

Code	What did you learn from practical 5. You can mention specific knowledge, und
S255	I learned that certain chemical reactions are much more efficient than others ar
S275	I learnt about how many aspects to look at when looking at sustainability and al
S302	Working in a team with good communication makes tasks easier.I also learned t
S329	I learnt that the sustainable use of resources is very important. In everything we
S120	I learned that there are different drug synthesis routes to choosefrom and that i
S021	I learnt about the different routes and I found it interesting to see what goes ir
S218	I learnt that the production of drugs actually have a real impact on the environn
S265	I learnt that there are mulitples diffrent ways to create the same product but so
S007	I have learnt that there manners to ilimate unnessecary waste product through
S320	I learnt how important an engineer can be in the drug synthesis route and how i
S079	I learned the importance of suistainibilty.Also I leared it is neccasary to know ho
S101	I did not know about the manufacturing process, so it was interesting to learn a
S314	working together as a group is better and effective and the importance of consi
S133	I learnt that there is a lot of aspects that could impact sustainability and there a
S157	How apirin is produced and the various routes to do so. How to calculate atom e
S158	I learnt how a lot of these everyday chemicals and products that we use on a day

S214 I learnt about various green metrics such as : atom economy, carbon efficiency,

S313 I did not find the practical interesting enough to spark any joy for it, but i did lea

S219 i learned that in order for a process to be sustainable there are a lot of factors a

S054 The importance of designing a process that prioritises not only economical impa

S078 I realized that in the manufacturing of products with the use of chemical proces

S156 I learnt that Aspirin has many more side effects on humans than I expected. I lea

S091 I learned as an engineer it is important to factor in sustainability when designg

S174 People, social and personal skills I learnt during

S124 Practical 5 taught me how complex the process of finidng, achieving and mainta

S155 It was interesting to see the dirty work in production of goods, sometimes as a c

S041 Practical 5 gave me more useful information under sustainability. Sustainability

S008 I learned that the main goal of producing chemicals be it in the lab or in industri

S044 I learned that everyday things such as aspirin affect the environment directly, in

S233 Firstly i feel that Practical 5 was useful and interesting ,I eel it was very useful th

S178 I learned that there is such a thing as percentage atom economy and percentag

S191 I learnt how every profession is connected in some way and that engineers worl

S230 I learnt of the multiple factors that need to be considered when achieviing susta

S248 I managed to learn and understand the different route in the manufacturing of a

S088 I found it extremely interesting to learn about a real world process such as aspir

S303 I learned how to properly dispose things such as Aspirin without harming or dan

S199 I was reminded that the process of producing products and materials should no

S287 It was very interesting actually. I learnt a few things and here are some of them.

S058 I learnt about sustainability. That how we use resources now can affect the next

S324 I learnt that there are many different ways to approach different processes and

S059 I learnt about one of the calculations they use to quantify carbon emissions, like

S025 I learned the skill of analyzing a process and the importance of setting boundaries

S316 From practical 5, I was well-introduced to the conversation of sustainability and

S033 I learned about the different ways to produce Aspirin, as well as what aspirin is

S132 I developed a better understanding about sustainability. It's not just something

S074 Prior to this practical, I was unaware of the fact that there were metrics to determine

S300 Green chemistry metrics describe aspects of a chemical process relating to the p

S119 Obviously it explained and let us apply t

S333 I now understand how businesses are impacted by sustainability and how their |

S326 I have learnt about the importance of saving our Earth for better use. Finding n

S024 Firstly, learning the concept of mass balances was not only interesting but will li

S263 I learned that there are 3 different routes that can be followed in order to produ

S328 Importance of considering greenest route when dealing with industrial processes

S115 I learned that there is more than one way of manufacturing aspirine and that th

S184 there were 2 routes present , one had a higher yield with a high amount of wast

S297 i have learnt more about the chemical processes (practical part of it).\ni got to le

S251 The knowledge of sustainability ,and the means of sustainability , as well as the

S068 I have learned alot more about the process of making aspirin as well as the diffe

S160 I learnt mostly about how deep sustainable development goes from an enginee

S262 Job creation \nUsing raw materials that do not produce waste \nWe must look i

S223 I learnt that we should use resorces in a sustainable manner so thatwe dont cor

S092 I learnt what a drug synthesis is and how there are different routes that can be 1

S307 I learnt that a large-scale of people have none to limited knowledge about the e

S197 I learnt that the production of aspirin can be through different processes and v

S050 The varies ways in which chemical production affect the environment social life

S039 I learned more about the importance of sustainability. I learned that sustainable

S266 I learnt that having a plant and producing a chemical suppliment is very impa

S015 Sustainability is not only about saving the environment but rather it also include

S270 Prac 5 taught me the responsibility I will have as an engineer and how I should u

S166 I learned that there are many different ways for a product to be produced. Ever

S321 I learnt how to establish the best green route and well as learnt how to calculate

S169 I learnt how to use certain metrics to find which route to produce a certain chemical

S123 I never realised how in depth sustainability goes. For example how one chemical

S304 I learned innovative skills that made me become interested on how can we green

S271 From practical 5 I learnt that there are more many ways to get salicylic acid in o

S154 I learnt about the process of manufacturing aspirin and what is the sust

S085 I learnt how to measure the sustainability of a production route, specifically thro

S289 I have learnt that we have to make a sustainable environment and take care of i

S331 The practical was interesting because it educated me that there is more than just

S035 It was interesting to learn how important sustainability is, and the way when car

S086 I learned new ways of how to make something more sustainable and it was usef

S153 I learnt that as an engineer, i will not work in isolation but i will rather work with

S165 I learnt that there was actually a way for manufacturing plants and industries to

S129 I learned that certain routes and chemicals have negative as well as positive imp

S037 I learnt that chemists and engineers are in the center of sustainability and that v

S012 I learned the importance of being economic effecient and the processes wich fo
S171 i learnt how asprin is made and what goes into each drug sysnthesis route along

S087 I learnt that every process of a product has a life cycle that can be assessed. We

S162 Practical 5 helped to teach me to consider multiple aspects of a process (enviroi

S116 Practical 5 has made me aware of impacts of different processes. I didn't think r

S212 The concept of Atom ecomnomy, which is the amount of product in relation to ·

S103 During the practical I found it informative to work with other people and hear tl

S259 I learnt that sustainability is the most important thing to take into consideratio

S080 In Practical 5 I learned the importance of taking in consideration all of the aspec

S038 I learnt about the manufacturing process of aspirin and also about how we can t

S005 I learned alot from practical 5, much more than I have ever known about sustair

- S159 I learned about various impacts of drug manufacturing and how manufacturing i
- S027 I learnt a lot in practical 5 including the fact that it is up to us and it is our duty a
- S203 i learned about the different aspects that are looked at when determining the s
- S246 I learnt that the best route to take which contributes to the green chemistry is t
- S069 I learnt that every step in the process contributes to a final sustainable product.
- S254 I learned how to use green metrics in order to find the best and "greenest
- S277 I learned that there are more than one way to make aspirin. One which impact th
- S216 Through practical 5 I learnt to really understand what the concept of sustainabil
- S001 I learnt about the different calculations that can be used to decide the route to
- S130 I learned about the life cycle of chemical manufacturing process and understand
- S110 I learned the importance of sustainability and the impact it has on everything.Th
- S276 From this practical I learned about an engineers role in linking the economic,soc
- S281 I learned that during chemical processes alot of waste can be produced and as a
- S099 The process of manufacturing aspirin\nYes it was interesting
- S002 The whole process of aspirin and what goes into itand what effects the whole pr

S030 I learnt that the production and manufacturing of everyday items such as aspirin

S135 I never knew about the 17 sustainability development goals: the goals that are

S185 I learnt that when it comes to production of products, we don't just produce products

S139 Practical five helped shape the mindset of engineers in training on what is involved

S201 That there are alternative routes to creating aspirin. It is also a very complex process

S200 I have learnt the importance of green chemistry so as to minimize the environmental

S213 I learnt that more people working on one goal is more efficient than working alone

S308 From practical 5 I learned that we should be able to understand how the present

S145 I learned the importance of sustainability when combining engineering and chemistry

S056 I have learned that chemistry also prioritizes sustainable development goals, such as

S256 I learned the importance of accessing different processes for obtaining a certain

S334 The practical was very insightful and it allowed us to collaborate regardless of our
S180 I learnt how to think from multiple perspectives and views

S243 The practical taught me to connect sustainability to my everyday life and understand

S208 While I didn't really learn anything major, I did come to the realization that the

S319 I learnt that every problem can be solved if many brains come together and sha

S210 It is always important to consider the environment whenever you manufacture

S081 i learned that the way aspirin is manufactured can acctually impact the environ

S064 After this practical I have learnt a lot about what is required in order to be a sus

S042 Practical 5 was both interesting and useful. It broadened my perspective on the

S149 The production of Aspirin and the different routes. The effects of the chemicals

S186 i learnt that sustainability takes place on multiple levels, from collecting the raw

S098 There are many aspects related to manufacturing products and various process

S198 \nGroup work.\nLlisteninhg, observing and resolving skills.\nThe

S235 I learnt about the different routes to produce aspirin as well as the reactants th

S188 I learned that there is waste produced when synthesising medicinal drugs. I had

S047 Practical 5 was very useful to me because I have learnt the importance of sustai

S182 I did not know that there are three differnet routes in the manufacturing of aspi

S051 This practical gave more insight about the waste created when material is produ

S105 I learned that inorder for a route to be sustainable you have to consider not onl

S061 I learned how aspirin is manufactured. \nI learned about green energy metrics a

S010 to always conserve or save things for the generation to come and to be able to l

- S253 I learnt that working together with all sorts of professions will in fact be more effective
- S137 Apart from learning how aspirin is produced, my group and I shared ideas and I learned
- S229 I have learned that sustainable practices promote the minimization of waste and
- S237 I learned that sustainability also extends to the social sector, through preservation
- S026 I learnt valuable knowledge that I am actually able to implement in everyday life
- S205 I think this was an interesting practical, I learned a lot about what goes into the
- S114 I learned that there were more than just waste management with sustainability
- S330 I learnt that if not controlled, drug synthesis can have negative impacts towards
- S102 I learned that there are many ways to achieve the same end product, and that v
- S152 I learned good communication as it was a group activity, as well as the greener i
- S045 I have learnt that even if a product that is being produced is made for saving lives
- S065 The way sustainability is approached and the cradle-to-grave and all the different
- S077 I learned about the green metrics and mass balances which is a powerful tool for
- S148 That it is important to know if specific reactions are bio-friendly or not, so that

S285 I learned that there are better ways and processes of production when it comes

S029 I learnt the impact of deciding which drug synthesis route to take as an engineer

S094 I was reminded of the importance of sustainability and the role it plays in various

S306 the importance of sustainability, and that we can do something about it, depending

S294 I can't say I learnt anything but the idea behind why it was done was interesting

S036 I learnt about the insight that chemical analysis reveals when reviewing routes

S292 #NAME?

S161 firstly I learnt about Aspirin and the different ways of producing salicylic acid, and

S108 I learned that there are a lot of green chemistry metrics to consider when choosing

S206 I learnt that using sustainable sources of power such as solar may not always be

S175 I learnt there are different methods of manufacturing a substance and manufacturing

S291 I learnt that engineers collaborate with people from other professions and careers

S301 The content covered in practical five was both useful and very interesting as I learnt

S097 All the methods of determining the metrics to determine which is the most green

S173 I learned about the concept of a life cycle assessment. I learned that when expo

S268 From Practical 5, I learned that using renewable resources does not necessarily

S252 I learnt more about the role chemical engineers can play in contributing to susta

S284 In this practical my perspective on sustainaility research as a whole was widend

S269 Practical 5 enlightened one in the different ways in which a production activity r

S071 I learned about the process of aspirin synthesis. What was interesting to me wa

S323 Learning about the certain processs that go behind the manufacturing a medica

S192 I thought about different ways that I can make a difference in my proffesion and

S236 most about sustainability and how aspirin is contributing to the environment an

S131 #NAME?

S014 It is important as an aspiring engineer to understand how to sustain a lot of our

S335 There is always more than one way to improve the production process in order

S226 I learnt about the important of sustainability for the current and future generati

S009 It is very important to consider all 3 factors when production processes in a corr

- S318 In Practical 5 i learnt the importance of sustainability and how every thing we do
- S209 The products of making aspirin and what is needed. What impact of making asp
- S189 Practical 5 taught me that as consumers there is a whole world we do not realis
- S089 Manufacturing any products through sets of chemical reactions generates alot r
- S062 It is important to consider environmental impacts when creating new manufact
- S122 I learnt that there are many ways or routes in which some products, such as asp
- S261 I learnt that the people involved in creating products through chemical process
- S283 I have learnt that when manufacturing products, a lot of aspects have to be take
- S118 I learnt about the different aspects of green chemistry and the different factors
- S057 That there is a lot of ways to maesure the efficiency of a process
- S100 I found this a very interesting prac that some of the ideas and thoughts we had
- S106 I learned about how asprin is manufactured and that the processing of one thing

S231 I learned that the synthesis of any product should be considered as a whole and

S257 Resource Conservation: Greener manufacturing processes are often more effici

S293 I learnt the manufacturing process for aspirin.

S060 I realised how much damage drug production can have on the environment and

S018 I learnt about all the factors that go into choosing which route to take in order t

S134 I did learn a lot about sustainability and developed skills to calculate atom econom

S082 i learnt that it is important to look at the impact of different methods and how t

S144 I learned that there are consequences when producing certain products. i learne

S280 I learned about atom economy and other calculations that can help determine i

S239 I learnt that there is a way to alternately produce what we want by taking more

S140 I learned that it is important as an engineer to know about the impact on the en

S138 Practical 5 taught me analytic skills that I may one day implement and use to de

S067 The skill to look at the whole picture [environmental, social and economic in the

S055 Understanding the variety of routes available for a certain product, I did not rea

S215 We only think of the things that happen at our place, there is more to the input:
S143 I learned that with atom economy you can determine which chemical route one

S183 I learnt to consider specific systems as only small parts of a greater multi-system

S117 Practical 5 learned me that the most green method is not jet the most priactical

S250 I learned that technology and the advancement of medication is actually not val

S217 The different methods of producing aspirin and their environmental effects\n

S224 I learnt to look at how unsustainable certain processes can be and to try and av

S299 I learnt that the manufacturing of aspirin is much less sustainable than I thought

S311 Green Chemistry was the main thing that I took away from this practical. Previo

S076 I learned that it is important to look at factors other than efficiency and maximiz

S032 From practical 5 I learn to think of all facets when deciding on a specific route, y

S290 I learnt that there is a lot for factors that cotribute to the production of product

S136 Diffrent ways of calculating if something is sustainable.
To be more sustaina

S127 I learnt the importance of engineers in the sustainability cycle. We have a vilat r

S312 I learned that sustainability should be accounted for in the way that Companies

S141 Practical 5 showed me that there is more to the drug synthesis industry and I fo

S309 I leant that the world needs more sustainable ways of making a ton of things. Th

S063 I learnt about the routes that are used to manufacture aspirin. It made me reali:

S221 I learned new calculations from the green chemistry metric that can help indicat

S267 The importance of agreeance in the workplace as well as the importance of a ba

S196 Firstly, I learnt about the synthesis of home-made aspirin following the appropri

S204 The practical helped form a deeper and more critical understanding of the indu

S046 The process of aspirin manufacturing, and the implications of how bussinesses t

S163 I learnt more about the oerspective i shoukd view things from as an engineer, e:

S317 I learned from practical 5, the process that a company makes when producing a

S232 I have learned that as an individual it is essential to ensure that sustainability is ma

S234 From Practical 5, I learnt that there are many ways that help you to choose a re

S164 I learnt that sustainability is not just about one aspect. There are different ways

S066 Aspirin manufacturing can have a huge impact on the environment.\nA lot of di

S142 It is important to be aware of sustainability in all stages of a product's lifespan (C

S296 Practical 5 was interesting, as it was different from the previous. Learning about

S028 I learned about the various manufacturing processes of aspirin, which includes the

S017 I learnt that as much as we may think everything works as an isolated system, it

S244 I learnt of the direct impact that most manufacturing processes may have on th
S049 Maximising your resources is very important and always find numerous pos

S020 Environmental sustainability should be established and understood as a collect

S242 I learned of the UN 17 sustainable development goals. I also learnt that natural/

S070 The practical was interesting and useful because it showed that to determine th

S019 I learned that there are different metrics to consider in the production of a chemi

S146 That chemistry is the basis of many processes, without knowing the chemistry y

S109 That even though something has a massive economical impact, it does not nece

S096 I learnt about the life cycle of a product and how it starts from cradle(raw materi

S225 I learnt about the importance of sustainaibility and the green-economy.I also lea

S052 Susatainability improves quality of our lives, protects our ecosystem and preser

S083 I learn't about what the meaning of sustainability is andd what it means to be su

S113 That there is an enviromental friendly and sustainable way to produce products

S043 The practical 5 provided us with valuable insights and learning oportunies in se

S282 I have learnt that chemists,engineers and various other professions can collabor

S150 Renewable energy is n better source of power. It was interesting

S227 i have learnt that the things that we do now have an impact on the future and v

S238 I learned the impOrtance of sustanability that everyone in capable of addressing

S181 that we should turn to renewable sources for production and also the importan

S305 I learnt that when things are done in the form of a group it becomes easier to fi

S031 the major role chemistry that plays and the the effect it has socially, environme

S147 It provided me with insights into the development and manufacturing of other p

S194 i've learned about three different routes of manufacturing Salicylic acid which is

S179 Sustainability challenges require collaboration across disciplines and sectors. I h

S126 It was interesting learning about how chemistry is used in everyday production :

S327 I learnt the importance of system thinking. I have a tendency of breaking things

S177 I understood the importance of sustainable of methods of production and the h

S090 One of my key takeaways from practical 5 was the concept of the green metrics

S095 I found the process by which aspirin is made to be quite interesting as it is one c

S228 how engineers and chemists can join to create ideas

S241 I learnt a new outlook on the significance of chemists and they're capability of c

S040 I learnt that when manufacturing a product, you need to be considerate of the t

S022 I learned the chemistry industry involves more than just chemists and engineers

S211 Doing practical 5 made me more aware of the impact drug synthesis has on the

S128 - I learnt that sustainability is a serious issue and is often swept under the carpe

S075 Practical 5 was an interesting and useful practical. It is useful in that it helped to
S264 chemistry plays a significant role in sustainability.

