

Module 5: Ideate

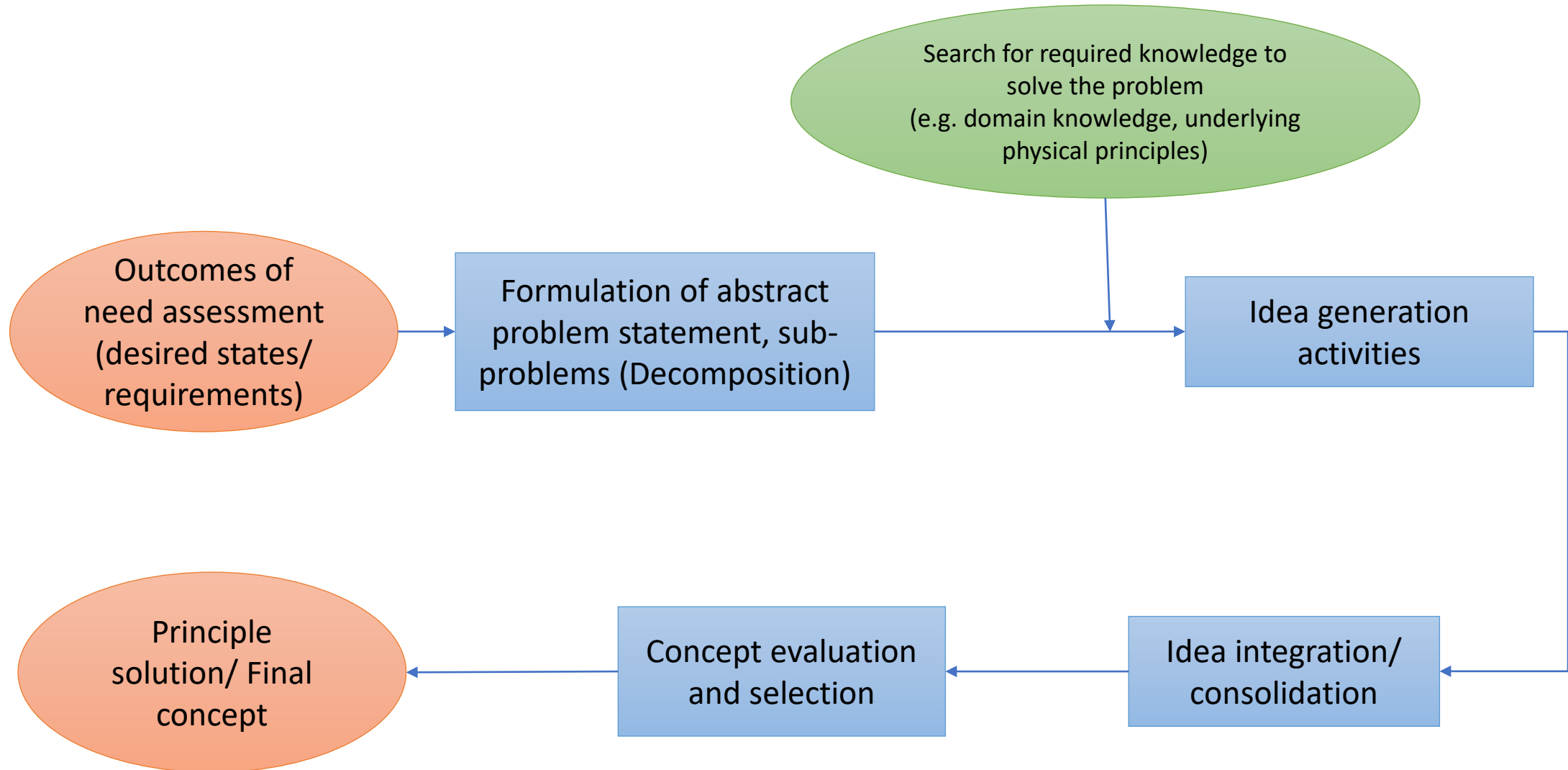
Learning Goals

- Learn what ideation is
- Understand step by step approach
- Learn different types of idea generation techniques
- Learn how to integrate ideas into concepts
- Learn how to evaluate alternatives and select concept/s

