

# Project-Based Learning

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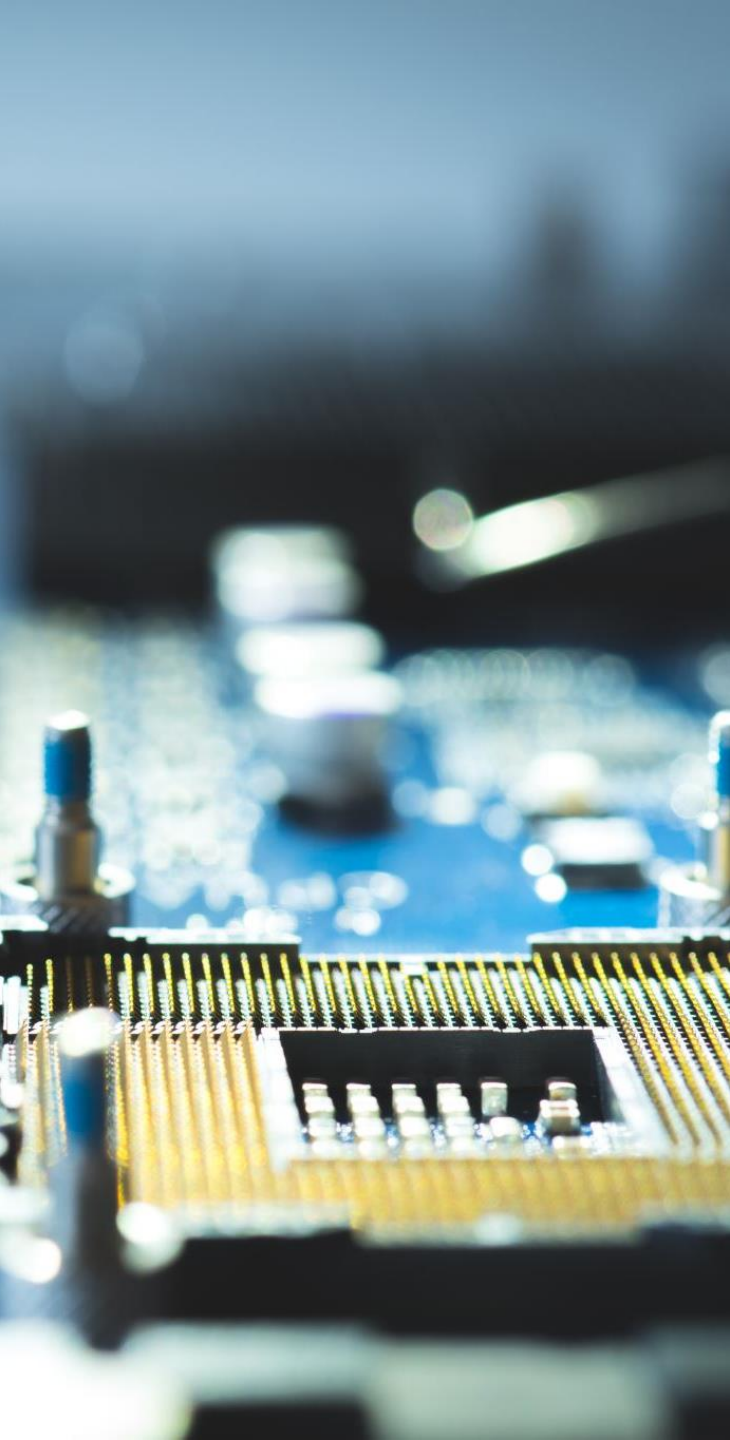




# Definisi Project-Based Learning

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- Sebuah pendekatan pengajaran dalam OBE
- Permasalahan dunia nyata/kompleks diangkat menjadi skenario pembelajaran (bisa mhs cari sendiri atau proyek dari industri)
- Berpusat pada mahasiswa
- Diselesaikan oleh mahasiswa secara berkelompok
- Merupakan salah satu Indikator Kinerja Utama (IKU) Kemendikbud



# Berfokus pada Mahasiswa

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- Merencanakan penyelesaian proyek
- Mengidentifikasi dan merumuskan masalah
- Memilih metode, merancang dan melaksanakan eksperimen
- Mengumpulkan, menyajikan, dan menginterpretasi data
- Menentukan alternatif solusi dan memilih solusi terbaik
- Mengkomunikasikan ide dan solusi yang diberikan

“Konstruktivis – mahasiswa membangun pengetahuan mereka sendiri”



# Peran Dosen

- Fasilitator, pembimbing, supporter.
- Dosen BUKAN sumber informasi.
- Informasi dan solusi harus dicari sendiri oleh mahasiswa.

