

Realidad aumentada, WebGIS y storytelling para la docencia geográfica: una revisión bibliográfica

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RESUMEN: Se presenta un resumen con la bibliografía recopilada en el Proyecto de Innovación Docente, referida a realidad aumentada, WebGIS, cartografía y storytelling enfocados a la docencia en geografía y ciencias sociales afines. Todas las obras recogidas en el listado han podido ser consultadas a través de repositorios en Internet y en las bases de datos de la Universidad de Valladolid, y se han recopilado para poder ser consultadas en el ámbito de un grupo de innovación docente

PALABRAS CLAVE: proyecto, innovación, docente, docencia, geolocalización, realidad aumentada, storytelling, WebGIS, geografía, bibliografía.

REALIDAD AUMENTADA

Agarwal, A., et al. (2014). Mobile Application Development with Augmented Reality. *International Journal of Computer Sciences and Engineering*, 2, 20-25.

Azuma, R. T. (1997). A survey of augmented reality. *Presence*, 6(4), 355-385.

Azuma, R., Lee, J. W., Jiang, B., Park, J., You, S., & Neumann, U. (1999). Tracking in unprepared environments for augmented reality systems. *Computers & Graphics*, 23(6), 787-793.

Bacca, J., Baldiris, S., Fabregat, R., Graf, S., & Kinshuk. (2014). Augmented reality trends in education: A systematic review of research and applications. *Journal of Educational Technology & Society*, 17(4), 133-149.

Basogain, X., Olabe, M., Espinosa, K., Rouèche, C., & Olabe, J. (2010). Realidad aumentada en la educación: Una tecnología emergente. *Online Educa Madrid 2007: 7ª Conferencia Internacional De La Educación y La Formación Basada En Las Tecnologías*, Madrid.

Bishop, I. D. (2015). Location based information to support understanding of landscape futures. *Landscape and Urban Planning*, doi: [10.1016/j.landurbplan.2014.06.001](https://doi.org/10.1016/j.landurbplan.2014.06.001) (Online First)

Bitter, G., & Corral, A. (2014). The pedagogical potential of augmented reality apps. *International Journal of Engineering Science Invention*, 3(10), 13-17.

Bower, M., et al. (2014). Augmented reality in education—cases, places and potentials. *Educational Media International*, 51(1), 1-15.

Cadavieco, J. F. (2014). La interactividad de los dispositivos móviles geolocalizados, una nueva relación entre personas y cosas. *Historia y Comunicación Social*, 18, 777-788.

Cadavieco, J. F., de Fatima Goulão, M., & Costales, A. F. (2012). Using augmented reality and m-learning to optimize students performance in higher education. *Procedia-Social and Behavioral Sciences*, 46, 2970-2977.

Callejas, M., Quiroga, J. G., & Alarcón, A. C. (2011). Ambiente interactivo para visualizar sitios turísticos, mediante realidad aumentada implementando LAYAR. *Ciencia e Ingeniería Neogranadina*, 21(2), 91-105.

Cascales, A., et al. (2013). An experience on natural sciences augmented reality contents for preschoolers. 8022, 103-112. doi:10.1007/978-3-642-39420-1_12

Chen, C. H., Ho, C. H., & Lin, J. B. (2015). The Development of an Augmented Reality Game-based Learning Environment. *Procedia-Social and Behavioral Sciences*, 174, 216-220.

Cheng, K., & Tsai, C. (2013). Affordances of augmented reality in science learning: Suggestions for future research. *Journal of Science Education and Technology*, 22(4), 449-462.

Chi, H., Kang, S., & Wang, X. (2013). Research trends and opportunities of augmented reality applications in architecture, engineering, and construction. *Automation in Construction*, 33, 116-122.

Chiang, T. H., Yang, S. J., & Hwang, G. (2014). An augmented reality-based mobile learning system to improve students' learning achievements and motivations in natural science inquiry activities. *Journal of Educational Technology & Society*, 17(4), 352-365.

Chowdhury, S. A. (2013). A mobile augmented reality and multimedia application for mobile learning. *International Journal of Digital Content Technology and its Applications*, (7), 25-32.

