



MEDAID ACADEMY WORKING GROUP



DATA ANALYSIS OF 50 STUDENTS INTO THE EFFECTIVENESS OF THE
BIOMEDICAL ENGINEERING COURSE

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SUMMARY

Medical Aid International have created a well-received and highly recommended Biomedical Engineering course. This course helps biomedical engineers in Low to Middle Income Countries (LMICs) undertake key repairs to medical equipment, reducing machine down time, enhancing patient care whilst saving both lives and money.

Participants rated the course over 9.63/10 for course satisfaction, how likely they are to recommend the course, and for whether they wish to participate in future Medical Aid International courses. The course had significant positive impact on the participants day-to-day after completion, scored at 9.11/10¹.

Unit 11, Anaesthetics and the Operating Room, was rated by far the most useful unit of the course, with demonstration videos and practical examples the most effective learning tools of the course.



Figure 1. Two of our biomedical engineers putting their skills to use fixing operating room equipment.

Participants see an important link between better resourced operating rooms and saving lives. Being able to repair and maintain machines within operating rooms means they are better equipped, improving health outcomes. Even more lives could be saved if operating rooms were better resourced, and investments should be focused here to yield the best results.

A follow-up survey is planned to be sent to participants of the course to gain further insights into its day-to-day impact. Information collected will be used to better understand how, specifically, Unit 11, Anaesthetics and the Operating Room, has benefited participants and how impact of the course can be maximised to save lives.

The vast majority of participants' comments about the course were positive². Most were very grateful and thankful for the amazing work put in to make this fantastic course possible. Many noted their improved ability and understanding, seeing the clear impact of the course in their work.

Average first time score on the Multiple Choice Questions (MCQs) was a good predictor of unit challenge, whilst average number of attempts was a good metric to identify any questions that might be tripping students up. Unit 8, Ultrasound, was found to be the most challenging, either through inherent difficulty or unfamiliarity. Unit 9, Surgical Diathermy/ESU, and Unit 13, Train the Trainer, had, on average, a greater than expected numbers of attempts; further analysis on their MCQs will be conducted. Time spent on each set of MCQs only reflected the number of questions in a unit, the challenge of the unit having no discernible impact.

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LIST OF ACRONYMS AND ABBREVIATIONS

LMIC(s) Low to Middle Income Country(ies)

MCQ(s) Multiple-Choice Question(s)



1 – OVERVIEW

1.1 – Report Rationale

A key challenge in Low to Middle Income Countries (LMICs) is providing high quality, affordable healthcare. One factor that is a significant contributor to said challenge is the maintenance of medical equipment. Expertise in this area is often hard to obtain and/or is prohibitively expensive.

Medical Aid international has invested a large amount of time and money into developing a Biomedical Engineering course that trains local hospital biomedical engineers and estate managers how to maintain and repair key medical equipment. This reduces machine down time, enhancing patient care, saving the hospital vast sums of money, as replacement equipment, or expensive repair bills, can be avoided.

As part of the course, participants receive a toolkit, **Figure 2**, with all the necessary tools to carry out repairs, along with textbooks to further support their learning. For a full inventory of the toolkit, see section 5.2 – Appendix B; for a full list of the textbooks supplied, see section 5.3 – Appendix C.

In order to measure the efficacy, and to find out if there are any improvements that can be made to the course, this report will undertake data analysis using feedback provided by participants who have completed the course.

A variety of student data was collected and analysed to yield further insights. This data included: the time taken to complete the course, average first attempt score at each unit's set of MCQs, number of attempts at each unit's MCQs, and average first and last time taken to complete each unit's set of MCQs.

This data and its corresponding analysis allow for conclusions to be drawn as to the best metric for measuring unit challenge, the best metric to check for trip-up questions and the indication, if any, on the amount of time spent on each set of MCQs.

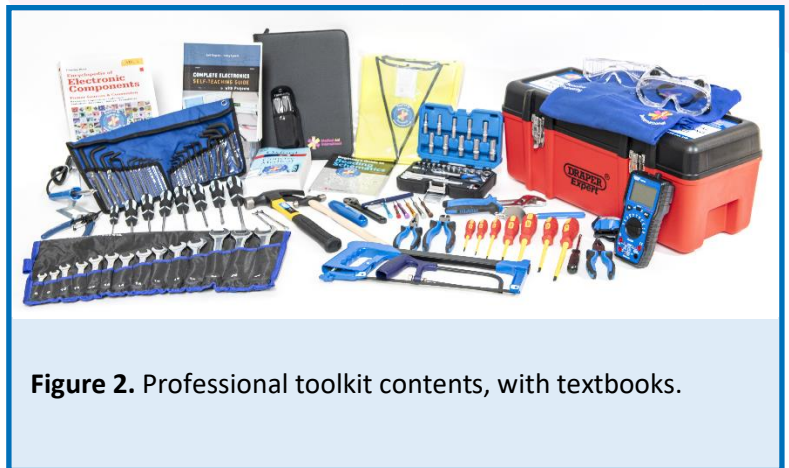


Figure 2. Professional toolkit contents, with textbooks.

1.2 – Report Objectives

This report seeks to investigate a variety of topics. **These include:**

COURSE SATISFACTION AND IMPACT

STUDENT REPORTED MOST USEFUL AND CHALLENGING UNITS

ATTITUDES TOWARDS THE COURSE

TIME TAKEN TO COMPLETE THE COURSE

IF AVERAGE FIRST ATTEMPT MCQ SCORE MEASURES UNIT CHALLENGE

IF AVERAGE NUMBER OF ATTEMPTS TO PASS MCQ MEASURES UNIT CHALLENGE

THE IMPACT OF ADDING QUESTIONS ON AVERAGE FIRST SCORE AND ATTEMPTS

IF TIME TAKEN ON MCQ MEASURES UNIT CHALLENGE

CONCLUSIONS AND RECOMMENDATIONS



2 – STUDENT FEEDBACK RESULTS AND DISCUSSION

2.1 – Feedback Data Collection from Biomedical Engineering Course

Participants of the course undertook a feedback survey; a sample of that data (the first 50 participants) has been analysed to provide preliminary findings.

The survey questions were as follows:

1. Overall, how satisfied were you with the course and the learning material?
2. Please identify the 3 units you found most beneficial and why?
3. Please identify the unit/s you found the most challenging and why?
4. What could be improved on the course?
5. On a scale of 1-10, how likely are you to recommend the Programme?
6. On a scale of 1-10, how likely are you to take any future Medical Aid International Programmes?
7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
8. Please comment further details.

A Likert-style response scale was used to evaluate the participant responses (to questions 1 and 5-7) with 10 being assigned to “Most Satisfied” and 1 being assigned to “Least Satisfied”. These scores were multiplied by the number of responses of each type to generate mean values. Free text comments were provided by participants to questions 2-4 and 8.

In total, over 50 participants have completed the course, with a further 25+ currently undertaking it. Participants come from a wide variety of countries including, but not limited to: the United Kingdom, Rwanda, Kenya, Uganda, Nigeria, Botswana, Tanzania, Zimbabwe, Ghana, Malawi, India and Bangladesh.

This report will be updated periodically to reflect the data generated as these, and other new participants, complete the course.



2.2 – Course Satisfaction and Impact

Throughout this section, the questions are primarily referred to by their respective numbers only. For reference, the full list of questions asked of participants is provided in section 2.1 – Feedback Data Collection from Biomedical Engineering Course, as well as alongside the relevant figures.

The data from the feedback surveys was incredibly positive. Questions 1 (satisfaction), 5 (recommendation) and 6 (subsequent offerings) had average responses above 9.5/10. This suggests not only an incredibly high level of satisfaction with the course, but also a large degree of positive recommendations and potential buy-in for any future courses provided by Medical Aid International.



Figure 3. Clear course impact – the ability to fix and maintain equipment.

Figure 4 shows the average score of each survey question (1 and 5-7) as given by the Biomedical Engineering course participants. The average feedback scores for each question were as follows: Q1 (satisfaction) = 9.64/10, Q5 (recommendation) = 9.76/10, Q6 (subsequent courses) = 9.76/10 and Q7 (impact) = 9.11/10¹.

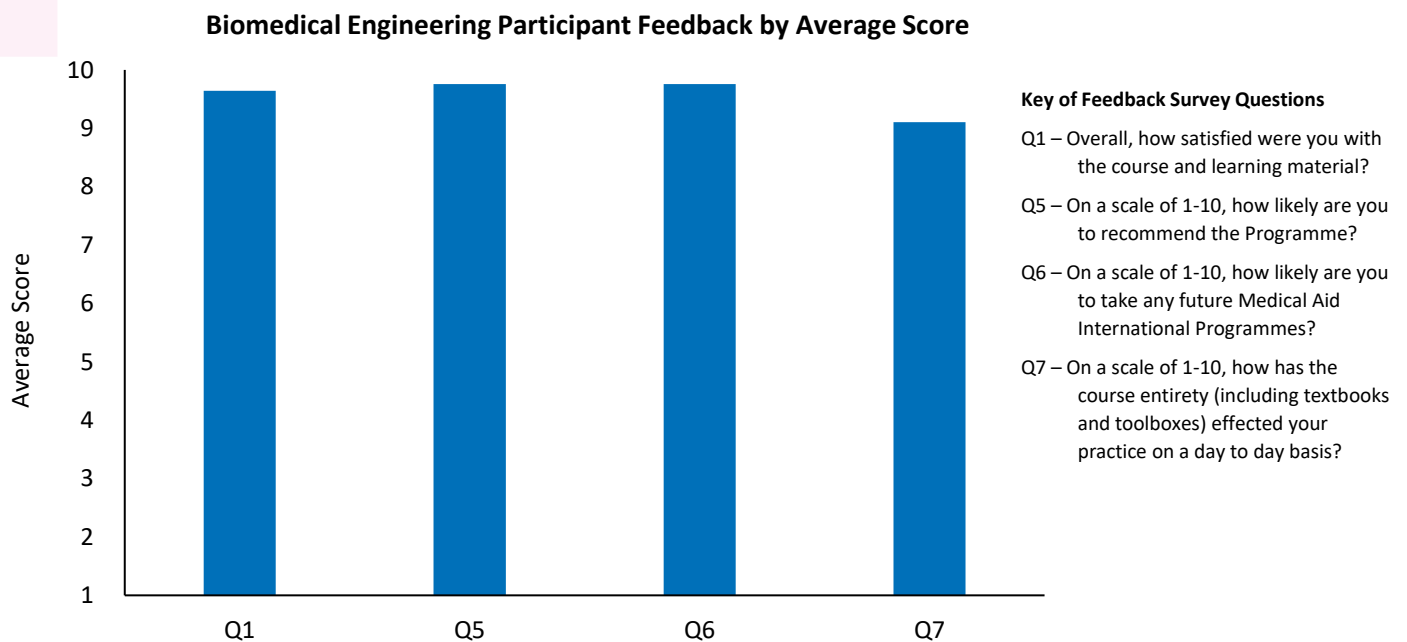


Figure 4. Average score of survey feedback by question number for a sample of Biomedical Engineering course participants (N = 50). ¹Due to minor logistical issues (given shipping to LMICs is challenging) and participants' enthusiasm to start the course early, a very limited number of participants did not receive their textbooks and toolkit for the start of the course. This practice has since been changed so participants must wait for all materials to arrive before starting the course. These participants' responses for Q7 (impact) have been removed as the course's impact would not have been fully realised given the delayed resources.

It is very positive to see that the high levels of course satisfaction led participants to implement the courses in their institutions effectively and therefore generate a large day-to-day impact. This will not only mean a higher level of medical care, but will translate into lives saved by having a greater arsenal of working medical equipment at their disposal.

Figure 5 shows the percentage of each type of response for each of the survey questions as given by the Biomedical Engineering course participants. Questions 5 (recommendation) and 6 (subsequent offerings) were the most positive with almost perfect 10s across the board. Question 1 (satisfaction) was also very favourable, with the lowest score for all being an 8. Almost 90% of participants rated the day-to-day impact (question 7) to be 8/10 or higher.

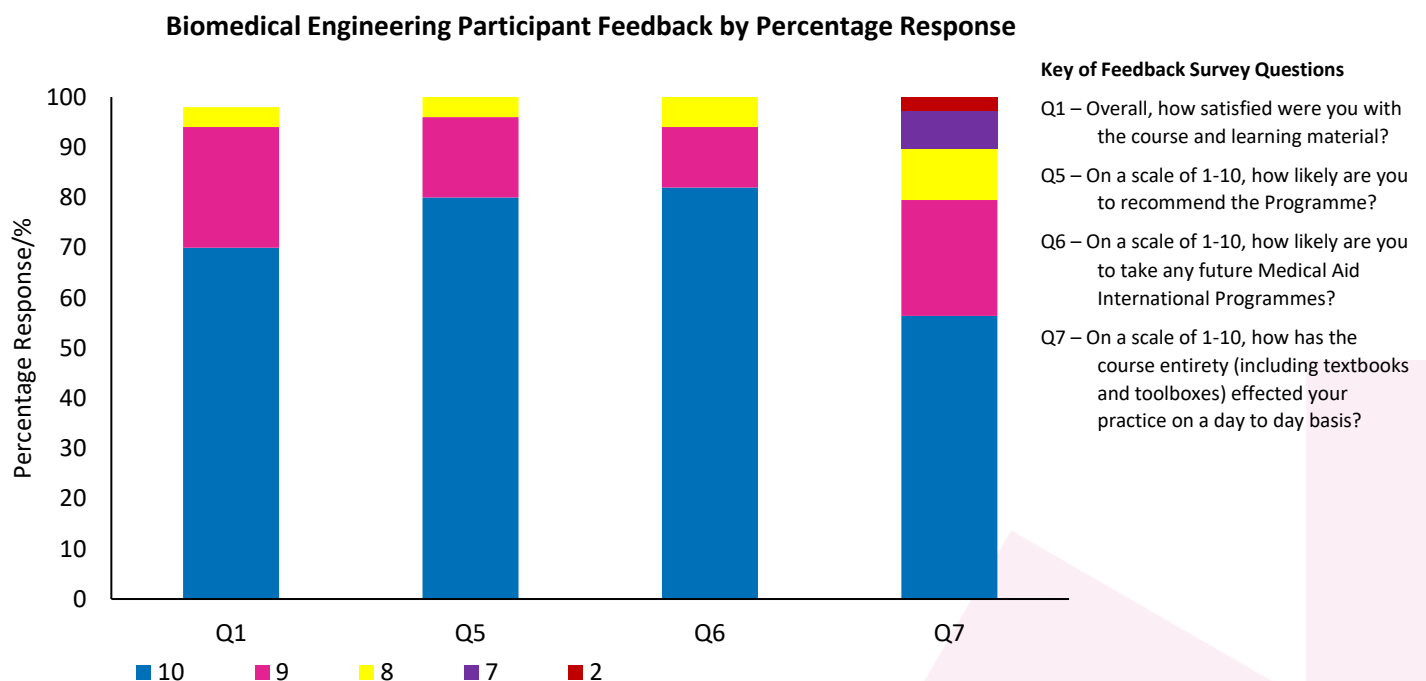


Figure 5. Proportion of responses of survey feedback by score (out of 10), for each question number, for a sample of Biomedical Engineering course participants (N = 50). ¹Due to minor logistical issues (given shipping to LMICs is challenging) and participants' enthusiasm to start the course early, a very limited number of participants did not receive their textbooks and toolkit for the start of the course. This practice has since been changed so participants must wait for all materials to arrive before starting the course. These participants' responses for Q7 (impact) have been removed as the course's impact would not have been fully realised given the delayed resources.

Given the extremely high course satisfaction and high impact across the participants' medical institutions, the course is a great success. Further work is planned to create a guide for participants regarding best practice when implementing the training within their medical institutions. This should serve to further increase the day-to-day impact of the course and provide additional support to future participants.

