NetFun Bot: An Aide for Delivery of Learning Materials in Computer Networking Fundamental Course during Online Learning

(NetFun Bot: Alat Bantu Penyampaian Material Pembelajaran Atas Talian Kursus Computer Networking Fundamental)

*DYG KHAYRUNSALIHATY BARIYYAH ABANG OTHMAN, CAROLINE ANN MAI
Department of Electrical Engineering, Politeknik Kuching Sarawak

Abstract

COVID19 pandemic has replaced traditional classes with online learning. The dramatic shift to online learning for educators and learners has become a new norm in the year 2021. In online learning, learning materials are delivered through many platforms such as Google Classroom and Learning Management System (LMS). Students need to access the resources and download them from the designated platform. These resources will be kept in physical storage such as their mobile phone storage or external drive. Physical storage has a limit and students are likely to delete files to clear the storage to store other resources. The deletion process will cause students to lose precious resources for reference and need to redownload the resources. The process requires students to access a certain website and the server may encounter high traffic and cannot be reached. This leads to delay in getting the learning materials. Hence, the existence of NetFun bot, a customized Telegram bot built for students who have enrolled in the Computer Networking Fundamental (DEC30023) course in the Electrical Department of Politeknik Kuching Sarawak has become crucial in delivering learning materials during online learning. Therefore, research was conducted on 109 students to study the level of acceptance, readiness, and effectiveness of the teaching aide. A major finding from the research shows that the majority 71.7% of the students who had enrolled in DEC30023 have good perspectives toward NetFun bot usage and 89.9% strongly agree that the bot is very convenient to acquire learning materials during online learning. For future study, it is recommended that the research on the usage of Telegram Bot can be conducted in other courses to determine students' acceptance, readiness, and effectiveness as a teaching aid for online learning.

Keywords: NetFun, bot, telegram, Covid19, online learning, Generation Z

Received: June 15, 2021; **Accepted**: September 10, 2021; **Published**: November 21, 2021

* Corresponding author: khayrunsalihaty@poliku.edu.my

INTRODUCTION

The development of modern communication technology in education has become prevalent long before the COVID19 pandemic hits the world (Kraleva, Sabani, & Kralev, 2019). Even so, printed textbooks and paper handouts were still widely used during face-to-face learning. However, in the new norm, the guideline from the World Health Organization (WHO) for social distancing (WHO, 2019) due to the nature of the pandemic, has reshaped and switched from in-situ learning to fully online learning. This has forced educators to resume sharing their teaching and learning materials through numerous online platforms (Azlan et al., 2020; Mohamad Nasri, Husnin, Mahmud, & Halim, 2020; Yusuf, 2020). Web based online platforms such as Learning Management System (LMS), cloud-based services such as Google Drive and Dropbox have become customary along with some other social media platforms, for instance: WhatsApp and Telegram.

While these online platforms allow distance learners to access their learning materials, different issues have arisen. For example, students may encounter difficulties in logging in and accessing learning materials (Essel & Wilson, 2017) in LMS, and there is security and privacy concern with cloud services (Sadik, 2017) and not least, a distraction from learning via social media platforms (Ali, Yaacob, Al-Amin Bin Endut, & Langove, 2017). Besides these concerns, the means of material access used by students must also be considered. Based on the Malaysia Internet User Survey in 2020 (Malaysian Communication and Multimedia Commission, 2020), smartphone predominates the access to the internet which is 98.7%; leaving laptops and desktops in second and third place, respectively. Most users are between the age of 20 to 24 years old and more than 80% of users have used social media as an online sharing platform in 2020. Thus, based on this figure, we can assume that semester 4 students in Politeknik Kuching Sarawak who are in their 20s are very dependent on their smartphones, as a source of online sharing platform.

PROBLEM STATEMENT

Most students use smartphones to access learning materials. However, the smartphone has limited file storage. Students may encounter problems storing the learning materials for their respective courses although cloud services such as Google drive may offer the solution. This leads to additional administration and maintenance and not all students have the luxury of time to build a virtual library in their cloud service. Furthermore, many courses need to be enrolled and completed during the whole study period and it is impractical to keep updating the whole courses' learning materials in a personal cloud service. Without a practical solution, students are left without a choice but to delete previous learning materials to empty storage space for other new learning materials.