Cruz, E. M. (2015). La realidad aumentada aplicada en los dispositivos móviles: Una alternativa educativa. *Revista Iberoamericana Para La Investigación y El Desarrollo Educativo ISSN: 2007-2619*, (12)

De la Torre, J. et al. (2013). Entorno de aprendizaje ubicuo con realidad aumentada y tabletas para estimular la comprensión del espacio tridimensional. *RED. Revista De Educación a Distancia. Número, 37*

De Paiva Guimarães, M., Gnecco, B. B., Roberto, D., & Dias, C. *Realidade aumentada para aplicações web e mobile*

De Pedro Carracedo, J. (2011). Realidad aumentada: Un nuevo paradigma en la educación superior. *Congreso Iberoamericano Educación y Sociedad*, 300-307.

De Pedro Carracedo, J., & Méndez, C. L. M. (2012). Realidad aumentada: Una alternativa metodológica en la educación primaria nicaragüense. *IEEE-Rita*, 7(2), 102-108.

Di Serio, A., Ibáñez, M. B., & Kloos, C. D. (2013). Impact of an augmented reality system on students' motivation for a visual art course. *Computers & Education*, 68, 586-596.

Doyle, S., Dodge, M., & Smith, A. (1998). The potential of web-based mapping and virtual reality technologies for modelling urban environments. *Computers, Environment and Urban Systems*, 22(2), 137-155.

