

## Article

# Impact of the COVID-19 Confinement on the Physics and Chemistry Didactic in High Schools

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**Abstract:** Online education due to COVID-19 confinement impacted the use of the Information and Communication Technology (ICT) in Spain, where it was poorly implemented. The aim of this paper was to inspect the methodological changes in Physics and Chemistry teaching during the confinement as well as in the ICT use and the lockdown impact afterwards. For this purpose, an online survey was administered by email to the Physics and Chemistry teachers of three provinces of Spain. Based on the analysis, the most widely used methodology was the traditional one. Still, during the lockdown, its use decreased, and others, such as the flipped classroom, increased significantly. Other adaptations included increasing the use of virtual simulations and self-learning by the student. It can be outlined the incorporation of new tools such as WebQuests, the smartphone, or online education platforms, whose use has continued. The ICT was used for new functionalities such as evaluation or answering student questions. According to the respondents, the lockdown had entailed that they strengthen implementation of ICT. In conclusion, there have been changes that have remained in the Physics and Chemistry didactic and in the ICT use due to the lockdown situation.



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**Keywords:** educational technologies; digital technologies; teaching experiences; learning experiences; pedagogy

## 1. Introduction

COVID-19 confinement caused an absolute rupture of the way life had been until then. Everyone was forced to remain at home and significant changes had to be implemented in order to minimize disruption on the economy and life. In this regard, education was one of the affected areas since there was a huge shift, especially in primary schools and high schools, from face-to-face teaching to online teaching.

Even if Information and Communication Technology (ICT) has a large presence in the classrooms, it has been proven that they are not really used during the lessons [1]. Nevertheless, due to the confinement, its implementation was imposed.

The aim of this article is to acquaint the changes in the Physics and Chemistry didactic due to the COVID-19 global confinement and its impact afterwards in the employed methodologies and in the use of ICT. For this purpose, an online survey was administered to the secondary teachers of Physics and Chemistry working in three provinces of Castilla and Leon, Spain.

For this purpose, first, the situation of the ICT in high schools in Spain was analysed, as well as its main applications in the Physics and Chemistry didactic and the difficulties encountered to implement them in the classroom. In addition, the use of the ICT during the confinement is presented in the introduction. Next, the methodology employed is described. Then, the results are analysed, and last, we present the the discussion and the conclusions of the paper.

44. Pratsobrerroca Pujol, M. Didactic Adaptations Needed to Successfully Teach EFL in a Pandemic Context: Teaching Speaking. In *Trabajo fin de Máster*; Universidad de Vic: Barcelona, Spain, 2021. Available online: <http://hdl.handle.net/10854/6868> (accessed on 31 March 2022).
45. Rodríguez-Rodríguez, E.; Sánchez-Paniagua, M.; Sanz-Landaluze, J.; Moreno-Guzmán, M. Analytical Chemistry Teaching Adaptation in the COVID-19 Period: Experiences and Students' Opinion. *J. Chem. Educ.* **2020**, *97*, 2556–2564. [[CrossRef](#)]
46. Bond, M. Schools and emergency remote education during the COVID-19 pandemic: A living rapid systematic review. *Asian J. Distance Educ.* **2020**, *15*, 191–247.
47. Hernández-Ortega, J.; Álvarez Herrero, J.F. Gestión educativa del confinamiento por COVID-19: percepción del docente en España. *Rev. Esp. Educ. Comp.* **2021**, *38*, 129–150. [[CrossRef](#)]
48. Mseleku, Z. A Literature Review of E-Learning and E-Teaching in the Era of Covid-19 Pandemic. *Int. J. Innov. Sci. Res. Technol.* **2020**, *5*, 588–597.
49. Prieto-Ballester, J.M.; Revuelta-Domínguez, F.I.; Pedrera-Rodríguez, M.I. Secondary School Teachers Self-Perception of Digital Teaching Competence in Spain Following COVID-19 Confinement. *Educ. Sci.* **2021**, *11*, 407. [[CrossRef](#)]
50. Rodríguez, C.L.; Mula-Falcón, J.; Segovia, J.D. The Effects of Covid-19 on Science Education: A Thematic Review of International Research. *J. Turk. Sci. Educ.* **2021**, *18*, 20.
51. Ballesta Pagán, F.J.; Lozano Martínez, J.; Cerezo Máiquez, M.C. Internet Use by Secondary School Students: A Digital Divide in Sustainable Societies? *Sustainability* **2018**, *10*, 3703. [[CrossRef](#)]
52. European Commission; Joint Research Centre. *The Likely Impact of COVID-19 on Education: Reflections Based on the Existing Literature and Recent International Datasets*; Publications Office: Luxembourg, 2020.
53. Kuhfeld, M.; Soland, J.; Tarasawa, B.; Johnson, A.; Ruzek, E.; Liu, J. Projecting the Potential Impact of COVID-19 School Closures on Academic Achievement. *Educ. Res.* **2020**, *49*, 549–565. [[CrossRef](#)]
54. Retnawati, H. The Influence of Online Learning on Physics Learning Outcomes during the Covid-19 Pandemic. *Radiasi J. Berk. Pendidik. Fis.* **2022**, *15*, 35–42.
55. Goyal, N.; Abdulahad, A.I.; Privett, J.A.; Verma, A.; Foroozesh, M.; Coston, T.S. Student Grade Evaluation, Survey Feedback, and Lessons Learned during the COVID-19 Pandemic: A Comparative Study of Virtual vs. In-Person Offering of a Freshman-Level General Chemistry II Course in Summer at Xavier University of Louisiana. *Educ. Sci.* **2022**, *12*, 226. [[CrossRef](#)]