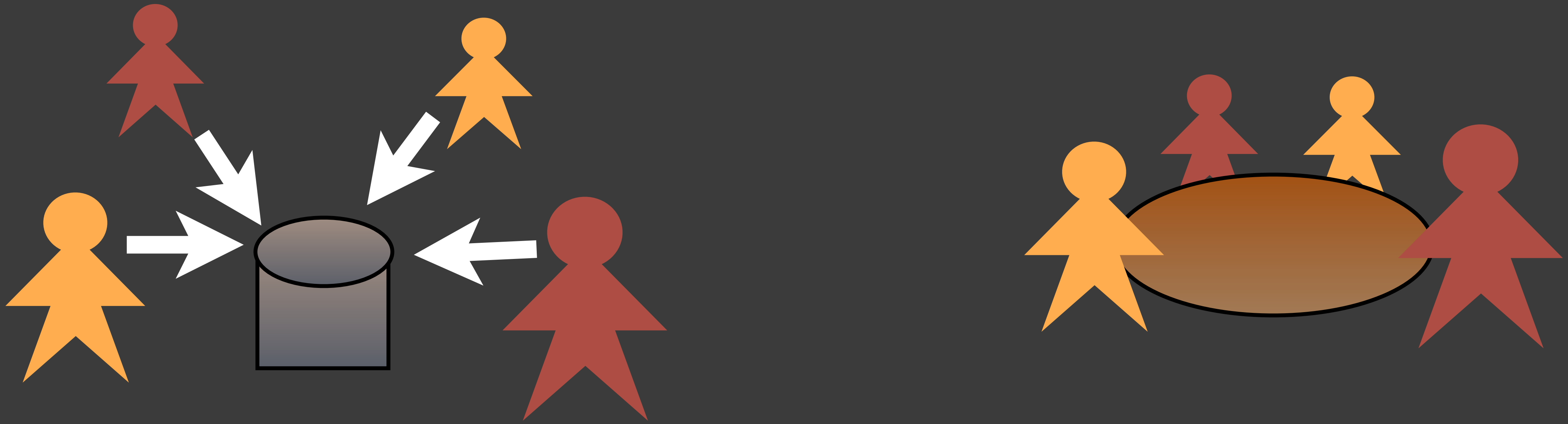
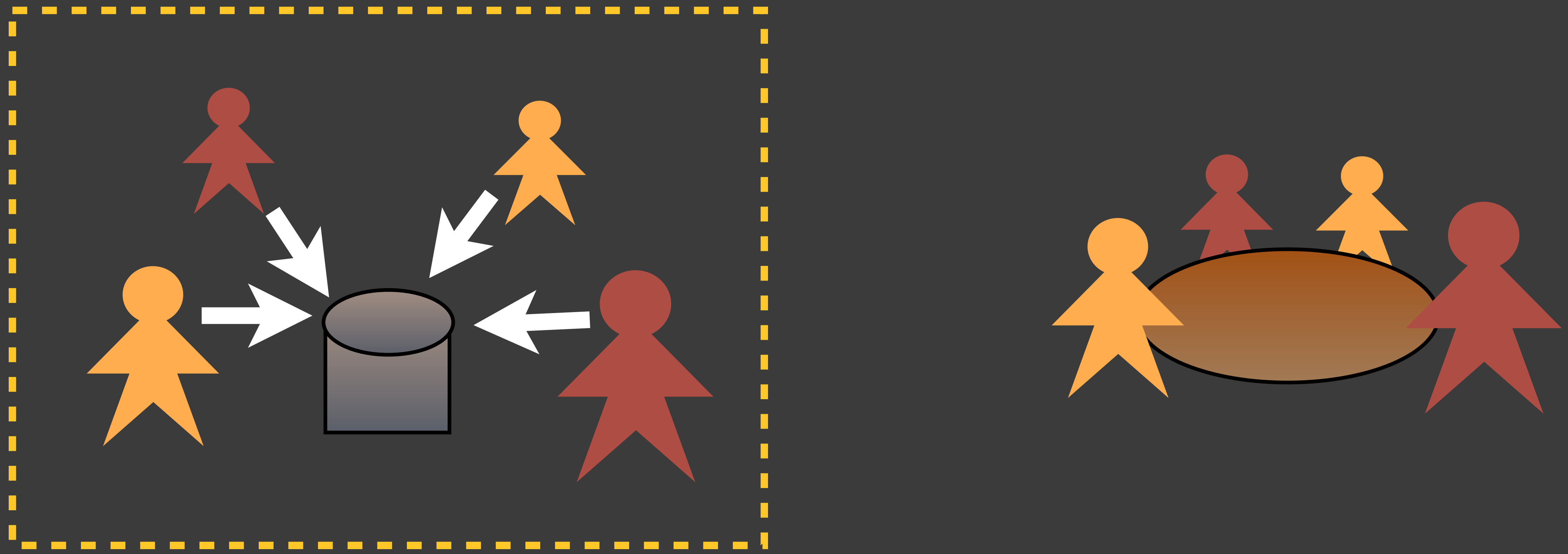
# PROTOTYPING DYNAMICS: Sharing Multiple Designs Improves Exploration, Group Rapport, and Results

**Steven P Dow, Julie Fortuna,
Dan Schwartz, Beth Altringer,
Daniel L Schwartz, & Scott R Klemmer**

# Individual vs Collective?

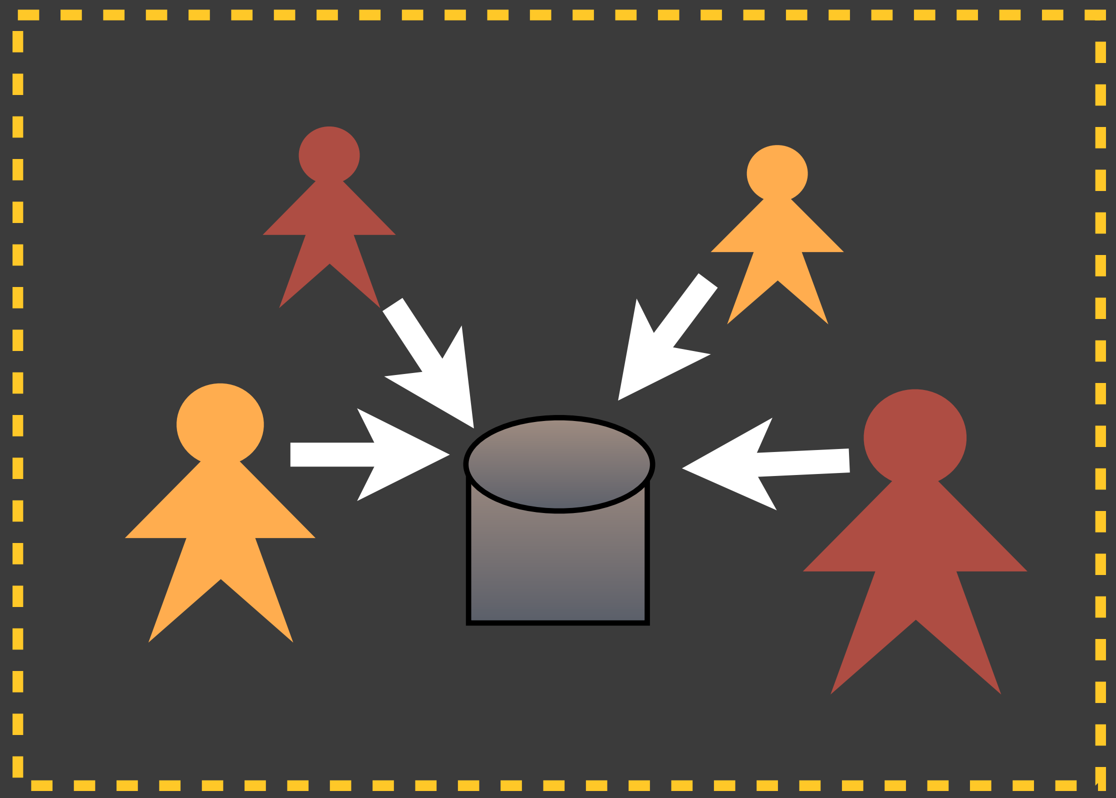


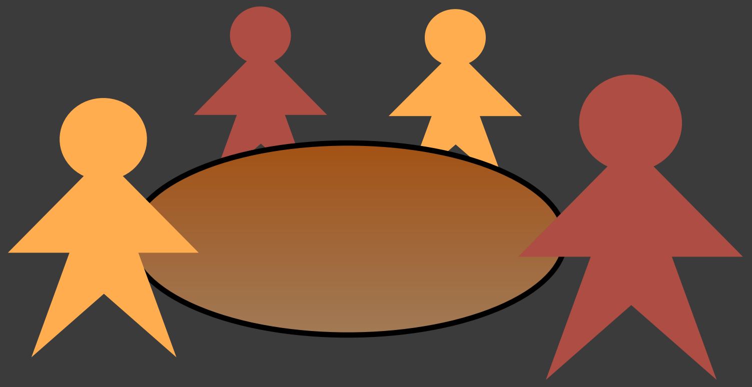
# Individual vs Collective?



