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Descriptive Analysis of Learner-to-Learner Engagement in Online Learning Survey

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Abstract

COVID-19 pandemic which began in early 2020 has impacted the education landscape when many countries were forced to implement lockdown. As a result, many moved to online learning mode throughout 2020 and 2021. There are proven success of online learning delivery when designed using the theory of cognitive constructivism which focus on combination of authentic and active learning. One aspect of active learning is learner-to-learner engagement. This study investigates the survey questions on learner-to-learner engagement from 117 respondents of UiTM bachelor's degree students by carrying out descriptive analysis. The descriptive analysis involves finding the measures of central tendency, calculation of Relative Important Index, classifying the distribution plot and determining the correlation between variables using Spearman correlation method. Results of the survey showed that peer support to finish task ranks first among while collaborative learning rank last.

Keywords: COVID-19, Online Learning, Learner-To-Learner, Survey, Descriptive, Analysis, Measures of Central Tendency, Relative Important Index, Distribution, Spearman Correlation

Introduction

Spread of virus COVID-19 in the early 2020 has impacted the education landscape when it was declared as pandemic. Many countries ensued lockdown which interrupted the students' learning and development. Instructors' pedagogical approaches also changes as learning moves online. Learning through an online medium as a form of education is defined as online learning (Bartley & Golek, 2004; Evan & Haase, 2001). According to United Nations, in 2020, 1.6 billion learners in more than 190 countries were affected and force to online learning (United Nations, 2020).

Similar challenges also occur in Malaysia. All universities must switch to online learning mode throughout 2020 and 2021. Although blended learning has been a practice for several years, many are unprepared when dealing with fully online learning. Both instructors and students must quickly adapt to new online learning apps and tools whilst at the same time have minimum knowledge to use them (Shanika, 2020). Therefore, his affect the quality of teaching and learning and believed to cause huge disparities. This is more evidence for those dealing with laboratory testing and practical learning processes.

The theory of cognitive constructivism focus on combination of active and authentic learning. Through this combination, learner can use the learning resources to develop their own understanding (Hong, 2003). This teaching and learning method help the integration of learners existing knowledge to new information while also increase their existing intellectual framework through proper amendments (McLeod, 2019). Past research (Salter, et al., 2004) has proven the success of online learning delivery when designed using the theory of cognitive constructivism.

Moreover, higher educational institutions benefited from online learning due to the flexibility it offered. Online learning is a cost-effective concept that cater to providing world class education without borders (Bartley & Golek, 2004). Furthermore, many workers who want to pursue higher education prefer online learning as they could study after their working hours and independently (Nguyen, 2015).

Although there are many benefits, online learning has its weakness. Online learning can be ineffective due to several reasons. The most popular is poor Internet connection which render learning useless and difficult. Most of these cases happens at rural areas where Internet connectivity is scarce (Kentnor, 2015). In addition, group activities become ineffective when there are no active participations among its members (Nandi et al., 2009). In summary, the influence of online learning could be categorized from the perspective of instructors, contents, and learners.

Hence the objective of this study is to investigate the influences of learner-to-learner engagement in online learning, which is a part of active learning in cognitive constructivism theory. The investigation involves carrying out a descriptive analysis of survey questions participated by UiTM bachelor's degree students who undergone online learning throughout their previous semester.

Literature Review

The theory of cognitive constructivism (Piaget, 1971) can be summarized as shown in Figure 1. According to the theory, knowledge is constructed by active learner based on their existing cognitive structures. In learning, the learners are actively involved (Piaget, 1971). For implementation, a democratic environment is needed. Furthermore, learning activities must be interactive and student-centred. Finally, the learning process is facilitated by instructor where students are encouraged to be responsible and autonomous.

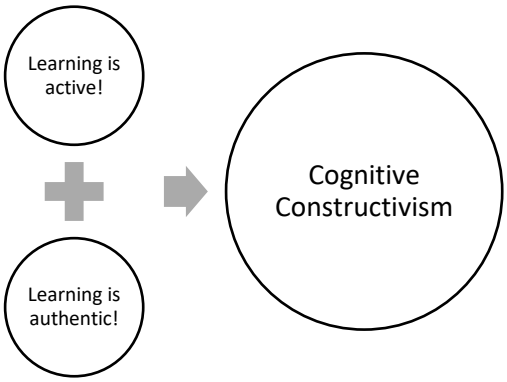

Figure 1

Figure 2 shows the modifications of Piaget (1971) cognitive constructivism to Martin & Bollinger's (2018) engagement factors. Here, cognitive constructivism is divided into authentic learning and active learning. Authentic learning is achieved through learner-to-instructor engagement. Active learning can be achieved through two methods: learner-to-content engagement and learner-to-learner engagement.