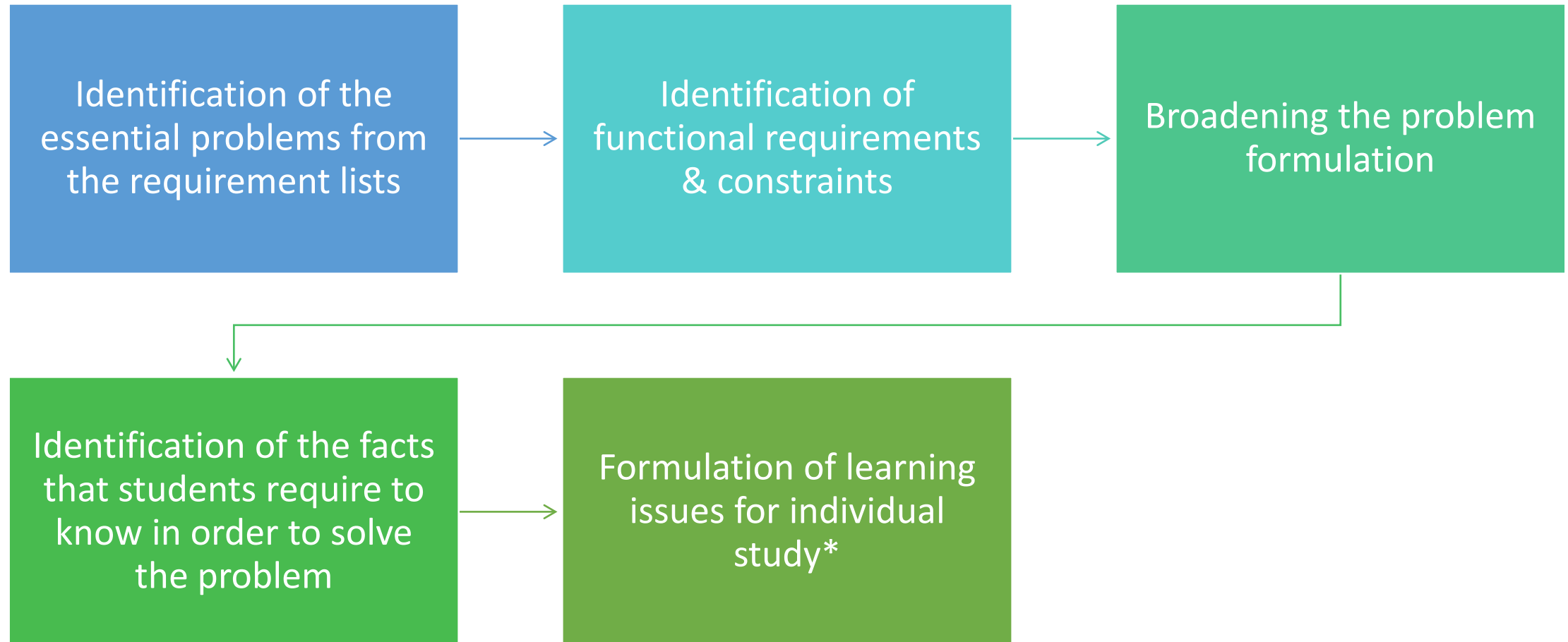
Terminologies to be learnt

- Requirements
 - Functional, Non-functional requirements
 - Demand, wish
- Function, sub-function
- Idea, Concept
- Solution, principal solution
- Activities: Generate, Evaluate, Modify, Select

Ideation



Lesson 1: Formulation of abstract problem statement, sub-problems



Mobile fridge/ refrigerator for outdoor use in rural area

- The fridge shall produce cooling with not less than 10 hours while in the absence of external power
- Minimum volume of interior space shall be 20L
- The fridge shall operate between -4°C to 25°C
- The weight of the fridge shall be low
- The operator shall be able to carry the fridge easily
- The fridge shall prevent development of ice crystals
- The fridge shall have silent operation while operating
- The fridge shall have minimum heat loss
- The fridge shall be easy to clean
- The fridge should be waterproof

Formulation of abstract problem statement

- “To design eco-friendly, light weight, easy to carry, waterproof portable system for cold medicine/ vaccine for outdoor use which can operate between -4°C to 25°C ”

Lesson 2: Search of knowledge that is required to solve the problem



SEARCHING FOR THE
RESOURCES



EVALUATING THE
RESOURCES



SEARCHING FOR THE
UNDERLYING
(PHYSICAL) PRINCIPLES



PURSUING DOMAIN
KNOWLEDGE

Identification of the facts that students require to know

- Laws of thermodynamics
- Basic knowledge of heat transfer
- Types of cooling systems, cycles and principles (Mechanical-Compression, absorption, Evaporative, Thermoelectric)
- Heat load calculation
- Basic psychrometric
- Insulation materials
- ...

Lesson 3: Idea generation activities

Group activities

- Brainstorming
- Gallery method
- Method 635
- ...

