

**Appendix 1. Quality assessment of literature reviews**

Study	AMSTAR Score												Total	Overall Rating
	Was an 'a priori' design provided?	Was there duplicate study selection and data extraction?	Was a comprehensive literature search performed?	Was the status of publication (i.e. grey literature) used as an inclusion criterion?	Was a list of studies (included and excluded) provided?	Were the characteristics of the included studies provided?	Was the scientific quality of the included studies assessed and documented?	Was the scientific quality of the included studies used appropriately in formulating conclusions?	Were the methods used to combine the findings of studies appropriate?	Was the likelihood of publication bias assessed?	Was the conflict of interest stated?			
Alammary (2019)	y	y	y	y	n	y	y	y	n	n	n	7 (64%)	Moderate	
Atmacasoy et al., (2018)	y	ca	y	y	n	y	na	na	na	n	4 (36%)	Low		
Bernard et al., (2014)	y	y	y	y	n	n	y	y	y	y	8 (73%)	Moderate		
Boelens et al., (2017)	y	y	y	y	n	y	na	na	na	n	5 (45%)	Moderate		
Valentina et al., (2019)	y	ca	y	na	n	y	na	na	na	n	3 (27%)	Low		
Spanjers et al., (2015)	y	y	y	y	n	y	y	y	y	n	9 (82%)	High		
Caravias (2015)	y	ca	y	y	n	n	na	na	na	n	3 (27%)	Low		
Coyle et al., (2019)	y	ca	y	na	n	y	na	na	na	n	3 (27%)	Low		
Coyne et al., (2018)	y	y	y	y	n	y	y	y	y	n	9 (82%)	High		
Keengwe et al., (2012)	y	ca	y	y	n	n	na	na	na	n	3 (27%)	Low		
Keengwe et al., (2013)	y	ca	y	y	n	y	y	na	na	n	5 (45%)	Moderate		
Li et al., (2019)	y	y	y	y	n	y	y	y	y	y	9 (82%)	High		
Liu et al., (2016)	y	y	y	y	y	y	y	y	y	n	10 (91%)	High		
Mahmud (2018)	y	ca	y	na	na	y	y	y	y	n	7 (64%)	Moderate		
Oliver et al., (2014)	n	ca	y	y	n	n	na	na	na	n	2 (18%)	Low		
Pima et al., (2018)	y	ca	y	y	na	na	na	na	na	n	3 (27%)	Low		
River et al., (2016)	y	y	y	y	n	y	y	y	y	n	8 (73%)	Moderate		
Rodríguez-Triana et al., (2017)	y	y	y	y	n	y	y	y	y	n	8 (73%)	Moderate		
Rowe et al., (2012)	y	y	y	y	n	y	y	y	na	n	7 (64%)	Moderate		
Chan & Quek (2014)	n	ca	y	na	n	y	na	na	na	n	2 (18%)	Low		
Smith et al., (2019)	n	ca	y	y	n	n	na	na	na	n	2 (18%)	Low		
Van Laer et al., (2017)	y	y	y	y	n	y	na	na	na	n	5 (45%)	Moderate		
Ho (2017)	n	ca	y	y	n	n	na	na	na	n	2 (18%)	Low		
Wang et al., (2015)	n	ca	y	na	na	n	na	na	na	n	1 (9%)	Low		
Zhang & Zhu (2017)	n	ca	y	na	na	na	n	n	na	n	1 (9%)	Low		
Mahmud (2017)	y	ca	y	y	n	na	y	y	y	n	7 (64%)	Moderate		
Mubayrik (2018)	y	ca	y	y	n	y	y	y	na	n	6 (54%)	Moderate		
Febriani & Abdullah (2018)	y	ca	y	y	n	y	y	n	n	n	5 (45%)	Moderate		
Seraji (2020)	y	y	y	y	n	na	na	na	na	n	4 (36%)	Low		
Kanika	n	ca	y	y	na	na	na	na	na	n	2 (18%)	Low		

