Vygotsky's Theory and Mathematics Education

Mathematics

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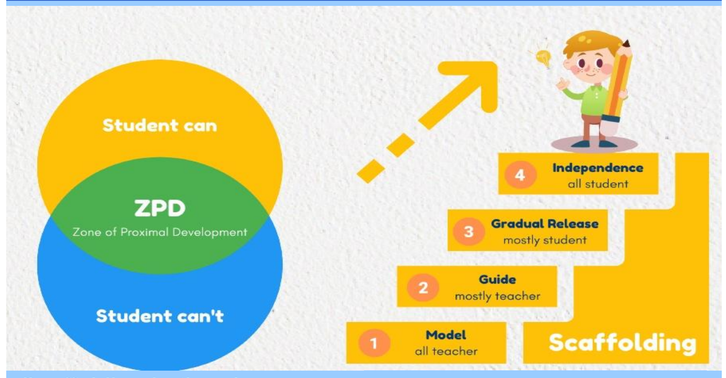
ABSTRACT

In this presentation, we introduce psychologist, Lev Semyonovich Vygotsky and explain his theory of The Zone of Proximal Development. We explain this theory in detail, describing its roots and how it has impacted mathematical education over the last century. We explore implementations of Vygotsky's theory as classroom activities, and furthermore, how children benefit from such activities

DESCRIPTION OF THE PROBLEM

- Vygotsky noticed cognitive growth increased less for students with a higher intelligence than a lower intelligence when entering school, so he coined the term relative achievement. This highlights the departure point of student learning, and not just the end result.
- His idea of relative achievement led to the idea of Zone of Proximal Development (ZPD), which also assesses the change in cognitive development of students and not just the final outcome.
- ZPD is the difference between the current level of cognitive development and the potential level of cognitive development
  - Consists of **two important competents**: student's potential development and the role of interaction with others
    - Potential development is simply what the student is capable of learning
    - A student is able to reach their goal by completing problem-solving tasks with their teacher or engaging with more competent peers-students cannot reach the same level of learning by working alone
- Vygotsky outlined scaffolding as a tool for growth to help learners achieve independence
  - The support given during the learning process is tailored to meet the needs of the student
  - Collaborating with a skilled teacher or more knowledgeable peers helps students make connections between concepts

SOLUTION and EXAMPLES



Scaffolding in the classroom

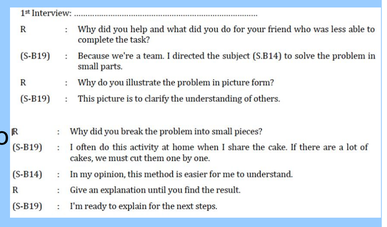
- Know each student's ZPD
- Encourage group work
- Don't offer too much help
- Have students think aloud

Scaffolding Methods

- Feedback
- Hinting
- Instruction
- Clarification
- Modeling
- Questioning

Examples

- Peer Scaffolding:Group activities provide scaffolding support by utilizing the strengths of one peer in the group who was considered more capable.



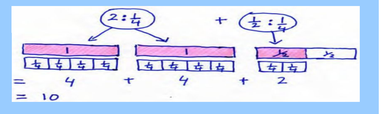
1st Interview: .....

R	:	Why did you help and what did you do for your friend who was less able to complete the task?
(S-B19)	:	Because we're a team. I directed the subject (S.B14) to solve the problem in small parts.
R	:	Why do you illustrate the problem in picture form?
(S-B19)	:	This picture is to clarify the understanding of others.
R	:	Why did you break the problem into small pieces?
(S-B19)	:	I often do this activity at home when I share the cake. If there are a lot of cakes, we must cut them one by one.
(S-B14)	:	In my opinion, this method is easier for me to understand.
R	:	Give an explanation until you find the result.
(S-B19)	:	I'm ready to explain for the next steps.

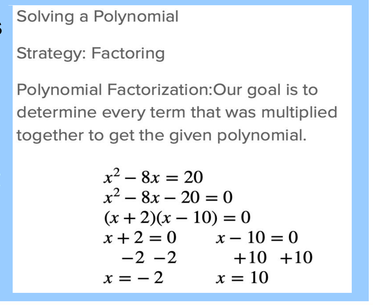
Study conducted by Kusmaryono, Jupriyanto, and Kusumaningsih

Problem: Mother has 2 ½ banana cake pans. Mother will cut the whole cake into pieces.

Question: How many ¼ pieces of cake do you get?



- Task Scaffolding: Teachers provide each step, of a strategy or task, one at a time to their students, increasing their responsibilities to the point where they are able to complete the task independently.



Solving a Polynomial

Strategy: Factoring

Polynomial Factorization:Our goal is to determine every term that was multiplied together to get the given polynomial.

$$x^2 - 8x = 20$$
$$x^2 - 8x - 20 = 0$$
$$(x+2)(x-10) = 0$$
$$x+2=0 \qquad x-10=0$$
$$-2\ -2 \qquad +10\ +10$$
$$x=-2 \qquad x=10$$

RESULTS

In the study, students completed "ready to learn work" and "not ready to lean work" with the aid of their teacher. It was found that they mastered the material significantly greater than when working on the material in their zone of proximal development.

Furthermore, students were assigned homework with similar material. Their progress in regards to the homework was compared to their progress in regards to the classwork, the classwork taking place in the presence of their teachers and the homework being done independently. Aligning with the researcher's hypothesis, the students mastered the material faster in the classroom. Having the aid of their teacher played a crucial role in mastery of the material. Hence, the concept of scaffolding is shown to be effective in the classroom.

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