

## E-learning in Karabuk University: The Influence of Students' Engagement on their Performance

Ibrahim Seghaer Mohamed ALGHOWL<sup>1\*</sup>, Dr. Akram ALHAMAD<sup>2</sup>

<sup>1,2</sup>Department of Finance and Islamic Banking, Karabuk University, Karabuk, Turkey

\*Corresponding author: [ibrahim.alghowl@gmail.com](mailto:ibrahim.alghowl@gmail.com)

Received: November 30, 2023

Accepted: January 30, 2024

Published: February 07, 2024

### Abstract:

During the COVID-19 outbreak, educational institutions throughout the globe rushed into 'emergency mode,' dramatically modifying teaching by implementing online and e-learning. In this study, we examine the students' engagement and its positive effect on their academic performances. The goal of this study to find out how Finance and Islamic Banking students felt about their e-learning engagement and performance throughout the illness epidemic. Students encounter a variety of challenges, including a lack of internet access and PCs on which to conduct lessons. This study will look at the problems that students face in online courses, as well as the negative and positive effects that they have on their academic performance. A cross-sectional random study of 235 students at Karabuk University's Department of Finance and Islamic Banking will be utilized to analyze the data, and SPSS will be utilized to do so. A Pearson correlation coefficient and a linear regression analysis will be the primary analytic methods.

**Keywords:** E-learning, Karabuk University, Students Engagement, Students Performance.

**Cite this article as:** I. S. M. ALGHOWL, A. ALHAMAD, "E-learning in Karabuk University: The Influence of Students' Engagement on their Performance," *Afro-Asian Journal of Scientific Research (AAJSR)*, vol. 2, no. 1, pp. 177–184, January - March 2024.

Publisher's Note: African Academy of Advanced Studies – AAAS stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2023 by the authors. Licensee The Afro-Asian Journal of Scientific Research (AAJSR). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

## التعلم الإلكتروني في جامعة كارابوك: تأثير مشاركة الطلاب في أدائهم

إبراهيم الصغير محمد الغول<sup>1\*</sup> و د. أكرم محمد الحمد<sup>2</sup>

<sup>2,1</sup> قسم التمويل والمشاركة المصرفية، كلية الإدارة، جامعة كارابوك، كارابوك، تركيا

### الملخص

أثناء تفشي فيروس كورونا (COVID-19)، سارعت المؤسسات التعليمية في جميع أنحاء العالم إلى "وضع الطوارئ"، مما أدى إلى تعديل التدريس بشكل كبير من خلال تنفيذ التعلم عبر الإنترنت والتعلم الإلكتروني. في هذه الدراسة، نقوم بدراسة مشاركة الطلاب وتأثيرها الإيجابي على أدائهم الأكاديمي. الهدف من هذه الدراسة هو معرفة كيف شعر طلاب التمويل والمصرفية الإسلامية تجاه مشاركتهم في التعلم الإلكتروني وأدائهم طوال فترة تفشي المرض. يواجه الطلاب مجموعة متنوعة من التحديات، بما في ذلك عدم توفر إمكانية الوصول إلى الإنترنت وأجهزة الكمبيوتر لإجراء الدروس. سنتظر هذه الدراسة في المشكلات التي يواجهها الطلاب في المقررات عبر الإنترنت، بالإضافة إلى التأثيرات السلبية والإيجابية التي تحدثها على أدائهم الأكاديمي. سيتم استخدام دراسة عشوائية مقطعية لـ 235 طالباً في قسم المالية والمصرفية الإسلامية بجامعة كارابوك لتحليل البيانات، وسيتم استخدام برنامج SPSS للقيام بذلك. سيكون معامل ارتباط بيرسون وتحليل الانحدار الخطي من الطرق التحليلية الأساسية.

