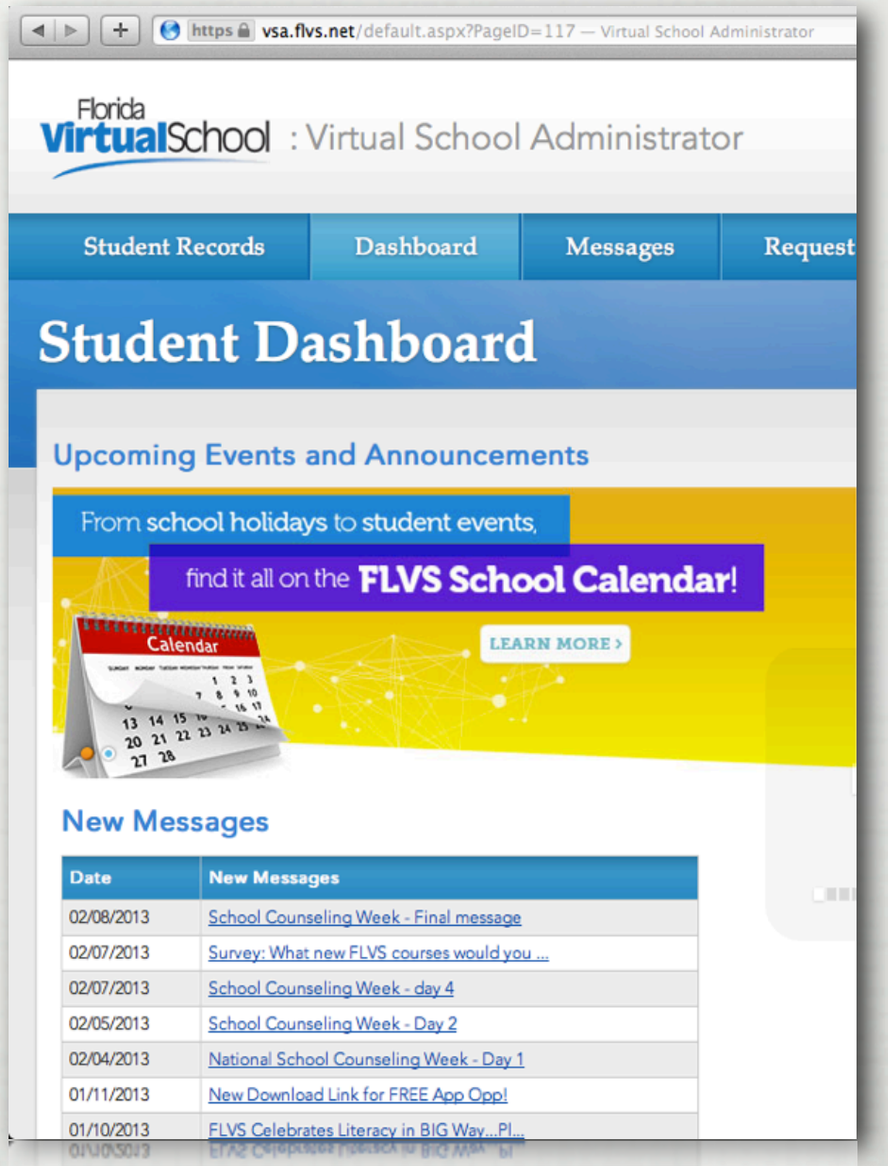
The Effects of a Web-Based Application on the Cognitive Processing of Students

Part of a Three Year Study on the Implications of Adding Technology into the Traditional Classroom Environment

Caitlyn Ralph

WHY?

