- [5] Witherspoon, E. B., Higashi, R. M., Schunn, C. D., Baehr, E. C. and Shoop, R. Developing Computational Thinking through a Virtual Robotics Programming Curriculum. ACM Trans. Comput. Educ., 18, 1 (2017), 1-20.
- [6] Martin, L. The promise of the Maker Movement for education. Journal of Pre-College Engineering Education Research (J-PEER), 5, 1 (2015), 4.
- [7] Rodger, S. H., Hayes, J., Lezin, G., Qin, H., Nelson, D., Tucker, R., Lopez, M., Cooper, S., Dann, W. and Slater, D. 2009. Engaging middle school teachers and students with alice in a diverse set of subjects. In *Proceedings* of the Proceedings of the 40th ACM technical symposium on Computer science education (SIGCSE). ACM, 271-275.
- [8] Bienkowski, M., Snow, E., Rutstein, D. W. and Grover, S. Assessment design patterns for computational thinking practices in secondary computer science: A first look. SRI International, Menlo Park, CA, 2015.
- [9] Grover, S. and Pea, R. Computational Thinking in K-12: A Review of the State of the Field. *Educational Researcher*, 42, 1 (2013), 38-43.
- [10] Wing, J. M. Computational Thinking. Communications of the ACM, 49, 3 (2006), 33-35.
- [11] K12CS K-12 Computer Science Framework. 2016.
- [12] NRC, N. R. C. A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. The National Academies, Washington, DC, 2011.
- [13] Buffum, P. S., Martinez-Arocho, A. G., Frankosky, M. H., Rodriguez, F. J., Wiebe, E. N. and Boyer, K. E. 2014. CS principles goes to middle school: learning how to teach Big Data. *Proceedings of the 45th ACM technical* symposium on computer science education (SIGCSE '14). ACM, 151-156.
- [14] Jona, K., Wilensky, U., Trouille, L., Horn, M., Orton, K., Weintrop, D. and Beheshti, E. 2014. Embedding computational thinking in science, technology, engineering, and math (CT-STEM). *Future Directions in Computer Science Education Summit Meeting.*
- [15] Weintrop, D., Beheshti, E., Horn, M., Orton, K., Jona, K., Trouille, L. and Wilensky, U. Defining computational thinking for mathematics and science classrooms. *Journal of Science Education and Technology*, 25, 1 (2016), 127-147.
- [16] Grover, S. 2017. Assessing Algorithmic and Computational Thinking in K-12: Lessons from a Middle School Classroom. In Emerging Research, Practice, and Policy on Computational Thinking. Educational Communications and Technology: Issues and Innovations. Springer, 269-288.
- [17] Grover, S., Cooper, S. and Pea, R. 2014. Assessing computational learning in K-12. In Proceedings of the 2014 conference on Innovation & technology in computer science education (ITTICSE '14). ACM, 57-62.
- [18] Shute, V. J., Sun, C. and Asbell-Clarke, J. Demystifying computational thinking. *Educational Research Review*, 22 (2017), 142-158.
- [19] Brennan, K. and Resnick, M. 2012. New frameworks for studying and assessing the development of computational thinking. In *Proceedings of* the 2012 annual meeting of the American Educational Research Association. AERA.
- [20] Denner, J., Werner, L. and Ortiz, E. Computer games created by middle school girls: Can they be used to measure understanding of computer science concepts? *Computers & Education*, 58, 1 (1// 2012), 240-249.
- [21] Tew, A. E. and Guzdial, M. 2011. The FCS1: a language independent assessment of CS1 knowledge. In Proceedings of the Proceedings of the 42nd ACM technical symposium on Computer science education. ACM, 111-116.
- [22] Weintrop, D. and Wilensky, U. 2015. Using Commutative Assessments to Compare Conceptual Understanding in Blocks-based and Text-based Programs. In International Computing Education Research Conference (ICER '15). ACM, 101-110.
- [23] Taylor, C., Zingaro, D., Porter, L., Webb, K. C., Lee, C. B. and Clancy, M. Computer science concept inventories: past and future. *Computer Science Education*, 24, 4 (2014), 253-276.
- [24] Curzon, P., McOwan, P. W., Plant, N. and Meagher, L. R. 2014. Introducing teachers to computational thinking using unplugged storytelling. In Proceedings of the 9th Workshop in Primary and Secondary Computing Education. ACM, 89-92.
- [25] Román-González, M., Moreno-León, J. and Robles, G. 2017. Complementary tools for computational thinking assessment. In Proceedings of international conference on computational thinking education (CTE 2017). The Education University of Hong Kong, 154-159.
- [26] Román-González, M., Pérez-González, J.-C. and Jiménez-Fernández, C. Which cognitive abilities underlie computational thinking? Criterion validity of the Computational Thinking Test. *Computers in Human Behavior* 72 (2016), 678-691.

