

2001-2002

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2001-2002

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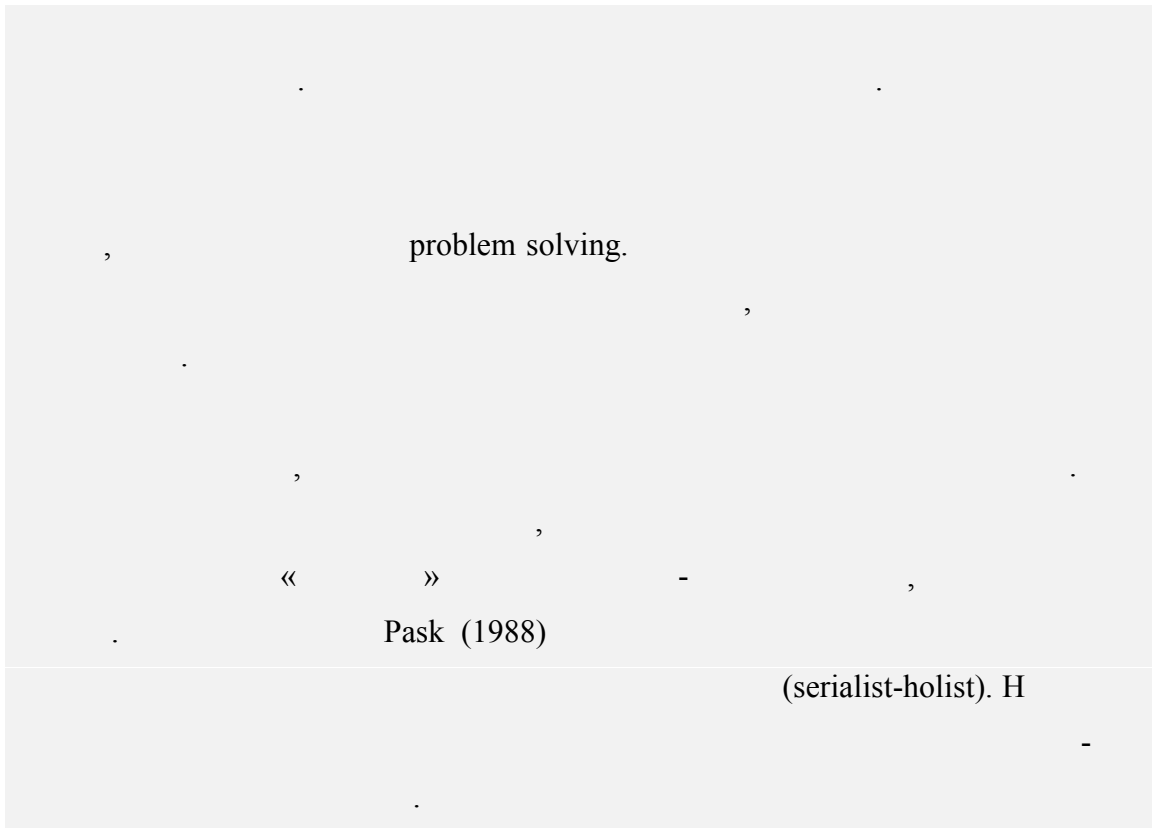
14

2001

1.	2
2.	3
3.	5
3.1	5
3.2	6
3.3	6
4.	—	7
4.1	8
4.2	9
4.3	9
4.4	10
4.5	11
4.6	11
4.7	12
4.8	(feedback)	12
5.		13
6.	.....	19
6.1	.....	19
6.2	.....	20
6.3	.....	27
6.4	.....	28
6.5	-	29
7.	..... ; .....	29
7.1	.....	31
7.2	.....	34
7.2.1	.....	34
7.3	.....	35
8.	.....	42
9.	:	46
	:	46
	:	52

1.

2.



(*cognitivism*).

(*behaviorism*)

Learning)

» (Perception

(constructivism)

« » (conceptual learning).

3.

