**Table 1.** Title: Questionnaire sample Caption: The 4 statements used for statistical analysis are stated in the table Questionnaire sample. Please select the answer you think it is matching your opinion for each statement.

| Questions | (A) Agree | (B) Neutral | (C) Disagree | (D) Do not know |
|---|---|---|---|---|
| 1. Learning Science, Technology, Engineering and Math (STEM) is important for my future success | | | | |
| 2. We live in a better world because of science, Technology, Engineering and Math (STEM) | | | | |
| 3. I have the skills to implement a scientific experiment | | | | |
| 4. I would like to have a career as a scientist or a researcher | | | | |

**Table S2.** Title: Example of Evaluation Rubric handed to judges Caption: All the criteria that is checked for evaluating a project is pointed in the table.

| No. | Presentation | Below Avg. (1 to 3) | Satisfactory ( 4 to 6 ) | Excellent ( 7 to 9 ) |
|---|---|---|---|---|
| 1. | Organization/planning | Many details are present but not in a logical or sequential order | Details are presented in a sequence | A clear and concise presentation of formulating the entire product is presented |
| 2. | Quality of slides/Pictures/Movie | The slides are documented without animation | Limited number of animated slides | Attractive presentation with graphics and sound |
| 3. | Students' self confidence | Shy to little confidence in presenting the project | Confidence displayed throughout the presentation | Presenter mastered in confidence |
| 4. | Research methodology | Lack of understanding of research problem which is presented in the slides | Research study and method are present but misleading without proper sequence in explanation | Well defined Research study objectives and methods with clear understanding |
| 5. | Critical thinking | Acceptable ideas are presented to solve problems | Relevant ideas with clear justification is presented | Relevant presentation of ideas with thoroughly explained concepts that are new. |
| 6. | Team work efficiency | Contributions from each team member was not available | Contributions from each team member is present but lack of coordination is visible | Well coordinated presentation of contributions to the research from each team member |
| | **Total** | | | |

| | Product | Below Avg. ( 1 to 3 ) | Satisfactory ( 4 to 6 ) | Excellent (7to 9 ) |
|---|---|---|---|---|
| 1. | Creativity of the idea (creativity in the mould/ using of materials) | The presentation of creativity in the mould/ using of materials fits the criteria but no out of box thinking | Limited expression of unique ideas which are previously present | Out of box thinking with uniqueness in different features/ applications |
| 2. | Utilization of equipment | Use of appropriate materials but not sustainable | Use of appropriate materials sustainable but not economical | Use of appropriate sustainable materials. |
| 3. | Quality of Work (design/shape/colors) | Lack of completion in finishing is visible | Finishing can be improved | Finishing of the product is commentable |
| | **Total** | | | |

| | Boat Testing | Below Avg. ( 1 to 3 ) | Satisfactory ( 4 to 6 ) | Excellent (7to 9 ) |
|---|---|---|---|---|
| 1. | Floating < 5 sec. | **Floating is observed but the boat is touching the sides of water** | **Floating is observed and the boat is not touching the sides of water but rocking from side to side** | **A steady floating is observed** |
| 2. | Floating < 60 sec. | **Floating is observed but the boat is touching the sides of water** | **Floating is observed and the boat is not touching the sides of water but rocking from side to side** | **A steady floating is observed** |
| 3. | Add weights (total incremented weights) | **5g-100g** | **100g- 500 g** | **Exceeds 1000g** |