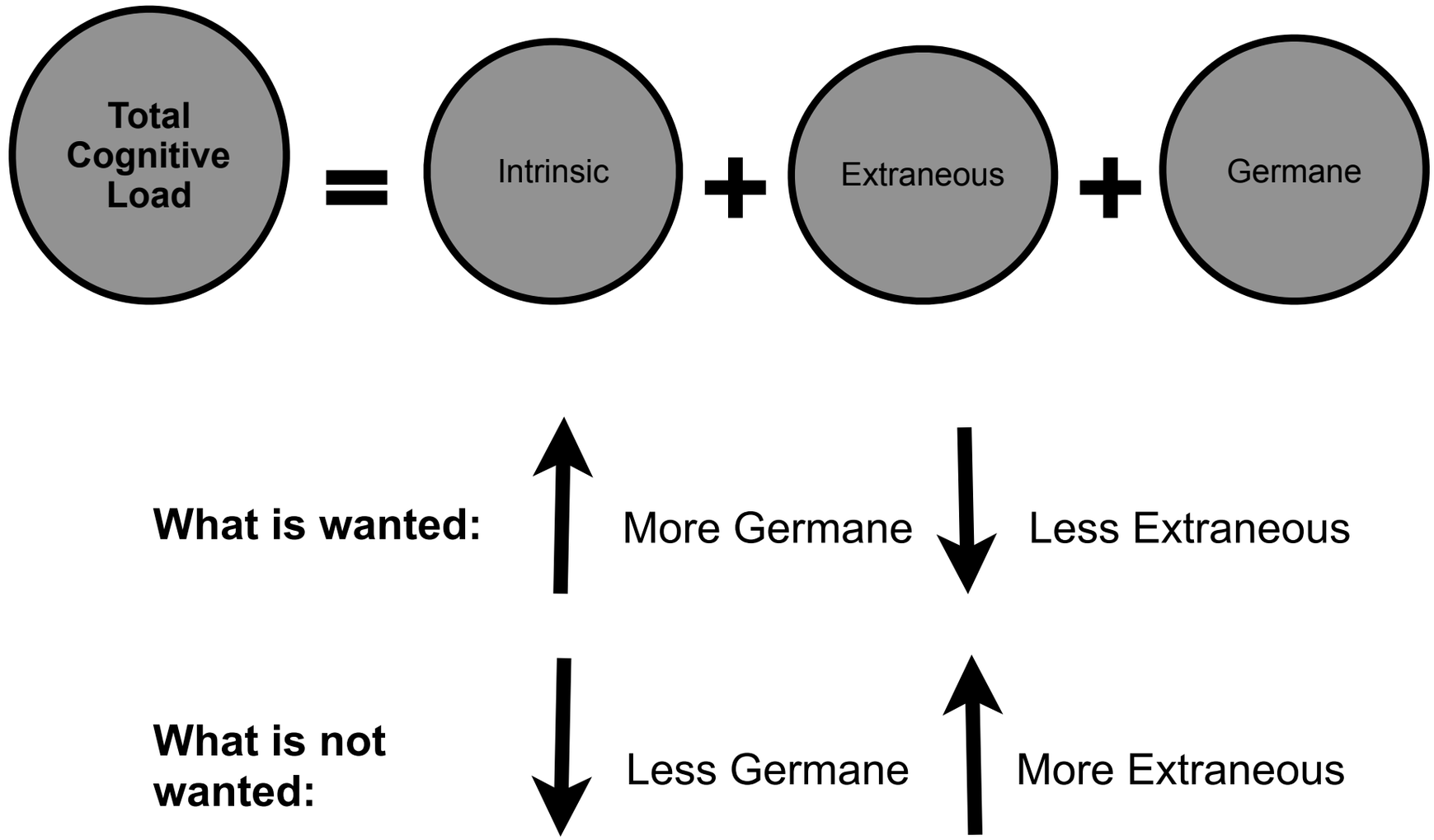
- The twenty-first century's change in learning
  - Online testing (FCAT, EOC)
  - Online classes (FLVS, SCVS)
- Need to test and analyze these alterations effect on learning



