

# Optimizing High School English Language Learning: The Impact of Modern Learning Apps and Technology Platforms

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## Abstract

*This research aims to gain a thorough understanding of how the most recent information technology has affected English language learning in the present, as well as to determine what kinds of platforms and applications are thought to be most useful for helping students improve their command of the language. Additionally, a detailed analysis of the English language learning platform's implementation in Muhammadiyah schools in the Metro will be included in this research. A survey design is used in this study as a quantitative research methodology. The participants in this survey research were drawn from three private secondary schools in Metro City. Once the pre-survey is completed, samples will be chosen and the methodology will be decided upon by researchers at the schools and madrasas that have been identified as the research population. The result of the study shows that Female research participants make up the majority (90.09%) of the sample, while male subjects make up just 9.01%), according to the findings of the demographic analysis of the study data. The demographic information provided above indicates that there may be gender biases or trends in the research that could affect the analysis's findings or the dynamics of student participation in the use of technology in the classroom. Moreover, the research focus was at a certain grade level or educational unit stage in high school, as the bulk of the research subjects (90.08%) were 17 years old.*

*Keywords: Technology Use, English Language Learning, Learning Application, Learning Platforms*

## 1. INTRODUCTION

English has a major role in the information and communication industries as a medium for technical advancement. English is considered a fundamental element of global literacy in the field of education. Proficiency in English is necessary to access academic literature, research, and information. English language education must be implemented in order to teach English as an international language as part of the globalization process in education, which is expected to establish a global educational landscape. The way that people learn has been greatly impacted by technological advancements, particularly when it comes to learning English. English language instruction now includes a significant amount of information and communication technology, including apps, digital platforms, and learning environments. With the use of this technology, studying English can be used more creatively to benefit the world community.

In a number of domains, such as business, technology, and international communications, English has emerged as the leading language spoken across borders. Understanding English is becoming more and more crucial as it is not just a tool of communication but also has a big impact on many aspects of life. The method that students communicate has changed dramatically as a result of the development of technology at the same time that the English language has spread. It makes sense to argue that the spread of the English language has been accelerated by the growth of the internet. This phenomenon arises when computers become accessible to a broader audience and are no longer the domain of a particular subset of people (Dockstader, 2008). English is the official language of international businesses and organizations, and proficiency in it is necessary to pursue a job in this field. The primary forces behind globalization are developments in information and communication technologies. As a platform for accessing and engaging with technological advancements, English is essential. Active engagement in the global community via digital media, social networks, and online platforms is made easier by the use of English.

The aforementioned industries and keys influence wider educational prospects. Technology's quick progress has significantly changed how people learn, particularly when it comes to learning English. With multimedia-based instruction, students can learn more than just what is contained in traditional textbooks. Their ability to provide a clear cultural background, a wide range of topics, and genuinely lively language resources makes their content far more genuine and reflective of actual experiences. In turn, this helps students have a better awareness of various cultural viewpoints and increases their hearing acuity. A multitude of communication channels can be used to comprehend information thanks to this strategy. Susikaran (2013) said that by breaking the mold of "teacher-centered" instruction and optimizing class time, multimedia-based learning enhances curriculum and significantly increases student productivity.

The goal of this research is to gain a thorough understanding of how the most recent information technology has affected English language learning in the present, as well as to determine what kinds of platforms and applications are thought to be most useful for helping students improve their command of the language. Additionally, a detailed analysis of the English language learning platform's implementation in Muhammadiyah schools in the Metro will be included in this research, along with recommendations for the best English language learning model in schools. All of these analyses will be done in the context of the contextual analysis of the impact of technology on language learning. - The use of information technology in English language instruction at Muhammadiyah schools and madrasas located in Metro City. Obtaining a complete picture of how technology contributes to the advancement of information technology-based English language instruction is another goal of this study (Creswell, 2017). The advancement of English language instruction in Metro City's Muhammadiyah schools will also benefit from this research.

Establishing the study objectives, identifying the research population, selecting a sample, designing the research instrument, and then testing the instrument's level of validity and reliability are all necessary steps in this research. Creswell (2017) said that, subsequently, an online questionnaire concerning the application of ICT in English language instruction was sent to research subjects and samples, which included leaders of schools and madrasas, a number of English-language teaching faculty members, and a number of students enrolled in the institution. Following After the researcher receives back the questionnaire that was delivered to the research sample, the following step is to examine the data that was gathered from the questionnaire (Dillman, 2007).