2.3 – Student Reported Most Useful and Most Challenging Units

Throughout this section, the course units are primarily referred to by their respective numbers only. For reference, the full list of unit titles, and corresponding numbers, is provided in section 4.1 – Appendix A – List of Units in the Biomedical Engineering Course, as well as alongside the relevant figures.

A wide range of units were selected by participants as one of the 3 most useful units of the course (question 2 of the feedback survey). This appears to be a testament to the high standard of each of the units in the course as well as reflecting the fact that each participant will have slightly different roles and expertise, hence different units will be more useful depending on the participant's circumstance.

Figure 6 shows that all units were rated the most useful at least once, revealing that participants all have differing needs and that the course is flexible enough to address them. Unit 11 was the standout unit with 30 of 50 participants (60%) touting its usefulness.

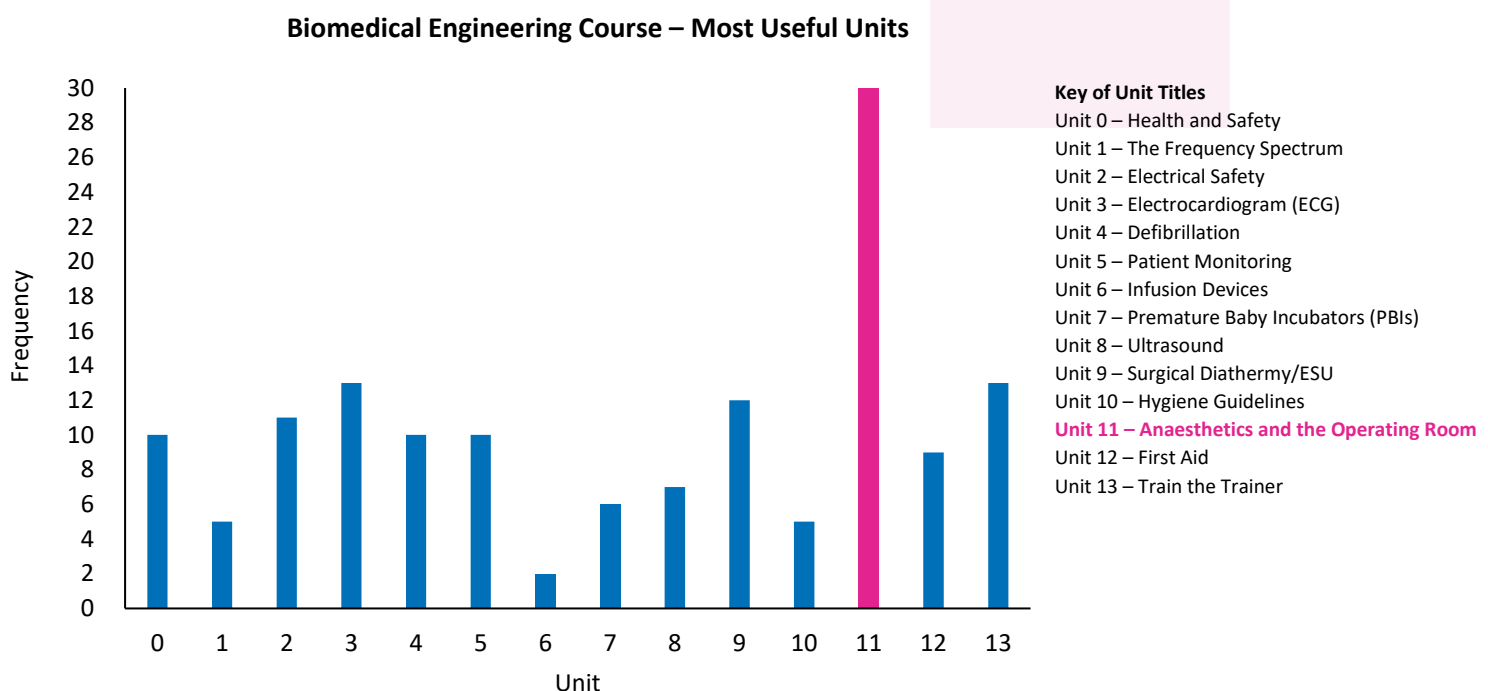


Figure 6. Responses of survey feedback asking which 3 units were the most useful for a sample of Biomedical Engineering course participants (N = 50). Unit 11, rated by far and away the most useful, is highlighted in pink.

The importance of Unit 11, Anaesthetics and the Operating Room, to participants cannot be overstated. Participants can see the impact of better equipped operating rooms as they are able to repair and maintain the machines within it. Even more lives could be saved if operating rooms were better resourced.

The argument that participants can see the impact of better equipped operating rooms, and that we should invest more heavily in resourcing them, is strengthened by the strong performance of Unit 9, Surgical Diathermy/ESU. This technique relies on equipment that is only used in the operating room. Again, by being able to repair this equipment surgeons are provided with another technique they can rely on, enhancing patient care.

Also of note is the fairly strong performance of the safety units of the course; Unit 0, Health and Safety, and Unit 2, Electrical Safety. This would also suggest knowledge gaps are being filled for good portion of participants.

The wide spread of units being chosen as useful is a real positive for the course. It reveals that each unit has significantly helped a participant increase their skills. This broad upskilling the course provides is invaluable to participants and is likely a significant contributing factor to the favourable feedback provided by participants (see section 2.2 - Course Satisfaction and Impact, for details).

Exploring units by order of reported challenge was a more concentrated affair; this was somewhat expected given participants could only select one option. In cases where participants did select more than one option, their scores were given fractional values and weight split equally between the selected options. I.e. if a participant selected 2 units to be “the most challenging unit”, each option would receive a score of $\frac{1}{2}$.

Figure 7 shows that Unit 11 was the most challenging, receiving a difficulty score of 9. Units 3 and 8 were also rated as challenging, with scores of 5 and 6 respectively. Units 0 and 7 were not rated most challenging by any of the participants.

Biomedical Engineering Course – Most Challenging Units

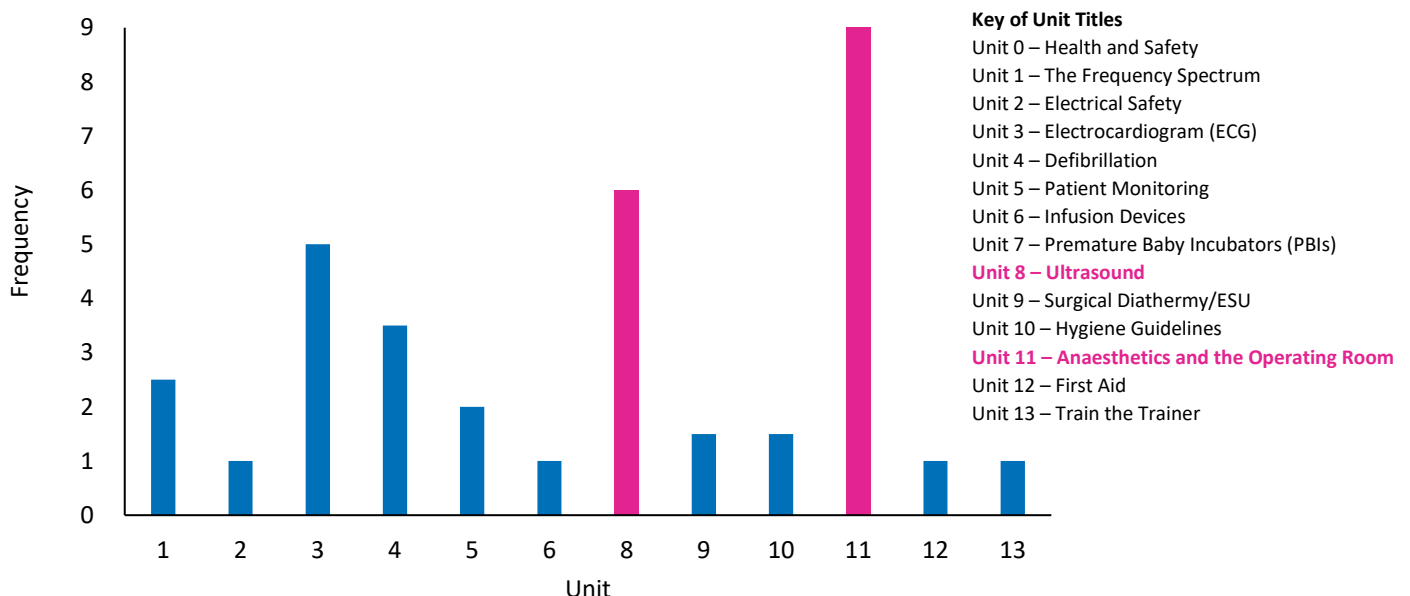


Figure 7. Responses of survey feedback asking which unit was the most challenging for a sample of Biomedical Engineering course participants (N = 50). Note: units with frequency 0 are not shown and if multiple units were selected, proportional fractional values were assigned. Units 11, rated most challenging, and Unit 8, rated second most challenging are highlighted in pink.

2.4 – Participant Comments and Suggestions

Question 8 was a free text response field that allowed participants to add any additional comments about the course.

The comments were categorised as either positive, negative, or suggestions. The results are shown in **Figure 8**².

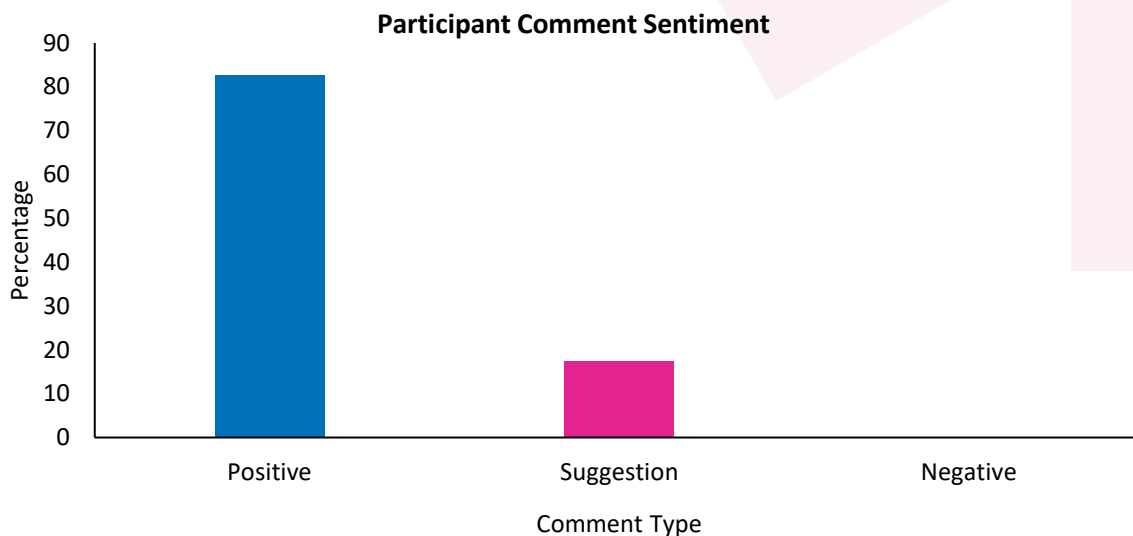


Figure 8. Participant free text comment by type (positive, negative, and suggestion). ²Due to minor logistical issues (given shipping to LMICs is challenging) and participants' enthusiasm to start the course early, a very limited number of participants did not receive their textbooks and toolkit for the start of the course. This practice has since been changed so participants must wait for all materials to arrive before starting the course. These participants' responses for Q7 (impact) have been removed as the course's impact would not have been fully realised given the delayed resources.

More than four out of five participants (83%) left a positive comment, with the overall attitude being one of overwhelming thanks and gratitude for the course. The participants can see how much of a huge difference the course has made.

Participants reported that the most useful aspects of the course were the demonstration and practical videos across the units, explaining that they aid understanding and help to deepen knowledge.

Many highlighted the usefulness of the course, citing their improved ability and greater understanding. Some offered suggestions of courses we could run in the future, including: Radiology, Dialysis and X-Ray imaging. We will take these suggestions under advisement.

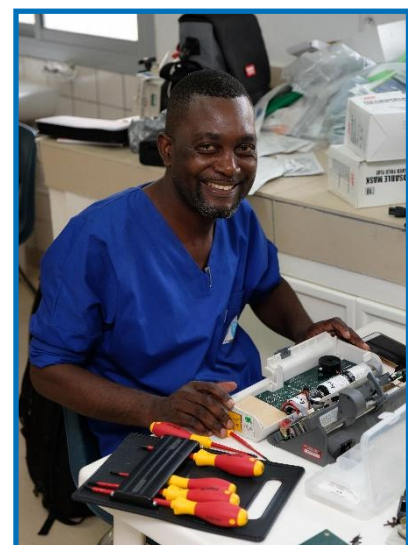


Figure 9. One of many satisfied Biomedical Engineers.

3 – UNIT DATA ANALYSIS RESULTS AND DISCUSSION

3.1 – Additional Data Collected

To further generate insights into the course regarding the challenge of each unit, it was necessary to collect additional data. This new data was also used to validate these conclusions.

The new data sets collected for this report included:

- The amount of time taken to complete the course.
- The number of attempts taken to pass the MCQs for each unit.
- The score achieved on the first attempt of the MCQs for each unit.
- The time taken on the first attempt of the MCQs for each unit.
- The time taken on the last (i.e. the passing) attempt of the MCQs for each unit.

When combined, this new data provides powerful insights into the course, such as: which unit is objectively most challenging, if student perceptions correlate with this objective study, if time spent is a good indicator of unit difficulty, if student scores are linked to the number of attempts taken to pass and if there are any units with questions that might need the wording slightly adjusted.

A variety of statistical methods and reasoning underpin the conclusions reached, with a decisive focus on linear regression and correlation.

3.2 – Time Taken to Complete the Course

It is worth considering the distribution of times taken to complete the course as it gives an insight into the amount of investment required to gain the large benefits of the course, as evidenced in **Figures 4-6**.

Figure 10 shows how surprisingly small the amount of time required to gain the full benefits of the course actually is. Close to the majority of students take between 12 and 24 hours to complete the course. Allotting just 1 hour per workday to study, the course can be completed in just 3-5 weeks.