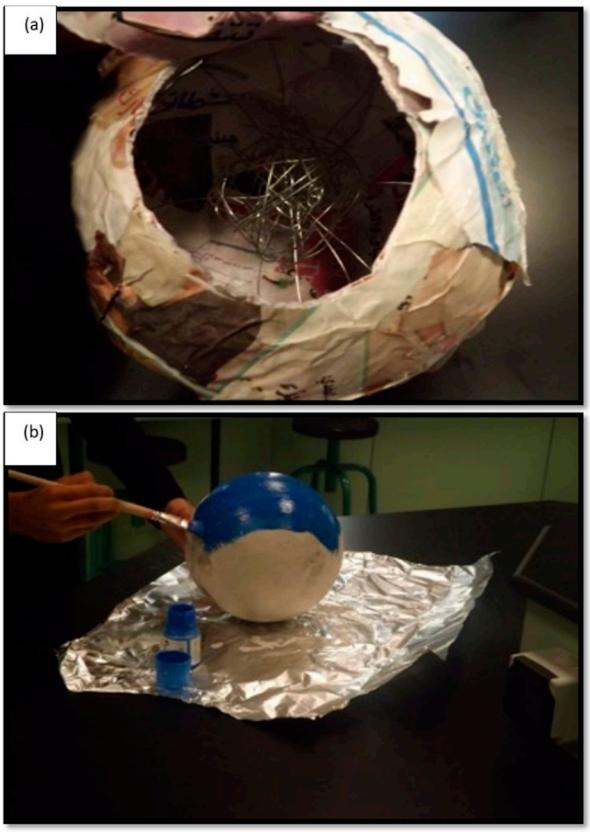


**Figure S1.** Title: Different stages of making a concrete bowling ball from making a mould to testing the end products Caption: (a) Reinforcements in the form of steel wires are added into the mould (b)The end product is undergoing finishing stage as the participants display their creative skills (c) Testing the product ball on the bowling ball testing pit.

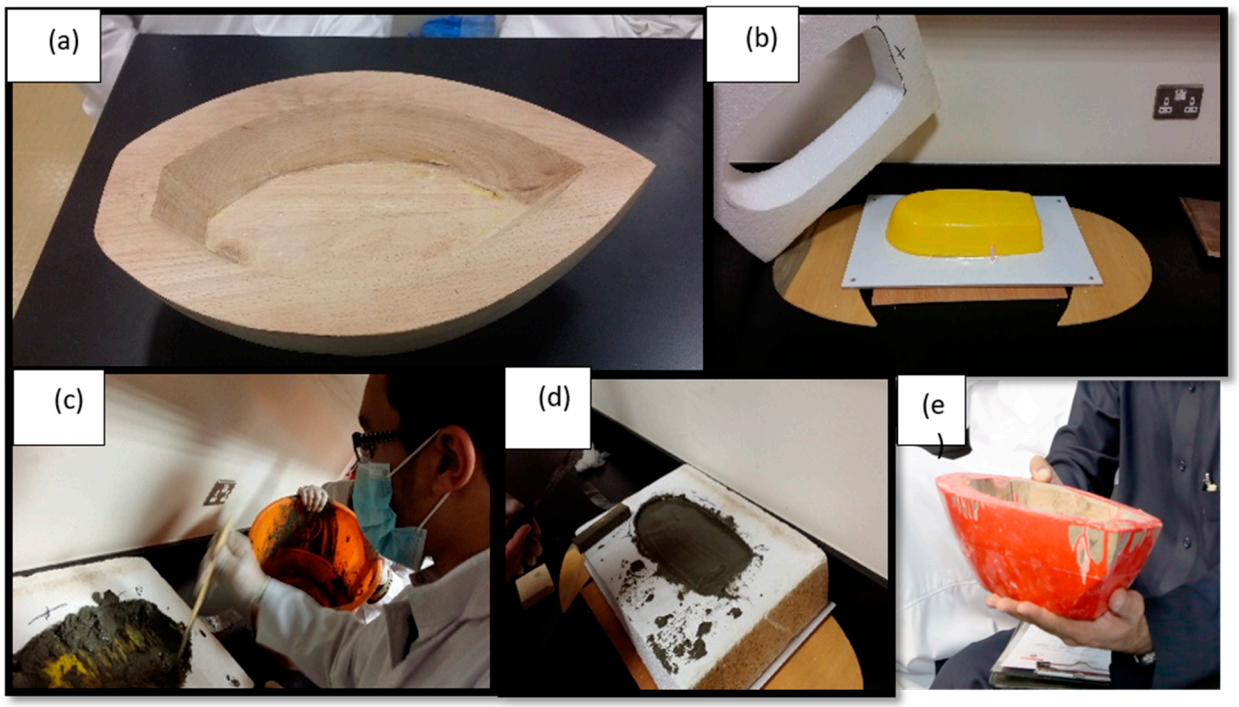


**Figure S2.** Title: Students during a concrete boat product challenge Caption: (a) Students either carve a wooden mould or else (b) they might even use a readymade mould. (c) Students are filling the moulds with concrete mixture ensuring that there are no air-bubbles. (d) Product of fresh concrete resting to dry. (e) A finished concrete boat during evaluation.



**Figure S3.** Title: A golf course is set up and tested by the students in the class. Caption: Students test their golf balls created, thereby examining the pros and cons of the product.

