**ENGG7811 Tutorial 4**

**Mixed-method data analysis**

Please go through this handout before the tutorial session. **Some activities are meant to be done before the class, these are indicated in blue**. You will not be given time to do these activities during the session.

Tutorials are evaluated for each student; therefore, all students are required to participate. Every student should be actively involved in discussions among your groups and participate when your tutor discusses the answers. The marking rubric for tutorials is on Blackboard.

In this tutorial, you will analyse a hypothetical dataset from a study involving the language learning software LinguaLift. LinguaLift is designed to teach new languages to users through engaging features such as AI-driven conversation practice, gamification to boost learning motivation, and adaptive learning paths tailored to the individual and their progress.

Twenty-one users participated in a short study to test the effectiveness of LinguaLift. The participants chose a language to learn, and initially tested their proficiency using the software. They then spent 2 months using and testing the software. The total number of hours each user spent in the software was automatically logged. At the end of the 2 month period, participants re-took the proficiency test and completed a survey. The survey asked the participants to rate aspects of the software on a 0-5 scale, and provide qualitative feedback about their experiences.

The survey questions and data from the study are at the end of this tutorial in Appendices A and B.

Work through the following exercises, discussing the answers in your groups. Where specified record your answers in your journals.

**Activity 1 – Initial Impressions (15 mins)**

1. What insights are the researchers hoping to gain by collecting this data? What research questions are they hoping to answer? (*In journal* *1-2 sentences*)

**They want to know how easy it is to use LinguaLift's pages, whether they are effective in helping users, how satisfied they are with their users, and what problems they still have.**

**“Which feature is the most useful for users?”**

1. Participant 13’s data differs from the others in the data set.

* What do you think could have happened and how might this affect the overall data analysis? (*In journal* *1-2 sentences*)

**The participant may think that 0 is the best and 5 is the worst. This will affect the overall data analysis by influencing the average number.**

* What strategies could you use to handle outliers in this data set? (*In journal* *1-2 sentences*)

**I will check with the participants and if it is not convenient, I will exclude this data from the statistics**

**Activity 2 – Quantitative Data (30 mins)**

1. What are some simple ways researchers might summarize the survey results to present to a team of software developers? (*In journal* *1-2 sentences*)

**Descriptive Statistics: Present mean, median, and standard deviation for each survey question to give an overview of overall trends and variability.**

**Bar Charts and Pie Charts: Visualize data with charts to illustrate distributions of responses and make comparisons easier.**

**data visualization is a way, which can make complex data easier to understand and analyze.**

1. Using Datawrapper (<https://www.datawrapper.de/>), Excel, Pylab or any other software you are familiar with, create a plot that shows

* Participant satisfaction with the app
* How participant satisfaction is related to learning outcomes
* The relationship between actual learning outcome and perceived learning outcomes of the participants

*Past an image of your plots in your journals. Include a one sentence justification for the visualization and one sentence describing the trend in the data revealed by the plot.*

**Bar chart shows more clearly how satisfied most users are with it. More than half of the users have a satisfaction level greater than or equal to 3.**

**Using a scatter plot plus a trade line shows the relationship between the two types of data in a straightforward way. The higher the user satisfaction, the better the final learning outcome.**

**A scatter plot coupled with a trade line was also used, demonstrating a positive relationship between the two types of data.**

**Activity 3 – Qualitative Data (30 mins)**

1. The research team has identified the following codes from the qualitative data:
2. Usability Issues
3. Technical Issues
4. Engagement Features
5. Learning Effectiveness
6. AI Interaction
7. Content Limitations and Diversity

In your groups, determine how you would code each of the participant comments (i.e. which code does each comment related to?)

1. One theme that could be developed from the qualitative data is “User Experience”. The User Experience theme encompasses both the issues that hinder experience as well as features that enhance it, including codes such as Usability Issues, Technical Issues, AI Interaction and Engagement Features.

Discuss in your groups other themes that could be developed from the data. *(In journal describe the theme and codes it relates to in 2-3 sentences).*

**Another topic could be content quality, which can be measured by Content Limitations and Diversity and Learning Effectiveness, which measures the quality of content by organizing the issues that arise in terms of content quality.**

**Activity 4 – Improving the Study Design (15 mins)**

1. Your group is tasked with re-designing the data collection methodology for the next round of testing. Discuss any changes you would make to the data collected through the software or in the feedback survey to improve the comprehensiveness and accuracy of the study.

As a group, share the changes you would make with the class.

**We thought it would be useful to add a column showing how much a participant's grade would improve if they were learning face-to-face with a tutor, which would reflect the learning outcomes of both software and live instruction。**

1. As a class, discuss the benefit of the mixed-method data set in this example. What information was gained from the mixed-method data that couldn’t be obtained from quantitative or qualitative data alone?

**It provides a more comprehensive way to display the data, we can’t get the relationship between user satisfaction and learning outcomes.**

**Activity 5 (optional) – do not do this exercise before completing the analyses above!**

Repeat the exercises above using generative AI. What differences does the LLM find compared to your own and your table’s findings?