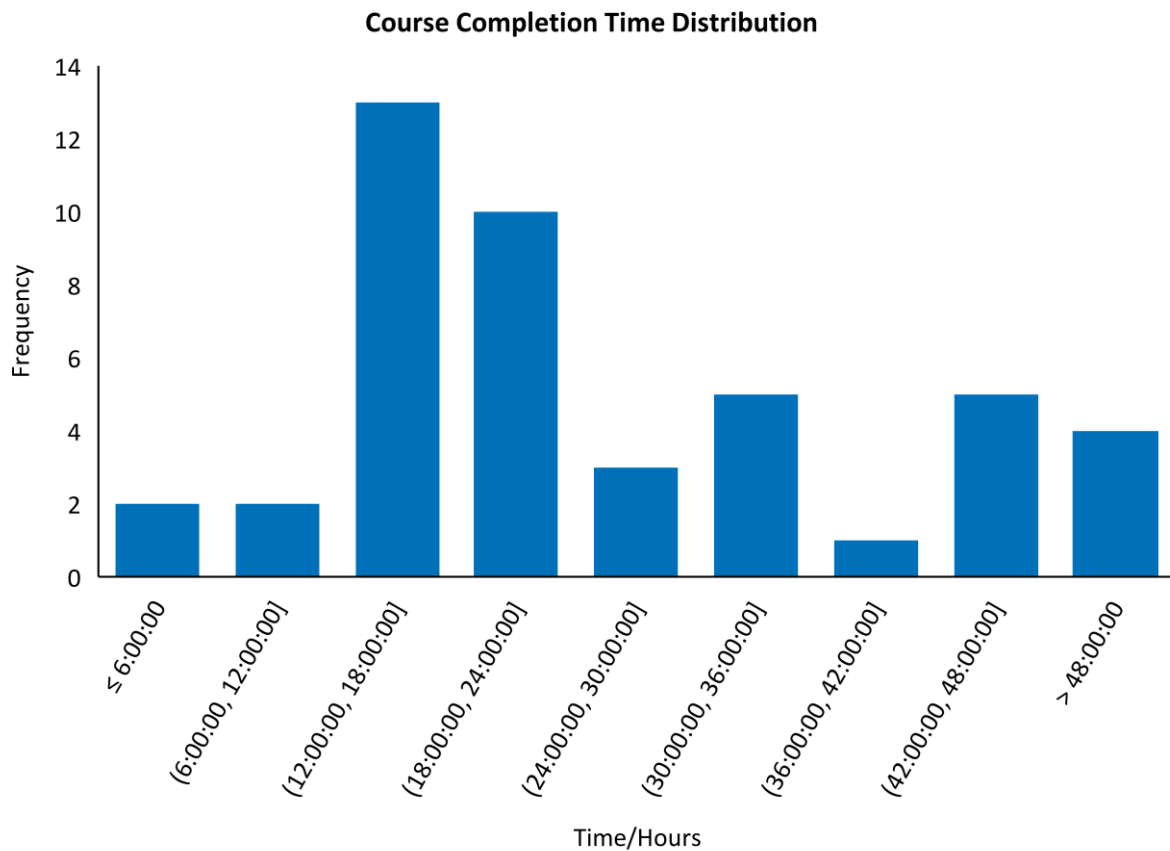


Figure 10. Distribution of time taken to complete the course for a sample of Biomedical Engineering course participants (N = 50).

3.3 – Average First Score as a Metric of Unit Challenge

Throughout this section, references to “the unit” refer to the Multiple Choice Questions (MCQs) of that unit.

These are perhaps the most obvious candidates to reflect the difficulty of a particular unit. A unit that students score poorly on (for their first attempt) or take many attempts to complete (i.e. achieve 100%) would seemingly reflect that the material in the unit is more challenging.

Figure 11 shows the average first attempt score (as a percentage) for each unit of the course. The vast majority of unit have an average first attempt score between 70 and 80. Unit 8 is an outlier in this regard, having by far the lowest average first attempt score, at 65 (over 7 points below the next lowest of 72, Unit 9). The highest first attempt score was Unit 12, with a score of 82.

Biomedical Engineering Course – Average First Attempt Score

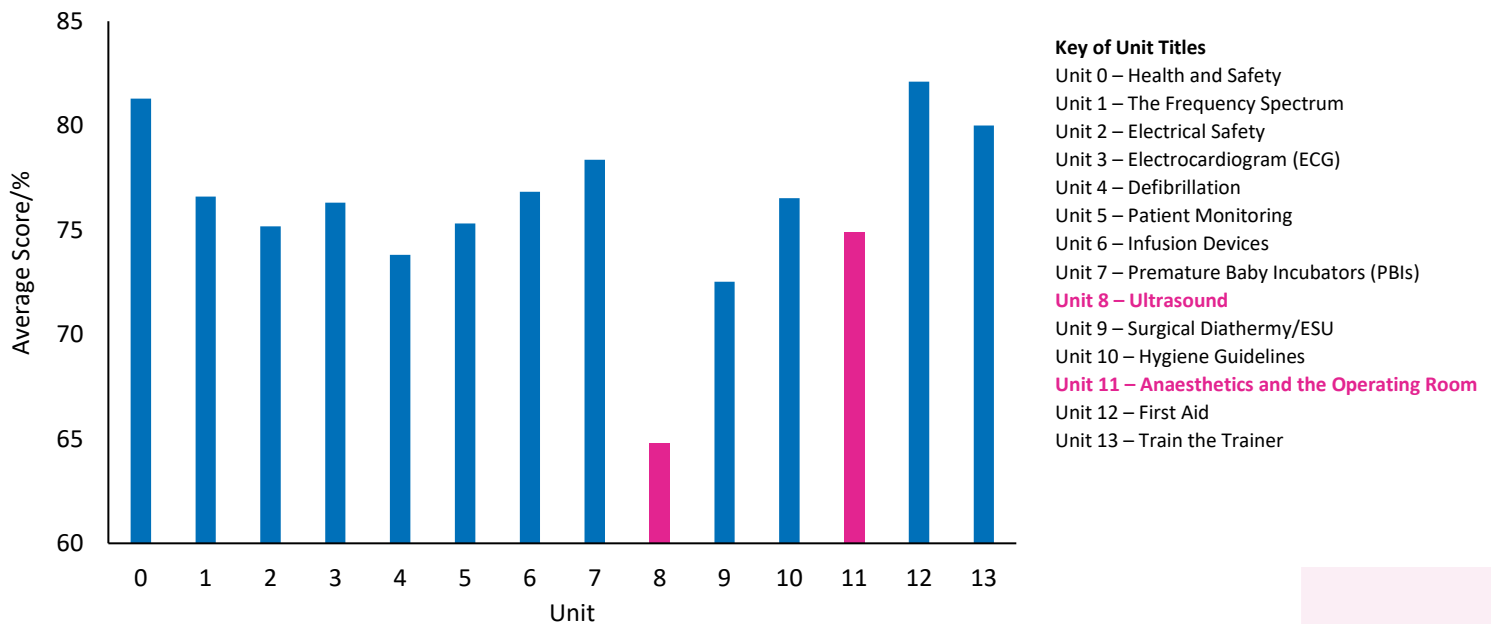


Figure 11. Average first attempt score (given as percentage) of each unit of the course, for a sample of Biomedical Engineering course participants (N = 50). Unit 8, a clear lowest scoring outlier is highlighted in pink, alongside Unit 11 which was rated most challenging by students.

It is interesting to note that students scored Units 11 and 8 the most challenging (in terms of their perception of unit challenge, see **Figure 7**) and that these units were some of the lowest scoring units, in terms of average score on the first attempt.

If a unit is more difficult, the chance of a student answering each multiple choice question correctly is reduced. This results in a lower average score for the unit. Coupling this with the fact that the two units reported as most challenging by students were also low scoring units, it is therefore a reasonable conclusion that average score on the first attempt is a good measure of unit challenge.

Specifically, regarding the particularly low average score of Unit 8, Ultrasound, it could be the case that this material is inherently challenging, i.e. a difficult topic, such that students score poorly. It could also be the case that the material covered in Unit 8 is relatively less familiar to the students. Thus, even if the material in and of itself is no more challenging, it is more difficult to our students as they have not covered it before. Further study would be required to understand the specific cause of these findings.

Figure 12 shows the correlation between and linear regression of average first time unit score vs the reported challenge of each unit. As students, on average, report a unit as being more challenging (in their feedback survey at the end of the course, see **Figure 7**), they also tend to score less well on that unit, on average.

A quick note on r-squared values: The r-squared value can range from 0 to 1. 0 means that the 2 variables being studied (in this case reported unit challenge and average score) are unrelated. I.e. a change in the reported unit challenge has no effect on the average score. 1 means that the 2 variables are perfectly related. I.e. the change in reported unit challenge fully explains/causes the change in average score. The closer the r-squared value is to 1, the stronger and more useful the relationship between the 2 variables.

An r-squared value of just 0.31 is not the strongest evidence (we typically look for r-squared values above 0.5). That said, the correlation is in the right direction and a value of 0.31 indicates some kind of link between the reported unit challenge and average score.

A quick note on linear regression equations. It is worth briefly discussing what the equation of line given by the linear regression means in general before we can apply it to our scatter graph, **Figure 12**. A linear regression line is in the form: $y = mx + c$. In our case, in **Figure 12**,
 $y = -0.9x + 78$.

For our purposes, we are only interested in the coefficient of x (the number before the x), in this case -0.9. If the coefficient is positive, this means that the 2 variables are positively correlated. If the converse is true, the 2 variables are negatively correlated.

If 2 variables, in our case reported unit challenge and average first attempt score, are positively correlated, then as one increases, so does the other. If the 2 variables are negatively correlated, as one increases, the other falls.

Given the coefficient of x is -0.9, i.e. negative, the 2 variables are negatively correlated. This means that as the reported unit challenge increases, the average first time score on the unit decreases. In short, the harder the unit, the lower the score. This is intuitively what we would expect.

This is further evidence that average first attempt score is a good indicator of unit challenge. By this measure, Unit 8 is by far the most challenging unit, given students achieve by far the lowest score, see **Figure 11**.

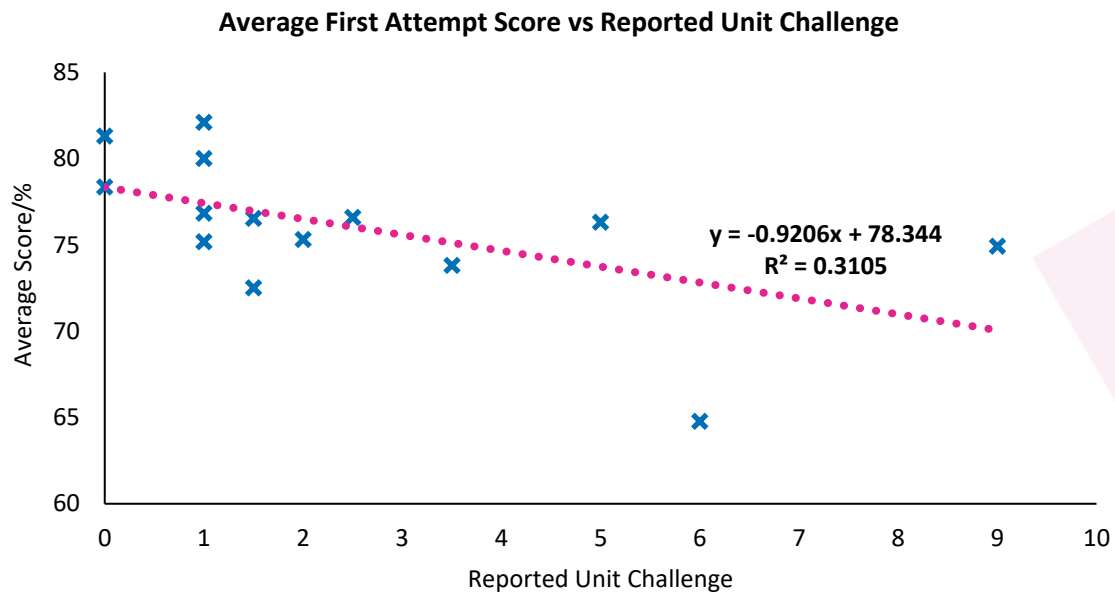


Figure 12. Average first attempt score (given as percentage) of each unit of the course vs the reported unit challenge, for a sample of Biomedical Engineering course participants (N = 50). The linear regression trendline is in pink with its equation and r-squared value shown.

3.4 – Average Number of Attempts as a Metric of Unit Challenge

Another possible metric that can be used to measure unit challenge is average number of attempts. This is because units that are more challenging mean that students are more likely to fail those units repeatedly and so will take more attempts to complete the unit's MCQ test.

Figure 13 shows the average number of attempts taken by students to pass (i.e. achieve 100%) each unit. The majority of units take between 2 and 3 attempts to pass them, whilst Unit 9 takes an anomalously large number of attempts, at 4.3, to pass.

Biomedical Engineering Course – Average Number of Attempts to Pass

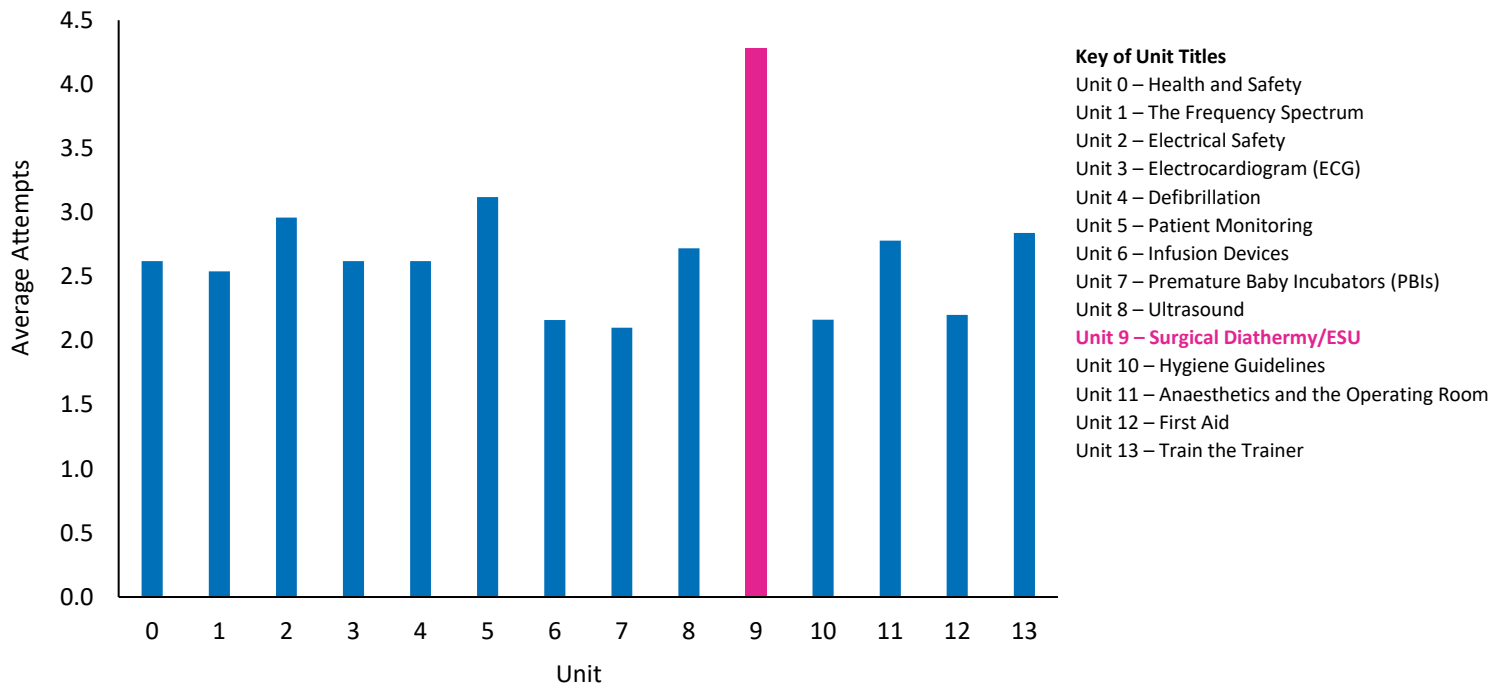


Figure 13. Average number of attempts required to pass (achieve 100%) each unit of the course for a sample of Biomedical Engineering course participants (N = 50). Unit 9, which took by far the most attempts to pass, on average, is highlighted in pink.

It could be the case that Unit 9 is particularly challenging for students, hence it takes a large number of attempts to pass the unit. **Figure 11**, student average first attempt scores by unit, show that Unit 9 has the second lowest average first attempt score, supporting this conclusion. However, students average reported unit challenge is one of the lowest for Unit 9, see **Figure 7**.

If it is the case that the number of attempts to pass the unit is a good measure of challenge, we would expect there to be a strong positive correlation between it and the reported challenge of each unit by students. I.e. as the reported challenge of the unit goes up, the number of attempts should also rise.

Figure 14 shows that there is essentially no correlation between reported unit challenge and average first attempt score. An r-squared value of 0.01 is essentially 0, meaning that no relationship exists between the 2 variables. It is clear that average number of attempts of each unit hovers around 2.5, regardless of the reported challenge of the unit.

