Visualizing Moon Phases in the Classroom with WorldWide Telescope

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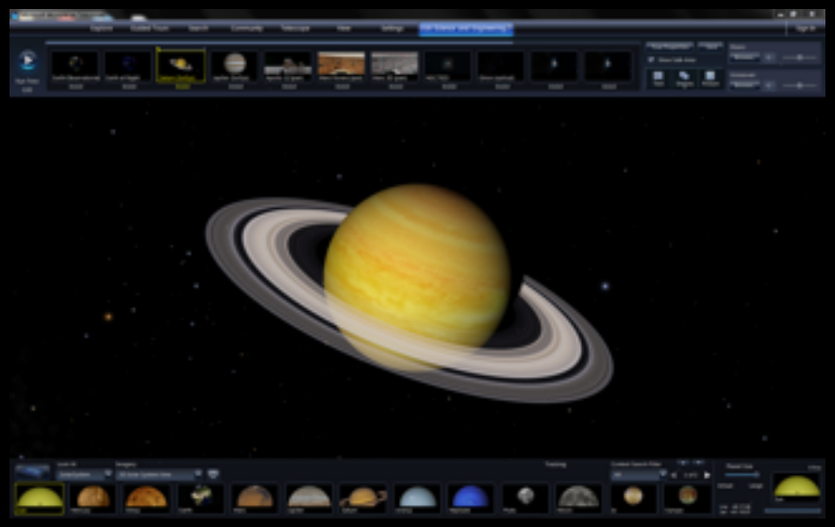

