

TLC ACTIVITY



Floating and Sinking

PHASE FIRST

Teacher Learning Centre Chinyalisaur !

Date/Time: 24 April'2016, 4-6 PM

Venue: TLC Chinyalisaur

Theme: Floating & Sinking-Phase 1st

Facilitator: Avneesh Shukla

In the continuation of Chinyalisaur TLC activities the Chinyalisaur block team have planned to organized an activity on “floating and sinking” on 24 April'16. A group of 20 teachers and 5 APF members participated in same. The session starts with the brief welcoming and introduction of the members.

The facilitator initiated the session by introducing the topic and with the observation that floating sinking is not only the part of our text-books but in any daily life we observed numerous object which floats and sink. When we talked or think around floating and sinking what are those things or ideas which comes in our mind. The responses of the participants were as follows:

- Iron Nail
- Stone
- Water
- Wood
- Paper
- Cotton
- Oil
- Iron block
- Leaves
- Tree
- Water
- Thermocol
- Plastic
- Boat
- Ship
- Ice
- Archimedes'

By taking the responses of the participants the facilitator asked them to classify the above men-

tioned objects in the floating and sinking categories. The responses of the members fell under the following two categories:

S.No.	Floating objects	Sinking objects	Confused
1	Wood	Iron nail	Paper
2	Tree	Stone	Cotton
3	Oil	Iron block	Ship
4	Ice		Boat
5	Thermocol		
6	Plastic		
7	Leaves		

Then the facilitator put forth the question *is it the property of the objects to float or sink or anything else? A sound in unison came "No, its not the matter of property or not a property of matters it's due to some other factors i.e. weight, shape, displaced water, volume, density."* Then the facilitator again put a question that *can those objects that are sinking, can ever be float?* Suddenly all get puzzled and murmuring sounds scattered in all directions. After sometime a sound in unison came, "No, its not possible , we have always seen the nail, iron, stone sinking into the water. Then the facilitator took nails, iron block, aluminum block and marbles one by one and put them on the thermocol piece against the water surface and all get started to float on water surface which created a situation of wonder because it was something different to their prior perception.

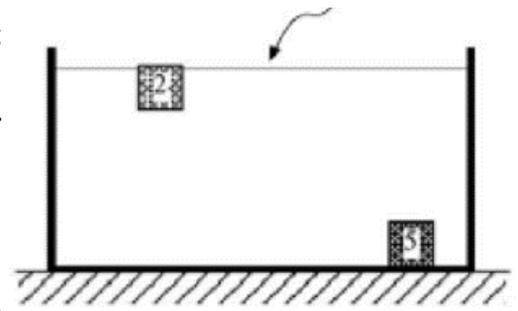
In continuation of this the facilitator asked that during classroom teaching learning processes or while dealing or thinking around floating and sinking, when wood and iron nail example comes i.e. whom will floats and whom will sink, what you called or what responses came in your mind? *Many of the participants responded that lighter and heavier factor i.e. **WEIGHT**. Wood is lighter object therefore it floats and iron or metallic objects are heavier therefore they sink, it means lighter object floats and heavier sink.*

By appreciating the reactions of the participants the facilitator took single marble and a heavy iron block (weight near about 156 g) with thermocol and asked participant that which one is lighter and heavier? A quick response from all came, marble is lighter and second one is heavier. Again the facilitator asked according to above weight concept, marble should float and heavy iron block with thermocol should float. Then the facilitator took both the object and released both into the water and observed that marble sank (lighter) and iron block with thermocol (heavier) floated. Similarly as iron nail (lighter) sink and boat or ship floats (heavier). A confusing environment created there and after a minute a sound came in unison that other factors are also playing role that might be shape of the object, density, volume, intermolecular distance, property of the liquid etc.

Holding this concept here facilitator introduced a problem task in front of all that:

Problem task 1:

There are five blocks of same shape and size (equal volume) but their masses are in increasing order as $m_1 < m_2 < m_3 < m_4 < m_5$. All the blocks are held approximately halfway down in a water filled container and then released. The final position of blocks 2 and 5 are shown in the figure. Sketch the final position of block 1, 3 and 4.



