# 2017 年度　機械工学科国際 PBL 実施報告書

１．担当教員

大阪工業大学：川田裕 教授，宮部正洋 教授，橋本智昭 講師

台湾科技大学：Prof. Liang-Kuang Chen, Prof. Wei-Hsin Tien

２．実施期間・場所

2017 年 8 月 28 日～9 月 3 日

国立台湾科技大学(National Taiwan University of Science & Technology, NTUST)

３．プロジェクトの実施概要

日本人学生 3 名と台湾人学生 3 名の計 6 名により 1 チームを構成し，全体として日本人 15 名と台湾人 15 名の計 30 人の学生が 5 チームに分かれて，風レンズ付き風車の設計開発を行い，風洞試験により発電性能の評価を行った．本プロジェクトを通して，参加学生は専門的知識やものづくり技術を修得し，さらに英語による異文化交流の体験を得ることができた．

４．参加学生数

大阪工業大学：PBL 学生 15 名，TA 学生 3 名

台湾科技大学：PBL 学生 15 名，TA 学生 3 名

５．募集・選考（4 月）

大阪工業大学機械工学科 2 年生及び 3 年生の学生を対象に募集を行い，38 名の応募者の中から，TOEIC，GPA，面接などから総合的に判断して 15 名を選出した．

６．チーム編成

| | OIT | | NTUST | |
|---|---|---|---|---|
| Group | Name | | Name | |
| 1 | 藤本　航太朗 | Fujimoto, Kotaro | 林煒翔 | LIN,WEI-HSIANG |
| | 原田　真樹 | Harada, Masaki | 朱瀚逞 | ZHU,HAN-CHENG |
| | 清水　麻由 | Shimizu, Mayu | 謝舜合 | SHIE,SHUN-HO |
| 2 | 酒井　誉仁 | Sakai, Takahito | 柯亭佑 | KE,KO,TING-YU |
| | 中村　渉 | Nakamura, Wataru | 張哲維 | VICO,CHANG |
| | 徳永　萌乃 | Tokunaga, Moeno | 高佑宗 | KAO,YU-TSUNG |
| 3 | 中村　優志 | Nakamura, Yusi | 辜士銘 | GU,SHIH-MING |
| | 藤田　悠希 | Fujita, Yuki | 楊昌霖 | YANG,CHANG-LIN |
| | 吉田　沙耶 | Yoshida, Saya | 王玳紳 | WANG,TAI-SHEN |
| 4 | 宮本　洋輔 | Miyamoto, Yosuke | 劉亦宸 | LIU,YI-CHEN |
| | 長倉　元基 | Nagakura, Motoki | 葉子毓 | YEH,TZU-YU |
| | 西村　祥輝 | Nishimura, Yoshiki | 陳佾德 | CHEN,YI-DE |
| 5 | 立花　啓一 | Tachibana, Keiichi | 陳威廷 | CHEN,WEI-TING |
| | 林田　理公 | Hayashida, Riku | 賴奕羽 | LAI,YI-YU |
| | 鳥谷　光希 | Toritani, Mitsuki | 林佑丞 | GARY LIN |

７．ティーチングアシスタント(TA)

| | | | | |
|---|---|---|---|---|
| TA | 三宮　敬樹 | Y. Sannomiya | 陳定閒 | D. S. Chen |
| | 林　健太郎 | K. Hayashi | 隥鎧澤 | K. Z. Deng |
| | 松田　龍介 | R. Matsuda | 陳宣翰 | H. H. Chen |

８．事前英語学習（6 月）

下記スケジュールにより，各教員による英語学習が行われた．

| 担当 | 第１期(5/22～6/2) | 第２期(6/5～6/16) | 第３期(6/19～6/30) |
|---|---|---|---|
| 川田 | １班・２班 | ３班・４班 | ５班 |
| 宮部 | ５班 | １班・２班 | ３班・４班 |
| 橋本 | ３班・４班 | ５班 | １班・２班 |