# Karakteristik Persoalan yang Dijadikan Skenario Pembelajaran

- Persoalan dunia nyata
- Open-ended problem
- Ill-defined/vague
- Diselesaikan dengan pendekatan multi-subject
- Solusi tidak bisa dicari di [Google](#), [Bing](#), [Wikipedia](#), dan [lain-lain](#)



# Hasil Pembelajaran

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- Produk, model, prototype, poster, pertunjukkan, dan lain-lain.



# Durasi Proyek

Diselesaikan dalam waktu yang agak lama, beberapa minggu/bulan.



# Tujuan

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- Memahami materi pembelajaran.
- Menghubungkan materi yang diperoleh di kelas dengan dunia nyata.
- Mengasah skills:
  - Critical thinking
  - Collaboration
  - Communication
  - Creativity
  - Life-long learning



# Langkah- Langkah Project Based Learning





# Langkah-Langkah PjBL

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## 1. Start with the big question

Contoh:

- Bagaimana cara mengurangi antrian kapal yang panjang pada sistem bongkar muat dipelabuhan?
- Bagaimana mengembangkan sistem informasi Kesehatan yang efektif selama pandemi?
- Bagaimana menentukan kematangan buah yang optimal dengan mempertimbangkan waktu delivery ke tangan konsumen akhir?

Langkah-  
Langkah  
PjBL  
(Lanj...)

## 2. Merencanakan Proyek (design a plan for the project)

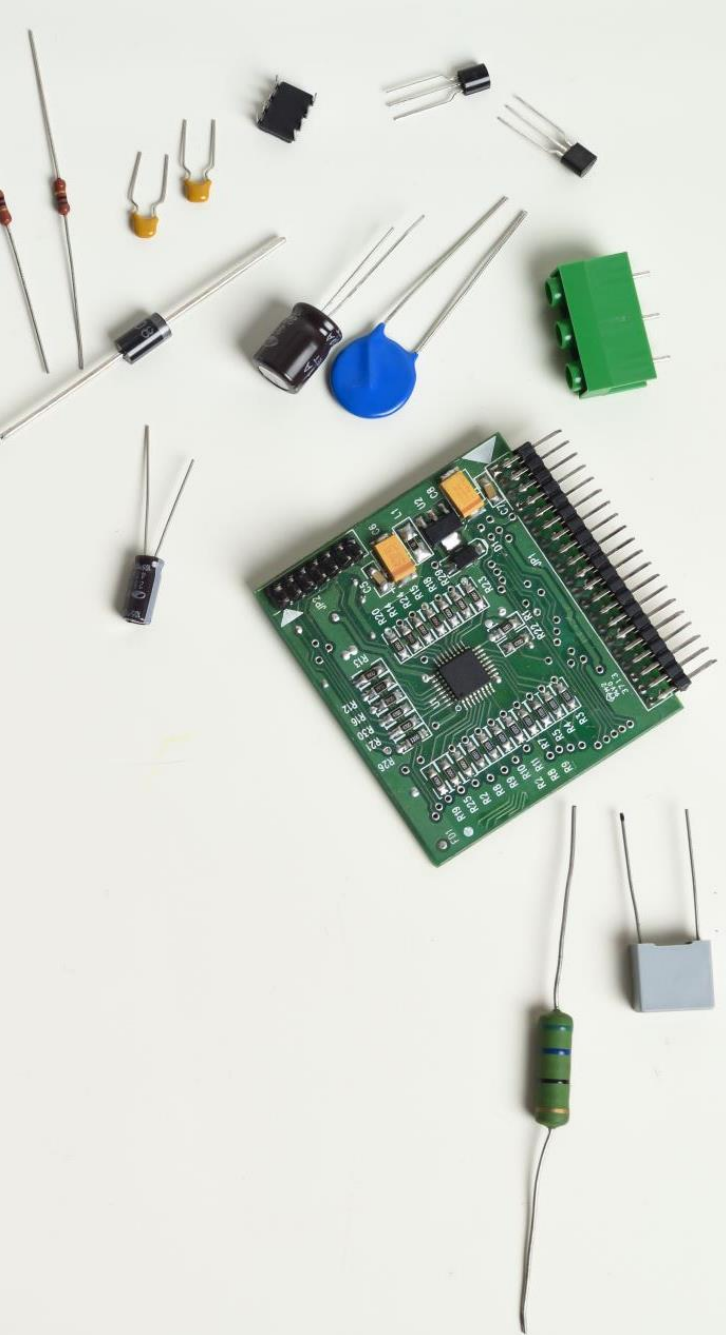
- Aturan main
- Pemilihan aktivitas
- Alat dan bahan
- Resources yang dapat dimanfaatkan