S168 I learnt about the processes of the manufacturing of aspirin and also about the g

S202 I learnt about the manufacturing of aspirin, its side effects, the different ways it

S187 I learned about methods to assess the sustainability of a process in creating a p

S176 Just how interconnected basic production systems can be and how many aspect

S310 I discovered what the process is of the synthesis of aspirin and the history of it.\

S172 Seeing how many people make use of aspirin. The production process of aspirin

S167 I learnt that when I become an engineer, I should strive to work with systems th

S112 I learnt how to produce aspirin through the most efficient and cleanest way that

S073 I learnt that sustainability is a serious issue that is well known but not implemer

S240 Sustainability consists of many different factors that all play a role and affect ea

S288 I learned how important sustainability is to different aspects of life such as social

S207 I learned that a lot more goes into the manufacturing of aspirin than meets the

S125 The role of chemistry in sustainability. A brief look at how chemists determine

S295 I've learnt more about how to be a useful engineer, what to consider when pro

S278 I learnt that scientists are trying their best to improve sustainability when creatin

S260 As an engineer I have a bigger impact on sustainability than I thought. I learned

S121 I learnt that sustainability does not only relate to the environment but also enc

S190 I learned as an engineer, if you don't think much about the consequences of your

S023 Engineering relies on the collaboration between different engineering disciplines

S258 I learnt the effects of aspirin on a human body. I was also unaware of the proces

S003 I learnt that there are different ways that drugs are synthesised and that the pro

S034 I learnt a lot about the pharmaceutical industry

S084 I learnt that sustainability is vital and does not only impact our environment, bu

S195 I learned that chemistry checks for multiple routes to synthesize products. It find

S245 I learned the manufacturing process of aspirin together with its environmental

S272 I learnt that the process of manufacturing Aspirin is much simpler than I would h

S004 I learnt about the issues of sustainability in the pharmaceutical industry and in c

S011 I have learnt that, just because a system or process works in a specific way, doe

S013 Learning about systems thinking was interesting. I have learnt that it is importar

S107 Collabaration and teamwork skills\nHow my career can be a postive influence tr

S193 Aspirin made impact in our world by providing easy and inexpensive method to

S249 I learnt that being an engineer isnt just about optimising processes for maximum

S322 I learned the different ways in which the community can better be involved in s:

S325 Practical 5 was very helpful.\nI learnt alot such as what different chemicals in as

S220 It taught me the importance of safety especially to mankind and its environmen

S151 I learned about the critical assesments that go into a project, all the relevant pe

S053 the importance of being mindful of the route chosen for production of aspirin ,f

S332 practical 5 taught me to think sustainably, and in doing so i have learnt to be mc

S111 I learnt more interesting details on how aspirin is manufactured and that there :

S093 I learned about sustainability and I learned the skills how to calculate things like

S048 I learned the term system thinking and sustainability. I learned that if engineers

S315 I have learned the importance of sustainability in a broad way than I did before.

S006 I learned about the United nations' plans to make the world a better place. We '

S170 I used to take sustainability lightly before this practical and i also lacked knowle

S072 The huge impact people have on the environment, economic and other people.

S222 I learned that it takes more than just manufacturing a product , we need to see

S279 I did not learn anything new in prac 5. I already knew about the sustainability iss
S016 <Unanswered>

S273 I learned that as an engineer, I play a big role in the industry of drug production

S274 I learned about calculated metrics of impact and to think about the impact of nc

S298 There are a number of ways that can be used to make drug synthesis more sust.

What aspects did you like or enjoy about the practical 5?

I enjoyed the group aspect.

The team work, made it alot more fun and comunication.

The teamwork and critical thinking.

I enjoyed the fact that we had to do a lot of research in order to understa

I enjoyed the problem solving aspects of the practical.

I liked that the questions were open ended and that we had to draw conc

I enjoyed the groupwork , i found that it is easier to reach solutions when

I enjoyed the culcations to find which of the routes would be better in c

I enjoy the role play aspect of the practical when the enviromenal, soci

The aspect I liked the most was hearing the different views in my group a

To do the calculations that predict the sustainibilty of a spesific routes lik

The information about the process of manufacturing Aspirin.

Calculations and role play

I liked the fact that we were given oppertunities as engineers to give a op

Learning about how aspirin is produced and the different ways doing so.

I like how the practical was really research based and the fact that the ma

1. Working with others.\n2. Calculating the green metrics

not alot, except the calculations needed to observe the difference in the

that i got to work with a team of young engineers like myself and hear th

I enjoyed learning about green chemistry and the metrics of sustainability

When we had to determine the atom economy and the carbon efficiency

I did not enjoy most of it because i enjoyed the wet labs more but i woukd

The learning of how to focus on a certain system that we can change the

Other than working with others, I enjoye

My favourite part of it was how challenging it was as it was like nothing I

It was guided with instructions whereas with previous you had to learn ev

Practical 5 was performed in groups, different group members gave diffe

Learning how aspirin(the number one drug) used by us(humans) is produ

The group work and sharing of ideas, just being able to tap in to what oth

I enjoyed gaining the knowledge about thie important matter of sustainal

I thought that I was not going to enjoy the group work but I actually had :

I enjoyed learning about the types of ways to calculate the sustainability |

working as a group about something that is going to improve the poor co

I enjoyed the fact that it was a group work and I had chance to work with

I liked learning about the synthesis, different routes that could be followe

I liked the part that raised more awareness about sustainability and learn

I enjoyed discussing the process from different views, the financial, social

I really enjoyed the group work, i was with 2 group members, it was very

I liked the role play activity.learning people s views on different aspects o

The aspect of challenging our thinking and allowing us the challenge of tr

For me the collaborative work was an aspect I liked. I think it was essenti

I enjoyed the team activity. I feel it is very helpful to hear and discuss wha

I enjoyed working in a group with other engineering students in order to

The role-playing part was enjoyable

I liked doing research to find out what impact every reactant and product

I enjoyed doing the roleplay toward the end of the practical as it allowed

I enjoyed mostly the calculations and the teamwork we had with our gro

The group work was a bit of a breath of fresh air from the usual and some

THIS IS WHAT I ENJOYED LEARNING ABOUT

Well Creating my own sustainable plant and discussing it with my group.

Often the work in first year feels general and inconsequential, this

I liked that this practical had to be done by groups and not by individual s

Group work which enhanced efficiency when doing the practical work. Al

I enjoyed working in groups and discussing the different questions of the

concluding and getting the results myself

it was so broad , it was so informat. i got to learn more compared to the c

The role of engineering part , or the part where you must take the effects

I enjoyed making 2 new friends whilst doing the prac 5 report . It was ver

The chance we were given to be real world problem solvers. We were giv

Getting to understanding how aspirin is synthesised \nRole play

Group working ,because it was easy to share ideas and solve problems m

I liked how detailed the aspirin information document was written. I en

I enjoyed brainstorming ideas with my group as different character-role p

I enjoyed making research about the production of aspirin and also worki

Having to think out of the box like a true engineer on how to improve inc

Role play : Role play allowed us to practice system thinking, even though

That we got to work in groups and getting to hear other people's views ai

It is a group work theoretical practical

The Role Play in terms of putting ourselves in those shoes

That it allowed us to think outside the box, particularly in the perspective

I liked how it enlightened me about the sustainability process. I also enjoyed

I enjoyed learning about sustainability how one would need to find the

Being able to role different positions in a company and being able to com

I liked learning the different ways we can green the economy I also liked

I liked finding out about the process of making aspirin and how there's no

I liked the group working part because I get to see how other stu

I like that we were able to work in groups, and were able to hear differen

Working with people and making research about the practical

Knowing the environmental, social and economic effects of the input an

Working in groups, it was interesting to hear the other people's opinions

The group work was the best aspect, to communicate and learn how other

I enjoyed the role play with the 3 managers listing what they would need

I liked that we worked in groups. I met people I've never seen before or e

I liked that we worked as a group and thinking on different ways to creat

It was quite free and open for discussion\nThe aspect of groupwork help

I enjoyed the research wich had to be done for the pre prac and furtherin
i liked caculating and figuring out which route was the greenest

I also loved preparing for the prac as I was informed of a real problem in t

I enjoyed how it forced me to apply myself and in some senses problem s

Being able to work with others during the practical.

Learning about how engineers and chemist can use different formulas to

Working in a group was very nice. Since we, as engineers, will always be v

I enjoyed learning about the drug synthesis routes available as well as lea

I quite enjoyed learning about the different phases the drug synthesis rou

I enjoyed the role-playing when we grouped up and talked about issues fi

I like the calculations of the green metrics and to use the results to conclu

I liked the group discussions because it allowed us to see different perspectives.

The part where I learnt about the production of aspirin from salicin. Also,

I enjoyed learning about the production of aspirin and about how to determine

Comparing which route to take after calculating the metrics of each route.

I enjoyed looking at the metrics and comparing them to see which was more

The aspect of working together with people, discussing problems, finding

I enjoyed where we had to work in a group to solve the problem. =This situation

I enjoyed that we were asked to work in groups. It is always enjoyable and

I enjoyed the group discussion on the topic.

I enjoyed the role playing part where groups brainstormed how to make a

Working in a group and thinking in other people's perspective and learning

I enjoyed the group work during the practical time.

I enjoyed working in groups to solve problems. I also enjoyed learning about

Group work\nInteresting type of questions

I enjoyed to know the process and learn the basic process of aspirin production.

I liked that it was a more relaxed approach to practices and allowed me to

I enjoyed working with my fellow students, it provided many different an

I liked the calculation of the metrics, as they helped to let us know how r

The part where the groups had to do role playing. That was a very fun ex

I liked learning about the chemicals that we utilize in daily chemical proce

I like that we got to work in groups. This showed with a team you can effi

I liked that we were in small groups and we could work at our own pace.

I enjoyed the part of working in a group, gathering information from one

I enjoyed combining chemistry with the working world and looking at the

Group Work.

I liked the teamwork aspect of it. It did cause a lot of debate but we coul

The fact that the practical was not the usual individual work and rather a
working in a group

Being able to work with my colleagues for the first time in the practical a:

I enjoyed working with others and sharing ideas

The role playing part we were able to share ideas help one another on w

Where we had to act like we are manufactures and actually list all the thi

I enjoyed the part where we were comparing the three routes to determi

I enjoyed the group work and being able to dicuss my ideas as well as lea

I enjoyed the more practical side of chemistry in which you have to take t

Learning about sustainability and working together in groups to obtain gc

i found the group work aspect of the practical enjoyabe. it allowed me to

I enjoyed working in the group and hearing different aspects and ideas cc

Learning the different opinions people have to resolve certain solutions.

I enjoyed the activity where we had to brainstorm different social, enviro

I liked the equations for the calculated metrics, because I like doing math

Is the fact that information from the information document was clear and

The group interaction, and being able to debate the points. hearing and l

Woking with other students was enjoyable because, there were different

I liked the group discussions, and building on eachothers ideas, I also enj

I enjoyed working in a team and hearing everyone's different interpretati

learning on way used to produce Asprin and learning more about sustain;

I enjoyed the system thinking and bigger picture imagining the most because

It introduced us to the reality of the world of production and process.

I liked the fact that it promotes environmental and social responsibility,

I enjoyed the group work aspect of the practical, because we have different

I enjoyed that it was a teamwork based project which also helped to characterize

I liked the fact that it was group work the most, I liked hearing other perspectives

The problem solving of the equations were fun, and also the role play. The

I enjoyed working in a group with others taking a different engineering course

Learning about the raw materials used in the manufacturing of aspirin. It

The group work.

Where we had to work together as a group to find a greener route of production

Looking at the process and how waste is calculated and seeing how the overall

I liked that we worked on a real world problem, sustainability, and the different

Working with others to think of new ideas for aspirin manufacturing, and

It was more inclusive in the sense that it was more than just about follow

Working in teams to come up with ideas about what each profession can

I enjoyed hearing different viewpoints from different people and listening

the fact that I had to look for information to answer the questions to the best

We were not limited in any way and were free to share our thoughts and

I enjoyed working in a group, specifically in the concept of sustainability,

The role play activity where each group member had the opportunity to

I really enjoyed the group work and the designing of the eco friendly fact

I really enjoyed doing the calculations with the products, waste and react

Working in a team and discussing different perspectives was enjoyable. A

I enjoyed learning about the seventeen sustainable development goals w

I liked that this practical was more relaxed. It didn't really feel like an assess

I really enjoyed covering sustainable methods and coming up with sustain
The working together in groups.

I enjoyed the group work as well as doing the research before the practical.

The role-playing question. The question may have been slightly difficult, but

I enjoyed looking at the role that engineers play in sustainability.

Group work and discussion over the topic throughout the practical.

I enjoyed all aspects of Practical 5, it was informative and every aspect of

I enjoyed making the calculations to determine the atom economy, mass

I enjoyed discussing sustainability with my group members, as hearing different

The practical required research to be done, good thinking skills and calculations.

The roleplay part where each team member had to be either playing the

Discussing Ideas and Teamwork. Everyone was equal to everyone and the

Pretending to be a Community representative in order to figure out what

The calculations and role play.

Role playing part because I learnt about a lot of ways sustainability can be

The calculations of the tables upstreaming and downstreaming.

The team work and brain storming of ideas was one particular good aspect

The chemistry that is involved in the production of aspirin. Working together

How informative it was and the role play was also nice as it simulated what

I enjoyed the freedom of thought and opinion, being asked to generate solutions

Learning how many people can be affected with unsustainable manufacturing

I liked that we could work in groups, as it is how it would be in the industry

I enjoyed working and interacting with other students. It gave me an opportunity

Working in groups.

I enjoyed evaluating and discussing the best route to take based off the calculations

Doing the calculations

I really enjoyed the group work, unlike most of our previous practicals this one

The equations we had to complete.\n

I enjoyed working in groups and I enjoyed being introduced to a new way

I enjoyed being able to work in a group and using everyone's opinions to f

Using equations to scientifically decide on the most environmentally frier

I enjoyed the group work and discussing the environmental, social and ecc

I enjoyed the research part where I got to learn new information and aga
The calculations

The role play

I enjoyed the part of prac 5 where we were given different roles and we c

Being able to communicate with others and hear as well as voice opinions
I liked learning about the different factors that are involved and the meth

The interactive and collaboration aspects with other students

I enjoyed coming up with environmentally sustainable solutions to implei

The preparation was interesting, different from other practicals and insig

The real-life considerations of drug abuse in its social impact of the simpl

Thinking with a group of people to try and think of all the possible ways to
I enjoyed the teamwork. It was the first teamwork session since joining u

I enjoyed the collaboration aspect of this practical, we got to feed off of e

The group work was fun it is nice to work in groups and think through th

It challenged me intellectually and forced me to think and even read artic

The teamwork required

I enjoyed the group work, as it allowed me to meet people in my enginee

That we could work with a team and we could make up for most of each

I enjoyed the team based narrative of the practical. As engineers I believe

It was nice to work as a group, it helps to expand your horizons and show

I enjoyed the group work, each partner in the group was from a different

The ability to work together as a group of students to overcome a task th

The group work. It was fun to do in the group since everybody had their c

The group working and the learning about sustainability with relation to €

I enjoyed the fact that the prep work was easy to do and still taught us m

The calculations.

Group work, it exposed me to how others think about sustainability and \

I enjoyed the groupwork, as I believe that it is useful to consider different

I enjoyed working with other students and getting to know my lab partne

i particularly enjoyed the group work aspect of the practical

\nLearning about how to make home-made aspirin using proper l

Working in a group with other people who have different view points anc

The theory of how engineers can play a role in sustainability.

I enjoyed learning that different chemical reactions may be used to obtai

The knowledge it imparted to me and my group. Playing the role of another

I enjoyed working in a group, I realised that two minds is better than one.

Teamwork, I enjoyed discussing with other students doing different engin

I enjoyed the teamwork. I liked how the work was left up to us to solve, v

The manipulation of values to calculate new values

The opportunity to collaborate with other members in the field of engin

Practical 5 had a less stressful environment in which we were allowed to

Having discussions about the topics on sustainability and what factors it a

I liked that it was more about critical thinking as opposed to just analysin

Researching about the roles I, as a future engineer would play in sustaina

We work in groups and even we had different opinions on some of the is:

Most questions could be answered without critical thinking. This seemed

Hearing my peer's view on sustainability. Hearing from my peer's on how

I enjoyed the role play because it forced me to look at a process from a d

I enjoyed working as group as this gives me ideas that I did not think abou

Learning of the different ways of making aspirin

When we were split into groups and had to come up with ways how we v

Learning the process of how we can innovate processes to be more effec

I enjoyed performing the calculations and working in groups.