Skype によるビデオ会議を実施し，自己紹介や LINE ID の交換を行い，日本人と台湾人の混成チームメンバー間での交流を開始した．

９．事前専門技術講習（7 月）

風車の原理や動作特性に関する技術講習会，Creo を用いた風車翼の 3D CAD 設計の技術講習会，Q-blade ソフトを使用した効率解析の講習会を実施した．

１０．　風車試作会（8 月）

専門技術講習会で得た知識を活用して，モノラボ（10 号館）１～３階で風車の試作会を行った．

１１．　実施期間（8/28～9/3）のスケジュール

| Day | Date | Time | Schedule |
|---|---|---|---|
| 1 | 28th Aug. (Mon) (Hosted by ME department vice chair, Prof. Liang-kuang Chen) | | |
| | | ~ 15：30 | OIT members arrival by bus (BR177, 13:05 at Airport) |
| | | 15：30 ~ 17：30 | Name card, Room key distribution<br>Dormitory check in<br>Team member social time |
| | | 17:40 ~ | Welcome Dinner<br>(Hosted by Vice Dean of International Affairs, Prof. Ming-Jyh Chern) |
| 2 | 29th Aug. (Tue) (Hosted by W.H. Tien) | | |
| | | 08：30 ~ 09：00 | Start: Opening Ceremony at E1-470<br>Speech by hosts from Taiwan Tech<br>PBL introduction by Prof. Kawata |
| | | 09：00 ~ 12：00 | Prototyping (I) Engage in concept making |
| | | 12：00 ~ 13：00 | Lunch break |
| | | 13：00 ~ 16：30 | Prototyping (II) Engage in concept embodiment |
| | | 16：30 ~ 17：00 | Presentation of Each Group's Concept |
| 3 | 30th Aug. (Wed) (Hosted by W.H. Tien) | | |
| | | 08：30 ~ 08：45 | Team meeting（Confirm daily works ） |
| | | 08：45 ~ 12：00 | |
| | | 12：00 ~ 13：10 | Lunch break |
| | | 13：10 ~ 16：30 | |
| | | 16：30 ~ 17：00 | Presentation of Each Group's Status |
| 4 | 31st Aug. (Thu) (Hosted by W.H. Tien) | | |
| | | 08：30 ~ 08：45 | Team meeting（Confirm daily works ） |
| | | 08：45 ~ 12：00 | |
| | | 12：00 ~ 13：00 | Lunch break |
| | | 13：00 ~ 16：30 | |
| | | 16：30 ~ 17：00 | Presentation of Each Group's Status |
| 5 | 1st Sep.(Fri) (Hosted by W.H. Tien) | | |
| | | 08：30 ~ 08：45 | Team meeting（Confirm daily works ） |
| | | 08：45 ~ 12：00 | |
| | | 12：00 ~ 13：00 | Lunch break |
| | | 13：00 ~ 15：00 | |
| | | 15：00 ~ 17：00 | Final　Competition |
| | | 17：10 ~ 18：00 | Closing ceremony　　Venue: Room E1-470<br>Speech by VIPs<br>Certification Delivering, Award of Prizes<br>Group photo |
| | | 18:00 ~ | Dinner (Hosted by ME department chair, Prof. Chao-Chang A. Chen) |
| 6 | 2nd Sep. (Sat) | 08：00 ~ 18：00 | Taipei Trip: National Palace Museum<br>Ceramic (Porcelain) Museum<br>Qingshui Zushi (Divine Ancestor) Temple in Sanxia |
| 7 | 3rd Sep. (Sun) | 09:30 | Departure to Airport by bus (BR130, 13:35) |

１２．　風レンズ付き風車の設計開発における制約条件と性能評価

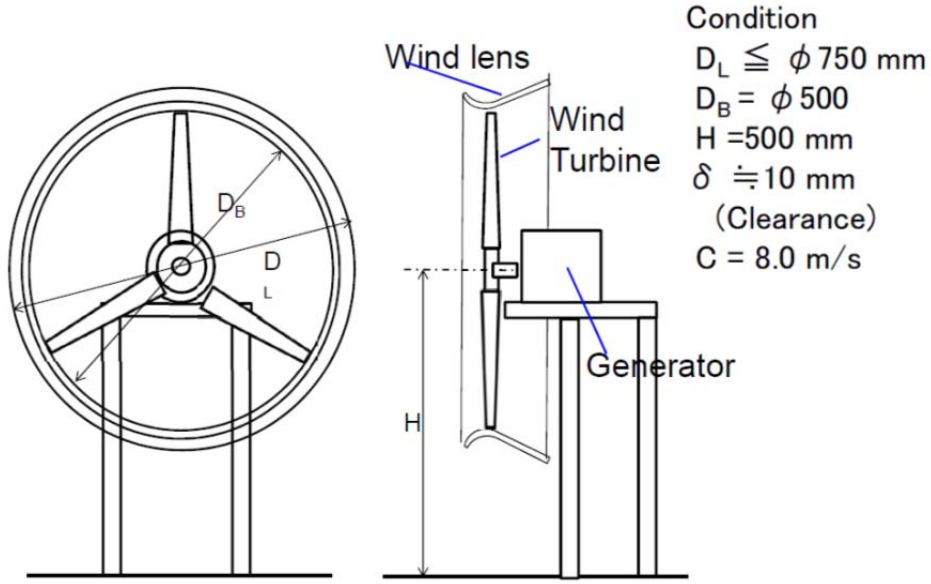
① 風速 8m/s における最大のパワーを発電.

