you ask about next?

	A	B	C	D
1				
2		2		
3				
4				

In a different game in the Treasure Hunt suite, Rubies, players choose a box and the computer looks in that box and all the boxes which touch that box and tells the players whether or not it sees a Ruby. (In the case of the two-Ruby game, the computer reports 0, 1 or 2 Rubies seen.)

In a third game, Diamonds, the player chooses a box. If the mystery jewel is in that box or if it is touching that box sideways, the feedback is Hot. If the mystery jewel is touching the child's box cornerwise, the feedback is Warm. If the two boxes are not touching, the feedback is Cold. (In the two-Diamond game, the child's box may be Hot to one jewel and Warm to another. The feedback is Hot, because Hot overrules Warm. Similarly, Hot overrules Cold. And Warm overrules Cold.)

During our research, no teaching took place aside from giving children an explanation of the rules of the game. Children worked together with the teacher as the data-giver. Sometimes a Palm device and a projection device were used and

sometimes the teacher calculated the feedback and recorded the data on a chalkboard.

Although three-jewel games have not been programmed for the Palm, recent research has involved three-jewels (with the teacher hiding the jewels and calculating the feedback.)

One-jewel games are accessible to most children, even as early as grade 1. Two- and three-jewel games, however, are very complex. Readers are encouraged to play the games with friends with or without an electronic device.

Conclusions

The main findings were four:

1. In general, children's thinking--from grade 1 to grade 5--was very complex and economical. Children very rarely asked a useless question and very rarely made a false inference.
2. Children worked together with enthusiasm and respect. They questioned each other's thinking in ways that were considerate, and they supported each other's learning by explaining how they arrived at their conclusions. This behavior would be a surprise to many teachers. How to explain what happened? Children were trusted to tackle very complex tasks rather than being spoon fed with the accompanying hidden message, "You are capable only of following the teacher's instructions."
3. Virtually all children were successfully engaged and it was often the case that children who had had little classroom success did very complex thinking. One implication is that the traditional method, direct teaching, often doesn't encourage original and complex thinking. Our research shows that they crave it.

One girl who was birth-deformed and who never spoke above a whisper, took over the class at one point, "Tell me, John, What box do you want to know about? A-3? A-3 is 3. What are the consequences? Now, Susan, tell me what you have to add to what John just said." Another child, Boris, had had no success, academically or socially, from kindergarten to grade 5. He thrived on the search games. Unknown to the school staff, Boris was an Asperger's logic machine, capable of incredibly complex thinking.

4. Throughout the years of research, evidence has been presented to support the view that learning involves **provoked adaptation**. People revise their original networks of ideas and construct new ones in the face of challenges, novelty and problem situations. This is far from what's commonplace in today's world of fundamentalist absolutist authoritarian policies and practices.

Comments

The notion that knowledge is constructed is not popular in these days. Indeed, a denial of this fundamental human act--perhaps the most fundamental cognitive act of all--has led American educational critics to impose an approach to education appropriate only for parrots. See Reference 3.

But in our research one sees children constructing important ideas concerning logical necessity.

The research supports the idea that knowledge evolves in terms of coherence, stability, economy and generalizability. And when it achieves equilibrium it quests. (See Reference 4. It was routine--no, universal--that kids finished a game and said, "Can we do a harder one?")

Are these experiences nourishing? That is, will they have an effect twenty years from now? We don't know. Come back in twenty years.

We think that the answer is yes. We base this hunch on the fact that we meet parents in the schoolyard or the grocery store who say, "What are these logic games Johnny is playing in class? He likes them very much and he has the whole family playing Emeralds and Rubies and Diamonds around the dinner table at night."

Other kids pop back to class two or three years after their class has moved on. "Can I play Diamonds? I remember the game well." And they play a game or two of Diamonds with all their tactics still fresh.

Indeed, it is the rare teacher who can cite such events. Rather, they say, "With the traditional curriculum it often seems as though that kids forget everything they've learned when summer vacation arrives. They come back in September having forgotten nearly everything. It seems like they had never been to school in the first place."

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References

1. Extracts from a Seminar, "Intellectual Development, Research and Education," by Hermina deZwart Sinclair (University of Geneva), Teachers' Center Project, Southern Illinois University at Edwardsville, Edwardsville, IL, 1977.

"The Child as Scientist," an interview with Hermina deZwart Sinclair (University of Geneva), Teachers' Center Project, Southern Illinois University at Edwardsville, Edwardsville, IL, 1977.

2. Thomas C. O'Brien and Judy Barnett, "Fasten your seat belts," Phi Delta Kappan, 85(3), 201-6, November 2003.

Thomas C. O'Brien and Judy Barnett, "Hold on to your hat," Mathematics Teaching, 87, June 2004.

Thomas C. O'Brien and Chris Wallach, "Children Teach a Chicken," Mathematics Teaching, 93, December 2005.

Thomas C. O'Brien, "A Lesson on Logical Necessity," Teaching Children Mathematics, 13(1), August 2006.

Thomas C. O'Brien and Chris Wallach, "Children's Construction of Logical Necessity," Primary Mathematics, Autumn 2007.

3. The Treasure Hunt games are available for purchase at www.Handango.com. See [Here](#).

Two other suites of O'Brien's software, Find It and Mystery Three, show identical research results, These can be found at the Handango site.

According to Palm experts, all three software suites work with all models of Palm devices including handhelds and smart phones -- i.e., M100 series, M500 series, Lifestroke, Tungstens, Zires, Treos and Centro.

4. Thomas C. O'Brien, "Parrot Math," Phi Delta Kappan, 80(6), February 1999.

5. Thomas C. O'Brien, "What's Basic--a Constructivist View" in Handbook of Basic Issues and Choices, National Institute of Education, USOE, March 1982.

Thomas C. O'Brien, "Some Thoughts on Treasure-Keeping," Phi Delta Kappan, January 1989.

Thomas C. O'Brien, and Ann Moss, "What's Basic in Mathematics?," The Principal, November 2004