3.1

Tobin&Dowson (1992)

objectivist ()

constructivist (,

) :
Objectivist (Thorndike 1913)

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⇒

⇒

⇒

Constructivist (Von Glaserfeld, 1989)

⇒

⇒ ,

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3.2

constructivist () instructivist (Duffy&Jonasen 1992, Papert,1993).

instructivists

(.)

(Rieber, 1992).

, constructivists

« »

3.3 .

(cognitive) (behavioral) (Skinner 1968) o

1.

2.

3.

4.

1989)

(Yllonen & Shute

4.

⇒

(Feedback).

⇒

modeling, coaching, scaffolding -exploration
fading (Collins et al., 1989).

(Groen 1978, Papert 1980).

« » :

- 1.
- 2.
- 3.

4.1

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4.2

1. Coaching :

2. Reflection :

3. Scaffolding fading:

proximal development Vygotsky () zone of

4.

4.3

(Brown, Collins & Duguid, 1989).

Newell & Simon (1972), Anderson (1983), Brown (1985)

() ()
).

« »
(ansford et al., 1990, Peleman 1992),

instruction - anchored

4.4

- (trial and
error).

«
».

4.5

(Carroll, 1963).

4.6

H

(Slavin, 1992, Johnson and Johnson 1987).

(Davidson 1994).

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(2-5).

4.7

4.8 (feedback)

«
» (Draper 1999).

feedback

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feedback

feedback

(transfer)

5.

(Constructivism)

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(Problem Solving).

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(Constructivism),

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Constructivism

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(Problem

Solving).

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« », (1997),

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(Balacheff 1984, 1989, 1990)

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- 1.
2. ()
(units),
(investigations) (projects).

6.

6.1

Taylor (1980)
(tutor, tool or tutee).

« »
Logo

Means (1994)

(Paterson, Strickland, 1985):

- (Drill & Practice).
- (Tutorial).
- (Educational game).
- (Simulation).
- Problem solving.

Drill &Practice

Tutorial

multimedia).

productivity software or tool software .

documents,
(Word, Excel, DataBase

).

6.2

Drill & Practice

Drill & Practice

feedback

Drill

& Practice

Drill & Practice

feedback

Drill & Practice
(Integrated Learning Systems - ILS),

Problem Solving

problem solving.

: means-end analysis, searching a problem space, brainstorming,
heuristics, working backward and incubation.

(Patterson & Strickland
1986).

Tutorial

Tutorial

(help screen)

tutorial

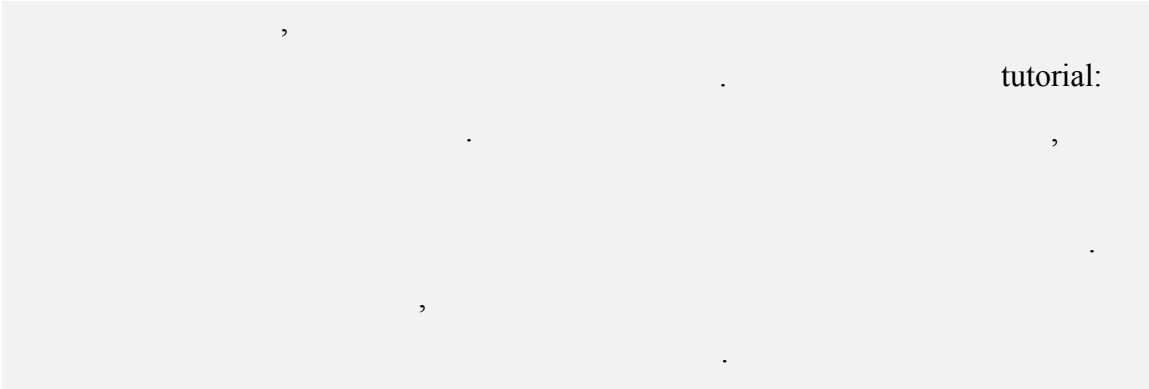
« »

feedback

animation, video,

tutorial

T



Simulation ()