② 大きさの制限
ブレードの直径は 500mm
風レンズの外径は 750mm 以内

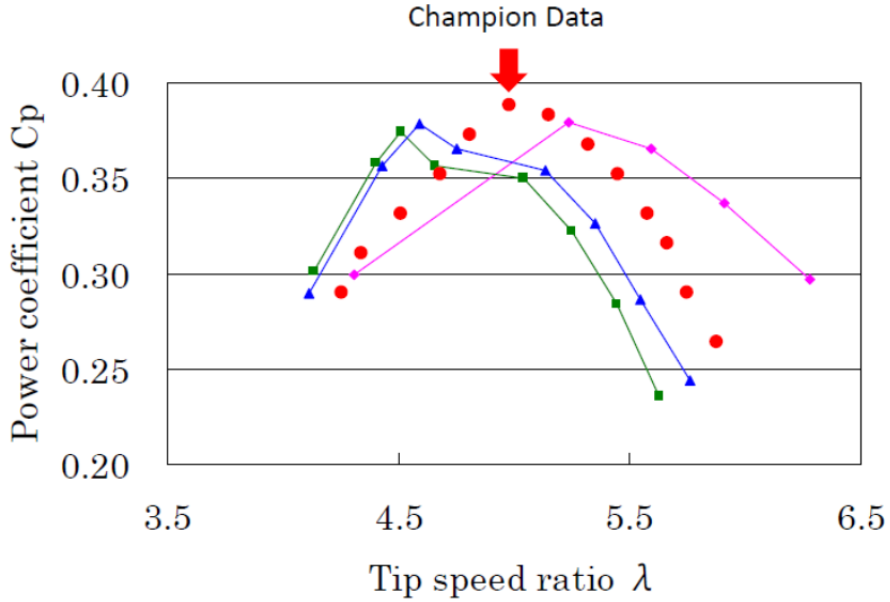
③ 使用可能なツール
CAD 設計：Creo
ブレードの性能予測：Q-Blade

④ 材料
土台：アルミ押し出し材，L 字角材
ブレード：ABS 樹脂
風レンズ：プラダン、針金、アルミテープ
その他：ボルト，ナット，鉄板，

⑤ 負荷を変化させて最大のパワー (ワット)で評価.