The primary methods of data analysis that will be used in this study are factor or dimensional analysis, regression analysis, frequency analysis, correlation analysis, data categorization, and descriptive statistical computations. The SPSS application will support all of these methods. The subsequent data analyses aim to uncover patterns of relationships between variables. Factor analysis, frequency analysis, and correlation analysis are some of the methods that can be used to identify relationships between dependent and independent variables, variables, and patterns of relationships between variables. The final step involves evaluating the data analysis findings through research reports, talks, and inferences from the study (Leedy, 2019).

In the field of education, evaluating digital learning platforms and applications is crucial, particularly to determine how information and communication technology might enhance students' comprehension, engagement, learning, and analytical skills in English. Thus, the goal of this research is to present a thorough understanding of how technology affects English language learning as well as the possible advantages of using information and communication technology to teach and learn English in the modern, globalized world. Thus, it is evident that technology is important to comprehend and use in a variety of sectors, and that technology will play a significant part in determining the future of global civilization.

## 2. LITERATURE REVIEW

The modern digital era has brought about a substantial revolution in education, with technology now playing a crucial role in the educational process. This study examines the impact of technology use on English language instruction in senior high schools (SMA). This survey of the literature will give an overview of the current state of the art in language learning technology and provide a roadmap for future development in the context of high school English language instruction. Yumnam conducted the first study, which looked at the advantages of using e-learning to teach English as a second language. As a result of the COVID19 pandemic, offline studying has become necessary in all educational institutions in an effort to stop the virus's spread. Diverse e-learning strategies are investigated by researchers in the context of English as a second language instruction. Many online learning (e-learning) resources are effectively explored, including the internet, mobile devices, podcasts, social networking sites like Facebook, Twitter, and WhatsApp, YouTube, video conferencing platforms like Zoom, Google Meet and Webex, Google Classroom, and podcasts. instructing foreign speakers of English. Additionally, this study examines and evaluates ESL classrooms that make use of a variety of e-learning resources. The study's conclusion is that, given the current COVID-19 outbreak, learning English as a second language online with the use of online learning resources has been shown to help students finish their coursework while also improving their English language proficiency. and effective and efficient learning occurs (Yumnam, 2021).

Alakrash, et.al, (2022) said that looked at the usage of digital platforms for English language learning in the context of teaching English as a foreign language (EFL) in Arab nations in their subsequent study. Finding out how learning, attitudes, and digital literacy are when using digital learning platforms for English language learning is the goal of this research. This study also looks at how attitudes, usage of digital learning platforms, and digital literacy abilities relate to English language learning objectives. Eighty students who were studying English as a foreign language (English as a Foreign Language) participated in this quantitative study and were chosen at random to respond to a survey. The software SPSS 23.0 was used to analyze the data. Students exhibit a high degree of attitude, moderate degrees of digital literacy, and moderate levels of use of digital platforms for learning, according to the research findings. These results suggest that attitudes, digital literacy abilities, and students' use of digital platforms for English learning are negatively and statistically correlated. Furthermore, it was made clear that attitudes and digital literacy are not reliable indicators of how digital platforms can improve English language acquisition. Researchers looking at the use of digital platforms for English language acquisition will find this study to be a modest but valuable addition. According to the research findings, the classroom teaching model that makes use of the MOOC teaching platform outperforms the traditional teaching model in terms of optimizing the learning process, demonstrating

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teaching effectiveness, and enhancing attitudes, interests, strategies, and collaboration in English language learning. So, it can be said that using MOOCs as an online teaching platform has a good effect and is advised for usage in online courses for learning English (Zhang, 2023).

### **3. RESEARCH METHODS**

#### **3.1 Research Design**

A survey design was applied in this study as a quantitative research methodology. Researchers identified the research population from three private secondary schools in Metro City in order to gather research data. This study's primary goals were to characterize the population's features, measure and comprehend certain population factors, and draw conclusions or generalizations about the larger population (Kish, 1965).

#### **3.2 Participants**

The participants in this survey research were drawn from three private secondary schools in Metro City. Once the pre-survey was completed, then the samples were chosen and the methodology was decided upon by researchers at the schools and madrasas were identified as the research population. According to Chappelle(2001), Based on demographic characteristics, study goals, and resource availability, sample selection techniques, such as stratified or random sampling, will be used.