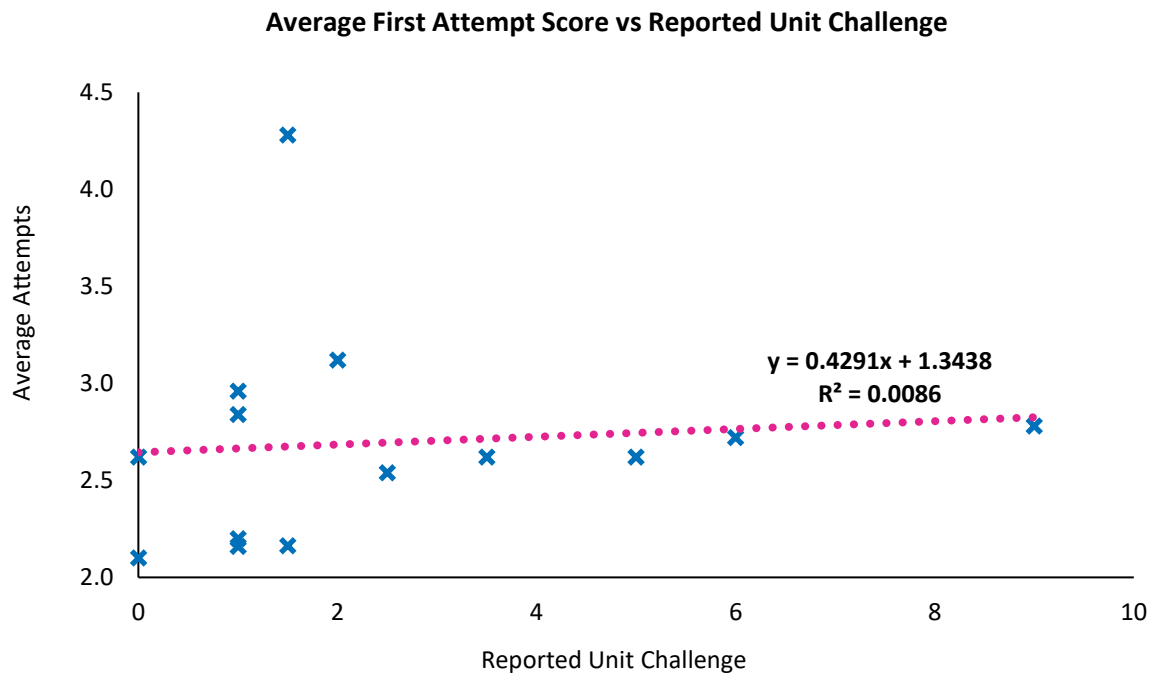


Figure 14. Average number of attempts required to pass (achieve 100%) each unit of the course against the reported unit challenge for a sample of Biomedical Engineering course participants (N = 50). The linear regression trendline is in pink with its equation and r-squared value shown.

This suggests that the average attempts metric is measuring something other than unit challenge. We can gain further evidence of this by looking at how well average attempts correlates with average first attempt score.

Given we established that average first attempt scores are a good measure of unit challenge, if the average number of attempts was also a good measure of unit challenge it should show a strong negative correlation with the average first attempt scores. I.e. if they are both measuring unit challenge, a unit with a high average first time score, should have a low average number of attempts.

Figure 15 shows that there is, indeed, a negative correlation between the average number of attempts and the average first time score (as the coefficient of x is -0.05). That said, the r-squared value is only 0.14, hence the strength of this relationship is nebulous at best.

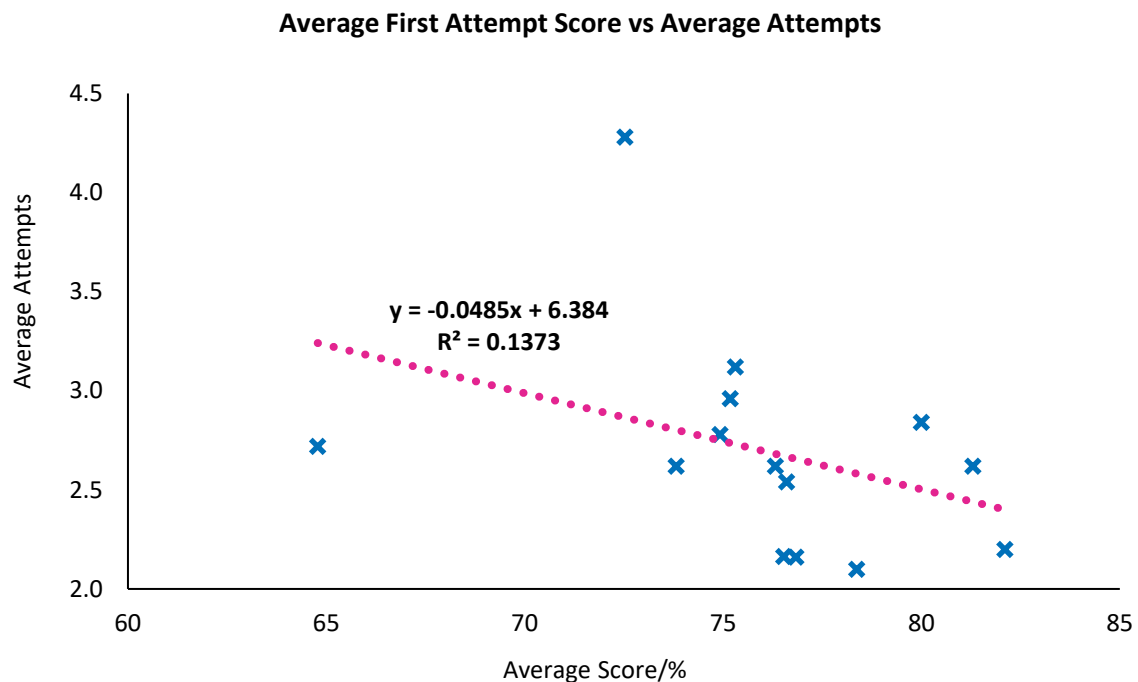


Figure 15. Average number of attempts required to pass (achieve 100%) each unit of the course against the average first time score of each unit for a sample of Biomedical Engineering course participants (N = 50). The linear regression trendline is in pink with its equation and r-squared value shown.

The fact that no clear relationships exist between average number of attempts, and either average first time score (**Figure 15**), or reported unit challenge (**Figure 14**), mean that we can conclude that whilst average first time score and reported unit challenge are good measures of unit challenge, average number of attempts is not.

We should then consider why this might be the case. If we take average first time score to be the definitive metric of unit difficulty, what other properties about the unit can be revealed by the average number of attempts? We need to uncover a reason why a student would take more attempts to pass a unit when compared to another with equal difficulty.

If a question is worded in a challenging manner, this might cause the student to get the question wrong. This would cause them to fail the unit, as in order to pass they must answer all questions correctly. If the same question (or set of questions) continues to trip up students, this will result in an increase in the average number of attempts taken to pass the unit.

We cannot rule out the impact such a hypothetical rogue question might have on unit average first time scores. If a difficultly worded question were to be present, causing students to answer incorrectly, then this will bring down the unit's average first time score. However, the proportional impact will be small, relative to the number of attempts taken.

If the student requires an extra attempt at the unit due to the rogue question, this may mean taking 3, rather than 2 attempts at the unit. This is a 50% increase in the number of attempts. However, if there are 20 questions in the unit (true for almost half the units) getting a single rogue question wrong will only have a 5% impact on their first time score.

Thus, the impact of challengingly formatted questions will show up far more in the average number of attempts than for the average first time scores.

The key conclusion is that average number of attempts is a good predictor of challengingly worded or difficultly formatted questions, whilst average first time scores is a good predictor of unit difficulty.

3.5 – Impact of Adding Questions on Average First Score and Attempts

We must not rule out the impact of adding questions to the set of multiple choice questions at the end of a unit. Adding additional questions to a unit has no impact on the average score of the unit, if all questions are of uniform difficulty.

Consider a fair coin. When it is flipped, the chance of getting heads is $\frac{1}{2}$, and the chance of getting tails is $\frac{1}{2}$. If we pretend the coin is like a question in our test, and we answer it correctly if we get heads, then the chance of answering one question correctly is $\frac{1}{2}$. This means the average score on our test is $\frac{1}{2}$, or 50%.

Now let us consider flipping the coin 2 times. We can get the following outcomes: HH, HT, TH or TT (where H is heads and T is tails). Given there are 4 different outcomes, the probability of each is $\frac{1}{4}$. In terms of answers to our test questions, where flipping heads corresponds to answering the question correctly, it means there are 4 outcomes. We can get 2 correct, 1 correct, 1 correct or 0 correct. All outcomes are equally likely, just like for the coin flips at $\frac{1}{4}$.

What is the average number of questions answered correctly over the 4 possible outcomes? We must average all the 4 outcomes. I.e. it is an average of 2, 1, 1, and 0. The average is 1. What does this make the average score? 1 is the average number of questions answered correctly, and we asked 2 questions. This means the average score is 1 out of 2 questions correct, or $\frac{1}{2}$ or 50% – the same as it was for a single question.

In short, adding additional questions to a unit should not make any difference to the average score of the unit.

Let us now consider the same thought experiment but look at average number of attempts taken to pass the end of unit MCQs. In order to pass, the student needs to answer all the questions correctly, or in our coin example get all heads.

If we only flip the coin once, or ask one question, the chance of getting heads is $\frac{1}{2}$, or 50%. This means that the chance of a student passing this hypothetical a unit on their first attempt is 50%. However, if we now have 2 questions, or 2 coin flips, we now need to get 2 heads, or 2 correct answers, before we can pass the unit.



We saw before that the possible outcomes are HH, HT, TH and TT. All 4 possibilities are equally likely as the coin is fair. So, the only way we can pass the unit is to get 2 heads. This only happens in 1 of the 4 outcomes, so the chance of passing the unit on the first try is $\frac{1}{4}$ or 25%

This is lower than the $\frac{1}{2}$ needed to pass the unit with just one question in it and so units with more questions in them, all else being equal, should take more attempts to pass.

How can we account for this? By taking the number of average attempts taken to pass each unit and raising it to the power of (1/the number of questions) we can account for the number of questions in each unit. Thus, we are only left with the effect of rogue questions which can push up the number of attempts to pass the unit.

Figure 16 shows the average number attempts of each unit raised to the power of (1/the number of questions in that unit). It is clear that Unit 13 is an outlier in this regard, with many more attempts required on a per question basis to pass it.

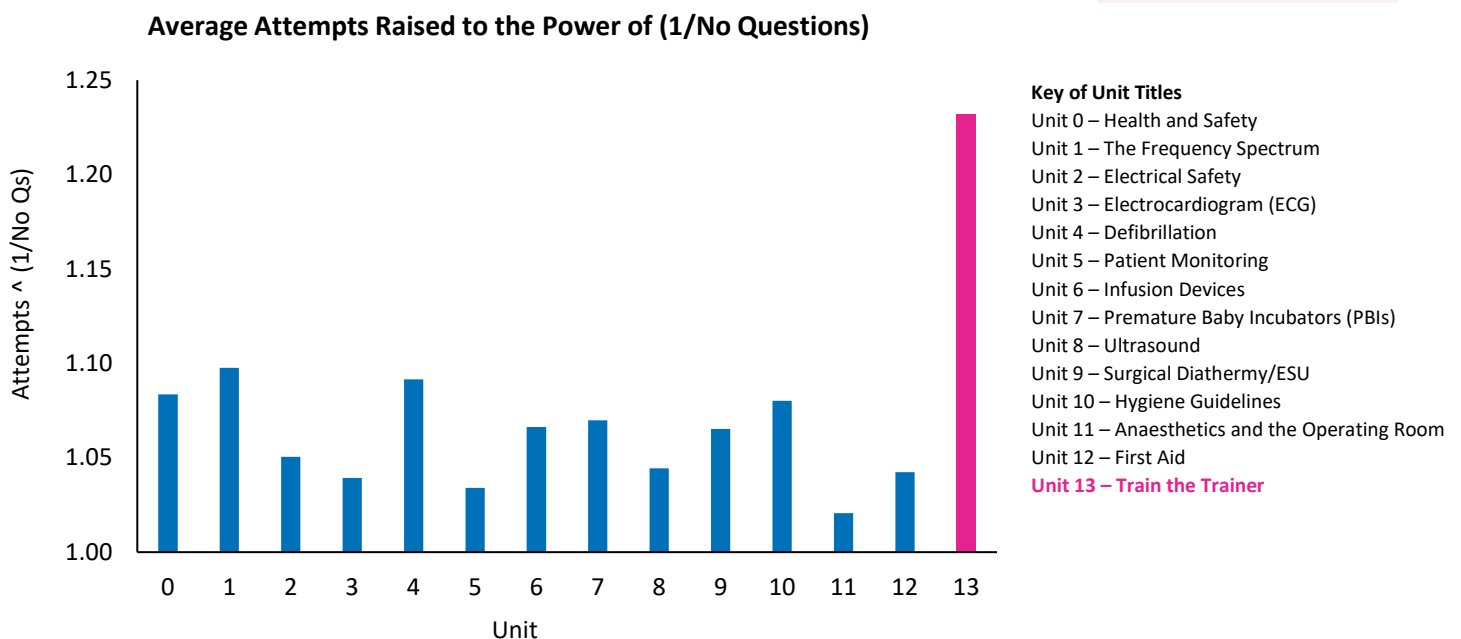


Figure 16. Average number of attempts required to pass (achieve 100%) each unit of the course raised to the power of (1/number of questions in that unit), for a sample of Biomedical Engineering course participants (N = 50). Unit 13, which took by far the most attempts to pass, on average and a per question basis, is highlighted in pink.

That said, given Unit 13 has by far the fewest number of questions (5 – the next lowest is 10), it could mean that this is the cause of the anomaly. Taking the 5th root of a number compared to taking the 10th root of a number will result in an extreme difference, and so if Unit 13 had a more representative number of questions, perhaps this would cause it to fall in line.

3.6 – Average Time as a Metric of Challenge

This report will now turn to investigating whether the average time spent to answer the set of MCQs for each unit can be used as a good measure of the difficulty of the unit.

It could be expected that students who find a unit more difficult will spend longer to complete the MCQs. Therefore, to prove this relationship we should look for a positive correlation between the time spent on each unit and the reported challenge of the unit.

Figure 17 shows the average time spent on the first and last attempt (i.e. the passing attempt) of each unit. It appears that Unit 11 is the most difficult and that Unit 13 is the easiest, given their MCQs took the longest and shortest amount of time, respectively to complete, on average.