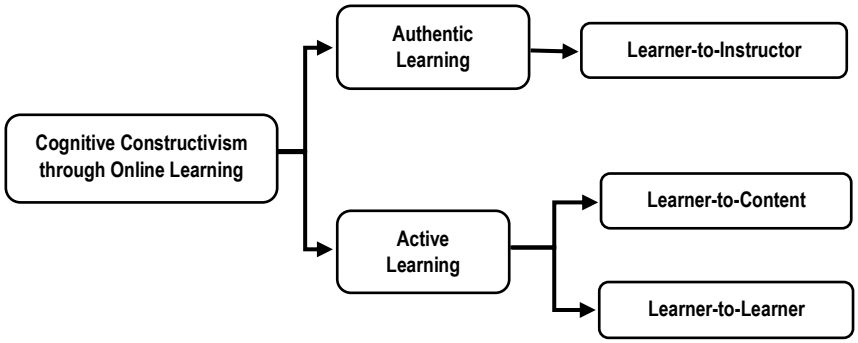

Figure 2

There are many benefits of online learning to learners. The advantages are gained when learner is active during learning, revise before attending class and focus on the online sessions (Robinson and Cook, 2018). Therefore, the learner motivation is a key element for online learning to be effective (Glynn e.al., 2011; Tsen and Tsai, 2010). Motivation gets amplified when education technologies are involved (Mallillin et al., 2020; Prabu et al., 2020).

Introduction of new skills and techniques through online learning builds learners' confidence and self-efficacy (Zhang & Liu, 2019). Time management also improve as instructors and learners can access online activities without time limit (Chen et al., 2009; Ching & Hursh, 2014). Hence, instructors and learners could be flexible with their time when engage in learning. In addition, learner will need to solve problem in new ways which will build their critical thinking skills (Webb et al., 2021).

Numerous research has been done to find out what benefits online learning has for students. Due to COVID-19, Almendingen et al (2021) conducted a study to determine how students experienced online learning. In this study, both quantitative and qualitative research methods were used in a mixed cross-sectional design. The survey's questions centred on the difficulties, pursuits, and assessments of online learners. The study's conclusions showed that regular online meetings, live and pre-recorded lectures were beneficial to students.

Next, Tareen and Haand (2020) looked at how students perceived the advantages of online learning. A questionnaire was sent to 353 master's degree students in Malaysian public universities as part of the methodology. It was broken up into three sections that covered the demographics, advantages, and difficulties of online learning. The study's findings showed that online learning is beneficial, encourages student engagement, and meets their requirements.

Ismail et al (2020) study on the difficulties of online learning in a Malaysian public institution demonstrated its drawbacks. The poll asked students about their problems with online learning during COVID-19. The results showed that students had trouble focusing during classes, particularly those delivered over WhatsApp. Due to the learners getting incoming communications from the instructors and other third parties through the application at the same time, they also find it difficult for the learning process to take place. Additionally, the students struggle with comprehension and questioning.

Additionally, there are certain drawbacks to online education that foster isolation when students find it boring to study by themselves at home (Alfarimba et al., 2021) and make it simpler to procrastinate because of a lack of social engagement with classmates and excessive use of technology (Hui & Ayub, 2021).

Methodology

A total of 117 participants responded to the instrument to investigate the learner-to-learner engagement in online learning. The instrument is a survey questions shown in Table 1. There are 6 questions asked to which participants responded to Likert scale of '1' to '5' where '1' is *Strongly Disagree* and 5 is *Strongly Agree*. All the participants are UiTM students studying in bachelor's degree level in both fulltime and part time mode.

Table 1
Survey's Questions

L2LQ1	Does collaborative learning promote peer-to-peer understanding?
L2LQ2	Are you more likely to ask for help from your peers?
L2LQ3	Do you prefer to be in the same group with your chosen peer for online activities?
L2LQ4	Do you think that the sense of community helps you to engage in online class?
L2LQ5	Do you think support from peers motivates you to finish tasks?
L2LQ6	Do you think that support from peers prevent you from dropping out of course?