#### **3.3 Instruments**

The primary methods for gathering research data for this study will be paper and internet surveys. The researchers will collaborate to design this questionnaire, which will be able to show every facet of the parameters that can be measured in this study, including how students view technology use, how effective learning platforms and applications are, how they affect motivation and learning outcomes, and other factors. This affects the process of learning English (Vygotsky, 1978).

#### **3.4 Data Analysis**

The present survey research will encompass a number of data collection steps, including planning, instrument selection, questionnaire development, sample selection, online questionnaire distribution and interview data collection, data processing, data analysis through various statistical methods, and result interpretation. Implementing the pre-survey starts to make sure the sample accurately represents the demographic. Data analysis includes classifying and coding the data, descriptive statistics, regression, factor or dimensional analysis, frequency, correlation, and theme analysis for open-ended questions. If necessary, hypothesis testing is also included, and the data is visualized using graphs or diagrams. The level of analysis performed has an impact on the researcher's capacity to derive insights from the data.

#### 4. FINDINGS

Based on examination of study data collected in an effort to determine how technology use affects high school students' acquisition of the English language. The examination of data gathered from different aspects of technology integration, such as its effectiveness and the viewpoints and advantages that educators and students believed were achieved. The usage of technology in educational settings and various factors that influence its efficient application in the classroom are both covered in this research. Female research participants make up the majority (90.09%) of the sample, while male subjects make up just 9.01%, according to the findings of the demographic analysis of the study data. The demographic information provided above indicates that there may be gender biases or trends in the research that could affect the analysis's findings or the dynamics of student participation in the use of technology in the classroom. Moreover, the research focus was at a certain grade level or educational unit stage in high school, as the bulk of research subjects (90.08%) were 17 years old.

The utilization of technology in education may also be influenced by the disparities in length of teaching experience and the diversity of educational backgrounds among research participants. For instance, when it came to using sophisticated technology, Teacher 3—the one with the longest tenure—showed superior ability than colleagues with shorter experience. The study's findings also suggested that teaching experience, adaptability, and technological integration may be related, even if this connection wasn't specifically looked at. The fact that all teachers used technology in their lessons shows that it is widely accepted as a useful teaching tool. Different applications and application platforms are used at different frequencies. The majority of subjects use technology regularly (63.06%). On the other hand, there are some teaching staff who rarely use technology, this is possibly due to obstacles such as lack of adequate training, limited resources, or inadequate technological infrastructure within educational institutions.

Canva and Quizizz, with a highly noticeable 100% usage rate, are the most popular educational apps or platforms for learning. Because of their user-friendly interface, these two applications are given consideration by their users. Moreover, when asked about their effectiveness, the majority of educators gave a neutral response, raising the possibility of hidden ambivalence or discontent. This occurrence begs the issues of whether technology is still employed differently in daily life than it is in education, and to what extent technology is aligned with educational needs.

Higher student engagement (50%) and more exciting content delivery (90.9%) are the three biggest benefits of incorporating technology into education that are most widely acknowledged. Moreover, more learning resources are now more easily accessible (72.7%). These results suggest that the successful integration of technology into education has had an impact on student engagement and learning dynamics. The difficulties faced by educators and students, as well as their hopes for the future of teaching that integrates technology into learning, were uncovered by an extensive qualitative survey intended to better understand and enhance the use of technology in

education, particularly in the teaching of English language to senior high school students. The narrative that follows provides an overview of these qualitative findings, outlining the challenges that were faced as well as expectations for the future development of educational technology.

This study also revealed that some teachers faced a variety of technical barriers and difficulties when it came to fully integrating technology into their lessons and instruction. Among these include the inability to find laptops with the hardware specs needed to run educational platforms and software for teaching and learning. Consequently, technological issues frequently arise during classes, which can lower the effectiveness of instruction and the distribution of learning resources. In addition, inadequate internet access might lead to significant challenges. In addition to interfering with the process of teaching and learning, a shaky Internet connection restricts access to instructional materials that could potentially increase student comprehension. Additional issues that crop up from time to time include difficulties connecting the device to the LED projector and a variety of software problems, like trouble downloading and upgrading applications or persistent requests for system updates.