WWW.FLVS.NET

Previous Years' Studies

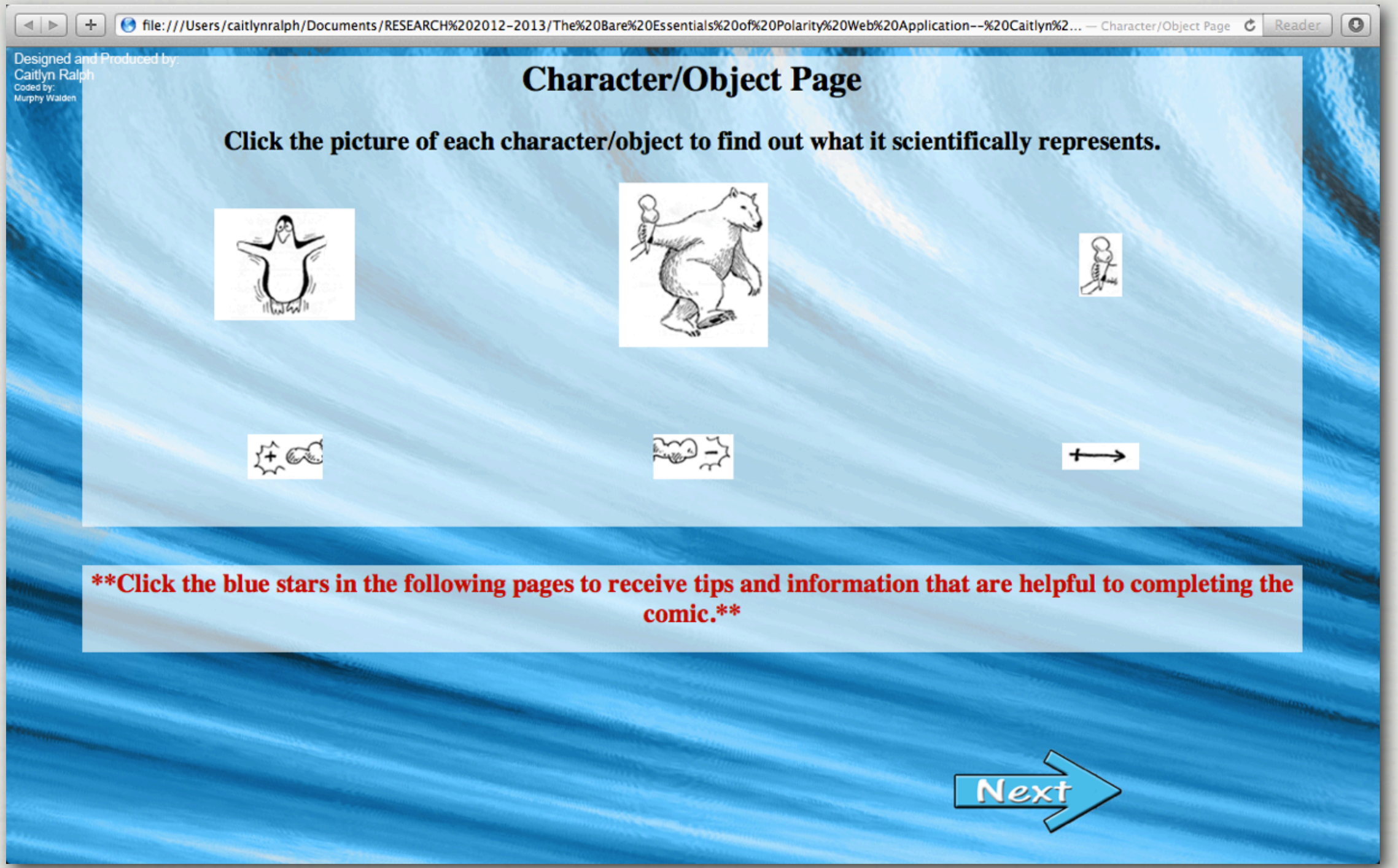
- 9th grade: Face-to-face (traditional) vs. webcam (technological) tutoring
- 10th grade: Face-to-face vs. webcam immediacy (group working interactions)
  - Elementary/middle school students
- Traditional environment more efficient



Cognitive Diagrams

How?

- ☐ **Paper-based comic activity (traditional method)**
  - ☐ **Redesigned with four parts**
- ☐ **Web-based application (technological method)**
- ☐ **Information is identical (intrinsic cognitive load)**
- ☐ **130 students (32 traditional/98 technological)**



Web-Based Application

file:///Users/caitlynralph/Documents/RESEARCH%202012-2013/The%20Bare%20Essentials%20of%20Polarity%20Web%20Application--%20Caitlyn... — Bare Essentials of Polarity

Reader

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Coded by:
Murphy Walden

The BARE ESSENTIALS of POLARITY

You don't have to go to the ends of the earth to find POLAR MOLECULES. They're all over the place. A polar molecule is just a molecule with a difference in electrical charge between two ends.

Questions

1. How does the comic book define a "polar molecule"?

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Web-Based Application

file:///Users/caitlynralph/Documents/RESEARCH%202012-2013/The%20Bare%20Essentials%20of%20Polarity%20Web%20Application--%20Caitlyn%20Ralph/3.html — Page One Reader

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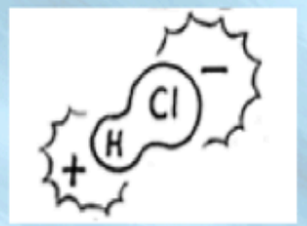
The electrical imbalance of polarity is caused by differences in **ELECTRONEGATIVITY** between atoms. Electronegativity is the ability of an atom/nucleus to attract bonding electrons toward itself.