Hence, due to these problems, a customized Telegram bot namely NetFun bot has been introduced to students who had enrolled in Computer Networking Fundamental course in Electrical Department of Politeknik Kuching Sarawak. It was first used in 2020 to help students access learning materials during the early stage of online learning. NetFun bot eliminates the need to store the learning materials in the students' physical storage device. Inherently, this custom Telegram bot is operated by software and has Artificial Intelligence (AI) feature which can provide services when requested by specific commands ("Bots: An introduction for developers," n.d.). This research is designed to observe the level of acceptance and readiness that leads to the effectiveness of NetFun bot in DEC30023 course. Figure 1 shows the main interface of NetFun bot.

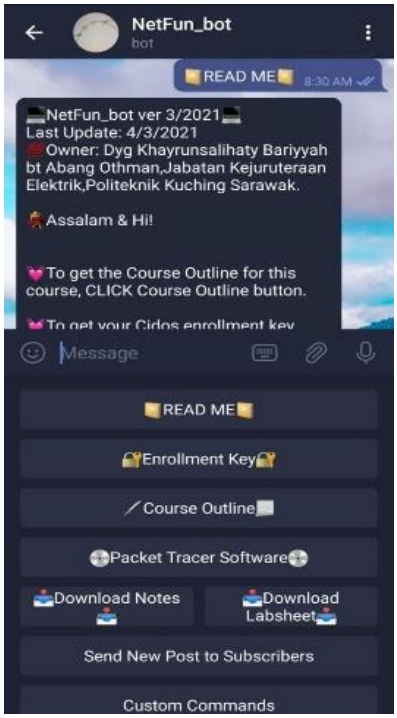

Figure 1. NetFun bot interface

RESEARCH OBJECTIVES

This research is guided by the following objectives:

1. To identify the level of acceptance of students in using Telegram bot as an alternative to deliver learning materials.
2. To identify the level of readiness of students in using Telegram bot as an alternative to deliver learning materials.
3. To identify the level of effectiveness of Telegram bot in facilitating students to prepare for an online learning session.

RESEARCH QUESTIONS

The following research questions were formulated by the researcher for this study:

1. How is the readiness and acceptance of students in using NetFun bot?
2. Does the usage of NetFun bot facilitate students to prepare for online learning?

LITERATURE REVIEW

Few researchers study the deployment of Telegram in education. Telegram ("Telegram FAQ," n.d.) itself is a free messaging app that allows users to share various kinds of files to up to 200,000 group members and an unlimited amount of channel subscribers. The main advantage of Telegram compared to its rival is; the ability to keep all files in the cloud service which will only cost users about 100MB of their phone storage. Nonetheless, Telegram also provides open codes to enable users to create their own bot and Telegram apps.

With the said advantages, it is easy to understand why Telegram is emerging as one of the efficient platforms for remote teaching (Karim, 2020). Research is done by Widiyono (2021) compared the effect of LMS and Telegram on students' learning activities. The findings which are based on multiple linear regression show that both applications have a significant impact on learning activities where LMS has more influence compared to

Telegram. However, this study only covers 28 students which do not reflect the entire population who are using LMS and Telegram. Another study such as in (A. Abu-Ayfah, 2019) used a larger sample of students in investigating the students' perceptions of using Telegram in learning English. Results show that although students only use the Telegram for 3-4 times a week, it was revealed that Telegram was the main venue for the English learning students to share resources and getting feedback from their peers and teachers. Whilst the outcome of the research only highlighted the usage of Telegram among English Foreign Language (EFL) students, the importance of Telegram was highlighted in (Aladsani, 2021). The results show that; not only did students hold positive perceptions using Telegram as a technology to enhance their course interaction, but the instructors also can identify the instructional activities that can be deployed using Telegram.

The effectiveness of Telegram may create other disadvantages such as adding up the workload to instructors due to frequent interactions (Habibi et al., 2018), therefore a self-access module using Telegram apps is another trend in education. For instance, (Habibi et al., 2018) had created a learning module using Telegram to facilitate teaching and learning. The study is based on Technology Acceptance Model (TAM) to check the readiness and acceptance of students in technology. The findings showed that students are ready to use Telegram based module in their course which may reduce the dependency on instructors. Also, in (Owusu-mensah, Augustine, Pufaa, & Sakyi, 2020), a study on the delivery of learning module using Telegram has highlighted how useful and efficient the application is for distance learning especially for heavily scheduled students.