Furthermore, a number of instructors expressed time and time again that they frequently forget how to use specific software. This means that instruction on the use of technology in the classroom needs to be more regular and regimented in the school system. The majority of instructors (95.5%) are positive about the use of educational technology in English language instruction going forward, despite a number of challenges. Numerous educators aspire to incorporate information technology into every subject, making learning easier for pupils and closing the skill gap between teachers and learners. Teachers also expect that schools, and policy makers in particular, will be able to offer the newest IT infrastructure, which will be able to improve education in a way that is both participatory and captivating.

Utilizing additional information technology to enhance the learning process is also highly stressed. Many research subjects want their students to be able to use engaging and interactive learning films that improve comprehension, encourage critical thinking, and guarantee that all students benefit academically from the use of technology in the classroom. Lastly, most research participants believe that English language learning will be facilitated by more affordable information technology, particularly if the platform or program provides a premium version.

## **5. DISCUSSION**

Constructing a discussion narrative that compares and contrasts the survey findings with the findings of undergraduate research conducted during the previous five years on the use of information technology for educational objectives. The use of technology in education has significantly increased over the past ten years,

particularly in the area of English instruction and learning in high schools. The aforementioned study findings demonstrate that nearly all instructors (100%) have included technology into their lesson plans and the education of their students. Substantial technical obstacles can make it more difficult to use technology in education. Examples of these obstacles include unsupported hardware, slow internet connectivity, and trouble upgrading or installing apps. The following are a few issues that frequently come up while using technology for education:

a. Infrastructure and Connectivity

According to the findings of this survey research data analysis about hardware accessibility and internet connectivity, this is because there is insufficient technological infrastructure, which can make it difficult to successfully adopt information technology-based learning. Aditya's (2021) research highlights the need to overcome technology-related issues when implementing information technology in the classroom, demonstrating that modifying technology choices and methodology can help address the difficulties encountered in digital learning. This suggests that the successful implementation of e-learning approaches requires the removal of technological obstacles.

The study results of Shahzad & Khan (2023) are presented next, which demonstrate that the primary barriers to integrating emerging technologies, including e-learning, into educational settings are a lack of skilled labor, a lack of adequate IT infrastructure, a lack of technical support, copyright issues, poor planning, and ineffective leadership (Shahzad & Khan, 2023). This emphasizes how important it is to fix infrastructure and support issues in order to make the successful integration of e-learning technology possible. The aforementioned results highlight the critical role that technology infrastructure plays in carrying out e-learning programs. It is imperative that educational institutions overcome technology-related obstacles, like inadequate infrastructure, a dearth of technical support, and inadequate planning, in order to successfully embrace and implement e-learning programs.

b. Education of Teachers

According to Huang et al. (2020), a study conducted in Taiwan, it is clear that in order to guarantee effective use of digital tools, educators must have sufficient training in technology. This is consistent with the results of other studies that highlight the significance of equipping educators to deal with the digital age that we live in today. For instance, Uerz et al.'s (2018) research made clear that pedagogy, material, and technology must all be integrated for online education to be effective. In a similar vein, Erstad et al. (2015) asserted that educational institutions have to prioritize enhancing teachers' digital literacy and utilizing technology within the classroom, particularly for secondary education.

Furthermore, Tondeur et al. (2016) underlined in their study the necessity of developing novel strategies to educate aspiring educators, particularly regarding their proficiency with educational technology. They also underlined the significance of



offering assistance and instruction regarding the incorporation of technology into the classroom. Çuhadar (2018) also investigated pre-service teachers' preparedness for incorporating technology into instruction by outlining the education and training they received. All of these studies highlight how crucial it is to give teachers the knowledge and self-assurance they need to adjust to the rapidly changing educational landscape of both the present and the future.

Based on the aforementioned findings, it is clear that all parties need to continue playing a crucial role in enhancing the abilities of teaching staff members to use technology in the classroom by giving them thorough training and assistance. by filling in the gaps in teachers' knowledge and expertise about the use of technology in the classroom. Educational institutions can accomplish this by giving their faculty members the training they need to become more proficient educators who can maximize the advantages of utilizing digital tools in the classroom.

