

Appendix A. Expanded coding form from original meta-analysis (adapted by Permission of SAGE Publications, Inc. from Nesbit & Adesope, 2006, p. 441-446).

Study	Map use	Control medium	Map type	Region	Domain	Age group	Intervention	Duration	<i>n</i>	<i>g</i>
Abayomi (1988) <i>Map construction versus outlining</i>	C	Outline	S	USA/CND	STEM	I	NR	4wk+	156	0.36
Amer (1994) <i>Cooperative mapping versus underlining and text reading</i>	C	Other	S	Africa	Non-STEM	PS+	Group	4wk+	99	0.72
Bahr & Dansereau (2001) <i>Bilingual maps versus lists</i>	S	Lists	S	USA/CND	Non-STEM	PS+	Indiv.	<1wk	77	0.48
Bahr & Dansereau (2005) <i>Bilingual maps versus lists</i>	S	Lists	S	USA/CND	Non-STEM	PS+	Indiv.	<1wk	43	0.59
Blankenship & Dansereau (2000) <i>Animated map versus animated text</i>	S	S text	A	USA/CND	STEM	PS+	Indiv.	<1wk	64	0.70
Bodolus (1986) <i>Maps versus teachers chosen activity</i>	C	Disc/Lec	S	USA/CND	STEM	S	NR	NR	244	0.06
Chang, Sung, & Chen (2002) <i>Map construction or correction versus text reading</i>	C	S text	S	Asia	STEM	I	Indiv.	4wk+	93	0.33
Chang (1994) <i>Mapping versus outlining</i>	C	Outline	S	Asia	STEM	I	Mixed	4wk+	140	-0.23
Chularut & DeBacker (2004) <i>Concept mapping versus study and discussion</i>	C	Disc/Lec	S	USA/CND	Non-STEM	PS+	Mixed	1-4wks	79	2.16
Cliburn (1985) <i>Map-structured lectures</i>	S	Disc/Lec	S	USA/CND	STEM	PS+	Indiv.	4wk+	70	0.68
Czerniak & Haney (1998) <i>Cooperative mapping versus expository lecture</i>	C	Disc/Lec	S	USA/CND	STEM	PS+	Group	4wk+	118	0.75
Dees (1989) <i>Map versus text (low verbal ability)</i>	S	C text	S	USA/CND	STEM	PS+	Indiv.	<1wk	76	0.42
Dees (1989) <i>Map versus text (high verbal ability)</i>	S	C text	S	USA/CND	STEM	PS+	Indiv.	<1wk	67	-0.36
Esiobu & Soyibo (1995)	C	Disc/Lec	S	Africa	STEM	S	Indiv.	4wk+	270	1.93

Concept and vee mapping versus lectures

Esiobu & Soyibo (1995) <i>Concept and vee mapping versus lectures (cooperative)</i>	C	Disc/Lec	S	Africa	STEM	S	Group	4wk+	538	1.34
Guastello, Beasley, & Sinatra (2000) <i>Mapping versus reading and discussion</i>	C	Disc/Lec	S	USA/CND	STEM	I	Mixed	1-4wks	124	2.75*
Hall & O'Donnell (1996) <i>Maps versus text</i>	S	S text	S	USA/CND	STEM	PS+	Indiv.	<1wk	43	0.55
Hall, Sidio, & Hall (1994) <i>Maps versus text</i>	S	S text	S	USA/CND	STEM	PS+	Indiv.	<1wk	118	0.29
Hall, Dansereau, & Skaggs (1992) <i>Maps versus text</i>	S	S text	S	USA/CND	STEM	PS+	Indiv.	<1wk	92	0.55
Jegade, Alaiyemola, & Okebukola (1990) <i>Maps versus lecture</i>	C	Disc/Lec	S	Africa	STEM	S	Indiv.	4wk+	51	1.54
Jolly (1998) <i>Maps versus discussion/lecture</i>	C	Disc/Lec	S	USA/CND	STEM	I	Mixed	<1wk	36	1.02
Lambiotte & Dansereau (1992) <i>Map versus outline (high prior knowledge)</i>	S	Lists	S	USA/CND	STEM	PS+	Indiv.	1-4wks	36	-0.18
Lambiotte & Dansereau (1992) <i>Map versus outline (low prior knowledge)</i>	S	Lists	S	USA/CND	STEM	PS+	Indiv.	1-4wks	36	0.50
Lambiotte, Skaggs, & Dansereau (1993) <i>Map versus lists</i>	S	Lists	S	USA/CND	STEM	PS+	Indiv.	1-4wks	38	-0.07
Lambiotte, Skaggs, & Dansereau (1993) <i>Map versus lists (cooperative)</i>	S	Lists	S	USA/CND	STEM	PS+	Group	1-4wks	47	0.03
Lee (1997) <i>Maps versus lists</i>	S	Lists	I	USA/CND	STEM	PS+	Indiv.	1-4wks	36	0.43
Lee (1997) <i>Maps versus lists (with metacognitive cues)</i>	S	Lists	I	USA/CND	STEM	PS+	Indiv.	1-4wks	31	-0.27
Lehman, Carter, & Kahle (1985) <i>Mapping and vee versus outlining</i>	C	Outline	S	USA/CND	STEM	S	Indiv.	4wk+	235	0.08
Markow (1996) <i>Maps versus objective/essay</i>	C	C text	S	USA/CND	STEM	PS+	Indiv.	4wk+	31	-0.02

