STEM, STEAM and Makerspace Archive.

Acosta, D.I., Polinsky, N.J., Haden, C.A., & Uttal, D.H. (2021). Whether and how knowledge moderates linkages between parent–child conversations and children's reflections about tinkering in a children's museum. *Journal of Cognition and Development, 22*(2), 226-245. Doi: 10.1080/15248372.2020.1871350	STEM
Adnan, M., Ayob, A., Tek, O, E., Ibrahim, M, N., & Sheriff, J. (2016). Enhancing Malaysian human capital from early childhood: A study in the feasibility and integrability of the STEM system in the PERMATA Negara curriculum. *Geografia: Malaysian Journal of Society and Space, 12*(1).	STEM
Aladé, F., Lauricella, A., Kumar, Y., & Wartella, E. (2021). Who's modelling STEM for kids? A character analysis of children's STEM-focused television in the US. *Journal of Children and Media, 15*(3), 338-357. Doi: 10.1080/17482798.2020.1810087	STEM
Aladé, F., Lauricella, A.R., Beaudoin-Ryan, L., & Wartella, E. (2016). Measuring with Murray: Touchscreen technology and preschoolers' STEM learning. *Computers in Human Behavior, 62,* 433-441.	STEM
Alghamdi, A.A. (2022). Exploring Early Childhood Teachers' Beliefs About STEAM Education in Saudi Arabia*. Early Childhood Education Journal (online first),* Doi: 10.1007/s10643-021-01303-0	STEAM
Angelone, L. (2020). The geometry of buildings. Science and Children 52(6), 64-69.	STEAM
Anggoro, F. K., Dubosarsky, M., & Kabourek, S. (2021). Developing an observational tool to measure preschool children's problem-solving skills. *Education Sciences, 11*(12), 779. Doi: 10.3390/educsci11120779	STEM
Areljung, S. & Günther-Hanssen, A. (2021). STEAM education: An opportunity to transcend gender and disciplinary norms in early childhood? *Contemporary Issues in Early Childhood.* Doi: 10.1177/14639491211051434	STEM/ STEAM
Ashbrook, P. (2019). Teaching the M in STEM. *Science and Children, 56*(6), 16-17.	STEM
Ata-Atürk, A., & Demicran, H. Ö. (2021). Supporting preschool children's STEM learning with parent-involved early engineering education. *Early Childhood Education Journal, 49*(4), 607-621. Doi: 10.1007/s10643-020-01100-1	STEM
Ata Aktürk, A., Demircan, H., Şenyurt, E., & Çetin, M. (2017). Turkish early childhood education curriculum from the perspective of STEM education: A document analysis. *Journal of Turkish Science Education, 14*(4), 16-34. Retrieved from, https://www.tused.org/index.php/tused/article/view/170/125	STEM

Atiles, J. T., Jones, J. L., & Anderson, J. A. (2013). More than a read-aloud: Preparing and inspiring early childhood teachers to develop our future scientists. *Teacher Education & Practice,* 26(2), 285-299.	STEM
Bagiati, A., & Evangelou, D. (2015). Engineering curriculum in the preschool classroom: the teacher's experience. *European Early Childhood Education Research Journal, 23*(1), 112-118. Doi: 10.1080/1350293X.2014.991099	STEM
Bauer, J., & Booth, A. E. (2019). Exploring potential cognitive foundations of scientific literacy in preschoolers: Causal reasoning and executive function. *Early Childhood Research Quarterly, 46,* 275-284. Doi: 10.1016/j.ecresq.2018.09.007	STEM
Baykal, G.E., Van Mechelen, M., Göksun, T., & Yantaç, A.E. (2019). Embedded figures in stories (EFiS): A method to observe preschoolers' interactions with spatial manipulatives. *International Journal of Child-Computer Interaction, 21*, 121-129. Doi: 10.1016/j.ijcci.2019.06.004	STEM/ STEAM
Baykal, G.E., Alaca, I.V., Yantaç, A.E., & Göksun, T. (2018). A review on complementary natures of tangible user interfaces (TUIs) and early spatial learning. *International Journal of Child-Computer Interaction, 16,* 104-113.	STEM/ STEAM
Bers, M. U. (2020). *Coding as a playground: Programming and computational thinking in the early childhood classroom.* Routledge.	STEM
Bers, M. U. (2019). Coding as another language: a pedagogical approach for teaching computer science in early childhood. *Journal of Computers in Education, 6*(4), 499-528.	STEM
Bers, M., Strawhacker, A., Vizner, M. 2018. The design of early childhood makerspaces to support positive technological development: Two case studies. *Library Hi Tech, 36(*1), 75-96	Makerspace
Bezuidenhout, H. S. (2021). An early grade science, technology, engineering and mathematics dialogue reading programme: The development of a conceptual framework. *South African Journal of Childhood Education (SAJCE), 11*(1), 1038. DOI:10.4102/sajce.v11i1.1038	STEM
Borgerding, L. A., & Kaya, F. (2018). Spinning a yarn about adaptations in different biomes: stories and science for preschool learners. *Science Activities, 55*(1/2), 75-87. Doi: 10.1080/00368121.2018.1518889	STEM
Brahms, L., & Crowley, K. (2016). "Making" waves: How young learners connect to their natural world through third space. *Education Science, 10*(8), 203.	Makerspace

