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Peer-to-peer Teaching in Higher Education: A Critical Literature Review

Martin Stigmar
Linnaeus University

The aim of my critical literature review is to identify studies where students are engaged as partners in teaching in higher education and to analyze how tutors and tutees benefit from peer teaching. Thirty studies were included for review. Thirteen countries are represented and two thirds of the studies conducted in the United States of America or the United Kingdom. There is a significant representation of studies from natural- and physical science. The dominating pedagogical belief and theory is social constructivism. The most frequent study design is the use of quasi-experimental pre- and post-testing. University teachers do not comprise the view of peer teaching necessarily resulting in greater academic achievement gains or deep learning. University teachers identify and esteem other pedagogical benefits such as improving students': critical thinking, learning autonomy, motivation, collaborative and communicative skills. The main finding of this review is the clarification that the training of generic skills benefits from peer teaching.

Keywords: deep learning, generic skills, higher-education, literature review, peer-to-peer teaching

Introduction, Purpose and Knowledge Gap

To meet the dual requirement of improving teaching and learning quality while doing more with less, an increased interest for engaging students as partners in learning and teaching has emerged. Consequently, in my critical literature review, I identify studies where university students are engaged as partners in learning and teaching in higher education and analyze how tutors and tutees benefit from peer teaching. A peer tutor is anyone who is of a similar status as the person being tutored and operates as a complement and active partner with university teachers in the process of learning and teaching. It is essential to clarify that student partners, often a senior student, involved in academic support programs such as peer-to-peer teaching are not teachers and are not expected to teach and present new material. However, they facilitate the learning of their peers. Peer-to-peer teaching is not consistently defined and a number of expressions are used interchangeably by authors (Dawson, van der Meer, Skalicky, & Cowley, 2014).

Reduced resources in higher education coupled with increased student numbers have often resulted in larger classes encouraging a traditional lecturing style of delivery and transmission of information from teacher to students and less interactive teaching and learning. There has also been concern that traditional lecturing promotes a surface approach to learning, failing to stimulate the development of transferable and generic

Martin Stigmar, University Center for Educational Development, Linnaeus University

Correspondence concerning this article should be addressed to Martin Stigmar, University Center for Educational Development, Linnaeus University, Box 451, 351 06 Campus, Växjö, Sweden. E-mail: martin.stigmar@lnu.se

skills (Topping, 1996). A highly relevant article within the field of peer teaching is, *Retrieval Practice Produces More Learning than Elaborative Studying with Concept Mapping*, by Karpicke and Blunt (2011). In this study students practice retrieval by recalling information, it is concluded that retrieval practice between peers is an effective tool to promote learning of complex concepts (Karpicke & Blunt, 2011). It was claimed that the act of reconstructing knowledge, in itself enhances learning "... tutoring itself can have an important, positive impact on knowledge retention. Thus, learning the material to teach another student may be a particularly effective way to increase content mastery" (Astin, 1993, p. 111). How then can student retrieval practice, reconstructing knowledge, be used in higher education, when students are teaching each other? John Hattie, Professor of Education, makes the following claim in his groundbreaking book, *Visible Learning*: "The remarkable feature of the evidence is that the biggest effects on student learning occur when teachers become learners of their own teaching, and when students become their own teachers" (Hattie, 2009, p. 22).

When learners shift from being students as recipients to being productive teachers, it is likely they need to understand the material at a deeper level to be effective teachers. According to Mazur (2014), many students concentrate on learning recipes or problem-solving strategies without understanding the underlying concepts; a focus on memorization does not always result in understanding.

On the other hand, students, who become teachers of their own learning, tend to engage in self-assessing, self-evaluating, self-monitoring, and self-learning. Cognitive activities to monitor and recall information include: (a) summarizing, (b) questioning, (c) clarifying, and (d) predicting and this is, according to Hattie (2009), accomplished when students become their own teachers" (p. 22). Cornwall (1980) suggested peer-assisted learning is successful because the peer-teacher and students share a similar knowledge base, or a cognitive congruence, which allows the peer-teachers to use language that their learners understand and to explain concepts at an appropriate level.

In summary, on the basis of the presumption that the best way to learn something is to teach it, the purpose of my literature review is to locate studies in which participating students must organize information in such a way as to be able to verbally articulate it to others.

