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Unpacking the Impact of E-Learning Participation on Academic Performance: An experimental study.

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Unpacking the Impact of E-Learning Participation on Academic Performance: An Experimental Study.

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Abstract

This paper explores the relationship between students' final exam scores and their participation in distance learning forums and platforms. The study investigates whether active engagement in online forums and educational platforms correlates with improved academic performance. Analyzing data from distance learners in Hellenic Open University, the research examines participation metrics, such as frequency of forum posts, responses to peers, and engagement with course materials.

Preliminary findings suggest a positive correlation between students' participation in online forums and their final exam marks. Students who actively contributed to discussions, sought clarification, and collaborated with peers tended to perform better in their exams.

Understanding this relationship is essential for educators and institutions aiming to enhance online learning outcomes. Insights from this research may inform instructional strategies and course design, emphasizing the importance of fostering robust online learning communities to support student success in distance education.

Keywords

Distance education, e-learning, academic performance, student participation, student engagement

Introduction

In recent years, distance learning has emerged as a prominent mode of education, offering flexibility and accessibility to a diverse range of students. One essential element of this educational landscape is the online forum or discussion platform, where learners engage in discussions, collaborate on assignments, seek clarification, and share insights (Onyema et al., 2019). These forums serve as the virtual classroom's social hub, fostering a sense of community and interaction that parallels the physical classroom experience (Sweet et al., 2020).

The connection between students' performance in final exams and their active participation in distance learning forums and platforms has become a subject of increasing interest and importance in the realm of online education. As the world embraces digital learning environments, understanding how students' engagement in these virtual spaces influences their academic outcomes is a critical area of study (Wikle, & West, 2019; Figueroa-Cañas & Sancho-Vinuesa, 2020; Libre, 2021). This paper aims to explore this dynamic relationship and shed light on its multifaceted aspects.

By examining the available literature, research methodologies, and findings, this paper aims to contribute to our understanding of the complex interplay between online engagement and academic achievement. Additionally, it intends to highlight potential implications for instructors, course designers, and educational institutions seeking to optimize the online learning experience. Through this analysis, we aim to contribute to the ongoing discourse surrounding online education and its impact on academic achievement, ultimately advancing our understanding of the complex relationship between digital engagement and student success.

We summarize the goals of our study in the following research question: How does students' participation in distance learning forums and platforms influence their academic performance, particularly in the context of final exams? This question is of paramount importance as educational institutions worldwide continue to integrate

online components into their curricula, whether in response to global events or the ongoing advancement of technology. The exploration of the relationship between students' participation in digital learning environments and their performance on final exams holds profound implications for instructional design, pedagogical strategies, and the overall effectiveness of online education.

This paper embarks on a comprehensive investigation into the interplay between students' engagement in distance learning forums and platforms and their marks in final exams. It delves into the multifaceted aspects of this relationship, considering variables such as the frequency and quality of participation, the nature of online interactions, and the influence of various educational contexts. By shedding light on these dynamics, this research endeavors to offer insights that can inform educators, institutions, and policymakers in their efforts to optimize online learning experiences and enhance student outcomes.

In order to answer this research question, we used data from postgraduate distance learning provided by the School of Science and Technology at the Hellenic Open University. While the answer may appear intuitive, the relationship is nuanced and influenced by various factors. This paper seeks to delve into existing research, analyze empirical evidence, and provide insights into the extent to which students' participation in distance learning forums and platforms affects their marks in final exams.

As we embark on this exploration, it is essential to recognize that the evolving landscape of distance education demands ongoing investigation. This paper serves as an introduction to a broader discussion, inviting readers to delve deeper into the empirical evidence and practical implications that follow in subsequent sections.

Related work

In the ever-evolving landscape of education, distance learning has emerged as a prominent and accessible mode of acquiring knowledge and skills. The widespread adoption of online platforms and forums has revolutionized the way students engage with course materials, instructors, and peers. Research on the correlation between students' final exam marks and their participation in distance learning forums and platforms has gained attention in the field of online education. The following related

work suggests that there is a positive association between students' active participation in online forums and their academic performance, particularly in terms of final exam marks. However, it is essential to note that the strength of this correlation can vary based on course design, discipline, and other factors. Further research in this area continues to refine our understanding of how online forum participation affects learning outcomes in distance education settings.