Figure 3 shows the distribution of participants in this survey. Out of 117 respondents, 32 respondents are male, and 85 respondents are female. From the 32 male respondents, 18 are from the science and technology discipline while 14 are from social sciences discipline. Similarly, out of 85 female respondents, 23 are from science and technology discipline while 62 are from social sciences discipline. All respondents are from age of 18 to 25. Unfortunately, the instrument did not ask in detail for the age breakdown.

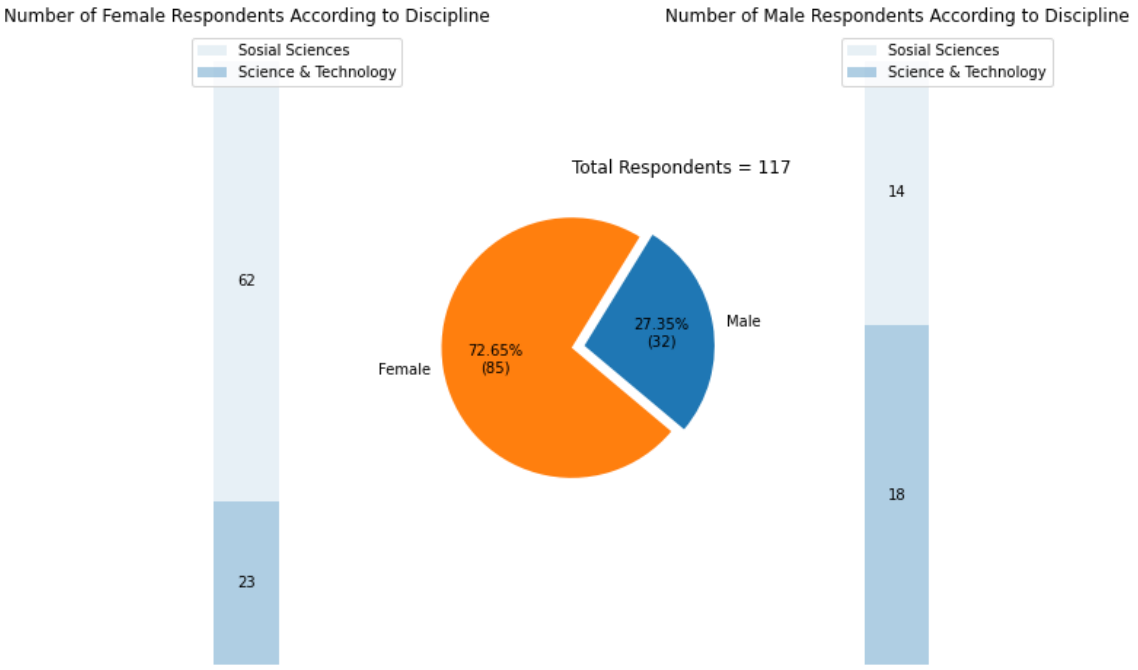

Figure 3: Distribution of Respondents

Results and Discussions

The first step in any descriptive analysis is to investigate the measures of central tendency. Central tendency parameters calculated here are the mean, standard deviation, median and mode. Result of measures for central tendency of all 6 questions are shown in Table 2. The mean, median and mode are highest at L2LQ5. The lowest mean, median and mode is at L2LQ1. Following these observations, all questions are ranked. The ranking order is shown in Table 3.

Table 2
Values of Central Tendency

PARAMETER	L2LQ1	L2LQ2	L2LQ3	L2LQ4	L2LQ5	L2LQ6
Mean	3.87	4.18	4.22	4.02	4.37	4.19
Standard Deviation	0.80	0.81	0.92	0.91	0.77	0.96
Median	4.00	4.00	4.00	4.00	5.00	4.00
Mode	4.00	4.00	5.00	4.00	5.00	5.00

Table 3
Ranking According to the Measures of Central Tendency

RANKING	SURVEY'S QUESTION
1	L2LQ5
2	L2LQ3
3	L2LQ6
4	L2LQ2
5	L2LQ4
6	L2LQ1

Another approach to rank Likert scale questions is to use Relative Important Index (RII) method. Equation 1 shows the mathematical formula used to calculate RII for each question. Results are shown in Table 4. From the table, we could observe that L2LQ5 recorded the highest RII value follow by L2LQ3, L2LQ6, L2LQ2, L2LQ4 and L2LQ1. Comparing Table 3 and Table 4, we could conclude that both results are same.

$$RII = \frac{(5 \times n_5) + (4 \times n_4) + (3 \times n_3) + (2 \times n_2) + (1 \times n_1)}{A \times N} \quad (1)$$

where:

$n_5 = number\ of\ respondents\ for\ Strongly\ Agree$
$n_4 = number\ of\ respondents\ for\ Agree$
$n_3 = number\ of\ respondents\ for\ Neutral$
$n_2 = number\ of\ respondents\ for\ Disagree$
$n_1 = number\ of\ respondents\ for\ Strongly\ Disagree$
$A = heighest\ weight$
$N = total\ number\ of\ respondents$

Table 4
RII Results for L2LQ1 to L2LQ6

	L2LQ1	L2LQ2	L2LQ3	L2LQ4	L2LQ5	L2LQ6
RII	0.7744	0.8359	0.8444	0.8034	0.8735	0.8376
Ranking	6	4	2	5	1	3

We then proceed to analyse the shape of distribution of each question. A histogram plot with kernel density estimate is produce for L2LQ1 to L2LQ6 as shown in Figure 4 to Figure 9. Each plot is compared between gender (male and female) and between discipline (Science & Technology and Social Sciences). The plots are generated using Python Seaborn packages in Jupyter Notebook environment.

Figure 4 shows the plot for "*L2LQ1: Does collaborative learning promote peer-to-peer understanding?*". Their distribution can be classified as almost symmetric where most respondents are concentrated in the middle (3 and 4). L2LQ1 is also the lowest in the ranking in Table 3 and Table 4. This might suggest that collaborative learning is still not integrated in current practice. Furthermore, lack of tools and poor Internet connection would make collaborative learning difficult.

Figure 5 shows the distribution plot for "*L2LQ2: Are you more likely to ask for help from your peers?*". Here we could observe that the distribution is almost symmetric for male respondents in social science and female respondents in science and technology. However, the distribution is left skewed for male in science and technology and female in social sciences. Since disciple of science and technology is male dominated while social sciences are female dominated, hence being minority in this discipline would result in less favour asked as indicted by the result.

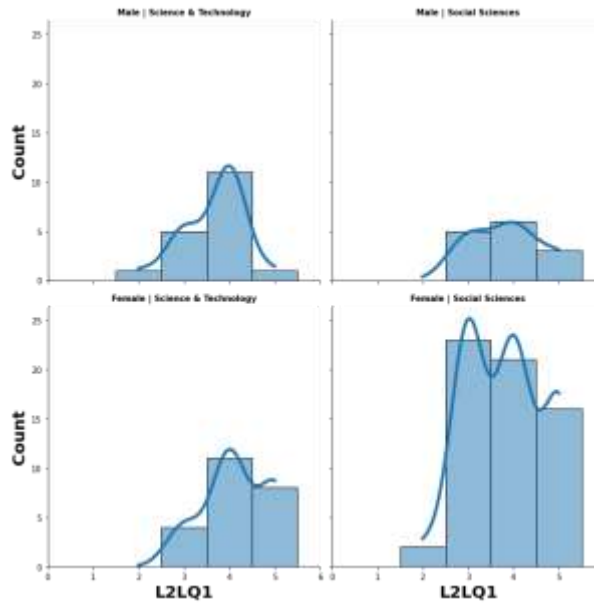

Figure 4: Plot for L2LQ1

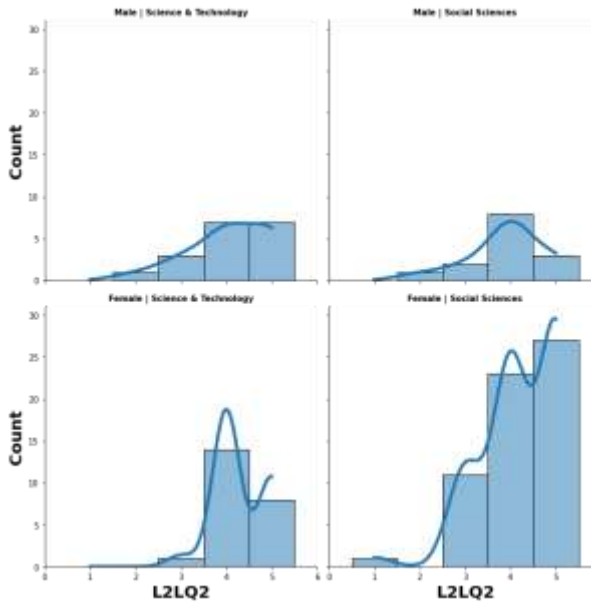

Figure 5: Plot for L2LQ2

Figure 6 shows the plot for "*L2LQ3: Do you prefer to be in the same group with your chosen peer for online activities?"*. Distribution in Figure 6 can be classify as left skewed. However, the sharp increase in female from both disciplines indicate that majority of female agree with the questions as compared to male. Here we can conclude that all students like to be with someone they are familiar with when learning, same as offline learning.