The Knowledge Gap

There are a number of research gaps that need to be investigated in connection to peer teaching. For example, how do researchers demonstrate how university teachers have arranged learning environments to support students in being actively involved in their learning? Hattie's book *Visible Learning* (2009) is based on synthesizing meta-analyses but there is much disapproval of meta-analyses, one being that of combining disparate studies. What findings will emerge if instead separate studies on a concrete detailed level are scrutinized?

First, while Topping (1996) established that there is substantial evidence that peer teaching is effective in schools in previous reviews and meta-analyses of research, these results can certainly not be automatically generalized to higher education. What conditions apply to higher education, what have university teachers in partnership with students as co-creators in teaching and learning actually accomplished? What lessons have been learned (see Velez, Cano, Whittington, & Wolf, 2011)?

Second, the theory that students who assume the role of teachers, need to understand the subject matter at a deeper level, is not well explored according to Hattie (2009). What then does previous research reveal on the relation of deep learning and students as peer teachers? What research has been presented since Hattie's book *Visible Learning* was published in 2009 in the field of students as peer teachers in higher education?

The lack of literature in the area of peer-to-peer teaching and learning was highlighted by Deakin, Wakefield, and Gregorius (2012). Without an updated literature review there will be no full understanding of the topic or what has already been researched and what remains to be explored (Booth, Papaioannou, & Sutton, 2012). The result of a literature review explicitly presented and in a transparent and reproducible way, can generally give us the most reliable estimate of the effectiveness of a specific intervention (Booth et al., 2012).

My study will serve as a first step and foundation reviewing previous research, a logical second step will be to continue with an empirical study.

Aim and Research Questions

The aim of my literature review was to identify studies where university students are engaged as partners in learning and teaching in higher education and to analyze how tutors and tutees benefit from peer teaching.

The following four questions are examined:

- (1) In which countries and subjects are the studies discovered?
- (2) What pedagogical beliefs and theories influence the teaching approach?
- (3) What study designs are frequent?
- (4) What are the research outcomes and what evidence in previous research show: "... that the tutors need to understand the material at a deeper level to be effective teachers" (Hattie, 2009, p. 187)?

Method

According to Booth et al. (2012), the stages of the search process and recommended techniques should be utilized in relation to the purpose of the review. Five stages were relevant for this review: (a) an initial *scoping search* for existing articles and getting familiarized with the topic, (b) *conduct search* using the identified search terms and publication years, (c) *synthesis and theory* based on data extraction (d) presentation of *research outcomes*, (e) *analysis, discussion and conclusions*.

Stage 1: Scoping Search and Descriptors

In order to get familiarized with the topic and volume of literature, an initial search for existing articles was carried out in the database ERIC, Educational Resource Information Centre. The purpose of this initial search was to develop a search strategy and determine what databases, descriptors, and search period to be used in the critical literature review.

The string *peer-tutoring OR reciprocal-teaching OR peer-teaching AND higher education AND review* limited to peer-reviewed journals and the years of 1976–2014,

resulted in 46 search outcomes. Out of the 46 search outcomes 38 were available in full text online. These 38 journal articles were skimmed through.

As a result of the initial search, it was determined that only face-to-face tutoring was of interest for this review, not tutoring in connection to electronic media or virtual learning environments. My review focuses both cross-level peer tutoring, when a student from a higher level (a senior student) helps a more novice student and a same-year group of peers. Librarians, community partnership, university writing centers, self-directed learning with work books were excluded from the review.

A complementary search was made in the University Library's discovery tool, EBSCO Discovery Service, to check for relevant articles indexed in other databases. The discovery tool includes the Web of Science databases, PsycInfo, ERIC and a number of other databases from all disciplines. The search with the same search terms as above resulted in only a few articles found in other databases than ERIC. A decision was therefore made to use ERIC as the main database. As a result of my searches, the descriptors were specified and limited to: peer teaching = "Practice in which students take on a teaching role in a school setting in order to share their knowledge with other students", and reciprocal teaching = "An instructional technique in which a teacher and student, or a tutor and tutee, take turns with the role of teaching—frequently used for improving reading comprehension."

Stage 2: Conduct Search

My literature search was conducted in ERIC, using the string: DE *peer teaching* OR DE *reciprocal teaching* AND *higher education* resulting in 127 peer-reviewed search hits. My literature review was limited to studies published as journal articles published during the years of 2010–2013, proceeding Hattie's book *Visible Learning*, from 2009. Neither literature reviews nor meta-analyses were included.

