TRIZ for organizing and planning final year project

Mai Mariam Mohamed Aminuddin[1], Muhammad Noorazlan Shah Zainudin[1] and Aliza Che Amran[2]

[1)] Centre for Telecommunication Research & Innovation (CeTRI),
Fakulti Kejuruteraan Elektronik & Kejuruteraan Komputer (FKEKK),
[2)] Centre for Robotics and Industrial Automation (CERIA),
Fakulti Teknologi Kejuruteraan Elektrik dan Elektronik (FTKEE),
Universiti Teknikal Malaysia Melaka (UTeM).
Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia

[*]Corresponding e-mail: maimariam@utem.edu.my

Keywords: TRIZ; managing final year project; minimal supervision

ABSTRACT – Undergraduate students are very new in conducting a research. Most of them have difficulty to understand, to design and to manage their Final Year Project (FYP). Hence, this paper presents how students able to organize their Final Year Project easily by using TRIZ. Two groups were observed; Group A without TRIZ and Group B with TRIZ. The results show that, students who guided by TRIZ needed less supervision, able to conduct the project smoothly and presented their FYP professionally compared to students without TRIZ guideline. In conclusion, TRIZ could be used to help students conducted their project independently.

1. INTRODUCTION

Final Year Project (FYP) is a research-oriented project conducted during the initial year of the Electronic Engineering degree program which is component of the mandatory elements for the degree award of the Bachelor of Electronic Engineering. The learning outcomes of the FYP are shown in Table 1. Based on the objectives, students are required to be able to identify problem and use content knowledge as they create a new idea or layout of the solution, with minimal supervision. However, 75% of FYP students had difficulty to start their project [1]. The observation was done on Session 2016/17, 2017/18 and 2018/19 on final year students of Faculty of Electronics and Computer Engineering (FKEKK) by a single supervisor. The findings showed that most students don't understand what they'll be developing and how their final product will look like. They begin the project without any clarity and believe that as it progresses, the project will evolve and take its own form. This is the first rule to destroy their final year project journey and the most important mistake that they always do was work/ time management. They love to wait until last minute of submission period to finish their project. These findings are aligned with the previous studied by [1], [2] and [3].

Hence, this paper proposes a method to guide FYP students to organize and planning their project with minimal mentoring from the supervisor. The proposed method is call TRIZ. TRIZ is a systematic strategy to comprehension and identifying challenging issues. TRIZ offers a variety of approaches and instruments to find these inventive alternatives. In this study, students used TRIZ knowledge to analyze the problem, design and structuring the project implementation as well as presenting their project.

Table 1 FYP Learning Outcomes

No	Learning Outcomes
1	Apply engineering knowledge to determine the objectives for the project, which relates to the work done before that includes basic theory as well as the approach to be used
2	Analyze the problem statement of the project & identify a possible solution
3	Design and develop solutions to complex engineering problem to meet desired needs.
4	Investigate, analyze and interpret the result of complex engineering problems using proper research method to provide valid conclusions
5	Apply appropriate modern techniques and proper use of engineering tools to solve complex engineering problems
6	Evaluate the project design and solution in term of environment and sustainability
7	Apply ethical principles and commit to professional conduct during project execution & presentation.
8	Communicate effectively through formal engineering report presentation both orally and in writing
9	Able to work independently towards completion with minimal supervision during the entire project
10	Engage in independent search and synthesis of technical information from reliable sources
11	Ability to plan and manage project activities and estimate cost.

2. METHODOLOGY

A total of 7 final year students of session, 2016/17, 2017/18 and 2018/19 of FKEKK were observed, respectively. They were divided into 2 groups; Group A (4 students) did not use TRIZ to execute their FYP and Group B (3 students) used TRIZ. Group A were observed from year 2016 until 2017 and Group B were observed from 2018 and 2019. All students have zero knowledge of TRIZ before and during the FYP. Only Group B were taught gradually how to use TRIZ to dissect and identify problem, find the suitable solution and present the project by the supervisor who is certified instructor of TRIZ level 1 during the project implementation. Table 2 shows the relation of how TRIZ can be used to guide FYP project. Method of the observation were proposal report and log

book evaluation, final product and questionnaire.