More specifically, the research by Chen, B., de Noyelles, A., & Zhao, J. (2018) explored the association between students' online discussion participation and their final course grades in higher education settings. The study revealed a positive relationship, suggesting that students who actively participated in online discussions achieved higher grades. On the same path, the research works of Dong, C., and Goh, D. H. (2015) and Schneckenberg, D. (2009) explore how students' acceptance and use of e-learning environments, including participation in forums, influence their academic performance.

Moreover, according to Kizilcec, R. F., Pérez-Sanagustín, M., and Maldonado, J. J. (2017), Kizilcec, R. F., Piech, C., & Schneider, E. (2013) and Khalil, H., & Ebner, M. (2015), students who actively engaged in course forums tended to have better exam scores. The research examined the relationship between forum participation and academic performance in massive open online courses. The impact of different levels of online forum participation on students' learning outcomes in blended courses was investigated by Hew, K. F. and Cheung, W. S. (2014). The results proved that higher levels of participation were associated with better final exam scores.

Focusing on nursing students in online courses, the relationship between participation in online discussion and academic performance indicated a positive correlation between participation and final course grades (Murphy, C. A., Stewart, J., & Duncan, C., 2015)

Another study of undergraduate students examined the influence of forum participation and other online activities on academic achievement. The outcomes proved that active forum engagement positively affected final exam scores (Li, N., & Liu, E. Z. F., 2019).

A critical issue that lies above and beyond every action of data analysis is students' privacy protection. In order to protect students' personal data several anonymization

techniques have been proposed such for example the work presented by Tsoni et al., (2021b) where a pipeline of anonymization techniques especially for students' log data is proposed.

In Verykios et al., (2022) temporal log data are used to create a prediction of online “traffic” based on times series analysis in order to be used in an alert system that would inform the tutors so they can promptly act to support students. Additionally, in Karapiperis et al., (2023) the analysis of students’ online actions during certain periods concerning due dates of written assignments and exams showed several different profiles and behavioral patterns. Concerning students’ behavior, an in-depth analysis of multiple features captured in students’ online actions can reveal latent traits in their behavior helping tutors support them according to their needs. A holistic system that would automatically retrieve, analyze and report in dashboards such characteristics is proposed in the work of Tsoni et al, (2022), while in Gkontzis et al, (2018) a Learning Analytics approach that can detect students who might have presented other people's work as their own. Amongst others, Learning Analytics can promote the improvement of inclusiveness especially in online, distance learning settings by detecting weaknesses in the educational material, excluded students and students of high dropout risk (Kouvara, 2023)

Description of the data set

This study was based on primary research that constitutes its originality and contribution. We gathered recent data, in terms of log files, capturing the interaction of students and their tutors in the LMS that supports a postgraduate course at the School of Science and Technology of the Hellenic Open University. The duration of the course is one academic year. During their studies, students have a predefined curriculum and their pace is set from benchmarks concerning mainly written assignments. They also have the right to participate in 6 optional online meetings. During these meetings students of the same group can interact in real-time with their tutor and their peers, they can get answers to their questions and discuss their difficulties. The course is provided in the first year of the two-year postgraduate program. In total 169 students were enrolled, supported by 11 members of the

teaching staff, including the supervisor of the course and the tutors of each group. The students were divided into 8 groups of approximately 20 students per group. All the groups follow the same pace, have the same workload and are evaluated by the same exams. Students also have the option to participate in the course's forum. However, there are no mandatory forum-related assignments. Therefore, the discussion topics may vary from simple ice-breaking discussions to subject-focused questions. The log files maintained pseudonyms for each student to allow our research to focus solely on their activity.

Results and Discussion

In this section, we analyze the data provided by the research. We consider that there are two types of students, according to the number of posts on the forum. We consider as *lonely wolves* the students who never post and as *super posters* those students whose number of posts is above the 95th percentile of the data set. We generated the following figures, using the Python programming language, utilizing the number of posts and views, the scores of the final exams, and the averages of scores of the written assignments.

The first two figures refer to the final exam scores and the averages of the written assignments of the lonely wolves and the super posters sorted according to the view counts. Figure 1 is about lonely wolves and shows that when the view counts are low, the marks on the final exam and the average of written assignments can be low or high. On the other hand, when the view counts are high, the marks on the final exam and the average of written assignments are high. Figure 2 is about the score in the final exam and the average of written assignments of the super posters and shows that their academic performance is irrelevant to the view count.