## Introduction

E-learning is a learning process that is facilitated by digital electronic resources and media, as well as the electronic delivery of a learning, training, or teaching system (Kostaki & Karayianni, 2021), or web-based engagement that is suited to students' learning styles and improves their capacity to connect with the learning process regardless of time or place (Al-Taweel et al., 2021; Kostaki & Karayianni, 2021). Due to the current Covid-19 pandemic, institutions have been compelled to transition from 100 percent face-to-face sessions to new scenarios that include online classrooms or mixed learning methods (Almaiah et al., 2020; Badenes-ribera et al., 2021; Petillion & McNeil, 2020). Colleges, universities, and other institutions of higher learning are racing to expand online course capabilities in a rapidly increasing cyber education market, according to (Pei Zhao, and Sara Sintonen et al., 2015).

The dissemination of instructional materials, instructor communication, developing student learning groups, regulating student learning progress, and allowing students to enroll in e-learning courses are all aided by universities' e-learning environments (Aljawarneh, 2020; Islam, 2013). During the COVID-19 epidemic, educational institutions across the world went into 'emergency mode,' drastically altering schooling by moving to online and e-learning (Kulikowski et al., 2021). As a result of these upcoming developments, many university lecturers who are unable to use e-learning or who lack the requisite abilities will be swiftly needed to teach using electronic technology and the Internet (Hussain et al., 2018).

For both professors and students, the need to convert face-to-face education to online instruction remains a significant problem (Revilla-Cuesta et al., 2021). As a result, we'd want to underline that mandatory e-learning is both an emerging and an involuntary way of communication—e-learning was not favored by academic teachers but was forced upon them by the COVID-19 case (Mutahi et al., 2017).

With all of this in mind, the study's problem statement is that practically all colleges have moved to online education these days, and students face several issues such as a lack of internet and a lack of PCs on which to take their classes (Mehrvarz et al., 2021). This research will delve into the issues that students confront in online classes, as well as the negative and positive consequences that online classrooms have on their academic performance (Hussain et al., 2018). It will discuss how Finance and Islamic Banking students in online classes view their learning, participation, and academic performance (Giray, 2021).

This research will take place at Karabuk University and will be aimed at Finance and Islamic Banking students. The goal of this study is to learn how Finance and Islamic Banking students regarded their e-learning engagement and performance during the outbreak of the disease, when on-campus learning opportunities, face-to-face classes, and in-person contact with peers and instructors were all absent. Student satisfaction, teacher encouragement, student participation and communication, student autonomy, and course materials are just a few of the factors that influence student satisfaction (Mehrvarz et al., 2021). There are numerous factors to consider in order to achieve this goal. Because students in the Finance and Islamic Banking department come from various nations and speak a variety of languages, English is used as the medium of instruction.

The success or failure of online learners, courses, and services is largely determined by student performance and engagement (Kim et al., 2019). Due to the pandemic, all Karabuk University classes are being delivered online. Creating and executing an effective and productive educational environment that fulfills the requirements of learners is a dynamic process that involves a number of variables, including teacher support, student participation and cooperation, and student autonomy (Kim et al., 2019; Stukalina, 2008). According to previous studies, a logic model for assessing the benefits of professional development (PD) implies that teachers' PD involvement is associated with knowledge and skill improvements related to changes in Instructional practice leads to higher student learning and achievement (Fischer et al., 2018).

## Literature Review

### What role does technology play in increasing engagement?

Though research into assisting students in their studies has shown the importance of consistent advice to learners on what they will read, evaluate, and review (Kostaki & Karayianni, 2021), the scope of this mechanism is expressed in research results from both general and specialist higher education research.

A new study on how students think and feel about their studies, as well as how various tools might be employed in identifying methods to improve students' experience and success, has added to the intricacies of the arguments (Hewitt & Stubbs, 2017). The more committed a pupil is, the more they are thought to be doing (Kostaki & Karayianni, 2021; Moubayed et al., 2018). In the previous two decades, the student profile in lower education has changed substantially, not only as a result of program internationalization (Moubayed et al., 2018), but also as a result of student enrolment trends. Although full-time students are still common, many students are working part-time or combining distance learning and classroom attendance. As a result of the shift in research habits, the usage of Web-based technology has become indispensable.