writing

McCagg & Dansereau (1991) <i>Maps versus learner-selected strategy</i>	C	Other	S	USA/CND	STEM	PS+	Mixed	4wk+	81	0.33
Moreland, Dansereau, & Chmielew (1997) <i>Maps versus text</i>	S	S text	S	USA/CND	Non-STEM	PS+	Indiv.	<1wk	64	0.36
Nesbit & Adesope (2005) <i>Animated map versus text</i>	S	S text	A	USA/CND	Non-STEM	PS+	Indiv.	<1wk	90	0.77
Nicoll, Fransciso, & Nakhleh (2001) <i>Mapping in chemistry</i>	C	Disc/Lec	S	USA/CND	STEM	PS+	Mixed	4wk+	20	1.03
Novak (1994) <i>Mapping cooperatively versus lecture</i>	C	Disc/Lec	S	USA/CND	Non-STEM	PS+	Mixed	4wk+	30	0.23
Okebukola (1990) <i>Mapping versus lecture</i>	C	Disc/Lec	S	Africa	STEM	PS+	Mixed	1-4wks	138	1.53
Okebukola (1992) <i>Mapping versus lecture</i>	C	Disc/Lec	S	Africa	STEM	S	Mixed	4wk+	147	1.16
Okebukola & Jegede (1988) <i>Mapping versus lecture</i>	C	Disc/Lec	S	Africa	STEM	PS+	Mixed	4wk+	145	1.86
Pankratius (1987) <i>Mapping versus experiment</i>	C	Other	S	USA/CND	STEM	S	Mixed	4wk+	87	0.45
Patterson (1993) <i>Map versus text</i>	S	S text	S	USA/CND	STEM	PS+	Indiv.	<1wk	181	0.42
Patterson, Dansereau, & Wiegmann (1993) <i>Map versus text (low verbal ability)</i>	S	S text	S	USA/CND	STEM	PS+	Group	<1wk	19	0.52
Patterson, Dansereau, & Wiegmann (1993) <i>Map versus text (high verbal ability)</i>	S	S text	S	USA/CND	STEM	PS+	Group	<1wk	19	-0.22
Patterson, Dansereau, & Newbern (1992) <i>Map versus text</i>	S	S text	S	USA/CND	STEM	PS+	Group	<1wk	101	0.39
Potelle & Rouett (2003) <i>Map versus list</i>	S	Lists	I	Europe	Non-STEM	PS+	Indiv.	<1wk	47	0.07
Prater & Terry (1988) <i>Mapping versus discussion</i>	C	Disc/Lec	S	USA/CND	Non-STEM	I	Mixed	4wk+	30	0.76
Reynolds & Dansereau (1990)	S	S text	I	USA/CND	STEM	PS+	Indiv.	<1wk	33	-0.12