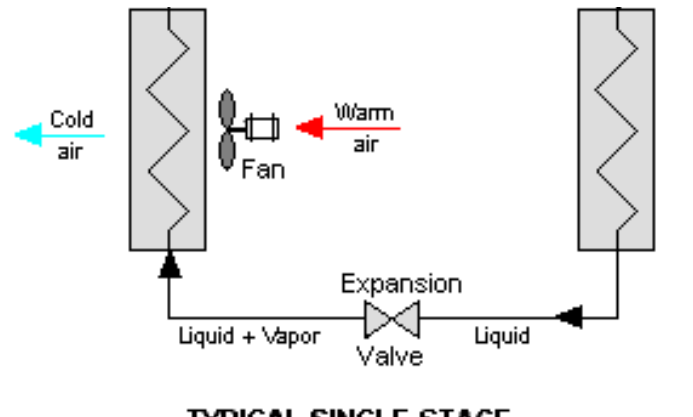
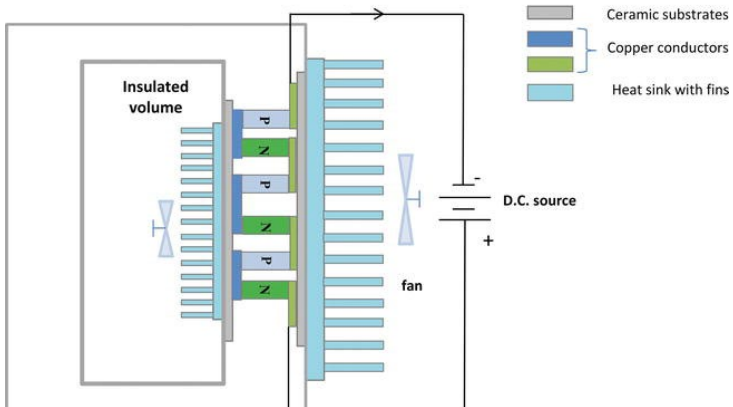
Providing stimulus

- Trigger word
- Inspiration from nature
- SCAMPER
- ...

Structured process

- Checklist
- Study of physical process
- Design catalogues
- ...

Function 1: Means of cooling



- Electronic (semiconductor) cooling principle
- Vapour compression principle

Function 2: Means of power for outdoor condition



- Battery
- Solar panel + Battery
- Charging from vehicles??
- Miniature windfarm??





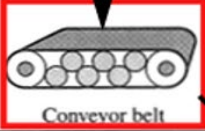







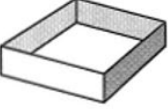

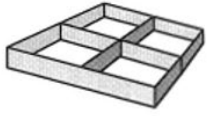

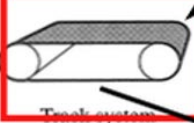

Function 3: Minimum heat loss



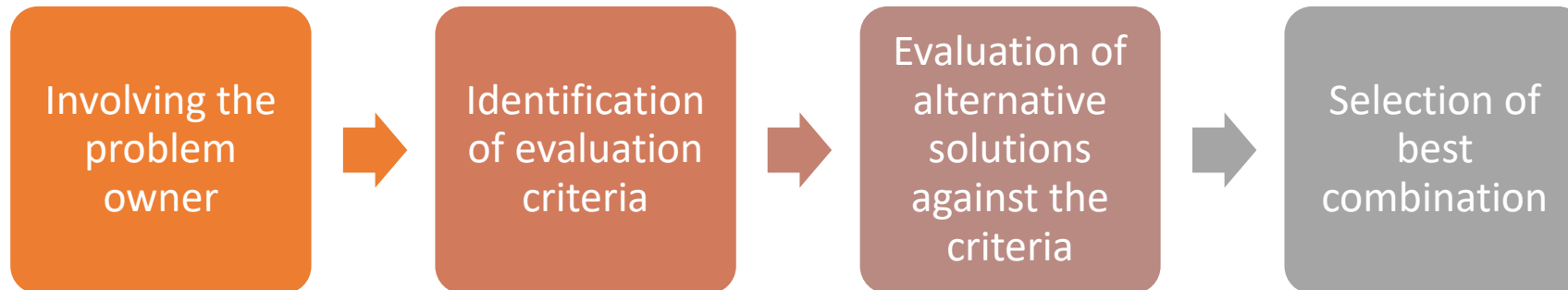
- **Foam insulation (PU form)**
- **Vacuum insulation panel**

Lesson 4: Idea integration

Critical Function 1	Critical Function 2	Critical Function 3	Critical Function 3
Solution 11	Solution 12	Solution 13	Solution 14
Solution 21	Solution 22	Solution 23	Solution 24
Solution 31	Solution 32	Solution 33	Solution 34

	Option 1	Option 2	Option 3	Option 4
Vegetable picking device		 Triangular plow	 Tubular grabber	 Mechanical picker
Vegetable placing device	 Conveyor belt	 Rake	 Rotating mover	 Force from vegetable accumulation
Dirt sifting device	 Square mesh	 Water from well	 Slits in plow or carrier	
Packaging device				
Method of transportation		 Track system	 Sled	
Power source	Hand pushed	Horse drawn	Wind blown	Pedal driven

Lesson 5: Concept evaluation and selection activities



- Concept selection
 - Ordinal methods
 - Cardinal methods

Where to Innovate?

- Design v/s selection process

Other topics

- Elements that create fruitful ideation sessions
- Characteristics of good problem solver
- Cognitive bias