### **Engagement**

Considered engagement 'the time and energy students invest in educationally purposeful activities and the effort institutions devote to effective educational practices (Kahn, 2014; Trowler, 2010; Zepke, 2018), observable through any number of behavioural, cognitive, or emotive responses to educational events both in and out of the classroom (Gunuc&Kuzu, 2015). It is influenced by a variety of external and internal factors, such as the intricate interplay of relationships, learning activities, and the learning environment (Bond & Bedenlier, 2019). The more involved and empowered students are in their teaching program, the more likely they are to put that energy back into their studies, resulting in a number of short- and long-term outcomes that may further drive engagement (Bond et al., 2020). Students' approaches to and knowledge of their own learning are linked to cognitive engagement (Gunuc & Kuzu, 2015). which relates to students' motivations, self-concepts, future aspirations, expectations, and views and views about school as a whole (Moreira et al., 2018). On the other hand, the best strategies to do this vary across and within fields. From a behavioral perspective, engagement is defined as the "time and effort students devote to school-related activities (Costley & Lange, 2016; J. Lee et al., 2019), but from an emotional perspective, it is associated with positive emotions such as students' interest and a greater sense of well-being(happiness) in class, whereas emotional disengagement is associated with negative emotions such as students' boredom (J. S. Lee, 2014; Urdan & Schoenfelder, 2006). The more a student's information acquisition and cognitive development, the more engaged they are in academic work or the learning environment (Avci & Ergün, 2019).

### **Performance**

Academic performance refers to students' ability to accomplish classroom assignments, problem-solving activities, and academic affairs as one of the most important measures of success in institutions (Mehrvarz et al., 2021). Student performance can also be defined and quantified in a variety of ways, such as course completion, grades, and increasing knowledge and abilities (Francescucci & Rohani, 2019). Student performance on standard evaluations and final course grades are used in the majority of studies. Furthermore, the effectiveness of tests and course grades in determining successful student learning is debatable, as different evaluations have varying degrees of potential to capture actual learning. They are, however, the most ubiquitous and accessible indicators, and they frequently provide reliable information on how well students are meeting course objectives (Driscoll et al., 2012). Furthermore, the personal variables of dedication and drive were substantially connected with university students' success, leading them to regard them as crucial aspects. Showed, on the other hand, that a student's motivation and dedication to academic performance were critical to their success (Ayala & Manzano, 2018).

### **The Relationship Between Student Engagement and Performance**

As can be observed from the variables listed above, they have a direct or positive link with one another. To put it another way, the value of a dependent variable is directly related to the value of an independent variable (Giray,2021). To be more specific, if students' engagement grows, so will the results of their performance. This is similar to the concept of cause and effect. The independent variable, students' engagement, is the cause, while the dependent variable, students' performance, is the impact (Aljawarneh, 2020).

Keeping the hypothesis in mind, we may say that other elements such as student contentment, instructor assistance, and student collaboration can affect students' academic success (Giray, 2021). According to previous studies, instructor assistance is a critical component impacting student satisfaction. The importance of student interaction in student performance and learning cannot be overstated (Moubayed et al., 2018). According to previous research, different education approaches have different perceptions of teacher support, student involvement and collaboration, and student autonomy. When students do not have face-to-face engagement with professors, for example, they feel

less instructor support (Aljawarneh, 2020). Interpersonal communication with instructors has a favorable impact on student motivation and performance.

Currently, there are only a few research that have found that gender plays a significant role in the relationship between student engagement and academic accomplishment. Academic achievement is often used to anticipate an educational system's success, evaluate school performance, assess teachers' ability to manage classes, and track changes in individual students' levels of achievement (Hussain et al., 2018).

