

The intertwinement of activity and artifacts in Realistic Mathematics Education

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Agenda

- Overview of RME
 - Activity → Products
 - Activity is a private mental activity, and products are mental objects
- Overview of cultural psychology
- Two claims:
 - Mathematical products are *cultural artifacts*
 - Activity and artifacts are *intertwined*, and activity is done by *systems* of persons and artifacts

“Mathematics should be thought of
as the human activity of
mathematizing

- not as a discipline of structures to
be transmitted, discovered, or even
constructed, but as schematizing,
structuring, and modeling the world
mathematically.” (Hans Freudenthal)

Realistic mathematics education

- Domain-specific instructional theory for mathematics
- A work in progress

“What would mathematics education, which fulfills the initial points of departure, look like?” (Gravemeijer, 1999, p. 159)

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- Mathematics as an activity and product
- Six instructional principles
- Individual cognitive focus

Mathematics as activity...

[Mathematics] is an activity of solving problems, of looking for problems, but it is also an activity of organizing [...] according to mathematical patterns (Freudenthal, 1971, pp. 413-414)

Every producer of mathematics will readily admit that mathematics is an activity—his private activity
(Freudenthal, 1991, p. 14)

It is this mental activity rather than its subject matter that characterizes mathematics (Freudenthal, 1991, p. 1)

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...and product

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Mathematics as activity...

...and product

“Mathematics must be seen foremost as a process, a human activity. However, at the same time, this activity has to result in mathematics as a product.” (Gravemeijer & Terwell, 2000, p. 786)

“The final goal of teaching and learning is *mental objects* [...] Whole number, the number line (even if drawn on the blackboard), geometrical shapes (even if materialised): all are mental objects” (Freudenthal, 1991, p. 19)

Mathematics as activity...

...and product

Activity → Product

mathematical
activity is
private mental
activity

mathematical
products are
mental
objects

Six instructional principles

- Activity principle
- Guided reinvention principle
- Level principle
- Interaction principle
- Reality principle
- Intertwinement principle

Six instruct

- Activity principle
- Guided reinvention principle
- Level principle
- Interaction principle
- Reality principle
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- Mathematics is the human activity of *mathematizing*: “a form of organizing that also incorporate[s] mathematical matter” (Gravemeijer & Terwel, 2000, p. 781)
- Through activity, students should create their “own [mathematical] productions” (Treffers, 1987, p. 249)
- “mathematics can and should be learned on one’s own authority and through one’s own mental activities” (Gravemeijer, 2004, p. 109)

Six instructional

- Activity principle
- Guided reinvention principle
- Level principle
- Interaction principle
- Reality principle
- Intertwinement principle

- Teacher's role: map a learning route, "along which the students can find the intended mathematics for themselves... [and] students should be given the opportunity to build their own mathematical knowledge store on the basis of such a learning process" (Gravemeijer, 1999, p. 158).
- **reINVENTED**: Mathematical productions are products of human activity.
- **RE**invented: Mathematical productions preexist individual students. They are durable, existing across time and across people (Freudenthal, 1991)

Summary: RME

- Domain-specific instructional theory for mathematics
- Mathematics as an activity and product
- Six instructional principles
- Individualistic, cognitive focus

Culture

... process ...

“the collection through time of
partial solutions to frequently
encountered problems”

(Hutchins, 1995, p. 168)

Culture

“the collection through time of
partial solutions to frequently
encountered problems”

(Hutchins, 1995, p. 168)

[product]

Culture

“the collection through time of
partial solutions to frequently
encountered problems”

(Hutchins, 1995, p. 168)

[artifacts]

Artifacts

“[material & ideal] accomplishments of past human activities that serve as crucial resources for the current life of a social group” (Cole, 2010, p. 462)



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Wertsch, 1998

Artifacts

“[material & ideal] accomplishments of past human activities that serve as crucial resources for the current life of a social group” (Cole, 2010, p. 462)