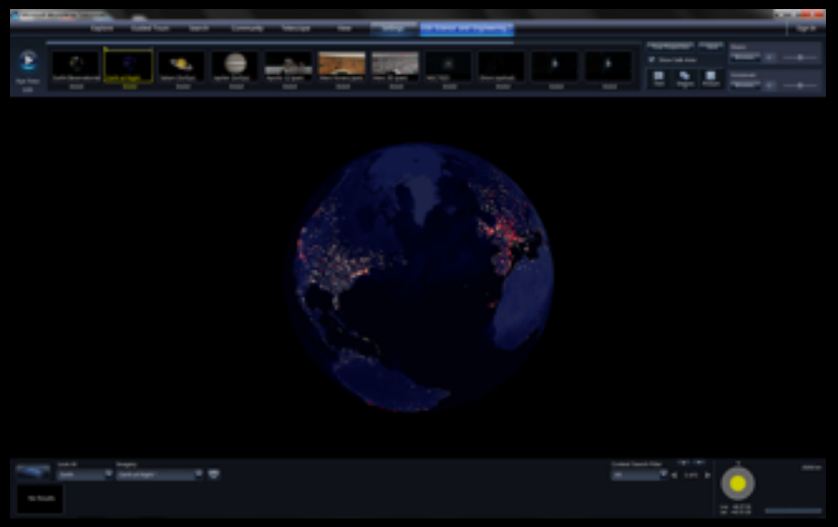

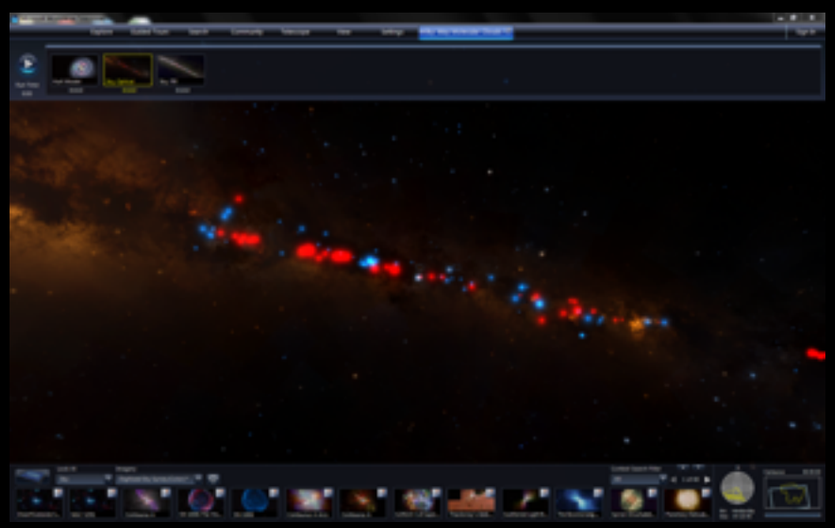

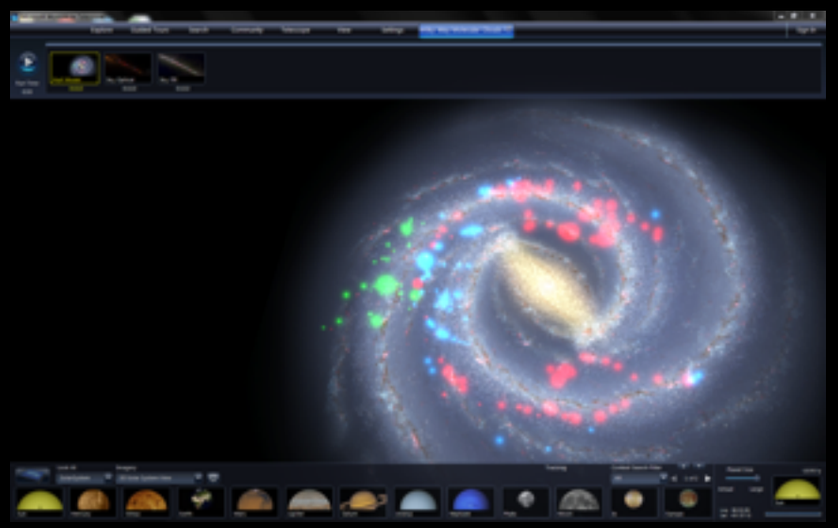

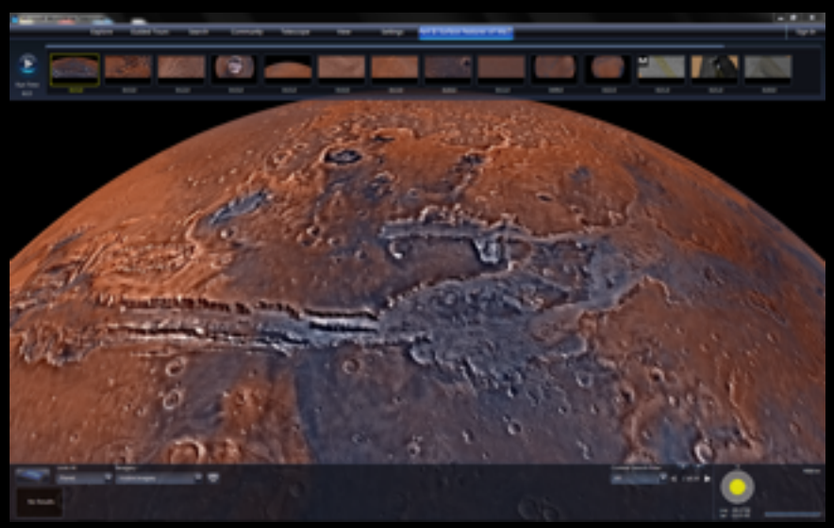

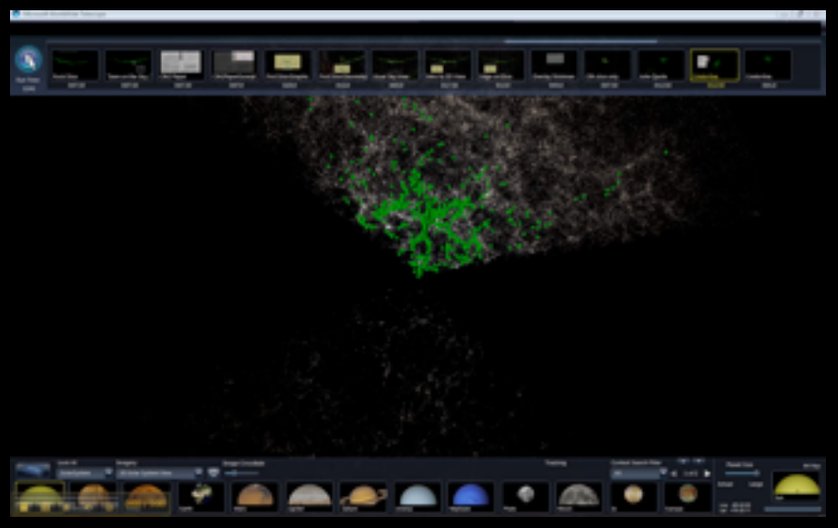

Experience WWT at **worldwidetelescope.org**

Challenge: Can novice astronomy students really make meaning from something so complex?

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Uttal & Doherty (2008): Provide scaffolding to help students connect components in visualization to parts they represent

WWT vs Simple 2D simulator