Hypermap versus hypertext

Reynolds et al. (1991) <i>Hypermap versus hypertext</i>	S	S text	I	USA/CND	STEM	PS+	Group	<1wk	38	0.03
Rewey, Danserau, & Peel (1991) <i>Studying map versus text</i>	S	S text	S	USA/CND	STEM	PS+	Indiv.	1-4wks	50	-0.10
Rewey, Danserau, & Peel (1991) <i>Summarizing map versus text</i>	S	C text	S	USA/CND	STEM	PS+	Indiv.	1-4wks	46	0.25
Rewey et al. (1992) <i>Map versus text (low ability)</i>	S	S text	S	USA/CND	STEM	PS+	Indiv.	1-4wks	19	0.04
Rewey et al. (1992) <i>Map versus text (high ability)</i>	S	S text	S	USA/CND	STEM	PS+	Indiv.	1-4wks	20	0.32
Rewey et al. (1992) <i>Map versus text (low ability)</i>	S	S text	S	USA/CND	STEM	PS+	Group	1-4wks	38	0.38
Rewey et al. (1992) <i>Map versus text (high ability)</i>	S	S text	S	USA/CND	STEM	PS+	Group	1-4wks	44	0.07
Rewey et al. (1989) <i>Map versus text</i>	S	S text	S	USA/CND	STEM	PS+	Indiv.	1-4wks	50	0.20
Rewey et al. (1989) <i>Map versus text</i>	S	S text	S	USA/CND	STEM	PS+	Group	1-4wks	54	0.08
Salata (1999) <i>Map versus outline</i>	S	Outline	S	USA/CND	STEM	PS+	Indiv.	<1wk	170	0.43
Schmid & Telaro (1990) <i>Mapping versus lecture</i>	C	Disc/Lec	S	USA/CND	STEM	S	Indiv.	1-4wks	43	0.35
Skaggs (1988) <i>Maps versus text</i>	S	S text	S	USA/CND	STEM	PS+	Indiv.	1-4wks	103	0.10
Smith (1992) <i>Maps and vee heuristics versus discussion</i>	C	Disc/Lec	S	USA/CND	STEM	PS+	Mixed	4wk+	42	0.91
Spaulding (1989) <i>Mapping versus biology concepts</i>	C	Other	S	USA/CND	STEM	S	Indiv.	1-4wks	107	0.17
Spaulding (1989) <i>Mapping versus chemistry concepts</i>	C	Other	S	USA/CND	STEM	S	Indiv.	1-4wks	44	0.07
Udupa (1992) <i>Cooperative mapping versus studying</i>	C	Other	S	USA/CND	STEM	S	Group	4wk+	32	0.41
Umar (1999) <i>Map versus text</i>	S	S text	I	Asia	STEM	PS+	Indiv.	1-4wks	114	-0.02
Wachter (1993) <i>Map versus text</i>	S	S text	S	USA/CND	Non-STEM	I	Indiv.	1-4wks	80	0.62

Wallace & West (1998) <i>Map versus text</i>	S	S text	S	USA/CND	Non-STEM	PS+	Indiv.	1-4wks	40	0.67
Wiegmann (1992) <i>Map versus text</i>	S	S text	S	USA/CND	STEM	PS+	Indiv.	<1wk	143	1.07
Willerman & Mac Harg (1991) <i>Map versus presentation</i>	S	Disc/Lec	S	USA/CND	STEM	I	Indiv.	1-4wks	82	0.42
Zittle (2001) <i>Maps versus texts</i>	S	S text	S	Other/NR	STEM	PS+	Indiv.	<1wk	139	0.83

* effect size was determined to be an outlier and was downsized to slightly greater than the next highest effect size.

Appendix B. Coding form for newly coded studies. Note that ‘traditional instruction’ was operationalized differently throughout the sample, hence why studies may be coded differently for the control medium.