Wertsch, 1998



$$\log(x)$$

Chilias 60.		Chilias 60.		Chilias 60.	
Num.	Logarithm	Diff.	Num.	Logarithm	Diff.
1000	3.000000		1000	3.000000	
1001	3.000434	0.000434	1001	3.000434	0.000434
1002	3.000868	0.000434	1002	3.000868	0.000434
1003	3.001302	0.000434	1003	3.001302	0.000434
1004	3.001736	0.000434	1004	3.001736	0.000434
1005	3.002170	0.000434	1005	3.002170	0.000434
1006	3.002604	0.000434	1006	3.002604	0.000434
1007	3.003038	0.000434	1007	3.003038	0.000434
1008	3.003472	0.000434	1008	3.003472	0.000434
1009	3.003906	0.000434	1009	3.003906	0.000434
1010	3.004340	0.000434	1010	3.004340	0.000434
1011	3.004774	0.000434	1011	3.004774	0.000434
1012	3.005208	0.000434	1012	3.005208	0.000434
1013	3.005642	0.000434	1013	3.005642	0.000434
1014	3.006076	0.000434	1014	3.006076	0.000434
1015	3.006510	0.000434	1015	3.006510	0.000434
1016	3.006944	0.000434	1016	3.006944	0.000434
1017	3.007378	0.000434	1017	3.007378	0.000434
1018	3.007812	0.000434	1018	3.007812	0.000434
1019	3.008246	0.000434	1019	3.008246	0.000434
1020	3.008680	0.000434	1020	3.008680	0.000434
1021	3.009114	0.000434	1021	3.009114	0.000434
1022	3.009548	0.000434	1022	3.009548	0.000434
1023	3.010000	0.000434	1023	3.010000	0.000434
1024	3.010434	0.000434	1024	3.010434	0.000434
1025	3.010868	0.000434	1025	3.010868	0.000434
1026	3.011302	0.000434	1026	3.011302	0.000434
1027	3.011736	0.000434	1027	3.011736	0.000434
1028	3.012170	0.000434	1028	3.012170	0.000434
1029	3.012604	0.000434	1029	3.012604	0.000434
1030	3.013038	0.000434	1030	3.013038	0.000434
1031	3.013472	0.000434	1031	3.013472	0.000434
1032	3.013906	0.000434	1032	3.013906	0.000434
1033	3.014340	0.000434	1033	3.014340	0.000434
1034	3.014774	0.000434	1034	3.014774	0.000434
1035	3.015208	0.000434	1035	3.015208	0.000434
1036	3.015642	0.000434	1036	3.015642	0.000434
1037	3.016076	0.000434	1037	3.016076	0.000434
1038	3.016510	0.000434	1038	3.016510	0.000434
1039	3.016944	0.000434	1039	3.016944	0.000434
1040	3.017378	0.000434	1040	3.017378	0.000434
1041	3.017812	0.000434	1041	3.017812	0.000434
1042	3.018246	0.000434	1042	3.018246	0.000434
1043	3.018680	0.000434	1043	3.018680	0.000434
1044	3.019114	0.000434	1044	3.019114	0.000434
1045	3.019548	0.000434	1045	3.019548	0.000434
1046	3.020000	0.000434	1046	3.020000	0.000434
1047	3.020434	0.000434	1047	3.020434	0.000434
1048	3.020868	0.000434	1048	3.020868	0.000434
1049	3.021302	0.000434	1049	3.021302	0.000434
1050	3.021736	0.000434	1050	3.021736	0.000434
1051	3.022170	0.000434	1051	3.022170	0.000434
1052	3.022604	0.000434	1052	3.022604	0.000434
1053	3.023038	0.000434	1053	3.023038	0.000434
1054	3.023472	0.000434	1054	3.023472	0.000434
1055	3.023906	0.000434	1055	3.023906	0.000434
1056	3.024340	0.000434	1056	3.024340	0.000434
1057	3.024774	0.000434	1057	3.024774	0.000434
1058	3.025208	0.000434	1058	3.025208	0.000434
1059	3.025642	0.000434	1059	3.025642	0.000434
1060	3.026076	0.000434	1060	3.026076	0.000434
1061	3.026510	0.000434	1061	3.026510	0.000434
1062	3.026944	0.000434	1062	3.026944	0.000434
1063	3.027378	0.000434	1063	3.027378	0.000434
1064	3.027812	0.000434	1064	3.027812	0.000434
1065	3.028246	0.000434	1065	3.028246	0.000434
1066	3.028680	0.000434	1066	3.028680	0.000434
1067	3.029114	0.000434	1067	3.029114	0.000434
1068	3.029548	0.000434	1068	3.029548	0.000434
1069	3.030000	0.000434	1069	3.030000	0.000434
1070	3.030434	0.000434	1070	3.030434	0.000434
1071	3.030868	0.000434	1071	3.030868	0.000434
1072	3.031302	0.000434	1072	3.031302	0.000434
1073	3.031736	0.000434	1073	3.031736	0.000434
1074	3.032170	0.000434	1074	3.032170	0.000434
1075	3.032604	0.000434	1075	3.032604	0.000434
1076	3.033038	0.000434	1076	3.033038	0.000434
1077	3.033472	0.000434	1077	3.033472	0.000434
1078	3.033906	0.000434	1078	3.033906	0.000434
1079	3.034340	0.000434	1079	3.034340	0.000434
1080	3.034774	0.000434	1080	3.034774	0.000434
1081	3.035208	0.000434	1081	3.035208	0.000434
1082	3.035642	0.000434	1082	3.035642	0.000434
1083	3.036076	0.000434	1083	3.036076	0.000434
1084	3.036510	0.000434	1084	3.036510	0.000434
1085	3.036944	0.000434	1085	3.036944	0.000434
1086	3.037378	0.000434	1086	3.037378	0.000434
1087	3.037812	0.000434	1087	3.037812	0.000434
1088	3.038246	0.000434	1088	3.038246	0.000434
1089	3.038680	0.000434	1089	3.038680	0.000434
1090	3.039114	0.000434	1090	3.039114	0.000434
1091	3.039548	0.000434	1091	3.039548	0.000434
1092	3.040000	0.000434	1092	3.040000	0.000434
1093	3.040434	0.000434	1093	3.040434	0.000434
1094	3.040868	0.000434	1094	3.040868	0.000434
1095	3.041302	0.000434	1095	3.041302	0.000434
1096	3.041736	0.000434	1096	3.041736	0.000434
1097	3.042170	0.000434	1097	3.042170	0.000434
1098	3.042604	0.000434	1098	3.042604	0.000434
1099	3.043038	0.000434	1099	3.043038	0.000434
1100	3.043472	0.000434	1100	3.043472	0.000434