**The tables given below provide details for each cycle, obtained after conducting paired t-test, considering average mean of student responses for all the statements. These table data were consolidated and presented in table 7 given in main manuscript file.**

**Cycle 1**

Table S3. Paired-samples statistics (pre-post), (n = 51).

| Paired Samples Statistics | | | | | |
|---|---|---|---|---|---|
| | | **Mean** | **N** | **SD** | **Std. E M** |
| Pair 1 | Pretest | 3.07 | 51 | .932 | .13044 |
| | Posttest | 3.80 | 51 | .865 | .12107 |

Table S4. Paired-samples test (pre-post), (n = 51).

| Paired Samples Test | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Paired Diff** | | | | | **t** | **df** | **Sig.** |
| | | **Mean** | **SD** | **Std. E M** | **95% CI Diff** | | | | |
| | | | | | **L** | **U** | | | |
| Pair 1 | Pretest - Posttest | -.730 | 1.185 | .16596 | -1.06372 | -.39706 | -4.401 | 50 | .000 |

***SD Standard Deviation , CI confidence interval, df degree of freedom , Sig. Significant degree or P value.**

**Cycle 2**

Table S5. Paired-samples statistics (pre-post), (n = 56).

| Paired Samples Statistics | | | | | |
|---|---|---|---|---|---|
| | | **Mean** | **N** | **SD** | **Std. EM** |
| **Pair 1** | **Pretest** | **3.38** | **56** | **1.205** | **.16104** |
| | Posttest | 3.98 | 56 | 1.032 | .13786 |

Table S6. Paired-samples test (pre-post), (n = 56).

| Paired Samples Test | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Paired Diff | | | | | t | df | Sig. |
| | | Mean | SD | Std. E M | 95% CI Diff | | | | |
| | | | | | L | U | | | |
| Pair 1 | Pretest - Posttest | -.603 | 1.681 | .22458 | -1.05275 | -.15260 | -2.684 | 55 | .010 |

***SD Standard Deviation , CI confidence interval, df degree of freedom , Sig. Significant degree or P value.**

**Cycle 3**

Table S7. Paired-samples statistics (pre-post), (n = 35).

| Paired Samples Statistics | | | | | |
|---|---|---|---|---|---|
| | | Mean | N | SD | Std. EM |
| Pair 1 | Pretest | 2.98 | 35 | .570 | .09635 |
| | Posttest | 3.81 | 35 | .900 | .15214 |

Table S8. Paired-samples test (pre-post), (n = 35).

| Paired Samples Test | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Paired Diff | | | | | t | df | Sig. |
| | | Mean | SD | Std. EM | 95% CI Diff | | | | |
| | | | | | L | U | | | |
| Pair 1 | Pretest - Posttest | -.836 | 0.889 | .15026 | -1.14108 | -.53035 | -5.562 | 34 | .000 |

***SD Standard Deviation , CI confidence interval, df degree of freedom , Sig. Significant degree or P value.**

**Cycle 4**

Table S9. Paired-samples statistics (pre/post), (n = 52).

| Paired Samples Statistics | | | | | |
|---|---|---|---|---|---|
| | | Mean | N | SD | Std. E M |
| Pair 1 | Pretest | 3.46 | 52 | .865 | .11998 |
| | Posttest | 3.66 | 52 | .913 | .12657 |

Table S10. Paired-samples test (pre-post), (n = 52).

| Paired Samples Test | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Paired Diff | | | | | t | df | Sig. |
| | | Mean | SD | Std. EM | 95% CI Diff | | | | |
| | | | | | L | U | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Pair 1 | Pretest - Posttest | -.202 | 1.195 | .16577 | -0.53473 | .13088 | -1.218 | 51 | .229 |

***SD Standard Deviation , CI confidence interval, df degree of freedom , Sig. Significant degree or P value.**

**Cycle 5**

Table S11. Paired-samples statistics (pre/post), (n = 54).

| **Paired Samples Statistics** | | | | | |
|---|---|---|---|---|---|
| | | **Mean** | **N** | **SD** | **Std. EM** |
| Pair 1 | Pretest | 2.31 | 54 | .746 | .10145 |
| | Posttest | 3.03 | 54 | .693 | .09431 |

Table S12. Paired-samples test (pre-post), (n = 54).

| **z** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Paired Diff** | | | | | **t** | **df** | **Sig.** |
| | | **Mean** | **SD** | **Std. EM** | **95% CI Diff** | | | | |
| | | | | | **L** | **U** | | | |
| Pair 1 | Pretest - Posttest | -.722 | 0.757 | .10295 | -0.92871 | -.51573 | -7.015 | 53 | .000 |

**SD Standard Deviation , CI confidence interval, df degree of freedom , Sig. Significant degree or P value.**