- Dunleavy, M., Dede, C., & Mitchell, R. (2009). Affordances and limitations of immersive participatory augmented reality simulations for teaching and learning. *Journal of Science Education and Technology*, 18(1), 7-22.
- Espinosa, C. P. (2015). Realidad aumentada y educación: Análisis de experiencias prácticas. *Pixel-Bit. Revista De Medios y Educación*, (46), 187-203.
- Fombona Cadavieco, J., Pascual Sevillano, M. Á., & Madeira Ferreira Amador, María Filomena. (2012). Realidad aumentada, una evolución de las aplicaciones de los dispositivos móviles.
- Fukuda, T., Zhang, T., & Yabuki, N. (2014). Improvement of registration accuracy of a handheld augmented reality system for urban landscape simulation. *Frontiers of Architectural Research*, 3(4), 386-397. doi: [10.1016/j.foar.2014.08.003](https://doi.org/10.1016/j.foar.2014.08.003)
- Ghadirian, P., & Bishop, I. D. (2008). Integration of augmented reality and GIS: A new approach to realistic landscape visualisation. *Landscape and Urban Planning*, 86(3), 226-232.
- Gould, P. (1970). Computers and spatial analysis: Extensions of geographic research. *Geoforum*, 1(1), 53-69.
- Graham, M., Zook, M., & Boulton, A. (2013). Augmented reality in urban places: Contested content and the duplicity of code. *Transactions of the Institute of British Geographers*, 38(3), 464-479. doi:10.1111/j.1475-5661.2012.00539.x
- Halik, Ł. (2012). The analysis of visual variables for use in the cartographic design of point symbols for mobile augmented reality applications. *Geodesy and Cartography*, 61(1), 19-30.
- Hedley, N. (2003). Empirical evidence for advanced geographic visualization interface use. *International Cartographic Congress, Durban, South Africa*, 383-393.
- Huang, B., & Lin, H. (1999). GeoVR: A web-based tool for virtual reality presentation from 2D GIS data. *Computers & Geosciences*, 25(10), 1167-1175.
- Hughes, C. E., Stapleton, C. B., Hughes, D. E., & Smith, E. M. (2005). Mixed reality in education, entertainment, and training. *Computer Graphics and Applications, IEEE*, 25(6), 24-30.
- Hughes, I. (2012). Virtual worlds, augmented reality, blended reality. *Computer Networks*, 56(18), 3879-3885.
- Kaufmann, H. (2003). Collaborative augmented reality in education. *Institute of Software Technology and Interactive Systems, Vienna University of Technology*,
- Jeřábek, T., Rambousek, V., & Wildová, R. (2014). Specifics of Visual Perception of the Augmented Reality in the Context of Education. *Procedia-Social and Behavioral Sciences*, 159, 598-604.
- Kerawalla, L., Luckin, R., Seljeflot, S., & Woolard, A. (2006). "Making it real": Exploring the potential of augmented reality for teaching primary school science. *Virtual Reality*, 10(3-4), 163-174.
- Kesim, M., & Ozarslan, Y. (2012). Augmented reality in education: Current technologies and the potential for education. *Procedia-Social and Behavioral Sciences*, 47, 297-302.
- Klopper, E., Perry, J., Squire, K., & Jan, M. (2005). Collaborative learning through augmented reality role playing. *Proceedings of Th 2005 Conference on Computer Support for Collaborative Learning: Learning 2005: The Next 10 Years!* 311-315.
- Kysela, J., & Štorková, P. (2015). Using Augmented Reality as a Medium for Teaching History and Tourism. *Procedia-Social and Behavioral Sciences*, 174, 926-931.
- Langlotz, T., et al. (2012). Sketching up the world: in situ authoring for mobile Augmented Reality. *Personal and ubiquitous computing*, 16(6), 623-630.
- Lechner, M. (2010). Arml-augmented reality markup language.
- Lechner, M., & Tripp, M. (2010). ARML—an augmented reality standard, 1-3.
- Lee, K. (2012). Augmented reality in education and training. *Techtrends*, 56(2), 13-21.
- Leiva Olivencia, J. L. (2014). *Realidad aumentada bajo tecnología móvil basada en el contexto aplicada a destinos turísticos*. (Unpublished), Universidad de Málaga, Servicio de Publicaciones y Divulgación Científica,
- Liarokapis, F., Mourkoussis, N., White, M., Darcy, J., Sifniotis, M., Petridis, P., Lister, P. F. (2004). Web3D and augmented reality to support engineering education. *World Transactions on Engineering and Technology Education*, 3(1), 11-14.
- Liu, T., Tan, T., & Chu, Y. (2009). Outdoor natural science learning with an RFID-supported immersive ubiquitous learning environment. *Journal of Educational Technology & Society*, 12(4), 161-175.
- Lwin, K., Hashimoto, M., & Murayama, Y. (2014). Real-time geospatial data collection and visualization with smartphone. *Journal of Geographic Information System*, 6(2), 99-108.
- Madden, L. (2011). *Professional augmented reality browsers for smartphones: Programming for junoia, layar and wikitude* John Wiley & Sons.
- Marimon, D., Sarasua, C., Carrasco, P., Álvarez, R., Montesa, J., Adamek, T., Gascó, P. (2010). MobiAR: Tourist experiences through mobile augmented reality. *Telefonica Research and Development, Barcelona, Spain*, , 1-6.
- Martín-Gutiérrez, J., Fabiani, P., Benesova, W., Meneses, M. D., & Mora, C. E. Augmented reality to promote collaborative and autonomous learning in higher education. *Computers in Human Behavior*, (0) doi: [10.1016/j.chb.2014.11.093](https://doi.org/10.1016/j.chb.2014.11.093)
- Martín-Gutiérrez, J., Luís Saorín, J., Contero, M., Alcañiz, M., Pérez-López, D. C., & Ortega, M. (2010). Design and validation of an augmented book for spatial abilities development in engineering students. *Computers & Graphics*, 34(1), 77-91. doi: [10.1016/j.cag.2009.11.003](https://doi.org/10.1016/j.cag.2009.11.003)
- Meana de la LLave, Ricardo. (2012). *Aplicación GPS de realidad aumentada para el camino de santiago en dispositivos android* Universidad Pública de Navarra.
- Milgram, P., & Kishino, F. (1994). A taxonomy of mixed reality visual displays. *IEICE Transactions on Information and Systems*, 77(12), 1321-1329.
- Milgram, P., Takemura, H., Utsumi, A., & Kishino, F. (1995). Augmented reality: A class of displays on the reality-virtuality continuum. *Photonics for Industrial Applications*, 282-292.
- Mortara, M., Catalano, C. E., Bellotti, F., Fiucci, G., Houry-Panchetti, M., & Petridis, P. (2014). Learning cultural heritage by serious games. *Journal of Cultural Heritage*, 15(3), 318-325.
- Pinto, F. S. & Centeno, J. A. S. (2012). A realidade aumentada em smartphones na exploração de informações estatísticas e cartográficas. *Boletim De Ciências Geodésicas*, 18, 282-301. doi: [10.1590/S1982-21702012000200007](https://doi.org/10.1590/S1982-21702012000200007)
- Priestnall, G., Brown, E., Sharples, M., & Polmear, G. (2010). Augmenting the field experience: A student-led comparison of techniques and technologies. In E. Brown (Ed.), *Education in the wild: Contextual and location-based*

mobile learning in action. A report from the STELLAR alpine rendez-vous workshop series. (pp. 43-46). Nottingham, UK: Learning Sciences Research Institute, University of Nottingham.

Radu, I. (2014). Augmented reality in education: A meta-review and cross-media analysis. *Personal and Ubiquitous Computing*, 18(6), 1533-1543.