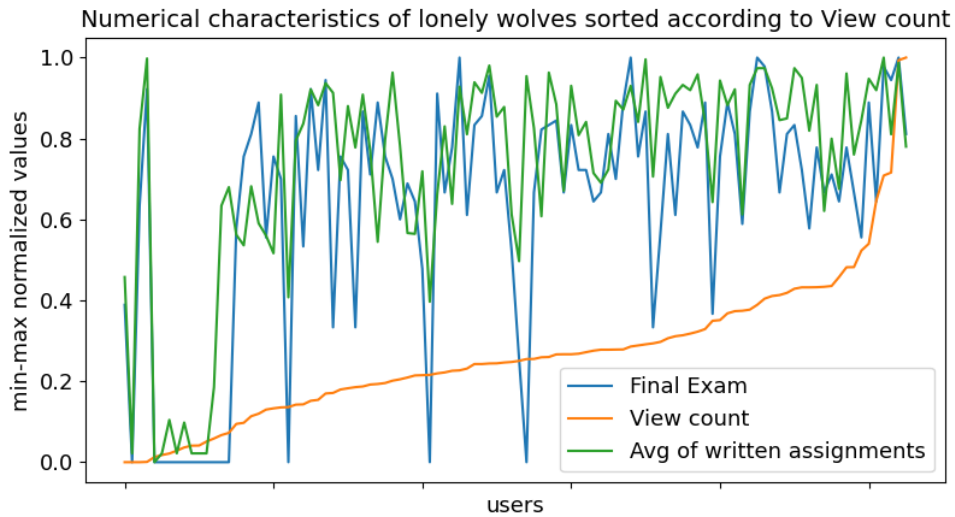


Figure 1: The final exam scores and the averages of the written assignments of the lonely wolves sorted according to the view counts

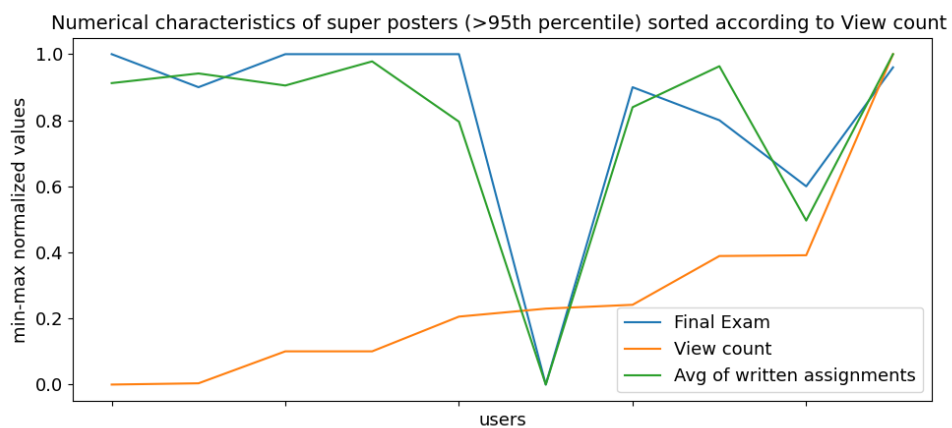


Figure 2: The final exam scores and the averages of the written assignments of the super posters sorted according to the view counts

The following pair of figures is about the averages of the written assignments and the view counts sorted according to the marks in the final exam. Figure 3 presents that the lonely wolves have low scores on the final exam when the view count is low and when they have high scores, the view count is irrelevant. Likewise, Figure 4 presents

that super posters have low or high scores in the final exam and low or high averages of written assignments even if they have low or high view counts.

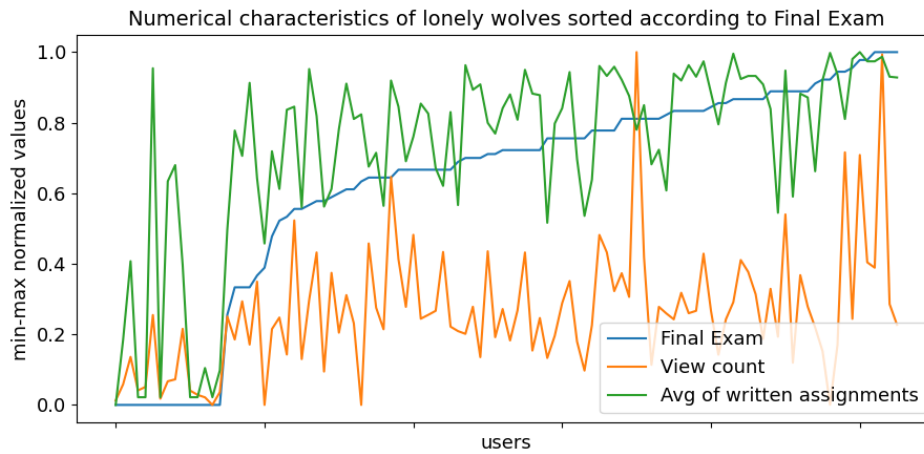


Figure 3: The view counts and the averages of the written assignments of the lonely wolves sorted according to the final exam scores