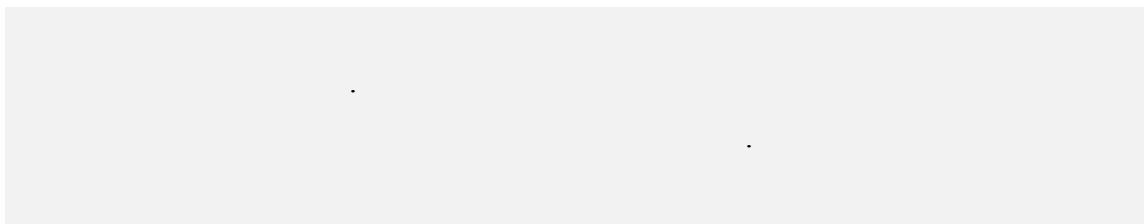
To simulation

simulation ()

(. . .),

simulation

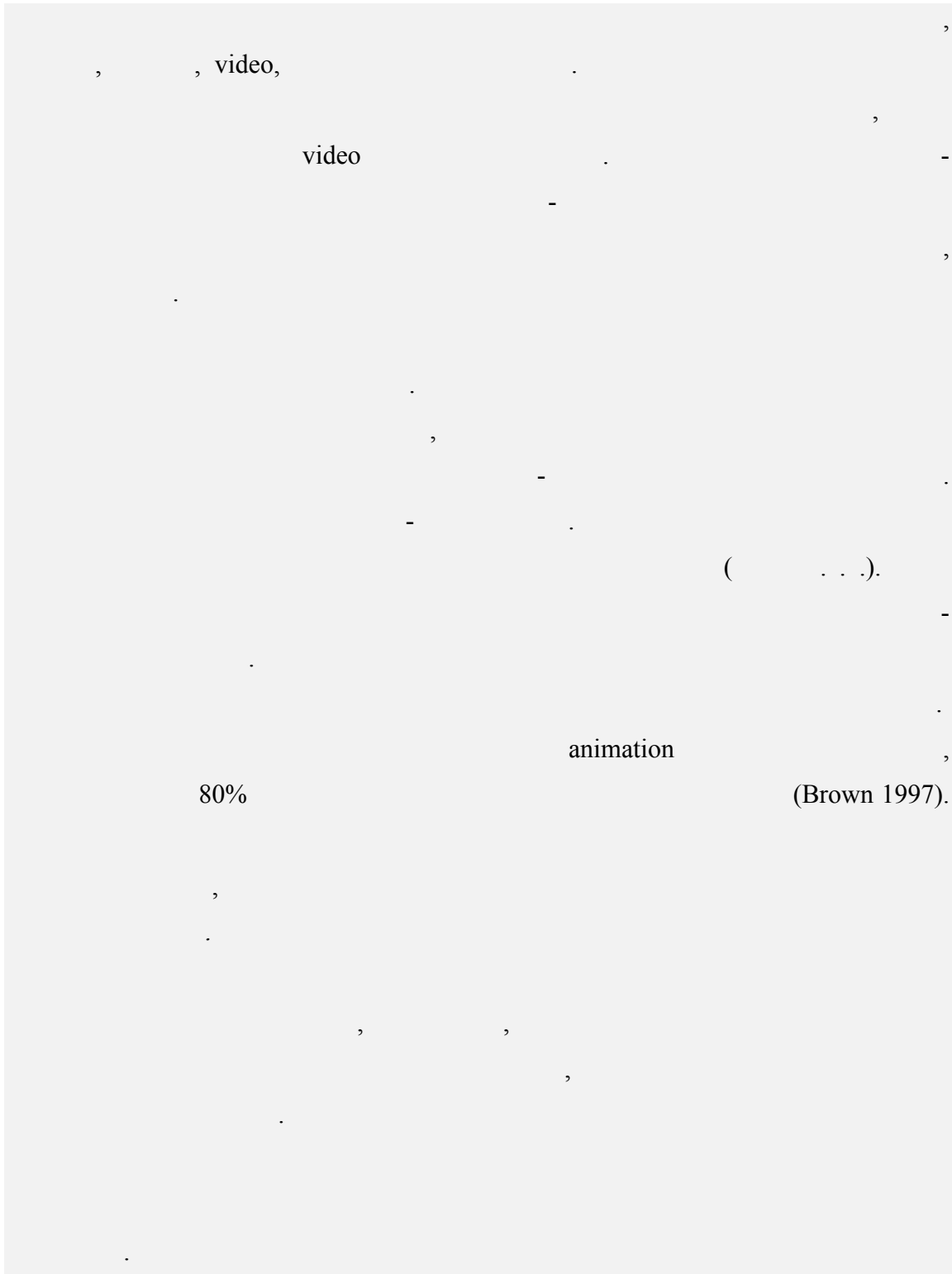