I got a chance to think like a qualified Electrical Engineer and come up wit

I enjoyed working within a group where I was able to gather more insight

The fact that the group could share their own opinion, which makes you t

Aspect of green chemistry principle.

I enjoyed the fact that I got to interact and learn with other engineering s
Learning about sustainability

It had calculations and it was an open minded topic that we can all relate

it was working as group as we all came up with different opinions on so

the fact that different types of upcoming engineers are able to work toge

I liked the fact that we got enough time to discuss as a group and i even g

the insights it gives you to the real world or rather the larger environmen

To work as a group, because this encourages interaction, teamwork, and

i enjoyed calculating the metrics which helped me to decide on which ro

Our practicals are mostly individual work, I like the fact that I was given a

One of the last questions involved role playing in a group. It was very inte

I did not really enjoy the practical at all. I think i was just trying to get as r

Having to think about sustainable processes of production, with having tc

I enjoyed working in a group for this practical, as it provided a contrast to

I enjoyed the critical thinking and analysis of the issue and how we, as a t

The group work

I enjoyed collaborating with new people and solving problems with them

Different engineering students had to work in groups and it was fun havir

I like this practical because it exposes me to more facets of the chemical |

Brainstorming with my groupmates. Getting to view the drug synthesis pi

I enjoyed learning about sustainabilty and its importance .I feel that my r

I enjoyed being able to see how other memebers of my group viewed sus
working in an assigned group. the theoretical qrestions.

The fact that we could work as a team and do the project together. The c

I enjoyed the group work, especially the play.\nI enjoyed doing somethin

Having to work with fellow class mates to complete the practical, and sor

The team I was placed in worked together very well making it a pleasant ·

I enjoyed calculating the E-factor , Atom economy and so fourth.\nI also f

How informative the information was which was given to complete the p

I enjoyed learning about a topic I've never thought of as much which is su

I likes everything. The research, the work, everything.

I enjoyed the group work aspect. I enabled me the learn what other peop

Working in a group with other people to try and solve the same problem

The teamwork and learning about sustainability for the manufacturing of

The group work was a fun aspect, more specifically hearing the opinions of

Learning about how chemists determine the efficiency of various drug synthesis

working in a group in order to look at each other's different points of view.

The cooperation with fellow colleagues to find ways to improve sustainability

Researching the impact each input, product, waste and energy have on the

I enjoyed the group work aspect of the practical as well as the role playing

It was not a wet lab practical and it made me open to learn about sustainability

Learning about the sustainable development goals.

learning about the many methods of production and all of the pros and cons

working in a group and brainstorming together
role play

I enjoyed learning about sustainability and green chemistry and how we can

I enjoyed the group discussion. It was interesting to learn other people's

I enjoyed the collaborative aspect of it and the critical thinking required to

I enjoyed that there was more of a space for our own opinions and ideas

I really enjoyed the systems thinking simulation which enabled different

I enjoyed getting to try a new experience. Practical 5 showed me that the

The group work. We were given a chance to interact with each other and

Team Work, critical thinking required to answer open minded questions ar

Learning about production of aspirin\nBenefits of aspirin to people who a

I enjoyed learning about Green chemistry and it was reassuring knowing t

It involved all my senses of learning which included visual (through the vi

one aspect of practical 5 that was enjoyable was the fact that this practic

I enjoyed teamwork, it gave us an opportunity to share ideas and our diff

The manner in which it was conducted, it was great being put in the shoes

Teamwork and sharing of ideas through group discussions.

I enjoyed the role play part because it gave my groupmates and I the cha

Working with a group and discussing the practical and working together.

it was interesting to learn about sustainability and all the processes includ

The practical had lots of situational questions. That put me in a position

I enjoyed working with a group of different engineers of different fields w

Practical 5 was very informative and forced students into thinking about i

I got to learn how aspirin is made, before this i never knew. I used to just

The part were you had to thought of ways to make drug synthesis more s

Collaborating with other types of engineers and working together to find

I liked working in a groupwith the other students.

<Unanswered>

I enjoyed having to work with other people. It made the work easier and

I liked the fact that we learned about sustainblity instead of doing an exp

Working in a group was the most enjoyable part since we were able to br

How could aspects of the practicals that you disliked be improved?

I feel like the practical was long and there were errors in the data given to us. The prac could be shortened a bit. After a few hours you lose concentration.

There was nothing to be improved upon in my opinion.

A better topic can be introduced that will be more interesting for the students to do.

The **group work** was challenging because not everyone contributed the same amount of help and/or knowledge. We did not understand each others thought processes about the practical very well. It can be improved by allowing the students to decide beforehand who they would like to be in groups with.

Some of the questions and tasks were very vague. For example when we had to name and explain the environmental, economic and social effects of the inputs, outputs and energy used, it was very difficult to answer those questions because for each one you can conduct an entire research project on it. But we only had a limited amount of space and answering these questions to this extent would take very long. Yes the practical tried to give us more insight about the impact of drug synthesis but it lacked some truth in it. We want to see the real impact it has on the society and environment so that we are more encouraged to make a real change.

The section where we had to design a factory could be improved by narrowing down what aspects we should work on.

The tedious calculations for Question 1 in the practical

I had no dislikes but I think giving a little more information to the drug route. Less group work and less roleplay activities will improve this practical.

I would make it more interesting with an experiment and not just calculations, that was no challenge. Also let the students decide in what group they want to be. It is nice to work with someone that is on the same level of thinking than you are, and it makes it more fun to brainstorm with someone you know. \nInstead of calling it a practical just call it an assignment and let the students team up into groups before the practical and let them gather information and put together a design plan as it was with the practical.
<Unanswered>

I would like there to be a provision of safety gloves especially when we were dealing with chemicals like Lead iodide and sulphuric acid. I would also like to be more scales to measure our compounds because waiting in a long queue just to weigh your sample can be a bit time wasting sometimes.

I want to produce the aspirin by doing the experiment myself. So allowing us to do experiments will improve this practical by a lot.

There could've been a more visual representation of how the products were synthesized, maybe through video or example.

Sources of information to refer to could be provided instead of using google so that the required information can be more clear.

rather not letting it be a practical and turning it to a lecture would have been more enjoyable for the people who have interest in those type situations but this topic is in somewhat important for every engineer to know atleast.

the questions were quite boring and i think there could be a different way of asking the questions that could make it more fun and mind provoking.

An improvement in the quality of the video production (i.e. a better microphone or using filmed footage) could help increase interest in the practical and shift the perception of it to one of equal value to the wet-labs(especially because the wet-lab practicals have highh quality videos)

I think that it was over-all a good practical and that there is no need for improvement

I think we should be able to pick our group members because this would allow people to generate more ideas as they are with people who they know and understand to an extent.

making the career role-play more about an engineering career and how this career could improve the prosses

I did not enjoy watching that 14 minute vidoe in the lab alone. I felt that it was unnecessary that each individual had to watch the video by themselves. I feel like it would have been more effiecient if that video was projected on a screen so that everyone could watch it at the same time. It was disruptive when a video on one device overlapped with someone elses video. Because the watch time and speeds were different for everyone, the clash of the audios distracted me from actually engaging with the video.

While I did not dislike working in a group, working with people who are in your allocated tutors group was my least favourite part of this practical. I do understand why it was necessary but I would have loved to work with my friends - who were in the other tutors group - and learn about their views and thoughts on this topic. If there was a way to work with people outside your tutors allocated group, that would be amazing but that was really the only thing about the practical that I did not like as much. \nAs someone who isn't the best at socialising and who loves getting things done efficiently while still maintaining quality, working with strangers was a bit nerve-racking but I did get to know new people who were thankfully nice so that was good.

It was a lot of work to prepare and go through on your own, perhaps it could be presented concisely in an effective manner by video that is directly applicable to the prac

I think health and safety issues should be considered when performing practicals, some practicals need protective clothes such as gloves, lab coats and glasses all of those shouldn't be in short.

Practical 4 titration I think the usage of among students KMnO_4 should have been monitored throughout the practicals because students were disposing unused KMnO_4 in the waste bottles whereas there were students who were actually short of KMnO_4
Practical 5 I feel like it could have been more interesting if it was more interactive or we did the actual experiment of producing aspirin and write out about our observations which contributes to the research of sustainability.

I feel like the groups could be larger maybe, or at the end of the sessions we would share our thoughts with other groups, in that way we're able to share with each other more.

I feel that the practical groups could be largened by one or two people as this will ensure that when doing the role play activities at the end of the practical it would feel more realistic than it did with only three people . Secondly I think that the pre prac document could better explain how to do some of the calculations in the practical as no-one in my group had done calculations like some of them before and they were not well enough explained to fully understand how to do some of the calculations.

More information about the pre-practical exercises could be provided as I felt as if I did not know what was going on, or what I was doing, when completing the work.

I would have liked it to be a wet lab practical, as I would have enjoyed seeing the processes up front.

I can't think of any, by far my favourite prac

I did not like the fact of us having to group ourselves and having to go and asking to join a certain group as some people are shy, sometimes people find themselves grouped with the same type of engineers as themselves. I think this can be improved by forming lines of different type of engineers and taking one of each line in order to form groups with different type of engineers and this also helps the shy people to engage in their groups.

I think it would be fun if we did parts of the synthesis ourselves in the lab. It was interesting learning about it and I was disappointed when I found out that we wouldn't be doing it ourselves.

By providing students with more information about the practical ,providing clear calculations that are going to help in the practical and providing them with tutors that will constantly assist them as some practicals are harder than the others .

Figuring out which values to use in the different calculations was confusing so I think making the instructions more clear of classifying the information better would have help.

Well, I think everything was okay, they all just require proper practice, they all had enough time allocated to them and they were actually very fair because the tutors did their very best to assist us during the practicals to ensure that we perform well.

The groups could have been expanded, so that a broader range of issues and problems can be discussed as insight would range from many people with different views.

I think the role-play activity could be explained better in the aspect that the instructions didn't specify what was required by the students.

I think each group should have had about 2 more people, I think we would have benefitted from more people in each group so that we have more ideas

The reading documents and the video that we watched in class covered very much the same topics. It was good to hear it more than once but maybe one must rather be regarded more like an overview and the other must treat the subject more in detail. Other than that I don't think there is much else that can be improved.

I did not like the fact that I had to watch a video during the practical on the manufacturing of Aspirin and other relevant information. I think it would be more effective to teach this information, probably during a tutorial session and have students really engage with the work in the tutorials by working in groups to do some calculations and answer some questions. Watching a video does not make the educating more engaging but removes an element of where a student can ask a question for better understanding. In summary, I would have the information taught on the video taught in an interactive tutorial session where students work in groups to complete the pre-practical report and then afterwards must go home and complete an online assessment to test whether they understood what was taught or they relied on their friends to help them.

Be more specific in the questions that were asked

More information could have been given during the pre-practical assignment because I didn't know how much information to provide when the impacts of the reactants and products had to be listed. I didn't know whether it had to be in terms of the aspirin manufacturing process or is it just the impact of the substances as a whole.

Reading about the production of aspirin was tedious for me because I prefer more interactive content, so maybe having an interactive video replace the document might help students like me engage with the content better.

Reading more information and understanding the work in a bigger point of view.

The video was a little meh, somewhat dull compared to our usual practical orientation videos. Perhaps a little bit of music and a few panning shots of a beautiful landscape being wrecked by the 'delicate touch of humanity', as usual. The pre-prac exercise was **very** repetitive, but it made sense why we had to list **everything**. I would suggest a simple column layout instead of a single block for all three categories of the materials. I would personally have liked a video or demonstration of each of the processes we had to pick from. Otherwise, beyond building an actual chemical plant, it was pretty comprehensive.

What I didn't like about the practical is the fact that we were not able to go out there and ask people around the communities about how they feel about sustainability and if they can think of possible ways to reduce it. We didn't actually get to ask different businesses how they feel about this and it were to be considered how would it affect them. I think this should have been an outing practical whereby we would actually go out there and ask for different opinions from different people. And include communities because they are the ones who are being affected by this.

Ensuing that the steps of the Green Efficiency methods are much more clearer. I struggle with the calculations.

The majority of the practical was spent doing theoretical work, it would have been a lot more enjoyable if maybe a rudimentary experiment could have been done outlining an example of green chemistry. I would have liked that the practical video that we had to watch when practical 5 began, was shown in the laboratory and that we did not have to rely on our own devices to watch the video because some of the devices is slow and may not work where the possibility of not being able to watch the video was there instead of having the assurance that we, the students, will be able to watch the video for it would be shown to us by the relevant lecturer.

The other practicals were more on individual work, the chemistry department must consider enrolling groupwork for most of the practicals to save resources and enhance efficiency by saving time.

During practicals there should be more measuring devices, for example scales, because often we had to wait a while to use them which made us rush and thus making our results less reliable because our readings were inaccurate.

more information and examples can be provided

For me I would not say there was something I did not like with the practicals aspects. Everything was according in my perspective.

By giving a brief explanation of the reasons for the aspects used, or the background of it.

I would have liked to know more information about what was expected of me during practical 5 and an idea of what was going to happen beforehand since this uncertainty made me feel very stressed and unprepared for practical 5. Nothing else was in need of improvement in my opinion.

There was not much I disliked apart from the fact of lazy group members but not much can be done about people's attitude so I have nothing more to add

There were no aspects I disliked

In this practical they should have given us time to present our group ideas to the rest of the groups so that we can be able to know how others think of. Give us time to present our ideas.

In most of the experiments we were required to use the weighing scale, however there is a lot of students that is expected to use one scale. This does cause a lot of impatience of students in the line which cause the person using the scale to make an error because they are rushing. It would be more convenient if an appropriate amount of students were allocated to a specific scale to minimize traffic. The placement of the scale is also in an inconvenient place, being above the cabinet where instruments are kept. This can lead to errors when using the scale or breaking of instruments as everyone is trying to get what they need in a rush. The gathering of instruments is also very congested as everyone rushes to the instrument cabinet at once. Often the instruments left for the last students will be not in the best condition, which places them at a greater disadvantage. It would be easier if before the practical explanation starts everyone gathers their instruments individually per table in an orderly manner. This ensures that everyone has the correct and working instruments.

The spelling and other errors in the practical report could be rectified. A prior introduction to sustainability in lectures could be done, to offer pre-knowledge of the concept. impact of the process towards the environmental aspect. I need to expose myself in to the environment in order to see how the environment is impacted in the whole process. As a student i have never actually seen with my own eyes how badly gaseous emissions from industries really affect the environment, i just read about it and was told that chemical production have some negative effects on the earth if unsustainable processes are not used and believe it but if u havent actually seen something happening you might take it for granted and choose not to believe. Therefore a practical example of how high carbon emission or waste from industries could be more practical because we will actually see for example how a plant we are working with is unable to thrive in such conditions and that could trigger our minds more into solving the problems that come up with chemical production processes.

There are no aspects of the practical that i disliked. Everything was flawless.

The information sheet could be more detailed and more explanatory as we were quite lost on how to do the calculations and were confused of what was expected of us.

-Adding a poll to the videos to insure the student stays focused when watching the videos \n-ensuring that the answer sheets have less errors

I would've liked Practical 5 be more practical based as it was the only different one

There was no real area that i disliked in the practical. The only difficult part is the pre-prac which was quite confusing at times so the only suggestion i have is to make that easier to understand.

Did not really dislike anything. Apart from the repetition of the calculations from the pre-prac. There were no aspects of practicals I did not like but I believe working in groups will increase the understanding of the practicals as it will show the student a different perspective to their own. Instead of mainly just calculations in the practical, there could be more real examples from factories or the manufacturing process as a whole

They should explain to us in person rather than to make us watch videos for information. Tutors should always check on us since other practicals are difficult than others.

The aspects of the practical that I disliked was when we had to watch the video during the practical lesson. I felt that the video was not helpful in my actual write-up and it just served as a visual representation and repetition of the information I had already read in the information document. This aspect could be improved by not making the videos a repetition of what we already read but rather as a video that shows examples and how to go about answering certain parts of the practical write-up and a video that has new information that we might need to know to better answer our write-up.

Nothing

The practical notes did not give us sufficient information on the production of aspirin's impact but required us to research the impacts, thus leaving us a bit unsure of the true impacts of its production as when researched a lot of the information online was generalized and not specific enough the aspirin production

Encourage students to be involved in group work

By choosing the people whom you want to be in the same group with because it is much easier to express your thoughts and views to people you are used to.

One of the role playing sections at the end of the practical was a bit tedious, you shortened the number of points given by each person from 8 to 5.

More visual representations.

N.A. I feel like we were given enough information but also enough "missing information" to make us think outside the box.

It would be nice if we got feedback on our practicals where we could see what went wrong and what we could do to fix it in the future. It gets a bit frustrating not knowing why you lost marks in certain places as we never saw our mistakes and wrong answers.