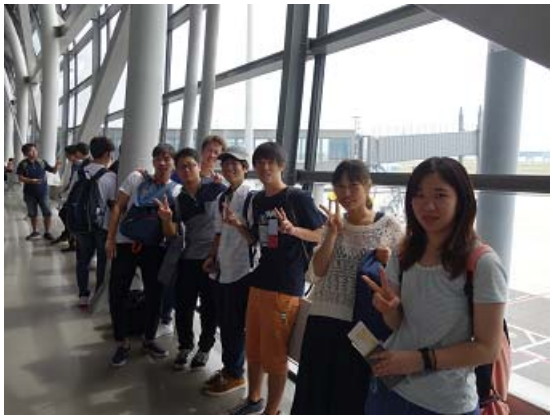



１３．　風車性能評価の一例



１４．　国際 PBL 実施中の様子

・関西空港で搭乗前の様子




・飛行機の中での様子


・台湾桃園国際空港に到着時の様子

・空港から大学へバスで移動中の様子

・大学に到着時の様子

・ウェルカムパーティの様子

・記念品の贈呈時の様子

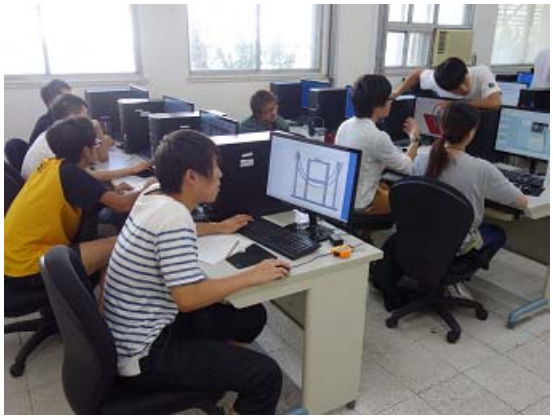
・オープニングスピーチ時の様子


・オープニングディスカッション時の様子




・PC 室で CAD 設計の様子



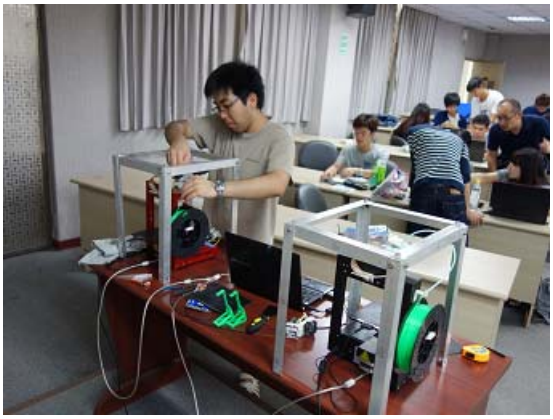




・ランチ時の様子




・教員の親睦会の様子

・3D プリンタでの作業時の様子



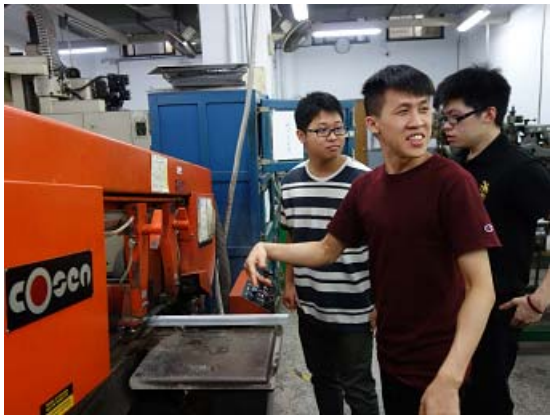
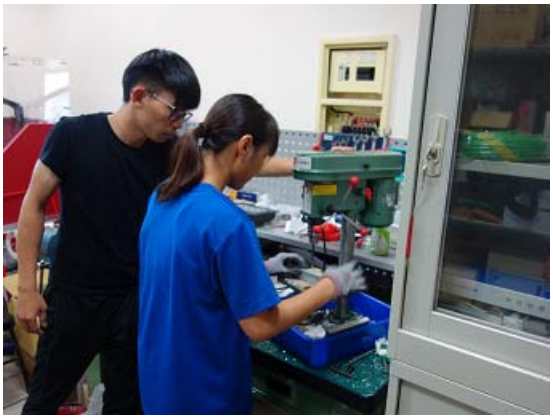
・ディリープレゼンテーション時の様子




・ブレードを磨いている時の様子

・アルミ加工時の様子



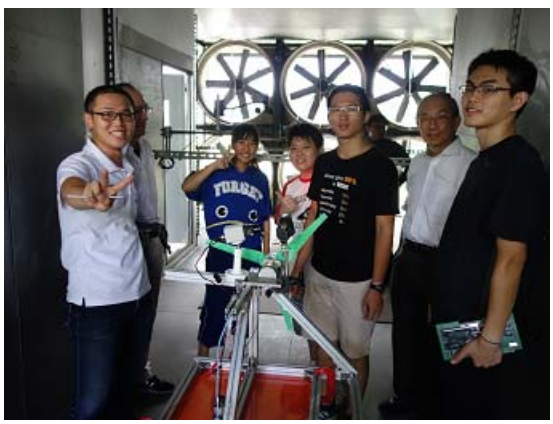
・プラダン加工時の様子


・風レンズ製作時の様子



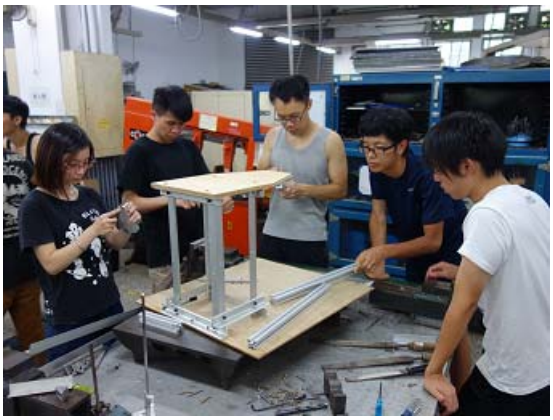
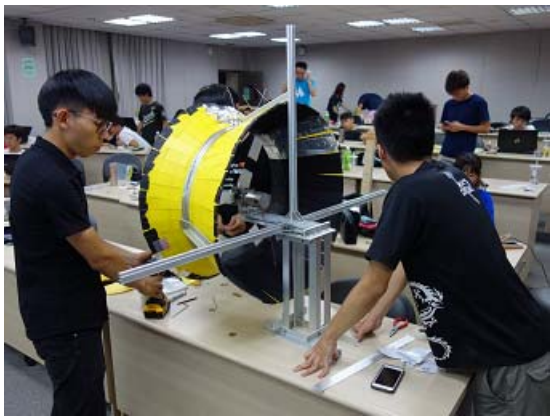