The next step was to exclude studies based on irrelevant title and/or abstract and/or full text as illustrated in Figure 1.

All 30 studies were read and data were extracted from each one. In addition to basic data about country and subject context, data extraction focused on (a) the pedagogical approach and theory, (b) the research design and (c) what outcomes and evidence was found on deep learning, in other words learning as primarily seeking meaning (Marton & Booth, 1997). The following studies were identified where university students were engaged as partners in learning and teaching in higher education Table 1.

Countries. In my review studies were discovered in the following countries:

- United States of America (4; 7; 8; 9; 14; 15; 17; 21; 23; 25; 26; 28; 29; 30)
- United Kingdom (1; 3; 10; 16; 20)
- New Zealand (12)
- South Africa (27)
- Australia (6)
- Thailand (5)
- Belgium (19)
- Sri Lanka (22)

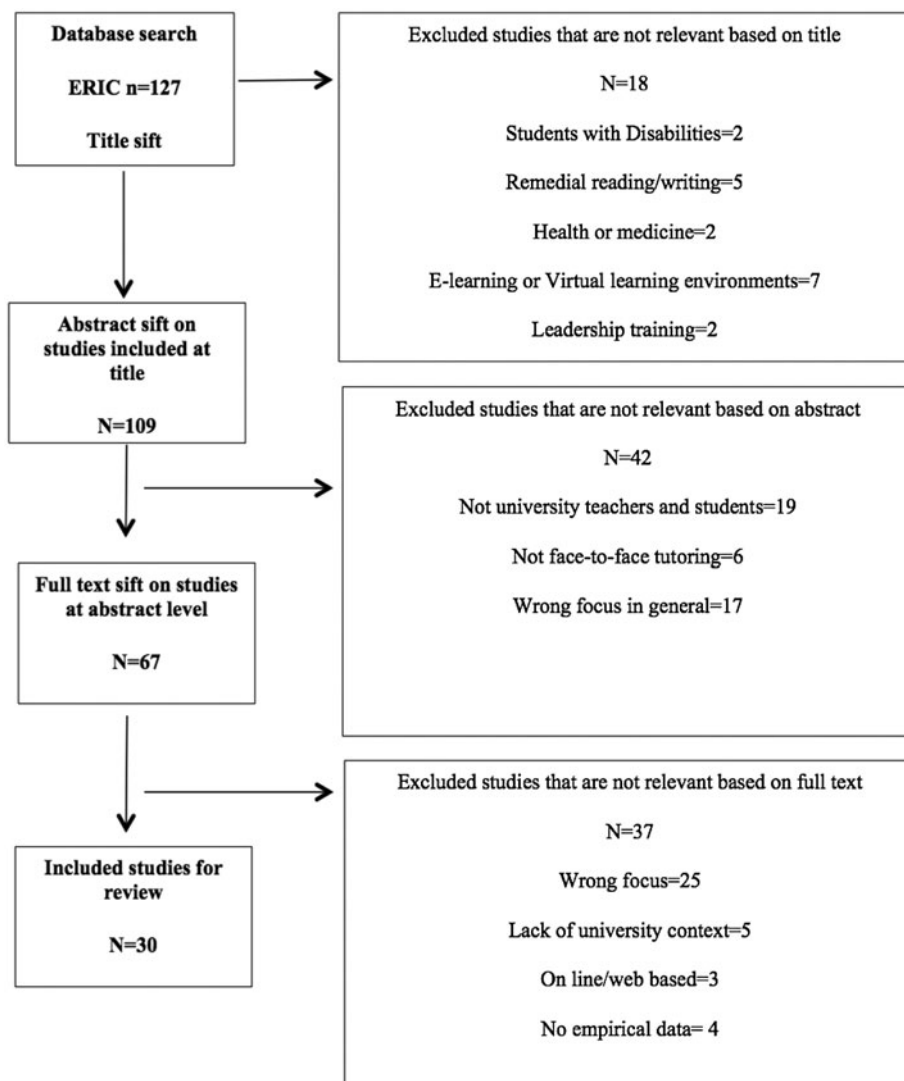


Figure 1. Flow diagram of review procedure.

- Turkey (13)
- Spain (2)
- Hong Kong (18)
- Mexico (11)
- India (24)

In total 13 countries are represented and almost two-thirds of the studies derive from the United States of America and the United Kingdom. Eleven countries are represented by a single study.