In my group I had a member that didn't contribute to the practical. Only two of us did all the work while the other one only wrote his name on the report. Therefore I would recommend the staff to walk around in the lab making sure that everybody works together. (This was the only aspect that I disliked)

I did not dislike any aspects of the practical

I did not enjoy the part of the practical where I had to be put in someone else's shoes and see it from their perspective as I had the role environmentalist and I don't relate to that field. I would have preferred that we could discuss the different divisions needed to be part of the plant and choose a role for ourselves. Furthermore the rest of the practical was enjoyable.

we could have made aspirin in the practical but there was nothing that i disliked about the practical

I wished given more time to work as group as we all under pressure finish in time. As well as more time to listen the the video to grasp the concept fully on how to to a mass balance but fortunately we were given an example at the back of the booklet to help. However the practical was very well planned and organised.

I felt that the pre-prac exercise was very lengthy and repetitive. I feel that some of the aspects could have been removed and more focus given to other aspects of the process.

The idea that the practical was about sustainability, however, multiple pages for the answer sheet were run out. And, it was not printed back to back, so more paper was wasted. Since we were working in groups it's likely that at least one of the members have a laptop in which we could of have done the task. The practical exercise could be made online.

Have a lecture dedicated to the practical, this way there can be more understanding and more knowledge on the practical. This will make the practical more esier and more approachable.

We found that some instructions sometimes are unclear, and that becomes stressful quickly. Also working in a team meant that we did not work as fast as we do individually.

I had no dislikes so I do not see anything that needs to be improved

There wasn't too many bad aspects when it came to the practical but I would change is when asked to do the whole role play aspect of the practical I would love to have done it with more people seeing as there would have been more knowledge and ideas spread than in the groups of three we were placed in.

I did not like particular questions and in future I would like to choose my own group instead of being grouped together randomly

I would like the pre prac video to be much simpler and explaining more in depth of what sustainable systems mean e.g. the cradle to grave, gate to gate, cradle to gate and gate to grave. I think it would benefit students if there were a guest speaker to come to a lecture and teach the students more about sustainability. The rest of the practical was extremely enjoyable.

I disliked the pre prac talk being in the form of a video. I think if we had a face to face pre prac talk to just briefly explain things it would have been better and more engaging.

I think the practical was perfect. It could be improved by actually putting this into actual doing and calculating the metrics with the values the students get themselves. The practical was a bit dull so it could be improved by instead of having us watch a video we could have someone explain what's going on in person.

More drug synthesis should be given, for us to gain more knowledge.

I disliked the group work, but only because one person in my group kept talking about other things and it was hard to concentrate on the actual prac because she would not stop talking. This is not something that can be improved, it was just my bad luck. I think group work is important and can be very helpful.

I did not have a problem with the practical.

They can be more thorough with what they want and state more information about how it impacts the environment and people. It can also be more professionally handled.

I feel like it would be more beneficial if the content that we are required to read before hand could perhaps be reduced whilst maintaining the substance of the document. It may be easier to understand and follow if the information booklet was slightly more simplified and had minimal to no unnecessary information.

Maybe if we could incorporate presentations to hear everyone's opinions of the subject of sustainability.

The practical should have more videos that actually show the life cycle of chemical manufacturing process, including life examples of cradles and gates, however the videos should be short. The practical should not be just theoretical, but we can actually run some experiments and calculate the metrics depending on the findings of the experiment.

By preparing and doing more research before the practical to enjoy everything by understanding everything.

The video is too long and the exercise seemed tedious with all the research that was required.

They could have provided more information and given a more detailed structure.

Less opinion questions more calculations.

There is nothing to be changed. Practicals are managed perfectly and the time and place as well.

The group work section could have been more detailed and groups could have been a little large to offer more varying opinions

I think that the tables that we had to calculate could of had less values to calculate they did not seem all that necessary since they were just ratios, the important part about the tables was the values and what those values were tied to, because those values ultimately shifted us towards what process we favoured, which was the one that produced the least waste and the most aspirin.

More images could be added to the aspirin information document for more understanding and engagement.
Educate learners on the proper ways of taking and disposing Aspirin and not just the production side of it.

There were not any parts that I did not like, everyone worked in groups which reduced the anxiety of being alone. Everyone worked amazingly through combined efforts and ideas.

The only part of the practicals that I did not like or that stressed me out, was the time crunch to complete the lab work and have enough time to complete the report, I was not able to finish two of the practical reports due to the time crunch.

<Unanswered>

I wish we were given our pre-prac research to refer back to during the practical. But other than that the setup was really good.

The practical is good. No dislike from my side

With previous practicals, I prefer step-by-step instructions instead of flow diagrams as it is easier to follow set-out instructions than pictures just to create more clear instructions for a specific individual to understand. If students could choose which option they prefer, it would create a sense of clearer instructions that they would need to follow.

I disliked that some practicals did not have an experiment and I believe every practical must have an experiment. and dry labs must be part of tutorials.

I disliked the fact this practical was not the first practical. it teaches you to think critically of what you are doing when following a process. Those skills would have been useful in the previous practicals. Instead of allocating each person a single role, the students can work together on all three roles so they have an insight of how to think in each role given longer videos with information

Not having someone who conducted a study about sustainability to come and talk to us about it and interact with us and all of us as a whole share our idea to help gain more knowledge.

There wasn't much that I disliked

By teaching us before about how to calculate the chemistry metrics, the mistake that we made is because we did not have any idea about which compounds we should use even though the information was provided in the instruction sheet.

Having enough time and more lab resources.

More information should be given as people are not really well educated with sustainability in terms of which aspect is the most important when selecting a green route

I would have enjoyed the practical more if we had a better idea of what we could expect coming into the practical as it is a lot different to our usual practicals.

The only aspect of the practicals that I disliked was the lack of equipment such as scales that put a lot of pressure and stress from time because of queues. This could be improved by adding a few more scales so that the queues could be split and students wouldn't have to wait as long.

In further occurrences of this experiment it would be enlightening to do the experiment by yourself to gain more insight toward the process. Please make the questions less open to interpretation.

The practical could be slightly more personal. Many of the calculations were simple but still foreign to many students, personally feel it would have been more beneficial if the groupwork was done in a bigger group to really allow a variety of views to be discussed.

<Unanswered>

Visualisation is a key learning component and with written practicals one takes away from that advantage.

They should incorporate more team work as thinking as a team yields better results due to multiple brains being put together.

The economic impacts of drug synthesis or chemical compounds could be explained to us, because it is difficult to research how different chemicals impact our economy. There could also be clearer explanations given on how sustainability benefits the economy, as it is easy to understand how it impacts the environment and people, but quite abstract to see how it impacts a country's economic status.

That video every student should watch before the practical commences, it was useful but it shouldn't be that long. At least it should suppose to summarize the important points because now a student will get confused by a lot of explanation and end up losing interest on know what they were suppose to know.

Did not dislike any aspect of the practical.

More questions should be given that require an individual to produce a unique answer on the understanding of the information.

Make a better informative video. That gives you more information about the metrics used.

I didn't like that you had to give so many examples of sustainability in the life cycle assessment. \n\nThe calculations were also a little easy. I would have enjoyed it more if it were more of a challenge.

there are no aspects I disliked

An article about sustainability and how system thinking works could be given in order for students to learn how to think in a systematic way in order to solve problems regarding sustainability.

I did not dislike any practical.

I disliked the fact that somehow it lacks practical relevance since it is not easy for everyone to personalise the practicals to their specific interest. I think this can be improved by involving students in a design process practicals so that it can be easily to personalise the practical our specific interest and values. I think that the tutors should be more involved. Since they are more experienced with this topic they can point out flaws in the students' perspectives and ideas or introduce new ideas. I think this practical could also include a small lecture at the end to point students in the right direction of thinking. We could have went through the practical questions together at the end.

I can think of no aspects being improved, except for the information video and the beginning of the practical session as it was slightly boring, otherwise the practical overall was a positive experience.

I didn't really encounter things I didn't like, but maybe more information of social impacts could be helpful.

There were too much opinionated and writing questions that I felt were getting too repetitive. I would make the questions more factual and also some questions multiple choice. I would also add in a bit more equations and graphs since some people learn and understand better with numbers and/or graphs.

The presentation of the information from the video was scanty and when answering the questions we just had to think. I think it would be wise to just watch the video at home ; properly analyze it and identify any useful information to use when answering the questions without wasting time.

Some of the questions were slightly on the vague side, so being more specific would help to come up with more relevant answers.

More information on what each metric is and which one is highly considered when aiming for a greener process.

I wish there was a more visual explanation of the different routes of aspirin production. It would have been more interesting to see why a specific route is less greener than the others.

Unlike all the other practicals this could have been done in a tutorial session as a group tut rather than a practical as there was mostly just writing and discussing rather than doing any experiments

I did not dislike any aspects of the practical.

By allowing more than 3 people per group, to get more ideas that might work. \nAllowing the students to watch the video opened during the practical, beforehand to quicken the practical.

I think all the practicals are well structured, however, it might have been better to teach us (the students) about sustainability in the beginning (as practical 1) before we proceeded with working with chemicals. i.e Practical 5 should be Practical 1, and all the other practicals move 1 up (practical 2 becomes practical 3). The preparation involved writing that became repetitive. You could use the same point for almost all the boxes when filling out the table so it became difficult to decide what to leave out and what to involve in the answer.

I really enjoyed all the practicals and don't think it requires much improvement, but I would make the suggestion to perhaps have smaller groups conducting the practical at one time as I often found that waiting to use a scale or get a piece of equipment was sometimes time consuming.

By adding a bit of examples that will improve understanding

I didn't dislike anything.

The time used for practicals is sometimes unnecessary, for example, the video about Aspirin sustainability could have been posted for viewing prior to the practical/played on a projector for simultaneous viewing, taking into consideration that we were working in groups.

I think the practicals could be more proactive in the sense that they should actually teach us ways to produce substances and objects that are helpful to the environment that can be applied in reality if needed.

I think for practicals in general, the lab should be equipped with more scales because students are often queued in lines to weigh at the scales and sometimes that can eat away at the limited time that we have for some practicals. and with regard specifically to prac 5, I think it could be improved by assigning some marks to the designing of the eco-friendly factory

I disliked the roleplay part of this practical. It can be improved by introducing more specific scenarios into this practical, because most of the time (as engineering students) we tend to only think about the science and efficiency behind the processes, giving us one vague scenario made it especially hard to think about how to be more economical for example.

Some of the questions were very repetitive.

I didn't dislike anything in particular, but I would like to state that it did challenge my tendency of being a narrow minded thinker, I realise now how important it is to think with a bigger picture in mind always. To be honest I enjoyed the whole practical entirely. It was a very cool experience and something very good to be part of. If anything this practical could be done in a normal lecture hall considering that it was a "dry" prac. This could potentially calm the nerves of those students who do get overwhelmed in the lab.

I do not think anything needs to be improved as I believe all aspects were covered thoroughly. I think the practical went well, no complaints

#NAME?

More information could be provided, this will help make more appropriate decisions.

I feel like the practical had a lot of repetitive questions and that it could be improved by carefully considering each question and making sure it is only asked once. This includes being asked in the pre prac, during the practical and in the post prac survey.

Absolutely no problems with the practical in my experience.

There were no aspects of Practical 5 that I did not like

I disliked the role play part of the practical. In my opinion this does not add any value to the research being conducted and I see no use in making it apart of the practical. I disliked the fact that there was no experiment connected to the practical. What would improve this practical is to let us make the aspirin so that we can fully understand the process of the drug synthesis before giving our opinion on how it could be made more sustainable.

I think that more discussions between group members should be stimulated as I would like to have heard more viewpoints, in addition to excursion to manufacturing plants that implement sustainable processes so we can see first hand what sustainability in manufacturing truly means instead of just calculations and videos.

The practical could be more interesting if we were divided into groups of different engineers to think of more ways to make the process more sustainable.

every part of the practical was fine but I feel like more information should have been included since I did not get the whole idea of sustainability like to fully understand it even though I understood some things, the info was not enough because I think the whole purpose of this practical was for students to fully understand what's going on and I didn't.

The jargon used in the information tab was a bit difficult to decipher, maybe the use of more direct wording.

Allowing more freedom in identifying different people not just the three sectors alone

I did not dislike anything.

The pre-practical can be improved by giving clear direction of why this practical is being conducted. Clear, lucid information is given about the Green chemistry metrics, where, how are they used in industries. Be explained a little better.

There were not really many components which I disliked in Practical 5, activities were attemptable and fun and the activities were all different and required serious thinking. I loved all the practicals and found them very interesting. The last practical could be improved by showing practical or physical examples.

There was nothing I disliked about the practical.

The practicals could be improved with more groupwork like practical five, it broadens your post prac understanding when you see from the perspectives of multiple individuals, helps you learn from others and feel supported in your responses. It makes the practical more enjoyable and creates a more productive and inquisitive environment that motivates participation involvement and interaction with the practical as opposed to just working towards the completion of the practical.

Making the teamwork more impactful by doing more practicals with partners as we would be doing in our careers one day. Many people struggle to communicate their ideas that could have had a bigger impact. People are not confident when presenting their ideas.

I disliked that this was a dry practical, as the synthesis of aspirin would have been very interesting and would have given us a hands on approach to the whole idea of aspirin production. It could be improved by giving different groups different routes to produce the aspirin and then allow the groups to compare their findings. I also disliked that some group members did a lot less than others. This can be fixed by allowing us to choose our own groups. If we are then stuck with group members that do less, it would be through our own choosing and thus our own problem.

They could have added more information on the information sheet about the practical and about what we should have expected coming into the practical. I would have been nice to get more info such as videos about the aspirin making process

I liked everything.

I would have liked to be able to see these reactions take place, and the environment in which these reactions are performed just to gain a better understanding of exactly how everything takes place, perhaps in the form of a video or more images, since I am a visual learner. I also think making it more visual would have cleared up some confusion regarding a few aspects and questions.

The resources where we should read about the impacts could be given to us

I would have preferred more calculation questions and less long answers. I enjoy working out the complex math and chemistry calculations instead of writing out lots of long answer type questions, if I were to do this again I would hope for more calculation type questions.

We should be able to choose our own groups.

It can be improved by letting the students decide in which group they want to be and it can be improved by showing us the real-life sequence of events in aspirin production to make the concept of sustainability more understandable by looking at all the different facets that are form part of aspirin production.

The practicals overall were a great success but i am personally allergic to iodene and thus needed gloves to perform practical 3 which i needed to go and buy which was time consuming.

<Unanswered>

I think the practical was very educational and enjoyed it very much, I would perhaps just provide the students with some sources or guidance on where to find information on the environmental, social and economical effects of all of the reactants and byproducts involved in producing asprin as I struggled to get enough information for some of these questions.

I wish there would be more clear instructions on how to calculate certain things like the green chemistry metrics.

Remove the role playing exercises

the questions could be stated more clearly as it was difficult sometimes to understand what waas wanted from us

The part of the practical that can be improved is the part where it is asked how the impact of inputs and outputs of a process has on the environment can be managed or minimized, this question should have been more specific.

There was nothing about the practicals that I disliked.

It should of been more engaging, the work was extremely theory based and not that exciting.

I did not dislike the practical.

I didn't like having to determine which green factor was the most important to take into account as I sometimes felt that it was somewhat vague having to choose between them. I think more elaboration is needed on how to differentiate between which green methods or even manufacturing routes are more sustainable.

There should be more small plastic pipettes, gloves need to be included as part of the protective equipment for practical sessions, cleaning up glassware after a practical session should be enforced more strictly and glassware and/or equipment for a specific practical should be separated based on the chemicals used to prevent cross contamination.

Instead of many videos, something more interactive/physical or visual would be more interesting.

It was really hard to research all the environment, economic and social impacts because there is not a lot of studies or information about specifically the social impacts of some of these chemicals being used.

I honestly did not dislike any part of the prac.

I think that the practical was very long, this could be improved by requiring us to do more of the calculations in the pre-prac prep and then only discussing what needs to be discussed with in the practical session.

The after practical takes up valuable time so maybe include it in the venue so that after we finish the practical done and do not need to use more time to spend on the practical.

There is nothing I disliked about practicals, In fact practicals were my favorite part of this module.

I would prefer less homework to be required

There could be further explanation about what was required prior to us completing the practical, as this would have allowed me to better understand the work that I was asked about, and the process which the practical tested. I walked into the prac with no prior knowledge regarding Aspirin synthesis and I walked out with a relatively extensive one, which I can be grateful for.

The questions on the report that we have to fill in could be more clear.

I really don't know how this can be improved but something I disliked was the "In your opinion" questions, maybe that's because I'm a person who prefers there to be a definite answer to a question rather than multiple but that was what I disliked about the practical. I understand its importance though as you'll need to think critically in the future to scale the pros and cons of your projects and techniques.

It was an interesting topic but not very relevant to a multitude of disciplines and thus felt like a waste of time to some of us. So a change in process that is considered could make it more interesting.

I feel that the chemical practicals were handled very well. The only complaint I have is that the interactive video questions sometimes are irrelevant to the chemistry practical. One of the videos has a question asking "What bird is in the background?", After listening to that portion of the video 4 times I still could not hear a bird in the background. I played the video for a group of people and all of us still did not hear the bird. Another question asked for where a particular word was derived from. These questions have nothing to do with the actual video being played.

I wish that more information was produced prior to the practical on how to answer the pre-prac.

There was nothing that I completely disliked about the practical it was just different from a normal practical.

I think it would be better to ask less questions that are open for interpretation and more questions that have a specific answer.