Stroebe and Diehl, 1994
Janis, 1982
Felps, Mitchell, Byington, 2006

# Individual vs Collective?





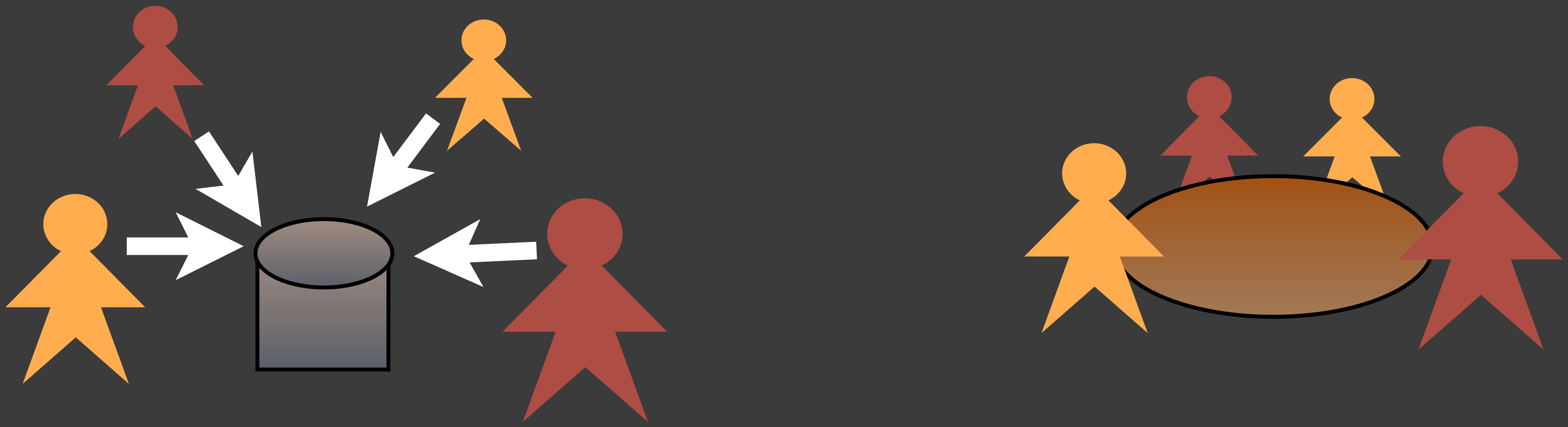
Organization memory

Skill recognition

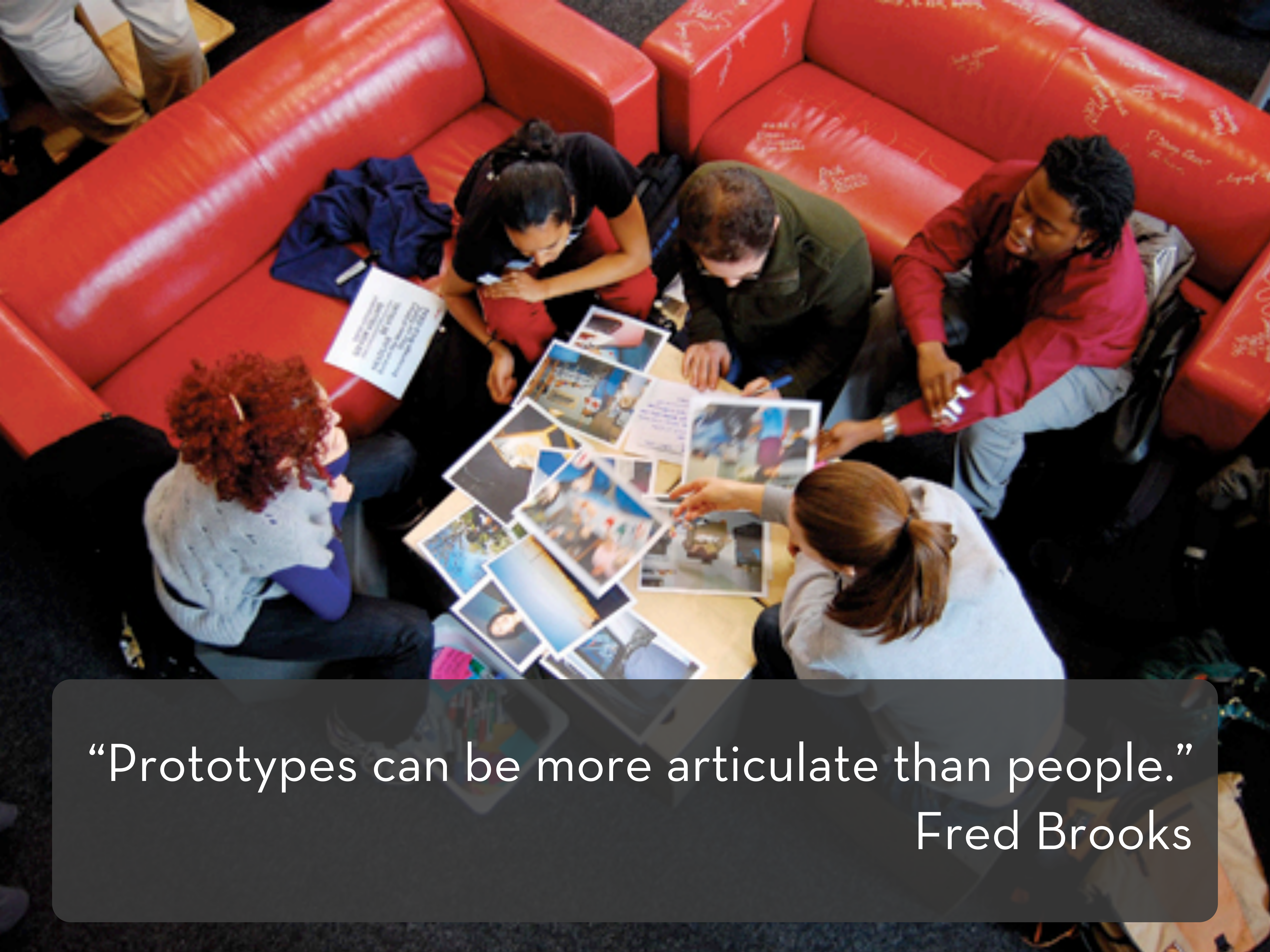
Shared ownership

Stroebe and Diehl, 1994
Janis, 1982
Felps, Mitchell, Byington, 2006

Sutton and Hargadon, 1996



# A false choice?



> “Prototypes can be more articulate than people.”
> Fred Brooks

# Research question

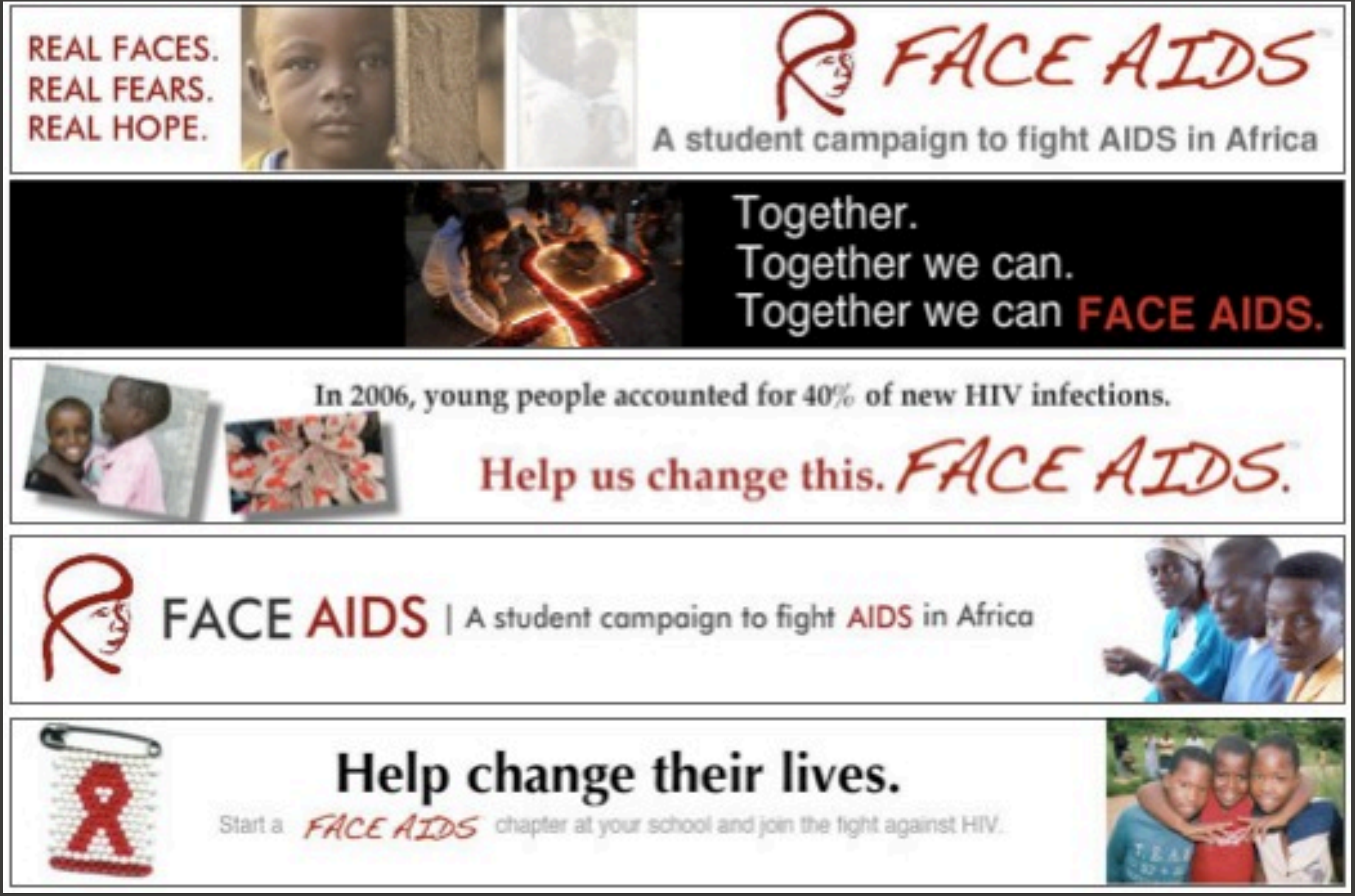
How does sharing **multiple** prototypes
— rather than just one —
affect design results?

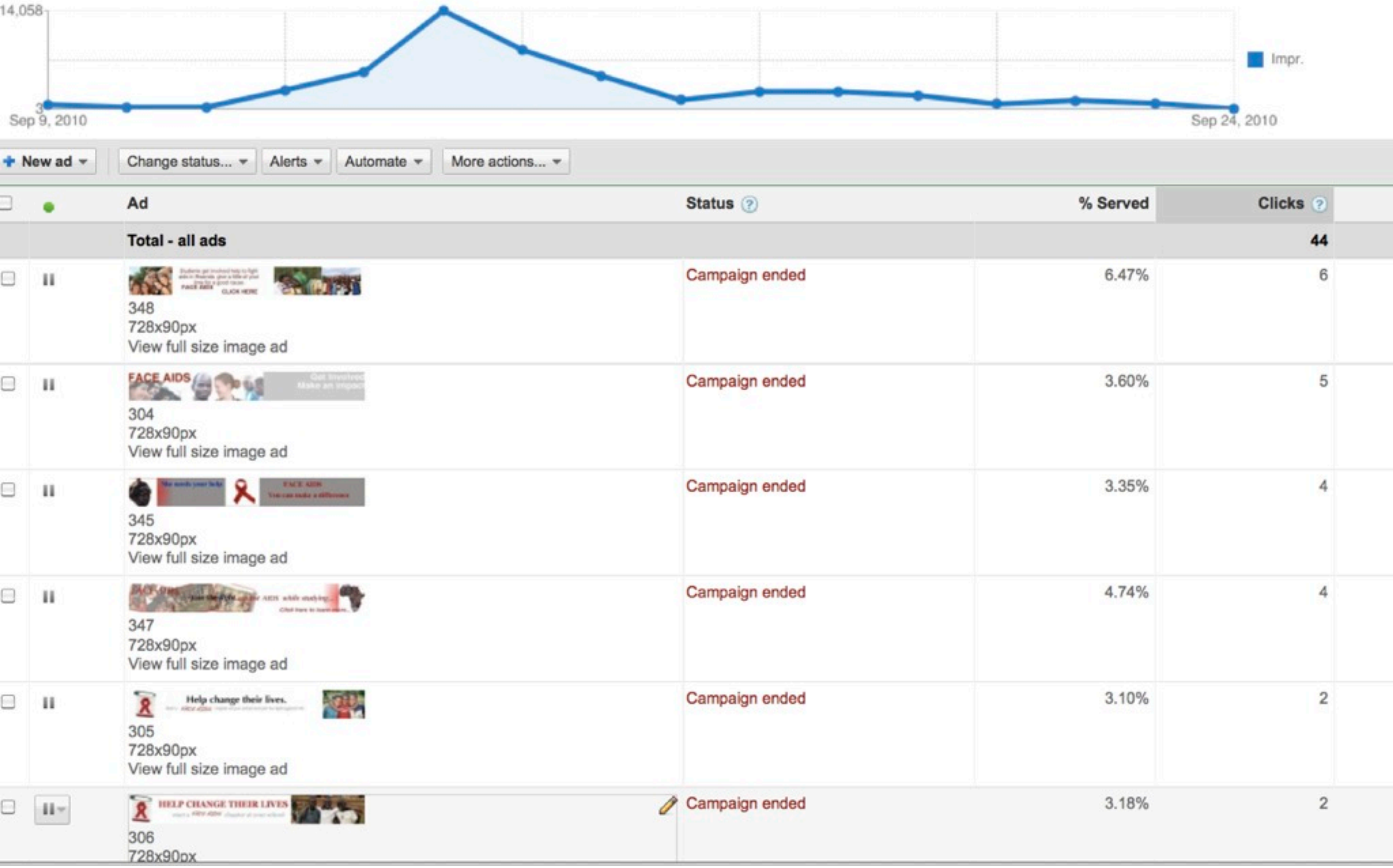
**Hypothesis** “sharing multiple” outperforms

# Design task selection

| | |
|---|---|
| **Demonstrate creativity** | No “right” or “wrong” solutions<br>Many paths to solution |
| **Contrast designs** | Objective and subjective outcome measures |

# Task: design an advertisement


REAL FACES.
REAL FEARS.
REAL HOPE.
FACE AIDS
A student campaign to fight AIDS in Africa
Together.
Together we can.
Together we can FACE AIDS.
In 2006, young people accounted for 40% of new HIV infections.
Help us change this. FACE AIDS.
FACE AIDS | A student campaign to fight AIDS in Africa
Help change their lives.
Start a FACE AIDS chapter at your school and join the fight against HIV.