- [27] Román-González, M., Pérez-González, J.-C., Moreno-León, J. and Robles, G. Extending the nomological network of computational thinking with non-cognitive factors. *Computers in Human Behavior*, 80 (2018), 441-459.
- [28] Alfonso, V. C., Flanagan, D. P. and Radwan, S. The impact of the Cattell-Horn-Carroll theory on test development and interpretation of cognitive and academic abilities. Guilford Publications, City, 2005.
- [29] McGrew, K. S. CHC theory and the human cognitive abilities project: Standing on the shoulders of the giants of psychometric intelligence research. *Intelligence*, 37, 1 (2009), 1-10.
- [30] Ambrósio, A. P., Xavier, C. and Georges, F. 2014. Digital ink for cognitive assessment of computational thinking. In *Proceedings of the 2014 IEEE Frontiers in Education Conference (FIE)*. IEEE, 1-7.
- [31] Basawapatna, A. R., Koh, K. H. and Repenning, A. 2010. Using scalable game design to teach computer science from middle school to graduate school. In Proceedings of the fifteenth annual conference on Innovation and technology in computer science education. ACM, 224-228.
- [32] Werner, L., Denner, J. and Campe, S. 2012. The Fairy Performance Assessment: Measuring Computational Thinking in Middle School. In Proceeding of the 44th ACM technical symposium on computer science education (SIGCSE '12). ACM, 421-426.
- [33] Dagienė, V. and Futschek, G. 2008. Bebras international contest on informatics and computer literacy: Criteria for good tasks. In International Conference on Informatics in Secondary Schools-Evolution and Perspectives. Springer, 19-30.
- [34] Dagiene, V. and Sentance, S. 2016. It's Computational Thinking! Bebras Tasks in the Curriculum. In International Conference on Informatics in Schools: Situation, Evolution, and Perspectives. Springer, 28-39.
- [35] Aksit, O. Enhancing Science Learning through Computational Thinking and Modeling in Middle School Classrooms: A Mixed Methods Study. Dissertation, North Carolina State University, Raleigh, NC, 2018.
- [36] Moreno-León, J. and Robles, G. 2015. Dr. Scratch: A web tool to automatically evaluate Scratch projects. In Proceedings of the workshop in primary and secondary computing education (WiPSCE '15). ACM, 132-133.
- [37] Blokhuis, D., Millican, P., Roffey, C., Schrijvers, E. and Sentance, S. UK Bebras Computational Thinking Challenge 2016. University of Oxford, Oxford, UK, 2015.
- [38] Barendsen, E., Mannila, L., Demo, B., Nata, Grgurina, A., Izu, C., Mirolo, C., Sentance, S., Settle, A., Gabriel, S. 2015. Concepts in K-9 Computer Science Education. In *Proceedings of the 2015 ITiCSE on Working Group Reports*. ACM, 85-116.
- [39] Dagienė, V., Stupurien, G. and Vinikien, L. 2016. Promoting Inclusive Informatics Education Through the Bebras Challenge to All K-12 Students. In Proceedings of the Proceedings of the 17th International Conference on Computer Systems and Technologies 2016. ACM, 407-414.
- [40] Bellettini, C., Lonati, V., Malchiodi, D., Monga, M., Morpurgo, A. and Torelli, M. 2015. How Challenging are Bebras Tasks?: An IRT Analysis Based on the Performance of Italian Students. In Proceedings of the 2015 ACM Conference on Innovation and Technology in Computer Science Education. ACM, 27-32.
- [41] Gujberova, M. and Kalas, I. 2013. Designing productive gradations of tasks in primary programming education. In *Proceedings of the 8th Workshop in Primary and Secondary Computing Education*. ACM, 108-117.
- [42] Hubwieser, P. and Muhling, A. 2014. Playing PISA with Bebras. In Proceedings of the 9th Workshop in Primary and Secondary Computing Education. ACM, 128-129.
- [43] Izu, C., Mirolo, C., Settle, A., Mannila, L. and Stupuriene, G. Exploring Bebras Tasks Content and Performance: A Multinational Study. *Informatics in Education*, 16, 1 (2017), 39-59.
- [44] Dagienė, V., Mannila, L., Poranen, T., Rolandsson, L. and Derhjelm, S. 2014. Students' performance on programming-related tasks in an informatics contest in Finland, Sweden and Lithuania. In Proceedings of the 2014 conference on Innovation; technology in computer science education. ACM, 153-158.
- [45] Fischer, G. H. and Molenaar, I. W. Rasch models: Foundations, recent developments, and applications. Springer Science, 2012.
- [46] Linacre, J. M. Winsteps®. Winsteps.com, 2018.
- [47] de Ayala, R. J. The Theory and Practice of Item Response Theory. Guilford Press, New York, 2009.
- [48] Chalmers, R. P. mirt: A multidimensional item response theory package for the R environment. *Journal of Statistical Software*, 48, 6 (2012), 1-29.