(2020)												
Anthony et al., (2020)	y	ca	y	y	n	y	y	na	na	n	6 (54%)	Moderate
Anthonysamy et al., (2020)	y	ca	y	y	y	y	y	na	na	n	7 (64%)	Moderate
Leidl et al., (2020)	y	y	y	y	n	y	y	na	na	n	6 (54%)	Moderate
Rasheed et al., (2020)	y	ca	y	y	n	y	y	n	na	n	5 (45%)	Moderate
Krismadinata et al., (2020)	y	ca	y	y	n	y	y	n	na	n	6 (54%)	Moderate
Castro-Gil & Correa (2021)	y	y	y	y	n	y	y	y	y	n	9 (82%)	High
Torresi-Steele & Drew (2013)	y	ca	y	y	n	na	na	na	na	n	3 (27%)	Low
Turan & Akdag-Cimen (2019)	y	y	y	y	n	na	na	na	na	n	4 (36%)	Low
Zou et al., (2020)	y	y	y	y	n	y	y	na	na	n	7 (64%)	Moderate
Yang et al., (2019)	y	y	y	y	n	y	na	na	na	n	5 (45%)	Moderate
Chen et al., (2019)	y	y	y	y	n	y	y	na	na	n	7 (64%)	Moderate
Cheng et al., (2020)	y	y	y	y	n	y	y	na	na	n	7 (64%)	Moderate
Birgili et al., (2021)	y	y	y	y	na	y	n	na	na	n	5 (45%)	Moderate
Bond (2020)	y	y	y	y	y	y	y	y	y	n	9 (82%)	High
Park et al., (2021)	y	y	y	y	y	y	y	na	na	n	8 (73%)	Moderate
Koh (2019)	y	y	y	y	n	y	y	y	na	n	8 (73%)	Moderate
Ekici (2021)	y	y	y	y	n	n	y	y	na	n	6 (54%)	Moderate
Evans et al., (2019)	y	y	y	y	n	y	y	y	y	n	9 (82%)	High
Lencastre et al., (2020)	y	ca	y	y	n	y	y	n	na	n	5 (45%)	Moderate
Karabulut - Ilgu et al., (2018)	y	ca	y	y	n	y	na	na	na	n	4 (36%)	Low
Lin & Hwang (2019)	y	y	y	y	n	y	y	na	na	n	7 (64%)	Moderate
Aydin et al., (2021)	y	y	y	y	n	na	na	na	y	n	6 (54%)	Moderate
Fernández-Martín et al., (2020)	y	y	y	y	n	y	na	na	na	n	5 (45%)	Moderate
Li et al., (2020)	y	y	y	y	n	y	y	y	y	n	9 (82%)	High
Lo & Hew (2017)	y	y	y	y	n	y	na	na	na	n	5 (45%)	Moderate
Algayres & Triantafyllou (2020)	y	ca	y	y	n	n	na	na	na	n	3 (27%)	Low
Presti (2016)	y	ca	y	y	n	y	na	na	na	n	4 (36%)	Low

*n = no; y = yes; ca = cannot answer; na = not applicable.*

- Alammary, A. (2019). Blended learning models for introductory programming courses: A systematic review. *PloS one*, 14(9), e0221765.
- Algayres, M. G., & Triantafyllou, E. (2020). Learning Analytics in Flipped Classrooms: A Scoping Review. *Electronic Journal of e-Learning*, 18(5), 397-409.
- Anthony, B., Kamaludin, A., Romli, A., Raffei, A. F. M., Phon, D. N. A. E., Abdullah, A., & Ming, G. L. (2020). Blended learning adoption and implementation in higher education: a theoretical and systematic review. *Technology, Knowledge and Learning*, 1-48.
- Anthonysamy, L., Koo, A. C., & Hew, S. H. (2020). Self-regulated learning strategies and non-academic outcomes in higher education blended learning environments: A one decade review. *Education and Information Technologies*, 1-28.
- Atmacasoy, A., & Aksu, M. (2018). Blended learning at pre-service teacher education in Turkey: A systematic review. *Education and Information Technologies*, 23(6), 2399-2422.
- Aydin, M., Okmen, B., Sahin, S., Kilic, A. (2021). The Meta-Analyses of the Studies about the Effect of Flipped Learning on Students' Achievements. *Turkish Online Journal of Distance Education*, 22(1), 33-51.
- Bernard, R. M., Borokhovski, E., Schmid, R. F., Tamim, R. M., & Abrami, P. C. (2014). A meta-analysis of blended learning and technology use in higher education: From the general to the applied. *Journal of Computing in Higher Education*, 26(1), 87-122.
- Birgili, B., Seggie, F. N., & Oğuz, E. (2021). The trends and outcomes of flipped learning research between 2012 and 2018: A descriptive content analysis. *Journal of Computers in Education*, 1-30.
- Boelens, R., De Wever, B., & Voet, M. (2017). Four key challenges to the design of blended learning: A systematic literature review. *Educational Research Review*, 22, 1-18.
- Bond, M. (2020). Facilitating student engagement through the flipped learning approach in K-12: A systematic review. *Computers & Education*, 151, 103819.
- Caravias, V. (2015). Literature review in conceptions and approaches to teaching using blended learning. *Curriculum Design and Classroom Management: Concepts, Methodologies, Tools, and Applications*, 1-22.
- Castro-Gil, R., & Correa, D. (2021). Transparency in previous literature reviews about blended learning in higher education. *Education and Information Technologies*, 1-28.
- Chan, R. H., & Quek, C. L. (2014). Benefits, challenges and strategies of implementing blended learning in tertiary institutes. *International Journal of Social Media and Interactive Learning Environments*, 2(3), 285-300.