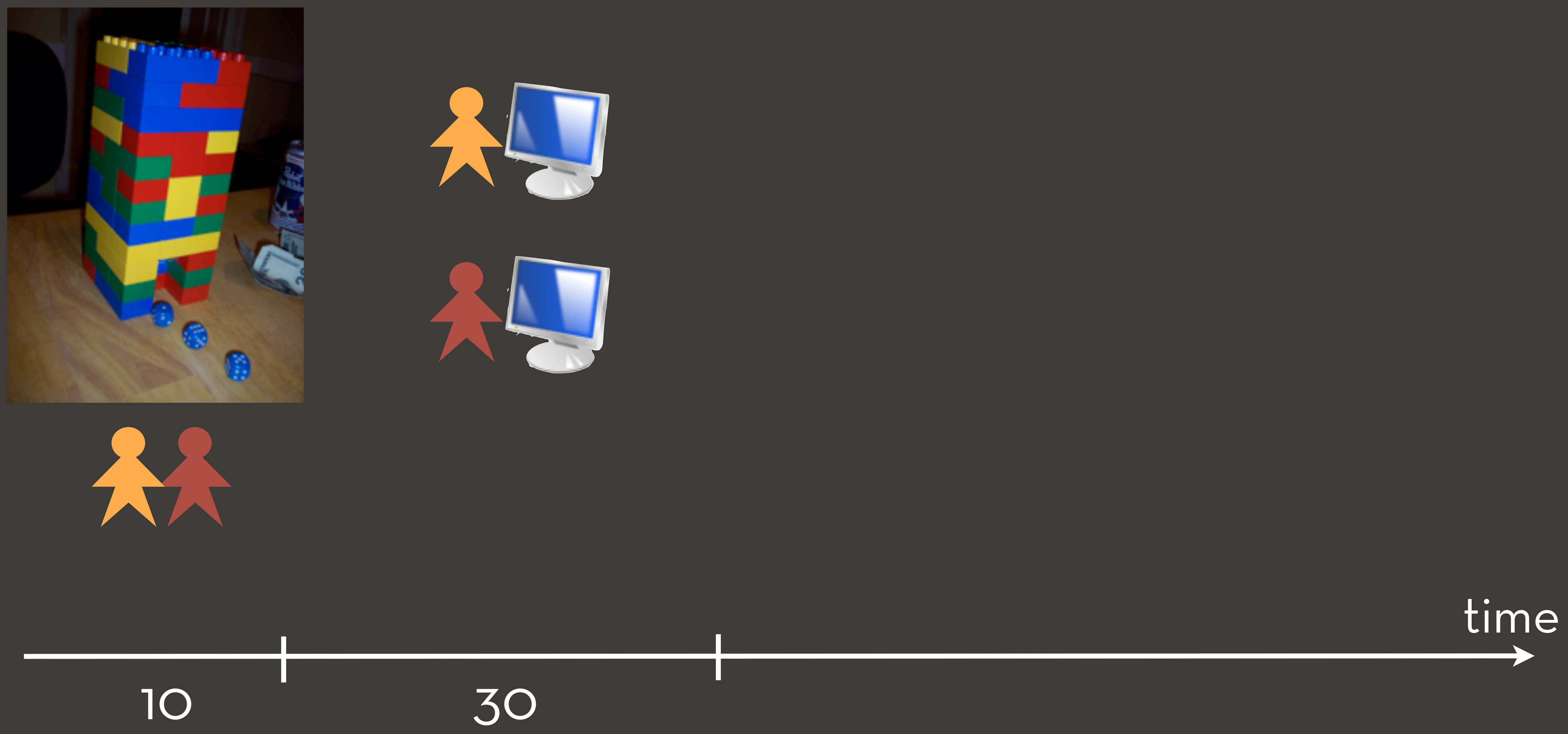

14,058
3
Sep 9, 2010
Sep 24, 2010
Impr.
New ad
Change status...
Alerts
Automate
More actions...

| ☐ | ● | Ad | Status | % Served | Clicks |
|---|---|---|---|---|---|
| | | **Total - all ads** | | | **44** |
| ☐ | ⏸ | 348<br>728x90px<br>View full size image ad | Campaign ended | 6.47% | 6 |
| ☐ | ⏸ | 304<br>728x90px<br>View full size image ad | Campaign ended | 3.60% | 5 |
| ☐ | ⏸ | 345<br>728x90px<br>View full size image ad | Campaign ended | 3.35% | 4 |
| ☐ | ⏸ | 347<br>728x90px<br>View full size image ad | Campaign ended | 4.74% | 4 |
| ☐ | ⏸ | 305<br>728x90px<br>View full size image ad | Campaign ended | 3.10% | 2 |
| ☐ | ⏸ | 306<br>728x90px | Campaign ended | 3.18% | 2 |

# **Procedure** (N=84, 42 pairs)

icebreaker
activity

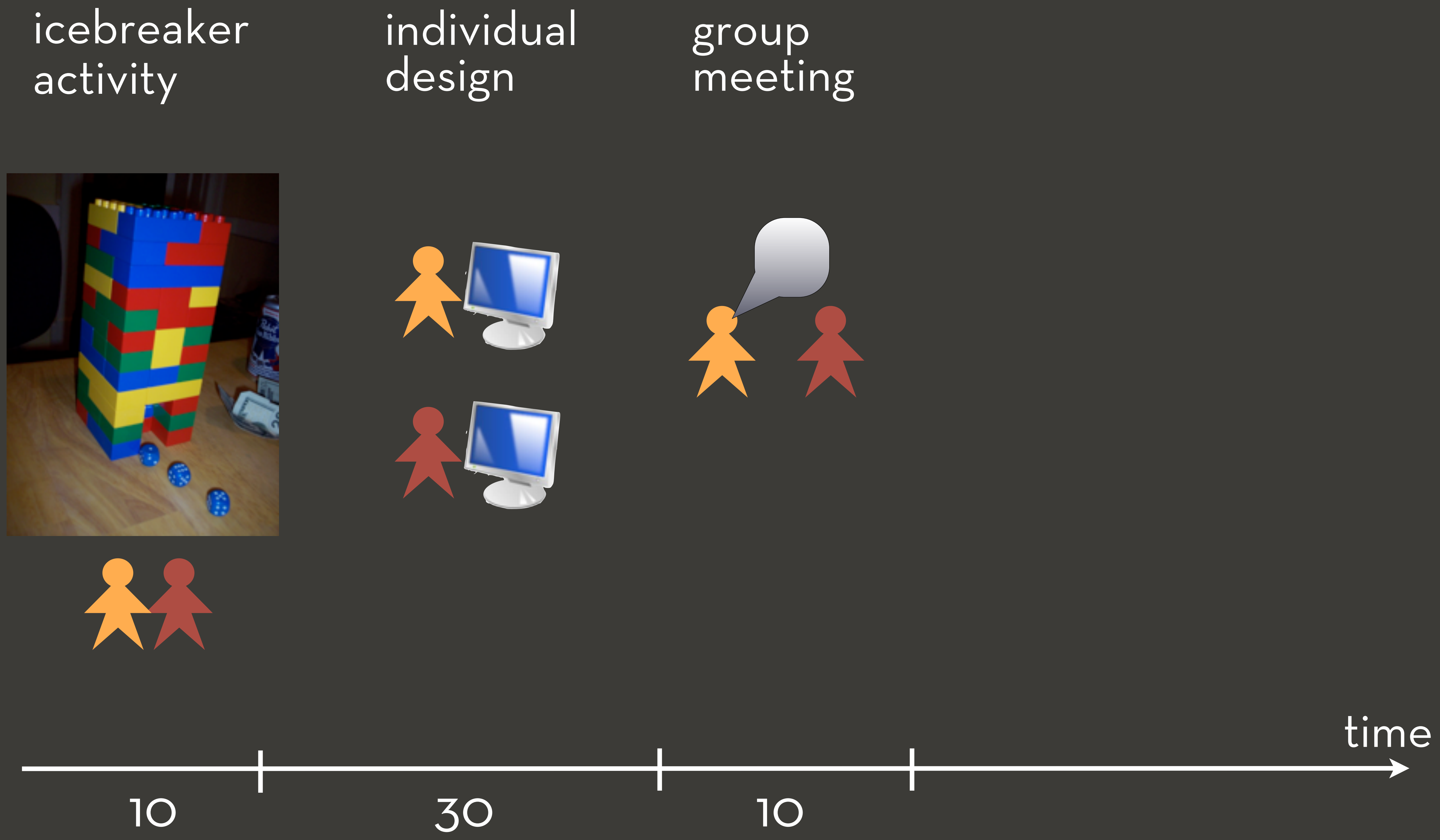
# **Procedure** (N=84, 42 pairs)



