

Strategy of using 'Blank-chart technique' in Engineering education

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Abstract — *In this study, students who majored in Engineering had been instructed in a 'Blank-chart technique' and applied it to develop team projects. This study examined the outcomes of a 'Blank-chart technique' in team projects in Engineering education; and, in particular, we analyzed the opinions of participants of this study regarding the difficulties in performing team projects and the usefulness of applying a 'Blank-chart technique' to conduct their team projects. Main difficulties in performing team projects were a) allocating tasks/roles to team members, b) making concrete plans and setting up time tables, c) developing and finalizing the outcomes of their team project, and d) communicating each other sufficiently. In regard to overcoming these difficulties, it was finding that Blank-chart technique had usefulness and advantages in a) developing diverse contents/items, b) establishing a systematic and concrete plan of what to do, c) promoting concrete contents and predicting the visual image of contents that students would propose, and d) facilitating communication among team members and developing communication skills. The research outcomes supported that 'Blank-chart technique' was effective in improving learning outcomes in team-based learning and activities.*

Index Terms — *Problem-based learning(PBL), Team-based learning, Black chart technique, Graphic organizer.*

INTRODUCTION

Recently, it is highlighted that practical and applicable education approaches in Engineering education fields. In particular, problem-based learning(PBL) emphasizes problem-solving skills and experiences in practical/actual contexts and requires what/how to approach in the practical manner, what/how to share learning contents, and how to construct final outcomes. However, students have difficulties and limitations in forming and constructing specific outcomes, who participate in such the education practices.

A 'Blank chart technique' is one of problem-solving techniques for management consultants, which may be applied for students in order to promote problem-solving process and skills in team projects. Furthermore, a blank-chart technique leads to draw visual images of final outputs before students propose final outcomes.

GRAPHIC ORGANIZER

A graphic organizer is a visual and graphic display that depicts the relationships between facts, terms, and/or ideas within a learning task. Graphic organizers are also referred to as knowledge maps, concept maps, story maps, cognitive organizers, advance organizers, or concept diagrams. Types of graphic organizers are as follow(Hall & Strangman, 2002).

- A **'Descriptive or Thematic map'** works well for mapping generic information, but particularly well for mapping hierarchical relationships.
- A **'Network tree'** organizes a hierarchical set of information, reflecting superordinate or subordinate elements.
- A **'Spider map'** helps with organization when the information relating to a main idea or theme does not fit into a hierarchy.
- A **'Problem and solution man'** is useful for organizing when information contains cause and effect problems and solutions.
- A **'Problem-solution outline'** helps students to compare different solutions to a problems.
- A **'Sequential episodic map'** is useful for mapping cause and effect.
- A **'Fishbon map'** may be particularly useful when cause-effect relationships are complex and non-redundant.
- A **'Comparative and contrastive map'** can help students to compare and contrast two concepts according to their features.
- A **'Compare-contrast matrix'** is another way to compare concepts' attributes.
- A **'Continuum scale'** is effective for organizing information along a dimension such as less to more, low to high, and few to many.
- A **'Series of events chain'** can help students organize information according to various steps or stages.
- A **'Cycle map'** is useful for organizing information that is circular or cyclical, with no absolute beginning or ending.
- A **'Human interaction outline'** is effective for organizing events in terms of a chain of action and reaction.