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Chilias 60.		Chilias 60.		Chilias 60.	
Num.	Logarithm	Differ.	Num.	Logarithm	Differ.
1000	3.0000000		1000	3.0000000	
1001	3.0004343	0.0004343	1001	3.0004343	0.0004343
1002	3.0008686	0.0004343	1002	3.0008686	0.0004343
1003	3.0013029	0.0004343	1003	3.0013029	0.0004343
1004	3.0017372	0.0004343	1004	3.0017372	0.0004343
1005	3.0021715	0.0004343	1005	3.0021715	0.0004343
1006	3.0026058	0.0004343	1006	3.0026058	0.0004343
1007	3.0030401	0.0004343	1007	3.0030401	0.0004343
1008	3.0034744	0.0004343	1008	3.0034744	0.0004343
1009	3.0039087	0.0004343	1009	3.0039087	0.0004343
1010	3.0043430	0.0004343	1010	3.0043430	0.0004343
1011	3.0047773	0.0004343	1011	3.0047773	0.0004343
1012	3.0052116	0.0004343	1012	3.0052116	0.0004343
1013	3.0056459	0.0004343	1013	3.0056459	0.0004343
1014	3.0060802	0.0004343	1014	3.0060802	0.0004343
1015	3.0065145	0.0004343	1015	3.0065145	0.0004343
1016	3.0069488	0.0004343	1016	3.0069488	0.0004343
1017	3.0073831	0.0004343	1017	3.0073831	0.0004343
1018	3.0078174	0.0004343	1018	3.0078174	0.0004343
1019	3.0082517	0.0004343	1019	3.0082517	0.0004343
1020	3.0086860	0.0004343	1020	3.0086860	0.0004343
1021	3.0091203	0.0004343	1021	3.0091203	0.0004343
1022	3.0095546	0.0004343	1022	3.0095546	0.0004343
1023	3.0100000	0.0004343	1023	3.0100000	0.0004343
1024	3.0104343	0.0004343	1024	3.0104343	0.0004343
1025	3.0108686	0.0004343	1025	3.0108686	0.0004343
1026	3.0113029	0.0004343	1026	3.0113029	0.0004343
1027	3.0117372	0.0004343	1027	3.0117372	0.0004343
1028	3.0121715	0.0004343	1028	3.0121715	0.0004343
1029	3.0126058	0.0004343	1029	3.0126058	0.0004343
1030	3.0130401	0.0004343	1030	3.0130401	0.0004343
1031	3.0134744	0.0004343	1031	3.0134744	0.0004343
1032	3.0139087	0.0004343	1032	3.0139087	0.0004343
1033	3.0143430	0.0004343	1033	3.0143430	0.0004343
1034	3.0147773	0.0004343	1034	3.0147773	0.0004343
1035	3.0152116	0.0004343	1035	3.0152116	0.0004343
1036	3.0156459	0.0004343	1036	3.0156459	0.0004343
1037	3.0160802	0.0004343	1037	3.0160802	0.0004343
1038	3.0165145	0.0004343	1038	3.0165145	0.0004343
1039	3.0169488	0.0004343	1039	3.0169488	0.0004343
1040	3.0173831	0.0004343	1040	3.0173831	0.0004343
1041	3.0178174	0.0004343	1041	3.0178174	0.0004343
1042	3.0182517	0.0004343	1042	3.0182517	0.0004343
1043	3.0186860	0.0004343	1043	3.0186860	0.0004343
1044	3.0191203	0.0004343	1044	3.0191203	0.0004343
1045	3.0195546	0.0004343	1045	3.0195546	0.0004343
1046	3.0200000	0.0004343	1046	3.0200000	0.0004343
1047	3.0204343	0.0004343	1047	3.0204343	0.0004343
1048	3.0208686	0.0004343	1048	3.0208686	0.0004343
1049	3.0213029	0.0004343	1049	3.0213029	0.0004343
1050	3.0217372	0.0004343	1050	3.0217372	0.0004343
1051	3.0221715	0.0004343	1051	3.0221715	0.0004343
1052	3.0226058	0.0004343	1052	3.0226058	0.0004343
1053	3.0230401	0.0004343	1053	3.0230401	0.0004343
1054	3.0234744	0.0004343	1054	3.0234744	0.0004343
1055	3.0239087	0.0004343	1055	3.0239087	0.0004343
1056	3.0243430	0.0004343	1056	3.0243430	0.0004343
1057	3.0247773	0.0004343	1057	3.0247773	0.0004343
1058	3.0252116	0.0004343	1058	3.0252116	0.0004343
1059	3.0256459	0.0004343	1059	3.0256459	0.0004343
1060	3.0260802	0.0004343	1060	3.0260802	0.0004343
1061	3.0265145	0.0004343	1061	3.0265145	0.0004343
1062	3.0269488	0.0004343	1062	3.0269488	0.0004343
1063	3.0273831	0.0004343	1063	3.0273831	0.0004343
1064	3.0278174	0.0004343	1064	3.0278174	0.0004343
1065	3.0282517	0.0004343	1065	3.0282517	0.0004343
1066	3.0286860	0.0004343	1066	3.0286860	0.0004343
1067	3.0291203	0.0004343	1067	3.0291203	0.0004343
1068	3.0295546	0.0004343	1068	3.0295546	0.0004343
1069	3.0300000	0.0004343	1069	3.0300000	0.0004343
1070	3.0304343	0.0004343	1070	3.0304343	0.0004343
1071	3.0308686	0.0004343	1071	3.0308686	0.0004343
1072	3.0313029	0.0004343	1072	3.0313029	0.0004343
1073	3.0317372	0.0004343	1073	3.0317372	0.0004343
1074	3.0321715	0.0004343	1074	3.0321715	0.0004343
1075	3.0326058	0.0004343	1075	3.0326058	0.0004343
1076	3.0330401	0.0004343	1076	3.0330401	0.0004343
1077	3.0334744	0.0004343	1077	3.0334744	0.0004343
1078	3.0339087	0.0004343	1078	3.0339087	0.0004343
1079	3.0343430	0.0004343	1079	3.0343430	0.0004343
1080	3.0347773	0.0004343	1080	3.0347773	0.0004343
1081	3.0352116	0.0004343	1081	3.0352116	0.0004343
1082	3.0356459	0.0004343	1082	3.0356459	0.0004343
1083	3.0360802	0.0004343	1083	3.0360802	0.0004343
1084	3.0365145	0.0004343	1084	3.0365145	0.0004343
1085	3.0369488	0.0004343	1085	3.0369488	0.0004343
1086	3.0373831	0.0004343	1086	3.0373831	0.0004343
1087	3.0378174	0.0004343	1087	3.0378174	0.0004343
1088	3.0382517	0.0004343	1088	3.0382517	0.0004343
1089	3.0386860	0.0004343	1089	3.0386860	0.0004343
1090	3.0391203	0.0004343	1090	3.0391203	0.0004343
1091	3.0395546	0.0004343	1091	3.0395546	0.0004343
1092	3.0400000	0.0004343	1092	3.0400000	0.0004343
1093	3.0404343	0.0004343	1093	3.0404343	0.0004343
1094	3.0408686	0.0004343	1094	3.0408686	0.0004343
1095	3.0413029	0.0004343	1095	3.0413029	0.0004343
1096	3.0417372	0.0004343	1096	3.0417372	0.0004343
1097	3.0421715	0.0004343	1097	3.0421715	0.0004343
1098	3.0426058	0.0004343	1098	3.0426058	0.0004343
1099	3.0430401	0.0004343	1099	3.0430401	0.0004343
1100	3.0434744	0.0004343	1100	3.0434744	0.0004343