・風レンズなしの風洞試験の様子



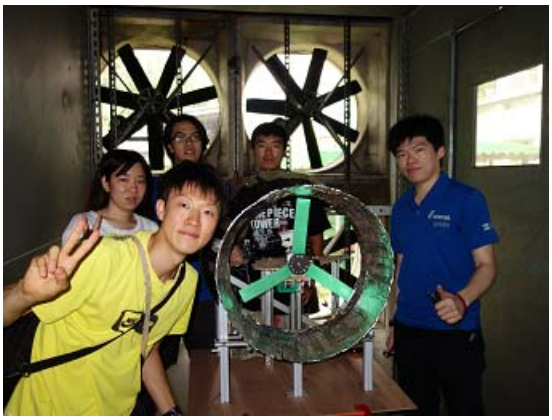
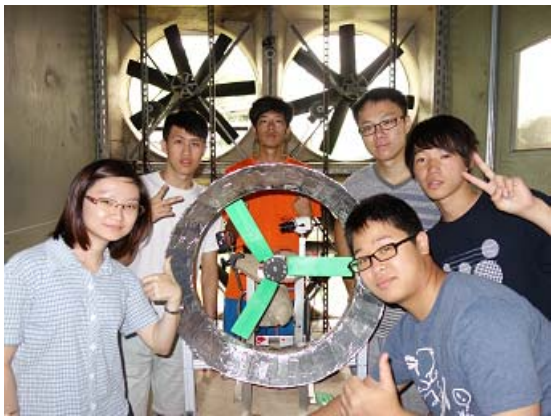


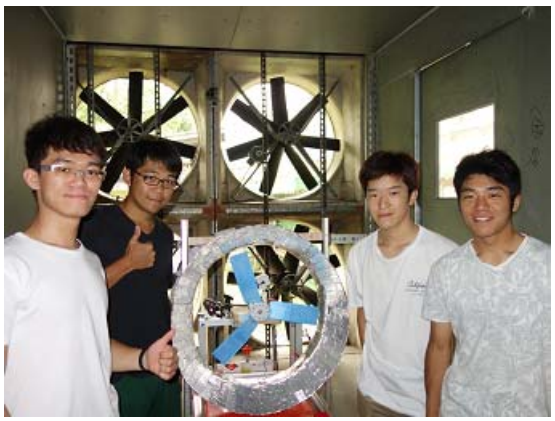
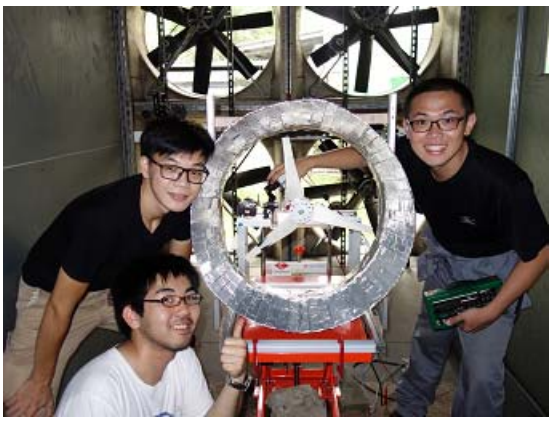
・風車の土台製作時の様子