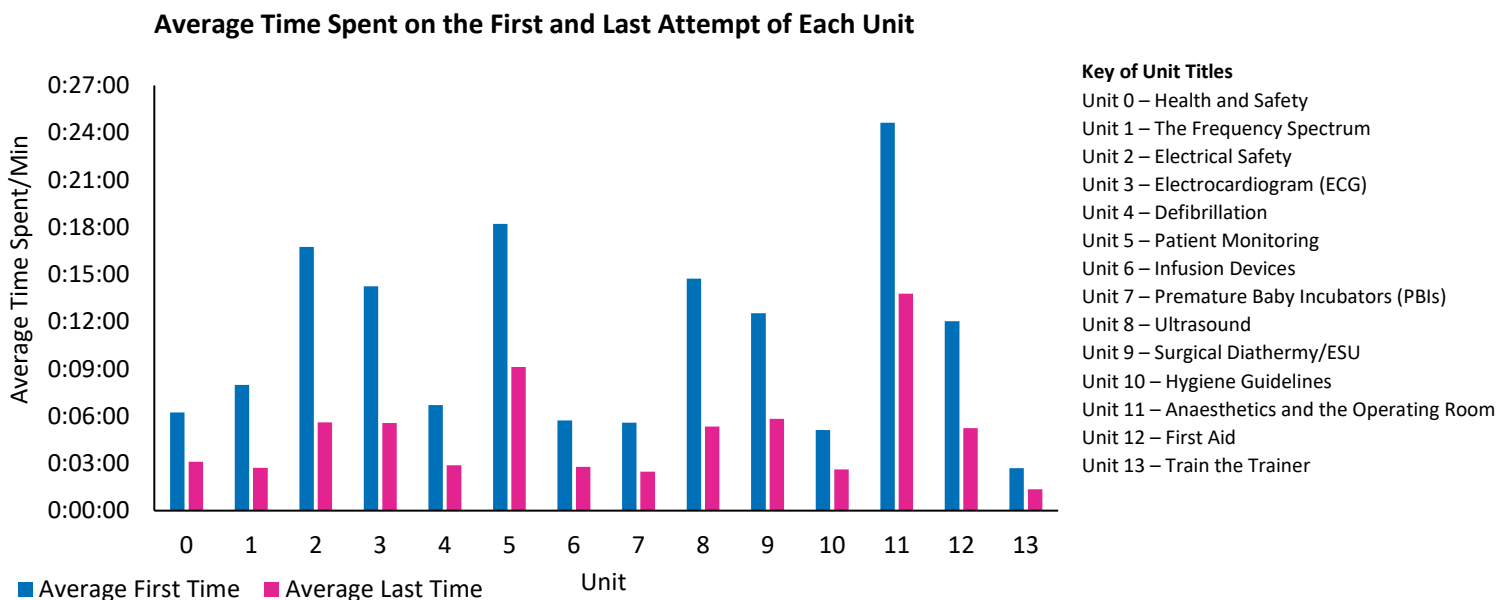


Figure 17. Average first and last time spent on the MCQs of each unit of the course for a sample of Biomedical Engineering course participants (N = 50). The average first time of each unit is shown in blue, whilst the average last times are shown in pink.

The next step is to see if the average times are related to the reported challenge of the unit, as rated by students. This can be achieved with a simple overlay of reported challenge onto the average and last times shown in **Figure 14**, by plotting it on a secondary axis.

Figure 18 shows this very result. On initial inspection there seems to be some kind of link between the two. Units, such as Unit 11, with a high average time have a high reported challenge. Conversely, units with a low average time have a low reported challenge, such as Unit 13.

Average Time Spent on the First and Last Attempt with Challenge Shown

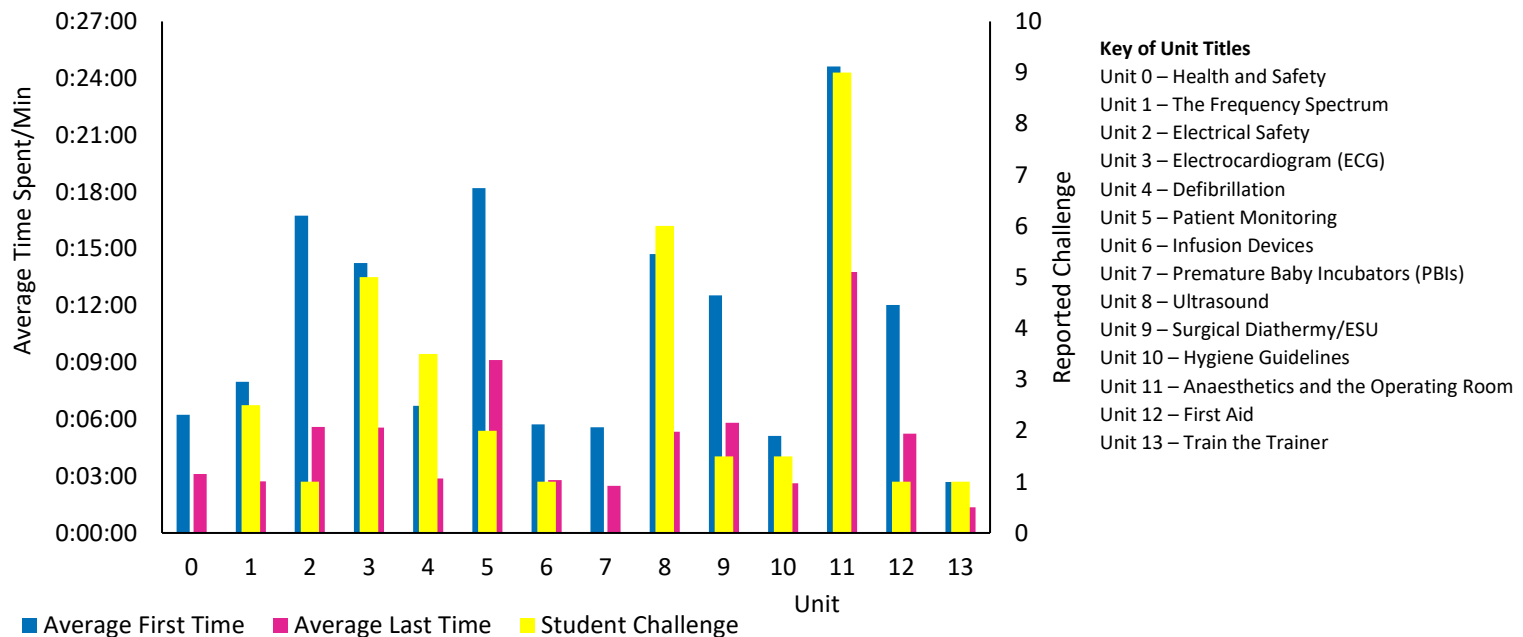


Figure 18. Average first and last time spent on the MCQs of each unit of the course, with an overlay of student reported challenge on a secondary axis, for a sample of Biomedical Engineering course participants (N = 50). The average first time of each unit is shown in blue, the average last times are shown in pink and the student reported challenge is shown in yellow.

We should not ignore the impact of adding more questions to a unit. As more questions are added to a unit, we would expect a student to spend proportionally longer time answering the questions, all else being equal. I.e. we need to study the average time spent answering the MCQs of each unit on a per question basis. This is achieved by dividing the average first and last times spent on the MCQs for each unit by the number of questions in their respective unit. The results are shown in **Figure 19**.

Per Question Average Time Spent on the First and Last Attempt

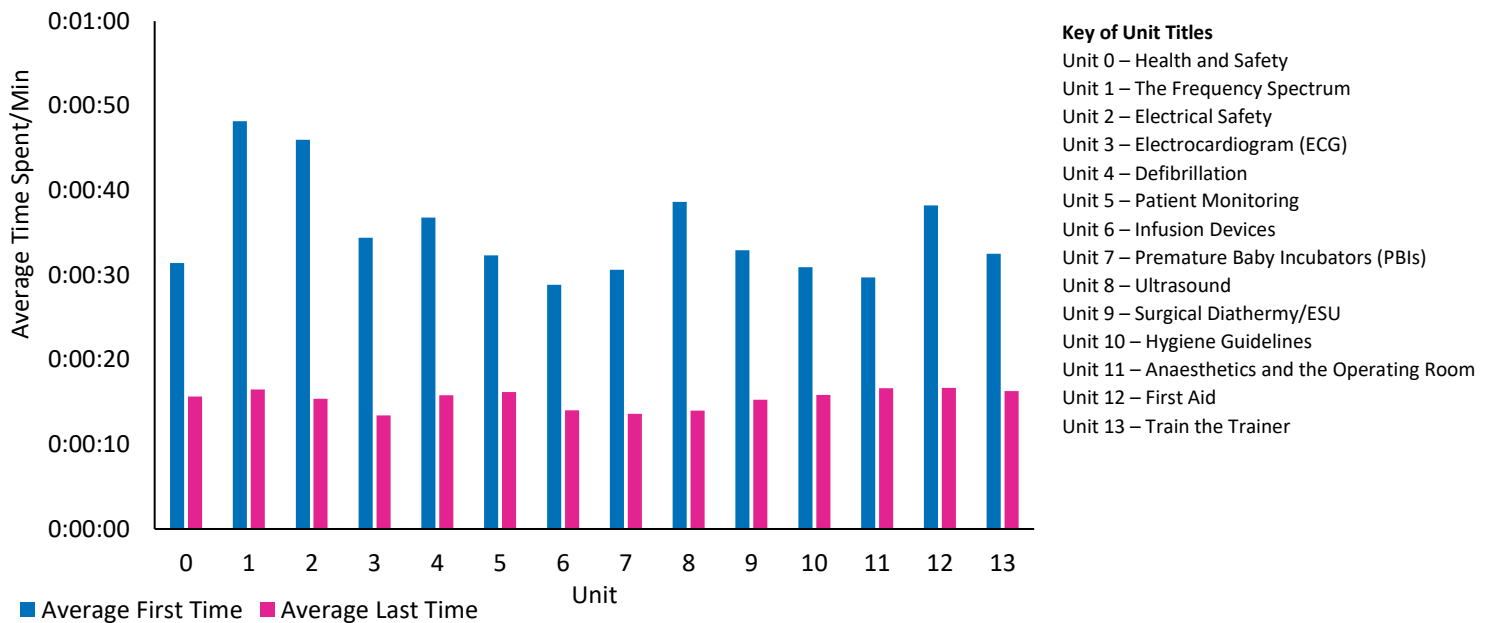


Figure 19. Average first and last time spent on the MCQs of each unit of the course for a sample of Biomedical Engineering course participants (N = 50). The average first time of each unit is shown in blue, whilst the average last times are shown in pink.

From **Figure 19** it is clear that any variation in the average first and last times taken by students on the MCQs of each unit is actually just variation in the number or questions in the sets of MCQs. The average first time for each unit's set of MCQs is around 30-40 seconds per question, whilst the average last time is between 10-20 seconds per question. This is roughly constant across all units, particularly for average last times. Thus, the supposed relationship to student reported challenge does not exist.

This is further evidence when plotting the average time (either first or last) against the number of questions in each unit's set of MCQs.

Figure 20 shows that the variance in average first times can be almost fully explained by the variance in the number of questions as the r-squared value of 0.92 is very close to 1. This means that 92% of the variation in the average first time is explained by differing amounts of questions in the end of unit MCQ tests.

We can thus conclude that the average times students spend on the MCQs of each unit is reflective only of the number of questions in each unit, not unit difficulty (or any other variable as the r-squared value is so high).

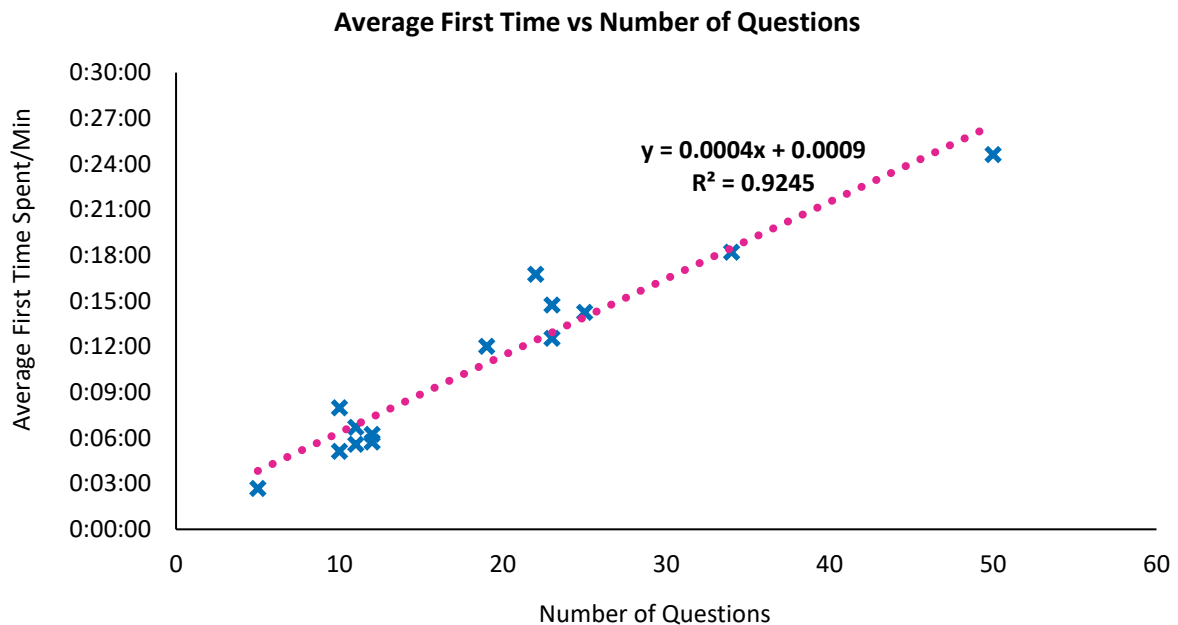


Figure 20. Average time spent on the first attempt at each set of end of unit MCQs against the number of questions in the respected unit, for a sample of Biomedical Engineering course participants (N = 50). The linear regression trendline is in pink with its equation and r-squared value shown.

For brevity, the result of average last time vs number of questions is not shown here, but the resultant r-squared value is even higher at 0.99, meaning 99% of the variance in average last time can be explained by the number of questions, an impressively conclusive result.

4 – CONCLUSIONS AND RECOMMENDATIONS

4.1 – Conclusions

The Biomedical Engineering course provided by Medical Aid International is incredibly well received by participants. High course satisfaction and a positive experience means participants not only highly recommend the course but wish to undertake future offerings from Medical Aid International, should any arise. The impact of the course is encouragingly strong, with the vast majority reporting very positive and significant day-to-day impact.

The standout unit for the course is Unit 11, Anaesthetics and the Operating Room; being rated by far the most useful unit of the course. It shows that the impact of improving operating rooms is enormous. Participants can see first-hand the enhancement to patient care, and with more resources invested into operating rooms this could be further improved.

Every unit was rated useful at least once, suggesting a broad applicability of the course and that it addresses a variety of differing needs. The course not only gives participants a thorough grounding in medical equipment, its use and care, but in doing so gives them greater confidence in their abilities. This confidence translates into motivation and drive to have a positive day-to-day impact, facilitating a better equipped hospital, increased support for clinical colleagues, and enhanced patient care.

The average first attempt score of students is a good metric for measuring the difficulty of a unit. It correlates to a reasonable degree with student reported challenge, giving further credibility to this argument. On this basis, Unit 8, Ultrasound, was by far the most challenging unit. Unit 11, Anaesthetics and the Operating Room, was not far behind and was voted most challenging by students. Unit 8 could be the most challenging because of the inherent difficulty of the material, or because it is less familiar to students; further study would be required to ascertain a definitive answer.

The average number of attempts did not correlate with the average unit scores; hence they must measure different variables. Rather than measuring unit challenge, the average number of attempts required to pass each unit is a good metric for measuring if there are any questions in a unit that might be tripping students up. It appears that Unit 9, Surgical Diathermy/ESU, may be one such unit, and requires further investigation by combing through the question responses in detail.

Accounting for the number of questions in each unit and the impact this can have on the number of attempts, Unit 13, Train the Trainer, also stands as a possible unit with a trip-up question. Investigating the cause of this falls outside the scope of this report, but a study should be undertaken to ascertain the root cause, in the future.

Average time taken, both on the first and last attempt, to finish each unit's MCQs was a very poor predictor of unit challenge. Instead, the amount of time taken correlates almost perfectly with the number of questions in each unit, i.e. the more questions there are, the longer it takes students to answer them.



Taking the number of questions into consideration and removing it as a factor shows that the average time to answer a question is about 30-40 seconds initially, falling to 10-20 seconds on the final attempt. This holds true irrespective of the unit in question. Plotting either average time against the number of questions in the unit yields an r-squared value over 0.9; irrefutably strong evidence that unit challenge plays no part in the amount of time spent on each unit, rather only the number of questions is a significant factor.

Participants found demonstration videos and practical examples the most helpful elements of the course. The overall attitude towards the course was positive, and one of gratitude and thanks.