# Langkah- Langkah PjBL (Lanj...)

## 3. Menyusun jadwal aktivitas (create a schedule)

### JADWAL PELAKSANAAN

No.	Task	Duration	September				Oktober				November				Desember			
			Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4
1	Membuat Mission statement (27 september)					■	■											
2	Pengembangan konsep: identifikasi customer need (18 oktober)						■											
3	Target specification, generate product concept, select product concept (25 oktober)							■	■									
4	Test product concept, set final specification, plan development (1 nov)									■								
5	System level design: arsitektur produk, subassembly, component, make or buy analysis, skema rakitan (8 Nov)										■							
6	Detail design: gambar teknik dari produk akhir dan komponen, part list, OPC (15 Nov)											■						
7	Testing and refinement: Rancangan akhir berdasarkan hasil pengujian (22 Nov)												■					
8	Presentasi hasil dan pengumpulan laporan akhir (29 Nov dan 6 Des)													■	■			



# Langkah-Langkah PjBL (Lanj...)

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## 4. Mengawasi Jalannya proyek *(monitor the students and the progress of the project)*

- Dosen bertanggungjawab memonitor aktivitas mahasiswa selama melaksanakan proyek.
- Membantu mahasiswa jika terdapat kendala.
- Menjadi mentor dalam kerja team mahasiswa.

# Langkah-Langkah PjBL (Lanj...)

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## 5. Penilaian terhadap proyek (*assess the outcome*)

- Mahasiswa diawal proyek harus diberitahu apa yang akan dinilai dari proyek yang mereka lakukan.
- Penilaian dapat bersifat individu maupun team (umumnya menggunakan rubrik).
- Adanya umpan balik terhadap capaian pembelajaran mahasiswa.



# Langkah-Langkah PjBL (Lanj...)

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## 6. Evaluasi (*evaluate the experience*)

- Refleksi terhadap proses dan hasil
- Pengalaman plus dan minus yang dialami mahasiswa selama proyek.



# Matakuliah

TIN 316 Supply Chain System, 2 SKS,  
Semester 6.

# Learning Outcomes

- Student have the ability to:
  - Identify engineering problem which consist of decision maker, objective, performance measure and alternative course of action.
  - Solves problem using an appropriate method or technique.
  - Develop alternative solutions by applying engineering design principles.
  - Evaluate and select the appropriate design solution.
  - Present ideas orally in front of audiences.
  - Function effectively in a team.

# Pengenalan Masalah

- Penundaan dan keterlambatan pengiriman produk merupakan permasalahan yang dapat mengakibatkan:
  - Biaya tambahan
  - Menurunnya kepuasan pelanggan



# Perencanaan Proyek

- **Cari sebuah perusahaan distribusi dan bantu mereka dalam merencanakan rute distribusi produknya.**
- **1 kelompok = 4-6 orang**
- **Aktivitas yang diperlukan:**
  - Identifikasi dan rumusan masalah
  - Memilih metode penyelesaian
  - Pengumpulan, penyajian dan analisis data
  - Menentukan alternatif solusi dan memilih solusi terbaik
- **Mata kuliah pendukung:**
  - TIN 104 Program Komputer, Semester 1
  - TIN 206 Penelitian Operasional 2, Semester 5
  - TIN 303 Sistem Informasi Manajemen, Semester 5
  - TIN 306 Pemodelan Sistem, Semester 6
- **Fasilitas yang dapat dimanfaatkan:**
  - Lab. Komputer, Lab. POSI, Lab MB

# Jadwal Aktivitas

Aktivitas	Due
Pengajuan dan persetujuan proposal	Minggu 7
Pemilihan Metode	Minggu 8
Presentasi dan progress report 1	Minggu 9
Menentukan alternatif solusi	Minggu 12
Memilih solusi terbaik	Minggu 13
Presentasi produk dan laporan akhir	Minggu 14

# Mengawasi jalannya Proyek

- Pengawasan jalannya proyek dibantu oleh asisten Lab.
- Masing-masing kelompok mendapatkan satu orang asisten.
- Dosen dan asisten bertindak sebagai mentor.

# Penilaian

- Penilaian dilakukan menggunakan rubrik untuk setiap learning outcome.