・作業 3 日目は夜中 22 時 30 分頃まで作業をして，ようやく風車が完成した時の様子

・風レンズありの風洞試験の様子

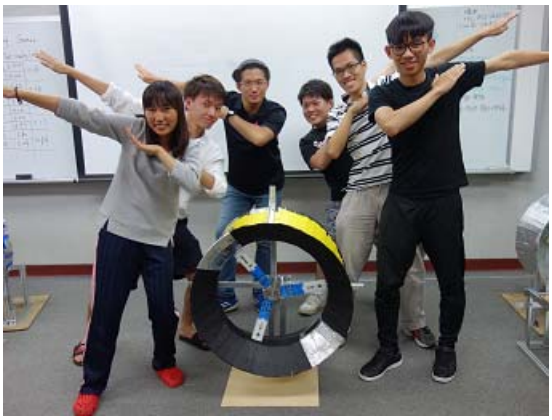




・最終発表会時の様子

・クロージングセレモニーの様子

・各チームが製作した風車の様子

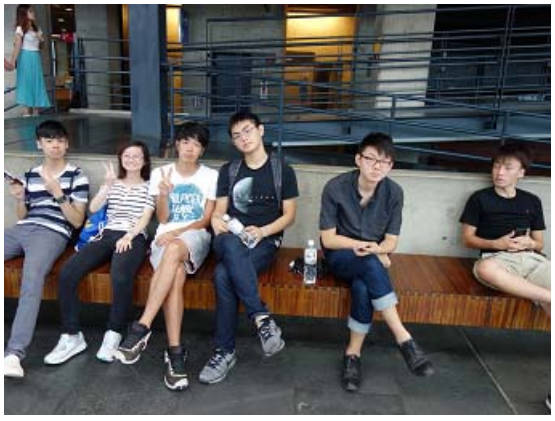

・課外活動(市内見学)の様子


訂購專線:(02)2671-9890


童年時光


興隆宮


金源成



・帰国日にバスが大学から出発する前，多くの台湾人学生が見送りに来てくれた際の様子

・一部の台湾人学生が空港まで見送りに来てくれた際の様子


・セキュリティ審査に入る直前まで，別れを惜しんでいる際の様子

１５．　国際 PBL の総合評価方法

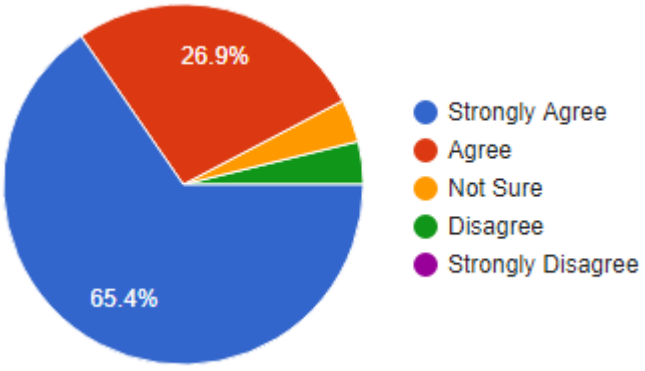
| | Evaluation Point | Evaluation basis | Full Points |
|---|---|---|---|
| 1 | Generating Power (With Wind Lens) | Measured Electric Power(W) | 40 |
| 2 | Generating Power (Without Wind Lens) | Measured Electric Power(W) | 20 |
| 3 | Communication and Cooperation | Observed Active Communication and Cooperation | 10 |
| 4 | Scheduling | Systematic design and production process | 10 |
| 5 | Presentation | Explanation, Slides, Contents | 10 |
| 6 | Quality of Turbine Blade Design | Wing Profile, Blade Design, Hubdesign, and Surface Funish | 5 |
| 7 | Vote for good team (Prof. and TA) | Comprehensive activity | 5 |
| | | Total | 100 |

１６．　総合評価の最終結果

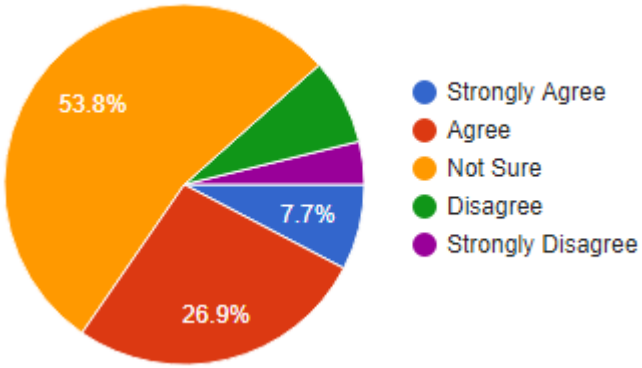
| Evaluation Terms of iPBL | | Team 1 | Team 2 | Team 3 | Team 4 | Team 5 |
|---|---|---|---|---|---|---|
| Testing | Generating Capacity | 39.4 | 40 | 36.6 | 38.0 | 35.5 |
| | Weight of Wind Turbine | 16.6 | 16.4 | 16.9 | 19.7 | 20 |
| Evaluation of Prof. | Quality of Wind Turbine Blade Design | 2 | 3 | 2 | 4 | 5 |
| | Communication and Coorporation | 6 | 7 | 8 | 10 | 10 |
| | Scheduling | 6 | 10 | 8 | 7 | 9 |
| | Presentation | 10 | 8 | 7 | 7 | 9 |
| Voting | Vote for Good Team (by TA) | 1 | 5 | 5 | 5 | 2 |
| | Vote for Good Team (by Prof) | 1 | 4 | 3 | 3 | 5 |
| | Total points | 82.1 | 93.4 | 86.5 | 93.7 | 95.5 |