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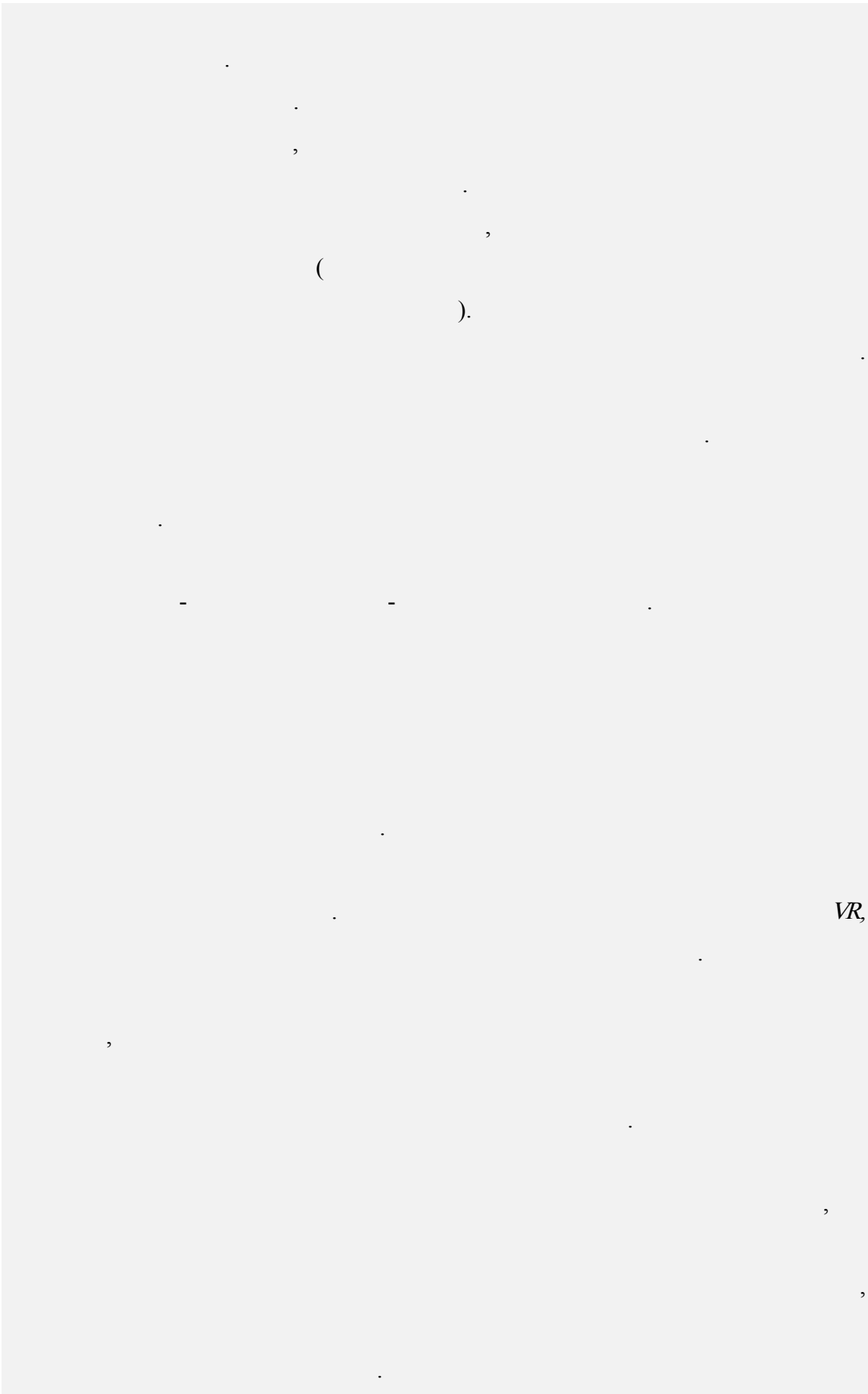