Study	Map use	Control medium	Map type	Region	Domain	Age group	Intervention	Duration	<i>n</i>	<i>g</i>
Acat (2008) <i>Studied concept map</i>	S	Disc/Lec	S	Middle East	Non-STEM	I	Indiv.	4wk+	86	0.97
Adesope & Nesbit (2013) <i>Static map versus text</i>	S	S text	S	USA/CND	STEM	PS+	Indiv.	<1wk	66	0.85
Adesope & Nesbit (2013) <i>Animated map versus text</i>	S	S text	A	USA/CND	STEM	PS+	Indiv.	<1wk	69	0.66
Akay, Kaya, & Kiliç (2012) <i>Created concept map</i>	C	Disc/Lec	S	Middle East	STEM	S	Mixed	1-4wks	45	0.91
Akpınar & Ergin (2008) <i>Maps versus traditional instruction</i>	C	Other	S	Middle East	STEM	I	Other	1-4wks	65	1.45
Al khawaldeh & Al Olaimat (2010) <i>Conceptual change text and map versus traditional instruction</i>	C	Disc/Lec	S	Other/NR	STEM	S	Indiv.	1-4wks	70	1.43
Arslan (2006) <i>Map versus control and note taking</i>	C	Other	S	Middle East	STEM	I	NR	1-4wks	135	-0.28
Asan (2007) <i>Created concept maps</i>	C	Other	S	Middle East	STEM	I	Indiv.	1-4wks	23	1.78
BauJaoude & Attieh (2008) <i>Map versus traditional instruction</i>	C	Other	S	Middle East	STEM	S	Indiv.	4wk+	58	0.39
Berry (2011) <i>Map versus comprehension questions</i>	C	C text	S	USA/CND	STEM	I	Mixed	1-4wks	58	0.63
Bramwell-Lalor & Rainford (2014) <i>Maps versus discussion and lectures</i>	C	Disc/Lec	S	Other/NR	STEM	S	Mixed	4wk+	156	0.56
Chape (2005) <i>Map versus discussion</i>	C	Disc/Lec	S	USA/CND	STEM	PS+	Group	4wk+	30	-0.33
Chin, Dohmen, & Schwartz (2013) <i>Maps versus traditional instruction</i>	C	Other	I	USA/CND	STEM	I	Indiv.	4wk+	133	0.97
Chiou (2008) <i>Maps versus traditional instruction</i>	C	Disc/Lec	S	Asia	STEM	PS+	Indiv.	4wk+	124	0.53
Chiou (2009) <i>Map versus textbook-based instruction</i>	C	Disc/Lec	S	Asia	STEM	PS+	Mixed	4wk+	51	1.40
Chou (2009)	S	S text	A	USA/CND	STEM	PS+	Indiv.	<1wk	63	0.14

Maps versus text or text and images

Chou (2009)

<i>Maps versus text or text and images</i>	S	S text	A	USA/CND	STEM	PS+	Indiv.	<1wk	63	-0.59
Chou, Chen, & Dwyer (2011)										
<i>Maps with or without image versus hypertext</i>	S	S text	Mix	USA/CND	STEM	PS+	Indiv.	1-4wks	95	0.76
Conklin (2007)										
<i>Map versus alternate instruction</i>	C	Other	S	USA/CND	STEM	S	Mixed	4wk+	79	0.03
D'Antoni et al. (2010)										
<i>Map versus notetaking</i>	C	C text	S	USA/CND	STEM	PS+	Indiv.	<1wk	131	-0.16
Erdogan (2009)										
<i>Map versus control</i>	C	Disc/Lec	Mix	Middle East	STEM	I	Mixed	1-4wks	77	0.75
Foor (2001)										
<i>High skill map (with or without images) versus text with or without images</i>	S	S text	Mix	USA/CND	Non-STEM	PS+	Indiv.	<1wk	67	-0.38
Foor (2001)										
<i>Medium skill map (with or without images) versus text with or without images</i>	S	S text	Mix	USA/CND	Non-STEM	PS+	Indiv.	<1wk	68	-0.17
Foor (2001)										
<i>Low skill map (with or without images) versus text with or without images</i>	S	S text	Mix	USA/CND	Non-STEM	PS+	Indiv.	<1wk	73	0.02
Gijlers & de Jong (2013)										
<i>Map versus online learning environment</i>	C	Other	I	Europe	STEM	S	Other	<1wk	50	0.44
González et al. (2008)										
<i>Map versus traditional method</i>	C	Disc/Lec	S	Other/NR	STEM	PS+	Group	1-4wks	122	0.20
Gurlitt & Renkl (2008)										
<i>Create and label lines or label lines versus no map</i>	C	Other	I	Europe	STEM	S	Indiv.	<1wk	43	0.62
Gurlitt & Renkl (2008)										
<i>Create and label lines or label lines versus no map</i>	C	Other	I	Europe	STEM	PS+	Indiv.	<1wk	45	0.84
Hagemans, van der Meij, de Jong (2013)										
<i>Map in simulation versus</i>	S	Lists	I	Other/NR	STEM	S	Indiv.	1-4wks	61	1.01