icebreaker activity

individual design

# **Procedure** (N=84, 42 pairs)



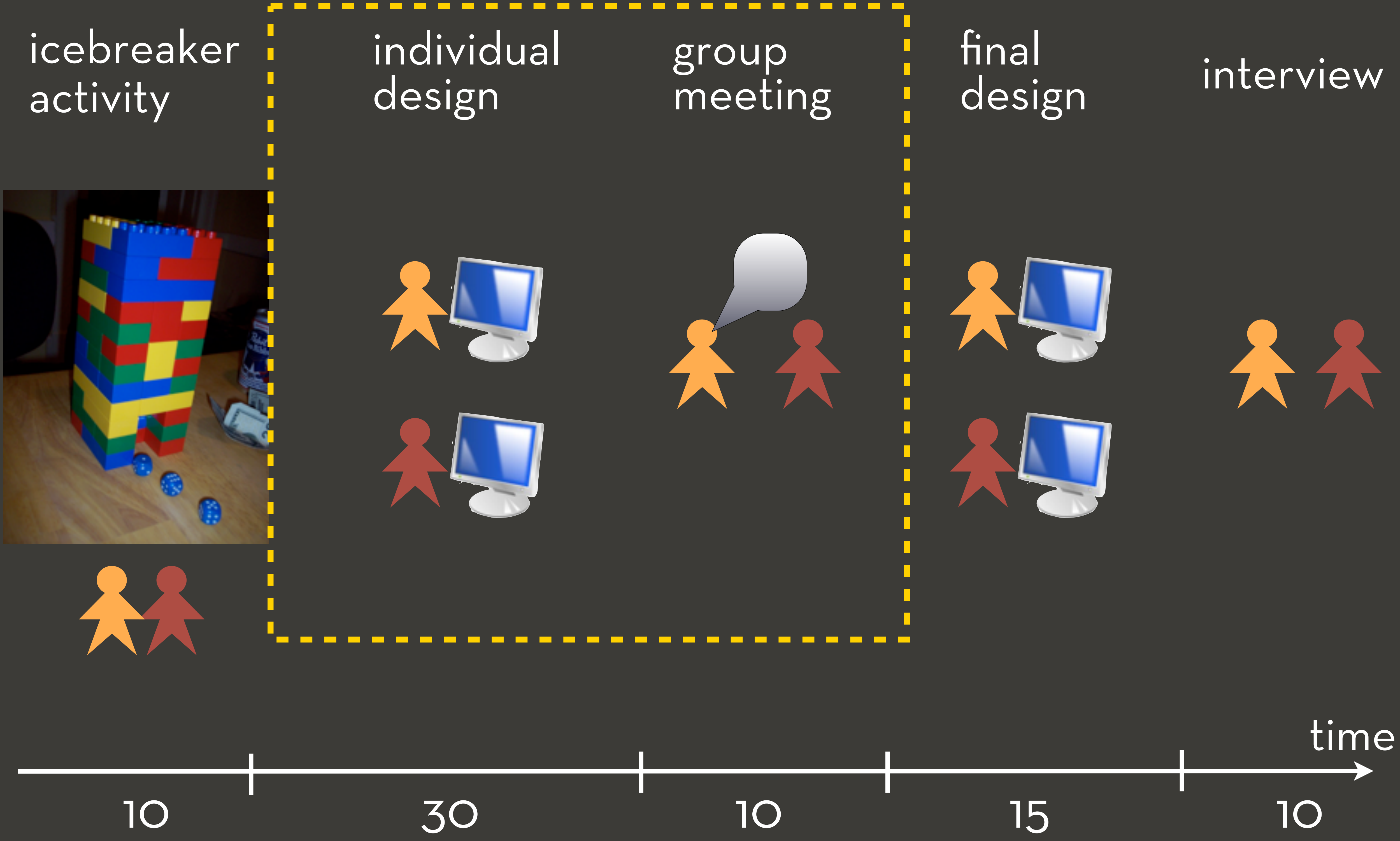
icebreaker activity

individual design

group meeting

time
10
30
10

# **Procedure** (N=84, 42 pairs)



icebreaker activity

individual design

group meeting

final design

interview

time

10

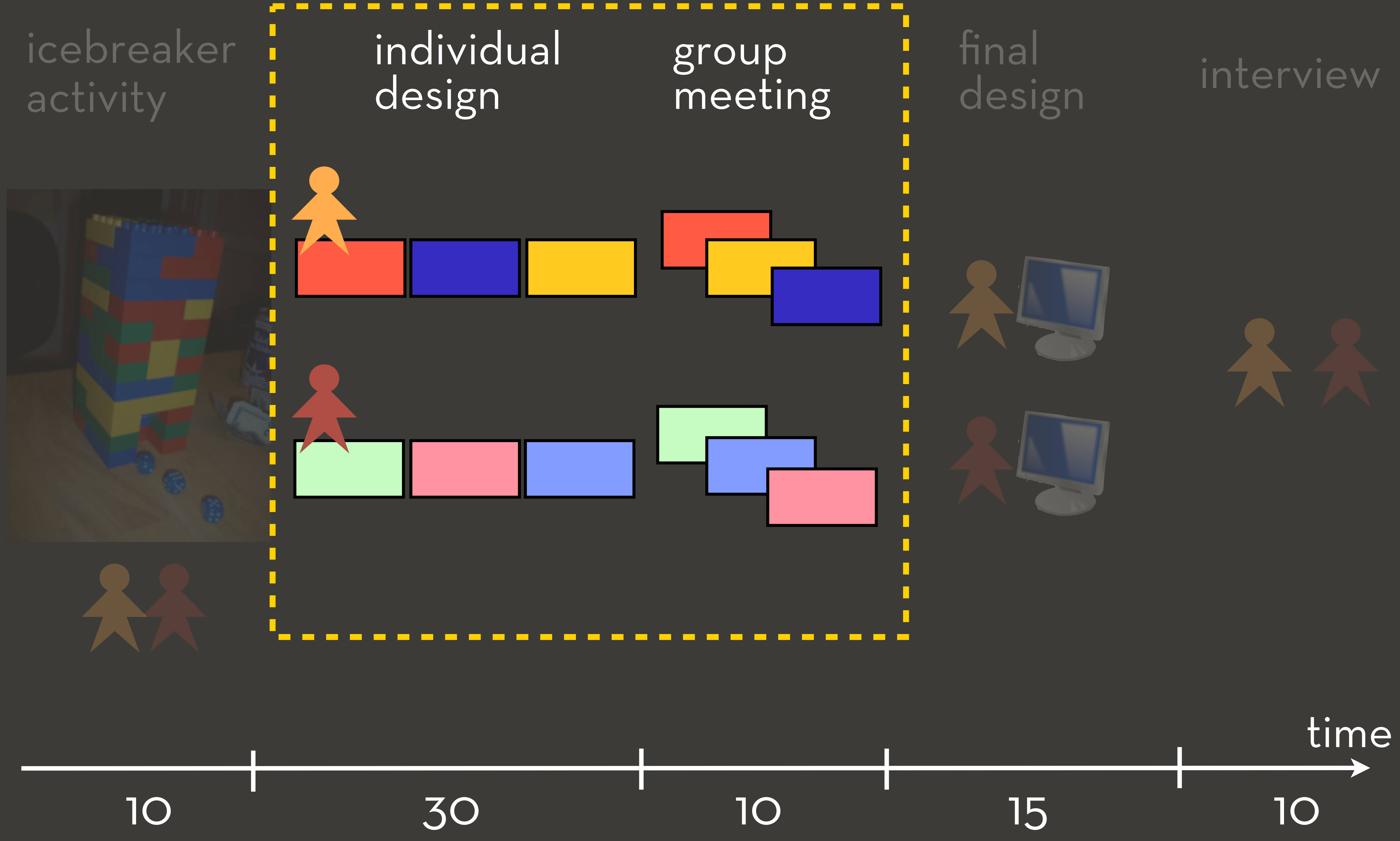
30

10

15

10

# **Procedure:** share multiple



icebreaker activity

individual design

group meeting

final design

interview

time

10

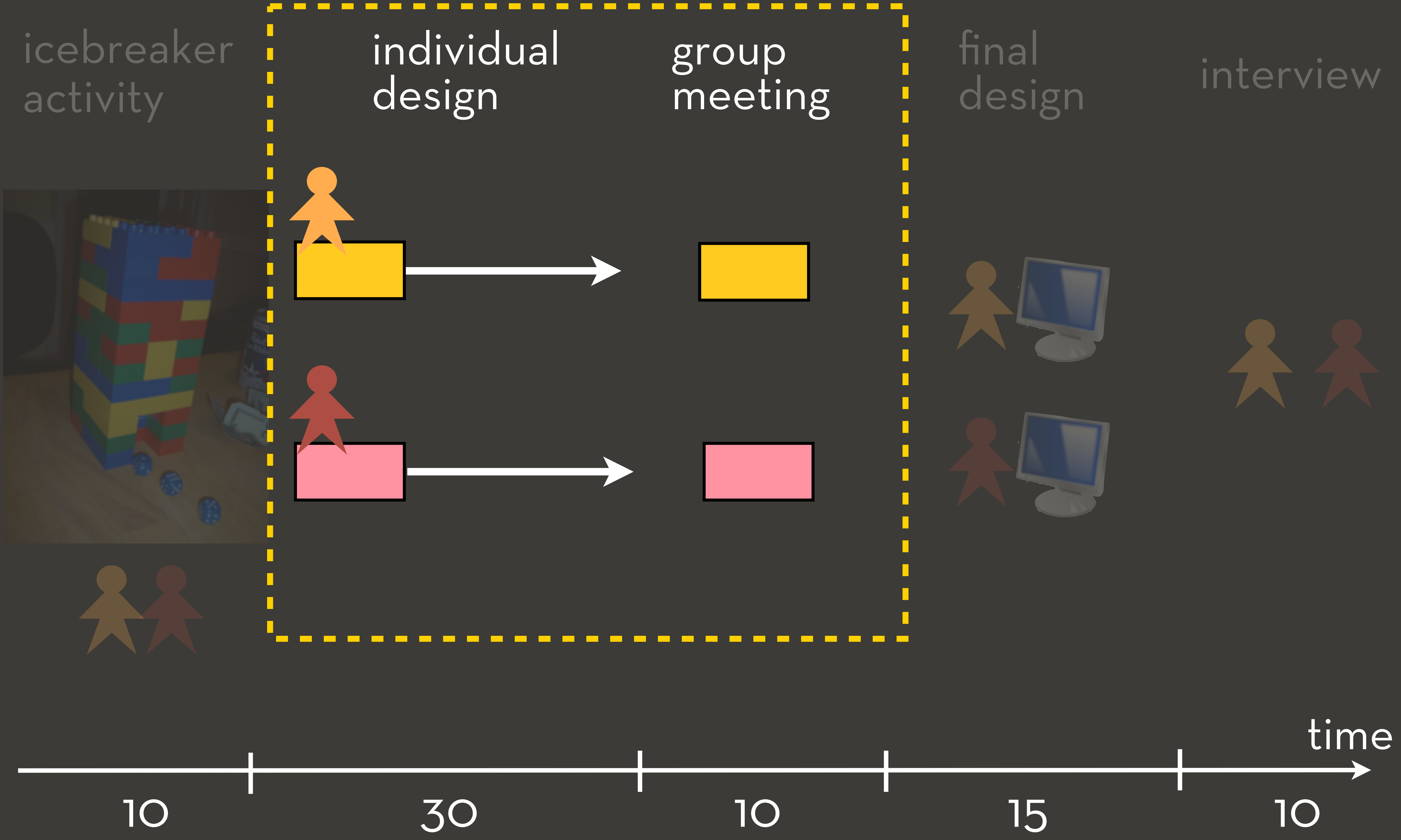
30

10

15

10

# **Procedure:** share one



icebreaker activity

individual design

group meeting

final design

interview

time

10

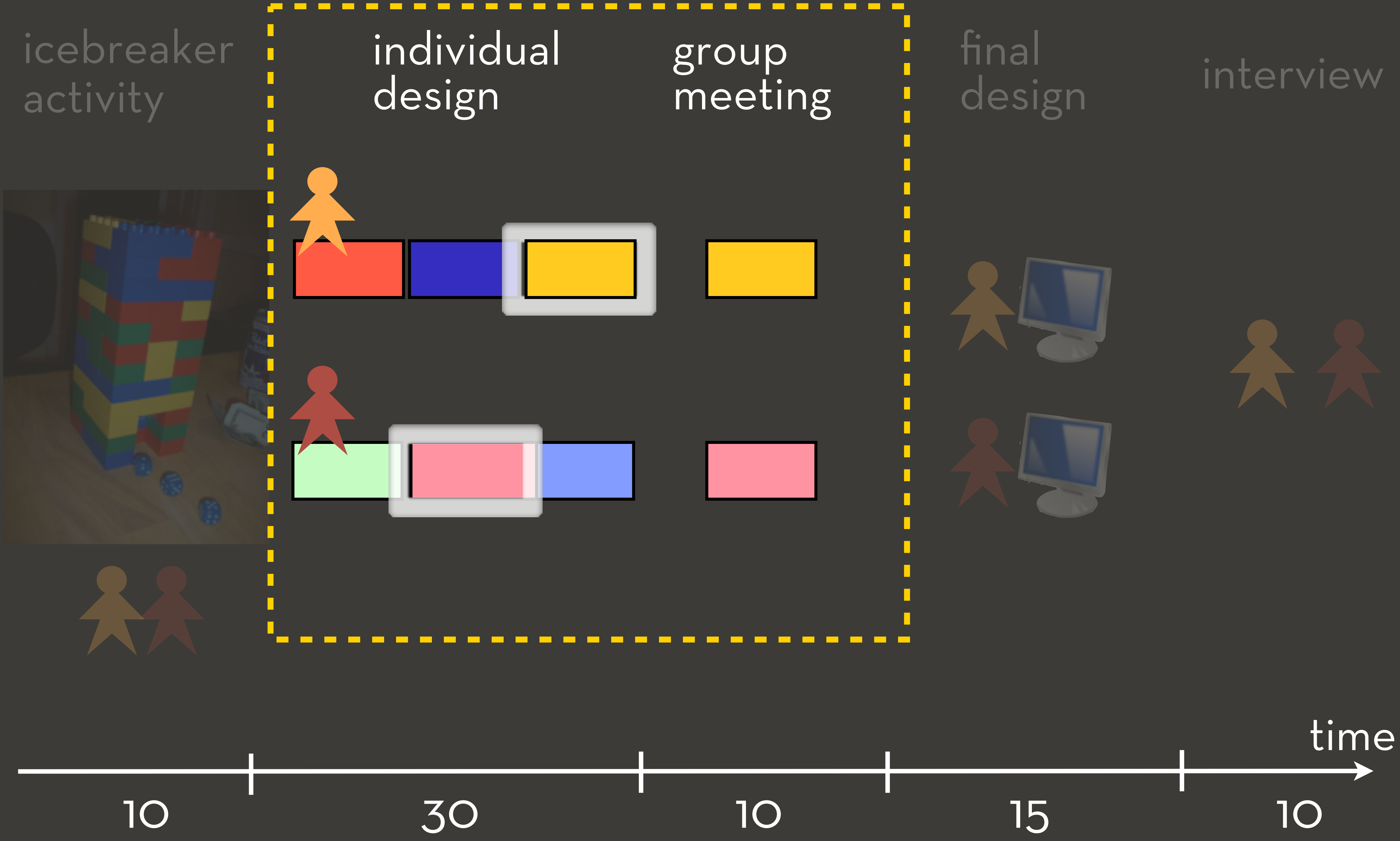
30

10

15

10

# **Procedure:** share best



icebreaker activity

individual design

group meeting

final design

interview

time

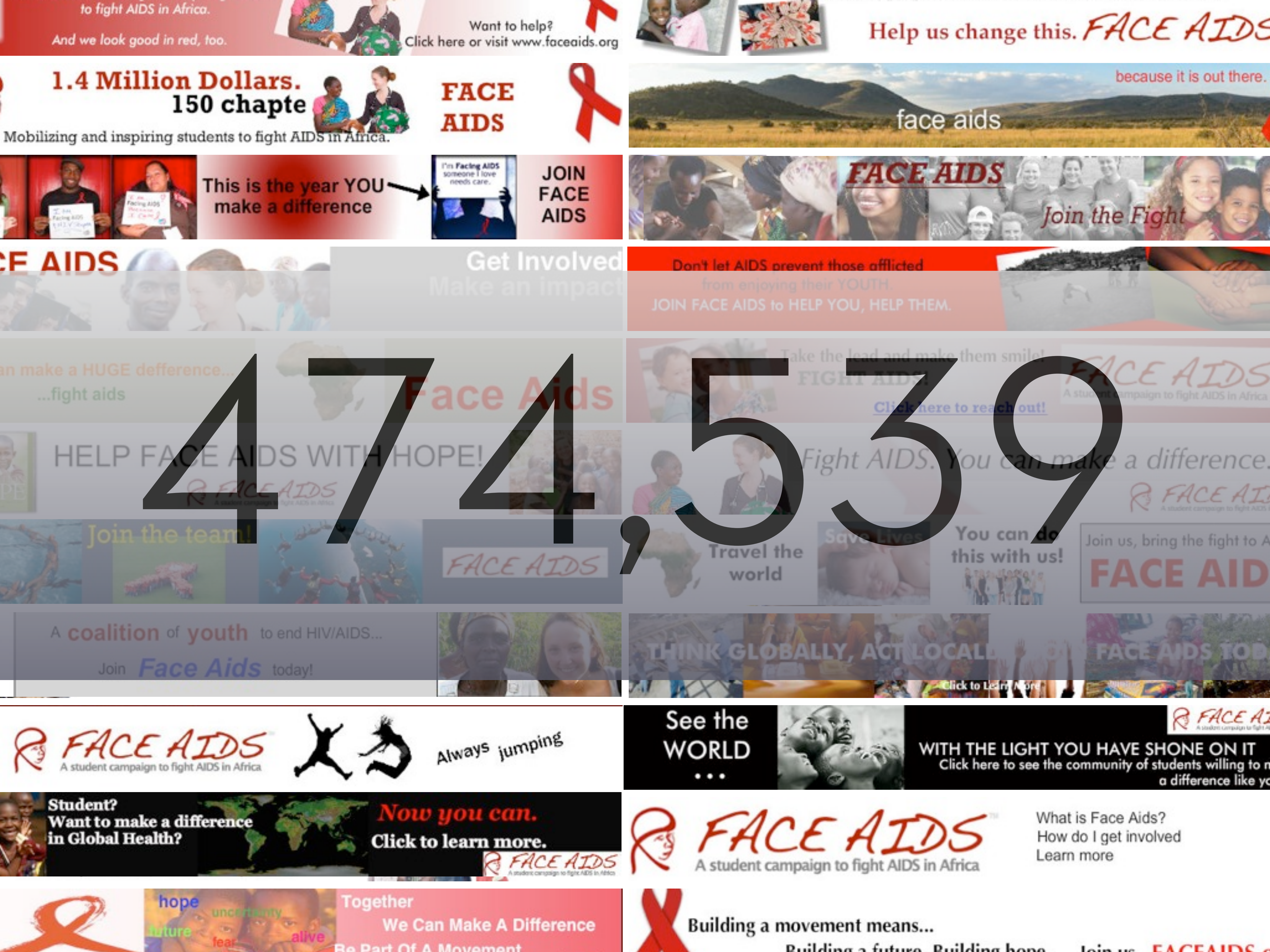
10

30

10

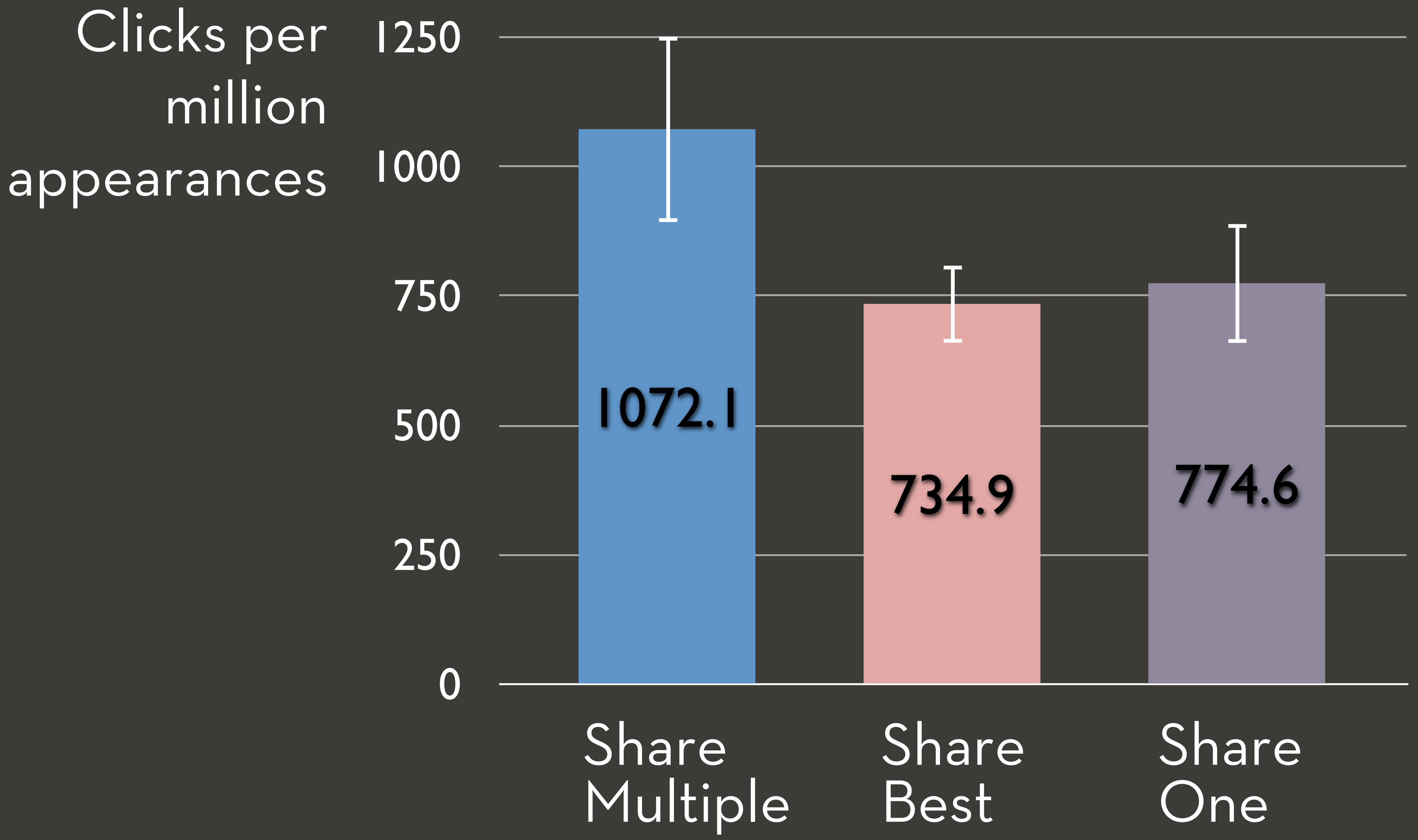
15

10


to fight AIDS in Africa.
And we look good in red, too.
Want to help?
Click here or visit www.faceaids.org
Help us change this. FACE AIDS
1.4 Million Dollars.
150 chapte
Mobilizing and inspiring students to fight AIDS in Africa.
FACE AIDS
because it is out there.
face aids
This is the year YOU make a difference
I'm Facing AIDS someone I love needs care.
JOIN FACE AIDS
FACE AIDS
Join the Fight
CE AIDS
Get Involved
Make an impact
Don't let AIDS prevent those afflicted from enjoying their YOUTH.