Tip Tip



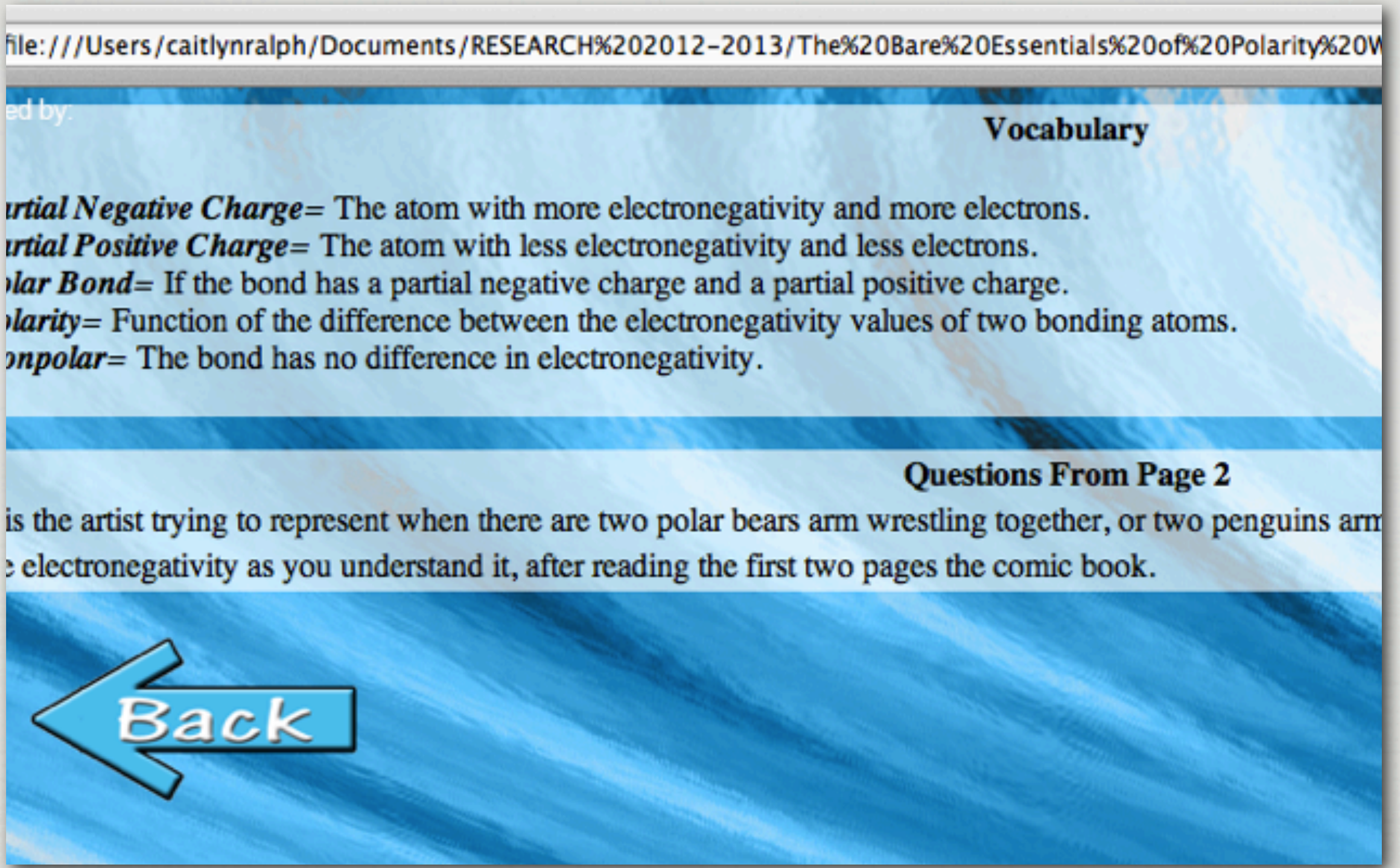
In HCI, the bonded pair of electrons spends more time near the chlorine's nucleus because chlorine is more electronegative than hydrogen.

The periodic table shows a general trend in the electronegativity of the elements. Electronegativity tends to rise as you move "northeast" on the periodic table, and fall as you move "southwest."