Brenneman, K., Lange, A., & Nayfeld, I. (2019). Integrating STEM into preschool education; Designing a professional development model in diverse settings. *Early Childhood Education Journal, 47*(1), 15-28. Doi: 10.1007/s10643-018-0912-z	STEM
Bucher, E., & Pindra, S. (2020). Infant and toddler STEAM. *Young Children, 75*(2), 16-23.	STEAM
Burke, A., & Crocker, A. (2020). "Making" waves: How young learners connect to their natural world through third space. *Education Science, 10*(8),	Makerspace
Bustamante, A. S., Begoli, K. N., Shahidi, N., Riesen, C., Schlesinger, M., Golinkkoff, R. M., Zonji, S., Evans, N., & Hirsh-Pasek, K. (2020). More than just a game: Transforming social interaction and STEM play with Parkopolis. *Developmental Psychology, 56(*6), 1041-1056. Doi: 10.1037/dev0000923	STEM
Butera, G., Horn, E.M., Palmer, S.B., Friesen, A., & Lieber, J. (2016). Understanding science, technology, engineering, arts, and mathematics (STEAM): Within early childhood special education. In. B. Reichow, B. A. Boyd, E. E. Barton, & S. L. Odon (eds). *Handbook of Early Childhood Special Education,* pp. 14-161. Springer.	STEM
Cabello, V.M., Loreto Martínez, M., Armijo, S., & Maldonado, L. (2021). Promoting STEAM learning in the early years: "Pequeños Científicos" Program. *LUMAT, 9*(2), 33-62	STEM/ STEAM
Cagle, N., Caldwell, L., & Garcia, R. (2018). K-12 diversity pathway programs in the e-STEM fields: A review of existing programs and summary of perceived unmet needs. *Journal of STEM Education: Innovations and Research, 19*(4), 12-18.	STEM
Calvert, S. L. (2017). Parasocial relationships with media characters: Imaginary companions for young children's social and cognitive development. In F. C. Blumberg and P. J. Brooks (Eds). *Cognitive Development in Digital Contexts,* (pp. 93-117). Elsevier Academic Press.	STEM
Campbell, C., & Walsh, C. (2017). Introducing the 'new' digital literacy of coding in the early years. *Practical Literacy: The Early & Primary Years, 22*(3), 10-12.	STEM
Cardella, M.E., Svarovsky, G.N., Dorie, B.L., Tranby, Z., & Cleave, S.V. (2013). Gender research on adult-child discussions within informal engineering environments (gradient): Early findings. *ASEE Annual Conference and Exposition, Conference Proceedings*	STEM
Carroll, K. Scott, C. (2017). Creating STEM Kits for the Classroom. *Science and Children 55*(1), 36-41.	STEM

Ceylan, R., & Malçok, B. (2019). STEM education implementation at early age and stakeholders' opinions: The case of Turkey. *Croatian Journal of Education, 22*(3), 717-754. Retrieved from: https://hrcak.srce.hr/file/360775	STEM
Çetin, M., & Demircan, H.Ö. (2020). Empowering technology and engineering for STEM education through programming robots: a systematic literature review. *Early Child Development and Care, 190*(9), 1323-1335. Doi: 10.1080/03004430.2018.1534844	STEM
Chawla, K., Chiou, M., Sandes, A., & Blikstein, P. (2013). Dr. Wagon: A 'stretchable' toolkit for tangible computer programming. *IDC '13: Proceedings of the 12th International Conference on Interaction Design and Children June 2013 Pages 561-564.* Doi: 10.1145/2485760.2485865	STEM
Chen, Y. L., Huang, L. F., & Wu, P. C. (2021). Preservice preschool teachers' self-efficacy in and need for STEM education professional development: STEM pedagogical belief as a mediator. *Early Childhood Education Journal, 49*(2), 137-147. Doi: 10.1007/s10643-020-01055-3	STEM
Cherniak, S., Lee, K., Cho, E., & Jung, S.E. (2019). Child-identified problems and their robotic solutions. *Journal of Early Childhood Research, 17*(4), 347-360. Doi: 10.1177/1476718X19860557	STEM
Christenson, A., & James, L/ (2020). Transforming our community with STEM. *Young Children, 75*(2), 6-14.	STEM
Çiftçi, A., Topçu, M., & Foulk, J. (2020). Pre-service early childhood teachers' views on STEM education and their STEM teaching practices. *Research in Science and Technological Education, 40*(2), 207-233.	STEM
Clements, D., & Sarama, J. (2016). Math, science and technology in early grades. *Future of Children, 26(*2), 75-94.	STEM
Clements, D.H., Vinh, M., Lim, C.I., & Sarama, J. (2021). STEM for inclusive excellence and equity. *Early Education and Development, 32*(1), 148-171. DOI:10.1080/10409289.2020.1755776	STEM
Clerkin, A., & Gilligan, K. (2018). Pre-school numeracy play as a predictor of children's attitudes towards mathematics at age 10. *Journal of Early Childhood Research, 16*(3), 319-334. Doi: 10.1177/1476718X18762238	STEM
Condon, K., Cross, M., Walkden, H., Pendergast, D., & Andrews, K. T. (2020). THAT'S RAD! Science STEM books: Survey results on adult perceptions of benefits and impacts. *Teaching Science: The Journal of the Australian Science Teachers Association. 66*(4), 11-18.	STEM