**Grading rubric for a Group Project  
Project Proposal and the System Analysis and Design Deliverable Rubric**

<b>Component</b>	<b>Sophisticated</b>	<b>Competent</b>	<b>Not Yet Complete</b>
<b>Teamwork</b> (25 Points)	The team worked well together to achieve objectives. Each member contributed in a valuable way to the project. All data sources indicated a high level of mutual respect and collaboration.	The team worked well together most of the time, with only a few occurrences of communication breakdown or failure to collaborate when appropriate. Members were mostly respectful of each other.	Team did not collaborate or communicate well. Some members would work independently, without regard to objectives or priorities. A lack of respect and regard was frequently noted.
<b>Contribution</b> (25 Points)	All requirements and objectives are identified, evaluated and completed.  The deliverable offered new information or approach to the topic under discussion. Likewise, the application is based on stated criteria, analysis and constraints.	All requirements are identified and evaluated but some objectives are not completed.  The deliverable offered some new information or approach to the topic under discussion. The application is reasonable; further analysis of some of the alternatives or constraints may have led to a different recommendation.	Many requirements and objectives are not identified, evaluated and/or completed.  The deliverable offered no new information or approach to the topic under discussion. Few application considerations are analyzed and other factors were ignored or incompletely analyzed.
<b>Subject Knowledge</b> (25 Points)	The deliverable demonstrated knowledge of the course content by integrating major and minor concepts into the response. The deliverable also demonstrated evidence of extensive research effort and a depth of thinking about the topic.	The deliverable demonstrated knowledge of the course content by integrating major concepts into the response. The deliverable also demonstrated evidence of limited research effort and/or initial of thinking about the topic.	The deliverable did not demonstrate knowledge of the course content, evidence of the research effort or depth of thinking about the topic.
<b>Supporting Material</b> (20 Points)	All relevant information was obtained and information sources were valid. Analysis and design considerations were well supported by the information.	Sufficient information was obtained and most sources were valid. Analysis and design considerations were mostly supported by the information.	Insufficient information was obtained and/or sources lack validity. Analysis and design considerations were not supported by the information collected.
<b>Composition</b> (5 Points)	The deliverable was well organized and clearly written. The underlying logic was clearly articulated and easy to follow. Words were chosen that precisely expressed the intended meaning and supported reader comprehension. Diagrams or analyses enhanced and clarified presentation of ideas. Sentences were grammatical and free from errors.	The deliverable was organized and clearly written for the most part. In some areas the logic and/or flow of ideas were difficult to follow. Words were well chosen with some minor expectations. Diagrams were consistent with the text. Sentences were mostly grammatical and/or only a few spelling errors were present but they did not hinder the reader.	The deliverable lacked overall organization. The reader had to make considerable effort to understand the underlying logic and flow of ideas. Diagrams were absent or inconsistent with the text. Grammatical and spelling errors made it difficult for the reader to interpret the text in places.

## Application Demonstration Rubric

Component	Sophisticated	Competent	Not Yet Complete
<b>Teamwork</b> (30 Points)	The team worked well together to achieve objectives. Each member contributed in a valuable way to the project. All data sources indicated a high level of mutual respect and collaboration.	The team worked well together most of the time, with only a few occurrences of communication breakdown or failure to collaborate when necessary. Members were mostly respectful of each other.	The team did not collaborate or communicate well. Some members would work independently, without regard to objectives or priorities. A lack of respect and regard was frequently noted.
<b>Contribution</b> (30 Points)	The demonstration offered new information or approach about the application. The demonstration also showed strong effort was made in breaking new ground and building excitement about the application.	The demonstration offered some new information or approach about the application. The demonstration also showed initial effort was made in building excitement about the application.	The demonstration was not complete and offered no new information or approach about the application. The demonstration also showed that little effort was made in building excitement about the application.
<b>Content and Creativity</b> (40 Points)	The demonstration was imaginative and effective in conveying ideas to the audience.	The demonstration techniques used were effective in conveying main ideas, but a bit unimaginative.	The demonstration failed to capture the interest of the audience and/or is confusing in what was communicated.

# Rubrik Presentasi

## Final Presentation Rubric

Component	Sophisticated	Competent	Not Yet Complete
<b>Content and Creativity</b> (40 Points)	The presentation contained an abundance of material which clearly related to the main arguments. External research was used to justify arguments or solutions. The presentation of the material was original and presented in a creative way that held audience attention.	The presentation contained material to support the main arguments but: 1) not all material clearly related to the main arguments; 2) limited external research was used to justify arguments or solutions; and/or 3) the presentation of the material was appropriate, but only somewhat held audience attention.	The audience had to make considerable effort to understand the underlying logical and flow of ideas. Major aspects of the analysis or recommendations were absent. No external research was used to justify arguments or solutions. The presentation lacked creativity and did not hold audience attention.
<b>Coherence and Organization</b> (30 Points)	The thesis, argument and solution were clearly stated and examples were appropriate. The transitions and flow were easy to follow. Slides were error-free and logically presented.	The thesis, argument and solution were clearly stated, but: 1) not all examples were supportive illustrations; 2) the transitions and/or flow were somewhat difficult to follow; and/or 3) slides were error-free and logically presented.	The thesis, argument, solution and examples were not clearly stated. The conclusion was unclear. The transitions and flow were not logical. Slides contained errors and a lack of logical progression.
<b>Speaking Skills and Participation</b> (30 Points)	Team members were poised and had clear articulation. Every team member spoke and participated at a very high and balanced level. Speakers demonstrated good volume, and eye contact. Enthusiasm and confidence was exuded. The presentation fit into the time allotment of 10 minutes.	Team members were mostly audible and/or fluent on the topic, but: 1) not all team members spoke and/or participated in a high and balanced level; 2) speakers demonstrated fair volume and/or eye contact was broken with audience; 3) light discomfort with public speaking was exuded; and/or 4) the presentation slightly went over the 10 minute allotment.	Team members were often inaudible and/or hesitant and relied heavily on notes. Speakers made distracting gestures with little or no audience eye contact. A high level of discomfort with public speaking was exuded. The presentation went over the 10 minute allotment.

