

SUPPLEMENTARY MATERIAL

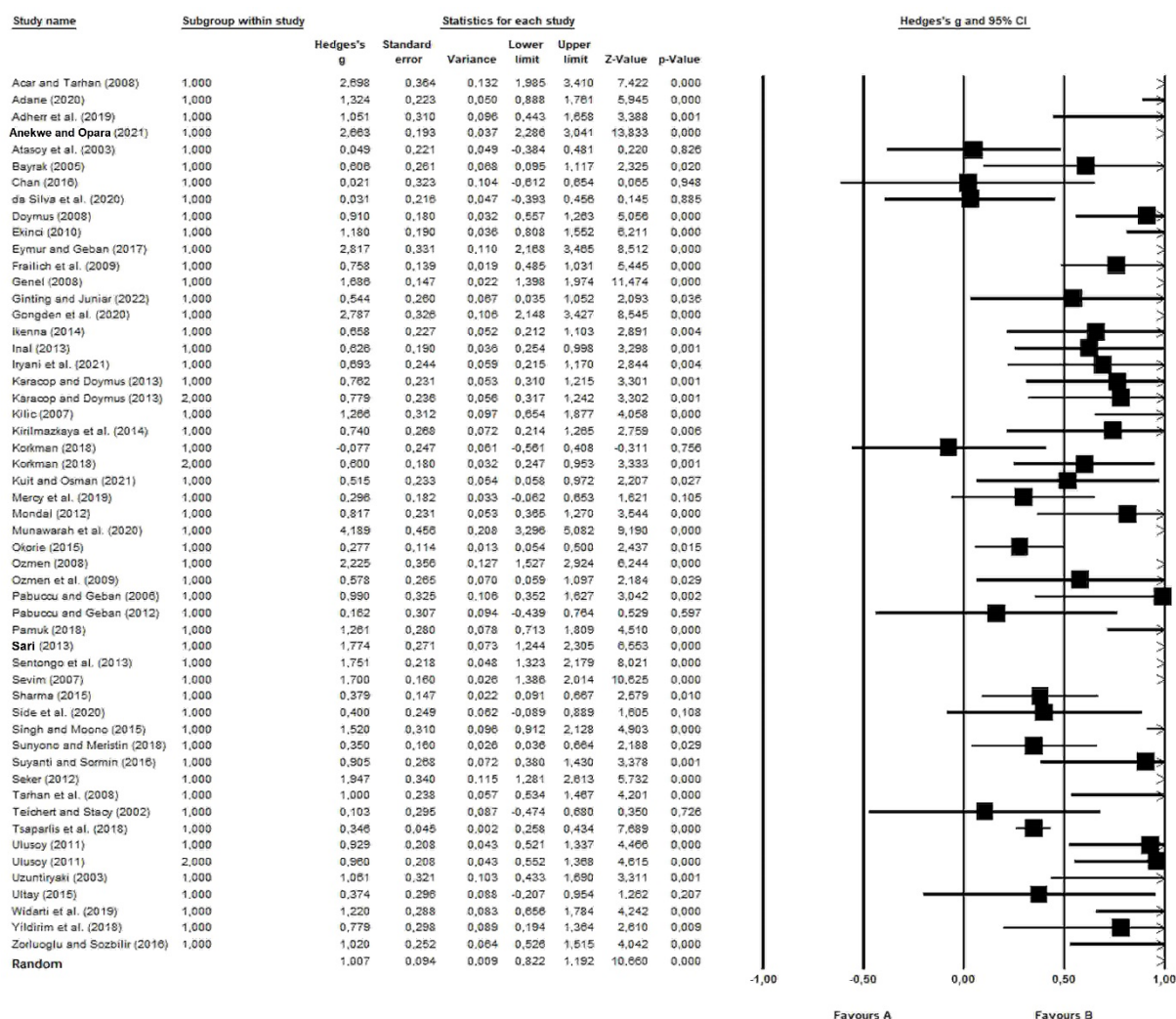
Table S1 Characteristics of the studies included in the meta-analysis