**H1:** students' engagement in lessons positively affects their performance.

**Conceptual Framework:**  
IV



**Figure 1** Conceptual Framework.

### Methodology

It is a quantitative research method in which questionnaires will be prepared and the Students of Finance and Islamic Banking will be asked to fill out the questionnaire online at [www.surveymonkey.com](http://www.surveymonkey.com) website (Mishra, 2019). Participants respond to a 5-point Likert scale ranging from "strongly agree" to "strongly disagree" when asked about their performance and engagement with e-learning (Aljawarneh, 2020; Giray, 2021). The Statistical Package for the Social Sciences (SPSS) will be used for data analysis obtained from questionnaires (Tahini et al., 2017).

### Population:

The participants will be all students of Karabuk University in the Department of Finance and Islamic Banking. There are students from different countries at Karabuk University, so the participants will be both Turkish and foreigners which is a good sign for the study since it encompasses different nationalities. The respondents will be both male and female. According to the Finance and Islamic Banking Department, there are 590 students at the university.

### Sampling Method

Because all of the desired population is inaccessible, a sample of the population of 235 students will be used. We'll utilize a basic random sampling approach.

### Sample Size

The sample size was calculated using the Yamane formula (1973). The formula is denoted as follows:

$$n = \frac{N}{1 + N(e)^2} = \frac{590}{1 + 590(0.05)^2} \tag{1}$$

$$n = N / (1 + N(e)^2) = 235 \text{ responses will be achieved} \tag{2}$$

n=sample size, N=total population, e = margin of error.

**Table 1:** Independent Variable.

Construct	Items	Measures	Sources
Student Engagement	SE1	Attending the class has a positive influence on students' engagement in the lessons	(Kapur&Anne, 2018).
	SE2	Good communication among the students and lecturers Has a positive effect on students' engagement in the lessons	

	SE3	Students' involvement with e-learning is favorably influenced by student interaction and cooperation.	(Giray, 2021).
	SE4	Student autonomy has a favorable impact on learning engagement.	
	SE5	Communication with the teachers and asking questions. Has a positive impact on students' engagement.	(J.Leeet al.,2019).

**Table 2:** Dependent Variable.

Construct	Items	Measures	Sources
<b>Student Performance</b>	SP1	With e-learning, instructors' help has a good impact on students' academic success.	(Giray, 2021)
	SP2	In e-learning, live lectures are more helpful for academic success than on-campus education.	
	SP3	Increased engagement with the online material results in better performance	(Stevens etal., 2019)
	SP4	The quality of the instructor has little effect on learning or academic success.	(Alam et al.,2021).
	SP5	The influence of institutional quality on learning and academic success is negligible.	

**Data collection:**

The data will be collected through a questionnaire sent to the students of Karabuk University, and the participants of all Finance and Islamic Banking students.

**Validity analysis:**

The questionnaire will be examined by two professors from two different departments. They assess whether the questions appropriately define the subject, and the questionnaire will be modified in response to their suggestions. By sending the questionnaire to a different department at Karabuk University, a pilot study will be conducted to minimize the risk of misleading questions and inadequate instructions. In this method, the validity of the study will be tested.

**Validity analysis:**

Cronbach's alpha approach will be used in order to ensure the validity of the questionnaire. Cronbach's alpha coefficient for the questionnaire will be 0.898.

**Data Analysis**

When all of the questionnaires have been completed, checked for mistakes, and answered satisfactorily, the study data analysis procedure will begin. The data from the surveys will be imported and entered into the computer system SPSS, where it will be evaluated using descriptive statistics and frequency analysis. To test the hypothesis, basic linear regression analysis and Pearson correlation will be used, as well as inferential statistics. The findings of the data analysis will be displayed as percentages, tables, and matrixes.

**Measures:**

Before filling out the questionnaire, all members will be provided explicit approval in the first portion of the online survey. It will clearly be stated that the obtained empirical data will only be used for educational purposes. The questionnaire begins with a brief clarification of the study's goal and confidentiality. Respondents who will not meet the inclusion criterion, namely, are currently studying in a Finance and Islamic Banking department at Karabuk University in Turkey, will be excluded using a filter query. Except for the open-ended questions, all of the questions were needed to minimize the number of unanswered questionnaires. While statistical techniques may be used to calculate the strength of incomplete information, they are typically ineffective when the sum of missing data is large.