**Appendix A. Survey Questions:**

**LinguaLift Participant Feedback**

Thank you for participating in our LinguaLift software testing phase. Your feedback is crucial in helping us improve and tailor our product to better meet user needs. Please answer the following questions based on your experience with the software.

1. **Ease of Use:** How easy is it to navigate the software’s interface?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| □ 0  Strongly disagree | □ 1 | □ 2 | □ 3 | □ 4 | □ 5  Strongly agree |

2. **Effectiveness:** How effective were the lessons in improving your language skills?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| □ 0  Strongly disagree | □ 1 | □ 2 | □ 3 | □ 4 | □ 5  Strongly agree |

3. **Engagement:** How engaging are the language games and AI conversations?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| □ 0  Strongly disagree | □ 1 | □ 2 | □ 3 | □ 4 | □ 5  Strongly agree |

4. **Overall Satisfaction:** Overall, how satisfied are you with the software?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| □ 0  Strongly disagree | □ 1 | □ 2 | □ 3 | □ 4 | □ 5  Strongly agree |

5. **Most Useful Feature:** What feature did you find most useful in the software?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6. **Biggest Issue:** What is the biggest issue you encountered while using the software?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Appendix B. Study Data:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Participant** | **Hours Used** | **Test Score**  **Before /100** | **Test Score After /100** | **Test Score Change /100** | **Q1** | **Q2** | **Q3** | **Q4** | **Q5** | **Q6** |
| 1 | 45 | 53 | 82 | 29 | 4 | 3 | 5 | 4 | Interactive quiz game | Occasional crashes during lessons 2 |
| 2 | 18 | 57 | 65 | 8 | 2 | 4 | 3 | 3 | AI conversations | Complicated to get around. 1 |
| 3 | 38 | 56 | 83 | 27 | 3 | 5 | 4 | 4 | Personalized learning paths | Needs more language options 6 |
| 4 | 15 | 48 | 56 | 8 | 1 | 3 | 2 | 2 | Daily progress tracker | User interface is not intuitive 1 |
| 5 | 50 | 58 | 85 | 27 | 5 | 4 | 5 | 5 | Gamification elements | Too few examples in foreign language 6 |
| 6 | 25 | 54 | 62 | 8 | 3 | 3 | 2 | 3 | Quiz game and feedback | Slow to load new lessons 2 |
| 7 | 30 | 49 | 59 | 10 | 4 | 2 | 3 | 3 | Multiple language support | Speech recognition needs improvement 2 |
| 8 | 35 | 60 | 70 | 10 | 4 | 3 | 4 | 4 | AI-driven practice conversations | Lacks advanced content for proficient users 6 |
| 9 | 28 | 46 | 60 | 14 | 3 | 2 | 4 | 3 | Variety of exercises | Repetitive tasks 6 |
| 10 | 10 | 70 | 68 | -2 | 2 | 1 | 1 | 1 | AI pronunciation feedback | Inaccurate translations sometimes 4 |
| 11 | 40 | 51 | 69 | 18 | 4 | 3 | 4 | 4 | Progress tracking and learning path | Not enough cultural context 6 |
| 12 | 55 | 61 | 83 | 22 | 5 | 5 | 5 | 5 | Custom learning pathway | Nothing, it's great |
| 13 | 52 | 58 | 69 | 11 | 1 | 1 | 0 | 1 | The lessons are really engaging and fun | Not much, a few games were a bit too easy 4 |
| 14 | 22 | 55 | 57 | 2 | 2 | 2 | 3 | 2 | Interactive games and quizzes | Limited number of stories 6 |
| 15 | 26 | 51 | 54 | 3 | 3 | 3 | 2 | 3 | Grammar tips from AI | Some lessons are too long 4 |
| 16 | 32 | 59 | 65 | 6 | 3 | 4 | 5 | 4 | Real-time feedback | Occasional technical glitches 2 |
| 17 | 12 | 49 | 51 | 2 | 1 | 2 | 1 | 1 | Cultural insights. 3 | Frequent crashes were annoying 2 |
| 18 | 29 | 65 | 68 | 3 | 4 | 5 | 3 | 4 | Learning games | Some games were too easy 4 |
| 19 | 48 | 60 | 87 | 27 | 5 | 4 | 5 | 5 | Extensive vocabulary lists | More examples needed in some sections 6 |
| 20 | 20 | 47 | 56 | 9 | 2 | 2 | 3 | 2 | Flashcard game | Would have loved more flashcard variety 6 |
| 21 | 5 | 71 | 73 | 2 | 3 | 2 | 2 | 3 | Real-time feedback on pronunciation | A lot of the time AI didn't understand me 5 |

**Frequency of Score Responses:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Score** | **Q1** | **Q2** | **Q3** | **Q4** |
| 0 Strongly disagree | 0 | 0 | 1 | 0 |
| 1 | 3 | 2 | 2 | 3 |
| 2 | 4 | 6 | 4 | 3 |
| 3 | 6 | 6 | 5 | 6 |
| 4 | 5 | 4 | 4 | 6 |
| 5 Strongly agree | 3 | 3 | 5 | 3 |