Sumber:

[www.cmu.edu/teaching/assessment](http://www.cmu.edu/teaching/assessment)

## Individual Reflection Essay Rubric

Component	Sophisticated	Competent	Not Yet Complete
<b>Contributions</b> (50 Points)	The individual contributed in a valuable way to the project. The individual is also able to articulate the key performance criteria of successful teams and evaluate the group performance accordingly.	The individual did not contribute as heavily as others but did meet all responsibilities. The individual is also able to identify some key performance criteria of successful teams and/or draw related connections the group performance.	The individual did not contribute to the project and failed to meet responsibilities. The individual does not identify key performance criteria of successful teams or draw inference to own experience.
<b>Lessons Learned</b> (50 Points)	The individual had a level of engagement that demonstrated a strong commitment to the class and the learning outcomes. The voice of the individual writer is evident.	The individual had a level of engagement that demonstrated a commitment to the class and/or the learning outcomes. The level of analysis and reflection could have been deeper.	The individual had a level of engagement that did not demonstrate a commitment to the class or the learning outcomes. Conclusions simply involved restating information without reflective thought.

# Contoh penggunaan rubrik presentasi

	1 (Inferior)	2 (Average)	3 (Good)	4 (Excellent)
<i>Sistematika</i>	Audiens tidak paham apa yang disampaikan karena informasi yang disampaikan tidak sistematis	Audiens sulit memahami apa yang disampaikan karena penyampaian melompat-melompat	Mahasiswa menyampaikan presentasi dengan sistematis dan audiens bisa memahami dengan baik	Mahasiswa menyampaikan presentasi dengan sistematis, menarik, dan audiens bisa memahami dengan baik
<i>Pengetahuan</i>	Mahasiswa tidak mampu menjawab pertanyaan tentang materi presentasi yang disampaikan	Mahasiswa mampu menjawab sebahagian pertanyaan yang diberikan	Mahasiswa mampu menjawab semua pertanyaan yang diberikan tetapi tidak mampu memberikan penjelasan yang rinci	Mahasiswa mampu menjawab semua pertanyaan yang diberikan dan mampu memberikan penjelasan yang rinci
<i>Grafis</i>	Tidak ada gambar (diagram, grafik, skema, dll) yang digunakan di slide presentasi	Mahasiswa menggunakan gambar (diagram, grafik, skema, dll) tetapi tidak mendukung presentasi yang diberikan	Mahasiswa menggunakan gambar (diagram, grafik, skema, dll) tetapi tidak semua gambar mendukung presentasi yang diberikan	Mahasiswa menggunakan gambar (diagram, grafik, skema, dll) dan semuanya mendukung presentasi yang diberikan
<i>Cara penyampaian</i>	Terburu-buru, tidak ada intonasi, dan tidak ada bahasa tubuh	Tidak buru-buru, tanpa intonasi dan bahasa tubuh	Tidak buru-buru, menggunakan intonasi dan bahasa tubuh tetapi masih kurang	Tidak buru-buru, menggunakan bahasa tubuh, dan intonasi yang sesuai
<i>Eye contact</i>	Hanya membaca slide dan tidak ada <i>eye contact</i>	Sekali ada <i>eye contact</i> tetapi masih membaca semua slide	<i>Eye contact</i> selalu dijaga tetapi kadang-kadang masih membaca slide	<i>Eye contact</i> selalu dijaga dan hanya sedikit membaca slide
<i>Pengelolaan waktu</i>	Harus <i>skip</i> satu subbab (misal teori) karena waktu sudah hampir habis	Harus <i>skip</i> satu atau dua slides karena waktu sudah hampir habis	Harus menyampaikan dengan cepat/terburu-buru karena waktu sudah hampir habis tetapi tidak ada slides yang <i>diskip</i>	Semua slides disampaikan dengan baik dalam batas waktu yang ditentukan