It seemed very laid back and not as serious as the other prac so maybe making it a bit of a more serious topic and making us do some solo work first then splitting into groups.

The video quality can be improved.

A summary of what sustainability is in the drug synthesis industry before the practical would be informative.

The research was really challenging. Finding proper material was really difficult and challenging. There should be some guidance how to find the proper information and how to put it down to paper in the most efficient and understandable way.

I would have liked if there were also some physical aspects of the practical, considering that we didn't do any "practical" part of the practical. I looked forward to my last practical and thought it would be a really exciting practical. It was slightly disappointing to learn that we wouldn't do anything with the lab apparatus.

There were no aspects that I would say I disliked strongly as we were guided throughout the process by others and our tutor.

By increasing the availability of certain lab equipment, as some resources were quite limited

There are no aspects of the practicals that I disliked.

The video before the prac could have more information that provides more perspectives and options.

I didn't dislike anything.

The role playing aspect of the practical could potentially be altered into presentations. The practical was less about the calculations and more on sustainability therefore I would have preferred it to be simply that. I believe in that way more information could be provided and passed on to students in order to improve the standard and effectiveness of the practical. The practicals would have worked better in a different venue instead of the lab. Most importantly the students should be given sustainability notes to further educate themselves outside of the practical.

Currently i do not see a way to improve the presentation and the practical.

Students should atleast be breifed on what this research is really about therally so, the wording could atleast be a much better so most learners truly get the idea of what is expected of them.

I think getting people with experience and who know more about this come as speak to us live, we could ask questions to them. Instead of watching Practical video about the content.

There wasn't enough physical work, like maybe we could do perform reactions to show how some methods are more sustainable

More information can be given to calculate the values and so make the calculations more precise sothat a better decision can be made.

I did not have any problems with the practical.

I feel a more explanatory description of each method/formula could have aided in understanding what the goal of the experiment was. And how each route compares with the others with respect to the multiple formulas. Insteas of having to watch a video, a in-person explanation with guided visuals would have made the practical more exciting and help visual learners a chance to fully comprehend what the practical was truly about.

The were aspects of the practicals the I disliked. I feel like everything about the whole practical was on point.

The only thing I disliked about the practical was how sometimes, working as a team does not necessarily mean you will work more effectively, especially if a team member is not informed on a topic. This, however, is something that can only be improved with patience and willingness to assist where others may fall short. Inversley, you should be willing to receive help from others as well.

I think more resources should be provided so that we are able to understand the whole idea of sustainability .

Asking some the questions more specifically.

less informantion about how each route affects sustainability. Research had to be made.

The only thing I disliked about the practicals is that they are sometimes time-consuming but I enjoyed most of it there is nothing I would change.

The practical was well set up. Some of questions asked required a business thinking approach, which was different from what is normally expected from chemistry practicals. Discussions about sustainability should occur more often during the chemistry lectures to promote the importance of safety and sustainability.

I liked everything about the practical.

Include video of aspirin being made, so we can see the process

Often too many people do the same thing, then you get stressed with everyone grouping in a single place in the lab. Maybe let fewer people do an experiment at a single time, or let students work in a group. \n

During wet pracs my equipment wouldn't be clean enough. Ensuring that the equipment used is cleaned and checked by the tutors for the next practicals.\n

The instructions should be more clear from the beginning because this causes us to ask our tutors a lot of questions which then seems like we were not listening, focusing or we didn't prepare properly before coming to the practical session.

Maintaining sustainability can be expensive. We can reduce the costs of sustainability by using raw materials more efficiently, recycling, reducing packaging and making production process more efficient.

No dislikes from my side everything was good.

Maybe like doing the different reactions to give you a visual idea of product sustainability and productivity and give you an idea of how much waste is actually made.

the following strategies must be considered, waste management implement strategies to minimise waste generation throughout the synthesis process.

There is nothing I disliked.

There are none

the practical could have not been a group work, if it was an open discussion for everyone taking part in the practical it would've been more effective and also we would get to see other people's views on different ideas.

students should be given a week to complete the practicals as it needs them to think, so they can not only write for marks but also provide valid opinions.

i think next time it should be more practical than social as in we deal with the problem physically; maybe the students be taken to factories or even better dumping sites\n
\nanother thing is i think it would have been much better if we were given time to conduct our own personal research and conduct interviews where necessary and later in weeks or months we hand in a compiled report and everyone doesn't have to answer the same answer sheet/report.

Aspects such as having a shortage of some chemical instruments can be improved by only allowing a certain number of students to do their experiments in different time slots since we have less apparatus to allow all of us to do the practical at the same time, maybe a certain group of students should start with experiment 2 while some are doing experiment 1.

prac 5 should be the first practical in my opinion. many a times people have a disliking towards the subject. However, as a first practical it would give students the insights and develop a liking towards chemistry considering the effect it has on many platforms and it would make students view chemistry differently.

Before performing unknown practicals, it is advantageous to provide appropriate theoretical knowledge and understanding in a classroom context to better practical work. Students are able to better understand concepts, acquire necessary abilities, and approach practical work with more assurance and competence as a result. Many of the work weren't even completed in class before the practicals, which made things much more difficult because the preparation process for the practicals took a lot longer. It would have taken less time if the work for the practicals had first been reviewed in class. They made us watch the Sustainability video during the practical session which wasted most of our time and by improving that, they should've posted the video before the practical because by doing that we were going to have more time to watch the video and also write notes to understand the process of sustainability when it comes manufacturing aspirin.

We should have practical sessions where we just ask our tutors questions regarding how they were able to pass their practicals as we are provided by the best practical tutors but we never have the time to ask them productive questions that may lead towards academic excellence. \n

I have enjoyed all of my practicals, likely as a result of my passion for chemistry, although the time constraint is sometimes extremely stressful and can result in students making errors in measurements or more

The question in the pre-prac report that speaks about the economic, social and environmental impacts was a bit confusing. I did not understand if we were supposed to just list any impacts or if they had to be directly related to the aspirin making process. Like, for example, I believe sulphuric acid was used as a catalyst. Now am I meant to say what the impact of that is in relation to the process or just the an impact that sulphuric acid can have?

<Unanswered>

There was not a single practical that I had an unpleasant experience completing. I thought that all the experiments were easy to follow and understand, and the laboratory as a whole was very well organised and responsibly controlled.

I personally am not a fan of group work as there are often people that will not pull their weight on a project. However, that was not the case with this project and I found that I actually enjoyed it. Mostly because I was put in a group with someone I was already friends with and someone I had seen was hardworking and dedicated. With this being said, I think the practical could be improved by grouping together specific people that have similar work ethics and styles but still with different ideas and opinions.

more information about how the practical will be conducted.

I've often felt a lack of confidence prior to entering a practical session. I usually felt like my preparation was potentially inadequate as I was uncertain about whether I missed an important aspect. So I recommend that the most important aspects of a practical could be separately highlighted and emphasised somewhere in the practical instruction document. This could aid in students in the future having way better and complete clarity about the practical and can more confidently prepare..

The tutors should group us not the other way round where I pick my friends.

I do not like this practical because as a group work, the inputs of team members are not equal and the focus of the discussion is not balanced (perspective of only 1 or 2 members, instead of all).
More examples of how waste management mishaps can be accentuated to bring awareness on chemical dumps/spills.
Energy in terms of sustainability can be explained more in the pre-prac documents so that students will have more knowledge to improve on energy sustainability.

There should be groups of more people than just 3 or 4. That way, the information and ideas are spread more and more people are enlightened on the ideas of sustainability one person could deliver.

During the practical the discussion on the different social, environmental and economic roles and impacts on production processes that we had as a group was a bit difficult as our knowledge on certain aspects was limited. Discussing these ideas in larger groups would have been more effective and intellectually stimulating, to explore different peoples views, opinions and ideas.

There is not much that the Chemistry department can do, it is just a personal preference. I chose to study engineering, I don't really enjoy the massive amounts of reading. I do however enjoy the problem solving and finding better ways to do things.

reduce the number of calculations that need to be accomplished. make the calculations more simple.

There should be ways implemented for student to get apparatus quicker in practicals, because it saves time. The reason for that is because students block your way to get to your work station. Students should be organised in lines so that other students can move past them and to get there apparatus quicker.

Students could work in pairs so as to make less mistakes that obligate them to starting over which ultimately leads them to not finishing the practical in time.

Require less points for the role playing section of it, or rather have the students communicate with fellow relevant students regarding aspects such as finance and well-being of the community, thus pushing for communication between the different disciplines.

It is not a super chemistry heavy practical. It felt more like a business project. More information on the chemical processes would have been appreciated.

By doing the aspects with an open mind. You can approach the specific aspect with another mindset, thus would not only be keen to learn more but also enjoy it while you're at it. Remind yourself that you are becoming smarter everyday by sometimes doing things that is a little bit out of your comfort zone and that you dislike.

I enjoyed the practical thus I have no suggestions on what should be improved on.

All the practicals that I have done were all good. We were provided with enough information and they were all straight forward. Practical 5 was the only one that was sketchy in the beginning because it was such a different practical compared to the others.

I did not dislike anything

The brainstorming part was really long.

<Unanswered>

There could've been more practical activities. Not just paperwork. This would help students raise awareness towards sustainability.

More clarity of the task at hand.

I disliked that this practical wasn't much of a lab practical. Perhaps teach sustainability through a lab practical that students can do and learn the efficiency of different routes.

There's nothing I disliked.

More time given to cooperate and create reasonable opinions rather than rushing through the practical.

I did not dislike any.

I did not dislike any part of the practical. I found it both enjoyable and interesting and it was a nice change to the usual structure of our chemistry practicals

There is nothing I disliked about the practical

Send out surveys in order to get feedback on what is exactly wrong with that aspect. Then, we could work around the feedbacks and suggestions provided to improve the aspect.

I would have like to actually produce aspirin (I understand that this would be very impractical)
The practical was very fun and well made.

Watching the video I would have preferred to have our tutor or a lecturer teach us the content of the video

make it shorter

More involvement from tutors.

I did not dislike anything about Practical 5

Allow students to be involved physically in the production of salicylic acid to make information learned easier to remember.

The only aspect I did not enjoy about the practical was that it was not a practical. It was more of a written report about information that we had to read. I would prefer, if possible, to see how one of the routes of Aspirin manufacturing are carried out by our tutor (to save more materials). Having a more personal, first-hand experience with the topic in question would make the practical far more interesting.

In my opinion, the metrics could have been explained a bit further on what they meant in their contribution to choosing the greenest route as I had some trouble deciding on which metric is the most important factor to consider. However, with that being said, the Aspirin Information Document was thorough and provided a lot of insightful information with regards to the various processes of how aspirin is made.

There were no aspects of any of the practicals that I disliked. However, I would love to see more practicals performed where the real world applications are slightly more evident and will help us to further get a feeling for system focus and sustainability in more production routes.

The fact that we could not do the drug synthesis experiment on our own but only had to read about it.

By providing more time to do research on the topic sustainability, to be able to make a more informed agreement of how process can be made to be more sustainable primarily aspirin in this case.

As a team the should be presentation explaining what we learnt throughout the research \nWe should increase the number of people in a group
We could make it more practical and allow us to make aspirin in order to better remember the process and keep us more interested.

I think they could incorporate a pre practical exercise that together with the flow diagram that allows students to engage theoretically with the work.
There was nothing about this practical that I really disliked . it was quite enjoyable to complete and there's nothing really I would change about it.

N/A

Making the practicals a bit more hands on as the name intends it must be "practical" and should revolve around the principle of converting the work done in class on paper to a visual and practical practise.\nPromoting teamwork and collaboration in more of the pracs\n

Practising better time management

I disliked having to calculate the percentage carbon efficiency and atom efficiency because the instructions on how to calculate them were not very clear

none

less group work, and more self study and we should be allowed to prepare more.
We only studied a theory through a document and video slides. Next time students can be taken to a spring manufacturing plants where they would see the actual processes happening. That way they can be in a better space to practice system thinking and sustainability and give more better ideas

The way we were not clearly told how the practical will be as it was different from what we knew. I didn't particularly dislike anything about the practicals (in fact they went rather smoothly), but if I had to suggest any improvements I would suggest that more equipment be available, and when fewer equipment is available, that a "buddy-buddy" system be implemented to prevent students wandering around the lab aimlessly searching for equipment not being used. The "buddy-buddy" system can be made up of two students seated next to each other.

The practical focused more on the environmental impacts than other aspects. As much as we need to conserve the environment, we also need to look at the financial aspects of things which directly and indirectly impacts people. We needed to consider all aspects as they are interlinked and have an impact on each other.

The practicals should be group work, groups of two. Therefore less chemicals and equipment needed. The process is faster and the people in the group can discuss every question and learn more from the other person.

We should collaborate more and work in groups so that we can learn from each other.

More practical work should be done. Practical are meant to experiment with the topic at hand and not just discuss the topic.

<Unanswered>

<Unanswered>

<Unanswered>

All aspects of the practical were perfectly fine.

Dislikes codes

Topic

Group work

Too big, Limited time

Too big, Limited info
provided

Too big, too wide
Tedius calculations

Limited info provided
Group work

Need for experiment

N/A

Need for experiment

Limited info provided

Limited info provided

Include in lecture time

Boring

Do you think it would be good to continue with this kind of sustainability and systems thinking practical. Briefly explain.

Continue

Maybe, but as an engineer I would rather focus on how to do my job as efficiently as possible and understand the reactions better rather than the impact they have

Maybe

Maybe, I'm not sure I wasn't interested too much but I guess it was informational.

Maybe

Maybe, it feels more like a workshop than a practical so I would say add a little more interactivity to it.

Maybe

Honestly no, I don't think a lot of learners enjoy research practicals, as engineers we prefer using our hands more and working on things physically.

No

I do not think it would be good. Most of the students I spoke with afterwards did not enjoy it or find it useful or interesting.

No

I think from a studying engineering perspective I would say no. I found this practical interesting and insightful because I am a "lover of the environment" by nature. I am very enthusiastic about saving the environment and being more sustainable. However, for my studies this practical does not really have any academic value to me. And yes, I completely agree that engineers should be on the front of sustainability but my current knowledge of engineering is way too limited to understand and properly engage with the project. This type of practical would unfortunately not be helpful in my exam and future modules.

No

no, because it is one-sided, it only focuses on showing negative aspects and not positive ones

No

No as it is too specific for 1st years as little to no-one will be working in the aspirin production section, and we should do topics that are more accessible to everyone.

No

No because not all the reactants are renewable.

No

No because this is just theoretical and in the perfect environment, in real life we have to consider much more

No

No I do not think it contributes completely to our understanding of chemistry.

No

No I think the students did not take the practical seriously at all and most of them just wanted to finish and did not provide valuable information and ended up wasting everybody's time.

No

No we can always do something better and new as engineers

No

No, as much as we can try and say we are finding more ways to get good sustainability not much action is taken and by using route 2 it requires a lot of energy because of the multi-step and that continuously harms the environment. In my opinion we need to find more routes the three routes are not enough.

No

No, it would be better suited to be taught in a lecture and applying the knowledge in a practical by doing an experiment.

No

No, the current method is very unsustainable and could lead to big problems in the future.

No

No. I believe that most people who were involved in the practical did not care about sustainability. If they did it would be a relevant topic being brought up by students, not for school educational purposes, but for improving campus as a whole in making a lot more aspects sustainable.

No

not at all, chemistry needs more practicals with actual chemical reactions and a good understanding of what we are being taught in the lecture, because it is absolutely dreadful to study thermodynamics and having a practical about sustainability.

No

not really because the reality is soon after the practical most people just forget about it because students are just so stressed and only do it for the marks, they soon after the practical leave half of the things behind. Instead of it being like a practical where students just go write and leave it should be a continuous conversation that lecturers have with students and chemistry department should create more mind stimulating ways for students to learn and engage with the problems.

No

I believe once is enough to teach the people about it and get them thinking in such a way and any more would only frustrate them whenever it comes up due to its different nature to what they are used to

Once only

I believe that if we had one and we did it properly that more are not necessary but it can't do any harm.

Once only

I think doing this type of practical is important but I don't think it is necessary to do it more than once because it was not very enjoyable.

Once only

Yes it is important to be informed about how you can contribute to the sustainability of a system and to make you aware of factoring in sustainability when looking at a system

Yes

Yes. As engineers in the 21st century I think it is important to address such issues. As mentioned in Question 13, I feel practicals with this sort of structure and intention upholds us as students as we feel like what we are doing matters as it actually contributes not only our understanding but also our critical thinking methods.

\nApplication of critical thinking and problem solving on reality based problems are skills we need to develop in order for us to be successful engineers rather than focusing on textbook knowledge only.

Sustainability and systems thinking practicals also add perspective to our studies.

Yes

Absolutely yes. Given the direction our planet is going in, if we do not develop and implement sustainable ways of doing things, we are going to push Earth to a point of no return in the coming future and that is not at all what we, as a society, should allow to happen. But teaching students about this early on before entering the work force, we are not only having our minds conditioned to think about these things but we are learning how to think about it and being taught practical ways to achieve sustainability. \nGiven that it is done in an environment where our solutions do not have any external impact (beyond our marks of course), it allows for mistakes to be made and corrected in a safe environment. This really helps with preparing students to be put in a space where they are given the task to achieve sustainability and reduces the stress and anxiety that comes with such a responsibility. \nLastly, seeing the processes and understanding for ourselves how harmful they can be, gives students the opportunity to learn to care about sustainability by themselves without having it forced onto them. That is the single best way to achieve a sustainable future by giving people the opportunity to want to care about it and want to achieve it.