~~store or transmit~~

~~passive~~

~~external~~

transform

active

in the middle



$$\log(x)$$

Chilias	Chilias	Chilias
1	1000	1000
2	2000	2000
3	3000	3000
4	4000	4000
5	5000	5000
6	6000	6000
7	7000	7000
8	8000	8000
9	9000	9000
10	10000	10000
11	11000	11000
12	12000	12000
13	13000	13000
14	14000	14000
15	15000	15000
16	16000	16000
17	17000	17000
18	18000	18000
19	19000	19000
20	20000	20000
21	21000	21000
22	22000	22000
23	23000	23000
24	24000	24000
25	25000	25000
26	26000	26000
27	27000	27000
28	28000	28000
29	29000	29000
30	30000	30000
31	31000	31000
32	32000	32000
33	33000	33000
34	34000	34000
35	35000	35000
36	36000	36000
37	37000	37000
38	38000	38000
39	39000	39000
40	40000	40000
41	41000	41000
42	42000	42000
43	43000	43000
44	44000	44000
45	45000	45000
46	46000	46000
47	47000	47000
48	48000	48000
49	49000	49000
50	50000	50000
51	51000	51000
52	52000	52000
53	53000	53000
54	54000	54000
55	55000	55000
56	56000	56000
57	57000	57000
58	58000	58000
59	59000	59000
60	60000	60000
61	61000	61000
62	62000	62000
63	63000	63000
64	64000	64000
65	65000	65000
66	66000	66000
67	67000	67000
68	68000	68000
69	69000	69000
70	70000	70000
71	71000	71000
72	72000	72000
73	73000	73000
74	74000	74000
75	75000	75000
76	76000	76000
77	77000	77000
78	78000	78000
79	79000	79000
80	80000	80000
81	81000	81000
82	82000	82000
83	83000	83000
84	84000	84000
85	85000	85000
86	86000	86000
87	87000	87000
88	88000	88000
89	89000	89000
90	90000	90000
91	91000	91000
92	92000	92000
93	93000	93000
94	94000	94000
95	95000	95000
96	96000	96000
97	97000	97000
98	98000	98000
99	99000	99000
100	100000	100000

transform
active
in the middle

Higher mental functions are, by definition, **culturally mediated**. They involve not a direct action on the world, but an indirect action, one that takes a bit of material matter used previously and incorporates it as an aspect of action. (Cole & Wertsch, 1996, pp. 252-253)

Artifacts *mediate* activity



Chilias 60	Chilias 60	Chilias 60
1	2	3
4	5	6
7	8	9
10	11	12
13	14	15
16	17	18
19	20	21
22	23	24
25	26	27
28	29	30
31	32	33
34	35	36
37	38	39
40	41	42
43	44	45
46	47	48
49	50	51
52	53	54
55	56	57
58	59	60

$\log(x)$

transform

active

in the middle

the implication [is] that mind is no longer to be located entirely inside the head. Higher psychological functions are transactions that include the biological individual, the cultural mediational artifacts, and the culturally structured social and natural environments of which persons are a part.

(Cole & Wertsch, 1996, pp. 252-253)

Artifacts *mediate* activity

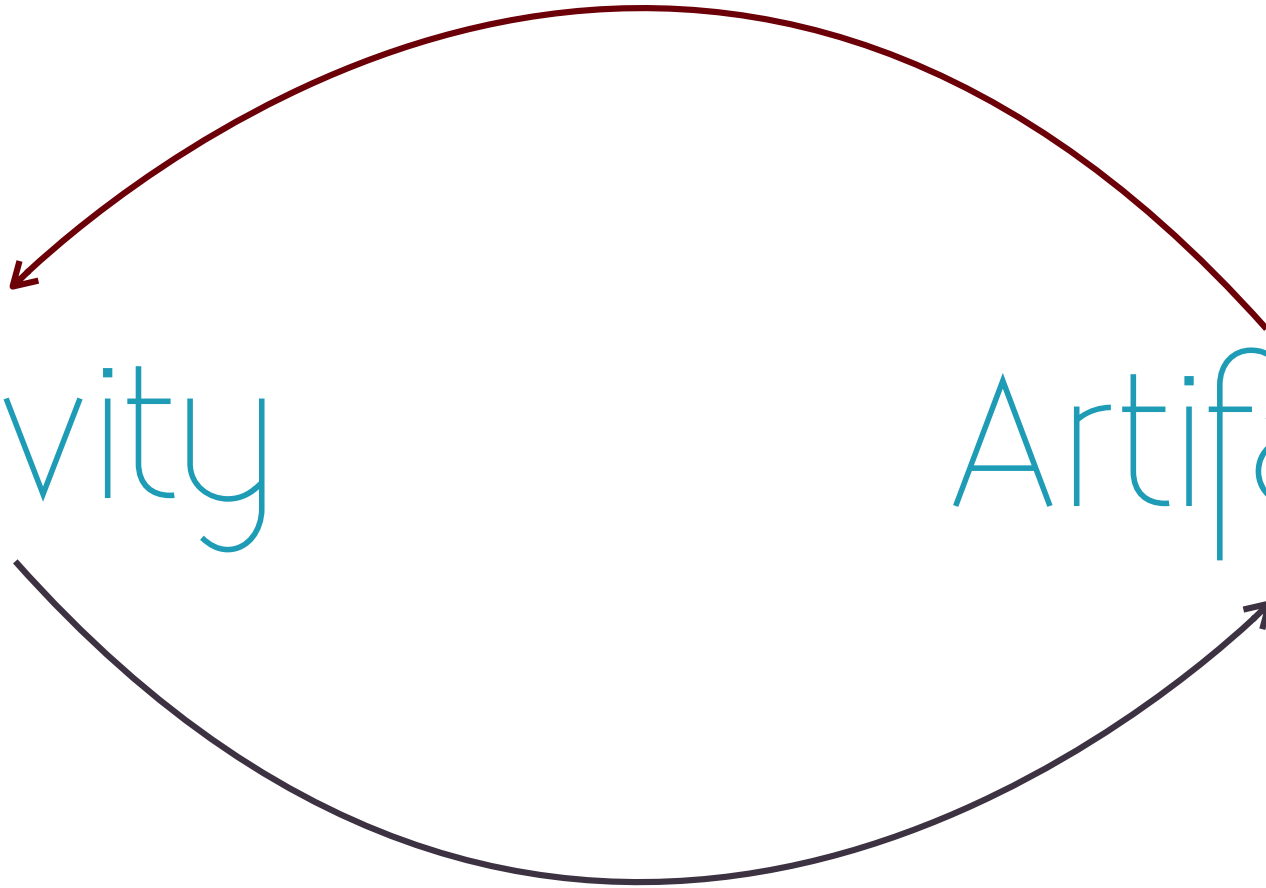
⇒ activity is an accomplishment of a *system*