Komentar: \_\_\_\_\_



# Contoh penggunaan rubrik penilaian bekerja dalam team

	1 (Kurang)	2 (Rata-rata)	3 (Bagus)	4 (Cemerlang)
<i>Partisipasi dan kontribusi</i>	Tidak pernah memberikan informasi/data yang berguna untuk tim; tidak memberikan usulan yang berguna untuk tim.	Mengumpulkan informasi/data yang diperlukan tim setelah disuruh tetapi hasil yang diberikan tidak terstruktur, dan tidak dipaparkan dengan jelas.	Mengumpulkan informasi/data dan terbatas hanya terhadap apa yang diperlukan oleh tim saja; kadang-kadang memberikan usulan yang terstruktur dan jelas untuk tim.	Mengumpulkan dan menyajikan banyak informasi/data yang berguna untuk tim; dipaparkan dengan terstruktur dan jelas.
<i>Apresiasi terhadap semua pihak yang terlibat</i>	Sering berdebat dengan anggota tim; tidak memberikan kesempatan kepada orang lain untuk bicara; merendahkan orang lain; selalu ingin tugas dikerjakan menurut pendapatnya; tidak mendengarkan usulan orang lain.	Biasanya hanya banyak bicara; tidak memperhatikan ketika orang lain bicara; selalu berpendapat kalau idenya adalah yang benar; tidak pernah merendahkan orang lain; ketika orang lain tahu cara mendekatinya maka dia akan bekerja sama dengan orang itu dengan baik.	Secara umum mendengarkan pendapat orang lain; menggunakan bahasa yang bagus dan tidak merendahkan orang lain; mencoba untuk memahami ide orang lain.	Selalu mendengarkan pendapat dan ide orang lain; membantu orang lain dalam merumuskan idenya dan selalu memberikan penghargaan/kredit kepada yang punya ide; membantu tim dalam mendapatkan keputusan yang adil.
<i>Bertanggung jawab</i>	Tidak melakukan tugas yang diberikan; sangat bergantung kepada anggota tim yang lain dalam menyelesaikan tugas.	Melakukan tugas yang diberikan tetapi perlu banyak diingatkan; sering terlambat dalam menyelesaikan tugas; kadang-kadang mengharapkan orang lain dalam melakukan pekerjaannya.	Melakukan tugas yang diberikan; kadang-kadang terlambat dalam menyelesaikan tugas; menghadiri semua pertemuan; tidak mengharapkan orang lain mengerjakan tugasnya.	Melakukan tugas yang diberikan; selalu tepat waktu dalam menyelesaikan tugas; sangat bisa diandalkan.
<i>Respon terhadap perbedaan latarbelakang, peran, dan prioritas tim</i>	Tidak memberikan usulan/data/informasi untuk tim jika tim tersebut terdiri dari anggota dengan latar belakang dan peranan yang berbeda; selalu terlambat menyelesaikan pekerjaan yang sama sekali baru baginya.	Jika satu tim dengan orang-orang dari latar belakang yang berbeda, lebih sering diam apabila diminta usulan, dan tidak memiliki inisiatif untuk tim; sering terlambat menyelesaikan pekerjaan yang sama sekali baru baginya.	Jika satu tim dengan orang-orang dari latar belakang yang berbeda, sering memberikan usulan/data/informasi untuk tim; kadang-kadang terlambat menyelesaikan pekerjaan yang sama sekali baru baginya.	Jika satu tim dengan orang-orang dari latar belakang yang berbeda, antusias memberikan usulan/data/informasi untuk tim; tidak pernah terlambat menyelesaikan pekerjaan yang sama sekali baru baginya.



# Evaluasi

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- Mahasiswa diminta untuk mengungkapkan perasaan dan pengalamannya selama menyelesaikan proyek.



# Contoh Karya Mahasiswa #1

- PT Panay Farmalab merupakan perusahaan distributor produk farmasi.
- Wilayah distribusi: kota Padang.
- Rata-rata 7 pengiriman harus ditunda dari total 100 pengiriman.
- Rata-rata penundaan yaitu selama 26 jam dan 20 menit. Jumlah dus yang terlambat dikirim pada bulan lalu sebanyak 288 dus.

gui\_mtsp

Jam Pelayanan Mulai  s/d  Kecepatan kend.   
 Waktu Loading  Waktu unLoad  Kapasitas kend.   
 Jml Salesman  Jml Iterasi