After thinking for a while the participants shared the opinion or conditions which were as follows:

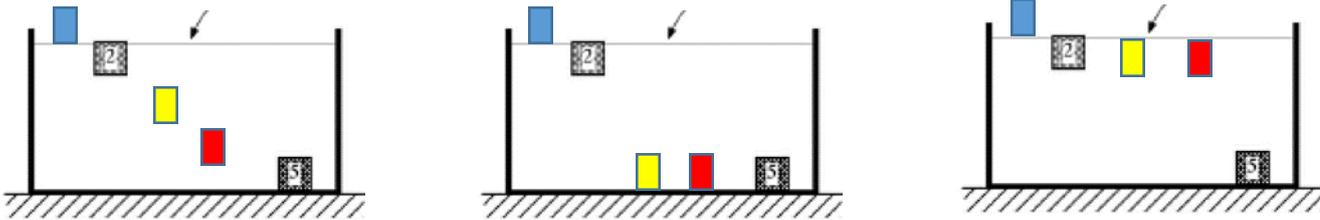


Figure 1

Blocks of different masses are represented as follows.

m_1 : blue block

m_3 : yellow block

m_4 : red block

Then the facilitator introduced all that similar kind of investigation were happens with the 2000 scholar of University of Washington and California state University in 2006. their responses were somehow like above. Then the facilitator introduced three more cases in-front of all which were like bellows:

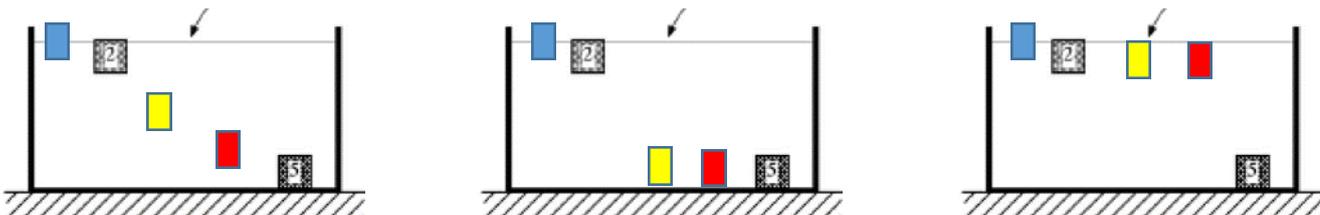


Figure 2

After this the facilitator asked is there any difference between above mentioned figures? After thinking for a minute the participants responded that “Yes, in first (figure 1) series figure block 1 is floating above the water surface and in below one it’s some part is submerging in water. By appreciating this response the facilitator again asked have you even seen any objects who is floating but haven’t have any part submerged in water. A sound in unison came that we have seen wood in water and observed that its some part be always submerged in water. Then we took a wooden object and released it into water and observed that its some part were submerged in water. Then the facilitator explained that for every floating object it is necessary that some part of it should be submerge in water. Paper, thermocol, leaves etc. are interesting for this phenomenon. Their some part also submerged in water but this is our eyes limitation we can’t observed this due to lesser submerged part. May be we can see it through any magnifier.

Then the facilitator asked all the participants to focus on second series of conditions (figure 2) and their opinions, which were as follows:

- Block will float and sink according to their weights and weights are in increasing order so the order will also in increasing order as ladder i.e. condition first.
- We fixed blocks by taking block 2 and 5 as references.
- Since block 2 is floating and block 1 having less weight (mass) than block 2 it means it is lighter than 2 so it will float.
- We are confused about the position of the block but might be due to increasing weight condition first may be.
- Since block 3 and 4 having greater weight than 2 therefore they will sink as block 5 i.e. condition 2.
- Since block 3 having greater mass than block 2 and less than block 5 as compared to block 4 so condition 3 may be possible.
- We are not sure about condition 3rd but it might be.

After that facilitator took blocks (wood, rubber, aluminum and iron) with increasing masses or weight and held approximately halfway down in a water filled container and then released & observed the following condition.

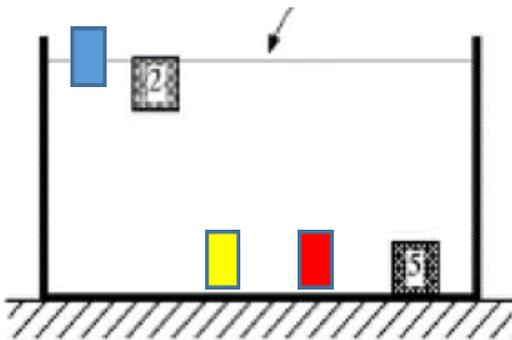


Figure 3

Some of the participants responded that density might be playing role. By appreciating this the facilitator put a view that initially we were focused on weight factor i.e. heavier objects sink and lighter floats or fixed the positions of block according to the their weight. But now we move towards density so the density of the objects is defined as:

Density = mass/volume

We have mass and volume of the objects so we can calculate the density of the objects by above mentioned mathematical expression. The blocks having same volume so their density will increases according to their weights. Which will:

$$d1 < d2 < d3 < d4 < d5$$

Where $d1$, $d2$, $d3$, $d4$ and $d5$ are the densities of the blocks having masses $m1$, $m2$, $m3$, $m4$ and $m5$ respectively. The weight, volume and densities of the blocks are as follows:

Objects	Weight (gram)	Volume (cubic centimeter)	Density (gram per cubic centimeter)
Wood block 1	8.14	17.7	0.46
Wood block 2	15.75	17.7	0.88
Rubber block	28.21	17.7	1.59
Aluminum block	50.42	17.7	2.85
Iron block	152.65	17.7	8.62
Water	-	-	1 (Generally)

Then the facilitator asked all the participants that are you able to find any pattern from above mentioned data? By looking closely to the table the participants responded that:

Wooden block have lesser density than water they are floating and rubber, aluminum and iron block have higher density than water they are sinking it means any object having more density than water will sink and those having lesser density will floats.

Then the facilitator told them that by applying this concept on the above problem task give their opinion. They responded that:

Since densities are in increasing according to the masses or weight of the objects since volume is constant and block 1 having less mass than block 2 therefore it have less density than block 2. Since block 2 is floating it means it have less density than water i.e. block 1 have lesser density than block 2 and water so it will also float. Block 3rd and 4th having higher masses so it is possibility that they have higher density than block 2 as well as than water so they will sink. Therefore condition according to figure 3rd is possible.

Then the facilitator introduced one more condition in front of all and asked is it possible or not?

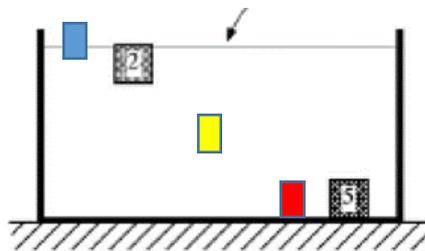


Figure 3

Without losing a second some of the participant responded that “No, Its impossible, we haven’t see any object like that, it may be possible if the density of the object will equal or approximately equal to the water/liquid.” By appreciating the responses of the participant we screened a video which shows the sinking of raw egg like figure 3 i.e. in the middle of container/jar. and also mix it. By ensuring salts has mixed in second and third cup add few amount of water in third glass.

Then the facilitator explained that out of above condition mentioned figure 3rd seems to be most probable it may occurs in the case when the density of block 3 is just equal to the density of water. You can also observed it in different kind of rubber materials.

Then one of the participants put his view that without introducing density just on the basis of weight factor can we can't explain floating and sinking? Then the facilitator explained that explaining floating and sinking only on the basis of weight may create confusion among the students as lighter floats and heavier sink. When they will face the nail and boat case that will definitely counter their perception as previously we were focused in weight factor but when these factors does not plays strongly we moves towards other factors as in problem task.

The whole activity concluded with sharing of the reading “biography of the Archimedes”, the famous story related with Archimedes’ and emphasized that while dealing with this concept with the students we should explain or dealt others factors minimizing the misconceptions & the second phase of floating and sinking i.e. Archimedes Principle, Buoyancy force etc. overall it was a good session as time spent members participated actively. Vivek Bhai ensured all the members for organizing similar kind of activities in up-coming days.

Reactions of the members

सत्र काफ़ी सराहनीय रहा | मै फाउंडेशन की ओर से होने वाली हर वर्कशॉप और मीटिंग में प्रतिभाग करता हूँ और मेरी पुरानी कुछ अवधारणायें टूटती हैं कुछ ओर पुक्ता होती हैं और कुछ नयी बनती हैं |

सुन्दर नौटियाल जी

सत्र में प्रयुक्त सामाग्री को हम भी आसानी से arrange कर सकते हैं और बच्चों के साथ इस तरह की गतिविधि करेंगे तो शायद उनको भी कुछ नया एहसास होगा |

सत्र से आज मुझे पहली बार पता चला कि कोई वस्तु बीच में भी तैर सकती है (चित्र 3) जो कि बराबर घनत्व के केस में हुआ |

ए.पी.एफ. की इस तरह की पहर काबिले-तारीफ़ है, आगे भी इस तरह के प्रयास होने चाहिए |

मुकेश नौटियाल जी