Apart from creating learning modules to reduce dependencies with the teacher, usage of Telegram bot can boost the Telegram experience in a more systematic way. For example, in (Aisyah, Istiqomah, & Muchlisin, 2021; Parlika & Pratama, 2020), the bot deployment in Telegram can be as simple as developing a learning module, up to creating an online test that uses more complicated coding. This shows how adaptable Telegram application is for a different levels of learners and users.

METHODOLOGY

This quantitative based research approach focused on 109 students who had enrolled in Semester 4 December 2020 session for Computer Networking Fundamental Course (DEC30023) in Politeknik Kuching Sarawak. The researcher used questionnaire forms as the research instruments. To accelerate data collection, the questionnaire is built in a Google form and distributed through Telegram group. A pilot test for the questionnaire was tested on students from June 2020 session before the form was distributed to the actual respondents. Based on the Alpha Cronbach value (Cronbach, 1951), the reliability coefficient of the research questions is 0.98.

The questionnaire used in this research was adapted and modified from (Syed Lamsah, 2017) and it holds two main parts: Part A – Respondents' demography and Part B – Research questions that cover the students' level of acceptance and readiness to NetFun bot, also its level of impact on the students.

Students' responses will be evaluated based on the 5 Likert scale where 5, 4, 3, 2, and 1 refers to Very Agree, Agree, Quite Agree, Disagree, and Very Disagree, respectively. There are 109 students population and 99 students have responded to the distributed questionnaires. This sample research population is based on (Krejcie & Morgan, 1970).
Data from the study will be extracted from the Google form and extracted to an excel file. All the data will be analyzed using Microsoft Excel to get the percentage, mean, and standard deviation of the sample.

RESULTS AND ANALYSIS

The data collected from this research are presented in three parts: demographic, acceptance and readiness of students, and the effectiveness of NetFun bot.

DEMOGRAPHY

Based on the collected data, 80.8% of the sample are male respondents and the rest are female respondents. 100% of the respondents own a mobile phone. Although 58.6% of respondents live in the city, the majority of 73.7% of respondents had claimed that their internet connection quality is only at average. Only 3% had poor internet connection quality. 75.8% of the respondents come from B40 background which means their families' earnings are below RM4,850 monthly and only 2% comes from T20 background which has a family income of more than RM10,971 per month. Although the majority of the respondents come from B40 background, the irony is that only 39.4% of the respondents have scholarships or national education loans. Figure 2 shows the demography data in this research.