Koordinat Depo X =  X =

DATA PEMESANAN

	1	2
1		
2		
3		
4		

Jml Data

HASIL TSP

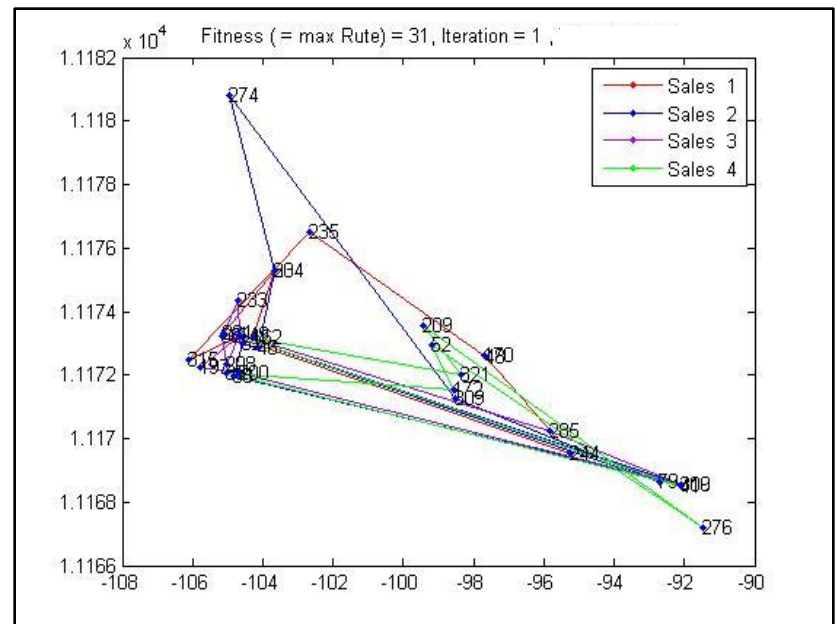
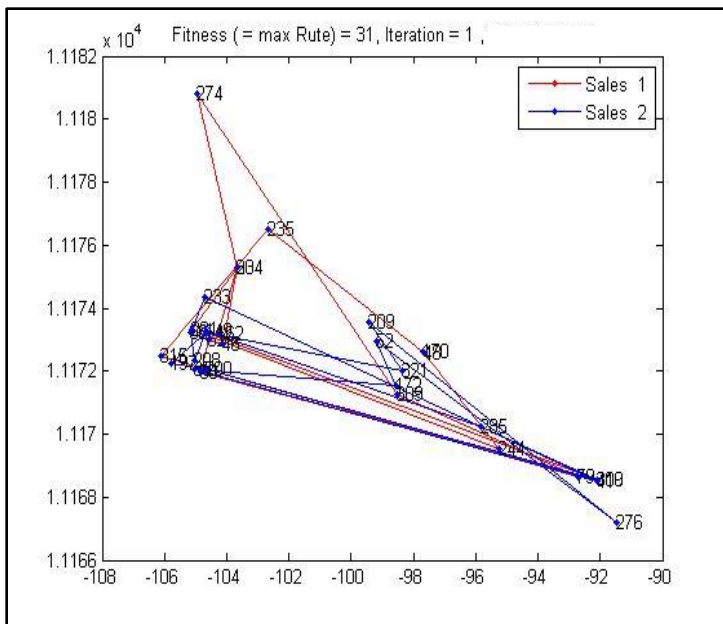
	1	2
1		
2		
3		
4		

DATA PELANGGAN

	1	2
1		
2		
3		
4		

Ready ...

Hasil penentuan rute pada program menghasilkan total waktu distribusi  $\pm 1$  jam atau 30,17 % lebih cepat dibandingkan penentuan rute aktual dari PT Panay Farmalab.





## Contoh Karya Mahasiswa #2

- CV Abro Mandiri adalah distributor produk KAO di kota Pariaman.
- Keterlambatan pengiriman bisa sampai 3 jam per hari.
- 3 jam kerja ekstra = biaya lembur.
- Perusahaan belum memiliki rencana distribusi.
- Rute distribusi ditentukan berdasarkan pengalaman driver.

```

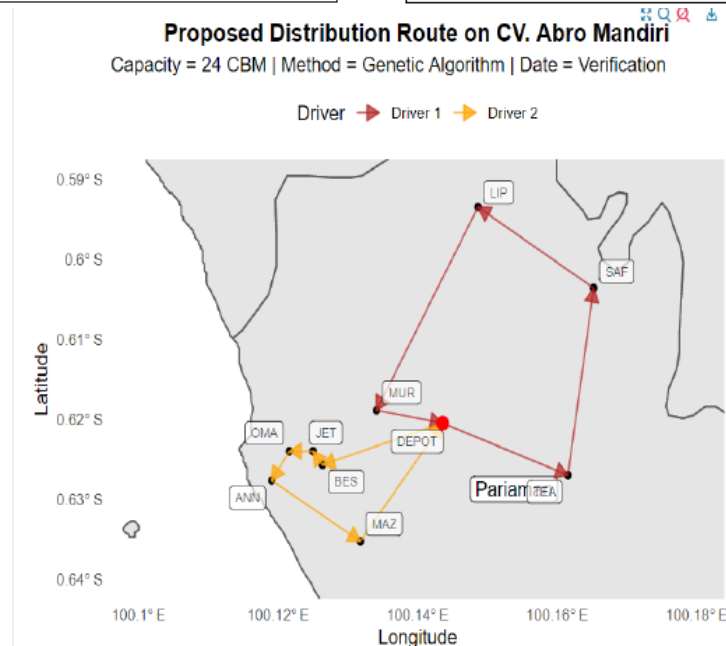
# GEOGRAPHIC INFORMATION SYSTEM (GIS) FOR PROPOSED ROUTE
route1 <- select (int_route,-
c(initial_driver, Latitude.km, Longitude.km))
route1 <- select (route1, -c(service_time))
service_time <- unloading_time
route1 <- cbind(route1, service_time)
route1[1,10] <- loading_time
data_gis <- genetic_algorithm_solution$Route %>%
  as.data.frame() %>%
  rename(from = ".") %>%
  mutate(to = lead(from)) %>%
  slice(- nrow(.)) %>%
  left_join(route1, by = c("from" = "node")) %>%
  rename(from_lon = longitude,
         from_lat = latitude) %>%
  left_join(route1, by = c("to" = "node")) %>%
  rename(to_lon = longitude,
         to_lat = latitude) %>%
  rename(from_outlet = outlet.x ) %>%
  rename(to_outlet = outlet.y) %>%
  rename(from_outlet_code = code.x) %>%
  rename(to_outlet_code = code.y) %>%
  rename(type = type.y) %>%
  rename(date = date.y) %>%
  rename(service_time = service_time.y) %>%
  rename(demand = demand.y) %>%
  rename(location = location.y) %>%
  select(-demand.x) %>%
  select(-date.x) %>%
  select(-type.x) %>%
  select(-service_time.x) %>%
  select(-location.x) %>%
  #Number Visisted Outlet (Include Depot)
  mutate(unit = c( rep("Driver 1", 5), rep ("Driver 2", 6)
))