(Educational games)

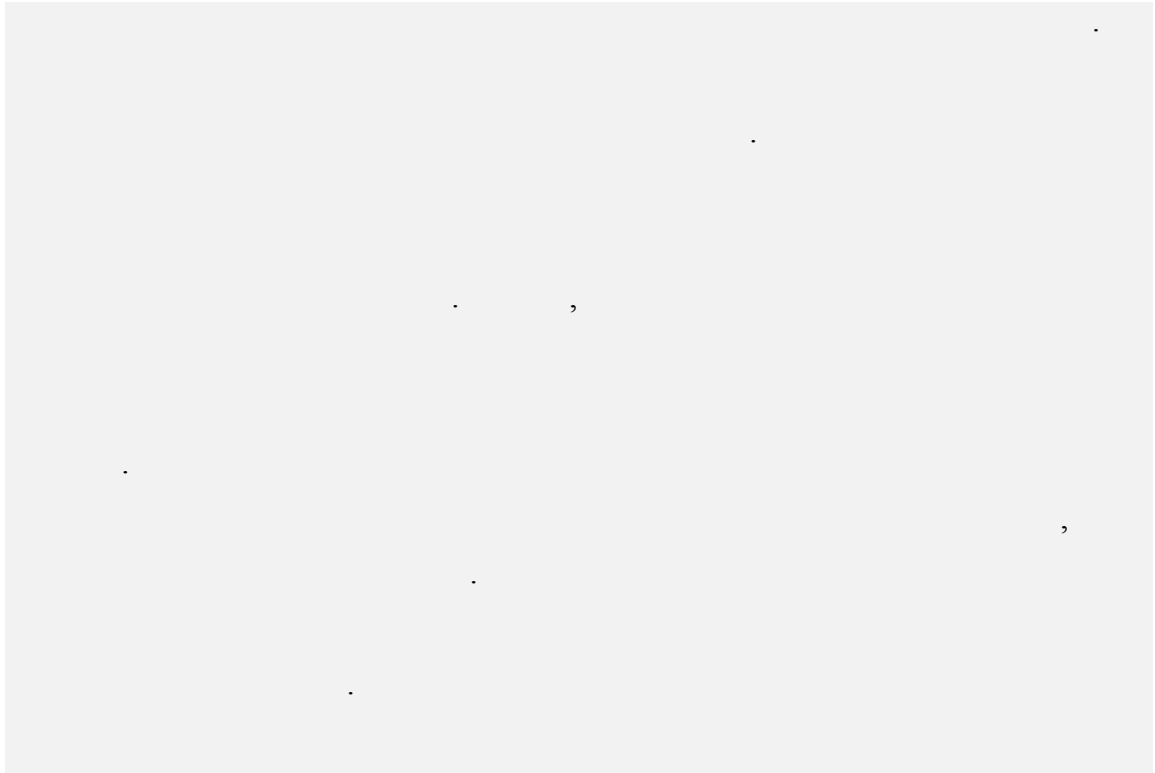
drill & practice

problem solving simulation

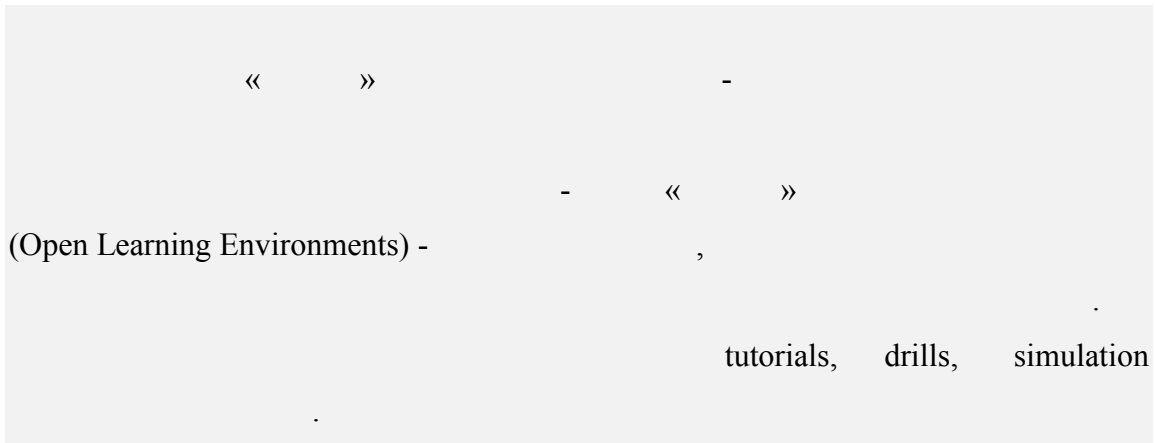




VR,



6.3



(Open Learning Environments) -

tutorials, drills, simulation

(, ,). ,
problem solving

6.4

- ⇒
- ⇒
- ⇒
- ⇒

(adaptive)

6.5

7.

4

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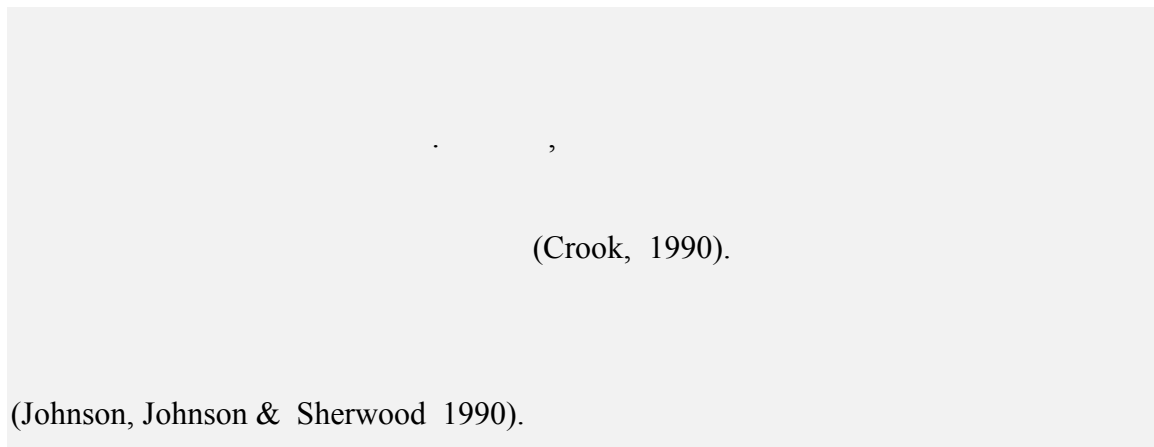
(, 1998a).

(Meskill & Mossop, 1997).

« »

Tall
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definition ().

concept image
concept



7.1
7.1.1

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 (1996)
 /
 (1991-1992)
 (9,3%), 3,6%
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 (- , 1992), 52%
 , 21% 28,85%
 «
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 « » (1992).