artifacts mediate and
transform current activity

Activity

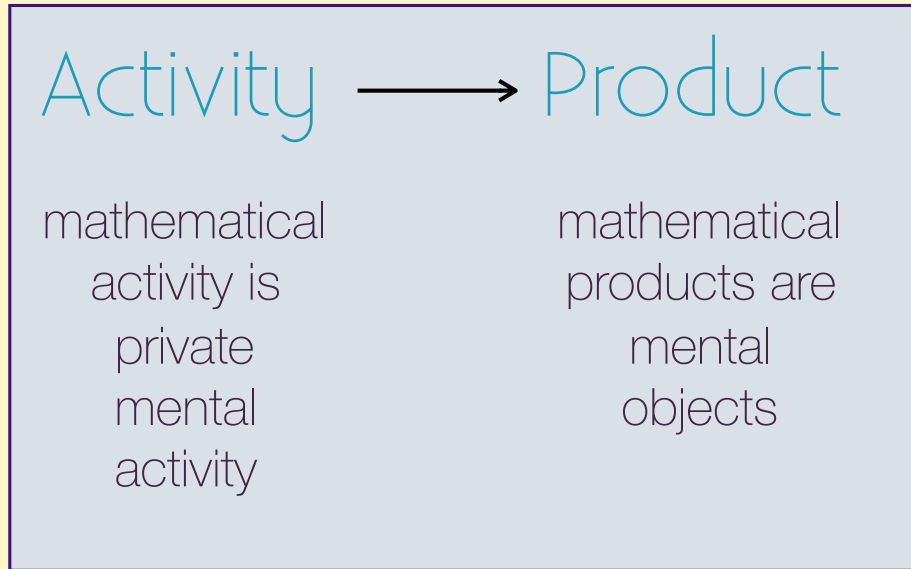
Artifacts

artifacts are the residue of
historic activity

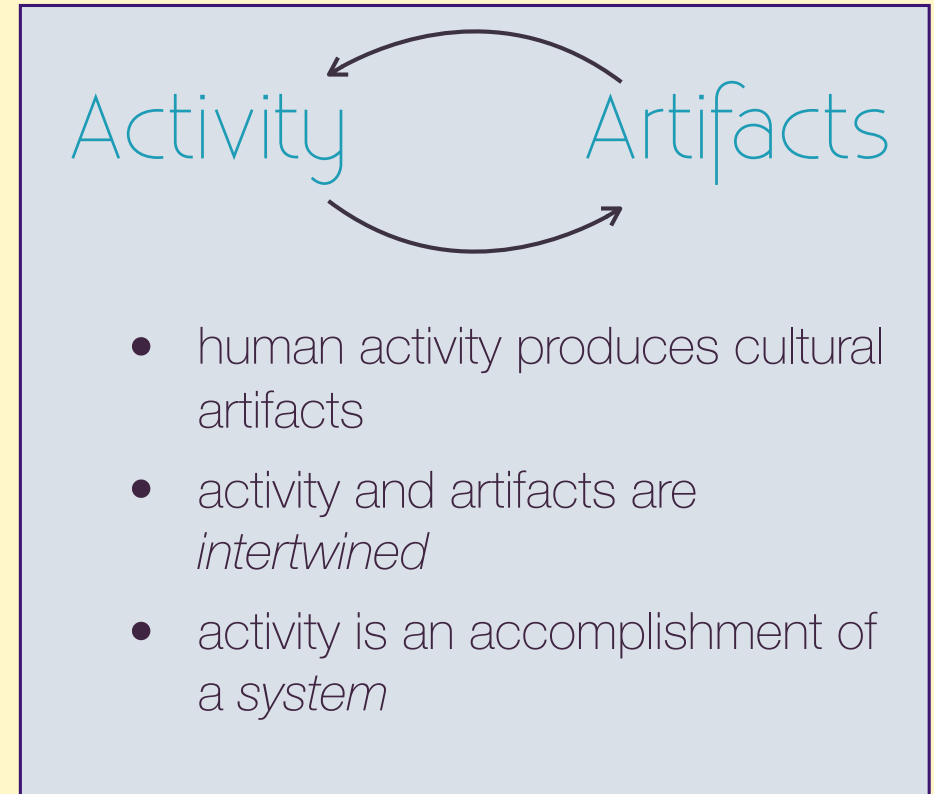


So far:

RME:



Cultural psychology



Claim 1: mathematical productions are cultural artifacts

“[material & ideal] accomplishments of past human activities that serve as crucial resources for the current life of a social group” (Cole, 2010, p. 462)

In RME...

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Guided reinvention principle

- Mathematical productions are products of human activity
- Mathematical productions are durable, existing across time and across people

(Freudenthal, 1991)

Activity principle

- Mathematics is the human activity of *mathematizing*: “a form of organizing that also incorporate[s] mathematical matter”

(Gravemeijer & Terwel, 2000, p. 781)

Claim 1: mathematical productions are cultural artifacts

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Empirically, in a design
experiment related to slope...

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In activity, students reinvented the ratio table and a “find one” strategy (Peck & Matassa, 2016)

There are 7 markers in 1 package
There are 21 markers in 3 packages
There are 42 markers in 6 packages
There are 14 markers in 2 packages

Problem set 4

Name: _____

4 cans will feed 9 people

1 can will feed $\frac{9}{4}$ people

$2.25 = 2\frac{1}{4}$

What do I want to find one of?