Cooke, A., & Walker, R. (2015). Exploring STEM education through pre-service teacher Conceptualisations of mathematics. *International Journal of Innovation in Science and Mathematics Education, 23*(3), 35-46.	STEM
Cohrssen, C., & Page, J. (2016). Articulating a rights-based argument for mathematics teaching and learning in early childhood education. *Australasian Journal of Early Childhood.* 41(3) p104-108. Doi: 10.1177/183693911604100313	STEM
Cohrssen, C., & Pearn, C. (2021). Assessing preschool children's maps against the first four levels of the primary curriculum. *Mathematics Education Research Journal, 33*(1), 43-60.	STEM
Counsell, S.L., Geiken, R. (2019). Improving STEM teaching practices with R&P: increasing the full range of young children's STEM outcomes. *Journal of Early Childhood Teacher Education, 40(4), 352-381*	STEM
Counsell, S., Palmer, M., & Peat, F. (2020). Shake, bake and growl. *Science and Children 52(7), 64-70.*	STEM/ STEAM
Counsell, S., Peat, F., Vaughan, R., & Johnson, T. (2015). Inventing mystery machines. *Science and Children 57(9), 47-53.*	STEM
Cowan, K. (2018). Multimodal technologies in LEGO house: A social semiotic perspective. *Multimodal Technologies and Interaction, 2*(4), 70.	Makerspace
Crisostomo, A.T., Reinertsen, A.B. (2020). Technology and sustainability for/in early childhood education and care. *Policy Futures in Education, 18*(4), 545-555.	STEM
Christenson, A., James, J., (2020). Transforming Our Community with STEAM. *Young Children. 75(2), 6-14*	STEM
Christenson, L. (2017). Focus on the family: The T in STEM: A guide for families. *Childhood Education, 93 , 1, 90-92*	STEM
Curby, A., Knezek, G., Christensen, R. Tyler-Wood, T, & Bull, G. (2014). The impact of project-based learning on pre-service teachers' technology attitude and skills*. Journal of Computers in Mathematics & Science Teaching, 33*(3), 257-282*.*	STEM
Dalvi, T., Wendell, K. B., & Johnson, J. (2016). Community-based engineering. *Young Children, 71*(5), 8-15	STEM
Das, M. (2020). Taking a bandsaw to 1st grade: Transforming elementary school through hands-on STEAM education (evaluation). *ASEE Annual Conference and Exposition, Conference Proceedings. June 20-26, 2020, 29823.*	STEM/ STEAM

Davis, M. E., Cunningham, C. M., Lachapelle, C. P. (2017). They can't spell "engineering" but they can do it *do to Three Journal, 37*(5), 4-11.	
Davis, S. J., Scott, J. A., Wohlwend, K. E., Pennington, C. (2021). Bringing Joy to School: Engaging K-16 learners through maker literacies and playshops. *Teachers College Record, 123*(3).	Makerspace
Deaton, C. C., Linder, S. M., & Eckhoff, A. (2017). From static to circuits. *Young Children. 72*(3), 89-93.	STEM
Dejarnette, N. K. (2018). Early childhood STEAM: Reflections from a year of STEAM initiatives implemented in a high needs primary school. *Education, 139*(2), 96-11	STEAM
Dejonckheere, P.J.N., De Wit, N., Van de Keere, K., Vervaet, S. (2016). Exploring the classroom: Teaching science in early childhood. *International Electronic Journal of Elementary Education, 8(*4), 537-558.	STEM
Dittert, N., Thestrup, K., & Robinson, S. (2021). The SEEDS pedagogy: Designing a new pedagogy for preschool using a technology-based toolkit. *International Journal of Child-Computer Interaction, 27,* 100210.	Makerspace
Donohue, C. (2017). Putting the "T" in STEM for the youngest learners. *Zero to Three, 37*(5), 45-52	STEM
Dorouka, P., Papadakis, S., Kalogiannakis, M. (2020). Tablets and apps for promoting robotics, mathematics, STEM education and literacy in early childhood education. *International Journal of Mobile Learning and Organisation 14*(2), 255-274.	STEM
Eckhoff, A. (2021). Engineering to understand: reflections on a learning and teaching partnership for preservice early grades teachers and preschoolers. *Journal of Early Childhood Teacher Education.*	STEM
Eilam, B. & Alon, U. (2019). Children's Object Structure Perspective-Taking: Training and Assessment. *International Journal of Science and Mathematics Education, 17(8), 1541-1562.*	STEM
ElSayary, A., Zein, R., Antonio, L.S. (2022). Using interactive technology to develop preservice Teachers' STEAM competencies in early childhood education programs. *Eurasia Journal of Mathematics, Science and Technology Education, 18*(2)	STEAM
Fleer, M. (2021). Re-imagining play spaces in early childhood education: Supporting girls' motive orientation to STEM in times of COVID-19. Journal of Early Childhood Research, 19*(1), 3-20*	STEM