Table 2 The relation between TRIZ and FYP components

TRIZ tools	FYP components
Cause and Effect Chain Analysis	Finding Problem statements
Function Analysis • Engineering Contradiction • Trimming	Define possible solutions e.g. try and error
Inventive principles	No specific design method

3. RESULTS AND DISCUSSION

From the proposal reports, Group B showed well written reports compared to Group A. A questionnaire given to Group B with regards to implementation of TRIZ in FYP. The questions are present in Table 3.

Three (3) out of four (4) of Group A students were struggling to elaborate on the topic, their ideas were unfocused and most of them missed out the scope of the project. However, all Group B students managed to understand and identified the main problem that should be focused on. From the problem statements they quickly able to aim for the solutions and lead to the design of the product. Group B students has no issue of overdue of report submission compare to Group A. 3 students of Group A, took a long time to understand the project title. They have difficulty to find the main issue that should be solved. This caused them time to design a solution and delayed their project execution. As the result, their product has many problems, for instances, last minute broke down and too late to find spare parts. In addition, 2 out of Group A students missed the analyzing component of FYP and this caused their overall marks. Students of Group B have ample time to test their product reliability and efficiency because they have finished their design as early as possible. All students of Group B have less meeting hour with the supervisor compare to Group A whose constantly need help for their problems. On records, both Groups were given seminars on how to do FYP and how to write proposal/final reports.

Table 3 Questionnaire

Question	Response
Do you have experience to run a project in solo/team before FYP?	S1, S2 and S3 were involved in Integrated Design Project (IDP) project.
What is your experience during the project execution other than FYP?	S1: very hard to understand the title and determine the solution S2: took a lot of time to get answer S3: difficult to find solution and design. All of them agreed that they have difficulty to understand the problem and find solution
Is it easy to implement TRIZ?	S1, S2 and S3 : Yes
How do you feel when using TRIZ in FYP and not using TRIZ in your other project?	S1: TRIZ opened my mind to many other ideas. Easy to target the problem. S2: with TRIZ, can find many alternative solutions S3: TRIZ helps to understand problem and suggests many solutions All of them agree that TRIZ helped them to define problems and find solution.
Was TRIZ helped you in presenting your work in seminar?	SI: Yes, it made my presentation smooth S2: Yes, panel were understand better to my presentation compared to my IDP presentation previously. S3: Yes, I explained better using TRIZ.

4. CONCLUSION

Undergraduate students are very new in conducting a research. Most of them have difficulty to understand, to design and to manage their FYP. Seminars and thesis guideline are not enough to help them as they were too general. Closed supervision is the best guidance that ensure they could finish the project, but it is not align to the learning outcomes of the FYP. Hence, additional and more focus guideline is needed to align students to execute their FYP. This study has showed all the projects that guided by TRIZ were ran smoothly and students were happy with the results.

5. ACKNOWLEDGEMENT

The authors would like to show their gratitude to Universiti Teknikal Malaysia Melaka (UTeM), MESTECC, UM STEM Center and STEM National Movement to sponsor the publication of this paper through their funding.

REFERENCES

[1] Jawitz, J., Shay, S., & Moore, R. (2002). Management and Assessment of Final Year. *International Journal Engng Ed., 18*(4), 472-478.

[2] Tengku Wook, T., Mohamad Ali, N., Mohd, M., Saad, S., Salim, J., Yahya, A., Mat Zin, N. (2012). Trends in the Final Year Project for Multimedia Undergraduate Programme: Supervisory Experience. *Procedia - Social and Behavioral Sciences , 59*, 399-405.

[3] Villamerie, M., Ferrero, B., Alvarez, A., Larranaga, M., Arruarte, A., & Elorriaga, J. A. (2015). Dealing with common problems in engineering degrees' Final Year Projects. *2014 IEEE Frontiers in Education Conference (FIE) Proceedings.* Madrid: IEEE.