Advancing the Quality of Physics Teaching using Peer Instruction

Long Island Physics Teachers’ Association
Manhasset High School
28 October 2023, Manhasset, NY
quick reflection

think of something you are good at
quick reflection

how did you become good at that?
an illusion...
1. transfer of information
1. transfer of information

2. assimilation of that information
1. transfer of information (in class)

2. assimilation of that information
1. transfer of information (in class)

2. assimilation of that information (out of class)
1. transfer of information (in class)

2. assimilation of that information (out of class)

Should focus on THIS!
1. transfer of information (in class)

2. assimilation of that information (out of class)
1. transfer of information (out of class)

2. assimilation of that information (in class)
1. transfer of information (out of class)

2. assimilation of that information (in class)
question
question

think
question
→
think
→
poll
question

think

poll

discuss
question

think

poll

discuss

repoll
question
think
poll
discuss
repoll
explain
Archimedes Principle
An object submerged either fully or partially in a fluid experiences an upward buoyant force the magnitude of which is equal to the magnitude of the force of gravity exerted on the fluid displaced by the object.
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The volume of displaced fluid is equal to the volume of the submerged portion of the object.
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A boat carrying a large boulder is floating on a small pond. The boulder is thrown overboard and sinks to the bottom of the pond.
A boat carrying a large boulder is floating on a small pond. The boulder is thrown overboard and sinks to the bottom of the pond.

After the boulder sinks to the bottom of the pond, the level of the water in the pond is

1. higher than
2. the same as
3. lower than

it was when the boulder was in the boat.
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1. higher than
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3. lower than

it was when the boulder was in the boat.

Before I tell you the answer, let’s analyze what happened.
A boat carrying a large boulder is floating on a small pond. The boulder is thrown overboard and sinks to the bottom of the pond. After the boulder sinks to the bottom of the pond, the level of the water in the pond is

1. higher than
2. the same as
3. lower than

it was when the boulder was in the boat.

Before I tell you the answer, let’s analyze what happened. You…
A boat carrying a large boulder is floating on a small pond. The boulder is thrown overboard and sinks to the bottom of the pond. After the boulder sinks to the bottom of the pond, the level of the water in the pond is

1. higher than
2. the same as
3. lower than
   it was when the boulder was in the boat.

Before I tell you the answer, let’s analyze what happened. You…

1. made a commitment
A boat carrying a large boulder is floating on a small pond. The boulder is thrown overboard and sinks to the bottom of the pond. After the boulder sinks to the bottom of the pond, the level of the water in the pond is

1. higher than
2. the same as
3. lower than it was when the boulder was in the boat.

Before I tell you the answer, let’s analyze what happened. You...

1. made a commitment
2. externalized your answer
3. }
A boat carrying a large boulder is floating on a small pond. The boulder is thrown overboard and sinks to the bottom of the pond.

After the boulder sinks to the bottom of the pond, the level of the water in the pond is
1. higher than
2. the same as
3. lower than it was when the boulder was in the boat.

Before I tell you the answer, let’s analyze what happened. You…

1. made a commitment
2. externalized your answer
3. moved from the answer/fact to reasoning
A boat carrying a large boulder is floating on a small pond. The boulder is thrown overboard and sinks to the bottom of the pond.

After the boulder sinks to the bottom of the pond, the level of the water in the pond is
1. higher than
2. the same as
3. lower than it was when the boulder was in the boat.

Before I tell you the answer, let’s analyze what happened. You…

1. made a commitment
2. externalized your answer
3. moved from the answer/fact to reasoning
4. became emotionally invested in the learning process
A boat carrying a large boulder is floating on a small pond. The boulder is thrown overboard and sinks to the bottom of the pond.

After the boulder sinks to the bottom of the pond, the level of the water in the pond is

1. higher than
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it was when the boulder was in the boat.
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After the boulder sinks to the bottom of the pond, the level of the water in the pond is

1. higher than
2. the same as ✔
3. lower than ✔

it was when the boulder was in the boat.
remember: amount of displaced water
remember: amount of displaced water
remember: amount of displaced water
remember: amount of displaced water

displaced water
remember: amount of displaced water

displaced water $= \text{weight of rock}$
remember: amount of displaced water

discharged water = weight of rock

= volume of rock
remember: amount of displaced water

You won’t forget this.
points worth noting

- my “clear” lecture wasn’t very good
- discussion promoted “aha” moments
Peer instruction leads to higher learning gains.
Higher learning gains

<table>
<thead>
<tr>
<th>Normalized gain (%)</th>
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<tbody>
<tr>
<td>100</td>
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<tr>
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</tr>
<tr>
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</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>20</td>
</tr>
</tbody>
</table>

Lecturing
Higher learning gains
Better retention
Instruction
Education is not just about:

• transferring information

• getting students to do what we do
Education is not just about:

- transferring information
- getting students to do what we do

active engagement/social interaction a must!
for a copy of these slides

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Follow me! @eric_mazur