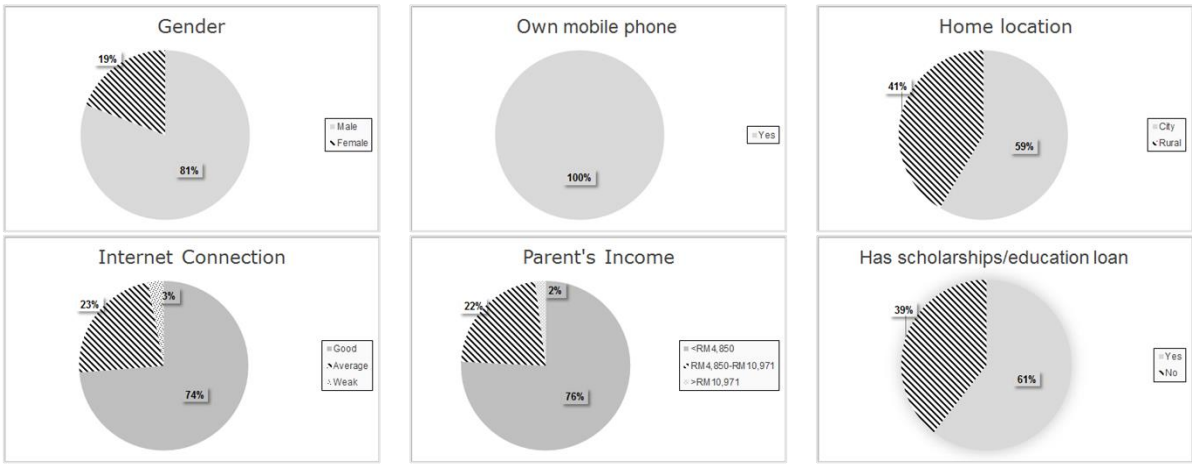

Figure 2. Demography data

The majority of the students who enrolled in the DEC30023 course are male and this is the main reason why male respondents dominate the survey. Having a mobile phone is now common for individuals in Malaysia (Fariza Khalid, Md Yusoff Daud, & Mohd Khalid Mohamad Nasir, 2016; Song, Murphy, & Farley, 2013) as the price is affordable nowadays due to high demand (Moura & Carvalho, 2008). Hence, it is not surprising that 100% of the respondents in this survey own a mobile phone. Although more than half of the respondents live in the city area, only 75.8% of the respondents have an average internet connection quality. This is understandable as Sarawak is among the states that have the lowest internet penetration rate in Malaysia, either mobile or fixed broadband (MCMC, 2019). The irony of low number or respondents who have scholarship or any educational loan was probably due to the parental attitudes toward financial education and the lack of financial literacy (Yi, 2018). Furthermore, the generation of the respondents lag in terms of financial independence hence require prolonged financial support from their parents (Graham, 2018).

STUDENTS' ACCEPTANCE

Table 1 shows the results for acceptance of students in using NetFun bot. From the results, we confirm that most of the respondents know about NetFun bot either from the lecturer or from their friends. 79.8% of the respondents are aware that the DEC30023 course uses NetFun bot and are aware of its needs. 71.7% of them have a good perspective regarding the bot. The respondents also think that the NetFun bot really helps in online learning as

72.7% of them agree to it and 69.7% approve that there is enough information on NetFun bot to help them with the course, but ironically only 55.5% are actively using the bot.

Table 1. Level of students' acceptance

No	Statement	Percentage (%)					Mean	Std Dev
		Very Agree	Agree	Quite Agree	Disagree	Very Disagree		
Q1	Aware the needs of NetFun bot in Computer Networking Fundamental course (DEC30023)	37.4	42.4	17.2	0	3.0	4.11	0.90
Q2	Actively using NetFun bot	22.2	33.3	34.3	10.1	0	3.68	0.94
Q3	NetFun bot really helps in online learning	33.3	39.4	24.2	3.0	0	4.03	0.84
Q4	Have good perspective regarding Netfun bot	34.3	37.4	25.3	2.0	1.0	4.02	0.88

STUDENTS' READINESS

Table 2 shows the results for the readiness of students in using NetFun bot. From the results, we confirm that 69.7% of respondents agree that there is enough information on NetFun bot and 79.8% are aware that DEC30023 course is using NetFun bot. 89.9% of the respondents know about NetFun Bot from their lecturer compare to 36.3% knowing it through their friends

Table 2. Level of students' readiness

No	Statement	Percentage (%)					Mean	Std Dev
		Very Agree	Agree	Quite Agree	Disagree	Very Disagree		
Q5	There is enough information on NetFun bot	28.3	41.4	28.3	0.0	2.0	3.97	0.86
Q6	Knows about NetFun bot through friends	12.1	24.2	37.4	14.1	12.1	3.10	1.17
Q7	Knows about NetFun bot through lecturer	68.7	21.2	6.1	1.0	3.0	4.52	0.9
Q8	Aware that DEC30023 course is using NetFun bot	48.5	31.3	16.2	1.0	3.0	4.2	0.96

Based on the results from Table 1 and 2, the majority of the students are aware that NetFun bot is used in DEC30023. The awareness either comes from their friends or the lecturer itself. This is reasonable as the customized bot is exclusively used in DEC30023 course for Politeknik Kuching Sarawak. The respondents in this research also belong to Generation Z (Graham, 2018; Michael, 2019) and the characteristics of fear of missing out (Mohr & Mohr, 2016) in this generation may induce more than half of them to actively use NetFun bot and hence allow them to have good perspectives for it. The always-connected culture (Hariadi, Sunarto, & Sudarmaningtyas, 2016) and the bot which complements hybrid learning for DEC30023, have allowed the respondents to feel that NetFun bot is handy for their online learning.

EFFECTIVENESS OF NetFun BOT

In Table 3, we can observe that 79.8% and 55.5% of students felt more motivated to enroll in DEC30023 course and interacting with their classmates, respectively. However, there is 10.1% of the respondents disagree with using NetFun bot as a medium to interact with their classmates. 72.7% of the respondents also believe that they had become more independent in obtaining their learning materials. Being independent to get the learning materials to help 71.7% of respondents to be ready to follow the DEC30023 course.