- Chen, C. K., Huang, N. T. N., & Hwang, G. J. (2019). Findings and implications of flipped science learning research: A review of journal publications. *Interactive Learning Environments*, 1-18.
- Cheng, S. C., Hwang, G. J., & Lai, C. L. (2020). Critical research advancements of flipped learning: a review of the top 100 highly cited papers. *Interactive Learning Environments*, 1-17.
- Coyle, K. K., Chambers, B. D., Anderson, P. M., Firpo-Triplett, R., & Waterman, E. A. (2019). Blended learning for sexual health education: evidence base, promising practices, and potential challenges. *Journal of School Health*, 89(10), 847-859.
- Coyne, E., Rands, H., Frommolt, V., Kain, V., Plugge, M., & Mitchell, M. (2018). Investigation of blended learning video resources to teach health students clinical skills: an integrative review. *Nurse education today*, 63, 101-107.
- Ekici, M. (2021). A systematic review of the use of gamification in flipped learning. *Education and Information Technologies*, 1-20.
- Evans, L., Bosch, M. L. V., Harrington, S., Schoofs, N., & Coviak, C. (2019). Flipping the classroom in health care higher education: a systematic review. *Nurse educator*, 44(2), 74-78.
- Febriani, I., & Abdullah, M. I. (2018). A systematic review of formative assessment tools in the blended learning environment. *Int. J. Eng. Technol.*, 7, 33-39.
- Fernández-Martín, F. D., Romero-Rodríguez, J. M., Gómez-García, G., & Ramos Navas-Parejo, M. (2020). Impact of the flipped classroom method in the mathematical area: A systematic review. *Mathematics*, 8(12), 2162.
- Ho, W. Y. (2017). A review of blended synchronous learning. *International Journal of Social Media and Interactive Learning Environments*, 5(4), 278-291.
- Kanika, H. K. (2020). Effect of Blended Learning on Academic Achievements and Attitude of Nursing Students: A Systematic Review. *Indian Journal of Forensic Medicine & Toxicology*, 14(3), 383.
- Karabulut-IIgu, A., Jaramillo Cherrez, N., & Jahren, C. T. (2018). A systematic review of research on the flipped learning method in engineering education. *British Journal of Educational Technology*, 49(3), 398-411.
- Keengwe, J., & Kang, J. J. (2012). Blended learning in teacher preparation programs: A literature review. *International Journal of Information and Communication Technology Education (IJICTE)*, 8(2), 81-93.
- Keengwe, J., & Kang, J. J. (2013). A review of empirical research on blended learning in teacher education programs. *Education and Information Technologies*, 18(3), 479-493.

- Koh, J. H. L. (2019). Four pedagogical dimensions for understanding flipped classroom practices in higher education: A systematic review. *Educational Sciences: Theory and Practice*, 19(4), 14-33.
- Krismadinata, U. V., Jalinus, N., Rizal, F., Sukardi, P. S., Ramadhani, D., Lubis, A. L., ... & Novaliendry, D. (2020). Blended Learning as Instructional Model in Vocational Education: Literature Review. *Universal Journal of Educational Research*, 8(11B), 5801-5815.
- Leidl, D. M., Ritchie, L., & Moslemi, N. (2020). Blended learning in undergraduate nursing education—A scoping review. *Nurse Education Today*, 86, 104318.
- Lencastre, J. A., Morgado, J. C., Freires, T., & Bento, M. (2020). A systematic review on the flipped classroom model as a promoter of curriculum innovation.
- Li, B. Z., Cao, N. W., Ren, C. X., Chu, X. J., Zhou, H. Y., & Guo, B. (2020). Flipped classroom improves nursing students' theoretical learning in China: A meta-analysis. *PloS one*, 15(8), e0237926.
- Li, C., He, J., Yuan, C., Chen, B., & Sun, Z. (2019). The effects of blended learning on knowledge, skills, and satisfaction in nursing students: A meta-analysis. *Nurse Education Today*, 82, 51-57.
- Lin, H. C., & Hwang, G. J. (2019). Research trends of flipped classroom studies for medical courses: A review of journal publications from 2008 to 2017 based on the technology-enhanced learning model. *Interactive Learning Environments*, 27(8), 1011-1027.
- Liu, Q., Peng, W., Zhang, F., Hu, R., Li, Y., & Yan, W. (2016). The effectiveness of blended learning in health professions: systematic review and meta-analysis. *Journal of medical Internet research*, 18(1), e4807.
- Lo, C. K., & Hew, K. F. (2017). A critical review of flipped classroom challenges in K-12 education: Possible solutions and recommendations for future research. *Research and practice in technology enhanced learning*, 12(1), 1-22.
- Mahmud, M. M. (2017). Twenty-seven years of technology in practice: A meta-analysis and systematic review on blended learning. *Turkish Online Journal of Educational Technology*, 748-770.
- Mahmud, M. M. (2018). Technology and language—what works and what does not: A meta-analysis of blended learning research. *Journal of Asia TEFL*, 15(2), 365.
- Mubayrik, H. F. B. (2018). The present and future state of blended learning at workplace-learning settings in adult education: A systematic review. *Journal of Social Studies Education Research*, 9(4), 247-273.