Tip Tip

Tip

Web-Based Application



Web-Based Application

Unpaired T-Test P-Values

	P-Value	Significant?
Accuracy	0.0017	Yes
Survey	0.2836	No
Mental Effort	0.936	No
Training Efficiency	0.9695	No

Means and Standard Deviations

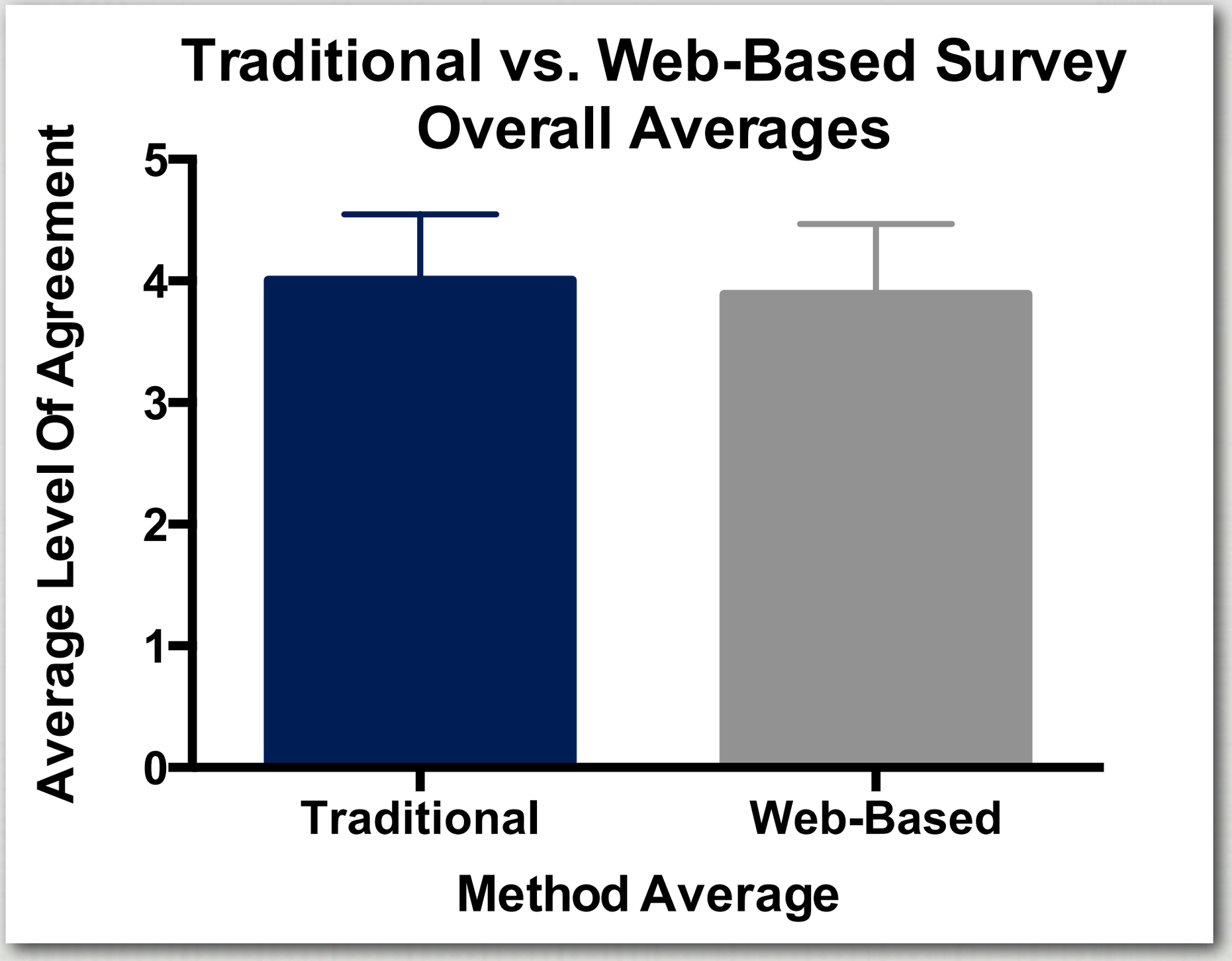
	Mean	Standard Deviation
Traditional Accuracy	86.96	16.54
Web-Based Accuracy	76.34	17.57
Traditional Survey	4.005	0.5412
Web-Based Survey	3.89	0.5768
Traditional Mental Effort	5.579	1.536
Web-Based Mental Effort	5.555	1.561
Traditional Training Efficiency	-0.00000004549	1.052
Web-Based Training Efficiency	0.007711	1.01