Similar results could be observed in Figure 7. Figure 7 shows the plot for "*L2LQ4: Do you think that the sense of community helps you to engage in online class?*". It is observed that female from both disciplines agree that sense community helps them although there are minority that did not agree with the question. Interestingly, the distribution for the male from both discipline is almost symmetrical. This might indicate that sense of community is not important for the male as compared to the female.

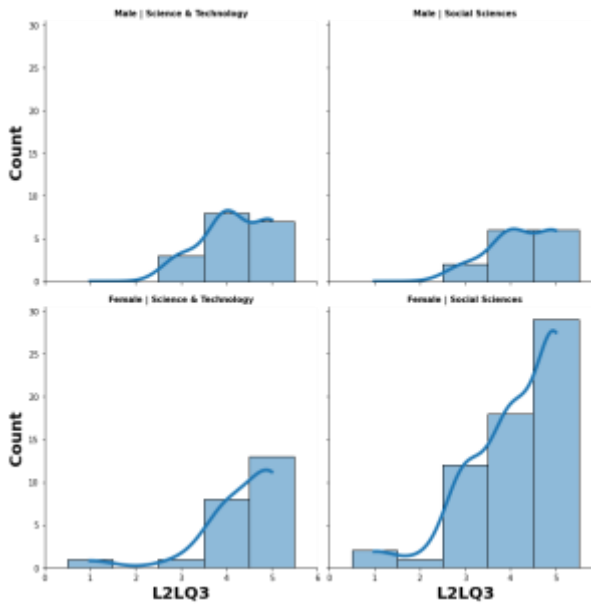

Figure 6: Plot for L2LQ3

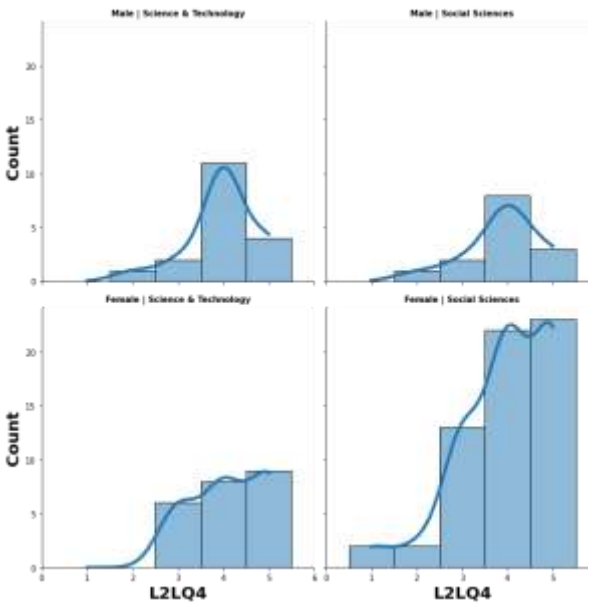

Figure 7: Plot for L2LQ4

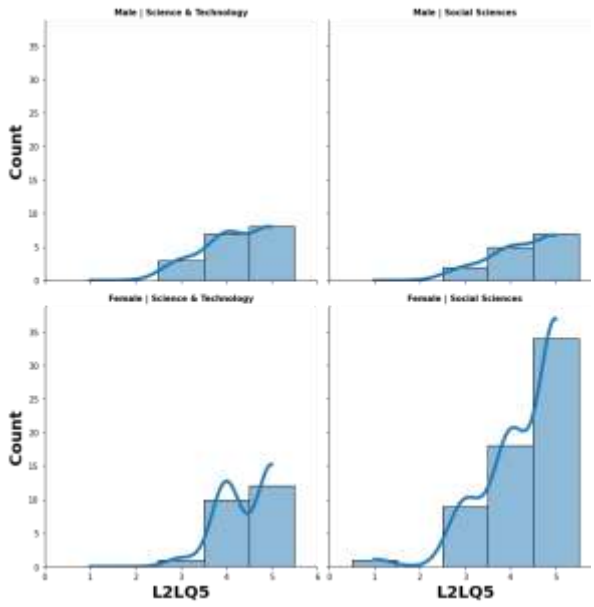

Figure 8: Plot for L2LQ5

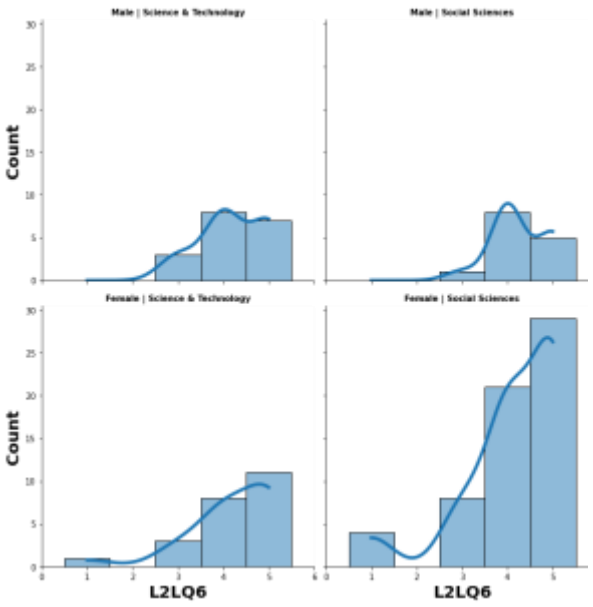

Figure 9: Plot for L2LQ6

Figure 8 shows the distribution plot of "*L2LQ5: Do you think support from peers motivates you to finish tasks?*". It is observed that the distribution is left skewed where majority of respondents strongly agree with this question. L2LQ5 also rank first in Table 3 and Table 4. Therefore, we can summarize that peer support is important for learning especially when in online learning environments regardless of discipline and gender.

Figure 9 shows the distribution plot of "*L2LQ6: Do you think that support from peers prevent you from dropping out of course?*". Similar to L2LQ5, L2LQ6 also involve peer support but towards different scope. Nonetheless, majority of female strongly agree with this question as compared to the male as shown by the left skewed distribution on both

disciplines. The distribution on male respondents for both disciplines are almost symmetrical. This might suggest that male peers influence has its limits or boundaries.

Last, we calculated the correlation between all variables using the Spearman correlation method. Spearman correlation is a non-parametric correlation test used commonly for Likert scale data. Result of Spearman correlation calculation for all variables is shown in Table 5. We then plotted into heatmap to visualise the calculation Figure 10 shows the heatmap of the Spearman correlation calculation.