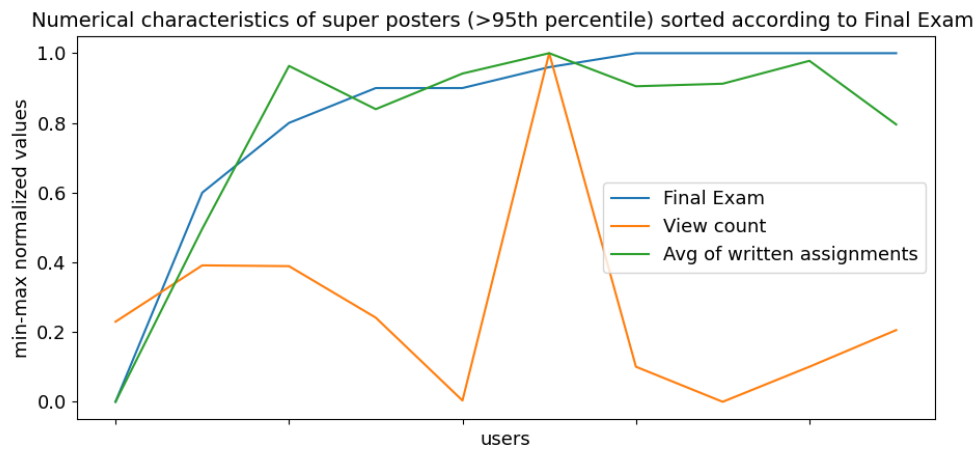


Figure 4: The view counts and the averages of the written assignments of the super posters sorted according to the final exam scores

The last pair of figures is about the view counts and the final exam scores sorted according to the averages of the written assignments of the lonely wolves and the super posters. Figure 5 presents that when the average of written assignments for

lonely wolves is low, the score in the final exam and the view counts are low too. On the other hand, when the average of written assignments for lonely wolves is high, the score in the final exam and the view counts can be either low or high. Figure 6 presents that when the average of written assignments for super posters is low, the score in the final exam and the view counts are low too. When the average of written assignments for super posters is high, the score in the final exam is high and the view counts can be either low or high.

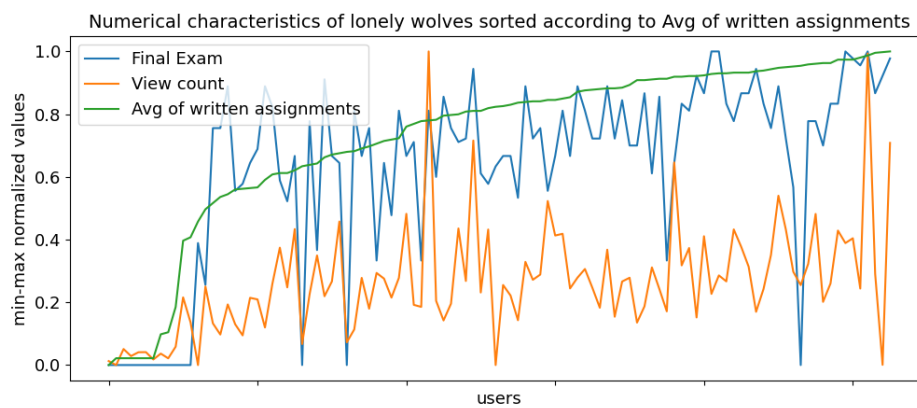


Figure 5: The final exam scores and the view counts of the lonely wolves sorted according to the averages of the written assignments