JOIN FACE AIDS to HELP YOU, HELP THEM.
an make a HUGE defference...
...fight aids
Face Aids
Take the lead and make them smile!
FIGHT AIDS!
Click here to reach out!
FACE AIDS
A student campaign to fight AIDS in Africa
HELP FACE AIDS WITH HOPE!
FACE AIDS
Fight AIDS. You can make a difference.
FACE AIDS
Join the team!
FACE AIDS
Travel the world
Save Lives
You can do this with us!
Join us, bring the fight to A
FACE AID
A coalition of youth to end HIV/AIDS...
Join Face Aids today!
THINK GLOBALLY, ACT LOCALLY
FACE AIDS TOD
Click to Learn More
FACE AIDS
A student campaign to fight AIDS in Africa
Always jumping
See the WORLD ...
FACE AI
WITH THE LIGHT YOU HAVE SHONE ON IT
Click here to see the community of students willing to m
a difference like yo
Student?
Want to make a difference in Global Health?
Now you can.
Click to learn more.
FACE AIDS
FACE AIDS
A student campaign to fight AIDS in Africa
What is Face Aids?
How do I get involved
Learn more
hope
uncertainty
future
fear
alive
Together
We Can Make A Difference
Be Part Of A Movement
Building a movement means...
Building a future. Building hope. Join us. FACEAIDS

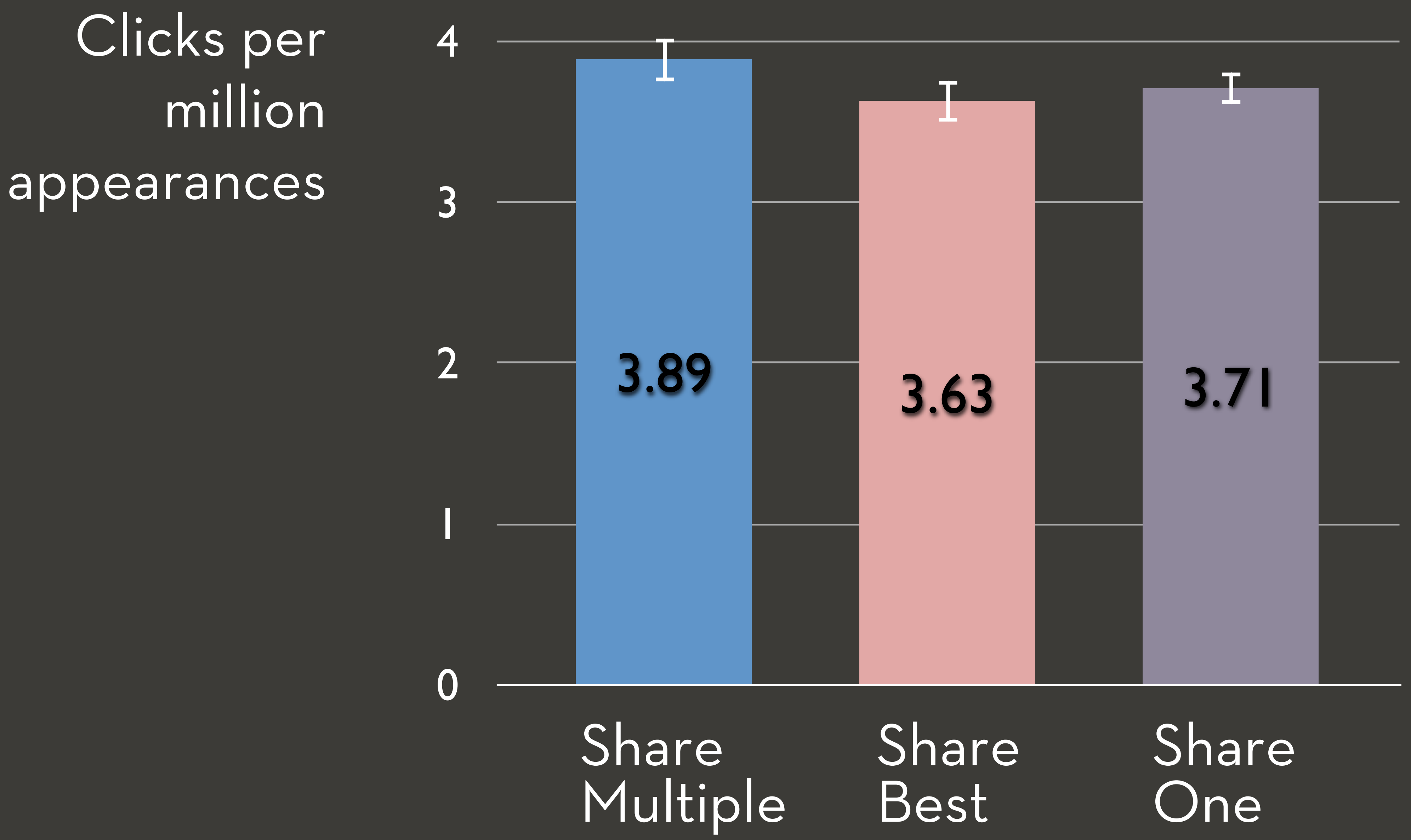
# 474,539

# Web users clicked more "Share Multiple" ads per appearance



$X^2=4.72$, $p<0.05$

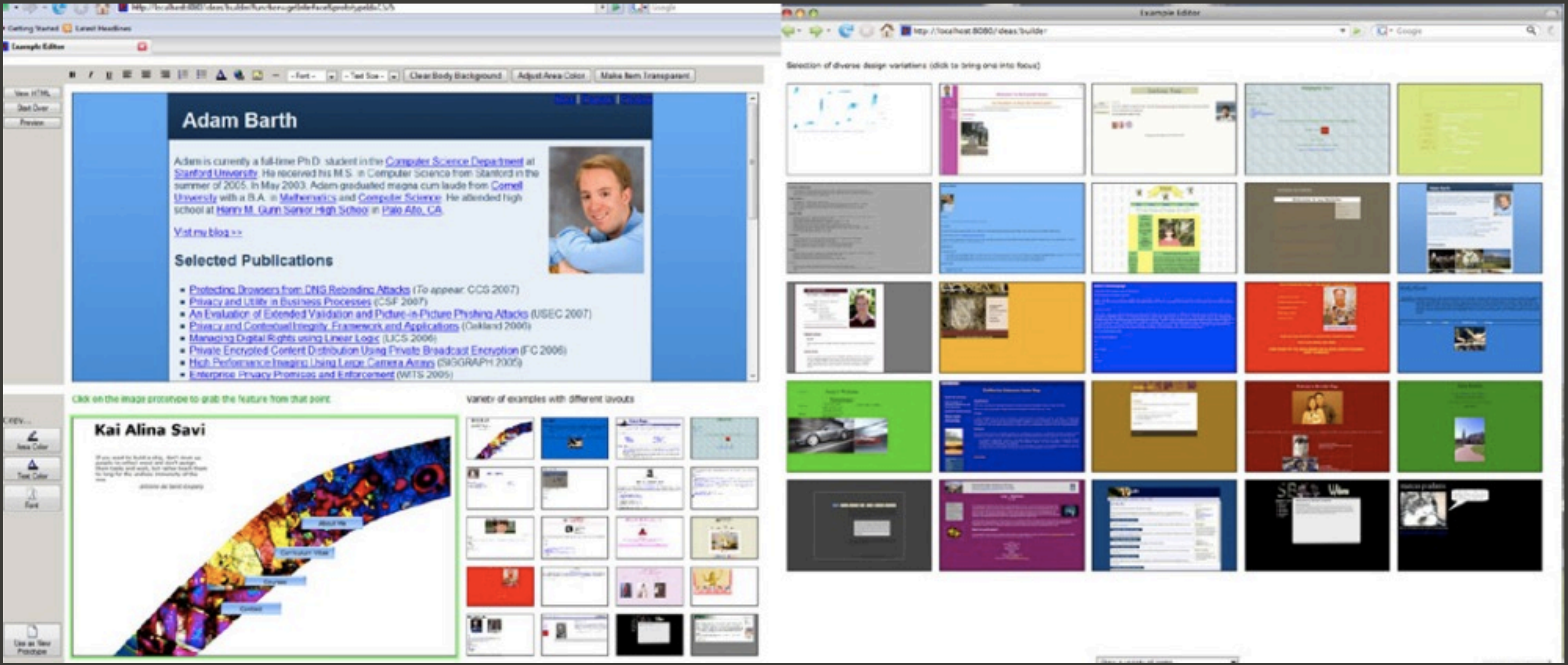
# Experts and clients rated "Share Multiple" ads better



$F(2,2519)=5.075$, $p<0.05$).