(both in conjunction with styrofoam ball/lamp model)

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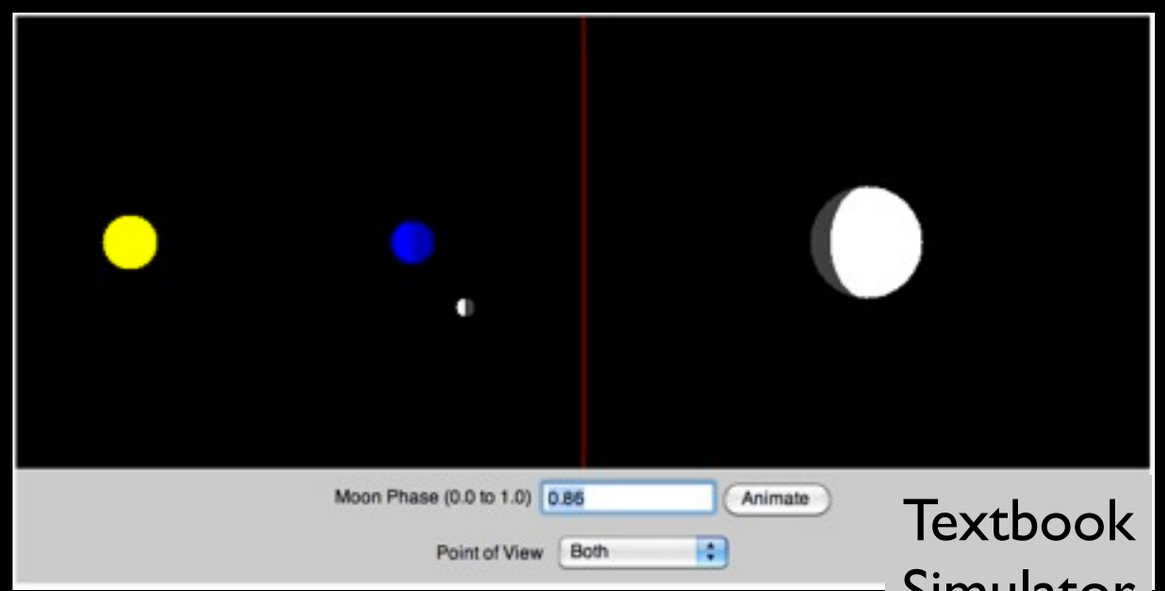

Textbook Simulator

Phase 1: Learning Comparison
WWT vs Textbook Simulator
(both with styrofoam/lamp model)

	Avg Pretest score out of 7 (stdev)	*Avg Posttest score out of 7 (stdev)*	*Gain*	*Effect Size*
WWT (N=39)	2.7 (1.2)			
Textbook Simulator (N=38)	2.6 (1.2)			

Phase 1: Learning Comparison
WWT vs Textbook Simulator
(both with styrofoam/lamp model)

Astronomy and Space Science Concept Inventory (Sadler et al 2009)