simulation

Hagemans, van der Meij, de Jong (2013) <i>Map optimal route versus list optimal route</i>	S	Lists	I	Other/NR	STEM	S	Indiv.	1-4wks	52	1.70
Hagemans, van der Meij, de Jong (2013) <i>Map suboptimal route versus list suboptimal route</i>	S	Lists	I	Other/NR	STEM	S	Indiv.	1-4wks	47	1.61
Haugwitz, Nesbit, & Sandmann (2010) <i>Mapping versus essay writing (high ability)</i>	C	C text	S	Europe	STEM	S	Group	<1wk	137	0.26
Haugwitz, Nesbit, & Sandmann (2010) <i>Mapping versus essay writing (low ability)</i>	C	C text	S	Europe	STEM	S	Group	<1wk	111	0.80
Hayati & Shariatifar (2009) <i>Map versus control (underlining or not underlining)</i>	C	S text	S	Middle East	Non-STEM	PS+	Indiv.	<1wk	60	0.34
Huang et al. (2012) <i>Maps versus textbook</i>	S	S text	Mix	Asia	STEM	I	Indiv.	1-4wks	103	1.08
Hwang et al. (2014) <i>Mapping versus summarizing</i>	C	C text	I	Asia	Non-STEM	I	Indiv.	<1wk	66	0.52
Hwang, Shi, & Chu (2011) <i>Map versus mobile learning</i>	C	Other	S	Asia	STEM	I	Mixed	<1wk	70	0.13
Hwang, Yang, & Wang (2013) <i>Map in game versus game without map</i>	S	Other	A	Asia	STEM	I	Indiv.	<1wk	56	0.73
Jia (2007) <i>Map versus text</i>	S	S text	I	USA/CND	STEM	PS+	Indiv.	1-4wks	40	-0.18
Johansson, Salanterä, & Katajisto (2007) <i>Map versus text</i>	S	S text	S	Europe	STEM	PS+	NR	4wk+	106	0.47
Kalhor & Shakibaei (2012) <i>Map versus traditional instruction</i>	C	Other	S	Middle East	Non-STEM	I	Mixed	1-4wks	36	1.32
Keown (2008) <i>Map versus traditional instruction</i>	C	Other	S	USA/CND	STEM	I	Indiv.	1-4wks	33	0.66
Keown (2008) <i>Map and thematic organizer versus</i>	C	Other	S	USA/CND	STEM	I	Indiv.	1-4wks	34	0.00