Table 1
Included Studies for Review

Author	Year	Title
1 Alpay, E., Cutler, P. S., Eisenbach, S., & Field, A. J.	2010	Changing the marks-based culture of learning through peer-assisted tutorials
2 Arco-Tirado J. L., Fernandez-Martin, F. D., & Fernandez-Balboa, J. M.	2011	The impact of a peer-tutoring program on quality standards in higher education
3 Asghar, A.	2010	Reciprocal peer coaching and its use as a formative assessment strategy for first-year students
4 Brooks, B. J., & Koretsky, M. D.	2011	The influence of group discussion on students' responses and confidence during peer instruction
5 Buraphadeja, V., & Kumnuanta, J.	2011	Enhancing the sense of community and learning experience using self-paced instruction and peer tutoring in a computer-laboratory course
6 Calma, A., & Eggins, M.	2012	Enhancing the quality of tutorials through peer-connected tutor training
7 Carr, W. D., Volberding, J., & Vardiman, P.	2011	A peer-assisted learning program and its effect on student skill demonstration
8 Constantinou, P.	2011	Empowering pre-service physical educators through the planning and instruction of a novel activity unit
9 Danowitz, A. M., & Taylor, C. E.	2011	Integrating a peer-taught module on practical research ethics into the graduate student orientation curriculum
10 Deakin, H., Wakefield, K., & Gregorius, S.	2012	An exploration of peer-to-peer teaching and learning at postgraduate level: The experience of two student-led Nvivo workshops
11 Duran, C. E. P., Bahena, E. N., & Rodriguez, Maria de los A. G.	2012	Near-peer teaching in an anatomy course with a low faculty-to-student ratio
12 Garbett, D., & Ovens, A.	2012	Being a teacher educator: Exploring issues of authenticity and safety through self-study
13 Gok, T.	2012	The effects of peer instruction on students' conceptual learning and motivation
14 Gosser, D. K., Jr. Kampmeier, J. A., & Varma-Nelson, P.	2010	Peer-led team learning: 2008 James Flack Norris award address
15 Goto, K., & Schneider, J.	2010	Learning through teaching: Challenges and opportunities in facilitating student learning in food science and nutrition by using the interteaching approach
16 Hammond, J. A., Bithell, C. P., Jones, L., & Bidgood, P.	2010	A first year experience of student-directed peer-assisted learning
17 Hennings, J., Wallhead, T., & Byra, M.	2010	A didactic analysis of student content learning during the reciprocal style of teaching
18 Hoi K. N., & Downing, K.	2010	The impact of supplemental instruction on learning competence and academic performance
19 Iserbyt, P., Elen, J., & Behets, D.	2010	Instructional guidance in reciprocal peer tutoring with task cards

(Continued)

Table 1 (Continued).

Author	Year	Title
20 Jackson, T. A., & Evans, D. J. R.	2012	Can medical students teach? A near-peer-led teaching program for “year 1” students
21 Kapp, J. L., Slater, Timothy F., Slater, S. J., Lyons, Daniel J., Manhart, K., Wehunt, M. D., & Richardson, R. M.	2011	Impact of redesigning a large-lecture introductory earth science course to increase student achievement and streamline faculty workload
22 Kommalage, M., & Imbulgoda, N.	2010	Introduction of student-led physiology tutorial classes to a traditional curriculum
23 Lloyd, P. M., Eckhardt, R. A.	2010	Strategies for improving retention of community college students in the sciences
24 Singh, S.	2010	Near-peer role modeling: The fledgling scholars education paradigm
25 Streitwieser, B., & Light, G.	2010	When undergraduates teach undergraduates: Conceptions of and approaches to teaching in a Peer led team learning intervention in the STEM disciplines—results of a two year study
26 Tsui, M.	2010	Inter-teaching: Students as teachers in lower-division sociology courses
27 Underhill, J., & McDonald, J.	2010	Collaborative tutor development: Enabling a transformative paradigm in a South African university
28 Vazquez, A. V. & McLoughlin, K., Sabbagh, M., Runkle, A. C., Simon, J., Coppola, B. P., & Pazicni, S.	2012	Writing-to-teach: A new pedagogical approach to elicit explanative writing from undergraduate chemistry students
29 Velez, J. J., Cano, J., Whittington, M. S., Wolf, K. J.	2011	Cultivating change through peer teaching
30 Zhang, A.	2012	Cooperative learning and soft skills training in an IT course