Ramírez, P., et al. (2013). Explora México: A mobile application to learn Mexico's geography. *Procedia Computer Science*, 25, 194-200. doi: [10.1016/j.procs.2013.11.024](https://doi.org/10.1016/j.procs.2013.11.024)

Rosenbaum, E., Klopfer, E., & Perry, J. (2007). On location learning: Authentic applied science with networked augmented realities. *Journal of Science Education and Technology*, 16(1), 31-45.

Santos, M. E. C., Chen, A., Taketomi, T., Yamamoto, G., Miyazaki, J., & Kato, H. (2014). Augmented reality learning experiences: Survey of prototype design and evaluation. *Learning Technologies, IEEE Transactions on*, 7(1), 38-56.

Schall, G., et al. (2009). Handheld augmented reality for underground infrastructure visualization. *Personal and Ubiquitous Computing*, 13(4), 281-291.

Shelton, B. E., & Hedley, N. R. (2004). Exploring a cognitive basis for learning spatial relationships with augmented reality. *Technology, Instruction, Cognition and Learning*, 1(4), 323-357.

Stirbu, V., Murphy, D., & You, Y. (2012). Open and decentralized platform for visualizing web mash-ups in augmented and mirror worlds. *Proceedings of the 21st International Conference Companion on World Wide Web*, 609-610.

Sumadio, D. D., & Rambli, D. R. A. (2010). Preliminary evaluation on user acceptance of the augmented reality use for education. *Computer Engineering and Applications (ICCEA), 2010 Second International Conference on*, 2 461-465.

Visser, A. (2011). Survey of XML languages for augmented reality content. *Proc. of AR Standardization Forum, Barcelona*,

Wang, X., Kim, M. J., Love, P. E. D., & Kang, S. (2013). Augmented reality in built environment: Classification and implications for future research. *Automation in Construction*, 32(0), 1-13. doi: [10.1016/j.autcon.2012.11.021](https://doi.org/10.1016/j.autcon.2012.11.021)

Wilches, D., & Figueroa, P. (2010). Visualización de información urbana georeferenciada por medio de realidad aumentada. Bogotá.

Wu, H., Lee, S. W., Chang, H., & Liang, J. (2013). Current status, opportunities and challenges of augmented reality in education. *Computers & Education*, 62, 41-49.

Yovcheva, Z., Buhalis, D., & Gatzidis, C. (2012). Smartphone augmented reality applications for tourism. *E-Review of Tourism Research (eRTR)*, 10(2), 63-66.

Yuen, S., Yaoyuneyong, G., & Johnson, E. (2011). Augmented reality: An overview and five directions for AR in education. *Journal of Educational Technology Development and Exchange*, 4(1), 119-140.

STORYTELLING

Bell, S. L., Phoenix, C., Lovell, R., & Wheeler, B. W. (2015). Using GPS and geo-narratives: A methodological approach for understanding and situating everyday green space encounters. *Area*, 47(1), 88-96.

BOJ, C., & DÍAZ, D. (2013). Ciudad, narrativa y medios locativos. aproximación a una teoría de los géneros en la

narrativa espacial a partir del análisis de cuatro propuestas. *Arte y Políticas De Identidad*, 9, 129-147.

Bonacini, E. (2013). Geo-social tagging as a creative way to communicate stories on geographies.6(3), 251-264.

Calandra, L. M. (2008). Il territorio attraverso le carte geografiche: Un modello didattico per la scuola di base. *Scripta Nova: Revista Electrónica De Geografía y Ciencias Sociales*, (12), 120.

Cameron, E. (2012). New geographies of story and storytelling. *Progress in Human Geography*, 36(5), 573-592. doi:10.1177/0309132511435000

Caquard, S., & Fiset, J. (2014). How can we map stories? A cybercartographic application for narrative cartography. *Journal of Maps*, 10(1), 18-25. doi:10.1080/17445647.2013.847387

High, S., Mills, J., & Zembrzycki, S. (2012). Telling our Stories/Animating our past: A status report on oral history and digital media. *Canadian Journal of Communication*, 37(3)

Illera, J. L. R., & Monroy, G. L. (2009). Los relatos digitales y su interés educativo. *Educação, Formação & Tecnologias-ISSN 1646-933X*, 2(1), 5-18.

Jong, A. (2015). Using facebook as a space for storytelling in geographical research. *Geographical Research*, 53(2), 211-223.