```

```

# 2 | Plot Data to the Map, ggplot, gis location is used by library(indonesia
)
indonesia_kota <- id_map("indonesia", "kota")
indonesia_kota <- indonesia_kota[381:399,]
plot_gis <- ggplot(indonesia_kota) + geom_sf() +
  coord_sf(xlim = c(100.1, 100.18), ylim = c(-0.64, -
0.59))+ geom_sf_label(aes(label = nama_kota), label.padding = unit(1, "mm"))
+ geom_point(data = route1, aes(longitude, latitude), show.legend = F) + geom_s
egment(data = data_gis, aes(x = from_lon, xend = to_lon, y = from_lat, yend =
to_lat, color = unit), size = 0.5, alpha = 0.7, arrow = arrow(type = "closed
", angle = 30, length = unit(3, "mm"))) + geom_point(data = route1[1,], aes(l
ongitude, latitude), color = "red", size = 3) + geom_label_repel(data = route1
, aes(longitude, latitude, label = code), size = 2.5, alpha = 0.7, segment.size
= 0.2) + scale_color_manual(values = c("firebrick", "orange", "dodgerblue", "
green3", "purple"))+
  theme_minimal() +
  theme(panel.grid = element_blank()) +
  theme(legend.position = "top") +
  theme(plot.title=element_text(hjust=0.5, face="bold"))+
  labs(x = quote(Longitude),
       y = quote(Latitude),
       title = "Proposed Distribution Route on CV. Abro Mandiri",
       subtitle = "Capacity = 24 CBM | Method = Genetic Algorithm | Date =
Verification",
       color = "Driver")
gis <- girafe (ggobj= plot_gis)
gis <- girafe_options(gis, opts_zoom(min = .3 , max=10))
if (interactive()) print(gis)

```



**Total waktu  
distribusi 19% lebih  
pendek dari total  
waktu distribusi  
saat ini**

Contoh  
Karya  
Mahasiswa  
#3

- Mata kuliah **Sistem Perancangan Produk**
- Tujuan proyek: mahasiswa menghasilkan produk-produk inovatif sebagai solusi berbagai permasalahan yang dialami masyarakat.
- Durasi proyek: 10 minggu

- Perlihatkan slide presentasi mahasiswa

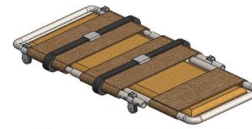
# Produk-produk kreasi proyek mahasiswa

Tandu  
Darat-Air

## Desain Produk



Produk Stretcher Landwater



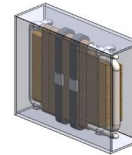
Produk Utuh Stretcher Landwater Menggunakan Pelampung



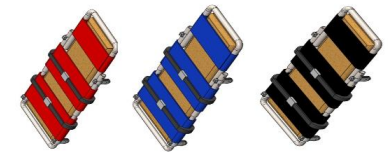
Penggunaan Roda Pada Produk Stretcher Landwater



Tandu Bagian Atas Produk Stretcher Landwater pada Posisi Dilipat



Pengemasan Produk Stretcher Landwater ke dalam Tas Tandu



Variansi Warna Produk Stretcher Landwater



# All-in Gym Tools

## TRICEP DIP



## VERTICAL ROWS



## SIT UP



## PULL UP





# Adjustable power terminal



**TERIMA KASIH**