Although some of the respondents still consider other platforms such as CIDOS, Whatsapp, and other related platforms to be more effective, 69.7% of respondents still agree that NetFun bot helps them to be ready for the lecture. However, the respondents seem to be uncertain to decide if NetFun bot can be a medium to share and learn more information compared to other platforms as there are only 36.3% respondents who agree to it and 26.2% disagrees. Despite the doubt, 89.9% of the respondents strongly agree that NetFun bot is convenient to them for obtaining learning materials compared to other platforms and 79.8% of them hope that other lecturers will use a platform such as NetFun bot.

Table 3. Level of effectiveness of NetFun bot

No	Statement	Percentage (%)					Mean	Std. Dev.
		Very Agree	Agree	Quite Agree	Disagree	Very Disagree		
Q1	Increase motivation to follow DEC30023 course	37.4	42.4	17.2	0.0	3.0	4.11	0.90
Q2	Motivated to have more interactions with classmate	22.2	33.3	34.3	10.1	0.0	3.68	0.94
Q3	Encouraged to be independent in obtaining learning materials	33.3	39.4	24.2	3.0	0.0	4.03	0.84
Q4	Helps to get ready to follow DEC30023 course through online learning	34.3	37.4	25.3	2.0	1.0	4.02	0.88
Q5	I am more ready to attend lecture with the help of Netfun bot compared using other platform (CIDOS/Whatsapp/Google drive and etc...)	28.3	41.4	28.3	0.0	2.0	3.94	0.86
Q6	More information can be learned and shared through Net Fun bot compared to other platform (CIDOS/Whatsapp/Google drive and etc...)	12.1	24.2	37.4	14.1	12.1	3.10	1.17
Q7	Learning material through NetFun bot is easier to be obtained compared to other platform (CIDOS/Whatsapp/Google drive and etc...)	68.7	21.2	6.1	1.0	3.0	4.52	0.90
Q8	I hope that more lecturers will use application like Netfun bot	48.5	31.3	16.2	1.0	3.0	4.21	0.96

The majority of the respondents are motivated to be enrolled in DEC30023 and interact more with classmates when using NetFun bot. This is in line with the outcome of the survey in (Malaysian Communication and Multimedia Commission, 2020) where this generation commonly use social media as their sharing platform. The 10.1% of respondents who disagree on using NetFun bot as a medium for interaction may not possess enough skill in Information and Communication Technology (ICT) which may cause them to feel anxious and not highly expecting the benefit of educational technology (Tabrizi & Onvani, 2018). Being more independent is the crème de la crème of NetFun bot as the main purpose is to manipulate the dependencies of respondents to technologies (Andujar & Medina-López, 2019) in order to help them in getting ready to attend DEC30023 course through online learning. The reason for uncertainties in using NetFun bot as a medium to share more information may be due to the limited function of the bot itself which only provides learning materials for the specific course which is why 79.8% of respondents hope other courses will follow to shift to a platform likely NetFun bot as majority feels the bot is an effective platform to obtain learning materials.

CONCLUSION

The research investigates the readiness and acceptance of students in using a customized bot to obtain learning materials, namely NetFun bot, and to study how the bot facilitates

students to prepare for online learning. A survey was performed on 109 students who had enrolled in DEC30023 – Computer Networking Fundamental course in Politeknik Kuching Sarawak. Overall results show 79.8% of respondents are aware of the needs of the bot and 71.7% have good perspectives towards its usage for the course. These show that the respondents are ready to accept NetFun bot as an aide for learning materials during online learning. 89.9% of the respondents also strongly agree that the bot is very convenient for them and the majority hopes that other courses will start using this platform to encourage them to be independent to prepare for online learning.

It is worthy to know that Telegram platform can be accepted by students as this can help lecturers to diverse their learning materials to another effective and more accessible way for the learners. The study has also provided the level of dependencies of students to mobile phone and this can be turned into a good purpose.

However, this study has several limitations where the first is the study is limited to only one course in the Electrical Department and the effectiveness of Telegram bot for obtaining material aide can be doubted for other courses that require practical showmanship. The second limitation is that the research does not compare directly the students' preferences for every available platform to obtain learning materials before and during the Covid19 pandemic.