Kerski, J. J. (2015). Geo-awareness, Geo-enablement, geotechnologies, citizen science, and storytelling: Geography on the world stage. *Geography Compass*, 9(1), 14-26.

Koki, S. (1998). Storytelling: The heart and soul of education. *Pacific Resources for Education and Learning*,

Lambert, J. (2006). *Digital storytelling cookbook: February 2007* Digital Diner Press.

López Parada, E. (2014). La cartografía como relato: Intervenir los mapas, narrar las ciudades. *Orbis Tertius*, 18(19), 158-186.

Lorimer, H. (2003). Telling small stories: Spaces of knowledge and the practice of geography. *Transactions of the Institute of British Geographers*, 28(2), 197-217.

Madge, C. (2014). On the creative (re)turn to geography: Poetry, politics and passion. *Area*, 46(2), 178-185. doi:10.1111/area.12097

Millington, J. D., O'Sullivan, D., & Perry, G. L. (2012). Model histories: Narrative explanation in generative simulation modelling. *Geoforum*, 43(6), 1025-1034.

Monroy, G. L. (2012). Aprendiendo en el aula: Contando y haciendo relatos digitales personales. *Digital Education Review*, (22), 19-36.

Motala, S., & Musungu, K. (2013). Once upon a place: Storytelling in GIS education. *International Multidisciplinary Scientific GeoConference: SGEM: Surveying Geology & Mining Ecology Management*, 1, 821.

Naughton, L. (2014). Geographical narratives of social capital telling different stories about the socio-economy with context, space, place, power and agency. *Progress in Human Geography*, 38(1), 3-21.

Ohler, J. B. (2013). *Digital storytelling in the classroom: New media pathways to literacy, learning, and creativity* Corwin Press.

Papadaki, H., Gadolou, E., & Stefanakis, E. (2009). Collaborative GIS platforms for Storytelling-Case study: Battleship averof. *Proceedings of the 2nd International Workshop on Story-Telling and Educational Games (STEG 2009) in Conjunction with the 8th International Conference on Web-Based Learning*,

Papadaki, H., Gadolou, E., Stefanakis, E., Kritikos, G., Cao, Y., Hannemann, A., . . . Pagomenos, G. (2010). The role of CMS in the education of GIS using storytelling. *Seventh European GIS Education Seminar (EUGISES 2010)*,

Phillips, J. (2012). Storytelling in earth sciences: The eight basic plots. *Earth-Science Reviews*, 115(3), 153-162. doi:<http://dx.doi.org/10.1016/j.earscirev.2012.09.005>

Robin, B. (2006). The educational uses of digital storytelling. *Society for Information Technology & Teacher Education International Conference*, , 2006(1) 709-716.

Seemann, J. (2012). Cartographic-story-telling, performance of way-finding and (e) motional mapping in the cariri region, state of ceará. *Boletim De Geografia*, 30(2), 5-13. doi:[10.4025/bolgeogr.v30i2.12468](https://doi.org/10.4025/bolgeogr.v30i2.12468)

Seemann, J. (2014). Entre mapas e narrativas: Reflexões sobre as cartografias da literatura, a literatura de cartografia e a ordem das coisas. *Raega-O Espaço Geográfico Em Análise*, 30, 85-105.

Spierling, U. (2002). Digital storytelling. *Computers & Graphics*, 26(1), 1-2. doi:[http://dx.doi.org/10.1016/S0097-8493\(01\)00172-8](http://dx.doi.org/10.1016/S0097-8493(01)00172-8)

Van House, N. A. (2009). Collocated photo sharing, storytelling, and the performance of self. *International Journal of Human-Computer Studies*, 67(12), 1073-1086. doi:<http://dx.doi.org/10.1016/j.ijhcs.2009.09.003>

WEBGIS

Anselin, L. (2000). Part 2 the link between GIS and spatial analysis. GIS, spatial econometrics and social science research. *Journal of Geographical Systems*, 2, 11-15.

Anselin, L., Kim, Y. W., & Syabri, I. (2004). Web-based analytical tools for the exploration of spatial data. *Journal of Geographical Systems*, 6(2), 197-218.

Baker, T. R. (2005). Internet-based GIS mapping in support of K-12 education. *The Professional Geographer*, 57(1), 44-50.

Batty, M., Hudson-Smith, A., Milton, R., & Crooks, A. (2010). Map mashups, web 2.0 and the GIS revolution. *Annals of GIS*, 16(1), 1-13.