Training Efficiency Formula

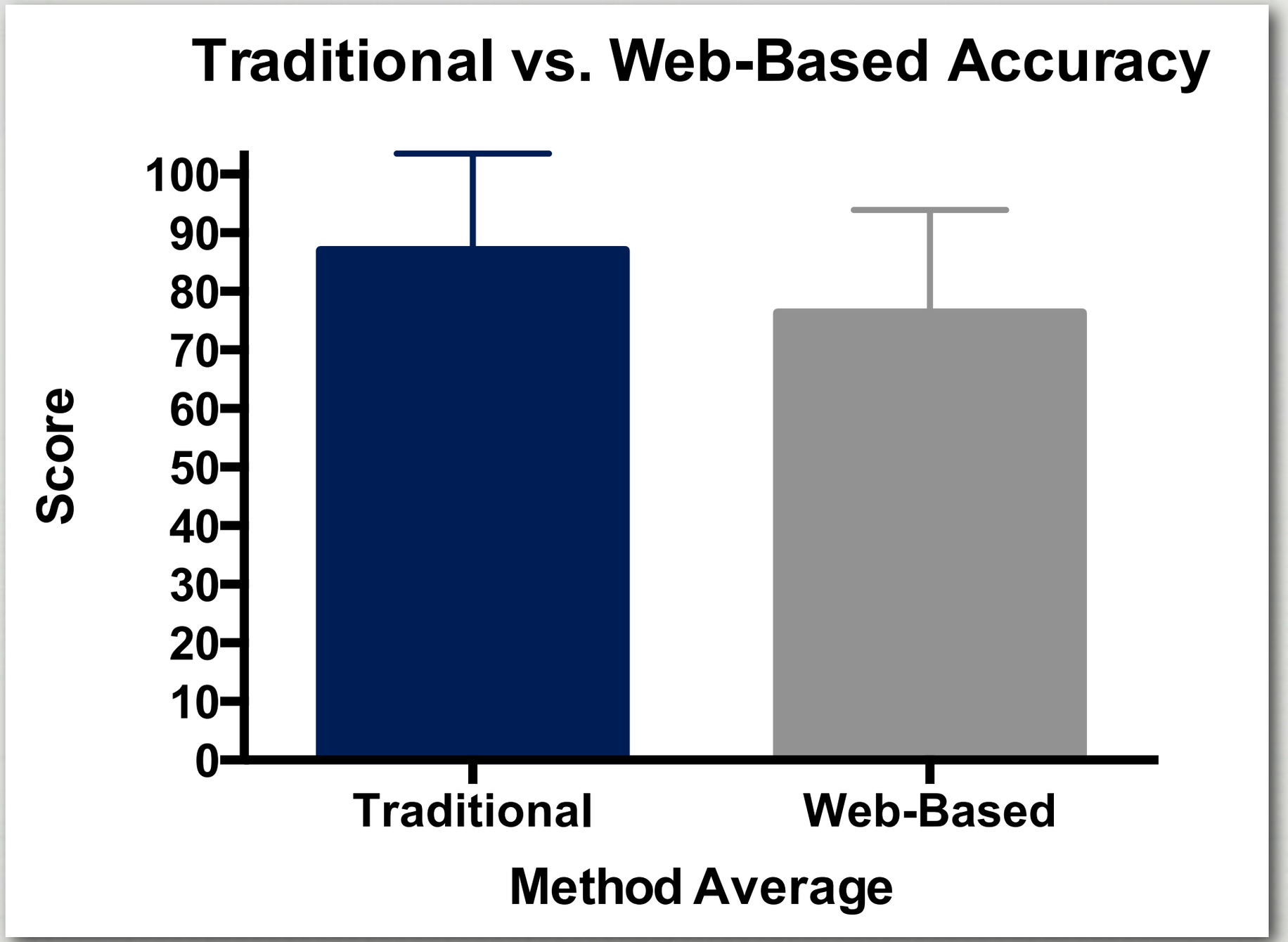
Efficiency (**E**) is positive when **performance** (**P**) > **mental effort** (**M**), negative if **P** < **M**, and zero if **P** = **M**. Ideally, **M** < **P**, therefore the more efficient a strategy, the higher **E** value.