The questionnaire is set based on the study purpose. Since the study is about students' engagement and its positive effect on their academic performances, we have arranged 5 questions for each of the two variables. Five questions measure the engagement and five questions that talk about the performance. All the questions were standardized questions (Giray, 2021).

## Conclusion

The research set out to identify how students' participation affected their academic achievement, Instructor help, according to prior research, is a significant component influencing student happiness. Varying education styles have different perspectives of teacher support, student engagement and cooperation, and student autonomy, according to past studies. Students, for example, perceive less teacher support when they do not have face-to-face interactions with instructors, Student motivation and performance benefit from interpersonal interactions with teachers.

We feel that our research adds to the current literature on the topic at Karabuk University's Department of Finance and Islamic Banking that it will give other departments with proof of how the students' engagement and its positive effect on their academic performances. It is recommended that Karabuk University students and other researchers perform studies in different areas. This will allow for a clear comparison, and the data acquired by this study will enable the best outcomes to be generalized.

## References

1. Al-Taweel, F. B., Abdulkareem, A. A., Gul, S. S., & Alshami, M. L. (2021). Evaluation of technology-based learning by dental students during the pandemic outbreak of coronavirus disease 2019. *European Journal of Dental Education*, 25(1), 183–190. <https://doi.org/10.1111/eje.12589>
2. Alam, M. M., Ahmad, N., Naveed, Q.N., Patel, A., Abohashrh, M., & Khaleel, M. A. (2021). E-learning services to achieve sustainable learning and academic performance: An empirical study. *Sustainability (Switzerland)*, 13(5), 1–20. <https://doi.org/10.3390/su13052653>
3. Aljawarneh, S.A. (2020). Reviewing and exploring innovative ubiquitous learning tools in higher education. *Journal of Computing in Higher Education*, 32 (1), 57–73. <https://doi.org/10.1007/s12528-019-09207-0>
4. Almaiah, M.A., Al-Khasawneh, A., & Althunibat, A. (2020). Exploring the critical challenges and factors influencing the E-learning system usage during COVID-19 pandemic. *Education and Information Technologies*, 25(6), 5261–5280. <https://doi.org/10.1007/s10639-020-10219-y>
5. Avci, Ü., & Ergün, E. (2019). Online students' LMS activities and their effect on engagement, information literacy and academic performance. *Interactive Learning Environments*, 0(0), 1–14. <https://doi.org/10.1080/10494820.2019.1636088>
6. Ayala, J. C., & Manzano, G. (2018). Academic performance of first-year university students: the influence of resilience and engagement. *Higher Education Research and Development*, 37(7), 1321–1335. <https://doi.org/10.1080/07294360.2018.1502258>
7. Badenes-ribera, L., Torrijos, C., Ballesteros, M. A., & Cebadera, E. (2021). *Studies in Educational Evaluation The effectiveness of the Go Koane-learning platform in improving university students' academic performance eNa. 70*. <https://doi.org/10.1016/j.stueduc.2021.101026>
8. Bond, M., & Bedenlier, S. (2019). Facilitating student engagement through educational technology: Towards a conceptual framework. *Journal of Interactive Media in Education*, 2019(1), 1–14. <https://doi.org/10.5334/jime.528>
9. Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2020). Mapping research in student engagement and educational technology in higher education: a systematic evidence map. In *International Journal of Educational Technology in Higher Education* (Vol. 17, Issue 1). <https://doi.org/10.1186/s41239-019-0176-8>
10. Costley, J., & Lange, C. (2016). The effects of instructor control of online learning environments on satisfaction and perceived learning. *Electronic Journal of E-Learning*, 14(3), 169–180.
11. Driscoll, A., Jicha, K., Hunt, A.N., Tichavsky, L., & Thompson, G. (2012). Can Online Courses Deliver In-class Results?: A Comparison of Student Performance and Satisfaction in an Online versus a Face-to-face Introductory Sociology Course. *Teaching Sociology*, 40(4), 312–331. <https://doi.org/10.1177/0092055X12446624>
12. Fischer, C., Fishman, B., Dede, C., Eisenkraft, A., Frumin, K., Foster, B., Lawrenz, F., Levy, A. J., & McCoy, A. (2018). Investigating relationships between school context, teacher professional