Characteristics	Criteria	Studies	f
Publication year	2002-2008	S1, S5, S6, S9, S13, S20, S28, S30, S35, S42, S43, S46	12
	2009-2015	S10, S12, S16, S17, S19, S21, S25, S27, S29, S31, S33, S34, S36, S38, S41, S45, S47	17
	2016-2022	S2, S3, S4, S7, S8, S11, S14, S15, S18, S22-S24, S26, S32, S37, S39, S40, S44, S48-S50	21
Publication type	Article	S1, S3-S5, S8, S9, S11, S12, S14-S16, S18, S19, S21, S23-S25, S27-S31, S34, S38-S40, S42-S44, S47, S49, S50	32
	Dissertation	S2, S6, S7, S10, S13, S17, S20, S22, S32, S33, S35, S36, S41, S45, S46	15
	Proceedings	S26, S37, S48	3
Sample size	31-100	S1-S3, S5-S11, S14-S16, S18, S20-S23, S25, S26, S28-S33, S37, S38, S40-S43, S45-S50	38
	101-400	S4, S12, S13, S17, S19, S24, S27, S34-S36, S39, S44	12
Grade	K-8	S6, S21, S22, S32, S41, S46-S49	9
	High school	S1-S5, S7, S10-S15, S17, S18, S20, S23-S31, S34, S36-S40, S42, S44, S45, S50	34
	University	S8, S9, S16, S19, S33, S35, S43	7
Academic performance	Achievement	S1-S4, S6, S8-S10, S12-S17, S20-S29, S32, S34-S36, S38-S40, S42, S44, S45, S49, S50	36
	Understanding	S5, S7, S11, S18, S19, S30, S31, S33, S37, S41, S43, S46-S48	14
Type of intervention	Computer-assisted instruction	S3, S4, S8, S12, S15, S21, S23, S25, S27, S28, S32, S34, S45	13
	Concept map	S2, S38	2
	Conceptual change	S20, S30, S33, S35, S47, S50	7
	Constructivist learning environment	S5, S24, S46	3
	Cooperative learning	S1, S9, S11	3

	Enriched learning environment with different techniques	S13, S19, S26, S29, S31, S41	6
	Inquiry-based learning	S14, S16, S18, S22, S40	5
	Multiple representation	S39, S48	2
	Other	Context-based learning	S10
		Discovery learning model equipped re-lyric songs	S37
		Drama-assisted instruction	S49
		Enriched text	S44
		Explain and integration ideas	S43
		Learning styles	S17
		Modelling	S7
		Multiple intelligence	S6
		Problem-based learning	S42
		Remedial learning system	S36

S1-Acar & Tarhan (2008); S2-Adane (2020); S3-Adherr et al. (2019); S4- Anekwe & Opara (2021); S5-Atasoy et al. (2003); S6-Bayrak (2005); S7-Chan (2016); S8-da Silva Júnior et al. (2020); S9-Doymuş (2008); S10-Ekinci (2010); S11-Eymur & Geban (2017); S12-Frailich et al. (2009); S13-Genel (2008); S14-Ginting & Juniar (2022); S15- Gongden et al. (2020); S16-Ikenna (2015); S17-İnal (2013); S18-Iryani et al. (2021); S19-Karacop & Doymus (2013); S20-Kılıç (2007); S21-Kırılmazkaya et al. (2014); S22-Korkman (2018); S23-Kuit & Osman (2021); S24-Mercy et al. (2019); S25-Mondal (2012); S26-Munawarah et al. (2020); S27-Okorie (2015); S28-Özmen (2008); S29-Özmen et al. (2009); S30-Pabuçcu & Geban (2006); S31-Pabuçcu & Geban (2012); S32-Pamuk (2018); S33-Sarı (2013); S34-Sentongo et al. (2013); S35-Sevim (2007); S36-Sharma (2015); S37-Side et al. (2020); S38-Singh & Moono (2015); S39-Sunyono & Meristin (2018); S40-Suyanti & Sormin (2016); S41-Şeker (2012); S42-Tarhan et al. (2008); S43-Teichert & Stacy (2002); S44-Tsaparlis et al. (2018); S45-Ulusoy (2011); S46-Uzuntiryaki (2003); S47-Ültay (2015); S48-Widarti & Marfu'ah (2019); S49-Yıldırım et al. (2018); S50-Zorluoğlu & Sözbilir (2016).

Figure S1. Forest plot of the papers included in the meta-analysis



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