Forbes, A., Falloon, G., Stevenson, M., Hatzigianni, M., & Bower, M . (2021). An analysis of the nature of young students' STEM learning in 3D technology-enhanced makerspaces. *Early Education and Development, 32*(1), 172-187.	STEM/ Makerspace
García Terceño, E.M., Greca, I.M., Redfors, A., Fridberg, M. (2021). Implementation of an integrated STEM activity in pre-primary schools. *Advances in Intelligent Systems and Computing, AISC,* 30-39.	STEM
Garner, P. W., Gabitova, N., Gupta, A., & Wood, T. (2018). Innovations in science education: infusing social emotional principles into early STEM learning. *Cultural Studies of Science Education, 13*(4), 889-903.	STEAM
Gerson, S. A., Morey, R. D., & van Schaik, J. E. (2022). Coding in the cot? Factors influencing 0-17s' experience with technology and coding in the United Kingdom. *Computers and Education, 178.*	STEM
Giusti, T., & Bombieri, L. (2020). Learning inclusion through makerspace: a curriculum approach in Italy to share powerful ideas in a meaningful context. *The International Journal of Information and Learning Technology, 37*(3), 73-86.	Makerspace
Glavich, C. (2016). Growing strong STEM reflections of a beginning teacher's preservice program. *Issues in Teacher Education, 25*(2), 89-102	STEM
Gold, Z. S., & Elicker, J. (2020). Engineering Peer Play: A New Perspective on Science, Technology, Engineering, and Mathematics (STEM) Early Childhood Education. *International Perspectives on Early Childhood Education and Development, 30,* 61-75.	STEM
Gonzalez-Gonzalez, C.S., Caballero-Gil, P., Garcia-Holgado, A., (...), Iranzo, R.G., Ramos, S. (2021). COEDU-IN Project: an inclusive co-educational project for teaching computational thinking and digital skills at early ages. *2021 International Symposium on Computers in Education (SIIE)*, 2021, 1-4.	STEM
Guimaraes, V., Pessoa, L., Bentes, A.L., (...), Melo, T., De Freitas, R. (2020). W-STEAM card game to develop computational thinking. *CEUR Workshop Proceedings, 2709,* 116-127.	STEM/ STEAM
Hachey, A. C., An, S. A., & Golding, D. E. (2021). Nurturing kindergarteners' early STEM academic identity through makerspace pedagogy. *Early Childhood Education Journal, 50,* 469-479.	STEM/ Makerspace
Hadani, H.S., Winthrop, R., Hirsh-Pasek, K. (2021). Playful learning landscapes: convergence of education and city planning. In Ra S., Jagannathan S., Maclean R. (eds) *Powering a learning society during an age of disruption. Education in the*	STEM

Asia-Pacific Region: Issues, concerns and prospects, vol 58. Springer, Singapore. pp. 151-164	
Hapidin, Pujianti, Y., Hartati, S., Nurani, Y., Dhieni, N. (2020). The continuous professional development for early childhood teachers through lesson study in implementing play based curriculum (case study in Jakarta, Indonesia). *International Journal of Innovation, Creativity and Change, 12*(10), 17-25.	STEM/ STEAM
Haron, H.N., Hussain, N.H., Mohammad, R., (...), Kutty, R.M., Sarip, S. (2019). Grooming future scientists and engineers from the root through fun learning concept. *Journal of Physics: Conference Series, 1174*(1).	STEM
Harris, G., Ma, K. 2018. STEAMed about inquiry buddies. *Teacher Librarian, 46*(1), 23-27.	STEM
Hatzigianni, M., Stevenson, M., Bower, M., Falloon, G., & Forbes, A. (2021). Young children's design thinking skills in makerspaces. *International Journal of Child-Computer Interaction, 27,* 100216.	Makerspace
Hatzigianni, M., Stevenson, M., Bower, M., Falloon, G., & Forbes, A. 2020. Children's views on making and designing. *European Early Childhood Education Research Journal, 28*(2), 286-300.	Makerspace
He, X., Li, T., Turel, O., (...), Zhao, H., He, Q. (2021). The impact of STEM education on mathematical development in children aged 5-6 Years. *International Journal of Educational Research, 109.*	STEM
Herro, D., Quigley, C., Abimbade, O. (2021). Assessing elementary students' collaborative problem-solving in makerspace activities. *Information and Learning Science, 122*(11-12), 774-794.	STEM/ Makerspace
Highfield, K. (2014). Stepping into STEM with young children: Simple robotics and programming as catalysts for early learning. In C. Donohue (ed). *Technology and Digital Media in the Early Years: Tools for Teaching and Learning,* Routledge, *150-161.*	STEM
Hitt, R. E. (2017). Providing the spark: Using informal education experiences at the U.S. Space & Rocket Center© and Space Camp© to generate interest in STEM during early childhood. *53rd AIAA/SAE/ASEE Joint Propulsion Conference,* 2017-4617.	STEM
Ho, C.-L., Lin, T.-G., Chang, C.-R. (2022). Interactive multi-sensory and volumetric content integration for music education applications. *Multimedia Tools and Applications (online first)*	STEM
Hoisington, C. & Winokur, J. (2015). Gimme an "E". *Science and Children, 53*(1), 44-51.	STEM

Hunter-Doniger, T. (2021). Early childhood STEAM education: The joy of creativity, autonomy, and play. *Art Education, 74*(4), 22-27.	STEM/ STEAM
Hurst, M. A., Polinksy, N., Haden, C. A., Levine, S. C., & Uttal, D. H. (2019). Leveraging research on informal learning to inform policy on promoting early STEM. *Social Policy Report, 32*(3), 1-33.	STEM
Jackson, E.M., & Hanline, M.F. (2020). Using a concept map with RECALL to increase the comprehension of science texts for children with Autism. *Focus on Autism and Other Developmental Disabilities, 35*(2), 90-100.	STEM
Jamil, F., Linder, S., Stegelin, D. A. (2018). Early childhood teacher beliefs about STEAM education after a professional development conference*. Early Childhood Education Journal, 46*(4), 409-417.	STEAM
Jeon, M., Barnes, J., Fakhrhosseini, M., (...), Zheng, Z., & Dare, E. (2017). Robot opera: A modularized afterschool program for STEAM education at local elementary school. *2017 14th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI)*, 2017, 935-936.	STEM/ STEAM
Jiang, L. (2022). Development and implementation path of kindergarten STEM educational activities based on data mining. *Computational Intelligence and Neuroscience, 2022,* 2700674.	STEM
Johnson, C.C., Mohr-Schroeder, M.J., Moore, T.J., & English, L.D. (2020). *Handbook of research on STEM education.* Routledge.	STEM
Jung, S. E. & Won, E. S. (2018). Systematic review of research trends in robotics education for young children. *Sustainability. 10*(4), 905.	STEM
Kardeş, S. (2020). Analysis of preschool education program in the context of 21st century skills and STEAM education. *Journal of Theory and Practice in Education, 16*(2), 109-119.	STEM/ STEAM
Kazemitabaar, M., Norooz, L., Guha, M.L., Froehlich, J.E. (2015). MakerShoe: Towards a wearable e-textile construction kit to support creativity, playful making, and self-expression. *Proceedings of IDC 2015: The 14th International Conference on Interaction Design and Children,* 2771883, 449-452	STEAM
Kewalramani, S., Palaiologou, I., & Dardanou, M. (2020). Children's engineering design thinking processes: The magic of the ROBOTS and the power of BLOCKS (electronics). *Eurasia Journal of Mathematics, Science and Technology Education, 16*(3).	STEM