As a suggestion for future study, it is recommended that the research on the usage of Telegram Bot can be conducted in other courses to determine its effectiveness as a teaching aide for online learning.

REFERENCES

A. Abu-Ayfah, Z. (2019). Telegram App in Learning English: EFL Students' Perceptions. *English Language Teaching*, *13*(1), 51. https://doi.org/10.5539/elt.v13n1p51

Aisyah, R. N., Istiqomah, D. M., & Muchlisin, M. (2021). Developing E-learning Module by Using Telegram Bot on ICT for ELT Course. *Proceedings of the 5th International Conference on Arts Language and Culture (ICALC 2020)*, *534*(534), 106–111. https://doi.org/10.2991/assehr.k.210226.054

Aladsani, H. K. (2021). University Students' Use and Perceptions of Telegram to Promote Effective Educational Interactions: A Qualitative Study. *International Journal of Emerging Technologies in Learning (IJET)*, *16*(09), 182. https://doi.org/10.3991/ijet.v16i09.19281

Ali, M., Yaacob, R. A. I. B. R., Al-Amin Bin Endut, M. N., & Langove, N. U. (2017). Strengthening the academic usage of social media: An exploratory study. *Journal of King Saud University - Computer and Information Sciences*, *29*(4), 553–561. https://doi.org/10.1016/j.jksuci.2016.10.002

Andujar, A., & Medina-López, C. (2019). Exploring new ways of eTandem and telecollaboration through the WebRTC protocol: Students' engagement and perceptions. *International Journal of Emerging Technologies in Learning*, *14*(5), 200–217. https://doi.org/10.3991/ijet.v14i05.9612

Azlan, C. A., Wong, J. H. D., Tan, L. K., Muhammad Shahrun, M. S. N., Ung, N. M., Pallath, V., … Ng, K. H. (2020). Teaching and learning of postgraduate medical physics using Internet-based e-learning during the COVID-19 pandemic – A case study from Malaysia. *Physica Medica*, *80*(July), 10–16. https://doi.org/10.1016/j.ejmp.2020.10.002

Bots: An introduction for developers. (n.d.). Retrieved June 7, 2021, from https://core.telegram.org/bots

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16*(3), 297–334. https://doi.org/10.1007/BF02310555

Essel, D. D., & Wilson, O. A. (2017). Factors affecting university students' use of moodle: An empirical study based on TAM. *International Journal of Information and Communication Technology Education*, *13*(1), 14–26. https://doi.org/10.4018/IJICTE.2017010102

Fariza Khalid, Md Yusoff Daud, & Mohd Khalid Mohamad Nasir. (2016). "Perbandingan penggunaan telefon pintar untuk tujuan umum dan pembelajaran dalam kalangan pelajar universiti. *International Conference on Education and Regional Development*, *2016*(November), 173–182.

Graham, L. P. (2018). Generation Z Goes to Law School: Teaching and Reaching Law Students in the Post-Millennial Generation. *University of Arkansas at Little Rock Law Review*, *41*(1), 29.

Habibi, A., Mukminin, A., Riyanto, Y., Prasojo, L. D., Sulistiyo, U., Sofwan, M., & Saudagar, F. (2018). Building an online community: Student teachers' perceptions on the advantages of using social networking services in a teacher education program. *Turkish Online Journal of Distance Education*, *19*(1), 46–61. https://doi.org/10.17718/tojde.382663

Hariadi, B., Sunarto, M. J. D., & Sudarmaningtyas, P. (2016). Development of Web-Based Learning Application for Generation Z. *International Journal of Evaluation and Research in Education (IJERE)*, *5*(1), 60. https://doi.org/10.11591/ijere.v5i1.4523

Karim, M. A. (2020). whatsapp telegram emerge efficient platforms remote teaching. Retrieved from New Straits Times website: https://www.nst.com.my/education/2020/04/587804/whatsapp-telegram-emerge-efficient-platforms-remote-teaching

Kraleva, R., Sabani, M., & Kralev, V. (2019). An analysis of some learning management systems. *International Journal on Advanced Science, Engineering and Information Technology*, *9*(4), 1190–1198. https://doi.org/10.18517/ijaseit.9.4.9437