１７．　国際 PBL アンケート結果

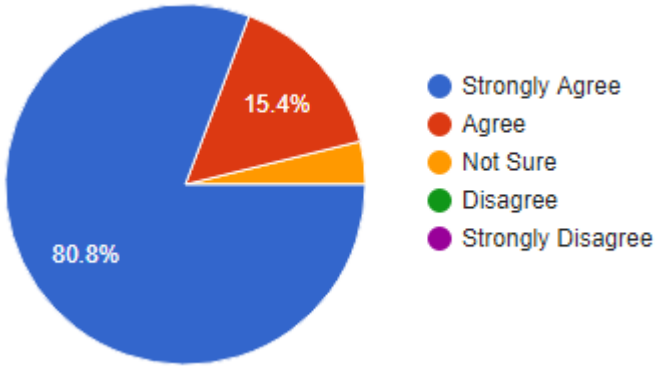
①　The PBL was well organized.



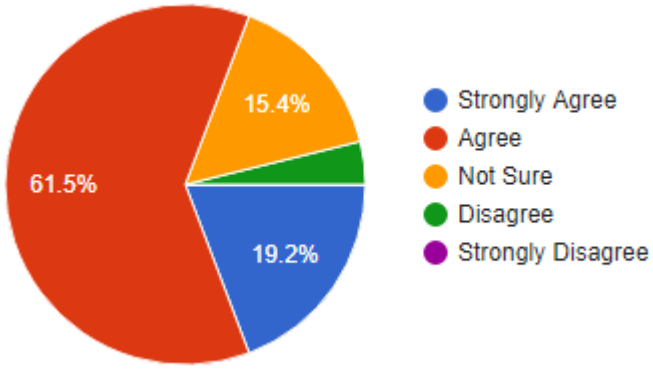
② The theme was too difficult.



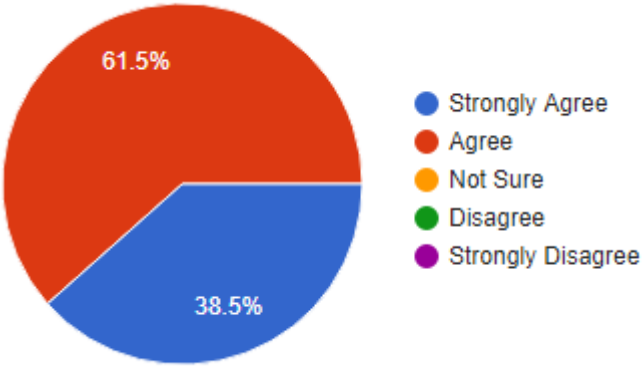

③ I was very glad to join this PBL.



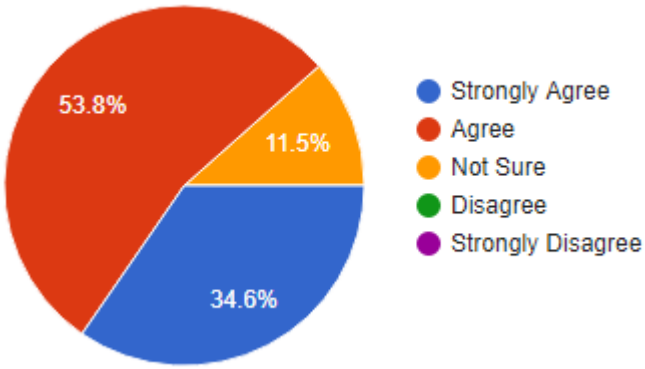

④ The PBL schedule was appropriate.