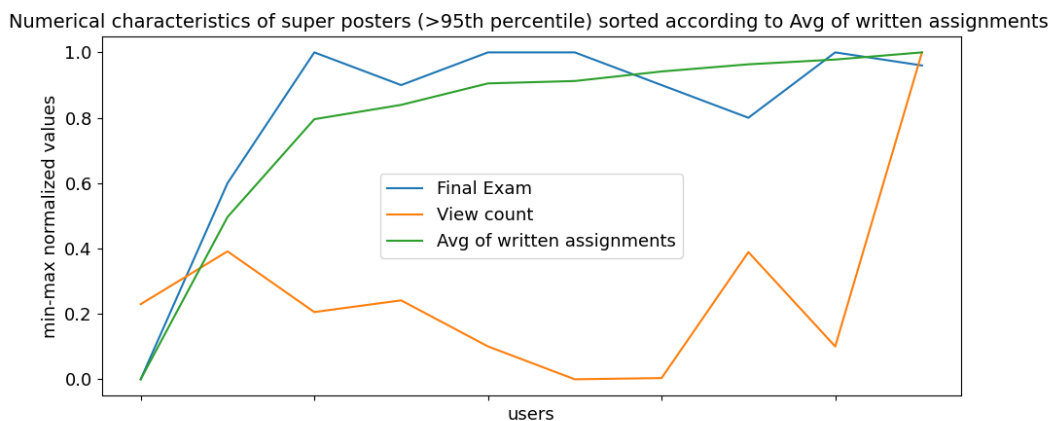


Figure 6: The final exam scores and the view counts of the super posters sorted according to averages of the written assignments

The above figures present that the students who participate in the forum have high academic performance. On the other hand, students who prefer to stay alone and not participate may have low or high scores. The above findings are a reason to continue the research, taking other parameters into account.

Conclusions and future work

Our analysis of existing literature and empirical evidence suggest a positive correlation between these students' active participation in online forums and their performance in final exams. Students who engage meaningfully in virtual discussions, seek clarifications, and collaborate with peers tend to achieve better marks in their exams. The connection between students' marks in final exams and their participation in distance learning forums and platforms is an evolving area of study. While this paper has offered a glimpse into the existing research landscape, it is clear that further exploration and investigation are needed to fully grasp the intricacies of this relationship. Future research could benefit from longitudinal studies tracking students' forum participation and exam performance over multiple courses or semesters to identify patterns and trends. Additionally, the use of advanced data analytics and machine learning techniques can provide deeper insights into the relationship between online participation and academic outcomes. Further qualitative research could enlighten the correlation between high performance and active participation on forums and e-platforms.

As online education continues to evolve, understanding how to harness the potential of digital forums for improved learning outcomes remains a vital area for educational research and practice. Ultimately, it is through such scholarly inquiry that we can refine our approaches to online education, enhance student-learning experiences, and foster success in the digital age.