Subjects. The subjects and content areas below met the criteria for peer teaching and reciprocal teaching in higher education during 2010–2013:

- Anatomy, medical curriculum, physiology (11; 20; 22; 24)
- Chemistry (4; 14; 23; 28)
- Physical education (7; 8; 12; 17)
- Engineering (1; 2)
- Geoscience, science (21; 25)
- Physiotherapy (3; 16)
- Business Disciplines (6; 18)
- Microcomputer Applications (5)
- Research ethics (9)
- NVivo workshops (10)
- Algebra-based physics course (13)
- Nutrition and food science (15)
- Kinesiology to learn Basic Life Support (19)
- Sociology (26)

- History (27)
- Early pre-service teacher candidates (29)
- IT-course (30)

There is a significant representation of studies from natural- and physical science. Several of the subjects are of a practical and professional nature.

Stage 3: Synthesis and Theory

Pedagogical belief and theory. The dominating pedagogical belief and theory of knowledge, in my review is social constructivism, represented by Vygotsky ($N = 7$). This leading theory is based on the idea that humans generate knowledge and meaning from interaction between experiences and ideas and therefore construct their own knowledge. “The interaction between peers allows students to enter the zone of proximal development where a less able peer is able to enter a new area of potential development through problem-solving with someone more able” (Asghar, 2010, p. 406).

University teachers in my review, represent the theoretical belief that learners benefit from collaborative work when students interact with each other constructing knowledge. Collaboration is based on active questioning, explaining, monitoring, and regulating the learning process. The theory of metacognition, the ability to monitor learning, and Eric Mazur’s instructional strategy for teaching, called peer instruction are also recurrent in the reviewed articles.

More pedagogical beliefs and theories expressed in the reviewed articles to engage students in teaching and learning are active and student-led involvement and lower student anxiety, since peer tutors may seem less intimidating than lecturers. Furthermore communication and organizational skills development, improved student socialization, retention and critical thinking, increased ownership of the learning process, i.e. autonomy and self-esteem are mentioned.

Additional time to help students with difficulties, stimulating generic skills, and increasing motivation are also mentioned. Theoretical belief in constructivism and the teacher incentives presented above are more frequent and dominating in my review, than the notion that peer teaching necessarily leads to academic student improvements and higher grades.

Stage 4: Research Outcomes

The research outcome is extensive and this is a representative summary of recurring patterns and common themes that cut across the data and all statements are based on empirical data generated out of the 30 articles.

Study design. The most frequent study design is the quasi-experiment (5; 13; 17; 21) and pre- and post-testing (7, 18, 25). Three studies (12; 16; 27) are action research based and several studies report quantitative as well as qualitative data (mixed methods). A wide range of traditional data collection methods are reported (for example: focus groups, semi-structured interviews, multiple-choice items, written explanations, open-ended questions, word frequency counts, student experience survey, videotaping, feedback forms, case studies, journals, observations, Likert scales and discourse analysis).

The findings confirm a minor over-representation of studies with cross-level peer tutors ($N = 18$) when a student from a higher level helps a more novice student, to same-year peer tutoring ($N = 12$). About half of the studies ($N = 16$) include first-year (freshmen at junior-level) tutees.

Deep level learning. It is unclear how peer teaching influences student learning outcome. The imprecise outcome is demonstrated by frequent expressions like: plausible, suggests, indicated, can help, most likely, slight improvement, difficult to assess the effects, effects were not rigorously recorded; a direct causal relationship between peer teaching to teaching quality cannot be established, no significant difference in the learning index, no statistically significant differences, etc.

The vague outcome is owed to several explanations. It is difficult, if not impossible, to isolate different variables in a complex teaching and learning context and to identify casual relationships. This methodological weakness is not only relevant for peer teaching, but applies to most behavioral research. Accordingly, quasi-experimental methods based on pre- and posttests are of limited usefulness in systematic investigations in higher education to identify casual variables. The context has to be considered in a holistic way. What is characteristic about the teacher, is he or she experienced or a novice? What subject matter competence does the teacher hold? Are the students beginners or proficient in their skill base? Where does the teaching take place? What methods or media are included in the teaching environment? All these variables co-vary and influence the learning outcome and thus it is problematic to identify what causes what.

