

Appendix 1.

The papers included in the scoping review: Exploring the Applications of QR Codes in STEM Subjects. Evgenia Tsoukala, Ioannis Lefkos and Nikolaos Fachantidis.

No	Paper title	Authors	Date
1	An interactive concept map approach to supporting mobile learning activities for natural science courses	Hwang, G.-J., Wu, P.-H., & Ke, H.-R	2011
2	The implementation of mobile learning in outdoor education: Application of QR codes	Lai, H.-C., Chang, C.-Y., Wen-Shiane, L., Fan, Y.-L., & Wu, Y.-T.	2013
3	Combining mobile technologies in environmental education: a Greek case study	Kalogiannakis, M., & Papadakis, S.	2017
4	An evaluation of the learning effectiveness of concept map-based science book reading via mobile devices	Yang, C.-C & Hwang, Gwo-Jen & Hung, Chun-Ming & Tseng, S.s	2013
5	Interaction Between Gaming And Multistage Guiding Strategies On Students' Field Trip	Chen, C.-H., Liu, G.-Z., & Hwang, G.-J.	2015
6	Mobile Learning Performance And Motivation Scan & Learn! Use of Quick Response Codes & Smartphones in a Biology Field Study	Lee, J.-K., Lee, I.-S., & Kwon, Y.-J.	2011
7	Mobile Gaming and Student Interactions in a Science Center: the Future of Gaming in Science Education	Atwood-Blaine, D., & Huffman, D.	2017
8	Implementation of Gamification and Elements of Augmented Reality During the Binary Lessons in a Secondary School	Buzko, V. L., Bonk, A. V. & Tron, V. V.	2018
9	A Progressive Prompting Approach to Conducting Context-Aware Learning Activities for Natural Science Courses	Chen, C.-H. ., Hwang, G.-J. ., & Tsai, C.-H. .	2014
10	Gamification of Assessments in the Natural Sciences Subject in Primary Education	Sánchez- Rivas, E., & Ruiz-Palmero, J.	2019
11	Effects Of Mode Of Target Task Selection On Learning About Plants In A Mobile Learning Environment: Effortful Manual Selection Versus Effortless Qr-code	Gao, Y., Liu, T.-C., & Paas, F.	2015
12	The problem-refining progress of 5th graders' ubiquitous inquiry	Hung, P. H., Hwang, G. J., Lee, Y. H., & Wu, T. H.	2011
13	Effects of an integrated mind-mapping and problem-posing approach on students' in-field mobile learning performance in a natural science course	Hung, C. M., Hwang, G. J., & Wang, S. Y.	2014
14	Enhancing elementary student learning in natural sciences through mobile augmented reality technology	Stoyanova, D., Kafadarova, N., & Stoyanova-Petrova, S.	2015
15	Using QR-Code in a green technology module to foster motivation and independent learning	Rasul, M. S., Rauf, R. A. A., Mansor, A. N., & Affandi, H. M.	2017
16	Using Smartphones and QR Codes for Supporting Students in Exploring Tree Species	Eliasson, J., Knutsson, O., Ramberg, R., & Cerratto-Pargman, T.	2013

17	Work in progress: On the improvement of STEM education from preschool to elementary school	Ros, S., Tobarra, L., Robles-Gómez, A., Caminero, A. C., Hernández, R., Pastor, R., Ricoy, A., Fernández, A., Díaz, L. M., & Cano, J.	2016
18	Use of Information and Communication Technology and Resources of the Internet in Education Natural Sciences	Pietrzak, M.	2016
19	Ict And Current Trends As A Path To Stem Education:implementation And Prospects Using The Potential Of Mobile Augmented Reality For Teaching/learning Elementary School Natural Sciences	Lukychova, N. S., Osypova, N. V., & Yuzbasheva, G. S.	2022
20	Quick Response (qr) Code Assisted Learning Media On System Materials For Distance Learning Sky Coordinates	Stoyanova-Petrova, S., Kafadarova, N., & Stoyanova, D	2013
21	QR Code Card Media on Science Learning to Overcome Misconception of Elementary School Student	Serevina, V., Nurhasanah, D., & Shaladsha	2022
22	INTERACTIVE LEARNING MODEL OF THE QUR'AN AND NATURAL SCIENCE BASED ON QR-CODE INTEGRATED AUGMENTED REALITY FOR HIGH SCHOOL STUDENTS	Sejati, M. W., & Sayekti, I. C.	2022
23	Science in the Context of Society through QR Code in Problem Based Learning	Ramadhan, M. R., Fahmi, M. I. N., & Hasanah, S. M	2021
24	STEM Students on the Stage (SOS): Promoting Student Voice and Choice in STEM Education through an Interdisciplinary, Standards-focused Project Based Learning Approach	Devraj Kumar, D., & Lapp, S.	2019
25	Using Location-Based Games for Educational Purposes	Sahin, A.	2015
26	Constructivism Through Project Based STEM Transmedia	Erenli, K.	2013
27	The Effects of a STEM Intervention on Elementary Students' Science Knowledge and Skills	Stansell, A., & Tyler-Wood, T.	2016
28	Enhancing nutritional learning outcomes within a simulation and pervasive game-based strategy	Cotabish, A., Dailey, D., Robinson, A., & Hughes, G.	2019
29	The Implementation of Educational Technology by Brazilian Teachers Participating in a Finnish Online Teacher Education Program	Mcmahon, M. T., & Henderson, S.	2011
30	Teacher Efficacy in 1:1 Tablet Integration	Curcher, M., Mendes, C., Lima, C., Miyaji, D., Martins, J., & Ragusa, J.	2015
31	Mobile-based Quiz Rally Management System aimed at learning the Region	Minshew, L. & Anderson, J.	2014
32	Development of QR Code-Based Learning Multimedia to Improve Literature of Elementary School Students	Takata, S., & Yamagishi, Y.	2015
33	Qr Based U-learning Material Production System (qr-ulmps)	Auliaty, Y., Iasha, V., & Siregar, Y. E. Y.	2021
34		K.G. Sathyavathy, P. Vijayaragavan, & Sharmasth, V. Y.	2016