Yes

Absolutely, our actions affect everything around us Yes

Absolutely, Practicals like Practical 5 should be performed more often... not only in the laboratories but also in the communities. the knowledge yielded by Practical 5 was so important. The information on Sustainability should be exposed to different communities, in doing so the world will come to better change. This is what should be learned almost every day " sustainability". Yes

Definitely yes because it would guide us whenever we are about to produce a specific chemical/drug of the procedures and measures we need to put in in place to ensure sustainability. Yes

I do actually, because like I've stated that for me personally I feel like that it has given me perspective and unveiled a veil over my eyes and hopefully with the continuation of the sustainability practical and other systems thinking systems it can do the same for other students. Yes

I do as it teaches future engineers to keep sustainability in mind as they progress through their degree and into the workplace. Yes

I do think that this would be a good practical to continue with in the future as it caused me to think more deeply about the impact processes have. Yes

I do think this should be continued because moving forward sustainability is a major concern and as engineers we should be equipped with the knowledge to deal with these issues as well as be able to think systematically Yes

I do, it will enlighten many people on how to create a sustainable world and thus improve the quality of our world in the future Yes

I personally think it would be good to continue with this kind of sustainability and systems thinking. I believe people will know or understand how to use the raw materials in a more sustainable and this will help the future generation to still have access to the raw material to sustain their needs. Yes

I think doing one practical about it is good, but maybe it should be the first prac so students can think about these things in the following practicals. Yes

I think it is good in this way the knowledge about sustainability is being passed on to everyone and more and more people are becoming aware that their actions do not only affect them but everyone as a whole. More people are now aware of the different types of ways that they can Green the economy and more industries and companies can therefore consider greener ways of manufacturing certain things .the proper way of disposing certain chemicals is also being passed on to individuals . Yes

I think it would be good. It would help students practice to look at problems from all perspectives and it would help them recognise who their solutions would impact and how. Yes

I think it would be great actually, it helps bring to light issues that we would have never really thought of caring about or even finding time to look at. I think its a very imporant topic that needs to be loood at again and again and awareness be made more. Yes

i think it would be great to continue with such a practical because it gives students the opportunity to reflect on matters they normally dont give much thought and can discuss such problems. Yes

I think it would really benefit continuing this thinking practical as it really challenges the engineering students to change their mindsets and think of a broader picture. Yes

I think so. It shows how collaborative engineers may need to be at a part of their career Yes

I think that it is good to analyze a system and to be able to see an example of how it is done as seen in the video. The process of trying to optimize a system and making it more sustainable I think should definitely be continued. It helps the students think critically about every step of the process and it encourages suggestions that start discussions between people. Yes

I would definitely think it's a good idea to continue this practical because it prepares you and introduces you to a different type of thinking that you need to get acquainted with as soon as possible to be an effective engineer. You learn a lot of skills during this practical process making it a good tool for first years. Yes

It would be beneficial especially to engineers as our job does not involve thinking about the environmental impacts of production. Yes

It would be good to continue with this kind of sustainability and system thinking practical. There is always potential for people to learn new things and to be able to start thinking about ways to contribute to sustainability early. Yes

It would be good to do so because it encourages budding engineers to broaden their perception of problem solving to include sustainability in all its facets and moving parts (including labour and communities) as it did for me. Yes

It would be great because it is being sustainable to all and we get to learn more annd tleleni . Yes

Of course.
Sustainable thinking is crucial in this day and age. It makes us consider the resource usage of manufacturing and ensures that we are aware of the implications this could have on the future of mankind and our little climate disaster waiting to happen. The practical helps people recognize the "interconnectedness" of all the factors in manufacturing and that allows us to find practical and realistic solutions to complex issues, like the climate crisis, addressing root causes rather than isolated symptoms of our species greatest screw ups.

Stuff like this is what changes how people think about the limited resources we have to work with on Earth, and limited time to figure out how to do so without drowning Durban in the process. Yes

Sustainability practice can help reduce negative impacts on the environment, conserve resources, and improve overall health and well-being. System thinking involves examining how different components of a system work together to create a larger whole, allowing for a more holistic and comprehensive understanding of complex issues. Implementing sustainable practices and adopting a system thinking approach can also lead to cost savings, increased efficiency, and better decision-making outcomes. In conclusion, practicing sustainability and system thinking is generally considered a good idea for a wide range of reasons.

Yes

Well YES. Since we have outlined what the problem is, we can now see all more ways we preserve our planet. Hence the future we are saving.

Yes

While it may appear to be diminishing overall profits as of today, if sustainable manufacture and systems thinking becomes the norm over a suitable period of time it won't matter. The benefits to human health and the environment far outweigh the economic downsides of modifying pre-existing industrial processes.

Yes

Yes, because by continuously introducing more students to sustainability and systems thinking, future generations of engineers will be more aware of sustainability and will consider this concept whilst designing products or processes and will be able to more easily solve systematic problems because these engineers, was introduced to system thinking and the concept of sustainability as students.

Yes

Yes, because it is more relevant to our career field as engineers.

Yes

Yes, because people need to understand that we need to find more sustainable ways to manufacture things and not to deplete natural resources so that the future generations can also enjoy these resources. So that everyone can understand the impact that we as humans have on the environment and how we can address these issues.

Yes

yes, it doesn't just show, but instead proves to us engineers the importance of sustainability

Yes

yes, it is very important for the current generation to develop products that meet their own demands.

Yes

Yes, it will help spread the importance of sustainability and will help future engineers in processes where sustainability will be needed.

Yes

Yes, since sustainability has an impact on our career and profession one day, more exposure to the concept and importance of sustainability will definitely help us to be better prepared. I do however only think that this exposure is necessary every once in a while but not constantly or in great depth since there are professions that go into great depth in sustainability.

Yes

Yes, this tests the problem-solving ability which is considered a fundamental engineering ability so I would advocate for this program's continuation because of how it deviates from much of the standard content we do as 1st year's

Yes

Yes, to educate people about sustainability and not waste resources for the upcoming generation

Yes

Yes, because it gives us notice about how to use resources and how to take care of the environment and our health.

Yes

Yes ,because it will help us to continuously think about being sustainable in our lives and eventually throughout our career as we should always try to implement the most effective ways to be sustainable. System thinking enables us to realise that the normal and most common ways of doing things might not be the most ideal in certain situations

Yes

Yes ,prior to this practical ,I had no idea about the issue of sustainability and greener methods of manufacturing hence I think continuation of this practical would be eye-opening to a greater audience and possibly helpful as a step forward to addressing sustainability issues.

Yes

yes ,sustainability ensures that the overall process is more efficient

Yes

Yes .As young upcoming engineers who are going to make product decisions it is important to think,learn and more about discuss green routes ,in order to build our sustainability skills.There will be more success at tackling the climate and environmental crises if more sustainability skilled staff in industries are guiding the industry on various ways to implement sustainability.Practicals like this also make us to be more cautious about the environmental impacts of whatever new ideas we come up with as young engineers because the future of the earth is in our hands,we can either destroy it by our innovations or save it by coming up with sustainable innovations.

Yes

Yes : Everyone needs to know as early as possible about sustainability and systems thinking.For example as engineers we consider a lot of calculations in our studies and research of which are important and good to know but we need to know about system thinking so that when making industrial decisions we consider other factors and not necessarily our calculations. This practical should be done even in other fields of study but in a way that is relevant to that field of study and not necessarily as a chemistry practical. e.g Those in finance studies may do the system thinking practical in a way that focuses on cost factors related to each method used in aspirin production.

Yes

Yes and no, in my personal opinion because of the lack of in depth instructions the students were lost on what to do and how to do the practical but with improvements done with the process and how explanatory it will become I think it was an important practical as it educated a lot of the students on how much waste and by products can be produced by a chemical process when one does not account for sustainability and waste management.

Yes

Yes as it informs us to critically think about systems that we will then create in the academic ,working or social spaces with consideration of their pros and cons

Yes

Yes as it is helpful but I'd like for it to be more practical based in terms of outing ourselves in these scenarios more.

Yes

Yes as it keeps this concept of sustainability consistently in the mind of the chemistry student and would give a greater chance for them to strive for sustainability when they are older.

Yes

Yes as it will enlighten the engineer's of the future (the next years of engineers) about the importance of sustainability. Yes

Yes as this will grow the world as whole as it will make more people in different industries work together. This will only benefit the sustainability process. Yes

yes as we are the future generation and so if we are educated in these issue we will not follow the same paths as previous generations. Yes

Yes because it made the manufacturers aware of how much waste was being produced in the the production of the aspirin. Yes

Yes because as future engineers we need to know that all the process or work we initiate or partake in have impacts that we need to be aware of and that we can't just ignore those impacts (whether good or bad), in preference to finishing the processes or work we had started. Yes

Yes because as students we get to see our wrong doings that might affect our environments and our lives even risk the future of the next generations. Yes

Yes because as we are the future engineers, we should be made aware of the effects of the the processes which we create. As it may engineering is about working with systems, it can make us closed minded and insensitive to the impacts of our systems processes as we are only focused on the functionality of it. This practical thus makes us aware of the impacts of the functioning of systems and that we should be sensitive to this. Yes

Yes because aspirin manufacturing would have a good impact on the economy and people Yes
Yes because it also help to expand your knowledge for in future, for example if an engineer whants to invent or creat something to know what to look for in terms of creating something sustainable and that of which will not cause harm on the environment, social and the economic. Yes

Yes because it encourages us to think about sustainability, which I haven't really ever thought about Yes

Yes because it will give more knowledge to people of how to think of others and what the affects could be. Yes

Yes because it will give us an important skill to always look at sustainability when we design systems or machines in our jobs in the future. Yes

Yes because it's important for students to be aware of the problems of sustainability we face as a society. If we do not begin to start changing our ways and thinking of more environmentally friendly ways of living, future generations will be in danger of facing a desolate future. Yes

Yes for this is a very important aspect that isn't always prioritised. It is important to reduce pollution and to protect natural resources like for example water through sustainability. Yes

Yes I believe it is good and quite necessary because in doing so you are helping to equip us future engineers with a mindset that will always consider the sustainability of our day to day operations in the future. This will definitely play a part in trying to keep the world green for the future

Yes

Yes I believe so because it hones in on a division of engineering I never thought I would have to consider. It widens the way we think as engineers and forces us to re-evaluate our priorities.

Yes

yes i do as it will help students understand more what goes on in these systems

Yes

Yes I do think so. We need to improve sustainability for the future as natural resources are essential to humans, daily life, and existence and neglecting sustainability could cause natural resources to run out. When informing more and more people about the issue such as students doing this practical we encourage more and more people to live a more sustainable life which could lead us to a greener world. It also encourages us engineers whose future roles in society will be to solve problems from the start of our studying career to solve problems like these at the end of degrees.

Yes

Yes i do think this is a good thing to continue with. The ideas and thought process of this practical are important for an engineer to consider in their future careers. Additionally, it forces you to look at your own lifestyle and consider how you are affecting the planet. The ideas of sustainability are important for our future careers. The process of system thinking is a valuable life skill and therefore important to learn about and practice as we did in this practical.

Yes

Yes I do. In the same way I was made aware of the different impacts a substance could have, I think it would be good for other people to be made aware.

Yes

Yes I do. It is essential for students who frequently work with chemicals to understand the impacts they could cause socially, economically and environmentally. Once they understand the importance of using these chemicals while reducing the harm they could potentially produce they will understand the importance of sustainability and systems thinking.

Yes

Yes I do. People are not taught to think sustainably on school level and that makes them choose systems that can be more environmentally damaging.

Yes

Yes I learnt many things that I was very unaware of things I believe way more people should know about because this practical makes you aware of things that you didn't know make an impact on the world around you

Yes

Yes I think it brings in a new aspect to the module which is not really explored in lectures. It also helps us to think about the picture and gives us a chance to develop our problem solving abilities.

Yes

yes I think it is a very good exercise and future engineers should definitely be thinking about sustainable practices since their jobs deal with people's lives and are very important

Yes

Yes I think it is excellent to continue with this practical for various reasons. 1. To educate students more in depth of sustainability and systems thinking, because there are a few students who do not even know what these terms mean. 2. Let engineers use the 17 SDGs in their workplace someday.

Yes

Yes i think it is important to talk about sustainability and allow for students to critically analyse the concept of green thinking. This practical allows students to understand and be educated about sustainability which is very important as they are the new generation and have the responsibility to keep the planet safe.	Yes
Yes i think it would be good because it introduced groupwork activities to a set of engineering students who are used to working alone and i personally enjoyed it .	Yes
yes i think it would be good because it would lead to more green thinking engineers.	Yes
Yes I think it would be good to continue as this will help save resources and use them in the most efficient manner for the future generation.	Yes
yes i think it would be good to continue this. it makes us aware of the issue of sustainability but it also makes us aware that we will be the people to come up with innovative ways to improve sustainability. it is good to start thinking of the future now, because the sooner you start getting comfortable with this way of thinking the better you will be at it by the time you get to actually putting your ideas into practise.	Yes
Yes I think it would be very educational and it will improve upon the students communication and innovation. Teaching them to think of new ways and improvements whilst keeping certain factors in mind.	Yes
Yes i think so, because it helps the students to think further than just the final product. And it also helps the university to make progress in the research and may get faster to the end result that they want.	Yes
Yes i think that this practical will be beneficial for all engineers. It is important for us as engineers who are going to invent and innovate many things in the future to learn from the past mistakes and proceed with caution. We should always think about future generations and protecting the environment and ecosystem as these 2 things are vital to our survival on earth.	Yes
Yes it allows us to be aware of the importance of sustainability, and we can use this knowledge in the future in our work places communities etc. We can also use what we have been taught to inform others that are in our communities	Yes
Yes it is good to continue with this kind of sustainability of and system thinking practical because students get to understand the basics of drug synthesis and how drugs are created until they reach the final customer. Students get to understand there are various factors that affect the chemical manufacturing process and how these factors affect the environment , people and the economy. In addition if the environmental, economic and social impacts are prioritized then there will always be resources that can be used to produce drugs such as aspirin the future generations can use and benefit from.	Yes
Yes it is helpful and needed, as a student you have to know everything especially when it comes to safety and sustainability it is critical aspects of engineering.	Yes
Yes it is important. It is easy to take sustainability into account when the main focus is making money so I learned about the importance of sustainability.	Yes
Yes it makes us aware of wastage and what we can expect if we plan on doing that in the future.	Yes
Yes it makes you think about the impacts of chemistry on our environment and the world we live in	Yes
Yes it is important it helps us as engineers to understand the whole process and it helps us to take the environment social and economic factors into account and not just do something to make money	Yes

yes it promotes deeper thought on the impact of our actions on the world at large Yes

Yes it teaches the students about what to keep in mind when dealing with certain problems in their faculty of engineering. Yes

yes it will be good as it will help conserve resources for the future generation while satisfying the current generation Yes

Yes it would be a good idea, mainly because as you are continuously practising, you are also training your own critical thinking and how you can evaluate different types of situations within their production process. You would also get to sort of step into the shoes of an active engineer and how they evaluate situations. Yes

Yes it would be a good practical to do again. It makes us think more critically and realize how much a process can affect the world around us and diminish our quality of life. Yes

Yes it would be a good to continue because the practical shows the importance in of sustainability, especially in this day and age. In order to reduce global warming and climate change, alternative renewable sources of energy need to be used whilst ensuring that these resources are not used up. Yes

yes it would be good because most of the time people tend to just focus on the outcome and not how it might impact the whole system in a bigger scale. so having these kinds of practicals opens up our minds to thinking about the whole system of things rather than just manufacturing something only. Yes

yes it would be good to continue with sustainability because sustainability thinking encourages us to consider the long term impacts of our actions on the economy, environment and society. And it is also important as it finds solutions that balance the economy, society and the environment. Yes

Yes it would be good to continue with this sustainability and systems thinking as it allows students to think further and help them realize that certain processes have consequences and impacts and that nothing in engineering can be manufactured without considering the environmental, social and economic impacts that it has on a certain community. Yes

Yes it would be good, but it must be associated with an actual experiment such as carbon dioxide capture and utilization experiments. Yes

Yes it would. As I mentioned before it allows you to think about what you are doing and the consequences of your actions in the lab. it also encourages some teamwork which can be utilized in the other Pracs. Yes

Yes it would. It helps students to think beyond their degree of choice and makes them more open minded. Yes

yes it's important to be aware of the impact of what you produce Yes

Yes most students either do not know about sustainability or are unsure of it and it is good practice to build the future professions of people who work in a more sustainable way. Yes

Yes since not only is it enjoyable, it brings new ideas and solutions to the table and plants a seed in future engineers and the likes that will only grow into a will to look at things in their industry in a more sustainable light. Yes

Yes so that we can be aware of what is going on in our world and the routes that should be taken so that our future generations can have resources too Yes

Yes to consider the environmental, social and economic factors whenever manufacturing a product. Yes

Yes we live in a world where a serious change needs to happen in terms of sustainability because we are damaging the environment more than we are doing good people need to be educated and this practical is a great place to start. Yes

Yes, after this practical I have learnt a lot about what is required in order to be a sustainable industry and that there are many different factors to consider. Yes