- development, teaching practices, and student achievement in response to a nationwide science reform. *Teaching and Teacher Education*, 72, 107–121. <https://doi.org/10.1016/j.tate.2018.02.011>
14. Francescucci, A., & Rohani, L. (2019). Exclusively Synchronous Online (VIRI) Learning: The Impact on Student Performance and Engagement Outcomes. *Journal of Marketing Education*, 41(1), 60–69. <https://doi.org/10.1177/0273475318818864>
  15. Giray, G. (2021). An assessment of students at its faction with e-learning: An empirical study with computer and software engineering undergraduate students in Turkey under pandemic conditions. *Education and Information Technologies*, 4. <https://doi.org/10.1007/s10639-021-10454-x>
  16. Gunuc, S., & Kuzu, A. (2015). Student engagement scale: development, reliability and validity. *Assessment and Evaluation in Higher Education*, 40(4), 587–610. <https://doi.org/10.1080/02602938.2014.938019>
  17. Hewitt, A., & Stubbs, M. (2017). Supporting law students' skills development online – A strategy to improve skills and reduce student stress? *Research in Learning Technology*, 25(201). <https://doi.org/10.25304/rlt.v25.1786>
  18. Hussain, M., Zhu, W., Zhang, W., & Abidi, S. M. R. (2018). Student Engagement Predictions in an e-Learning System and Their Impact on Student Course Assessment Scores. *Computational Intelligence and Neuroscience*, 2018. <https://doi.org/10.1155/2018/6347186>
  19. Islam, A. K. M. N. (2013). Investigating e-learning system usage outcomes in the university context. *Computers and Education*, 69, 387–399. <https://doi.org/10.1016/j.compedu.2013.07.037>
  20. Kahn, P. E. (2014). The rising student engagement in higher education. *British Educational Research Journal*, 40(6), 1005–1018. <https://doi.org/10.1002/berj.3121>
  21. Kapur, R., & Anne, L. (2018). Analysing the impact of e-learning technology on students' engagement, attendance and performance. *Research in Learning Technology*, 26(1063519).
  22. Kim, H. J., Hong, A. J., & Song, H. D. (2019). The roles of academic engagement and digital readiness in students' achievements in university e-learning environments. *International Journal of Educational Technology in Higher Education*, 16(1). <https://doi.org/10.1186/s41239-019-0152-3>
  23. Kostaki, D., & Karayianni, I. (2021). *Houston, we Have a Pandemic: Technical Difficulties, Distractions, and Online Student Engagement*.
  24. Kulikowski, K., Przytuła, S., & Sułkowski, Ł. (2021). E-learning? Never again! The intended consequences of COVID-19 forced e-learning on academic teacher motivational job characteristics. *Higher Education Quarterly, January*, 1–16. <https://doi.org/10.1111/hequ.12314>
  25. Lee, J. S. (2014). The relationship between student engagement and academic performance: Is it a myth or reality? *Journal of Educational Research*, 107(3), 177–185. <https://doi.org/10.1080/00220671.2013.807491>
  27. Lee, J., Song, H. D., & Hong, A. J. (2019). Exploring factors, and indicators for measuring students' sustainable engagement in e-learning. *Sustainability (Switzerland)*, 11(4). <https://doi.org/10.3390/su11040985>
  28. Mehrvarz, M., Heidari, E., Farrokhnia, M., & Noroozi, O. (2021). The mediating role of digital informal learning in the relationship between students' digital competency and their academic performance. *Computers and Education*, 167(June 2020), 104184. <https://doi.org/10.1016/j.compedu.2021.104184>
  29. Mishra, D. (2019). *Skills to Excel in Higher Education ONLINE SKILLS FOR RESEARCH SCHOLAR. May 2015*.
  30. Moreira, P. A. S., Dias, A., Matias, C., Castro, J., Gaspar, T., & Oliveira, J. (2018). School effects on students' engagement with school: Academic performance moderates the effect of school support for learning on students' engagement. *Learning and Individual Differences*, 67(October 2017), 67–77. <https://doi.org/10.1016/j.lindif.2018.07.007>
  31. Moubayed, A., Injadat, M., Shami, A., & Lutfiyya, H. (2018). Relationship between student engagement and performance in e-learning environment using association rules. *EDUNINE 2018 - 2nd IEEE World Engineering Education Conference: The Role of Professional Associations in Contemporaneous Engineer Careers, Proceedings*. <https://doi.org/10.1109/EDUNINE.2018.8451005>
  33. Mutahi, J., Kinai, A., Bore, N., Diriye, A., & Weldemariam, K. (2017). Studying engagement and performance with learning technology in an African classroom. *ACM International Conference Proceeding Series*, 148–152. <https://doi.org/10.1145/3027385.3027395>
  34. Pei Zhao, Sara Sintonen, H. K., Currie, K. L., & J. Courduff. (2015). The pedagogical functions of arts and cultural-heritage education with ICTs in museums. *International Journal of Instructional*