Bednarz, S. W., & Ludwig, G. (1997). Ten things higher education needs to know about GIS in primary and secondary education. *Transactions in GIS*, 2(2), 123-133.

Bednarz, S. W. (2004). Geographic information systems: A tool to support geography and environmental education? *GeoJournal*, 60(2), 191-199.

Bryan, J. (2011). Walking the line: Participatory mapping, indigenous rights, and neoliberalism. *Geoforum*, 42(1), 40-50.

Buzai, G., & Ruiz, E. (2014). Geotecnósfera. tecnologías de la información geográfica en el contexto global del sistema mundo. *Anekumene*, 1(4), 88-106.

Curry, M. R. (1994). Image, practice and the hidden impacts of geographic information systems. *Progress in Human Geography*, 18(4), 441-459.

de Arroyabe, P. F. (2006). Virtual divide, bologna education model and geographic information technologies. *GeoFocus.Revista Internacional De Ciencia y Tecnología De La Información Geográfica*, (6), 39-51.

Del Bosque González, I., Fernández Freire, C., Martín-Forero Morente, L., & Pérez Asensio, E. (2012). Los sistemas

de información geográfica y la investigación en ciencias humanas y sociales.

DiBiase, D., DeMers, M., Johnson, A., Kemp, K., Luck, A. T., Plewe, B., & Wentz, E. (2007). Introducing the first edition of geographic information science and technology body of knowledge. *Cartography and Geographic Information Science*, 34(2), 113-120.

Downs, R. M. (1997). The geographic eye: Seeing through GIS? 1. *Transactions in GIS*, 2(2), 111-121.

Dragicevic, S. (2004). The potential of web-based GIS. *Journal of Geographical Systems*, 6(2), 79-81.

Dunn, C. E. (2007). Participatory GIS—a people's GIS? *Progress in Human Geography*, 31(5), 616-637.

Dunne, C. E., Atkins, P. J., Blakemore, M. J., & Townsend, J. G. (1999). Teaching geographical information handling skills for Lower-income countries. *Transactions in GIS*, 3(4), 319-332.

Edoh-Alove, E., Hubert, F., & Badard, T. (2013). A web service for managing spatial context dedicated to serious games on and for smartphones. *Journal of Geographic Information System*, 5(2), 148-160.

Elwood, S. (2011). Geographic information science: Visualization, visual methods, and the geoweb. *Progress in Human Geography*, 35(3), 401-408.

Elwood, S., & Leszczynski, A. (2011). Privacy, reconsidered: New representations, data practices, and the geoweb. *Geoforum*, 42(1), 6-15.

Evans, A. J., Kingston, R., & Carver, S. (2004). Democratic input into the nuclear waste disposal problem: The influence of geographical data on decision making examined through a web-based GIS. *Journal of Geographical Systems*, 6(2), 117-132.

Foote, K. E. (1997). The geographer's craft: Teaching GIS in the web. *Transactions in GIS*, 2(2), 137-150.

Forer, P., & Unwin, D. (1999). Enabling progress in GIS and education. *Geographical Information Systems: Management Issues and Applications*, 2

Forer, P. (1997). Flexible delivery and social learning: Seeking a new geography of education for GIS and GIS in education. *Transactions in GIS*, 2(2), 169-179.

Freed, A. P. (2011). The effects of multiple thematic layers on web map use by middle school students.

Gerlach, J. (2015). Editing worlds: Participatory mapping and a minor geopolitics. *Transactions of the Institute of British Geographers*, 40(2), 273-286.

González González, M. J. (2005). La utilidad de los sistemas de información geográfica para la enseñanza de la geografía. *Didáctica Geográfica*, 7, 105-122.

González, R. D. M., TORRES, MARÍA LUISA DE LÁZARO Y, JESÚS, M., & GAITE, M. (2013). *Innovación en la enseñanza de la geografía ante los desafíos sociales y territoriales* Institución Fernando el Católico.

Goodchild, M. F. (2007). Citizens as sensors: The world of volunteered geography. *GeoJournal*, 69(4), 211-221.

Green, D. R. (2000). *gis* CRC Press.

Gregory, I. N., & Healey, R. G. (2007). Historical GIS: Structuring, mapping and analysing geographies of the past. *Progress in Human Geography*, 31(5), 638-653.

Haggett, P. (1969). On geographical research in a computer environment. *Geographical Journal*, , 497-507.