Yes, although I think they can be improved as well because they do show the sustainability of the different routes and allow one to compare them, but they do not take the danger of certain chemicals into consideration. Yes

Yes, although creating insight toward the problem at hand it would be better to reduce it to a lecture or optional pep-talk. Yes

yes, as engineering students it is important for us to understand sustainability and our role in sustainable processes. Yes

Yes, as future engineers it is important that we develop this type of thinking so that it becomes part of our nature to consider the sustainability related to a project Yes

Yes, as it helps develop a better future as teaching the youth about the state of the world and the factors that contribute to destruction of environmental, economic and social aspects of the world can innovate a development to prevent this. Yes

Yes, as it is important for engineers to think about the larger impact of production. Since there is a bigger issue of future generations not being able to meet their needs, as the current generation, we need to practice methods that develop the quality of life but don't affect the ability of future generations to meet their needs. Yes

Yes, because sustainability is essential in the preservation and protection of our planet for future generations. Therefore it is important that this information reaches coming students to spread awareness about how our future careers will impact the world and the people around us, and what we can do to improve systems to have a smaller negative impact on the planet. Yes

Yes, because at high school there is no subject which educates learners about sustainability, even in university students need that lesson. Yes

Yes, because I do not think a lot of first year students are aware of the importance of sustainability. Thus such a practical would be great to create awareness. Yes

Yes, because it is a way to make people aware of the kinds of sustainability tactics in place and may help inspire new efficient ideas to be created. Yes

Yes, because it is important to find new and more sustainable routes, to fight against resource depletion and global warming. We have a limited amount of resources on earth and must learn how to use them wisely. Yes

Yes, because it is very fun to do and helps students think outside the box about how to improve sustainability. It also helps students to learn how to work in a team. Yes

yes, because it makes students aware of how certain industries impact the environment, our social life and economy and how to sustain all those efficiently Yes

Yes, because it opens the mind of students to other problems and how decisions can affect other aspects of a problem. It encourages a growth mindset in students rather than a fixed mindset.	Yes
Yes, because it prepares students for what is possible to come and teaches lessons critical thinking and analysing.	Yes
Yes, because it promotes group work which is a skill that enables one to see things from the perspectives of others and helps to build a positive and engaging learning community through peer learning and teaching .	Yes
yes, because many people are not aware that we even have sustainability issues in the first place. This practical gives us good insight onto the matter and motivates us to go do further research on our own. This will be a beneficial concept for future engineers to understand.	Yes
Yes, because not many people have a deep understanding of sustainability, resource management and waste managment and this allows for a deeper understanding to be instilled in those that do this practical.	Yes
Yes, because our world needs to start thinking like this more now. We need to find ways to ensure future generations can still breathe clean air or swim in a blue ocean. With how things are going now, and with us just thinking in short term or only on single parts of the problem, we could be our own doom.	Yes
Yes, because people learn better and faster when doing the research and work practically because it feels like you are part of the real world's problems. The practical also let you talk to others and hear their opinions on the sustainability and systems thinking which can form better understanding of the subject.	Yes
Yes, because sustainability is a topic that everyone should be well vest in so as to protect the envinment and keep up with a good economy; especially us engineering students whom in the future we are going to be working with production processes and we will be extracting raw material from the environment. Also some amount of waste will be produced which we have to dispose off properly.	Yes
Yes, because sustainability plays a more important role with each passing year. This means that people could even start building their entire career on sustainability.	Yes
Yes, because these system are reducing waste on the environment.	Yes
Yes, becuse the more people are taught about sustainability and system thinking ,the higher the chances of there being improvement in sustainability and the future generation will impliment that.	Yes
Yes, but as mention in the previouese answer rather in a tutorial than a practical	Yes
Yes, but i believe not all practicals should be changed to this format, it should be a combination of previous practicals and this practical so that more theoretical based practicals and real world system thinking praticals can enable students to have a good balance of different types of thinking and ways of approaching challenges such as sustainability.	Yes
Yes, but let it be more applicable towards spesific professions to get students to understand it better towards their future profession.	Yes

Yes, educating us about sustainability will surely make more of us prefer more sustainable processes over "easier" or "cheaper" processes. Yes

Yes, engineering students should learn about sustainability practices early. Yes

Yes, engineers are at the forefront of making decisions that can have a big impact on the lives of other people as well as the environment. It is critical for us to understand sustainability and the importance it has. Yes

Yes, for those that did not know anything about it will be interested in it. This is important because now as engineers we must now think about what is best for all not just one person. Seconded it starts to make us think in terms of sustainability. Yes

Yes, having to do this only once will not have any effect on the students but if done multiple times the idea would be ingrained into our minds and we would develop many skills (such as persuasion, quick and critical thinking, listening, and communication skills) that would benefit us in the future when dealing with a global or even national threat. Yes

Yes, however I think that a research section that breaks down each metric, thereby allowing students to gain a proper understanding of the impact of the metric, would be beneficial when evaluating the greenest routes as we would be able to expand further on our thoughts and concepts. Yes

Yes, I believe it opens doors to thinking about ways to improve our environment in the future, especially in this time of global warming. Practicals like these really allow us to have a deeper understanding of key aspects of the environment around, and how certain activities may affect it. Yes

Yes, I do think that it is a good idea to continue this practical in the future because as engineers, we need to know that the things that we are making will have an impact on the environment and I believe that this practical is important because it can help us to be aware of exactly how we are affecting the environment and which is the greenest route to go when designing a process. Yes

Yes, I do think that this kind of sustainability and systems thinking practical is very useful. Engineers are tasked with designing technology / products which aid in making our lives more comfortable, but with great power, comes great responsibility. We need to find the most sustainable routes to get to our end point, regardless if it's designing a process or a road, otherwise we jeopardize future generations. Yes

Yes, I do. All impacts should be considered when implementing production of drugs or other commodities. Yes

Yes, I have learnt about the sustainability development goal through this practical, so I think it should be continued. Yes

Yes, I learnt a lot of new things that I didn't know. For example I didn't know the role of Chemistry in Civil Engineering and as an aspiring civil engineer this was very informative for me. Yes

Yes, I strongly believe this sort of practical should be used in future practicals as it enlightens students on sustainable methods and techniques which is very vital knowledge to have. Yes

Yes, I think it gives a new in-depth look into sustainability which is easy to understand. Yes

Yes, I think it is crucial. But I also think that it is unfortunately contrary to the way most students approach academic work, so some institutional changes are necessary. Many people don't engage with the ideas, they only want to maximise their marks which is quite stupid. I believe it should be continued and further implemented, especially the aspect of working with other engineering disciplines. Yes

Yes, I think it is important for first-year engineering students because it will teach them how to think quicker and more thoroughly when given different scenarios. Yes

yes, I think it is important to get everyone involved in furthering our knowledge in sustainability especially since it is an important aspect in most disciplines in the sciences
These kinds of thinking practicals gets different people to work together in a collaborative attempt and makes you think outside of the box and take into consideration different aspects and ideas that others may find important Yes

Yes, I think it re grounds students to some major factors in chemistry that many overlook and it is good to understand how such processes operate in the real world as opposed to us just being left to guess. Yes

Yes, I think it would be good to continue with this kind of sustainability and systems thinking practical. Implementing sustainable practices reduces the project's environmental impact and furthermore improving its efficiency and profitability. Yes

Yes, I think it would be good. It challenges you to really think and analyze the process of drug synthesis. It makes you think like a real life engineer would think and it allows you to be part of solving a real life crisis. Yes

Yes, I think it's important, as it presents the opportunity to enlighten future engineers to take sustainability into consideration when managing processes which can lead to the destruction of the environment and our living space. Yes

Yes, I think this is a good way to solving problems and sustainable systems have lots of benefits. Yes

Yes, in fact every student in the university should conduct this practical because I realised that most people including myself knew anything about the process of sustainability except its definition. So more people knowing about this would contribute to the country and even the world because less waste will be produced and renewable energy will be used will be used for the environment. Yes

Yes, in the workspace that we are possibly going to be working in, work should contribute toward sustainable development. Ultimately the work you do as an engineer should not cause any harm so society, economy and environment Yes

Yes, it allows engineers to improve their outlook on engineering and the world environment as a whole Yes

Yes, it educates people more on the different solutions and encourages engineering students to think towards more than one possible solution. Yes

Yes, it enables student to be involved in sustainability as it introduces them to one of the world crisis problem and thus enabling them to put their thinking caps on and think of methods to sustain the environment for future generations and for the current generation. Yes

Yes, it gives many students insight on how they need to approach future projects. Yes

Yes, it gives students like myself the avenue to be revealed or exposed to things that they may have not thought about or may have not considered to be important, Instead of a informatic session where students wouldve had to listen to someone reading off the importance of sustainability, students were given the chance to physically understand the impact of the drug synthesis route on the environment, through the calculations and students were given the chance to brain storm ideas which would help improve the sustainability of the drug synthesis route. Yes

Yes, it gives the students another way of thinking about chemistry by realizing what big of an impact it has on the world. Yes

Yes, it gives the students performing the practical a glimpse into what could potentially be their realities and exposes them to the issues faced by day-to-day practitioners in their fields. Yes

Yes, it gives you a real worl view at the application and implication of what you might be doing the the environment, economy and society as an engineer, as well as showing you how you could combat those as an engineer, it introduces the reality of the field to engineers helping us understand what we are working towards in the end. Yes

Yes, it helps people visualise the impact of certain manufacturing processes and that we need to consider sustainability when creating new products.It help visualise al the factors that we need to take into consideration. Yes

Yes, it helps us realize just how big of an impact a simple way of doing something one or another way can have and that we thus have the power to really change the world for the better if we so choose. Yes

Yes, it increases our awareness about the impact engineering yes, it is a good idea to spread awareness about sustainability and bearing in mind that there is a next generation to come and they still have to use these resources to make this world a better place. Yes

Yes, it is absolutely necessary for future engineers and people in general to work with sustainability in mind. The earlier topics like sustainability gets introduced the better. The earth has limited resources and people need to be aware of any possible damage caused by production. The concern should not just be profit and yield. Yes

Yes, it is different than most practicals and shows that sometimes you must think before you do. Yes

Yes, it is easy for engineers to loose sight of the whole picture and to only focuse on completing the project while loosing sight on all the other aspects that go into the creating and builind of the ojects like the sustainability of the project. It is useduf to have had to think about these sort of problems and to come up with solutions that needed practical thinking. Yes

Yes, it is good for students to learn about everything the practical is about. Although i did not necessary enjoy the prac I did learn from it.\n Yes

Yes, it is good to continue with this practical because we as engineers should be introduced to a the system thinking mentality to improve the industries we will one day work in and if it was not for this practical, we would not have gained the information we did. Yes

Yes, it is good to have sustainable manufacturing processes for several practical reasons: Cost Savings: Sustainable manufacturing processes can often reduce costs associated with waste, energy consumption, and raw material usage. By reducing these costs, companies can improve their bottom line and remain competitive. Compliance: Many regulatory bodies have introduced environmental regulations that mandate sustainable manufacturing practices. By adopting sustainable manufacturing processes, companies can comply with these regulations and avoid potential fines and legal action. Brand Reputation: Consumers are increasingly conscious of environmental and social issues and are more likely to support companies that prioritize sustainability. By implementing sustainable manufacturing processes, companies can improve their brand reputation and attract environmentally conscious consumers. Resource Availability: Natural resources are becoming scarcer and more expensive. By adopting sustainable manufacturing processes, companies can reduce their reliance on finite resources and develop more efficient processes that conserve resources. Thus, adopting sustainable manufacturing processes is good for businesses and the environment. By reducing costs, improving compliance, enhancing brand reputation, and conserving resources, sustainable manufacturing processes can help companies achieve long-term success while also promoting environmental sustainability. Yes

Yes, it is good to introduce and educate young people, especially engineers, on being environmentally friendly. Yes

Yes, it is good to think about the impact the things you do has on the environment. We cannot just keep mixing chemicals and doing experiments if they are destroying the environment and the plants and animals that live there. Therefore it is important to be mindful and to do your research about these types of effects on the environment. Yes

Yes, it is important for engineers to start thinking about sustainability as early on in their studies as possible so that we can have that mentality early. Yes

Yes, it is important for people to understand sustainability and system thinking Yes

Yes, it is important for real world applications and thus should be taught. Yes

yes, it is important people understand the extent in which the production of certain products has on the environment, and how it could impact future generations and the resources available for them to produce products. Yes

Yes, it is important that engineering students learn about it so that their future work and designs will consider sustainability and not impact the environment, economy or people negatively. Yes

Yes, it is important to educate individuals on sustainability as they are the future. Yes

Yes, it is important to teach the next generation of engineers to think sustainably in their individual industries. Yes

Yes, it is important. It teaches engineering students important lessons and values regarding sustainability. Furthermore, it enables us to think critically and problem solve, which are both very important skills for an engineer in the working world. Yes

Yes, it is informative and enlightening to future engineers, though would benefit from some practical elements.	Yes
Yes, it is not something that an engineer would automatically consider and is good to be aware of.	Yes
Yes, it makes the society aware of sustainability and for especially as engineers to maybe think again when we make something to produce products that we might think of all the impacts and make this world a better place for our children to live.	Yes
Yes, it makes young engineers think about a sustainable future.	Yes
Yes, it opens our minds up to more than just the reactions that we've carried out throughout the semester to a practical example of these reactions and reactions and their effects environmentally, socially and economically.	Yes
Yes, it provide a base to open the discussion in your head to think about sustainability that is a needed part of any chemistry or any engineering degree and thus it is needed to continue the practical.	Yes
Yes, it serves as awareness and provides knowledge on the after effects of invention and how we can continue creating systems that are going to help improve human life without causing more problems for ourselves and even future generations.	Yes
Yes, it teaches students and future engineers the extensive effects that chemistry has on social, economical and environmental aspects of our world	Yes
Yes, it teaches the future engineers how they could systematically think regarding a real world problem like sustainability, it definitely helps to form a positive mindset behind the sustainability venture before the negative mindset of inconvenience creeps in, in the later years.	Yes
Yes, it teaches us about waste and the unsustainability of chemical processes and how they are much more severe they are.	Yes
Yes, It was a good eye opener on the importance of sustainability and eco-awareness in the field of chemistry	Yes
Yes, it was good to look at the design process of something in another light especially since engineers generally only think about efficiency over other things.	Yes
Yes, it was interesting to see how chemistry and business go hand in hand and work together. Also seeing how you need to take a holistic view when deciding which route to take	Yes
Yes, it was the first time I actually dived deep into sustainability and what sustainability actually means. The system thinking also lets us as engineers understand what challenges we will be faced within the future and that it is not others responsibility to be sustainable but actually all of ours responsibility.	Yes
Yes, it will help the future engineers to think in a sustainable way when they work	Yes

Yes, it will help this generation think about the future and not just themselves. Yes

Yes, it will help to minimize the amount of waste produced and the effect that practicals have on the environment concerning accidental waste of dangerous chemicals. Yes

Yes, it will improve a lot of factors over time and as a practical it makes future engineers think more critical. Yes

Yes, it will make more engineers to think green and influence others to do so too. Yes

Yes, it would be beneficial to continue with sustainability and systems thinking practical. Here's a brief explanation of why:

- Holistic Approach: Sustainability and systems thinking practical foster a holistic approach to problem-solving. It encourages individuals to consider the interconnections and interdependencies between social, environmental, and economic systems. This approach is crucial for addressing complex challenges and finding comprehensive and long-term solutions.
- Long-Term Sustainability: Sustainability practices promote responsible resource management, conservation, and minimizing negative environmental impacts. By integrating sustainability into various aspects of life, such as education, business, and policymaking, we can work towards a more sustainable and resilient future.
- Systems Awareness: Systems thinking encourages individuals to understand the intricate relationships and feedback loops within complex systems. This mindset helps identify unintended consequences and uncover sustainable opportunities. It enables us to make informed decisions and design interventions that consider the broader system, leading to more effective and sustainable outcomes.