References

- Chen, B., deNoyelles, A., & Zhao, J. (2018). Impact of students' use of discussion forums on their learning outcomes. *Journal of Online Learning and Teaching*, 1-16. [\(λειτουργεί doi ή link, italics\)](#)
- Dong, C., & Goh, D. H. (2015). Modeling the Impact of E-Learning on Academic Performance. *Computers & Education*, 58-68. [\(λειτουργεί doi ή link, italics\)](#)
- Figuerola-Cañas, J., & Sancho-Vinuesa, T. (2020). Early prediction of dropout and final exam performance in an online statistics course. *IEEE Revista Iberoamericana de Tecnologías del Aprendizaje*, 86-94. [\(λειτουργεί doi ή link, italics\)](#)
- Gkontzis, A., Kotsiantis, S., Tsoni, R., & Verykios, V. S. (2018). An Effective LA Approach to Predict Student Achievement. In *Proceedings of the 22nd Pan-Hellenic Conference on Informatics. ACM*. [\(λειτουργεί doi ή link, italics και σελίδες\)](#)
- Hew, K. F., & Cheung, W. S. (2014). Students' and instructors' use of massive open online courses (MOOCs): Motivations and challenges. *Educational Research Review*, 45-58. [\(λειτουργεί doi ή link, italics\)](#)
- Karapiperis, D., Tzafilkou, K., Tsoni, R., Feretzakis, G., & Verykios, V. S. (2023). A Probabilistic Approach to Modeling Students' Interactions in a Learning Management System for Facilitating Distance Learning. *Information*. [\(λειτουργεί doi ή link, italics και σελίδες\)](#)
- Khalil, H., & Ebner, M. (2015). What Is the Impact of MOOCs on Participants' Networks and Collaboration? *Computers in Human Behavior*, 341-349. [\(λειτουργεί doi ή link, italics\)](#)
- Kizilcec, R. F., Pérez-Sanagustín, M., & Maldonado, J. J. (2017). Self-regulated learning strategies predict learner behavior and goal attainment in massive open online courses. *Computers & Education*, 18-33. [\(λειτουργεί doi ή link, italics\)](#)
- Kizilcec, R. F., Piech, C., & Schneider, E. (2013). Deconstructing Disengagement: Analyzing Learner Subpopulations in Massive Open Online Courses. In *Proceedings of the Third International Conference on Learning Analytics and Knowledge (LAK'13)*, 170-179. [\(λειτουργεί doi ή link, italics\)](#)
- Kouvara T., Tsoni R., Verykios V. S. (2022). Openness Is not Enough Without Inclusiveness: The Learning Analytics Parable. In the proceedings of I-HE2022, EADTU. [\(λειτουργεί doi ή link, italics\)](#)
- Libre, N. A. (2021). A Discussion Platform for Enhancing Students Interaction in the Online Education. *Journal of Online Engineering Education*, 07-12. [\(λειτουργεί doi ή link, italics\)](#)
- Li, N., & Liu, E. Z. F. (2019). Exploring factors influencing the academic performance of undergraduate students in online courses. *Journal of Online Learning and Teaching*, 57-72. [\(λειτουργεί doi ή link, italics\)](#)
- Murphy, C. A., Stewart, J., & Duncan, C. (2015). Nurse educators' experiences of facilitating students' learning in an online discussion board. *Nurse Education in Practice*, 15(6), 483-488. [\(λειτουργεί doi ή link, italics\)](#)
- Onyema, E. M., Deborah, E. C., Alsayed, A. O., Noorulhasan, Q., & Sanobar, S. (2019). Online discussion forum as a tool for interactive learning and communication. *International Journal of Recent Technology and Engineering*, 4852-4859. [\(λειτουργεί doi ή link, italics\)](#)
- Rovai, A. P., & Jordan, H. M. (2004). Blended learning and sense of community: A comparative analysis with traditional and fully online graduate courses. *The International Review of Research in Open and Distributed Learning*. [\(λειτουργεί doi ή link, italics\)](#)

- Schneckenberg, D. (2009). Investigating Students' Acceptance of E-Learning Environments: A Combination of the Technology Acceptance Model and Uses and Gratifications Theory. *Educational Computing Research*, 305-321. [\(λείπει doi ή link, italics\)](#)
- Shea, P., & Bidjerano, T. (2012). Learning presence: Towards a theory of self-efficacy, self-regulation, and the development of communities of inquiry in online and blended learning environments. *Computers & Education*, 1121-1131. [\(λείπει doi ή link, italics\)](#)
- Swan, K., & Shih, L. F. (2005). On the nature and development of social presence in online course discussions. *Journal of Asynchronous Learning Networks*, 115-136. [\(λείπει doi ή link, italics\)](#)
- Sweet, K. S., LeBlanc, J. K., Stough, L. M., & Sweany, N. W. (2020). Community building and knowledge sharing by individuals with disabilities using social media. *Journal of computer assisted learning*. [\(λείπουν doi ή link, italics\)](#) [doi ή link, italics αριθμός σελίδων](#)
- Tsoni, R., Panagiotakopoulos, C. T., & Verykios, V. S. (2021). Revealing latent traits in the social behavior of distance learning students. *Education and Information Technologies*, 1-37. [\(λείπει doi ή link, italics\)](#)
- Tsoni, R., Zorkadis V. & Verykios, V. S. (2021). A data pipeline to preserve privacy in educational settings. In *Proceedings of the 25nd Pan-Hellenic Conference on Informatics*. ACM. [\(λείπει doi ή link, italics σελίδες\)](#)
- Tsoni R., Garani G. & Verikios V.S (2022). Incorporating Data Warehouses into Data Pipelines for Deploying Learning Analytics Dashboards. In *Proceedings of 13th International Conference on Information, Intelligence, Systems & Applications (IISA)*. IEEE. [\(λείπει doi ή link, italics & σελίδες\)](#)
- Verykios V. S., Tsoni R., Garani G., & Panagiotakopoulos C. T. (2022). *Fleshing out Learning Analytics and Educational Data Mining with Data and ML Pipelines*. Springer. [\(λείπει doi ή link, italics\)](#)
- Wikle, J. S., & West, R. E. (2019). An analysis of discussion forum participation and student learning outcomes. *International Journal on E-Learning*, 205-228. [\(λείπει doi ή link, italics\)](#)