Heinrich, P. (1997). Addendum: Secondary school geography and GIS in the united kingdom. *Transactions in GIS*, 2(2), 134-135.

- Hogrebe, M. C., Kyei-Blankson, L., & Zou, L. (2008). Examining regional science attainment and school-teacher resources using GIS. *Education and Urban Society*,
- Jayasinghe, P. C., & Machida, T. (2008). Web-based GIS online consulting system with crop-land suitability identification. *農業情報研究*, 17(1), 13-19.
- Keiper, T. A. (1999). GIS for elementary students: An inquiry into a new approach to learning geography. *Journal of Geography*, 98(2), 47-59.
- Kemp, K. K., & Unwin, D. J. (1997). From geographic information systems to geographic information studies: An agenda for educators. *Transactions in GIS*, 2(2), 103-110.
- Kraak, M. (2004). The role of the map in a web-GIS environment. *Journal of Geographical Systems*, 6(2), 83-93.
- Kwan, M., & Ding, G. (2008). Geo-narrative: Extending geographic information systems for narrative analysis in qualitative and mixed-method research*. *The Professional Geographer*, 60(4), 443-465.
- Leszczynski, A. (2012). Situating the geoweb in political economy. *Progress in Human Geography*, 36(1), 72-89.
- Liu, S., & Zhu, X. (2008). Designing a structured and interactive learning environment based on GIS for secondary geography education. *Journal of Geography*, 107(1), 12-19.
- Lwin, K. K., & Murayama, Y. (2011). Web-based GIS system for real-time field data collection using personal mobile phone. *Journal of Geographic Information System*, 3(04), 382-389.
- MacEachren, A. M. (1998). Cartography, GIS and the world wide web. *Progress in Human Geography*, 22, 575-585.
- Manso Callejo, M. Á., & Castañeda Sanabria, E. (2011). Geo-almacén de datos geográficos.
- McCall, M. K., & Dunn, C. E. (2012). Geo-information tools for participatory spatial planning: Fulfilling the criteria for 'good' governance? *Geoforum*, 43(1), 81-94.
- McClurg, P. A., & Buss, A. (2007). Professional development: Teachers use of GIS to enhance student learning. *Journal of Geography*, 106(2), 79-87.
- Metternicht, G. (2006). Consideraciones acerca del impacto de google earth en la valoración y difusión de los productos de georrepresentación. *Geofocus*, 6, 1-10.
- Milson, A. J. (2012). SIG en la nube: WebSIG para la enseñanza de la geografía. *Bienvenidos*, (12), 111-124.
- O Sullivan, D. (2006). Geographical information science: Critical GIS. *Progress in Human Geography*, 30(6), 783.
- O'Kelly, M. E. (2000). GIS and educational and instructional challenges. *Journal of Geographical Systems*, 2(1), 23-29.
- Peng, Z., & Zhang, C. (2004). The roles of geography markup language (GML), scalable vector graphics (SVG), and web feature service (WFS) specifications in the development of internet geographic information systems (GIS). *Journal of Geographical Systems*, 6(2), 95-116.
- Rey, S. J. (2009). Show me the code: Spatial analysis and open source. *Journal of Geographical Systems*, 11(2), 191-207.
- Santos, J. M. (2006). Las tecnologías de la información y de la comunicación y el modelo virtual formativo: Nuevas posibilidades y retos en la enseñanza de los SIG. *GeoFocus.Revista Internacional De Ciencia y Tecnología De La Información Geográfica*, (6), 113-137.
- Schobesberger, D., & Cartwright, W. (2013). The potential of using web mapping as a tool to support cultural history investigations. *Understanding different geographies* (pp. 175-192) Springer.
- Schuurman, N. (2000). Trouble in the heartland: GIS and its critics in the 1990s. *Progress in Human Geography*, 24(4), 569-590.
- Schuurman, N., & Kwan, M. (2004). Guest editorial: Taking a walk on the social side of GIS. *Cartographica: The International Journal for Geographic Information and Geovisualization*, 39(1), 1-3.
- Singh, S. S. B., Kleeman, G., & Van Bergen, P. (2012). Opportunities to implement GIS in teaching and learning geography: A survey among smart schools in sabah, malaysia. *Procedia-Social and Behavioral Sciences*, 69, 884-889.
- Singh, S. P., & Singh, P. (2014). Mapping spatial data on the web using free and open-source tools: A prototype implementation. *Journal of Geographic Information System*, 6(1), 30-39.
- Srivastava, S. K. (2013). Threshold concepts in geographical information systems: A step towards conceptual understanding. *Journal of Geography in Higher Education*, 37(3), 367-384.
- Sui, D. (2012). Looking through Hägerstrand's dual vistas: Towards a unifying framework for time geography. *Journal of Transport Geography*, 23, 5-16.
- Sui, D. (2014). Opportunities and impediments for open gis. *Transactions in GIS*, 18(1), 1-24.
- Sui, D. Z. (1995). A pedagogic framework to link GIS to the intellectual core of geography. *Journal of Geography*, 94(6), 578-591.
- Thompson, D., Lindsay, F. E., Davis, P. E., & Wong, D. W. (1997). Towards a framework for learning with GIS: The case of urban world, a hypermap learning environment based on GIS. *Transactions in GIS*, 2(2), 151-167.
- Wikle, T. A., & Fagin, T. D. (2014). GIS course planning: A comparison of syllabi at US college and universities. *Transactions in GIS*, 18(4), 574-585.
- Wikle, T. A., & Fagin, T. D. (2014). Hard and soft skills in preparing GIS professionals: Comparing perceptions of employers and educators. *Transactions in GIS*,
- Wilson, M. W. (2012). Location-based services, conspicuous mobility, and the location-aware future. *Geoforum*, 43(6), 1266-1275.
- Xiao, N., Kwan, M., Goodchild, M. F., & Shekhar, S. (2012). *Geographic information science: 7th international conference, GIScience 2012, columbus, OH, USA, september 18-21, 2012, proceedings* Springer.
- Yasobant, S., Vora, K. S., Hughes, C., Upadhyay, A., & Mavalankar, D. V. (2015). Geovisualization: A newer GIS technology for implementation research in health. *Journal of Geographic Information System*, 7(1), 20-28.
- Zerger, A., Bishop, I., Escobar, F., & Hunter, G. (2002). A self-learning multimedia approach for enriching GIS education. *Journal of Geography in Higher Education*, 26(1), 67-80.