$$E = P - M / \sqrt{2}$$

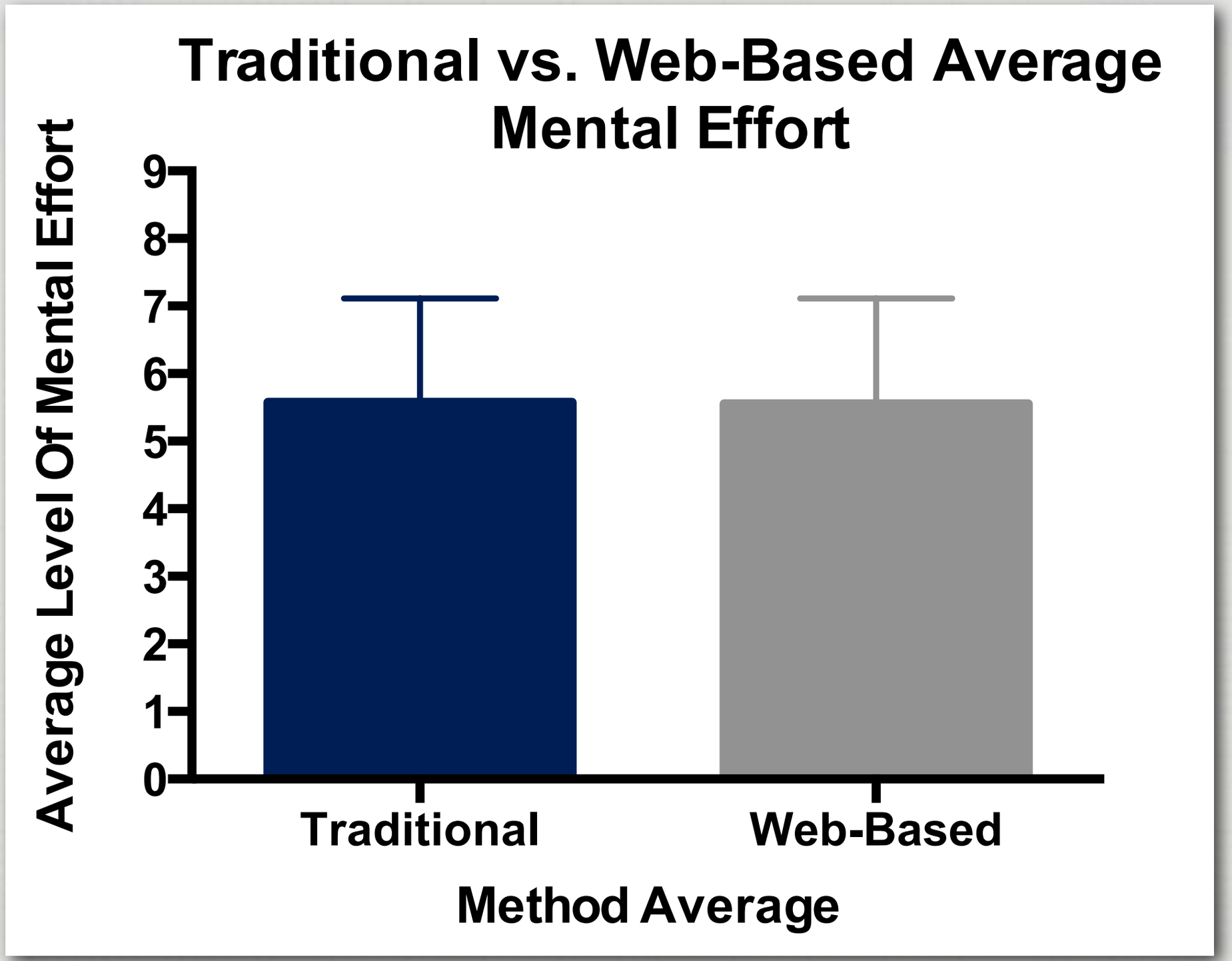
Data Analysis


Traditional vs. Web-Based Survey
Overall Averages
Average Level Of Agreement
5
4
3
2
1
0
Traditional
Web-Based
Method Average