Why does sharing multiple designs lead to better results?

# Viewing examples improves designs


Example Editor
View HTML
Start Over
Preview
Clear Body Background
Adjust Area Color
Make Item Transparent
Use as New Prototype
Selection of diverse design variations (click to bring one into focus)

Adam Barth

Adam is currently a full-time Ph.D. student in the Computer Science Department at Stanford University. He received his M.S. in Computer Science from Stanford in the summer of 2005. In May 2003, Adam graduated magna cum laude from Cornell University with a B.A. in Mathematics and Computer Science. He attended high school at Henry M. Gunn Senior High School in Palo Alto, CA.

Visit my blog >>

Selected Publications

- Protecting Browsers from DNS Rebinding Attacks (To appear: CCS 2007)
- Privacy and Utility in Business Processes (CSF 2007)
- An Evaluation of Extended Validation and Picture-in-Picture Phishing Attacks (USEC 2007)
- Privacy and Contextual Integrity: Framework and Applications (Oakland 2006)
- Managing Digital Rights using Linear Logic (LICS 2006)
- Private Encrypted Content Distribution Using Private Broadcast Encryption (FC 2006)
- High Performance Imaging Using Large Camera Arrays (SIGGRAPH 2005)
- Enterprise Privacy Promises and Enforcement (WITS 2005)

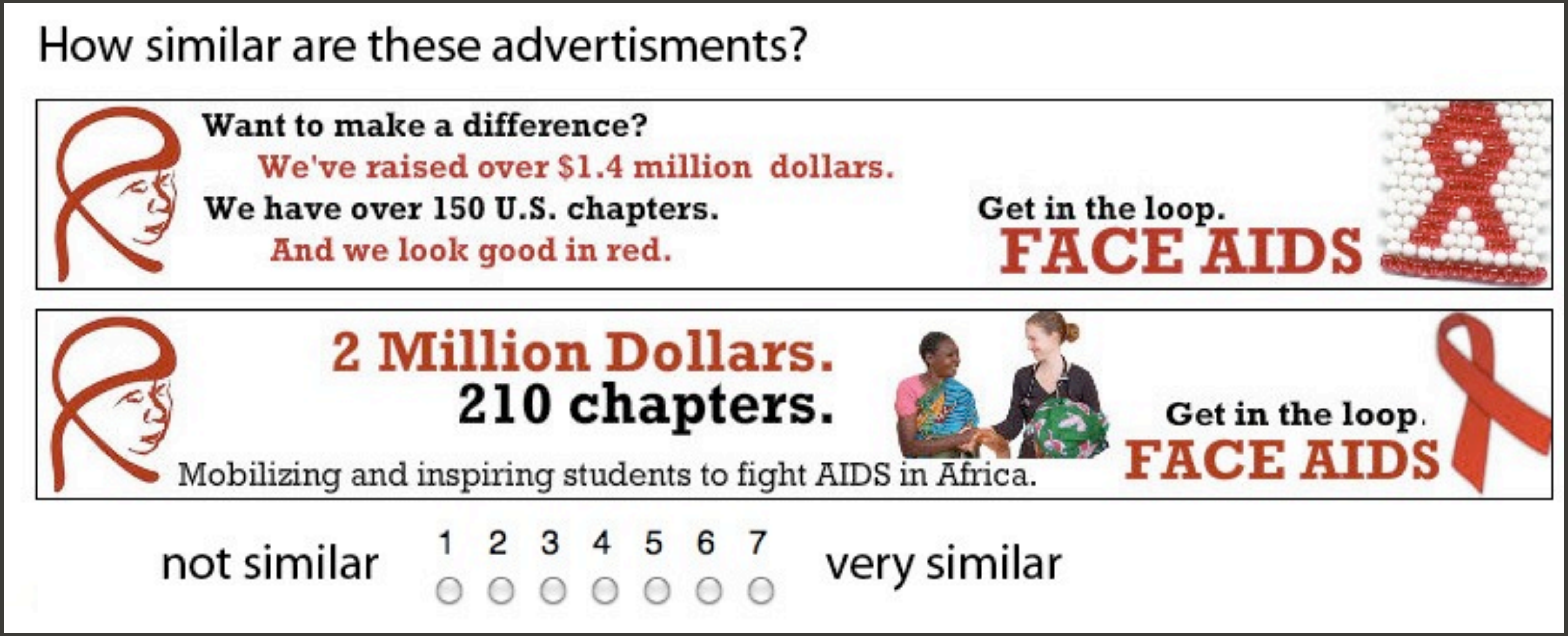
Click on the image prototype to grab the feature from that point

Variety of examples with different layouts

Kai Alina Savi

Lee, Srivastava, Kumar, Brafman, and Klemmer, CHI 2010

# Measuring transformation by rating ad similarity



How similar are these advertisments?

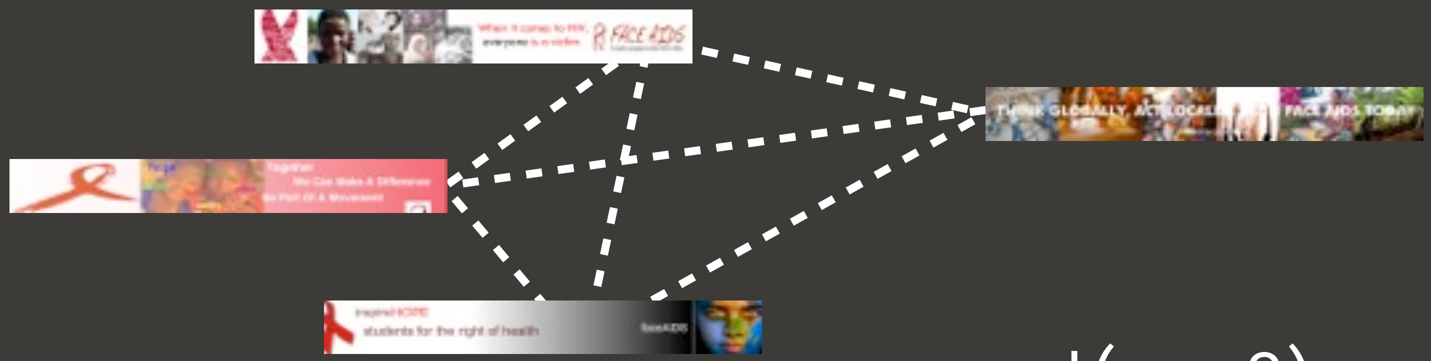
Want to make a difference?
We've raised over $1.4 million dollars.
We have over 150 U.S. chapters.
And we look good in red.
Get in the loop.
FACE AIDS

2 Million Dollars.
210 chapters.
Mobilizing and inspiring students to fight AIDS in Africa.
Get in the loop.
FACE AIDS

not similar 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ very similar

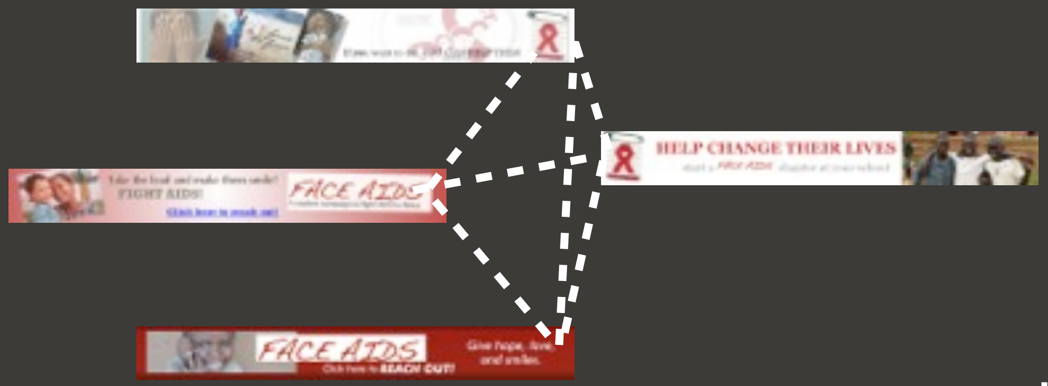
# Share Multiple designs transformed the most

share
**multiple**


FACE AIDS
THINK GLOBALLY, ACT LOCALLY
FACE AIDS TODAY

t(3358)=2.077, p<.05

share
**best**


HELP CHANGE THEIR LIVES
FACE AIDS
FIGHT AIDS!
FACE AIDS
Click here to REACH OUT!
Give hope, love, and smiles.

t(1958)=11.66, p<.05

share
**one**

Make a difference in their lives.
Help us change this. FACE AIDS

# Sticking with my first idea

SHARE BEST or
SHARE ONE groups

[illegible] completely transformed ads [illegible] about
[illegible] to what we came to the table with.” [illegible] started with.”

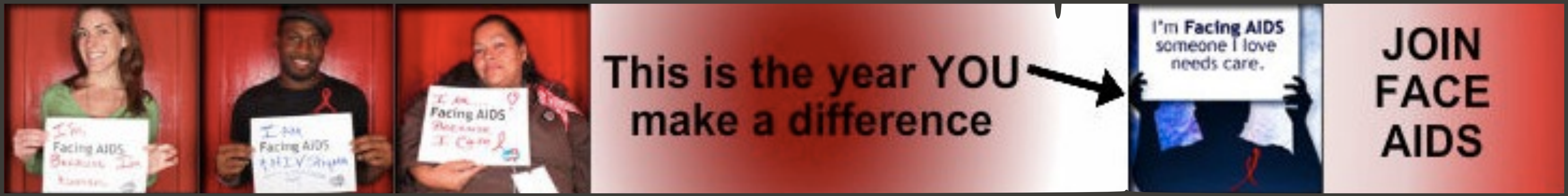
# Taking the best of both

SHARE MULTIPLE

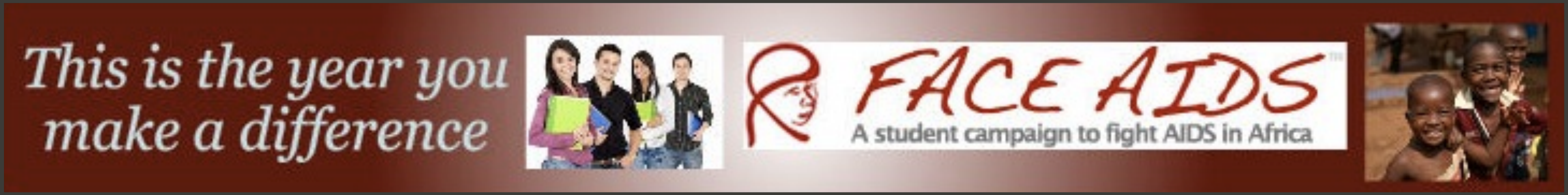
Maltese falcon
Mackerel
315
306
M

[illegible]