#### c. Effect on Education of Students

Recent educational research has made the incorporation of technology into the classroom an intriguing subject. Research conducted in Japan by Fernandez and Aoki (2021) demonstrates the benefits of incorporating technology into the classroom for student engagement and comprehension of the subject matter. These results are consistent with studies that highlight the value of instructional interfaces in raising student engagement (Kahu & Nelson, 2017). Additionally, Wester et al. (2021) go over how involvement in class can boost motivation and critical thinking abilities, which will enhance academic achievement. In their study on the value of integrating instructional technology into the classroom, Maniva et al. (2018) underlined the necessity of a rigorous validation procedure. The research conducted by Goldhaber (2021) provides additional evidence for the significance of integrating ICT in education to enhance the caliber of learning opportunities. These results highlight how crucial technology is to raising academic standards.

Zhang (2022) also emphasized the need of enhancing teachers' technological pedagogical expertise via online resources, highlighting the necessity for educators to be flexible enough to adjust to the creation of new teaching models. Dangi et al. (2022) highlight the need for a comprehensive approach to guarantee the successful integration of technology in learning as they address the critical junction between content, pedagogical, and technological knowledge to achieve effective learning. The aforementioned research results highlight the beneficial effects of technology integration on student learning outcomes and engagement in the classroom. Effective use of technology by teachers can boost their pupils' comprehension, drive, and critical thinking abilities, all of which will contribute to an improvement in the standard of instruction.

#### d. The Way Teachers View Technology

A topic that comes up frequently in research is educators' unwillingness to fully adopt new technology tools due to a perceived lack of technical support and insufficient use of school-provided resources. The similar issue is expressed by Patel (2022) in relation to Indian education. Sadly, despite the fact that all policymakers recognize the advantages of technology, many continue to be reluctant to offer electronic resources for education due to a lack of funding and inadequate technical support. This result is consistent with survey research that demonstrates that technological issues related to the use of technology in education frequently become roadblocks to the integration of technology in the classroom. The significance of teachers' perspectives in the adoption of technology in the classroom. Developing successful technology integration in educational contexts requires removing technical obstacles, offering sufficient assistance, and improving teachers' opinions of technology's use.

e. Efficiency of Learning

As noted in the study by Gomez et al. (2023) in their research conducted in Spain, the application design and platform employed have a significant impact on the usage of information technology in promoting successful learning. According to this research, the effectiveness of technology in education is directly tied to its user-friendly design and frequent updates, both of which enhance the educational process. These results are consistent with the idea that platforms and programs that are user-friendly and have regular upgrades are better suited to facilitate instructional activities (Pal et al., 2014). Furthermore, Tuma's study from 2021 emphasizes how crucial educational technology is for enabling interactive instruction using web-based resources and multimedia. It highlights how communication, information storing, using audio-visual material, and knowledge sharing have all become facilitated by educational technology, underscoring the significance of well-designed platforms in educational settings (Tuma, 2021). Based on the aforementioned research findings, it can be inferred that well-thought-out applications and platforms play a crucial role in boosting the efficiency of using technology in education. It is possible to maximize the use of technology in education by giving priority to user-friendly design, frequent updates, and cutting-edge features that enhance the quality of the learning experience.

## 6. CONCLUSION

The primary purpose of information technology in academic settings is to promote English language instruction and learning in the classroom, as this study successfully demonstrated. This study also identifies key elements that affect how well information technology is used in teaching and learning. According to this survey, practically all teachers employ technology in their lessons, however there are still differences in the frequency and efficacy of this integration. The primary challenges are insufficient technology infrastructure, including inadequate internet access and a deficiency of

auxiliary hardware, in addition to the requirement for more comprehensive technological training for educators. This implies that although technology might improve education, it can also have the opposite effect due to technical difficulties and inadequate teacher preparation.

The popularity of user-friendly platforms and apps like Canva and Quizizz demonstrates that instructors are more likely to employ technology when it is readily available and easy to use. On the other hand, some educators' ambivalence or lack of satisfaction with the actual educational demands met by currently available technology is shown by their less enthusiastic or neutral response to the effectiveness of technology. Using technology is thought to improve accessibility of course materials, promote student participation, and present material in a more interesting way. This demonstrates that technology may significantly raise educational standards under the proper circumstances and with the right infrastructure. In conclusion, even if there is a lot of potential for improving learning through the use of technology in the classroom, infrastructure, teacher preparation, and technological adaption to better serve educational needs still need to be prioritized. In order to maximize the use of technology in education, these areas require consistent investment.