4.2 – Recommendations

As participants rated Unit 11, Anaesthetics and the Operating Room, so highly, it suggests that improvements to healthcare outcomes will come from developments in this area. Participants can see that being able to repair equipment in the operating room, i.e. them being better equipped with more of the machines functioning, improves health outcomes. Increased investment into better resourcing operating rooms should be a priority to improve health outcomes most effectively.

A follow-up survey is planned to be sent to participants of the course to gain further insights into its day-to-day impact. Information collected will be used to better understand how, specifically, Unit 11, Anaesthetics and the Operating Room, has benefited participants and how the day-to-day impact of the course can be maximised to save lives.

Given Unit 8, Ultrasound, was rated the most challenging by students, part of this planned feedback survey could include a question asking how familiar students were with the material before starting the course. That way it can be resolved as to whether the low average scores of Unit 8 were because the material was challenging or just unfamiliar.

The questions of Unit 9, Surgical Diathermy/ESU, and Unit 13, Train the Trainer, should be studied in detail and an analysis undertaken to spot any questions students are failing significantly more often than is statistically predicted. Remedial action should then be taken to adapt these questions to bring them in line with the others.

Although not investigated in this report in any way, it would also be interesting to see if the device a student uses to study the course, i.e. a desktop, laptop, tablet or mobile has any impact on the quality of the experience or learning outcomes.

This report will be periodically updated to reflect any changes in the data generated from participants who complete the course after the publication of this report.

5 – SUPPLEMENTARY INFORMATION

5.1 – Appendix A – List of Units in the Biomedical Engineering Course

Unit 0 – Health and Safety

Unit 1 – The Frequency Spectrum

Unit 2 – Electrical Safety

Unit 3 – Electrocardiogram (ECG)

Unit 4 – Defibrillation

Unit 5 – Patient Monitoring

Unit 6 – Infusion Devices

Unit 7 – Premature Baby Incubators (PBIs)

Unit 8 – Ultrasound

Unit 9 – Surgical Diathermy/ESU

Unit 10 – Hygiene Guidelines

Unit 11 – Anaesthetics and the Operating Room

Unit 12 – First Aid

Unit 13 – Train the Trainer

Moving Forward (Feedback Survey)



5.2 – Appendix B – Toolkit Inventory

- Plastic toolbox – 610x325x305mm
- Soft grip plier set – 4 pieces
- Circular plier set – 5 pieces
- Cross pein pin hammer – 110g/4oz
- Inspection mirror
- Soft grip screwdriver set – 8 pieces
- Hacksaw with soft grip – 300mm
- Hexagon key set & wallet – 25 pieces
- Telescopic magnetic pick-up tool
- Retractable blade trimming knife – 5 spare blades
- VDE approved fully insulated screwdriver set – 7 pieces
- Precision screwdriver set – 6 pieces
- Junior hacksaw blades – 10 pieces
- Fiberglass shafted claw hammer – 450g/16oz
- Adjustable wrench – 150mm
- Combination spanner set – 14 pieces
- Combination spanner – 6mm
- Combination spanner – 7mm
- Bi-metal hacksaw blades – 300mm, 32tpi, 10 pieces.
- Measuring tape – 5m/16ft x 19mm
- Square socket set – ¼", 20 pieces
- Safety glasses
- Professional safety goggles
- Pocket multi-tool
- Head lamp – 3W
- Heavy duty AAA alkaline batteries – 4 pieces
- Digital multimeter
- Heavy duty 9V alkaline battery
- Junior hacksaw and blade
- Soldering Iron – 230V, 30W
- Lead-free solder – 1.2mm x 20g
- Ear plugs
- High visibility vests
- Medical Aid International portfolio & desk pad
- Biomedical Engineer polo shirt
- USB-manuals

5.3 – Appendix C – List of Provided Textbooks

- Beginner's Guide to Reading Schematics – ISBN: 978-1260031102
- Complete Electronics, Self-Teaching Guide (with projects) – ISBN: 978-1118217320
- Encyclopaedia of Electronic Components – ISBN: 978-1449333898
- Oxford Concise Medical Dictionary – ISBN: 978-0198836612



5.4 – Appendix D – Student Feedback Surveys

For transparency, and so our excellent student feedback can be shared, all of the students' feedback survey have been appended to this report. For data protection, the students have been anonymised, but the surveys have been ordered alphabetically to avoid any reporting bias.



Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 **9** 10 Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
Unit 2, Unit 7, Unit 8. Unit two was beneficial more especially that i work as an on site electrician in the hospital. Unit 7 we have some old model incubation machine which i have been helping maintain them and finally unit 8 we have an ultrasound machine and x ray machine which i monitor their usage and help arrange for maintenance.

3. Please identify the unit/s you found the most challenging and why?
Unit 3 Electrocardiogram, it had several subtopics which were quite many of which i feel would have been treated as units in their own way for enough material to be supplied.

4. What could be improved on the course?
More material for most complex units and the complex units to be sub divided into units in their own way and more reading materials be provided.

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 **9** 10 Drastically

8. Please comment further details.
It was a wonderful undertaking. Looking forward for next level course in BioMed so that i can improve my skills and improve my career as well. It was an honor to have been your student and will continue in future courses.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied
2. Please identify the 3 units you found most beneficial and why?
unit 9,unit 11 and unit13
3. Please identify the unit/s you found the most challenging and why?
all because all units was increased my knowledge
4. What could be improved on the course?
all the courses was the best
5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically
8. Please comment further details.
no comment but I thank you very much about this courses



Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?

Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?

Surgical Diathermy

The unit helped improve my understanding on ESU and its origins operation and importance in a hospital theatre.

Anaesthetics ad operating Room

Gave a clear overview of this important department and the am more confident to interact with the different users and at least be of the same understanding.

First aid

It is a topic that we often forget about but very important to know what to do in different accident situations, more so working with various pieces of equipment and different levels of staff,

3. Please identify the unit/s you found the most challenging and why?

[No User Response].

4. What could be improved on the course?

Considering that at times connectivity is difficult in so places the number of questions may need to be reduced or split into two parts especially unit 11

5. On a scale of 1- 10, how likely are you to recommend the Programme?

Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?

Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?

Not at All 1 2 3 4 5 6 7 8 **9** 10 Drastically

8. Please comment further details.

The course has helped me a lot because it is very specific to medical equipment and has taken me through step by step, easy to understand and follow through.

My profound gratitude to the sponsors, facilitators and the crew behind the scenes. A Big Thank you and may I suggest that you may consider another course on Healthcare technology management for those in supervision or management positions.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied
2. Please identify the 3 units you found most beneficial and why?
Unit 6
Unit 7
Unit 8
Unit 9
Unit 10
Unit 11
Unit 12
3. Please identify the unit/s you found the most challenging and why?
Unit 13 because it's often ignored in most programs that i have done
4. What could be improved on the course?
Increase the length of videos
5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically
8. Please comment further details.
I would like to thank you for this nice program it has changed the way i am working and responding to emergencies



Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?

Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?

*First of all I thank you, The Medical International team for your effort and commitment towards developing well standardized biomedical engineers especially for rural hospitals of underdeveloped and developing nations. I am indeed very happy and fortunate to be the part of this team now. I, Mr. Bravin Lakshmanan Rajaretnam, Operating room nurse by profession find Unit 1 about frequency spectrum, Unit 11 about anesthetics and the operating room helped me enhancing my knowledge on this areas. Unit 13 is very crisp and sharp about communication which helped me to imagine scenario of various situation, how to be more effective communicator, Trainer/Teacher etc. Overall, This course is an asset not only for biomedical engineers but also other healthcare workers especially nurses like me. Once again I thank you the team and hats off for your support. THANK YOU.....
Bravin.*

3. Please identify the unit/s you found the most challenging and why?

Unit 1 Frequency Spectrum is quite challenging. As a Nurse it is very new to me. However It is interesting to learn about this.

4. What could be improved on the course?

Standard operating procedures (Flow chart type) for all medical instruments may help non technical staff a lot

5. On a scale of 1- 10, how likely are you to recommend the Programme?

Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?

Very Unlikely 1 2 3 4 5 6 7 8 **9** 10 Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?

Not at All **1** 2 3 4 5 6 7 8 9 10 Drastically

8. Please comment further details.

I haven't received my toolkit yet due to customs problem, Expecting in a day or two. Thanks.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
Health and Safety because in everything it must be safety first then you can proceed with your duty delivery
Hygiene guidelines because hygiene keeps you safe
Importance of communication because communication being the basis of everything it has to be mastered well

3. Please identify the unit/s you found the most challenging and why?
Electrical safety, surgical diathermy maybe because I only did these topics during my general nurse training

4. What could be improved on the course?
Since its more of a hands on course more practicals need to be done

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 **9** 10 Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 **9** 10 Drastically

8. Please comment further details.
The course is good , course material very helpful. thank you

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
Of course all the units were good however to mention three
1. *Anaesthesia*
2. *Patient Monitors*
3. *Ultrasound*

3. Please identify the unit/s you found the most challenging and why?
1. *Ultrasound*
2. *Defibrillation*

4. What could be improved on the course?
There is could be inclusion on Radiology and also practical sessions on maintenance of medical equipment

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.

I have learnt a lot from this course. Most of the things that I found in this course are new and some were taken for granted.

As an Engineer I bypassed a lot of steps on safety issues but I have been equipped with knowledge which I am going to apply.

I also had gaps on medical equipment used in operating theatres as you know that this is a restricted area and mostly we go only when there are faults so it is difficult to familiarise ourselves with theatre equipment.

The other area is also that the whole course used most of medical terminologies which we just hear doctors discussing. I have learnt a lot that I have even become a good biomedical engineer than I was before.

However I still request that you should also include something to do with a Life of a Biomedical Engineer. So that we may have a common behaviour in our operations. On this I am trying to mean what Biomedical Engineers do on a daily basis. Is it about maintenance of medical equipment and how do they do it.

Lastly I appreciate for this initiative and am happy to be one of the people to benefit from this course. I will put everything in practice and be able to bring change to my country's Biomedical Engineering application and beyond

Regards

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied
2. Please identify the 3 units you found most beneficial and why?
Surgical Diathermy, premature baby incubators and Anaesthesia and the operating room
Because they offered new insights and information than I had previously learnt from classwork.
3. Please identify the unit/s you found the most challenging and why?
[No User Response]
4. What could be improved on the course?
Using more than one voice. Preferably interchange between male and female.
5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 **8** 9 10 Very Likely
7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 **8** 9 10 Drastically
8. Please comment further details.
Great course and initiative for biomedical engineers.
Much appreciated

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?

Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?

Unit 11

Unit 3

Unit 1

I believe the whole material was extremely beneficial to me. I was enlightened and empowered by the content and I am really looking forward to applying the knowledge. I choose the three because I found them very interesting and they exposed knowledge I did not have.

3. Please identify the unit/s you found the most challenging and why?

I didn't find any units challenging, I really enjoyed the content of the material.

4. What could be improved on the course?

I think we can pay attention to details especially in the spelling of words in the subtitles. I can recollect that you can not have a word spelt wrongly in biology.

5. On a scale of 1- 10, how likely are you to recommend the Programme?

Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?

Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?

Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.

I am really impressed by the thoughtfulness of international medical aid. I am indeed motivated to apply the knowledge and skill-set wherever I find myself. I will be forever grateful and encouraged to give out my best in the practice of the profession.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 **9** 10 Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
Unit 9, Unit 11 and Unit 13.
Everything explained I encounter them in my work place and from this time iam going to apply that knowledge I gained to solve most of the issues which were a problem.

3. Please identify the unit/s you found the most challenging and why?
Unit for Orthopaedic was so challenging since most of the work is being done by Doctors and Nurses. That area need someone with strong bias in Anatomy and Physiology.

4. What could be improved on the course?
You must also include Radiology, Radiotherapy, Laboratory and Intensive Care Equipment.

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 **9** 10 Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All **1** 2 3 4 5 6 7 8 9 10 Drastically

8. Please comment further details.
I haven't received any tool box and text books which were said to be received. So their impact is not yet realised. I will realise the impact the I will receive those materials. Also as a developing country we also lack Information Technology equipment to read and also go on internet.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 **9** 10 Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
Anaesthetis and the Operating Room
Surgical Diarthromy
Patient Monitoring

3. Please identify the unit/s you found the most challenging and why?
Anaesthetics and the Operating Room

Because of the various processes and equipment and need for precision in the theatre processes.

There was definitely too much stuff for one unit. Would love to know more about that

4. What could be improved on the course?
The course could be more enlightening if it could involve practical problems regarding the equipment used in each unit, like really showing opened machinery instead of Just the outside operating demo and showing us possible, common faults of these equipment

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.
Thank you for the enlightening course! For someone in Zimbabwe, a 3rd World country whose Medical sector is saddled with poorly serviced equipment, inadequacies of equipment, poor training and staffing, this course has given me the invaluable confidence and knowledge i needed to face the problems i encounter.
I hope more programs will be coming our way as i have started to successfully implement some of the knowledge in these troubled COVID-19 times.
The more knowledge we get the more lives we will likely save. Thank you

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?

Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?

Unit 0. This unit has helped me alot, as biomedical engineer, we frequently work on dirty machines which normally carry pathogens, this unit outlines the safety producers that, as engineers, we must follow to avoid cross contamination from the machine to an engineer

Unit 2: This unit outlines the electric safety producers, as biomedical engineers, we frequently work with machines that needs electricity to power them, the electric safety producers outlined in this unit are beneficial and it will prevent the occurrence of accidents, for example fire, electrocution in the hospital as well as in the workshop

Unit 13. This unit outlines the importance of communication, as biomedical engineers we must have these communication skills as we frequently commmunicate with other hospital stuffs, doctors etc on the technicality of medical equipments. As engineers, we often perform user training on the proper and effective use of medical equipment to doctors ,nurse etc therefore communication skills gained in this course are of paramount importance

3. Please identify the unit/s you found the most challenging and why?

In unit 5, it is necessary to simulate some parameters before using to a patient, the challenge is that we don't have enough patient simulators. For example where am working, at mzuzu central hospital, we don't have these simulators. So it becomes so difficult to tell if the patient monitor is working properly or not

4. What could be improved on the course?

please add x-ray imaging equipment and laboratory equipment

5. On a scale of 1- 10, how likely are you to recommend the Programme?

Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?

Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?

Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.

Thank you very much Medical Aid team, you have helped me alot as an engineer. Your knowledge that you have imparted on me will help to improve my professional career as a biomedical engineer, your textbooks will further widen my knowledge in biomedical engineering field. In Malawi biomedical engineers lacks resources, the tool kit that you have provided will help me to diagnise and troubleshoot the equipment accurately and with ease,now i will be able to work professionally and improve the quality of service delivery at my institution as well as the entire country. Thank you very much Medical Aid team for you overwhelming support

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
Unit 3, 7 and 11

Because, they actually touch on things that I did not know and it gives detail information on what you have to know as a Biomedical Engineer

3. Please identify the unit/s you found the most challenging and why?
Unit 12

Because the First Aid, in my part of the country, which is Ghana, hardly will you get even a first aid box at your facility. It is even less practice in Ghana.

4. What could be improved on the course?
Everything is on point for me

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 **8** 9 10 Drastically

8. Please comment further details.
It is actually a good program and I will encourage more of it in our part of the country, but if something can be done about the cost for individuals to also access the program.
Thanks

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
The ventilator and anaesthetic machine I new little about these equipment . The three basic procedures of dealing with emergencies and accidents (A,B andC) airway, breathing and circulation. I found it very wonderful and helpful and indeed many casualties die because of lack of such basic knowledge and management. Most importantly is the very last lesson of training the trainer. Wonderful principles let alone procedure and how to help engineers on how to get knowledge and experience.

