Competitive Brainstorming

This is a team competition where students can demonstrate their problem-solving abilities for engineering design. They are presented with a societal problem requiring an improvement from the current solution. They demonstrate their ability to analyze a problem by thinking up a solution during a brainstorming session that applies new/novel/or even older technology for a better result, and communicate their solution. They are judged based on their presentation of their ideas and teamwork. Nothing is required of the student prior to the competition other that a portable device to help document their ideas and maybe a pencil and pad for sketching.

Brainstorming aspects

In design it is important to recognize a need. What does a client actually need? This is step one in designing. The articulation of the need can be an expression of a dissatisfaction with the current situation.[1]

The second step is to realize the need can be expressed as a problem "Too many people are drowning accidently, how can this be prevented?" By digging into the problem and refining it you are clarifying what is needed. In step 2 you construct a problem statement that consist of three components:

> Goal Statement—a brief, general and ideal response to the needs statement. Our goal is to "prevent people from drowning." Limit goal statement to 25 words or less.
>
> Objectives—a description of the conditions under which a design must perform. This leads to a consideration of narrowing the problem because there are many ways people can drown. You need to list the performance characteristic your solution will satisfy. "In hotel pools" would signify and limit the scope of your design because a life guard is usually not present but a video camera could be.
>
> Constraints—define the range of the design and performance parameters. A parameter for "drowning in a hotel pool" could be "after hours." Another could be "using software" or "24-7" or "by adding surveillance using video monitoring". Other typical constrains are time and money.

In step 3, an explanation of how the improvement can deliver the expected results and what those results are. A consideration of potential problems should be included that the improvements are expected to overcome.

Finally, an elevator speech is required that combines the problem and your solution (in brief) in a one-minute blurb.

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[1] Barry Hyman, *Fundamentals of Engineering Design*, Prentice Hall, Saddle River, NJ, 1998 ISBN 013531385

Team Composition

In the competition students would be on teams of 2 to 5+ members usually from the same school. They would join with other teams in a common room for the braining session but members of the same team should not sit together during the initial rounds. Ad-hoc teams can be formed for participation. A facilitator and/or subject matter expert (SME) conducts the common brainstorming session.

Scheduling

If 3 hours have been allotted for the brainstorming competition, two additional rounds featuring different problems may be started after the initial session's first stage is complete. Students may sit through and observe earlier presentation if they desire but if they have not selected one of the earlier subjects for presentation, the 3rd round becomes their default selection. Judging begins one and a half hours after the first session began. All teams presenting on that topic are required to be present at that time else penalty points will be assessed for taking additional time for preparation. The presentation by the teams would take approximately $^1/_2$ hour with 5 minutes allotted per team.

General Rules for Brainstorming

There are 3 stages in conducting a competitive, brainstorming session.

The first stage is held in the common room where a problem is presented and individual participants offer suggestions for solving a problem. This will take approximately $^1/_2$ hour. There are two phases in this stage: the problem presentation and reflection then the initial sharing of ideas for solution.

The following two stages are team based.

The second stage begins with participants who have decided to work on this problem leaving the room to form up into teams, deciding what solution idea(s) they will present and preparing the presentation. There is one hour allowed for this stage. There are two parts in this stage, research and development.

The final stage is the presentation where the teams present their ideas and judges complete an evaluation rubric. This is conducted in the common room using media service for power point presentation. Once a team has finished their preparation and returned to the common room no more work is allowed on their presentation and/or preparation. Multiple teams may present using the same solution.

<u>Stage 1 Initial presentation</u>

It is useful if participants have a note pad handy. After the problem is presented by the facilitator or SME there is 1-2 minutes of reflective thinking. *Solution ideas are written down by individuals in their own note pad.* Sketching is an important factor.

<u>Stage 1 Revelation process</u>

The facilitator then goes around the room one time and asks everyone to express their "initial" idea to the group. No suggestion is ruled out as being ridiculous and no criticism (including moaning) is not allowed by other participants. These initial ideas are written down on a white board or flip chart on an easel. These list is the session list. If you have no initial idea, say so. This doesn't mean you won't have a great idea later. Questions will come up with discussions for clarity but some questions may be addressed in the later parts of Stage 1.

Participants should draw a line on their notepad to separate *their initial ideas* from those ideas that are collaborations of ideas presented by other participants (and your improvements).

After the last person's suggestion is posted, this is the end of the revelation portion of stage 1.

<u>Stage 1 Collaborative process</u>

A second reflective thinking period is held but it doesn't need to be as long as the first round. This time, the posted suggestions are allowed to be consider by all. What someone else said can inspire more and different ideas within you. In this 2nd round the participants are allowed to:

Present a completely different idea from their first idea and distinct from any in the session list,

Confirm another idea already listed,

Or add an improvement/twist to an idea already listed.

And participants can make a statement as to why they make their suggestion.

Or if the participant is out of ideas, indicate why they support another idea.

The facilitator adds any new ideas to the group list, puts a check that confirms another idea, and notes any modification suggested by starting a list under the idea modified. Once every one is finished adding their ideas the collaboration process as individuals is closed. During this rounds no criticism is allowed by participants, just why you support your selection. The facilitator/SME could be consulted or they may volunteer clarifications to concepts during this round.

Stage 2 Team collaboration and research

Teams collect together to select one solution idea for development preferably in different classrooms. Team members can write down more ideas in their note-pads and/or drawing graphics. As this stage progresses, two or more ideas may be attracting support/suggestions from team members. At this time criticism by team members can be allowed provided supporters are allowed to explain their ideas. After a discussion, a raise-your-hand vote within the team can be taken to select one solution idea for development. In rare cases, if there are enough members, the team can be split into groups of 2 or more.

Stage 2 Development

By development what is meant is the team writes a power point presentation that describes their understanding of the problem, solution, drafting of their elevator speech, and practice in handling questions. Each team member should have a verbal portion of the presentation to handle.

The presentation should include:

      A cover page including affiliation and team member listing

      The problem statement (as understood by the team)

      A Needs statement

      A Goal statement

      An Objective statement

      A Constraint statement

      The elevator speech spoken by a team member

      A verbal defense that addresses why this solution satisfies the need.

This stage is wide open with team members allowed to access the Internet and/or consult with an industry expert. Sources should to be referenced in a casual manner, your ideas do not. Graphics may be added to support explanation of the solution or improvements. If the hosting facility has the capability, drawings can be scanned so an image can be included in their presentation or simply drawn on a white board or easel during the presentation. Also, a printed copy of the presentation (3 slides per page) for each judge would be useful.

Stage 3 Presentation/Judging

After the teams finish and at the appointed time they should gather in the common room. The facilitator will then call on teams to come forward and present their solutions. Judges are selected from sponsors, IEEE Boston Section members, and other guest will complete a rubric evaluating the team's solution and presentation. They may ask questions after the team's presentation for clarification or to solicit additional aspects. Winners will be announced during the evening event.