## REFERENCES

- Aditya, D. S. (2021). Embarking Digital Learning Due to COVID-19: Are Teachers Ready? *Journal of Technology and Science Education*, 11(1), 104. <https://doi.org/10.3926/jotse.1109>
- Çuhadar, M. (2020). Türkiye'nin Dış Aktif Turizm Gelirlerinin Alternatif Yaklaşımlarla Modellenmesi Ve Tahmini. *Ankara Hacı Bayram Veli Üniversitesi Turizm Fakültesi Dergisi*, 23(1), 115–141. <https://doi.org/10.34189/tfd.23.01.006>
- Dangi, M. R. M., Saat, M. M., & Saad, S. (2022). Teaching and Learning Using 21st Century Educational Technology in Accounting Education: Evidence and Conceptualisation of Usage Behaviour. *Australasian Journal of Educational Technology*, 19–38. <https://doi.org/10.14742/ajet.6630>
- Goldhaber, A. B. (2021). Impact of ICT Integration on Quality of Education Among Secondary Schools in USA. *Journal of Education*, 4(6), 53–61. <https://doi.org/10.53819/81018102t5015>
- Gondwe, F. (2021). A Case Study on Teacher Educators' Technology Professional Development Based on Student Teachers' Perspectives in Malawi. *Journal of Interactive Media in Education*, 2021(1). <https://doi.org/10.5334/jime.613>

- Gunawan, V. A., Karliani, E., Triyani, T., Saefulloh, A., & Putra, L. S. A. (2021). Desain Fitur Aplikasi E-Learning Penunjang Pembelajaran Berbasis Android. *Jurnal Edukasi Dan Penelitian Informatika (Jepin)*, 7(3), 314. <https://doi.org/10.26418/jp.v7i3.49226>
- Kahu, E. R., & Nelson, K. (2017). Student Engagement in the Educational Interface: Understanding the Mechanisms of Student Success. *Higher Education Research & Development*, 37(1), 58–71. <https://doi.org/10.1080/07294360.2017.1344197>
- Manek, M., & Tanuwijaya, J. (2021). Pengaruh Faktor-Faktor Profesional, Personal, Lingkungan, Teknologi Informasi Dan Kepuasan Terhadap Prestasi Mahasiswa Melalui Penggunaan E-Learning Berkelanjutan Sebagai Variabel Mediasi. *Jurnal Muara Ilmu Ekonomi Dan Bisnis*, 5(2), 417. <https://doi.org/10.24912/jmie.v5i2.11455>
- Maniva, S. J. C. de F., Carvalho, Z. M. de F., Gomes, R. K. G., Carvalho, R. E. F. L. de, Ximenes, L. B., & Freitas, C. H. A. de. (2018). Educational Technologies for Health Education on Stroke: An Integrative Review. *Revista Brasileira De Enfermagem*, 71(suppl 4), 1724–1731. <https://doi.org/10.1590/0034-7167-2017-0041>
- Pongsakdi, N., Kortelainen, A., & Veermans, M. (2021). The Impact of Digital Pedagogy Training on in-Service Teachers' Attitudes Towards Digital Technologies. *Education and Information Technologies*, 26(5), 5041–5054. <https://doi.org/10.1007/s10639-021-10439-w>
- Shahzad, K., & Khan, S. A. (2023). Effects of E-Learning Technologies on University Librarians and Libraries: A Systematic Literature Review. *The Electronic Library*, 41(4), 528–554. <https://doi.org/10.1108/el-04-2023-0076>
- Shih, Y.-H. (2021). Moral Education in Taiwanese Preschools: Importance, Concepts and Methods. *Policy Futures in Education*, 20(6), 717–730. <https://doi.org/10.1177/14782103211040512>
- Tondeur, J., Scherer, R., Baran, E., Siddiq, F., Valtonen, T., & Sointu, E. (2019). Teacher Educators as Gatekeepers: Preparing the Next Generation of Teachers for Technology Integration in Education. *British Journal of Educational Technology*, 50(3), 1189–1209. <https://doi.org/10.1111/bjet.12748>
- Wester, E. R., Walsh, L. L., Arango-Caro, S., & Callis-Duehl, K. (2021). Student Engagement Declines in STEM Undergraduates During COVID-19–Driven Remote Learning. *Journal of Microbiology and Biology Education*, 22(1). <https://doi.org/10.1128/jmbe.v22i1.2385>

Zhang, Y. (2022). Developing EFL Teachers' Technological Pedagogical Knowledge Through Practices in Virtual Platform. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.916060>