Khwaengmek, V., Pitiporntapin, S., Pimthong, P., & Bukatunyoo, O. (2020). Perceptions of pre-service teachers about outdoor learning for STEM education in early childhood education. *Journal of Physics: Conference Series, 1957*(1) id.012018.	STEM
Kim, H-J. (2017). A development on S-STEAM education program utilisation of a machine for early childhood in Korea. *Journal of Engineering and Applied Sciences, 12*(1). 5714-5719	STEAM
Kim, R-E. (2021). The development of STEAM teaching model and program based on smart device for connection of kindergarten-elementary school. *Ilkogretim Online, 20*(3), 952-960.	STEAM
Kim, S. H., Choi, G. W., & Jung, Y. J. (2020). Design principles for transforming making programs into online settings at libraries. *Information and Learning Science, 21*(7-8), 619-630	STEM/ Makerspace
Kim, H.-J., Kim, B.-H. (2017). Development of instruction media model based on smart device for steam education of young children. *Advanced Science Letters, 23*(10)10460-10463.	STEAM
Kim, H.J., & Song, M.S. (2017). Development of a teaching model for STEAM using R-learning educational robot to promote young children's creative problem-solving ability. *Advanced Science Letters, 23*(10), 10447-10452.	STEM/ STEAM
Kney, A. D., Tatu, J. C., Marlin, M., & Meng, X. (2016). Transforming STEM to STEAM (Work in Progress): How a traditionally run STEM camp successfully incorporated the arts into its framework. *ISEC 2016 - Proceedings of the 6th IEEE Integrated STEM Education Conference*, 7457470, 1-4.	STEAM
Kim, C.M., Yuan, J., Vasconcelos, L., Shin, M., & Hill, R.B. (2018). Debugging during block-based programming. *Instructional Science, 46*(5), 767-787.	STEM
Koralek, D. (2012). Curriculum, assessment, and teaching: Putting it all together. *Young Children, 67*(1), 10-12.	STEM/ STEAM
Kumptepe, A. T., & Kumptepe, E. (2014). STEM in early childhood education: We talk the talk, but do we walk the walk? *STEM Education: Concepts, Methodologies, Tools, and Applications*. 1-3, pp 1-24. IGI Global.	STEM
Lampley, S. A., Dyess, S. R., Benfield, M. P. J(…), Dillihunt, M. L., & Turner, M. W. (2022). Understanding the conceptions of engineering in early elementary students. *Education Sciences, 12*(1), 43.	STEM
Lange, A.A., Nayfeld, I., Mano, H., & Jung, K. (2021). Experimental effects of a preschool STEM professional learning	STEM

model on educators' attitudes, beliefs, confidence, and knowledge. *Journal of Early Childhood Teacher Education.*	
Lee, J., Collins, D., & Melton, J. (2016). What does algebra look like in early childhood? *Childhood Education, 92*(4), 305-310.	STEM
Linder, S., Emerson, A., Hefron, B., Shevlin, E., & Vest, A. (2016). STEM use in early childhood education. *Young Children, 71*(3), 87-91.	STEM
Linderman, K. Jabot, M., & Berkley, M. T. (2013). The role of STEM (or STEAM) in the early childhood setting. *Advances in Early Education & Day Care. 17,* 95-114.	STEM/ STEAM
Liu, X., Huang, H., Yu, K., & Dou, D. (2020). Can video game training improve the two-dimensional mental rotation ability of young children?: A randomized controlled trial. In: Fang X. (ed) *HCI in Games. HCII 2020. Lecture Notes in Computer Science, vol 12211.* Springer.	STEM
Lowrie, T., & Larkin, K. (2020). Experience, represent, apply (ERA): A heuristic for digital engagement in the early years. *British Journal of Educational Technology, 51*(1) 131-147	STEM
MacDonald, A., Danaia, L., Sikder, S., & Huser, C. (2021). Early childhood educators' beliefs and confidence regarding STEM education. *International Journal of Early Childhood, 53,* 241-259.	STEM
MacDonald, A., & Huser, C. (2020). Making STEM visible in early childhood curriculum frameworks. In A. MacDonald, L. Danaia, S Murphy, C. Huser (Eds*). STEM education across the learning continuum*. Springer, Singapore. 87-112	STEM
MacDonald, A., Huser, C., Sikder, S., Danaia, L. (2020). Effective early childhood STEM education: Findings from the Little Scientists evaluation. *Early Childhood Education Journal, 48*(3), 353-363.	STEM
Magloire, L. & Aly, N. (2013). SciTech kids electronic arts: Using STEAM to engage children all ages and gender. *ISEC 2013 - 3rd IEEE Integrated STEM Education Conference*	STEAM
Magnusson, L.O., & Bäckman, K. (2021). What is the capacity of A in the contexts of STEM? *Early Years,* 1-14.	STEM/ STEAM
Manches, A., & Plowman, L. (2017). Computing in children's early years: A call for debate. *British Journal of Educational Technology, 48*(1) 191-201.	STEM
Manera, L. (2020). STEAM and educational robotics: Interdisciplinary approaches to robotics in early childhood and primary education. *Springer Proceedings in Advanced Robotics, 12,* 103-109.	STEM/ STEAM