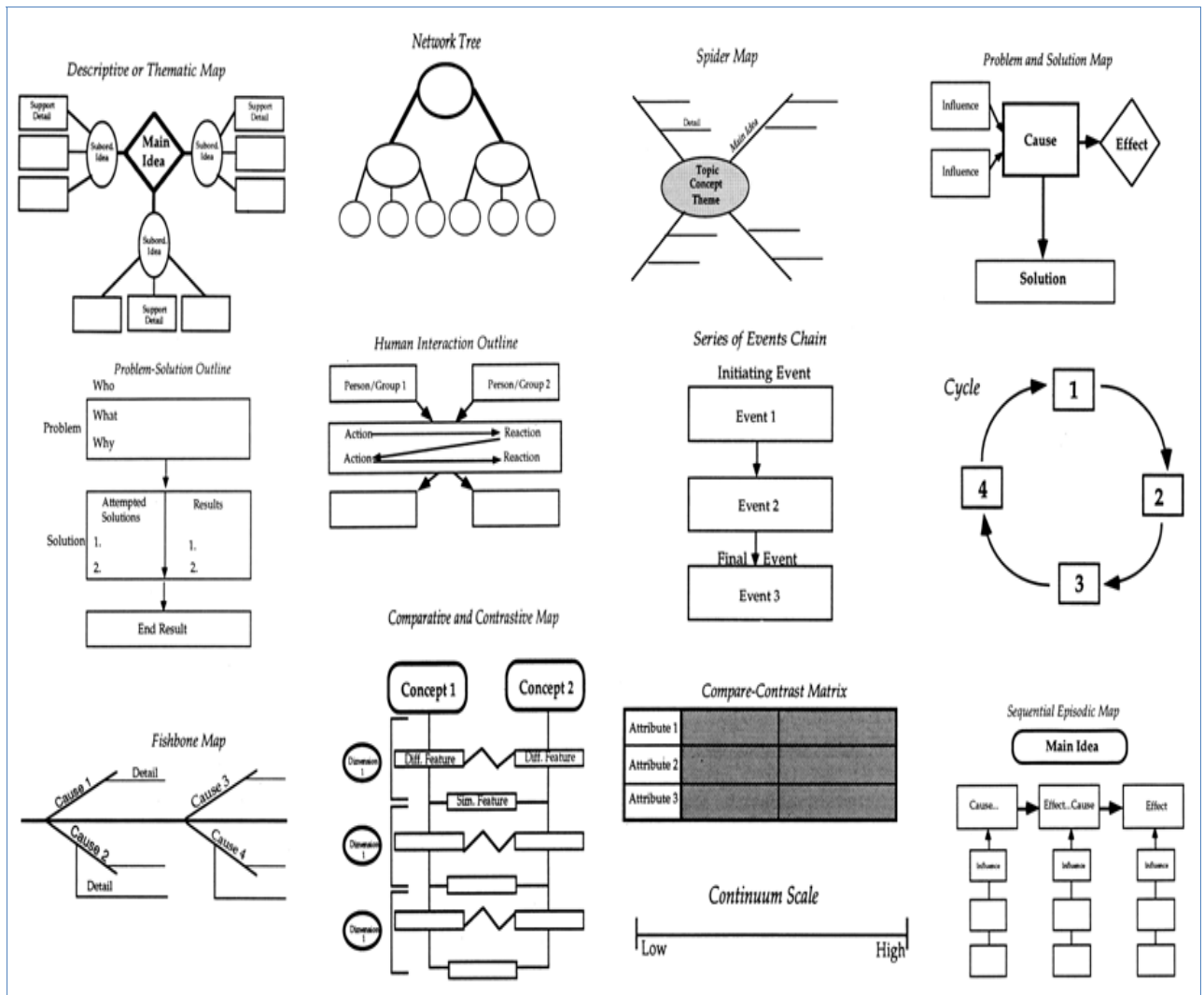


FIGURE 1
TYPES OF GRAPHIC ORGANIZER (TRACY & STANGMAN, 2002)

APPLYING BLACK-CHART TECHNIQUE

A Blank-chart technique is using graphic organizers in a) identifying specific ideas and summarize key points for implementation, b) using graphic organizers to take notes, summarizing key points, and identifying specific ideas for implementation, and c) forming to use in taking ideas for implementation from the professional development module.

Steps for students:

1. Identify and write problems/learning issues in post stick note.
2. Categorize/and assign problems/learning issues among team members- It may help to separate the problems/learning issues into a) essential issues for everyone to look up, and b) specific issues for individuals to look up.
3. Organize the contents of problems/learning issues and assign the contents to team members, separately.
4. Make a blank-chart.
5. Take action plans based on the blank-chart.
6. Search and learn information and knowledge to fill blank-chart.
7. Share and revise filled-chart.

EFFECTS OF BLANK-CHART TECHNIQUE AS A TEAM LEARNING SKILL

For the purpose of the study, 78 college students who majored in Engineering were collected. The total number of students was 78; male students were 60(76.9%), and female students were 18(23.1%).

For the purpose of the study, a team was consisted of 5~7 students and applied a blank-chart technique in their team projects. After applying a blank-chart technique, we asked the opinions of participants of their experiences and evaluated the outcomes of their team projects.

Research outcomes

It was found that meeting all team members in time(76.9%) was the most difficult when students performed team projects. In addition, students had main difficulties in allocation of tasks/problems to team members(37.2%), making a concrete plan in team project(34.6%), developing final outcomes(33.3%), communication and incorporation(30.8%).

Contents	Frequency (%)
Understanding of tasks/problems and sharing/confirming their understanding of tasks/problems	15 (19.2)
Making a concrete plan in team projects	27(34.6)
Meeting all team members in time	60(76.9)
Communication and incorporation	24(30.8)
Allocation of tasks/problems to team members	29(37.2)
Sharing learning contents each other	9(11.5)
Developing final outcomes	26(33.3)
Discussion to other members	13(16.7)
Being familiar to team members	8(10.3)
Learning through activities in team projects	9(11.5)

TABLE 1
THE DIFFICULTIES IN CONDUCTING TEAM PROJECTS (N=78)(MULTIPLE CHOICES)

In regard to usefulness and advantages of using a Blank-chart technique, most of all, they reported that using a blank chart technique promoted corporative and familiar learning environments(61.5%). Next, it was found that a blank-chart technique facilitated concrete plans of what to do in team projects(38.5%), and promoted concrete contents and predicted the visual image of contents in team project(32.1%).

Contents	Frequency(%)
Promoting concrete contents and predicting the visual image of contents	25(32.1)
Establishing systematic, effective, and democratic process	19(24.3)
Facilitating communication appropriately and developing communication skills	21(26.9)
Promoting corporative and familiar learning environment,	48(61.5)
Making concrete plans of what to do, reinforcing responsibility of each member, reducing burdens of finalizing a team project	30(38.5)
Promoting skills of preparing and framing a final report in team	11(14.1)
Reducing time and energy requiring for finishing a team project	4(5.1)

TABLE 1
THE ADVANTAGE OF BLANK-CHART TECHNIQUE (N=78)(MULTIPLE CHOICES)

In conclusion, the main difficulties in team projects were a) allocating tasks/roles to team members, b) making plans and setting up time tables, c) developing and finalizing the outcomes of team projects, and d) communicating each other sufficiently.

In regard to overcoming these difficulties, it was finding that a Blank-chart technique was usefulness and had advantages in a) developing diverse contents, b) establishing systematic and concrete plans of what to do, c) promoting concrete contents and predicting the visual image of contents that students would propose, and d) facilitating communication among team members and developing communication skills.

Consequently, the research outcomes supported that a 'Blank-chart technique' was effective in improving learning outcomes in team-based learning and activities.

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