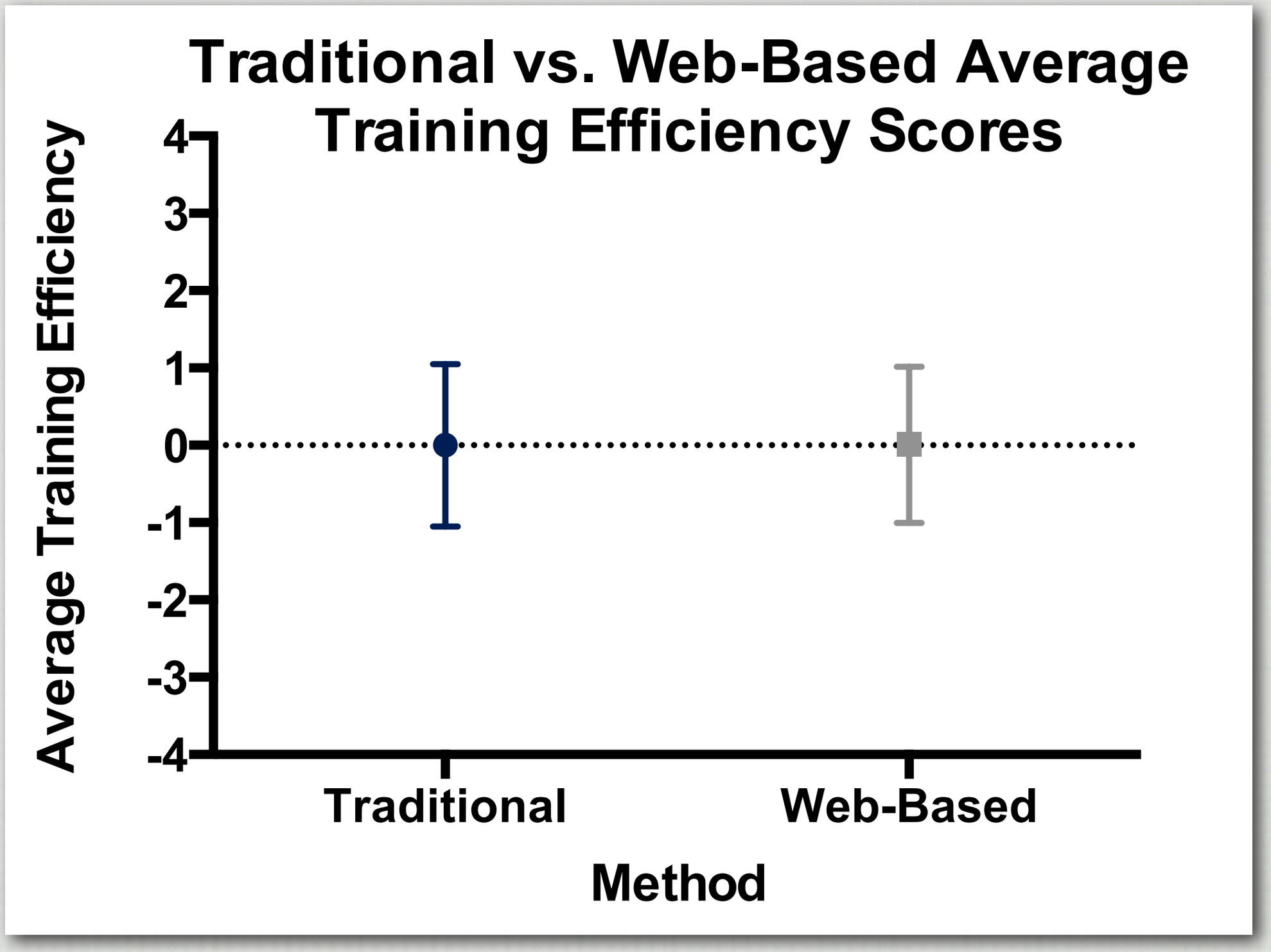
Graphs


Traditional vs. Web-Based Accuracy
Score
100
90
80
70
60
50
40
30
20
10
0
Traditional
Web-Based
Method Average

Graphs


Traditional vs. Web-Based Average Mental Effort
Average Level Of Mental Effort
9
8
7
6
5
4
3
2
1
0
Traditional
Web-Based
Method Average

Graphs


Traditional vs. Web-Based Average Training Efficiency Scores
Average Training Efficiency
4
3
2
1
0
-1
-2
-3
-4
Traditional
Web-Based
Method

Graphs

Conclusions and Discussion

- ☐ **Activity was successful (based on the means)**
- ☐ **Limited difference between traditional and technological methods**
- ☐ **Relationship with previous studies**
  - ☐ **Inverse relationship**
  - ☐ **Younger students: Gradual incorporation**
  - ☐ **Older students: More rapid**
  - ☐ **All ages: Progressive exposure (increase experience/accuracy)**
- ☐ **Other ramifications**

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