1994). / (1984,90,

(1993)

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« » « » « » .
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7.1.2

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CDGV (The Cognition and Technology Group
at Vanderbilt University)
« - » « ».
constructivist

7.2

7.2.1

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7.2.2

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7.3

7.3.1

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- ⇒
- ⇒
- ⇒
- ⇒
- ⇒
- ⇒ ROM video, CD-

7.3.2

(multimedia)

- ⇒
- ⇒
- ⇒
- ⇒
- ⇒ (picture indexes) (menu)
- ⇒
- ⇒

7.3.4

7.3.5

7.3.6

7.3.7

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7.3.8

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Micro Worlds Pro, The Geometer's Scetchpad, Modellus, Cabri
 Geometry II, Function Probe, Tabletop JR & Tabletop, Eyewitness Virtual Reality Earth
 Quest.

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 (2003) «
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 1989.
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 , 2, 39-72.
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9. :

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1. :

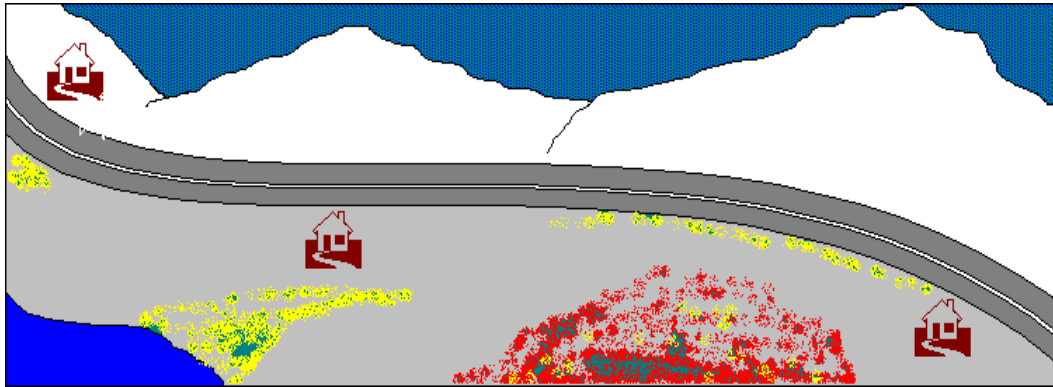
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□ :

$$f() = | | + | - | + | - |$$

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5km 3 Km. 2km,

4, 5, ... ,40,

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□ → 5-10 min ().

- ;
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 :
 4^0 , $2Km$
 ,
 ;

□ → 8 - 12 min.
 - ;
 □

·
 - 3^4 , $14, 44, \dots$,
 ;

- ,
 :

- 3 .
 ;

□ → 8 min.
 : () = $|x-2|$.
 - ;
 : () = $|x-5|$.
 - ;
 : () = $|x|$.
 -
 ;

□
 ·
 : $d = |x| + |x-2| + |x-5|$.
 - d
 ;

□ → 3 min
 : $d = |x| + |x-2| + |x-5| + |x-7|$.

- : ;
 - : ;

□

“Mathematica”

“The Geometer’s Sketchpad”

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 - ;
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: minimum 5 x=2.

- ; ()
 - 4 :

□

- ;
 - : minimum 10 2≤x≤5.

- ; ()

- ;

- ;

- |x|+|x-5|+|x-7|+|x-8|+|x-10|,

« » ;