From the heatmap, there are correlations between L2LQ5 and L2LQ6 which is around 64%. Since both questions touch on the same topic of peer support, therefore the correlation is expected. Apart from that, there is almost 50% correlation between L2LQ5 with L2LQ2 and L2LQ3. The rest of variables have weak correlation between each other's.

Table 5
Result of Spearmen Correlation Calculation

	L2LQ1	**L2LQ2**	**L2LQ3**	**L2LQ4**	**L2LQ5**	**L2LQ6**
L2LQ1	1.0000	0.2476	0.2583	0.4753	0.2334	0.0779
L2LQ2	0.2476	1.0000	0.4246	0.2566	0.4762	0.4135
L2LQ3	0.2583	0.4246	1.0000	0.4022	0.4760	0.4027
L2LQ4	0.4753	0.2566	0.4022	1.0000	0.3649	0.2449
L2LQ5	0.2334	0.4762	0.4760	0.3649	1.0000	0.6384
L2LQ6	0.0779	0.4135	0.4027	0.2449	0.6384	1.0000

Figure 10: Heatmap of Calculated Spearman Correlation

Conclusion

One of the most crucial elements in learner-to-learner interaction is peer support. It aids students with online education. The survey's findings demonstrate how encouragement from peers and the chance to select the group members who will receive the highest-ranking drive students to complete assignments. These results all point to the possibility that peer

assistance might lessen the strain associated with online learning while also enhancing its effectiveness. This study also shows that peer support also deters students from abandoning a course. Overall, all parties must actively participate to create a favourable environment that will boost the learning efficacy if online distance learning is to be successful. Another essential aspect of online learning is the flexibility of employing different platforms or tools. As a result, it will consider the learner's limits in areas like technological aptitude, internet access, and learning preferences. Peer support is more important to learners than the technical aspects of online learning. Peer support from acquaintances or others with similar interests can significantly improve engagement levels in online learning.

Future research directions would be to improve the accuracy of the research. One solution would be to widen the number of respondents. By having large sample of respondents with more variety of variables, a more detail insight could be viewed, Furthermore, this might give better correlation value between the variables. In addition, large samples allow for training and validation of prediction models.

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