IS STRATEGY

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1. After a race, five people shared two gallons of water equally. How much water did each person receive?
Show your work or explain your reasoning:

Handwritten work shows: 5 people, 2 gallons, $\frac{2}{5}$ gallons per person. A diagram shows two water bottles with arrows indicating sharing.

State your final answer using units: $\frac{2}{5}$ gallons per person.

There are 7 markers in 1 package
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 $\times 2$ ()
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 $\div 3$ ()
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Problem set 4

Handwritten work shows: 4 cans will feed 9 people, $\div 4$, $\frac{9}{4} = 2\frac{1}{4}$. A diagram shows a can of Campbell's Tomato Soup.

J's STRATEGY
What do I want to find one of?

Ms. Magro runs 6 miles every day. On average, she can run six miles in 54 minutes. At this rate, how long would it take Ms. Magro to run an 11-mile race?

Handwritten work shows: 6 mile > 54 min, 1 mile 9 min, $9 \times 11 = 99$. Takes 99 minutes.

Handwritten work shows: $\frac{517}{7} = 1$ window, $\frac{517}{7} = 5$ windows, $\frac{517}{7} = 1$ window, $\frac{517}{7} = 5$ windows.

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State your final answer using units: $\frac{2}{5}$ gallons per person.

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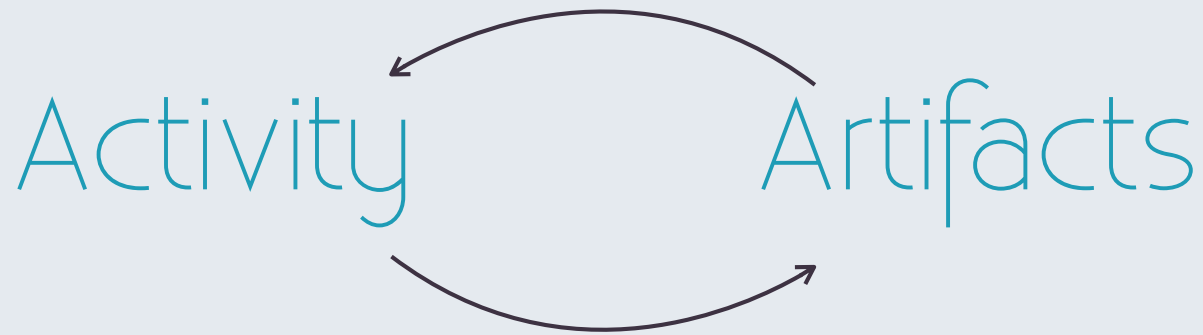
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Claim 2: mathematical activity and artifacts are intertwined



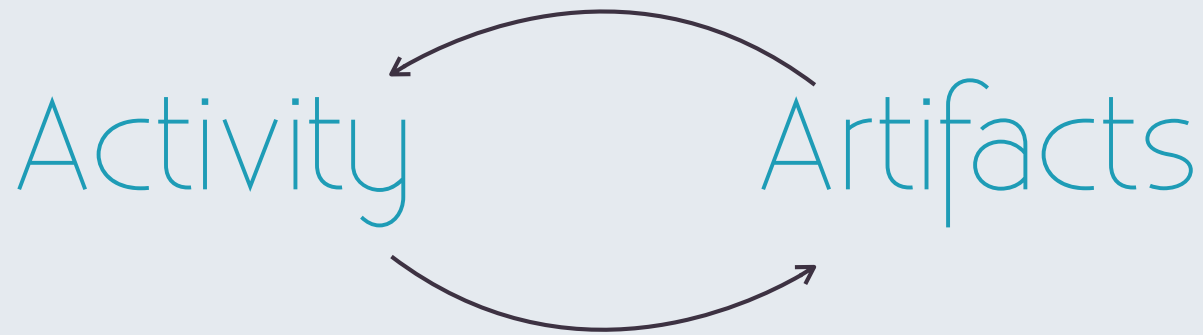
Definition of mediation:

Higher mental functions are, by definition, culturally mediated. They involve not a direct action on the world, but an indirect action, one that takes a bit of material matter used previously and incorporates it as an aspect of action.

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In RME...

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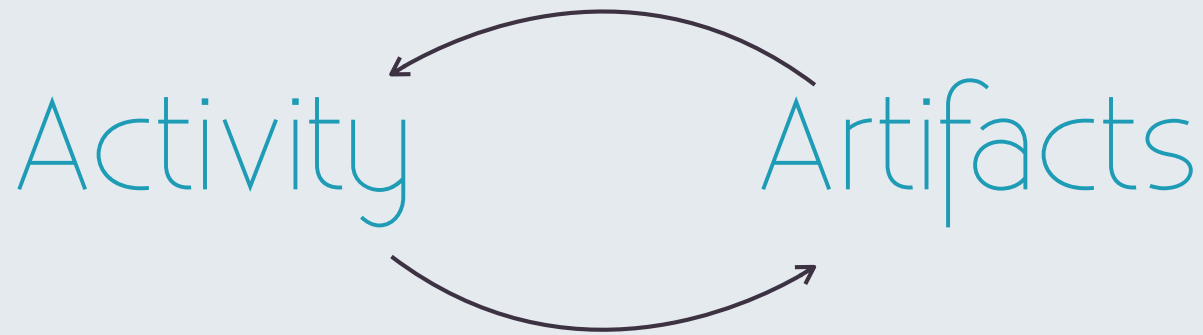
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Activity principle in RME:

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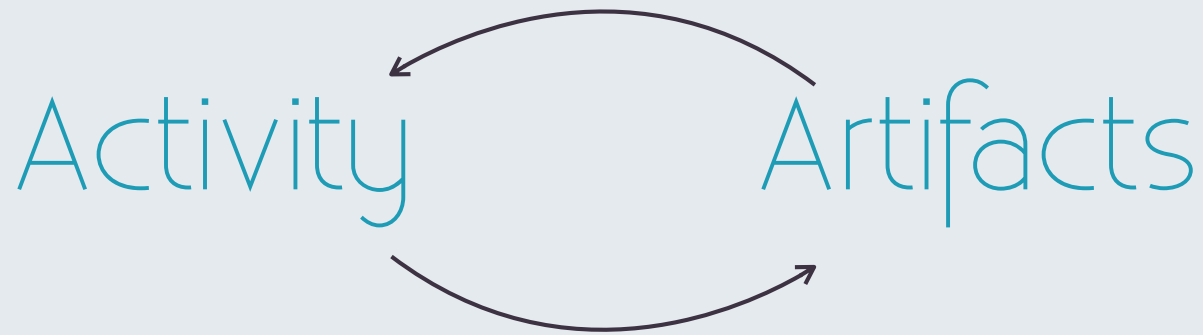
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(Gravemeijer & Terwel, 2000, p. 781)

⇒ **mathematizing is a *mediated* activity.**

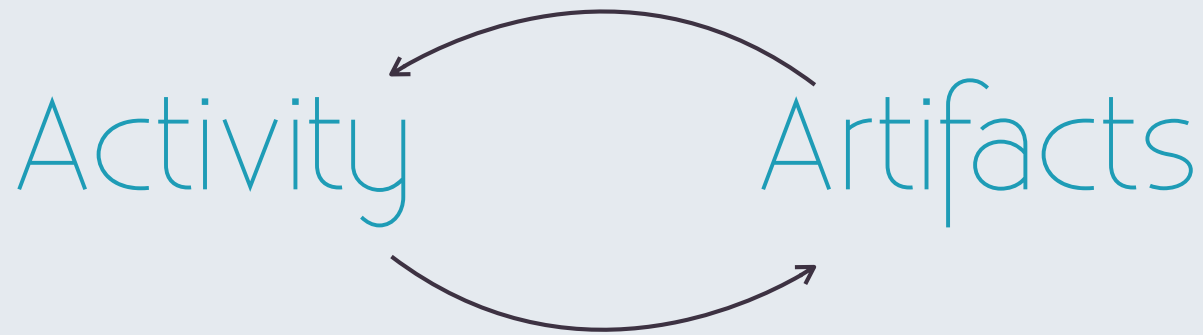
⇒ **mathematical activity and artifacts are *intertwined***

Claim 2: **mathematical activity and artifacts are intertwined**



Empirically, in a design
experiment related to
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Claim 2: mathematical activity and artifacts are intertwined



Leslie is a window installer. On Friday, she installed two windows, and charged 402 dollars. Last week, on another job, she charged 517 dollars to install seven windows.



A new customer has asked Leslie to install five windows. How much will this cost?

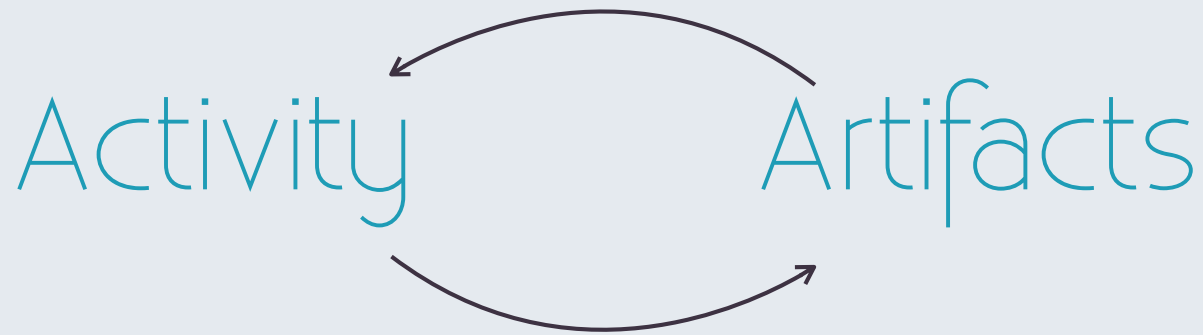
14. M: do tw- divided by two divided by two to
find the one, the price of one window?

29. S: it's five hundred and seventeen over seven
and then=

39. S: =equals on:e (.) window. And **then also**
four oh two (...) over two equals one
window

119. D: Okay, 'cause if you were trying to **find**
one window, and you were dividing two
in half, that wouldn't really work

Claim 2: mathematical activity and artifacts are intertwined



134. S: We were right. Cause **four over two::o is equal to one window.**

find the one, the price of one window?

188. T: Wouldn't you do this to find the se- the, **how much one window** [costs=

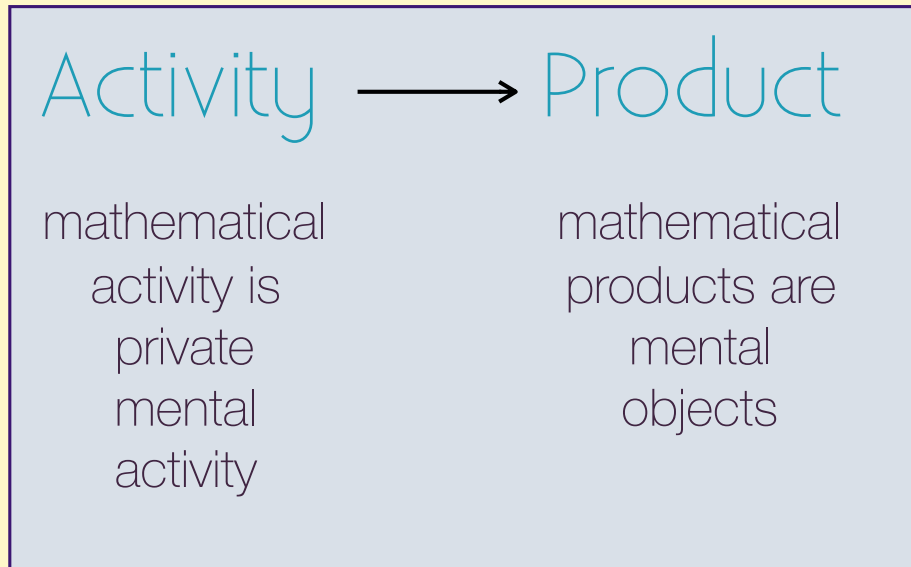
190: T: =wouldn't you do that divided by seven and that divided by seven