# Measuring feature adoption

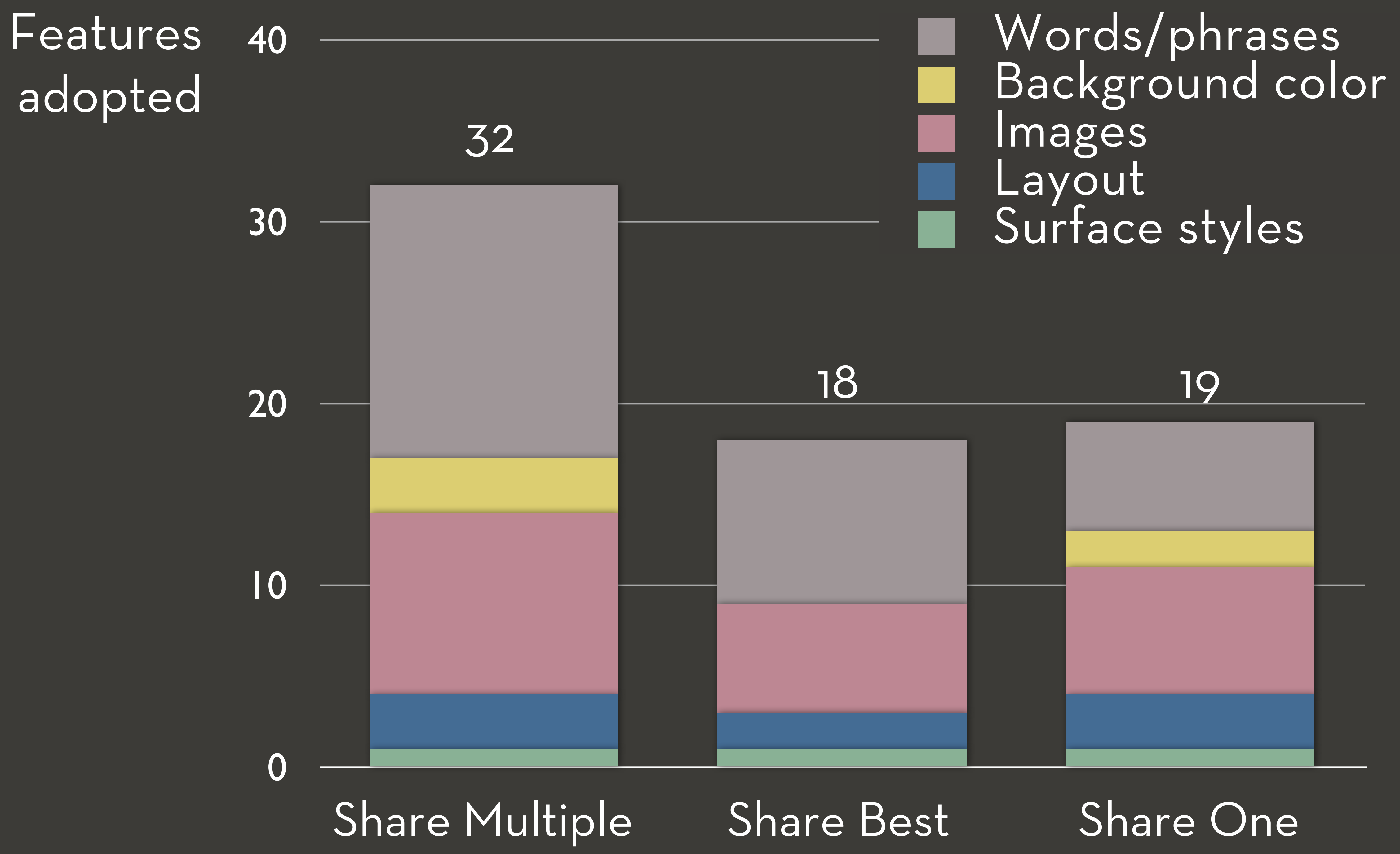

Facing AIDS
Facing AIDS
I am... Facing AIDS Because I Care
This is the year YOU make a difference
I'm Facing AIDS someone I love needs care.
JOIN FACE AIDS

Partner A


This is the year you make a difference
FACE AIDS
A student campaign to fight AIDS in Africa

Partner B

# Share Multiple partners adopted more features



$\chi^2=4.05$, $p<0.05$

# Critiquing multiple designs

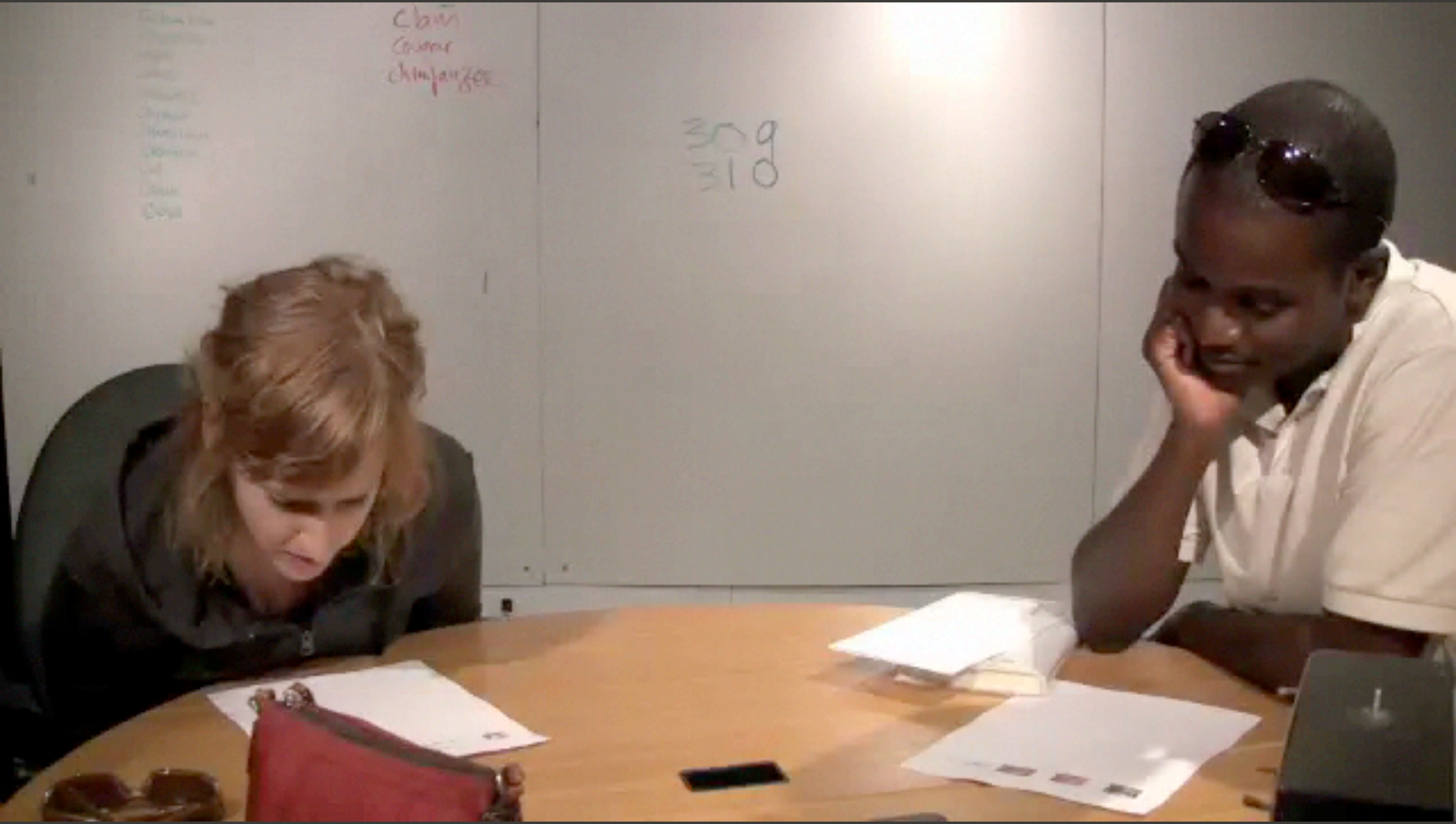
SHARE MULTIPLE

“If you just used one color, just like the background color, it will be more powerful.”

[illegible]

# Critiquing one design

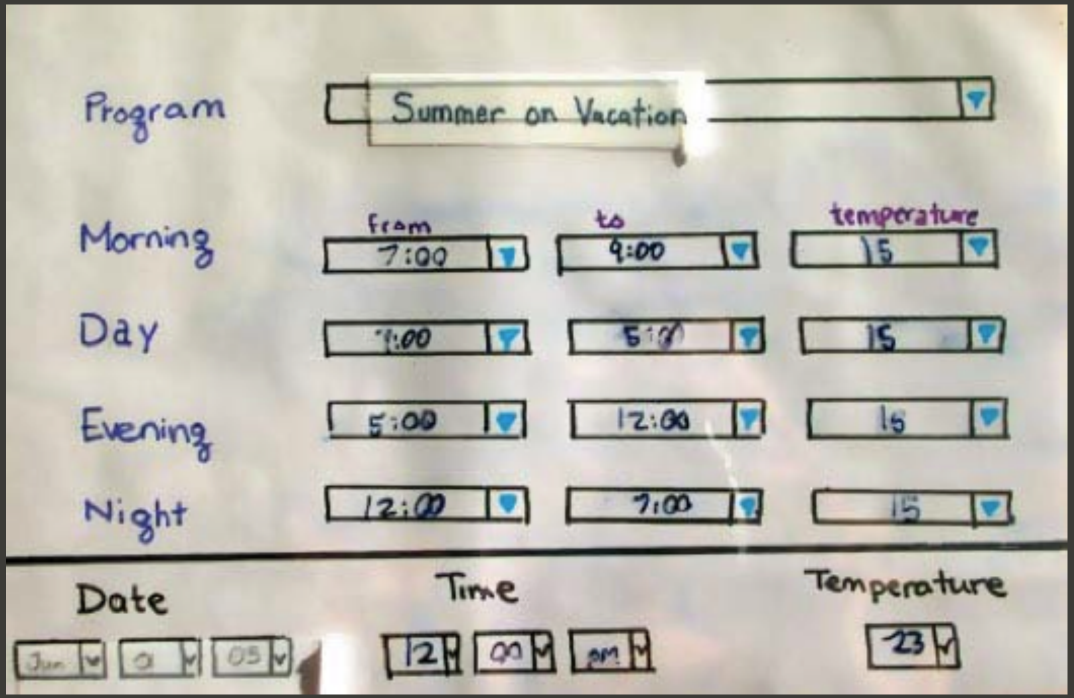
SHARE ONE

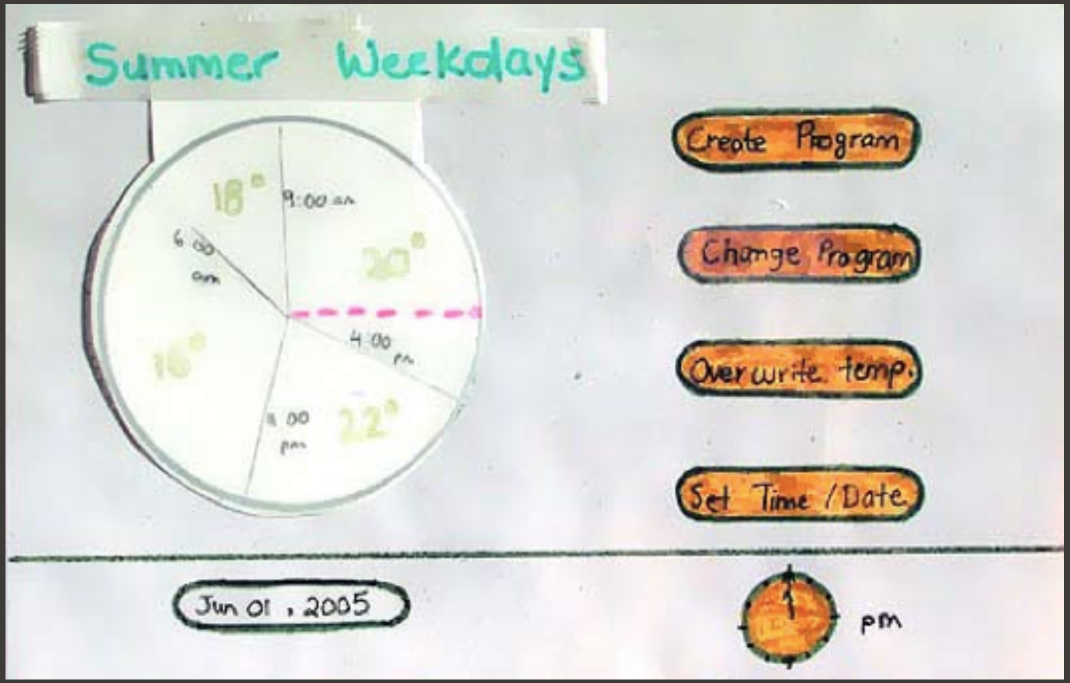

claim
cougar
chimpanzee
309
310

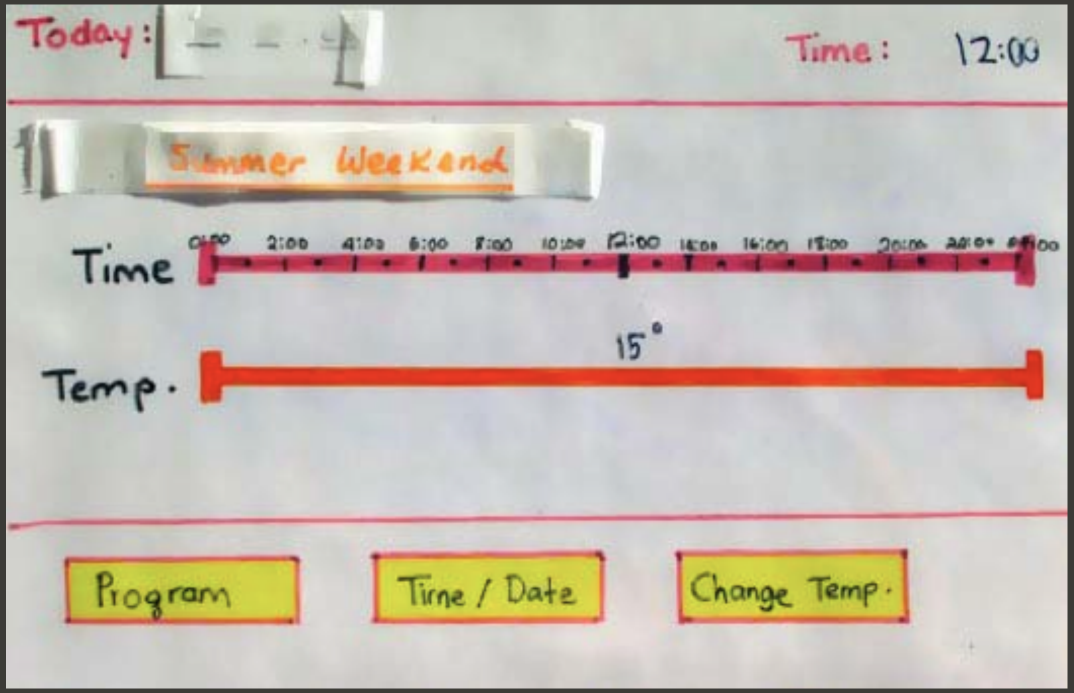
“[illegible] it's the first one I did. [illegible] if we move this picture over here or something like that.”