 Yes

Yes, it would benefit students as they get to interact with each other and see the real-life impacts of different processes on the world on different levels. Yes

Yes, its challenges students ability of practical thinking at the same time allows students to socially participate with their fellow peers. Yes

Yes, its continuation will enable generations to come to comprehend and work within the complexity of life on Earth, understand the impact of their work done on the world around them and take the responsibility of their creation and innovation. Yes

Yes, makes future engineers realise that their actions will have real life consequences and that there more to engineering than just making money. Efficiency and sustainability are just as important as that what will set you apart from okay to good engineer. Yes

Yes, raising awareness of sustainability is important, as everyone has a responsibility to be involved in sustainability, whether it is from the population recycling to businesses producing as little waste as possible. Yes

Yes, similarly to the engineering humanities model, the aim is to equip students with broad knowledge and to eliminate one dimensional thinking. This practical helped create a bridge between the engineering and manufacturing world, and the social and economic aspects of living. Yes

Yes, some might think that it is not as important for students at our level to learn of this but this is a vital process when making a product as such it is important to learn.	Yes
Yes, Some students may literally have some very good ideas on how to ensure sustainability is secured within an environment in an everyday life.	Yes
Yes, Sustainability and system thinking as an engineer is important. Student should be aware of it and be able to apply it. Hence it is good to continue with it.	Yes
Yes, sustainability and systems thinking practicals should continue as sustainability becomes more and more important.	Yes
Yes, sustainability is very important and it is therefore necessary to enlighten people about this topic.	Yes
Yes, sustainability is not always something we think about and this practical reminds us that sustainability is an important one we always need to consider especially people in the field of engineering.	Yes
Yes, the possibility of students not understanding and comprehending the importance of sustainability could be vast, which is why implementing such practicals would aid in such a scenario. The importance green systems need to be implemented in a faster rate globally and by exposing future engineers to these issues - a positive change in the future is highly achievable.	Yes
Yes, the practicals help us on how we can improve sustainability, for example: we learned the different ways aspirin can be produced, on what raw materials were used and how the reactants were extracted with different methods. With that, we were able to deduce the apt route to retain or improve sustainability.	Yes
Yes, the world operates as an entity; we are all part of a large system. That system can only function when we all work together. Hence, it is important for the sustainability of human nature and our planet to operate in such a manner that supports the best interests of this system. It is not only about the now, but also the future. In which case, sustainability and systems thinking is not only good, it is also paramount.	Yes
Yes, they get us out of our comfort zones and make us think more about how our intended professions contribute to the society, economy and environment.	Yes
Yes, they help in a lot of ways such as sustaining	Yes
Yes, think it would be good to continue with sustainability and system thinking. Systems are helpful in preventing future consequences because after establishing what happens after a particular process, conducting research and alternative ways can be used. Sustainability basically curbs our usage of resources by thinking about the future and how these resources will be required.	Yes
Yes, this exposes young people to sustainability and ways in which they can improve methods of manufacturing to make it more sustainable.	Yes
Yes, this forces the students to not think about process-creation as an isolated system. Although, the science needed to make the production possible is important, it should not be done at the risk of damaging the environment and disadvantaging the population directly and indirectly involved in the manufacturing and consumption of the product.	Yes
Yes, this is because it opens up your mind onto why we do a practical in a certain way, such as the harm that a specific way of doing it may cause as compared to another and also the benefits of doing a practical in a certain way as compared to another as it can reduce waste or the waste produced may not harm the environment. It shows us the social, environmental and economic impact of a practical which is really good and eye-opening.	Yes

Yes, to be able to teach the youth about what is going on in our environment and how we can better the situation Yes

Yes, we could make people, especially young engineers, aware of the sustainability issue in the world. This might encourage them to practice sustainability in their future careers. Yes

Yes, we'd be able to find different ways to find more sustainable routes thus improving the system and allowing us to think more like engineers. Yes

Yes, because it actually encourages us to think in depth about the work we will be doing in the future, and what the effect/impact it will have on the environment we are living in, in the long run and the numerous routes and methodologies we can implement to avoid this. It also widens our thinking in how change can be implemented, how we future engineers can implement change that is sustainable. Yes

Yes, because it improves our lives, protects our ecosystem and preserves natural resources for future generations. Yes

Yes, because it teaches us and informs us about sustainability, that way, in the future we can incorporate it. Yes

Yes, because you produce less waste and is more sustainable. It would also be less expensive because of the productivity is much higher. Yes

Yes, continuing with sustainability and systems thinking is highly beneficial. Sustainability is crucial in addressing the environmental and societal challenges we face today. Yes

Yes, exposing students to sustainability on a consistent basis enables them to be enriched on the knowledge and understanding of sustainability, thus bringing forth a more significant potential on their applications of sustainable education into their work place and the environment. Yes

Yes, good for the environment. Yes

Yes, it helps in keeping us aware of the things that are happening and also helps us to try and find ways that can not prevent future generations from having an experience that we had, which is simply sustainability. Yes

Yes, it will be a great thing to secure a better healthy future for the next generation. As it will be reducing the risks of damaging the environment and focus on fixing it. Yes

Yes, it will be a lesson to many upcoming engineers on how to conduct their daily duties once they are qualified professionals and for them to be considerate of their surroundings and hence I learnt and I believe even those that are behind me deserve the same knowledge and lessons I got so we can make this planet a better place to live on. Yes

Yes, it would be good as we are learning to be more creative in terms of how we view the impacts that certain behaviours have on the improvement of sustainability and we will be making a very good contribution to the environment and economy as we are coming up with ways to act in a way that is more beneficial and even coming up with ideas that are not only reducing waste production but also the risks that come with it. Yes

Yes, most definitely. By doing this students are informed of one of the major roles that they would have in the future as engineers in contributing towards a greener and more sustainable tomorrow. Yes

Yes, systems thinking and sustainability practicals increase awareness of the significance of sustainable practices and their applicability in various industries. They promote involvement and inspire us as students to take an active role in enacting lasting change. It promotes interdisciplinary teamwork, develops critical thinking and problem-solving abilities, improves our comprehension of sustainability ideas, and cultivates a mindset that takes the bigger picture into account when making decisions. Yes

Yes, this is going to help us in the future as we are moving to the other industrial revolution meaning the world is advancing and we should also protect it because we humans can only survive on a healthy environment. Yes

Yes, this sustainability and systems thinking practicals help us develop a holistic understanding of complex real-world issues. We learn to consider the interconnectedness of environmental, social, and economic factors and how they influence each other within a system. This enables students to grasp the bigger picture and make informed decisions that account for various sustainability considerations. \n
\n
 Yes

Yes. Allowing fresh minds to come in every year is a great idea. Not only does it teach the students about sustainability, but it also allows for more new and improved ideas to improve sustainability technology that is being innovated everyday Yes

Yes. although i did not like this practical it taught me the value of sustainable thinking and teamwork and that though I may not care for something, it is still important to consider it as a factor when working on projects. Yes

Yes. Although we as engineering students are aware that our duty is to create efficient processes to manufacture products of higher values, we are not well informed on the role that we are to play in sustainability. Yes

Yes. As engineering students, we have the potential to make a real impact with regards to sustainability and environmentally-friendly processes. This practical provides valuable insight into the realm of sustainability, and thus presents us with vital knowledge that we could utilise later on in life, as we pursue our careers in this field. Yes

Yes. As engineers of the future, we should be taking into consideration the sustainability of everything we will create as it our generation and future generations that will be affected. Many engineering students understand the idea and theory behind systems thinking, however, putting it into practice is an entirely different story. Therefore, practically incorporating systems thinking is beneficial to all that participate in it. Yes

yes. As engineers we will be creating projects that will impact the environment. Its important to understand about sustainability Yes

Yes. As youthful, aspiring engineers, we tend to dream and aim for making problem-solving creations a reality, commonly without thinking about cost-effectiveness and conservative resource usage. Hence, this practical serves to instill an essential mindset about sustainability. Yes

Yes. Because it actually teach students that there's more than 1 route to reach the same destination (product) and there's sustainable ways of manufacturing without causing harm. Yes

Yes. Firstly, it exposes us students to a connection between academic chemistry/chemical engineering to industry applications, which we direly need as engineers. In additon, we also are expensed to that the chemistry industry involves much more than just engineers and chemists; we also have to weigh in the judgements and demands of other professionals, such as finance managers and environmental officers. Yes

Yes. Greener practices are promoted and we will move to a greener world minimizing global warming and its effects. The environment will have more people taking care of it so it can take care of us back. Yes

Yes. I think it would be extremely beneficial to students , as these ideas could be carried into industry and applied by future graduates and therefore have a positive impact on the environment, society and industry, by increasing sustainability in these areas. Yes

Yes. I think that it would be an eye-opener to amny who are not aware of such things. It will also expose engineers to think about their methods of doing things and be more environmentally friendly. Yes

yes. it broadens the research and understanding of sustainability. Yes

Yes. It educates students on what sustainability really means. It also teaches your brain to think in a sustainable manner and will help in concouring the chemistry aspects as you are encoutered by them in the future. Yes

Yes. it emphasizes the importance of green earth. It raises awareness and may lead to a better tomorrow even for future generations Yes

Yes. It encourages students to actively think and collaborate with each other, and also propels one to see how chemistry plays a huge role in pursuit of sustainability. Yes

Yes. It encourages team work and gives an in deapth view of the complexity of the sustainability issue. Yes

Yes. It forces your brain to think in multiple directions. You better understand what the effects may be when doing something Yes

Yes. It helps shape young engineers' minds into thinking sustainably which is very necessary in the current state and trajectory the world and pollution is going. Yes

Yes. It helps to inform students about the importance of sustainability and how important it is to keep our environment safe for the next generation. Yes

Yes. It informs us as students about sustainability and teaches us how to be sustainable and the dangers of the future that will occur if we are not. Yes

Yes. It is important to think about sustainability because it impacts our future. The more we talk about sustainability and systems thinking the more it will be implemented in our everyday life resulting in a more sustainable world. Yes

Yes. It is very different from other graded work done in any subject and is a great way to introduce different ways of thinking to solve a problem. Yes

Yes. It makes students more aware about sustainability.	Yes
Yes. It opens up people's way of thinking, not only to think as a business but to also think about the community and the people that sustainability issues will impact.	Yes
Yes. It provides awareness to students who did not know of sustainability. It also shows the role of chemistry in the fight for sustainability.	Yes
yes. It raise's awareness of areas of which could be improved while brainstorming possible solutions.	Yes
Yes. it will educate young students about the significance of sustainability and teaches us hw to communicate and wrk in groups. A great teaching tool.	Yes
Yes. It will let the engineering students understand what kind of an impact they have. It will let them realise that they can contribute to sustainability.	Yes
Yes. It's important to be be aware of sustainability as we are the next generation of working people. It is benefical to introduce these concepts at an early stage so that by the time we get into the work place we are already familiar and comfortable with is and can apply it in our jobs and lives.	Yes
Yes. Not only is it serving as an eye opener for upcoming engineers, but its also helping us to be critical, open-minded and have a broad understanding of our actions and the consequences they have on the surroundings arounds us.	Yes
Yes. Such helps us understand the impact of our work on the environment and it also alerts us to be responsible for what we create.	Yes
Yes. sustainability is very important for our future and teaching people about it is very important and should be done more often.	Yes
Yes. Sustainability isn't something i thought of throughout the practiclas and i think if it's something that is mentioned wth every practical it will be drilled into our heads and we will be able to think of more innovative ways of sustainability	Yes
yes. Sustainability is becoming more and more important	Yes
Yes. This can serve as information to individuals who are not aware of these concepts and maybe they can start to implement them in them in their daily lives.	Yes
Yes. This is becuae it will enable us to broadly think about the impacts of our practices in our professions, especially the environmental impacts, and help us to come up with solutions to improve sustainability or sustainable practices.	Yes
Yes. This prac was eye opening in showing the effects of drug production on sustainability and the importance of sustainability. Arming students with this knowledge ensures a bright and green future.	Yes
Yes. This practical is a very effective eye-opener that will inform many students about the consequences of the processes they may, one day, design themselves, as engineers. It should not only continue, but become a far bigger aspect of the engineering degree at TUKS.	Yes
Yes. This practical taught me about the issues of sustainability in our society. I was informed on how engineers can partner with industries to design and develop newer systems that enable socio-economic growth without harming the environment and causing sustainability issues. The systems thinking simulation was fun and enabled us to think together in our different roles. I thoroughly enjoyed this practical and learnt a lot about sustainability which is necessary for us engineers workingn in industry in the future.	Yes

Yes. This practical was a brilliant insight into the real world applications of what we have learnt thus far in chemistry. It was also great to see the ways in which we will potentially have to apply the knowledge we are learning now in our everyday jobs in the future. The problem solving, co-operation and system centred thinking skills that we had to use in this practical are very important skills to develop as they will be very essential to us in our future careers.	Yes
Yes. This way we are considering the needs of the future generations if we keep doing the practical. Every first year will learn about it if they haven't learnt about it in high school. The goal will of the practical be achieved, the goal being enlightening people about sustainability and systems thinking.	Yes
YES. To educate future engineers about how important sustainability is and how they can drive this sustainability with thier proffession	Yes
Yes. We are developing a new skill regarding such matters as in few years to come we will be future leaders who must think critically and come up with efficient safe methods of saving our nation. While we still have a chance of learning from our elders we should learn some things. It is easy to learn something while you are still young rather than when you old because it is easy to adapt and it sharpens the third eye of your perspective	Yes
yes. We sometimes need to be reminded of what impacts our job will have on the environment and be prepared to do the righty thing.	Yes
yes..This kind of sustainability and systems of thinking allows us to learn sustainable design principles,resource efficiency, life cycle assessment and the the environmetal impact of the different components needed in producing things.	Yes
yes.\nit helps engineers think logically about sustainability and systems thinking and could be very beneficial to every engineer doing this practical.	Yes
Yes.\nit is important that engineers (and everyone, at large) get educated about their environment hence creating responsible individuals.	Yes
Yes.\nit would be really benefitiary as it would put future engineers to the test and help develop their critical thinking, collaboration skills which are 2 important aspects to have in the field of engineering.	Yes
Yes.Ensures awareness of importance of sustainability in industries by future employees and employers	Yes
yes.It helps students in the engineering students develop solutions that are both effective and environmentally friendly.	Yes
yes\nin a brief period we are exposed to what certain impacts of manufacuring and engineering can have on the environment and reminds us the we should always consider every aspect and impact something that we create can have on the people and the environment and implores that we should prioritise sustinability, which is important at this time when you think about non-renewable materials	Yes
Yes\n-it teaches us about how to be more Sustainable, and how to implement some of these techniques in our own projects and maybe one day at your job.	Yes
Yes\nThat way pollution to the water by manufacturing plants can be canceled to conserve lifes under water \nAlso the impacts to to environment, society and economy can be predicted by calculations and assumptions before the actual process	Yes

YES\nThis kind of practicals challenges engineers on what they know as it gives them opportunity to think about things that they don't normally think of during the course of their career.-

Yes

Yes
If sustainability and green ways to carry out processes is not continually implemented, future generations will be forced to live life less comfortably and more difficult. Therefore we cannot focus on the short term and be too selfish in such a way that our childrens' children will be affected.

Yes

Yesd , thinking practical enables us to see a clear picture. it also enables us to adapt to change and to also set goals.

Yes

Yes, Engineers and and all other careers should become more aware of sustainable and how we can improve it.

Yes

Yess, it teaches us important things that we never considered when thinking about manufacturing.

Yes

I think the idee of the practical is a good idee, but the way it was presented should have more practical work.

Yes with ex

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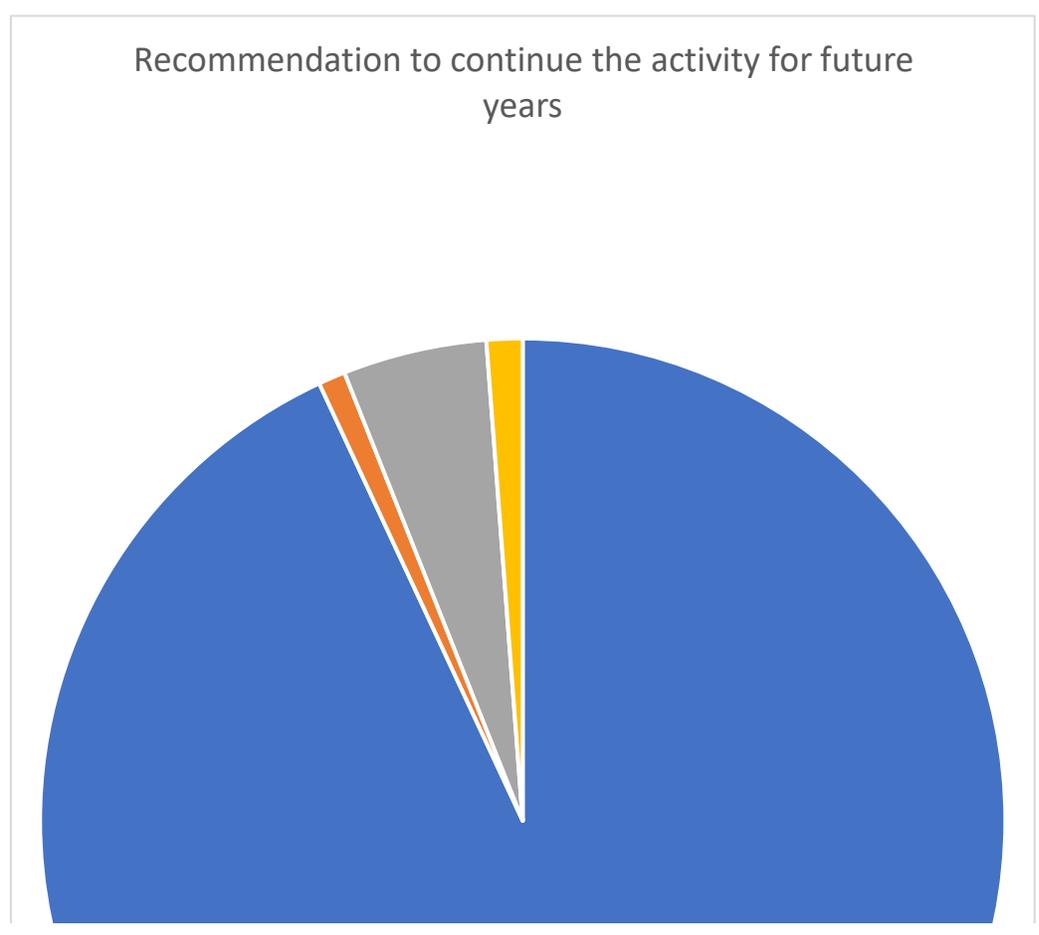
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