3. Please identify the unit/s you found the most challenging and why?
The unit which covered Defibrillators and so the intubation. Since we as biomedical engineers are not very much involved hence not exposed on how it is done. Especially the defibrillator as cases of these are rarely found kr due to lack of expertise who can perform these cases.

4. What could be improved on the course?
Iam looking at the practical side as we engineers are very much involved area. Much as i appreciate some of the demonstrations like that of an oxygen concentrator, would as well wish the ventilator and again the anaesthetic machine could have the same type of demonstration. This is one area very critical which i think more input in terms of illustrations is concerned. And also forgotten another challenging area is that of an ECG. Here also may need well demonstrated clips.

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 **9** 10 Drastically

8. Please comment further details.

I would like to see this programme to continue as it is very effective in terms of quality health service delivery by brainstorming biomedical engineers with some important basic knowledge. Let me also request a full soft copy which can be accessed in pdf format to every engineer who has taken this course for ease of reference dissemination of information and knowledge to other engineers who have not benefited from the programme. As a motivating factor i would like to see as well a sort of recognition ie certificate of some kind to those who have participated fully. With this foundation it could well suit the Medical Aid in facilitating in upgrading these engineers an ongoing process to sit or pursue this course under the City and Guilds of London

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
Unit 5 Patient monitoring
Unit 7 Premature baby incubators
Unit 10 Hygiene Guidelines

These Units were such an eye opener and have broadened my knowledge especially that of Hygiene Guidelines greatly appreciate.

3. Please identify the unit/s you found the most challenging and why?
unit 11 and unit 9
learning new things at first is a bit challenge

4. What could be improved on the course?
broadening the units

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.
thank you for offering this course, have learnt new things that improves our professionalism in the field

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 **9** 10 Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
Defibrillation
ECG
Anaesthetic and Operating Room

3. Please identify the unit/s you found the most challenging and why?
Anaesthetics and Operating Room

4. What could be improved on the course?
The length of each unit to be made relatively short so that it's easy to understand and assimilate

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 **9** 10 Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 **7** 8 9 10 Drastically

8. Please comment further details.
I did not receive any textbooks and tool boxes I strongly suggest that the course should be structured such a way that it automatically refuses to open the next unit if one has not scored 100% instead of allowing and then only get feedback upon completion of the course that you can't get a certificate because you were supposed to score 100% on every unit.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
Unit 3, Unit 5 and Unit 11.

*They are equipment I have been struggling to understand its operation and maintenance .
With these videos I have understood the dark parts that were hidden from me the past.
These three units has now give me the edge to communicate freely with the users, doctors
and my staffs.*

3. Please identify the unit/s you found the most challenging and why?
Unit 3.

This unit looks more clinical.

4. What could be improved on the course?
*Some of the topics are broad so the sub units should not exceed more than four. That of unit
5 and unit 11 can be split in to two at least .*

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International
Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected
your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.
I will advise more people are enrolled on this program.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
 - 1. Unit 12-First Aid: this unit has benefited me a lot due to the sense that i did not cover it in my Diploma in Biomedical Engineering Technology i did. I now have the knowledge (First Aid) to handle situations that i have not been handling.*
 - 2. Unit 11- Anaesthetics and the Operating Room: This unit has opened my mind on how to resolve the challenges we have been having in the operating rooms, e.g the operating light challenges that can be resolved by using LED lights as mentioned in this unit.*
 - 3. Unit 13-Train the Trainer: This unit has helped me realize the importance of communication. Indeed my ability to interact well and professionally with others will mean that they are more likely to listen to my opinion, have more confidence in me and involve me in decisions moving forward.*

3. Please identify the unit/s you found the most challenging and why?
I was able to understand all the units.

4. What could be improved on the course?
I suggest the course to include ICU equipment such as Mechanical ventilators and CPAPs, and the basic knowledge of radiology equipment such as X Ray machines and CT Scans.

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.
Thank you for giving me an opportunity to study this online course (Biomedical Engineering Theory Course). The knowledge i have acquired will create a positive impact in my practical work.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?

Many thanks to you, Tim Beacon, and the entire Medical Aid International team, for this holistic education. I am grateful for the opportunity to learn.

Henceforth, I can enter an Operating Room and no more be overwhelmed by the intricacies of some equipment in use, thanks to the walk through in Unit 11 on Anesthetics and Operating Room.

I very much appreciate the First Aid tutorials in Unit 12, and would recommend it for not only health professionals but everyone. They are in truth, Life Saving!

Finally but not least, the lessons on Role and importance of communication in Unit 13, have been driven home for me. I am better poised to participate more actively as a Clinical Engineering Manager.

Thank you!!

3. Please identify the unit/s you found the most challenging and why?

Each Unit presented with an exciting exposure and its contents were quite easy to comprehend.

4. What could be improved on the course?

I loved the Demos whenever they were available. If applicable, all Units could employ more of those to afford users some extra practicality of the course.

5. On a scale of 1- 10, how likely are you to recommend the Programme?

Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?

Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?

Not at All 1 2 3 4 5 6 7 **8** 9 10 Drastically

8. Please comment further details.

This online biomedical engineering training course has been informative and exciting. I believe when I finally access the tool box and textbooks, it would be like icing on cake. I would even better apply what I've learned.

I'm impressed, and I look forward to making positive impacts in my area of work.

Thanks to you all at Medical Aid International!

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
Unit 3 Electrocardiogram> This unit has enhance my understanding not only on how to repair ECG machine but also to understand the function of the heart and placement of the electrodes for accurate recording.

Unit 13 First Aid> This unit has enhance my understanding on the right approach in attending to a person unconscious in an event of accident and how to manage the airway of such a person and also how to put such persons into recovery position to save life.

Unit 11 Anaesthetics and the operating room > This unit touches on most of the equipment used in the operating room and gives some basic troubleshooting techniques.

3. Please identify the unit/s you found the most challenging and why?
Unit 3 Electrocardiogram > This unit because it's not just repairs but physiological aspects of the heart and the interpretation.

4. What could be improved on the course?
This course is very good but going forward the course touch on ENT and Laboratory equipment's. Thank

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.
*I will like to this opportunity to thank the medical aid international for the great work and helping hand you are giving to people like me to be more efficient and effective in discharging of our duties for a better health care delivery. God bless us all.
Thank you.*

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied
2. Please identify the 3 units you found most beneficial and why?
Found Unit 5,7 and 11 as I have been educated on the risks associated with these units when it comes to the treatment of patients.
3. Please identify the unit/s you found the most challenging and why?
Unit was tough for me due to lack of enough exposure to the type of equipment
4. What could be improved on the course?
The must provide for books that contain Biomedical Equilment
5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically
8. Please comment further details.
I greatly appreciate the content that was provide for a starter/ beginner like ,well explained and in found great motivation from it.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
unit: 0, 01, 02, 08,09,10,11 The above topics were really focusing on my daily work and the setup its really a reflection of the practical hospital setup

3. Please identify the unit/s you found the most challenging and why?
unit 03, and 04: This are areas I had some challenges since the topics are complex.

4. What could be improved on the course?
-Troubleshooting technic topic to be introduced. The common problem we have is opening the equipment as a technician before frontline discussion with the uses. Most problems are there due to user error and lack of knowledge. The tips or steps used during troubleshooting to avoid breaking or damaging the equipment as a technician.

– Quality standards: Risk assessment, coming up with replacement plan for equipment, documentation of whatever we do at the facility(data),

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.
This has been an eye opener to me. However i feel there are some areas needs to be looked at in future: -A need to be clear on what you expect from the participants like type of reports, if someone after the course will produce evidence of hands on task done. Because that is not clear. -How someone can communicate with anyone from your end regarding technical support, do you have online support hotline, technically ? -Do you have follow up means? I feel all this needs to be displayed on your websites for participants to see. See we started the course people were asking question which needed your direct connection with each individual. That is my take. This is good. Thanks

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
unit 11, because at first, I did not have full knowledge concerning operating room pieces of equipment
unit 8, am very much fascinating with how the ultrasound machine works
unit 10, I have come to realize how important is hygiene in a hospital setup

3. Please identify the unit/s you found the most challenging and why?
units 11 and 5, I think because they are long units

4. What could be improved on the course?
I think you need to increase the number of demonstrations topics

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 **9** 10 Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 **8** 9 10 Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.
am very much pleased to undertake this course, am not certain for some of the medical equipment, where and which parts to tackle when they are down

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied
2. Please identify the 3 units you found most beneficial and why?
13,9,8
3. Please identify the unit/s you found the most challenging and why?
Nil
4. What could be improved on the course?
Everything is ok, but a more physical and practical training would do
5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 **9** 10 Very Likely
6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 **9** 10 Drastically
8. Please comment further details.
Like i said in the previous question, more physical trainings are better,especially for us biomed, because most of what we do are hands on.
Thank you 😊.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
unit 1, unit 3 and unit 11

Its very difficult just to choose only 3 units, because in all the units which are in this course there was something new which i learned and all units are relevant to work as a biomed.

3. Please identify the unit/s you found the most challenging and why?
Unit 8 (ultrasound) it covered alot of areas and machines of which i did not thought that they are part of ultrasound.

4. What could be improved on the course?
-add more tutorials on how to trouble shoot and repair some common faults on the equipment.

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.
Thanks to the organisers and sponsors of this course, it has helped me alot in understanding most of the equipment which are used in our hospital. The knowledge acquired here it will benefit clients who come to our facility to get services, users of medical equipment , my self as a biomed and my colleague .
Thanks alot

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?

Least Satisfied 1 2 3 4 5 6 7 8 **9** 10 Most Satisfied

2. Please identify the 3 units you found most beneficial and why?

Defibrillator

This unit was so beneficial to my current practice because i did not understand the functionality of this equipment yet its so vital in our day to day work. The potential hazards associated with this equipment means that we need to take all the necessary precautions when repairing it and make sure all electrical safety tests are done properly before releasing this piece of equipment to the clinicians.

Electrical safety

This unit explained the simple things that we mostly ignore in our work but which are so important. Issues around the safety of patients and visitors who come in the hospital could never have been over emphasized.

Patient monitoring

This unit provided some new knowledge on patient monitoring and how vital signs are acquired from the patient. This resulted in a more deeper understanding on the functions of the equipment.

3. Please identify the unit/s you found the most challenging and why?

[No User Response].

4. What could be improved on the course?

More information on radiological equipment like x ray machines, CT scan machines and such related equipment.

Operations of low temperature sterilizers, hemodialysis equipment and water treatment processes.

5. On a scale of 1- 10, how likely are you to recommend the Programme?

Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?

Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?

Not at All 1 2 3 4 5 6 7 8 **9** 10 Drastically

8. Please comment further details.

I have benefitted immensely through participating in this program and i have no doubt that this will result in a big improvement to my work. Steps of repairing equipment that i learnt in this course will help me to better organize my daily routine and be able to approach faults systematically.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 **9** 10 Most Satisfied
2. Please identify the 3 units you found most beneficial and why?
unit 4, 9,6. I had little knowledge I those areas but the course has widened my understanding
3. Please identify the unit/s you found the most challenging and why?
None was challenging
4. What could be improved on the course?
Practical aspects of the course should be developed. We need more practical of it. Repairs, troubleshooting etc
5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 **8** 9 10 Very Likely
6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 **8** 9 10 Very Likely
7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 **9** 10 Drastically
8. Please comment further details.
The course has really cleared so many doubt about some equipment that were treated in the course and now I have better understanding adding to the knowledge I had already.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 **8** 9 10 Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
Unit 3: Electrocardiogram(ECG)
-In this unit previously I didn't have enough knowledge on the placement of probe and how the machine Respond to heart beat to give a result, now I have understand and will be able to do maintenance

Unit 8: ultrasound, in this unit i didn't understand how the machine come up with an image but now I have understand

Unit 11 Anaesthetic machine: I have greatly understand almost everything of this machine alot of questions I had has been answered, now I will be able to do maintenance

3. Please identify the unit/s you found the most challenging and why?
Infusion pulp, I have not understand, the difference among motors(stepper motor, induction motor, synchronous motor and squirrel-cage motor) how they are made

4. What could be improved on the course?
You should add, general trouble shooting of every medical equipment and how to do planned preventive maintenance (PPM) of every medical equipment

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 **9** 10 Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 **9** 10 Drastically

8. Please comment further details.

I greatly appreciate you Medical Aid International for the program you offer and a simple demonstration of the course which makes easy to understand we have learned alot it might be hard to explain almost everything. Most questions I had concerning medical equipment has be answered.

They will be great improvement from now.

THANK YOU VERY MUCH KEEP IT UP

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
Surgical Diathermy, Electrocardiogram and Electrical Safety First of all I have learnt how best I can prevent all patient leakage currents which is very important to ensure that our patient are always safe. I have learnt a lot on how to repair surgical diathermy and the danger it possesses and on Electrocardiogram I have learnt a lot of things which will prevent misdiagnosis as I will be able to differentiate between the good trace and the bad trace hence repairing the machine thoroughly.

3. Please identify the unit/s you found the most challenging and why?
None

4. What could be improved on the course?
You need to split unit 11-Anaesthetics and Operating Room into sub units because it has got a lot of topics.

Some questions required selection of two answers yet there was no any instruction notifying the same. Before starting the test you need to come up with instructions that some questions have multiple answers. You need to improve on obvious answers. I noted that any question which had the option of "All answers are collect" was the right answer hence you need to look into that option

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.

I would like to thank MedAid International for this online Biomedical engineering course. I have been working as Biomedical Engineer for the past sixteen years and I have attended a lot of trainings within the continent of Africa and abroad but I have never come across any programme or course which can match you well explained units. They are very easy to understand.

Malawi is still in the infancy stage in as far as Biomedical Engineering is concerned. In Malawi we have four Referral Maintenance Units which trains interns who are doing Biomedical Engineering and for us to train the students better we are lacking some of the basic things which we can be using to train them better like Arduino boards, electronics practicing boards and anything which can assist when it comes to training interns. It will be great if you can also assist these units with the said items. Biomedical engineers are not there to only repair medical equipment but also to ensure that medical equipment are safe for patient as well as users. As developing countries we ask MedAid International to also assist in supplying testing equipment which we can be using to ensure that medical equipment are safe and effective. Lastly big up to MedAid international for supporting us with toolboxes and other materials which will help us to bridge the gap which is there between knowledge and reality.

I will continue to keep the MedAid International fire burning

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?

Least Satisfied 1 2 3 4 5 6 7 8 **9** 10 Most Satisfied

2. Please identify the 3 units you found most beneficial and why?

The 3 units I found most beneficial are Unit 0 (Health & Safety), Unit 04 (Defibrillation) and Unit 13 (Train the Trainer).

Under Unit 0, I learnt about general health and safety tips that I need to know as a Biomedical Engineer to ensure that I am protected from most hazards and dangers that my job exposes me to on a daily bases.

Also, prior to this course, Defibrillation was a tricky topic for me because of its complexity. However, Unit 04 not only taught me how to identify the different types of defibrillators and when to use them but also armed me with relevant information on different specifications that will help me in my procurement processes as a Biomedical Engineer.

Finally, my current role requires that I lecture users and relevant stakeholders on the principle of operation of some medical devices and also undertake user training exercises. Unit 13 (Train the Trainer) has therefore coached and enlightened me on how to effectively communicate with my audience and this will help me enormously in my training programs henceforth.

3. Please identify the unit/s you found the most challenging and why?

The unit that I found most challenging was Unit 11 (Anaesthetics and the Operating Theatre).

This is because, more than 5 highly specialised areas were compressed under one unit. It therefore made it a bit challenging to fully grasp the loaded information that each part provided.

4. What could be improved on the course?

Unit 11 could be divided into about 2 or 3 units so that, more light could be shed on each of the broad parts. Also, more live videos could be shared after each unit to show how some of these devices are used on the field and common faults that usually present in their use.