“[illegible] and I didn't know what I was doing. So I had some problems.”

# Alternatives facilitate user feedback

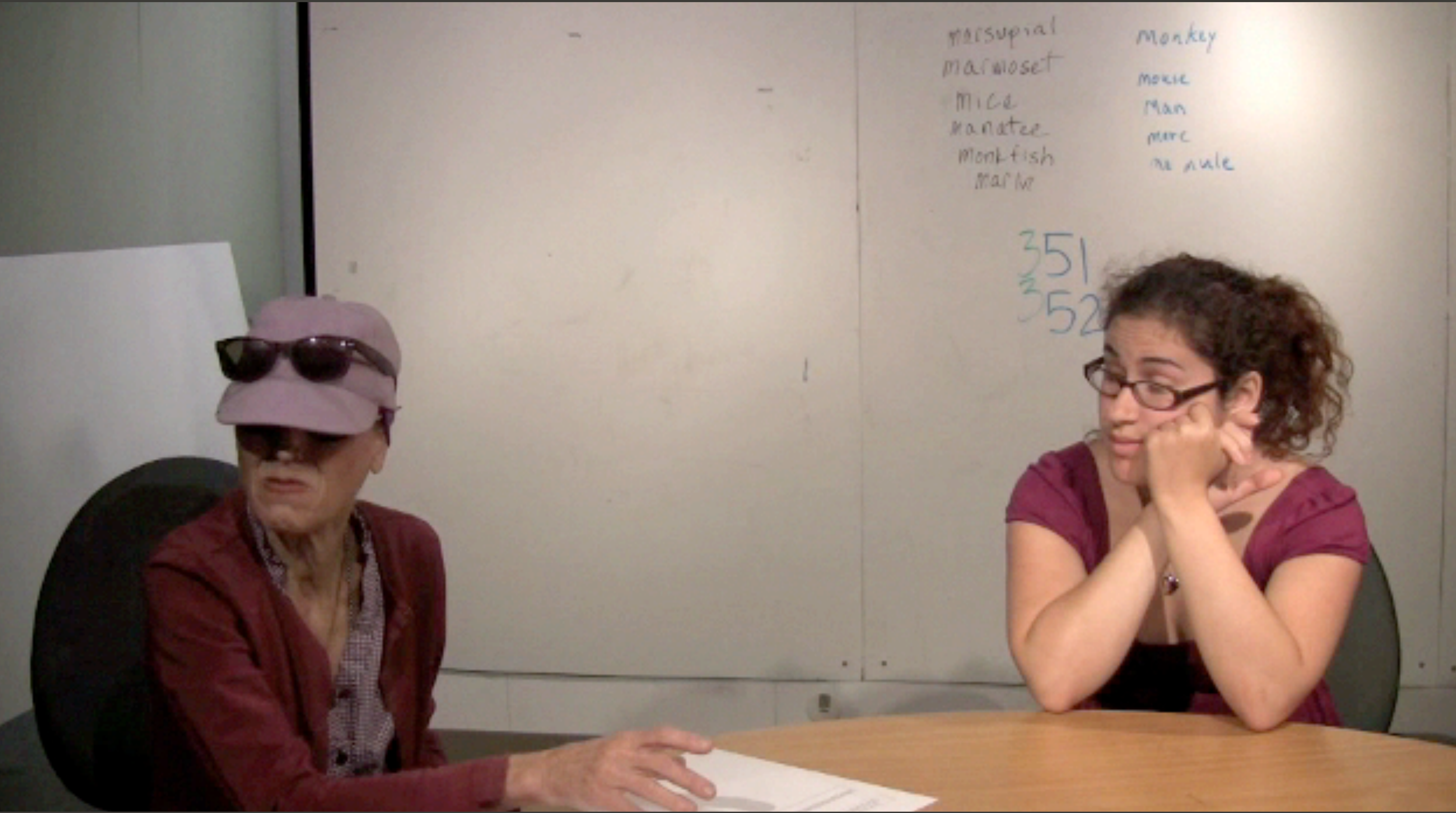

Program
Summer on Vacation
Morning
from
to
temperature
7:00
9:00
15
Day
9:00
5:00
15
Evening
5:00
12:00
15
Night
12:00
7:00
15
Date
Time
Temperature
Jun
01
05
12
00
pm
23


Summer Weekdays
18°
9:00 am
6:00 am
20°
4:00 pm
16°
8:00 pm
22°
Create Program
Change Program
Overwrite temp.
Set Time / Date
Jun 01 , 2005
pm


Today:
Time:
12:00
Summer Weekend
Time
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
24:00
Temp.
15°
Program
Time / Date
Change Temp.

Tohidi, Buxton, Baecker, Sellen, CHI 2006

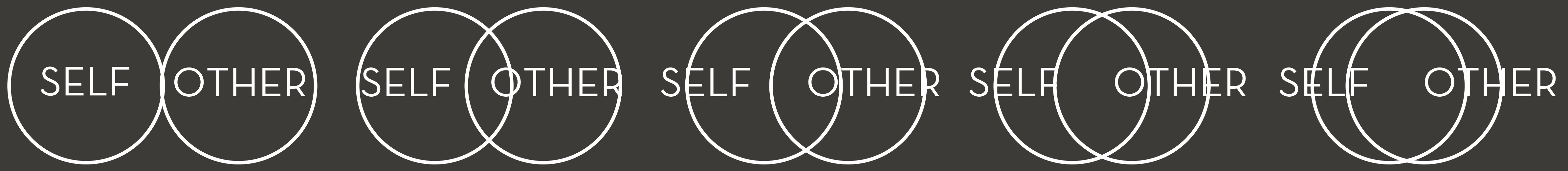
# The danger of critiquing one idea...


marsupial
marmoset
mice
manatee
monkfish
monkey
movie
man
351
352

"She didn't make me feel terrible about what I had produced..."
"She didn't make me feel like a total failure."

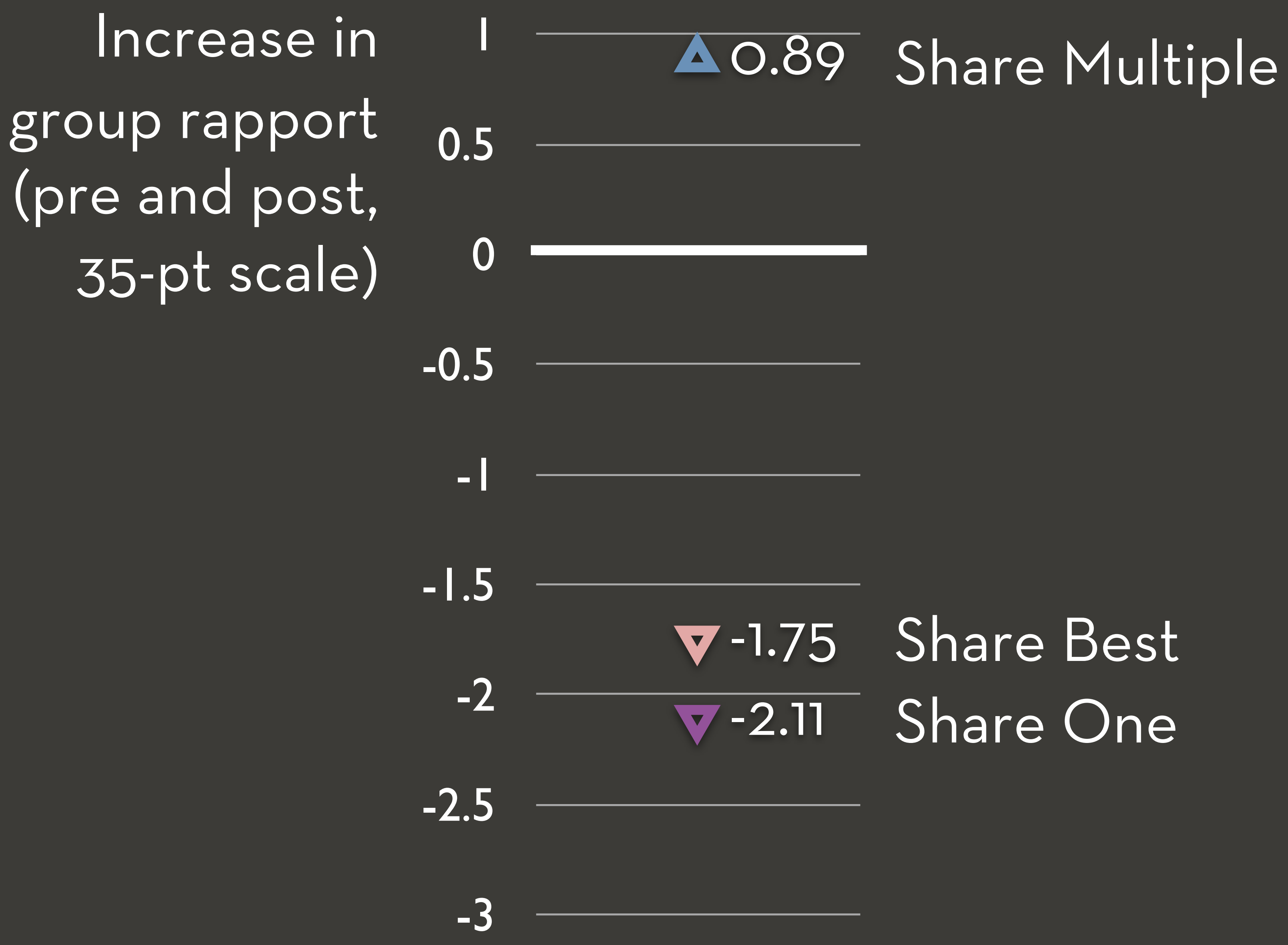
# Group rapport measure

- What overall **impression** did your peer make?
- How **satisfied** are you with the peer interaction?
- How much do you **trust** your peer?
- Do you have a foundation for **future interactions** with your peer?
- Which picture best describes your **relationship** with your peer:


SELF
OTHER
SELF
OTHER
SELF
OTHER
SELF
OTHER
SELF
OTHER

Curhan, *et al.*, 2006; Aron, *et al.*, 1992

# Group rapport rose for partners who shared multiple



F(2,83)=4.147, $p<0.05$

# Benefits of sharing multiple

- Better comparison
- More individual exploration
- More feature sharing
- Increase in group rapport
- More conversational turns

# Future work

- How can we encourage groups to meaningfully explore alternatives?

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- How can parallel prototyping help people develop expertise in design?

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- How can we encourage groups to meaningfully explore alternatives?
- How can parallel prototyping help people develop expertise in design?
- How do prototyping dynamics affect online creative collaboration?

# hci.stanford.edu/prototyping

Authors
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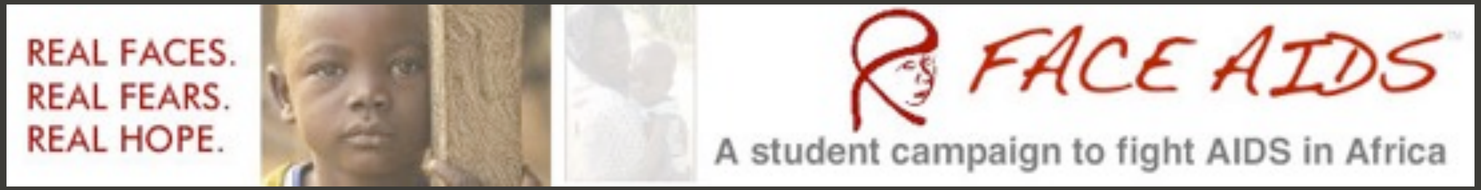
REAL FACES.
REAL FEARS.
REAL HOPE.
FACE AIDS
A student campaign to fight AIDS in Africa

Make a difference in their lives.
Start a local chapter today.
FACE AIDS

THINK GLOBALLY, ACT LOCALL
FACE AIDS TODAY
Click to Learn More

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*Hasso Plattner Design Thinking Research Program*