CARTOGRAFÍA

Caquard, S. (2013). Cartography I: Mapping narrative cartography. *Progress in Human Geography*, 37(1), 135-144. doi:10.1177/0309132511423796

Caquard, S. (2014). Cartography II: Collective cartographies in the social media era. *Progress in Human*

Geography, 38(1), 141-150. doi:10.1177/0309132513514005

Caquard, S. (2015). Cartography III: A post-representational perspective on cognitive cartography. *Progress in Human Geography*, 39(2), 225-235. doi:10.1177/0309132514527039

Caquard, S., & Cartwright, W. (2014). Narrative cartography: From mapping stories to the narrative of maps and mapping. *The Cartographic Journal*, 51(2), 101-106. doi:10.1179/0008704114Z.000000000130

Crampton, J. W. (2009). Cartography: Maps 2.0. *Progress in Human Geography*, 33(1), 91-100.

Crampton, J. W. (2009). Cartography: Performative, participatory, political. *Progress in Human Geography*, 33(6), 840-848.

Kitchin, R., & Dodge, M. (2007). Rethinking maps. *Progress in Human Geography*, 31(3), 331-344.

Monmonier, M. (2005). Cartography: Distortions, world-views and creative solutions. *Progress in Human Geography*, 29(2), 217-224.

Monmonier, M. (2006). Cartography: Uncertainty, interventions, and dynamic display. *Progress in Human Geography*, 30(3), 373.

Monmonier, M. (2007). Cartography: The multidisciplinary pluralism of cartographic art, geospatial technology, and empirical scholarship. *Progress in Human Geography*, 31(3), 371.

Monmonier, M. (2014). *How to lie with maps* University of Chicago Press.

Perkins, C. (2002). Cartography: Progress in tactile mapping. *Progress in Human Geography*, 26(4), 521-530.

Perkins, C. (2003). Cartography: Mapping theory. *Progress in Human Geography*, 27(3), 341-351.

Revuelto, R. M. L. (2011). El uso de la cartografía y la imagen digital como recurso didáctico en la enseñanza secundaria. algunas precisiones en torno a google earth. *Boletín De La Asociación De Geógrafos Españoles*, (55), 183-210.

Rossetto, T. (2014). Theorizing maps with literature. *Progress in Human Geography*, 38(4), 513-530.

Unwin, D. (1994). Cartography, ViSC and gis. *Progress in Human Geography*, 18(4), 516-522.