Marcus, M., Haden, C.A., & Uttal, D.H. (2018). Promoting children's learning and transfer across informal science, technology, engineering, and mathematics learning experiences. *Journal of Experimental Child Psychology, 175*, 80-95.	STEM
Marsh, J. (2019). Makerspaces in the Early Years: Enhancing digital literacy and creativity. In C. Donohue (Ed.). In *Exploring key issues in early childhood and technology: Evolving perspectives and innovative approaches,* pp. 1-136. Routledge.	Makerspace
Marsh, J., Arnseth, H., & Kumpulainen, K. 2018. Maker literacies and maker citizenship in the MakEY project (Makerspaces in the Early Years). *Multimodal Technologies and Interaction, 2*(3), 50.	Makerspace
Marsh, J., Nordström, A., Sairanen, H., Shkul, M. (2019). Making the moomins: A Finnish/ English adventure. In K. Kumpulainen and J. Sefton-Green (Eds), *Multiliteracies and Early Years Innovation: Perspectives from Finland and Beyond* pp. 131-147. Routledge.	Makerspace
Marsh, J., Wood, E., Chesworth, L., Nisha, B., Nutborown, B., & Olney, B. (2019). Makerspaces in early childhood education: Principles of pedadogy and practice. *Mind, Culture, and activity, 26*(3). 221-233.	Makerspace
Master, A; Cheryan, S; Meltzoff, & Andrew N. (2017). Social group membership increases STEM engagement among preschoolers. *Developmental Psychology, 53*(2), 201-209.	STEM
McClure, E. (2017). More than a foundation: young children are capable STEM learners. *Young Children, 72*(5), 83-89.	STEM
McClure, E., Guernsey, L; Clements, D; Bales, S; Nichols, J; Kendall-Taylor, N; & Levine, M. (2017). How to Integrate STEM Into early childhood education. *Science and Children 55*(2), 8-10.	STEM
McGuire, L., Hoffman, A.J., Mulvey, K.L., (...), Rutland, A., & Hartstone-Rose, A. (2021). Impact of youth and adult informal science educators on youth learning at exhibits. *Visitor Studies,* 41-59.	STEM
McGuire, L., Mulvey, K.L., Goff, E., (...), Hartstone-Rose, A., & Rutland, A. (2020). STEM gender stereotypes from early childhood through adolescence at informal science centers. *Journal of Applied Developmental Psychology, 67,* 101109.	STEM
McIntyre,E., Walkowiak, T., Thomson, M., Carrier, S., Lee, C., Greive, E., Zulu, R., Maher, M., & DiFrancesca, D. (2013). A STEM-focused elementary teacher preparation program: candidate and alumni perceptions. *Teacher Education & Practice, 26*(4), 670-687.	STEM

Menon, V. & Chang, H. (2021). Emerging neurodevelopmental perspectives on mathematical learning. *Developmental Review, 60,* 100964.	STEM
Monkeviciene, O., Autukeviciene, B., Kaminskiene, L., Monkevicius, J. (2020). Impact of innovative steam education practices on teacher professional development and 3-6-year-old children's competence development. *Journal of Social Studies Education Research, 11*(4), 1-27.	STEAM
Munday, J., Thompson, N., & McGirr, M. (2020). Supporting and scaffolding early childhood teachers in positive approaches to teaching and learning with technology. In A. MacDonald, L. Danaia and S Murphy (Eds), *STEM Education Across the Learning Continuum: Early Childhood to Senior Secondary,* 113-135. Springer.	STEM
Murcia, K., Pepper, C., Joubert, M., Cross, E., & Wilson, S. (2020). A framework for identifying and developing children's creative thinking while coding with digital technologies*. Issues in Educational Research, 30*(4), 1395-1417.	STEM
Murphy, S, MacDonald, A., Danaia, L., & Wang, C. (2019). An analysis of Australian STEM education strategies. *Policy Futures in Education, 17*(2), 122-139.	STEM
Ndijuye, L. G., & Pambas, B. T. (2020). STEM starts early: Views and beliefs of early childhood education stakeholders in Tanzania. *Journal of Childhood, Education & Society, 1*(1) 29-42*.*	STEM
Ness, D. (2021). *Block parties: Identifying emergent STEAM thinking through play.* Routledge.	STEAM
Ohland, C., Ehsan, H., & Cardella, M.E. (2019). Parental influence on children's computational thinking in an informal setting. *ASEE Annual Conference and Exposition, Conference Proceedings.* June 2109, Tampa, Florida.	STEM
Pagano, L.C., Haden, C.A., Uttal, D.H., Cohen, T. (2019). Conversational reflections about tinkering experiences in a children's museum. *Science Education, 103*(6), 1493-1512.	STEM
Papadakis, S., Vaiopoulou, J., Sifaki, E., Stamovlasis, D., Kalogiannakis, M. (2021). Attitudes towards the use of educational robotics: Exploring pre-service and in-service early childhood teacher profiles. *Education Sciences, 11*(5), 204.	STEM
Park, D., Park, M., & Bates, A. B. (2018). Exploring young children's understanding of the concept of volume through engineering design in a STEM activity: A case study. *International Journal of Science & Mathematics Education, 16*(2), 275-294.	STEM