*Technology and Distance Learning*, 7.

35. Petillion, R. J., & McNeil, W. S. (2020). Student experiences of emergency remote teaching: Impacts of instructor practice on student learning, engagement, and well-being. *Journal of Chemical Education*, 97(9), 2486–2493. <https://doi.org/10.1021/acs.jchemed.0c00733>
36. Revilla-Cuesta, V., Skaf, M., Varona, J. M., & Ortega-López, V. (2021). The outbreak of the COVID-19 pandemic and its social impact on education: Were engineering teachers ready to teach online? In *International Journal of Environmental Research and Public Health* (Vol. 18, Issue 4, pp. 1–24). <https://doi.org/10.3390/ijerph18042127>
37. Stevens, N. T., Holmes, K., Grainger, R. J., Connolly, R., Prior, A. R., Fitzpatrick, F., O'Neill, E., Boland, F., Pawlikowska, T., & Humphreys, H. (2019). Can e-learning improve the performance of undergraduate medical students in Clinical Microbiology examinations? *BMC Medical Education*, 19(1), 1–8. <https://doi.org/10.1186/s12909-019-1843-0>
38. Stukalina, Y. (2008). How to prepare students for productive and satisfying careers in the knowledge-based economy: Creating a more efficient educational environment. In *Technological and Economic Development of Economy* (Vol. 14, Issue 2, pp. 197–207). <https://doi.org/10.3846/1392-8619.2008.14.197-207>
39. Tarhini, A., Deh, R. M., Al-Busaidi, K. A., Mohammed, A. B., & Maqableh, M. (2017). Factors influencing students' adoption of e-learning: A structural equation modeling approach. In *Journal of International Education in Business* (Vol. 10, Issue 2, pp. 164–182). <https://doi.org/10.1108/JIEB-09-2016-0032>
40. Trowler, V. (2010). Student engagement literature review. In *Higher Education* (Issue November, pp. 1–15). [http://americandemocracy.illinoisstate.edu/documents/democratic-engagement-white-paper-2\\_13\\_09.pdf](http://americandemocracy.illinoisstate.edu/documents/democratic-engagement-white-paper-2_13_09.pdf)
41. Urdan, T., & Schoenfelder, E. (2006). Classroom effects on student motivation Goal structures, social relationships, and competence beliefs. *Journal of School Psychology*, 44(5), 331–349. <https://doi.org/10.1016/j.jsp.2006.04.003>
42. Zepke, N. (2018). Student engagement in neo-liberal times: what is missing? *Higher Education Research and Development*, 37(2), 433–446. <https://doi.org/10.1080/07294360.2017.1370440>