thematic organizer

Khajavi & Ketabi (2012) <i>Maps versus traditional instruction</i>	C	Other	S	Middle East	Non-STEM	PS+	Indiv.	4wk+	60	0.44
Kim & Olaciregui (2008) <i>Map versus outline</i>	S	Outline	I	USA/CND	STEM	I	Indiv.	1-4wks	50	1.11
Kolloffel, Eysink, & de Jong (2011) <i>Individual map versus text</i>	C	C text	S	Europe	STEM	S	Group	1-4wks	33	2.52
Kolloffel, Eysink, & de Jong (2011) <i>Cooperative map versus text</i>	C	C text	S	Europe	STEM	S	Indiv.	1-4wks	44	0.43
Lee & Segev (2012) <i>Map versus text</i>	S	S text	I	Other/NR	NR	PS+	Indiv.	<1wk	34	0.05
Ling & Boo (2007) <i>Maps versus outline summary</i>	C	Outline	S	Asia	STEM	I	Group	4wk+	31	0.84
Ling & Boo (2007) <i>Maps versus outline summary</i>	C	Outline	S	Asia	STEM	I	Group	4wk+	77	0.91
Liu, Chen, & Chang (2010) <i>Maps versus traditional instruction</i>	C	C text	S	Other/NR	Non-STEM	PS+	Indiv.	4wk+	192	0.44
Marée, van Bruggen, & Jochems (2013) <i>Maps versus traditional instruction</i>	C	Disc/Lec	I	Europe	STEM	PS+	Mixed	4wk+	69	0.35
Meijerink & van der Veen (2010) <i>Maps versus extra time</i>	S	Other	S	Europe	STEM	S	Other	4wk+	56	0.75
Miller et al. (2012) <i>Maps (before or after instruction) versus no map</i>	S	S text	S	USA/CND	STEM	PS+	Indiv.	<1wk	111	-1.37
Morey & Danserau (2010) <i>Map versus social perspective</i>	C	Other	S	USA/CND	Non-STEM	PS+	Indiv.	1-4wks	161	-0.04
Nesbit & Adesope (2011) <i>Map (plain and color) versus text (concurrent audio or delayed audio)</i>	S	S text	A	USA/CND	Non-STEM	PS+	Indiv.	1-4wks	115	0.83
Olgun (2008) <i>Maps versus traditional instruction</i>	C	Disc/Lec	S	Middle East	STEM	I	Indiv.	1-4wks	75	0.23
Özmen, Demircioğlu, & Coll (2009) <i>Maps and labs versus traditional instruction</i>	C	Disc/Lec	S	Middle East	STEM	S	Group	1-4wks	59	1.44
Pickens (2007) <i>Map versus traditional instruction</i>	C	Outline	S	USA/CND	STEM	PS+	Indiv.	4wk+	11	1.21
Redford et al. (2012) <i>Map versus rereading</i>	C	S text	S	USA/CND	STEM	I	Indiv.	<1wk	59	1.43
Redford et al. (2012)	C	S text	S	USA/CND	STEM	I	Indiv.	<1wk	103	-0.87

*Map (presented or constructed)
versus rereading*

Sas (2008) <i>Collaborative mapping versus traditional instruction</i>	S	Disc/Lec	S	Other/NR	STEM	PS+	Group	1-4wks	52	2.70*
Sawaya (2010) <i>Map during lecture versus lecture</i>	C	Disc/Lec	S	USA/CND	STEM	PS+	Indiv.	4wk+	39	0.45
Scandrett (2005) <i>Map versus worksheet</i>	C	C text	S	USA/CND	Non-STEM	PS+	Indiv.	<1wk	62	0.20
Shaw & Keh (2011) <i>Map versus browse-based</i>	S	Other	I	Asia	STEM	PS+	Indiv.	<1wk	78	2.65
Shaw (2010) <i>Map versus browse-based</i>	S	Other	I	Asia	STEM	PS+	Indiv.	<1wk	152	0.88
Stanisavljevic & Djuric (2013) <i>Map versus traditional instruction</i>	C	Disc/Lec	I	Europe	STEM	PS+	Indiv.	1-4wks	57	1.71
Su & Klein (2006) <i>Map versus hyperlink or outline</i>	S	Other	I	USA/CND	STEM	PS+	Indiv.	<1wk	354	0.03
Surapaneni & Tekian (2013) <i>Maps versus traditional instruction</i>	C	Disc/Lec	S	Asia	STEM	PS+	Group	4wk+	150	2.67
Tastan, Dikmenli, & Cardak (2008) <i>Map and conceptual change text versus traditional instruction</i>	C	Disc/Lec	S	Middle East	STEM	S	NR	4wk+	50	0.46
Uzuntiryaki & Geban (2005) <i>Maps versus traditional instruction</i>	S	Disc/Lec	S	Middle East	STEM	I	Group	1-4wks	64	0.94
Veronese et al. (2013) <i>Map versus no map</i>	C	Other	S	USA/CND	STEM	PS+	Group	4wk+	72	0.42
Wang & Dwyer (2006) <i>Map versus no map</i>	C	S text	I	USA/CND	STEM	PS+	Indiv.	<1wk	231	0.47
Wang (2007) <i>Map versus list</i>	S	Lists	I	USA/CND	STEM	PS+	Indiv.	1-4wks	75	-0.30
Yuruk, Beeth, & Anderson (2009) <i>Maps versus traditional instruction</i>	C	Disc/Lec	S	Middle East	STEM	S	NR	4wk+	43	1.18

* effect size was determined to be an outlier and was downsized to slightly greater than the next highest effect size.