Park, M.-H., Dimitrov, D.M., Patterson, L.G., & Park, D.-Y. (2017). Early childhood teachers' beliefs about readiness for teaching science, technology, engineering, and mathematics. *Journal of Early Childhood Research, 15*(3), 275-291.	STEM
Pattison, S., Svarovsky, G., Ramos-Montanẽz, S., (...), Smith, C., & Benne, M. (2020). Understanding early childhood engineering interest development as a family level systems phenomenon: Findings from the head start on engineering project. *Journal of Pre-College Engineering Education Research, 10*(1), 6.	STEM
Paulsen, C.A., & Andrews, J.R. (2014). The effectiveness of placing temporal constraints on a transmedia STEM learning experience for young children. *E-Learning and Digital Media, 11*(2), 204-213.	STEM
Pila, S., Lauricella, A. R., Piper, A. M.,& Wartella, E. (2021). The power of parent attitudes: Examination of parent attitudes toward traditional and emerging technology. *Human Behaviour and emerging technologies, 3*(4), 540-551.	STEM
Pato, S. (2017). Beyond the computer age: A best practices intro for implementing library coding programs. *Children & Libraries, 15*(1), 19-21.	STEM
Perez, M.E., Jones, S.T., Lee, S.P., Worsley, M. (2020). Intergenerational Making with Young Children. *FabLearn '20: Proceedings of the FabLearn 2020 - 9th Annual Conference on Maker Education. April 2020* Pages 68–73.	Makerspace
Rasyid, A., Sugandi, M. K., Gaffar, A. A., (…), Santoso, E., & Nahdi, D. S. Teaching STEM through play in kindergarten: Analysis towards pre-service early childhood teachers preparing the lesson plan. *Journal of Physics: Conference series 1764*(1).	STEM
Sangngnam, S. (2021). The development of early childhood students' creative thinking problem solving activities through STEM education learning activities. *Journal of Physics: Conference series 1835*(1).	STEM
Salama, G., Katbeh, T., Creel, B., (...), Ramadan, F., & Mazen, W. (2019). Illustrating engineering education: A children's book to support STEM outreach in Qatar. *2019 IEEE International Conference on Engineering, Technology and Education (TALE)*, 2019, pp. 1-5, doi: 10.1109/TALE48000.2019.9225947.	STEM
Setyowati, Y., Firda, R., & Kasmita, W. (2021). STEM education: Exploring practices across education levels. *Canadian Journal of Science, Mathematics and Technology Education, 21*(3), 686-690	STEM
Sharapan, H (2012). How early childhood educators can apply Fred Rogers' approach. *Young Children, 67*(1), 36-40	STEM

Shaw, P., Traunter, J. E., Nguyen, N., Huong, T., & Thao-Do, T. (2021). Immersive-learning experiences in real-life contexts: deconstructing and reconstructing Vietnamese kindergarten teachers' understanding of STEAM education. *International Journal of Early Years Education, 29*(3), 329-348.	STEM/ STEAM
Schlesinger, M.A., & Richert, R.A. (2019). The Role of Gender in Young Children's Selective Trust of Familiar STEM Characters. *Media Psychology, 22*(1), 109-132.	STEM
Schroeder, E.L., & Kirkorian, H.L. (2016). When seeing is better than doing: Preschoolers' transfer of STEM skills using touchscreen games. *Frontiers in Psychology, 7,* 1377.	STEM
Shaw, P., Traunter, J. E., Nguyen, N., Huong, T., Thao-Do, T. (2021). Immersive-learning experiences in real-life contexts: deconstructing and reconstructing Vietnamese kindergarten teachers' understanding of STEAM education. *International Journal of Early Years Education,* 329-348.	STEAM
Simoncini, K. & Lasen, M. (2018). Ideas about STEM among Australian early childhood professionals: How important is STEM in early childhood education. *Early Childhood, 50*(3), 353-369.	STEM
Speldewinde, C., & Campbell, C. (2021). Bush kinders: enabling girls' STEM identities in early childhood. *Journal of Adventure Education and Outdoor Learning.*	STEM
Somwaeng, A. (2021). Developing early childhood students' creative thinking ability in STEM education. *Journal of Physics: Conference series 1835(1).*	STEM
Strawhacker, A., Verish, C., Shaer, O., & Bers, M.U. (2020a). Young children's learning of bioengineering with CRISPEE: a developmentally appropriate tangible user interface. *Journal of Science Education and Technology, 29*(3), 319-339.	STEM
Strawhacker, A., Verish, C., Shaer, O., & Bers, M.U. (2020b). Designing with genes in early childhood: An exploratory user study of the tangible CRISPEE technology. *International Journal of Child-Computer Interaction, 26,* 100212.	STEM
Stephenson, T., Fleer, M., Fragkiadaki, G., & Rai, P. (2021a). Teaching STEM through play: Conditions created by the Conceptual PlayWorld model for early childhood teachers. *Early Years (online first)*	STEM
Stephenson, T., Fleer, M., Fragkiadaki, G., & Rai, P. (2021b). "You can be whatever you want to be!": Transforming teacher practices to support girls' STEM engagement. *Early Childhood Education Journal.*	STEM