Krejcie, R. V, & Morgan, D. W. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*, *30*(3), 607–610. https://doi.org/10.1177/001316447003000308

Malaysian Communication and Multimedia Commission. (2020). Internet users survey 2020: Infographic. *Statistics and Data Intelligence Department, Malaysian Communications and Multimedia Commission*, 1–6. Retrieved from https://www.mcmc.gov.my/ms/resources/statistics/internet-users-survey

MCMC. (2019). Komunikasi & Multimedia: Fakta dan Angka Terpilih, 1Q 2019 JUN 06, 2019. *Malaysian Communications and Multimedia Commission*, 6. Retrieved from https://www.mcmc.gov.my/resources/statistics/communications-and-multimedia-pocket-book-of-stati

Michael, D. (2019). Where Millennials end and Generation Z begins | Pew Research Center. *Pew Research Center*, 1–7. Retrieved from https://www.pewresearch.org/fact-tank/2019/01/17/where-millennials-end-and-generation-z-begins/

Mohamad Nasri, N., Husnin, H., Mahmud, S. N. D., & Halim, L. (2020). Mitigating the COVID-19 pandemic: a snapshot from Malaysia into the coping strategies for pre-service teachers' education. *Journal of Education for Teaching*, *46*(4), 546–553. https://doi.org/10.1080/02607476.2020.1802582

Mohr, K. A. J., & Mohr, E. S. (2016). Understanding Generation Z Students to Promote a Contemporary Learning Environment. *Journal on Empowering Teaching Excellence*, *1*(1), 84–94.

Moura, A., & Carvalho, A. A. (2008). Mobile learning: Teaching and learning with mobile phones and Podcasts. *Proceedings - The 8th IEEE International Conference on Advanced Learning Technologies, ICALT 2008*, 631–633.

Organization, W. H. (2019). Coronavirus disease (COVID-19) advice for the public. Retrieved June 12, 2021, from https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public

Owusu-mensah, F., Augustine, H., Pufaa, K., & Sakyi, D. K. (2020). Delivery of Learning Modules through the Telegram Social Media Application: Views of Post Graduate Diploma in Education Distance Students of University of Education, Winneba. *2nd International Conference on New Trends in Teaching and Education*, 1–21.

Parlika, R., & Pratama, A. (2020). The Online Test application uses Telegram Bots Version 1.0. *Journal of Physics: Conference Series*, *1569*(2), 0–7. https://doi.org/10.1088/1742-6596/1569/2/022042

Sadik, A. (2017). Students' acceptance of file sharing systems as a tool for sharing course materials: The case of Google Drive. *Education and Information Technologies*, *22*(5), 2455–2470. https://doi.org/10.1007/s10639-016-9556-z

Song, H. S. Y., Murphy, A., & Farley, H. (2013). Mobile devices for learning in Malaysia: Then and now. *30th Annual Conference on Australian Society for Computers in Learning in Tertiary Education, ASCILITE 2013*, (December), 830–834.

Syed Lamsah Syed Chear. (2017). Pengajaran dan pembelajaran melalui aplikasi Whatsapp dan. *Jurnal Pendidikan Malaysia*, *42*(2).

Tabrizi, H. H., & Onvani, N. (2018). Applied research on English language the impact of employing Telegram app on Iranian EFL beginners' vocabulary teaching and learning. *Applied Research on English Languagenguage*, *7*, 1–18. Retrieved from doi: http://dx.doi.org/10.22108/are.2017.103310.1087%0AThe

Telegram FAQ. (n.d.). Retrieved from https://telegram.org/faq

Widiyono, A. (2021). Pengaruh Penggunaan LMS dan Aplikasi Telegram terhadap Aktivitas Belajar. *Jurnal Penelitian Ilmu Pendidikan*, *14*, 91–101. https://doi.org/10.21831/jpipfip.v14i1.37857

Yi, W. C. (2018). Parental Saving: Does SSPN Matter to My Childrens Education? *Journal of Global Business and Social Entrepreneurship (GBSE)*, *4*(13), 16–29.

Yusuf, B. N. (2020). Are We Prepared Enough? a Case Study of Challenges in Online Learning in a Private Higher Learning Institution During the Covid-19 Outbreaks. *Advances in Social Sciences Research Journal*, *7*(5), 205–212. https://doi.org/10.14738/assrj.75.8211