	Avg Pretest score out of 7 (stdev)	*Avg Posttest score out of 7 (stdev)*	*Gain*	*Effect Size*
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WWT (N=39)	2.7 (1.2)	5.1 (1.3)		
Textbook Simulator (N=38)	2.6 (1.2)	4.3 (1.4)		

Phase 1: Learning Comparison
WWT vs Textbook Simulator
(both with styrofoam/lamp model)

Astronomy and Space Science Concept Inventory (Sadler et al 2009)

	Avg Pretest score out of 7 (stdev)	*Avg Posttest score out of 7 (stdev)*	*Gain*	*Effect Size*
WWT (N=39)	2.7 (1.2)	5.1 (1.3)	2.5	
Textbook Simulator (N=38)	2.6 (1.2)	4.3 (1.4)	1.7	

Phase 1: Learning Comparison
WWT vs Textbook Simulator
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WWT (N=39)	2.7 (1.2)	5.1 (1.3)	2.5	**2.0**
Textbook Simulator (N=38)	2.6 (1.2)	4.3 (1.4)	1.7	1.5

Phase 1: Learning Comparison
WWT vs Textbook Simulator
(both with styrofoam/lamp model)

Astronomy and Space Science Concept Inventory (Sadler et al 2009)

	Avg Pretest score out of 7 (stdev)	*Avg Posttest score out of 7 (stdev)*	*Gain*	*Effect Size*
WWT (N=39)	2.7 (1.2)	5.1 (1.3)	2.5	**2.0**
Textbook Simulator (N=38)	2.6 (1.2)	4.3 (1.4)	1.7	1.5

These students continued to explore WWT independently!

Phase 2: Order Comparison

Styrofoam→WWT vs. WWT→Styrofoam

	Low Prior Knowledge (pretest score < 3 of 5)	*High Prior Knowledge (pretest score ≥ 3 of 5)*
Styrofoam→ WWT		
WWT→ Styrofoam		

Phase 2: Order Comparison

Styrofoam→WWT vs. WWT→Styrofoam

	Low Prior Knowledge (pretest score < 3 of 5)	*High Prior Knowledge (pretest score ≥ 3 of 5)*
Styrofoam→ WWT	ES=2.0 *(N=51)*	
WWT→ Styrofoam		

Phase 2: Order Comparison

Styrofoam→WWT vs. WWT→Styrofoam

	Low Prior Knowledge (pretest score < 3 of 5)	*High Prior Knowledge (pretest score ≥ 3 of 5)*
Styrofoam→ WWT	ES=2.0 *(N=51)*	
WWT→ Styrofoam	ES=2.1 *(N=37)*	

Phase 2: Order Comparison

Styrofoam→WWT vs. WWT→Styrofoam

	Low Prior Knowledge (pretest score < 3 of 5)	*High Prior Knowledge (pretest score ≥ 3 of 5)*
Styrofoam→ WWT	ES=2.0 *(N=51)*	
WWT→ Styrofoam	ES=2.1 *(N=37)*	ES=1.1 *(N=26)*

Phase 2: Order Comparison

Styrofoam→WWT vs. WWT→Styrofoam

	Low Prior Knowledge (pretest score < 3 of 5)	*High Prior Knowledge (pretest score ≥ 3 of 5)*
Styrofoam→ WWT	ES=2.0 *(N=51)*	ES=-0.4 *(N=20)*
WWT→ Styrofoam	ES=2.1 *(N=37)*	ES=1.1 *(N=26)*

Phase 2: Order Comparison

Styrofoam→WWT vs. WWT→Styrofoam

	Low Prior Knowledge (pretest score < 3 of 5)	*High Prior Knowledge (pretest score ≥ 3 of 5)*
Styrofoam→ WWT	ES=2.0 *(N=51)*	ES=-0.4 *(N=20)*
WWT→ Styrofoam	ES=2.1 *(N=37)*	ES=1.1 *(N=26)*

ttest
p=0.3%

Learn more about the WWT Moon Lab
(and WWT labs for ASTRO 101)

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https://wwtambassadors.org/wwt/WWT-MoonPhasesVizLab

Or *Email* pudompra@cfa.harvard.edu