- Oliver, K., & Stallings, D. (2014). Preparing teachers for emerging blended learning environments. *Journal of Technology and Teacher Education*, 22(1), 57-81.
- Park, J. H., Han, W. S., Kim, J., & Lee, H. (2021). Strategies for flipped learning in the health professions education in South Korea and their effects: A systematic review. *Education Sciences*, 11(1), 9.
- Pima, J. M., Odetayo, M., Iqbal, R., & Sedoyeka, E. (2018). A thematic review of blended learning in higher education. *International Journal of Mobile and Blended Learning (IJM&BL)*, 10(1), 1-11.
- Presti, C. R. (2016). The flipped learning approach in nursing education: A literature review. *Journal of Nursing Education*, 55(5), 252-257.
- Rasheed, R. A., Kamsin, A., & Abdullah, N. A. (2020). Challenges in the online component of blended learning: A systematic review. *Computers & Education*, 144, 103701.
- River, J., Currie, J., Crawford, T., Betihavas, V., & Randall, S. (2016). A systematic review examining the effectiveness of blending technology with team-based learning. *Nurse education today*, 45, 185-192.
- Rodríguez-Triana, M. J., Prieto, L. P., Vozniuk, A., Boroujeni, M. S., Schwendimann, B. A., Holzer, A., & Gillet, D. (2017). Monitoring, awareness and reflection in blended technology enhanced learning: a systematic review. *International Journal of Technology Enhanced Learning*, 9(2-3), 126-150.
- Rowe, M., Frantz, J., & Bozalek, V. (2012). The role of blended learning in the clinical education of healthcare students: a systematic review. *Medical teacher*, 34(4), e216-e221.
- Seraji, F. (2020). What differences? Thematic analyses of blended learning researches in Iran. *Open Learning: The Journal of Open, Distance and e-Learning*, 1-18.
- Smith, K., & Hill, J. (2019). Defining the nature of blended learning through its depiction in current research. *Higher Education Research & Development*, 38(2), 383-397.
- Spanjers, I. A., Könings, K. D., Leppink, J., Verstegen, D. M., de Jong, N., Czabanowska, K., & van Merrienboer, J. J. (2015). The promised land of blended learning: Quizzes as a moderator. *Educational Research Review*, 15, 59-74.
- Torrisi-Steele, G., & Drew, S. (2013). The literature landscape of blended learning in higher education: The need for better understanding of academic blended practice. *International Journal for Academic Development*, 18(4), 371-383.
- Turan, Z., & Akdag-Cimen, B. (2020). Flipped classroom in English language teaching: a systematic review. *Computer Assisted Language Learning*, 33(5-6), 590-606.

- Valentina, C., Giovanna, A., Erika, N., Silvia, F., Maria, C. G., Gianfranco, M., & Leopoldo, S. (2019). The use of blended learning to improve health professionals' communication skills: a literature review. *Acta Bio Medica: Atenei Parmensis*, 90(Suppl 4), 17.
- Van Laer, S., & Elen, J. (2017). In search of attributes that support self-regulation in blended learning environments. *Education and Information Technologies*, 22(4), 1395-1454.
- Wang, Y., Han, X., & Yang, J. (2015). Revisiting the blended learning literature: Using a complex adaptive systems framework. *Journal of Educational Technology & Society*, 18(2), 380-393.
- Yang, Q. F., Lin, C. J., & Hwang, G. J. (2019). Research focuses and findings of flipping mathematics classes: a review of journal publications based on the technology-enhanced learning model. *Interactive Learning Environments*, 1-34.
- Zhang, W., & Zhu, C. (2017). Review on blended learning: Identifying the key themes and categories. *International Journal of Information and Education Technology*, 7(9), 673-678.
- Zou, D., Luo, S., Xie, H., & Hwang, G. J. (2020). A systematic review of research on flipped language classrooms: Theoretical foundations, learning activities, tools, research topics and findings. *Computer Assisted Language Learning*, 1-27.