Again, some information on maintenance practices specific to some of the medical devices in the course could also be covered.

5. On a scale of 1- 10, how likely are you to recommend the Programme?

Very Unlikely 1 2 3 4 5 6 7 8 **9** 10 Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 **9** 10 Very Likely
7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 **7** 8 9 10 Drastically
8. Please comment further details.

The whole course has been very informative and enlightening. Almost all aspects of Biomedical / Clinical Engineering were covered.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 **8** 9 10 Most Satisfied
2. Please identify the 3 units you found most beneficial and why?
In order of beneficial
 1. *Surgical Diathermy Because its more relevant to our hospital role and that it has been explained well to me*
 2. *Health and Safety Because I had little knowledge on that and now have great deal of it.*
 3. *Infusion devices. Because it has been well explained and I have now good background of it.*
3. Please identify the unit/s you found the most challenging and why?
Patient monitoring and Defibrillation Because these topics are crucial and need more practical demonstration on their mechanisms. You only provided few practical demonstration
4. What could be improved on the course?
You should give more examples on real models of machines, principle of operation and try to explain those that are common and how to troubleshoot them.
5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 **8** 9 10 Very Likely
6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 **9** 10 Very Likely
7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 **7** 8 9 10 Drastically
8. Please comment further details.
the course is good but I was expected to have more of practical demonstration of biomedical equipment based on their models and how to troubleshoot them based on your experience of their common problems.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
Unit 13: Train the trainer
Unit 12: First aid
Unit 0: Health & safety
I found these units extremely beneficial in the sense that they complement the technical skill that the engineer has. These skills are so essential and 'life-saving'

3. Please identify the unit/s you found the most challenging and why?
Unit 08: Ultrasound.
Some of the concepts were hard to understand.

4. What could be improved on the course?
Additional topics such as topics on the basic equipment used at the medical laboratory.

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.
I am very grateful to MedAid for putting this training programme together. The content of the course addresses most of the challenges I face in the hospital I work. Those who developed the content of the training have done extremely well by making it applicable to my setting. The course has raised my confidence by giving me more knowledge in the area I work.
I am also very grateful to my sponsor, Operational Smile, for sponsoring me to undertake this training

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
I found unit 2 very beneficial. As a Biomedical Engineer, most of the work that i get involved in is to do with electricity be it a piece of equipment or not. From tis unit, i learnt alot about safety when handling electrical equipment or devices. I also found unit 11 as being of a special importance. I got a more complehensive and advanced informartion on the operation and troubleshoot of anaesthtic machines. Finally, unit 13 gave me alot more of special insights on how i can communicate to various individuals or groups of people within the hospital set up or outside.

3. Please identify the unit/s you found the most challenging and why?
I found unit 11 as being very challenging. This is so because it covers alot more subtopics hence i's long. I had to spend much time on it than any other units.

4. What could be improved on the course?
I feel that this course is very well set and organised. However, there is something that needs to be improved. Firstly, the duration for this course is needs to be indicated. Secondly, there tutors need to reduce the speed when speaking during presentation.

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.
The course is very important in as far as helping to build a better Biomedical Engineer is concerned.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?

Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?

Unit 3 on electrocardiogram , i was not well versed in this topic but i had found out that these days a lot of patience are being diagnosed of heart conditions and they end up beind reffered for ECG so going through the ECG machine and the rhythms actually enhanced my understandingof this topic

Unit 4 on Defibrillation also was very beneficial to me, after going through this topic, and getting enough knowledge on how to use a defibrillator, i just feft at easy and i am now very confident and very comfortable to use the defibrillator

Unit 7 on premature baby incubator, the knowledge i obtained from this topic ic adequate enough for me to be in a position to use the incubator comfortably

3. Please identify the unit/s you found the most challenging and why?

Unit 9 on surgical diathermy and unit 11 on Anesthetics and the operating room, during my time as a health worker, i spent less time in the theatre so i was not well versed with thetre operations, but i just felt that at the end of these topics i had really gained a lot knowledge on these topics.

4. What could be improved on the course?

Some vedios were not opening properly

5. On a scale of 1- 10, how likely are you to recommend the Programme?

Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?

Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?

Not at All 1 2 3 4 5 6 7 8 **9** 10 Drastically

8. Please comment further details.

I personally enjoyed the course and i really learned a lot thank you so much.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied
2. Please identify the 3 units you found most beneficial and why?
Unit 11
Unit 9
Unit 3
3. Please identify the unit/s you found the most challenging and why?
All were good
4. What could be improved on the course?
So far so good
5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 **8** 9 10 Drastically
8. Please comment further details.
Thank you for such a great course



Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
Unit 0, 11 and 12. Health and safety; Most people think there is no risk associated with medical gas since it is provided to safe human beings. Anaesthetics and the operating room is a whole experience on it own. Equipment use and handling by most of the health professional ie Doctors, Nurses and Anaesthetist leave much to be desired. Education and continues user training is key and will go a long way in prolong the live circle of an equipment. First Aid: Accident scene in my part of the world is bad. In most cases, the victims live are being cut short due to the way they are handle. Sharing these experience with my colleagues will help us safe lives.

3. Please identify the unit/s you found the most challenging and why?
Unit 10. I am more inclined to the technical aspect than the microbiological due to the my professional line of training.

4. What could be improved on the course?
Practical demonstration of repairing an equipment.

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.
Can I have the videos send to me to be shared with my colleagues at the hospital where I work. I am also looking forward to having a practical course in the near future.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?

Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?

UNIT 0 HEALTH AND SAFETY health and safety guidelines has really help me a lot to understand precaution when working in hospital and also prevent injury, illness or coming into any other form of harm in the workplace. One of the main benefits of following health and safety practices is to prevent common workplaces injuries such as back pain, falling from height, asthma, injuries from slips and trips and asbestos-related illness.

UNIT 12 FIRST AID This unit has really trained me if should in case i come in contact of unconscious person can help before arrival of doctor or rapid reaction to illness or injury, before further aid such as an ambulance arrives can not only save lives, but in addition, will reduce recovery time of the patient. If that patient is a member of staff, that means they'll be back to work quicker.

UNIT 09 SURGICAL DIATHERMY This unit has help me to no how diathermy works and purpose used surgically for 3 distinct purposes – cutting, fulguration (destructive coagulation with tissue charring) and coagulation. In surgical diathermy the patient forms part of the circuit, the alternating current passing through the tissue produces heat as it tries to overcome its tissue impedance.

3. Please identify the unit/s you found the most challenging and why?

UNIT 01 THE FREQUENCY SPECTRUM

This unit was a little bit challenging when was answering the questions under , i did repeat like ten times before getting it right.

4. What could be improved on the course?

This course i mean it has really improve me a lot and hopping another one should be introduce soon as possible. secondly the videos displaying should be able to recorded and play back

5. On a scale of 1- 10, how likely are you to recommend the Programme?

Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?

Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely



7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?

Not at All 1 2 3 4 5 6 7 **8** 9 10 Drastically

8. Please comment further details.

Recommended for further studies

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
i will identify unit 1,5 and 2 because i now have a broader knowledge in frequency spectrum and i know medical devices that fall under the frequency wave spectrum, much more knowledge on electrical safety.

3. Please identify the unit/s you found the most challenging and why?
unit 9 and 8 are the most challenging for me, and there is need to pay more attention to these units in your other training.

4. What could be improved on the course?
Addressing equity issues not all trainees have equal access to technology or to reliable,high speed internet connections. Be mindful of the challenges trainees face, recognizing that trainees vary markedly in their comfort level with online learning and some are located in different time zones.

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.
we are very grateful for the help and many thanks the sponsors and the trainers

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 **9** 10 Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
1. Anaesthetics and the operation room
2. ECG
3. Defibrillation
These 3 units explained the details I wasn't aware about and offered me a clear picture about the significance of my profession in patients care.

3. Please identify the unit/s you found the most challenging and why?
ultrasound, I think some content was not clearly explained in the video

4. What could be improved on the course?
Clarify on the internal parts of ultrasound machine

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.
The course was very helpful to me . Thank you medical Aid International

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
Electrical safety. In this topic have learnt more of injuries that can happened due to the near miss that we overlook

Electrocardiograph. In this topic have learned a lot as it was one of my major gaps, have never interacted much with this device

Defibrillation

3. Please identify the unit/s you found the most challenging and why?
The topic which was more challenging is on Anaesthesia machine because of its complex data which are all important to be learnt

4. What could be improved on the course?
There should be some structured questions and practicals

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 **9** 10 Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.
Looking forward to have practicals on equipment that we have learnt in this theory course

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
PATIENT MONITORING
ANAESTHETICS AND THE OPERATING ROOM
ELECTRICAL SAFETY
THESE I FOUND TOO PRACTICAL AND I HAVE SO MUCH DAY TO DAY APPLICATIONS ON THIS VITAL INFORMATION.

3. Please identify the unit/s you found the most challenging and why?
ULTRASOUND NEEDS MORE TIME TO UNDERSTAND VERY WELL

4. What could be improved on the course?
Provide an advanced and higher level of the course it is so VITAL

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Least Satisfied 1 2 3 4 5 6 7 8 9 10 Most Satisfied
[No User Response]

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

8. Please comment further details.
Well designed, well planned and a very practical tool useful on day to day work

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
Anesthetics and the operating theater because I previously had some challenges with the anesthesia equipment

Oxygen concentrators and suction machines since they are one of the pieces of equipment we encounter in our work almost daily

Thirdly the diathermy and difibrillators, the course has been an eye opening

3. Please identify the unit/s you found the most challenging and why?
None

4. What could be improved on the course?
To me course is quite perfect, very well elaborate and n complecated terminologies

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.
I have greatly enjoyed the course and I hope this marks the beginning of our future interactions as biomedical engineers so we can refer to you on any matters that pertain to our work as biomed. The toll box you gave us and the materials were quite enormous! Please keep it up!

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied
2. Please identify the 3 units you found most beneficial and why?
The frequency spectrum
Defibrillation
Electrical safety
3. Please identify the unit/s you found the most challenging and why?
The frequency spectrum
Electrocardiogram
4. What could be improved on the course?
Give out some notes in form of short notes and not only videos
5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 **3** 4 5 6 7 8 9 10 Drastically
8. Please comment further details.
Thank you for bringing this course to us. I learned a lot and I am willing to learn more given the chance. It was very beneficial. Thank you very much.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied
2. Please identify the 3 units you found most beneficial and why?
Safety and health, anaesthesia
3. Please identify the unit/s you found the most challenging and why?
Hygiene technics and defibrillators
4. What could be improved on the course?
Anatomy and physiology unit
5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 **9** 10 Very Likely
6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 **6** 7 8 9 10 Drastically
8. Please comment further details.
Thanks for the zeal and confidence instilled in me as a biomedical engineer vested with knowledge which is able to have an understanding with other clinicians.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 **9** 10 Most Satisfied
2. Please identify the 3 units you found most beneficial and why?
defibrillation: helped me understand the importance of early defibrillation
patient monitoring : because it helped me to understand the importance of monitoring
anaesthetics and the operating room : the uses of ventilators
3. Please identify the unit/s you found the most challenging and why?
ultrasound
4. What could be improved on the course?
the course was spot on but there is need for practical aspect
5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically
8. Please comment further details.
we need the practical component

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 **8** 9 10 Most Satisfied

2. Please identify the 3 units you found most beneficial and why?
1 The electrical safety
2 The anaesthetic machines
3 The first aid

3. Please identify the unit/s you found the most challenging and why?
The anaesthetic machines because because they are alot of different types of equipment used in theatre or operating rooms.

The second topic is the defibrator because it is a sofiscated machine and complicated because it involves a special knowledge in anatomy about how it works

4. What could be improved on the course?
Since it's an online course involve more videos on demonstrating how to repara or find a problem in unfunction equipment that is in common equipments used in LMICs

5. On a scale of 1- 10, how likely are you to recommend the Programme?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Least Satisfied 1 **2** 3 4 5 6 7 8 9 10 Most Satisfied

8. Please comment further details.
If possible, have teams to physically routinely checking students purtaking online courses because some challenges faced by we(students) sometimes are best observed by a supervisor.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 **9** 10 Most Satisfied
2. Please identify the 3 units you found most beneficial and why?
patient monitoring
ECG
ULTRASOUND
3. Please identify the unit/s you found the most challenging and why?
NONE BECAUSE IM AN EMT
4. What could be improved on the course?
Its ok recent updates should be available for existing bio medical eng
5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 **9** 10 Very Likely
6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 **9** 10 Very Likely
7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 **7** 8 9 10 Drastically
8. Please comment further details.
it take more time

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 **9** 10 Most Satisfied
2. Please identify the 3 units you found most beneficial and why?
unit 08, unit 10, unit 12 were very important because i knew very little about them.
3. Please identify the unit/s you found the most challenging and why?
unit 11 was most challenging because of complexity i guess
4. What could be improved on the course?
please add x-ray imaging equipment and laboratory equipment
5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 **7** 8 9 10 Drastically
8. Please comment further details.
i did not have receive text books and had challenges but did manage to finish. thank you very much it has been an amazing journey for the first time am going to obtain biomedical engineering certificate, its a dream come true.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?

Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied

2. Please identify the 3 units you found most beneficial and why?

This is of more benefit because, i have fully understood that any slight mistake when dealing with medical equipment may be fatal to both engineers and other concerned parties e.g (nurses and patients). this has also helped me that biomedical engineers are the important element in avoiding accidents in hospitals.

2.Electricity and Safety

this has helped me understand what electric current does when manged both pour y and nicely. study the instruction manuals before installation of various electrical medical equipment. understand amount of voltage various equipment s may require e.g 240volt and 110volt equipment have different setup when we need to power them.

3. Ana-esthetics and the operating Room

The very crucial part to saving lives. biomedical engineers must always make sure that all equipment in operating room are frequently serviced to save lives and duties better. Poor conditioned equipment are a threat to successful operations.

3. Please identify the unit/s you found the most challenging and why?

Ana-esthetics and Operating Room

the explanations are just fantastic but it could be better to find the clear way of demonstrating eg. that of first aid.

4. What could be improved on the course?

Introduce another section per unit which will be answered through explanations not multiple choice.

5. On a scale of 1- 10, how likely are you to recommend the Programme?

Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?

Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely

7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?

Not at All 1 2 3 4 5 6 7 8 9 **10** Drastically

8. Please comment further details.

I am fully equipped with knowledge now and am happy for this program. Medical Aid International is just a wonderful tool in improving health issue through imparting of knowledge. Having Skilled biomedical engineers is best way to wonderful health service delivery.

Medical Aid International Biomedical Engineering Programme Feedback Survey

1. Overall, how satisfied were you with the course and the learning material?
Least Satisfied 1 2 3 4 5 6 7 8 9 **10** Most Satisfied
2. Please identify the 3 units you found most beneficial and why?
unity, 0,10,11. because these units shows how to protect every one, and functionality of the defibrillator and the operating and anaesthetics equipment are very important and all must have a maximum hygiene for patient life security.
3. Please identify the unit/s you found the most challenging and why?
unity 3 because of chemistry elements
4. What could be improved on the course?
some parts of curses (unities) was like new for me.
5. On a scale of 1- 10, how likely are you to recommend the Programme?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
6. On scale of 1- 10, how likely are you to take any future Medical Aid International Programmes?
Very Unlikely 1 2 3 4 5 6 7 8 9 **10** Very Likely
7. On a scale of 1-10, how has the course entirety (including textbooks and toolboxes) effected your practice on a day to day basis?
Not at All 1 2 3 4 5 6 7 8 **9** 10 Drastically
8. Please comment further details.
the curses was very good and very interested to me because in this period i tried to reviewing not only the maintenance of equipment but also function, utility and how to use those equipment. I would like to have another course in dip when it can be possible. Thank you very much for helping us to upgrade our knowledge in biomedical Equipment maintenance.