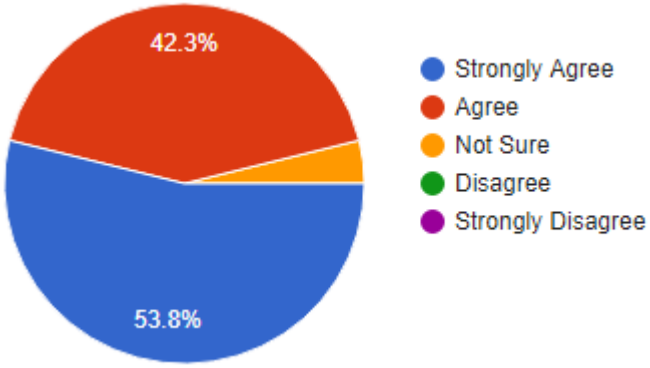

⑤ Teachers helped me to understand how to work on the tasks during the PBL.



⑥ I felt that our team members discussed ideas effectively and clearly.




⑦ I gained usable skills and will be able to apply them to my future life.




⑧ What was the most valuable aspect of this PBL?

| |
|---|
| the project and communication |
| Team Cooperation |
| team work |
| We cooperate with each other |
| Exchange with OIT students |
| communication |
| Conversation using english |
| Communication and time management |
| communication with taiwaneses |
| To design and to manufacture something is very impoment skill i learn this class. |
| It was only a week, but it became possible to hear English to some extent. |
| I made friends in Taiwan.It's the most valuable |
| First thing I could come to Taiwan. And communication with Taiwanese students |
| The most valuable aspect of it is communication. My partner can understand my mind one or two word.Because he uses simple sentence and more jesters. |
| Working together with foregin student |
| Make many foreign friends |
| Communication with Japanese students |
| Cooperate with each other |

Able to meet lots of Japenses friends
Cooperation was the most valuable
It's staying in Taiwan.
I could work with Taiwanese.
Communicating with Taiwanese students
What we could do with people from other countries
Communicate with people from different countries using English and make one thing together.
i get a friend in another country. and they're become best friends!

⑨ Did you find any of your weakness during the project? What skills would you like to improve?

the software
Maybe is design the blade
design wind blade is so difficult
About the Creo, I feel unhelpful when we design the blade. Although I learned for three days, it is not enough for this competition
I want to improve my design skill
I felt patience was my own weakness. Presentation ability improved.
Yes. I must improove positiveness
We need to communicate each other
yes. I want to improve designing skill.
I think we need to know how strong about the blade before we make it.
I want to convey my intention clearly in English.
Yes I did. I want improve English skill.
English skills. But I noticed that it was transmitted even by gesture
My weeknes point is knowledge and language skill and using machine skill. I'd like to improve these all skill.
To confirm offenly
Yes I should improve my software using skill
Improve the technical ability
I want to learn more computer simulation software, improve my structural strength or efficiency
My English ability is not good , maybe I will improve it after this camp.
The vacabulary quantity is not enough so in many parts when we have our own opnions,we can't say it out easily. So i think that i sholud learn more english.
I found that my English skills is bad. So I want to improve my English skills.
Yes, I cannot speak positively . So I want to improve communication skill.
I did not have aggressiveness so I want to improve it
Vocabulary and English talking power
I wanted to speak English better. And I wanted to raise creativity.
yes,I did. I can't speak english ,but at last i can speak english more smoothly. and i learn how to communicate with another country students.

⑩ What could have been done to improve the PBL?

maybe time longer
Longer time to join.
nothing
Maybe add on more 3D printer woud be better.

Software because we have not been to use before.
Ability to practice.
Ask somebody's opinion
The previous course could be longer!
communication skill in english.
I suggest we can change welcome day to sunday ,we will have one more day to design and manufacture the wind turbine.
I should have studied English to the extent that conversation is not a problem.
I should made a more study English.
It was very useful for the exercise, but I should have recognized enough why it would be like this
In our 2017 team two person can't do.Our team and the other team is a little hard. The other team worked over 24:00.The PBL improve one more TA.If anyone can't work,the PBL will be able to do.
English skil
No it's good enough
Extend the project period
no
Lunchbox meal provide by Taiwan is not good .
PBL can take place in JAPAN always. I love JAPAN.
Should consider the composition of members more.
I go LLC and talk with a foreigner.
Study English voluntarily before pbl
I think that it is to take communication.
Should practice more how to use creo
more to have a room in the schedule, please!

⑪ Additional Comments or suggestions:

It's great!
Thank professor and TA. We all enjoy it.
It was very good experience for me.
I suggest we can change welcome day to sunday ,we will have one more day to design and manufacture the wind turbine.
I made friends in Taiwan and I realized that English is important for the first time. It was a lot of fun
Taiwanese student have very high skill of English and mechanics and presentation. I notice a many things. I had a special time.
I'm so tired
None
I want to continue exchange with Taiwanese.
pbl has become a good experience