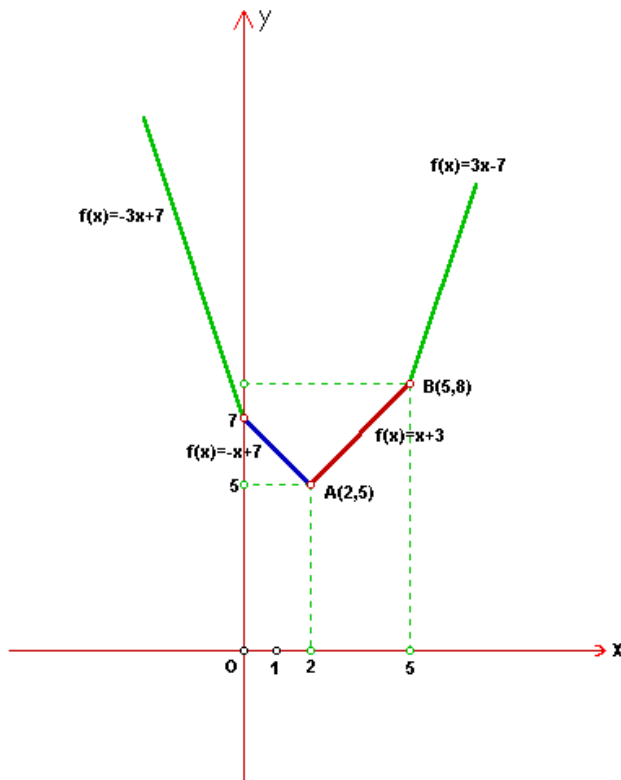
_____ ; 1,

2 4 , , ,

- ;

$$: d=1+|x-1|+2+|x-2|+4+|x-4| \Leftrightarrow d=7+|x-1|+|x-2|+|x-4|$$

$$: d=1+|x|+2+|x|+4+|x| \Leftrightarrow d=7+3\cdot|x|$$



The Geometer's Sketchpad - [Pkge.gsp]

Αρχείο Επεξεργασία Προβολή Κατασκευή Μετασχηματισμός Μέτρηση Γράφημα Εργασία Βοήθεια

Ελαχιστοποίηση

Γραφικά Απόκρυψη
Μετρήσις Απόκρυψη
Κίνηση

$f(x) = |x| + |x-2| + |x-5|$

MA + MB + MG = 6,80
 $x_M = 3,80$

A(0) B(2) Γ(5) M(x)

Έναρξη Εμ... Τα... Φ... Mic... Fin... Mu... Th... EN Δευ, 15 Οκτ 2001 23:54:06

The screenshot shows the Geometer's Sketchpad interface. The main workspace is a yellow grid with a coordinate system. A function $f(x) = |x| + |x-2| + |x-5|$ is plotted as a blue line segment on the x-axis, connecting points A(0), B(2), and Γ(5). A point M(x) is marked on the x-axis between B and Γ. A green box displays the result of a minimization process: MA + MB + MG = 6,80 and $x_M = 3,80$. The software's menu bar and toolbar are visible at the top, and the Windows taskbar is at the bottom.

□

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: (10)

(1)

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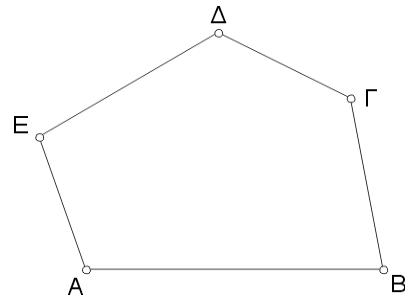
2.

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3.

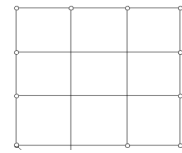
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1.



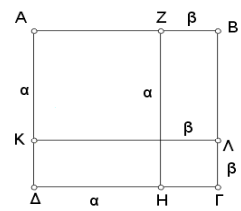
2.

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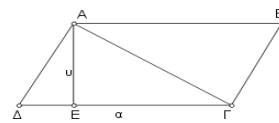
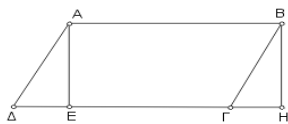


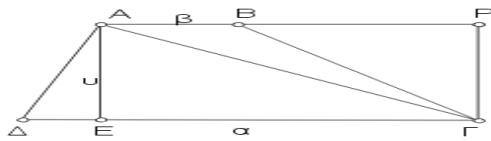
3.

$(+)^2$



4.





5.