Storjak, I., Pushkar, L., Jagust, T., & Krzic, A.S. (2020). First steps into STEM for young pupils through informal workshops. *2020 IEEE Frontiers in Education Conference (FIE)*, 2020, pp. 1-5.	STEM
Suh, D.D., Liang, E., Ng, F.F.-Y., Tamis-LeMonda, C.S. (2019). Children's block-building skills and mother-child block-building interactions across four U.S. ethnic groups. *Frontiers in Psychology.*	STEM
Sullivan, A., Strawhacker, A., & Bers, M.U. (2017). Dancing, drawing, and dramatic robots: Integrating robotics and the arts to teach. In M. S. Khine (Ed) *Robotics in STEM Education, 231-260,* Springer.	STEM/ STEAM
Sullivan, A., & Bers, M. U. (2019). Investigating the use of robotics to increase girls' interest in engineering during early elementary school. *International Journal of Technology and Design education, 29*(5), 1033-1051.	STEM
Sullivan, A., & Bers, M.U. (2018). Dancing robots: integrating art, music, and robotics in Singapore's early childhood centers. *International Journal of Technology and Design Education, 28*(2), 325-346.	STEM
Sullivan, A., & Bers, M. U. (2016). Robotics in the early childhood classroom: Learning outcomes from an 8-week robotics curriculum in pre-kindergarten through second grade. *International Journal of Technology and Design education, 26,* 3-20.	STEM
Tay, J., Salazar, A., Lee, H. (2018). Parental perceptions of STEM enrichment for young children. *Journal for the Education of the Gifted, 41*(1), 5-23.	STEM
Tippett, C. & Milford, T. (2017). Findings from a pre-kindergarten classroom: Making the case for STEM in early childhood education. *International Journal of Science & Mathematics Education, 15,* 67-86.	STEM
Ugur-Erdogmus, F. (2021). How do elementary childhood education teachers perceive robotics education in kindergarten? A qualitative study. *Participatory Educational Research, 8*(2), 421-434.	STEM
Uhlenberg, J.M., Geiken, R. (2021). Supporting young children's spatial understanding: Examining toddlers' experiences with contents and containers. *Early Childhood Education Journal, 49*(1), 49-60.	STEM
Üret, A., & Ceylan, R. (2021). Exploring the effectiveness of STEM education on the creativity of 5-year-old kindergarten children. *European Early Childhood Education Research Journal, 29(*6), 842-855.	STEM

Xiao, N; & Zhang, X. (2021). Interest in spatial activities predicts young children's spatial ability development: A two-year longitudinal study. *Contemporary Educational Psychology, 64.* 101943.	STEM
Yang, W. Wu, R., & Li, J. (2021). Development and validation of the STEM teaching self-efficacy scale (STSS) for early childhood teachers. *Current Psychology .*	STEM
Yang, W., Liu, H., Chen, N., Xu, P., & Lin, X. (2020). Is early spatial skills training effective? A meta-analysis. *Frontiers in Psychology, 11.*	STEM
Yelland, N., & Waghorn. (2020). STEM learning ecologies: collaborative pedagogies for supporting transitions to school. *International Journal of Early Years Education.*	STEM
Yücelyiğit, S. (2021). Effects of workshops on the early childhood Educators' perceptions of STEM practices. *Journal of Education and Future, 20*, 37-48.	STEM
Wan, Z. H., Jiang, Y. & Zhan, Y. (2021). STEM education in early childhood: A review of empirical studies. *Early Education and Development, 32*(7), 940-962.	STEM
Wargo, J. M., (2021). "Sound" civics, heard histories: A critical case of young children mobilising digital media to write (right) injustice. *Theory and Research in Social Education, 49*(3), 360-389.	Makerspace
Wargo, J. M., & Alvarado, J. (2020). Making as worlding: Young children composing change through speculative design. *Literacy, 54(*2), 13-21	Makerspace
Weng, J., & Li, H. (2020). Early technology education in China: A case study of Shanghai, *Early Child Development and Care, 190*(10), 1574-1585.	STEM
Wohlwend, K. E. (2018). Playing to our strengths: Finding innovation in children's and teachers imaginative expertise. *Language Arts, 95*(3), 162-170.	Makerspace
Wohlwend, K. E., Peppler, K. A., Keune, A., & Thompson, N. (2017). Making sense and nonsense: Comparing mediated discourse and agential realist approaches to materiality in preschool makerspace. *Journal of Early Childhood Literacy. 17*(3), 444-462.	Makerspace
Wohlwend, K. E., Scott, J. A., Yi, J. H., Deilman, A., & & Kargin, T. (2018). Hacking toys and remixing media: Integrating maker literacies into early childhood teacher education. In S. Danby, M. Fleer, C. Davidson, M. Hatzigianni (Eds) *Digital childhoods. International perspectives on early childhood education and development, 22*. Springer, Singapore.	Makerspace

Wright, B., Ford, D., & Scott, M. (2017). Multicultural pathways to STEM: engaging young gifted black boys using the color-coded bloom-banks matrix. *Gifted Child Today, 40*(4), 212-217	STEM
Zhao, W. & Guo, S. (2019). STEM in English for early childhood ecological awareness in China. Ekoloji, 28107), 3405-3416	STEM
Zhu, Y., & Palsha, S. (2016). Build our town - Using an augmented reality game to enhance young children's spatial cognition. *ICCE 2016 - 24th International Conference on Computers in Education: Think Global Act Local - Workshop Proceedings.*	STEAM