210. S: we- **we're trying to find out how much one is,** so we solved how much one would be each (.) or using each

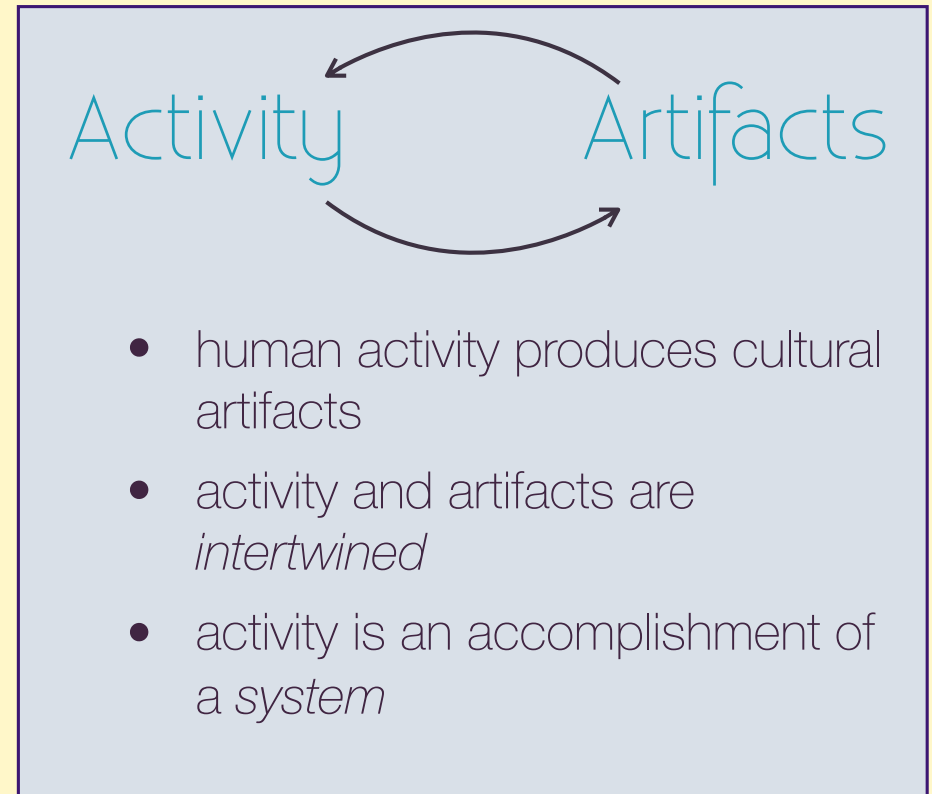
255. D: Four hundred and two plus a hundred and fifteen is five hundred seventeen. So that's the price between the two, so if we divide that by::, [that's what I'm trying to figure out **you'll get the price of one**

Conclusion

RME:

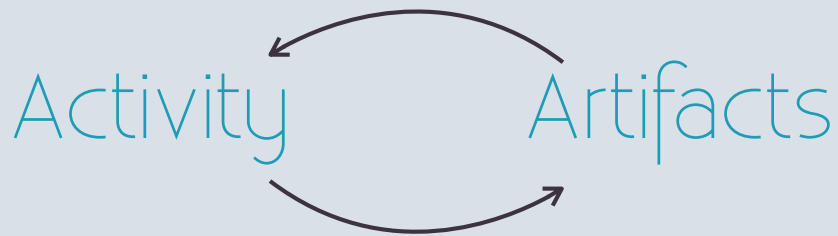


Cultural psychology



Conclusion

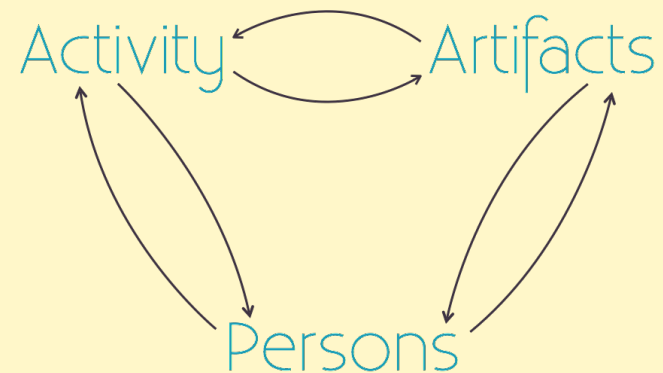
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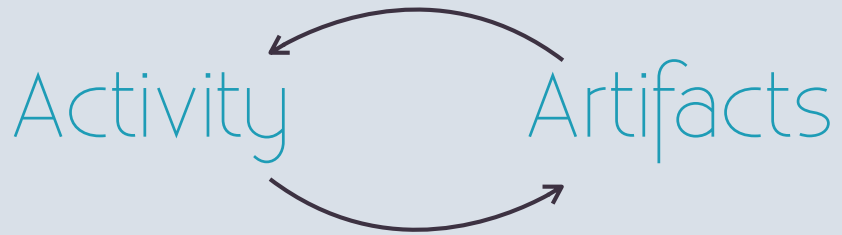
- human activity produces cultural artifacts
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- activity is an accomplishment of a *system*

Implications for the activity principle, interaction principle, and reality principle

New principle: Mathematics as a producer of persons



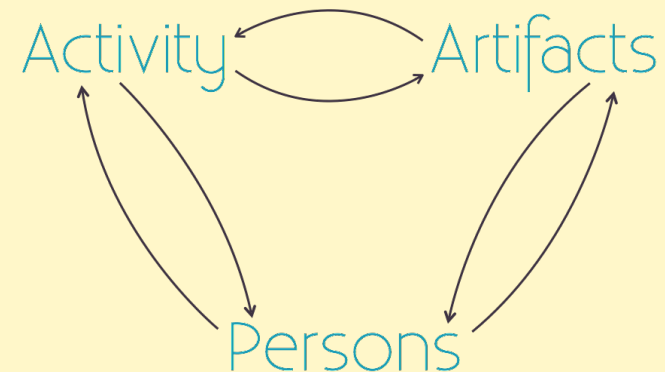
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www.RMEInTheClassroom.com