However, in seven of the studies (9, 10, 11, 16, 22, 25, 30) a deeper level of understanding as a result of peer teaching is mentioned. If results like increased responsibility and monitoring of the learning process and metacognitive awareness are included as signals for deep learning, then even more studies in this review indicate that deep learning is promoted by peer teaching. Two studies (24, 26) express an explicit intention of designing the peer teaching in order to deepen the student understanding, but tell nothing about the factual outcome. One study reveals both increased surface and deep learning and another one reports increased surface learning. These ambiguous results ought to be interpreted in the light of methodological limitations in the included studies for review.

Generic skills. Peer teaching can provide rapid feedback and develop a variety of generic skills. Peer-to-peer teaching is proved to be beneficial for tutors as well as tutees because of improved interaction. Included in the outcome are claims that peer teaching result in better connection to the student's level of understanding, increased critical thinking, wider student participation, and improved feedback and encourage greater engagement with the subject matter. Self-regulation is improved and includes elements of motivation, self-efficacy, time management, goal setting, metacognition, self-reflection, and organizational skills. Being asked to present something to a peer gives a clear reason for the work and is motivating for an active and engaging learning experience. The result and claim that students participating in peer-to-peer teaching, develop a range of academic skills as mentioned above, is consistent with a rigorous and extensive systematic review on supplemental instruction by Dawson et al. (2014).

Student teachers and learners develop richer explanations. Explaining, in turn, encourages students to integrate new knowledge with existing knowledge and leads to richer conceptual understanding. Peer teaching allows the instructor to foster a sense of community in the classroom and students to take control of their learning, increasing responsibility for their own learning process, and to develop an increased sense of belonging and engagement. When students are engaged as partners working with others, student leadership skills are promoted and learn to respect other perspectives, reaching a more nuanced understanding. Consequently, an increase in students social and self-awareness through collaboration and effective team-building in an interactive and warm classroom environment, lead to reduced student anxiety (see also Dawson et al., 2014).

Peer teaching counteracts “academic isolation” being an opportunity for discussion among students and encourage communication and improvement of the presentation ability. Peer teaching programs can lead toward low student dropout rates and create a low-risk environment.

Stage 5: Analysis, Discussion, and Conclusions

The main contribution of my literature review is the clarification that the training of generic skills benefits from peer teaching. The results of my review do not suggest that peer teaching result in greater academic achievement gains, such as higher students’ grades. Nonetheless academics continue to devote efforts into arranging peer-to-peer teaching and learning. Academics identify pedagogical benefits such as improving students’: (a) critical thinking, (b) learning autonomy, (c) motivation, (d) collaborative and (e) communicative skills. According to Bath, Smith, Stein, and Swann (2004) along with increases in the development of generic skills, there were increases in the development of discipline knowledge skills. Subject content knowledge seems to be a spin-off benefit from training of generic skills. There appears to be a symbiotic relationship between these two outcomes (Bath et al., 2004) and this is a finding useful for university teachers to encourage among students and colleagues.

A second finding worth noting is the methodological shortcomings in the reviewed studies. Quasi-experimental study designs, including pre- and post-tests only have limited potentials to explain the outcome of a teaching and learning environment. It is nearly impossible to isolate variables in a complex educational setting and to establish causal relationships. The quasi-experimental research outcome is not seldom meaningless and contradictory. According to Pedhazur and Pedhazur Schmelkin (1991) quasi-experimental designs have acquired respectability far beyond what they deserve. A note of caution in connection to quasi-experimental designs is also mentioned by Dawson et al. (2014).

Future researchers focused on peer teaching would benefit by using in-depth reflections (Altrichter et al., 1993). In general, it seems pointless to try to prove one teaching method’s superiority to another. The effect of a particular teaching method, such as peer teaching, can only be evaluated in a certain and specific educational setting.

Third, peer teaching encourages students to take control of their learning and increasing responsibility for their own learning process. The development of metacognitive skills, being able to learn and re-learn autonomously, will be increasingly essential in the future information society characterized by lifelong learning. University teachers need to be aware of their responsibility to arrange teaching and learning situations and develop

instructional strategies that better suit new generations of students. Students in turn, need to have a chance to foster and improve their metacognitive competence and learning strategies.

Conclusions

The main conclusions are that generic skills development and metacognitive training benefit from peer teaching. University teachers need to stimulate students' metacognitive skills and lifelong learning in a knowledge society through peer-led teaching. My review does not suggest that peer teaching result in greater academic achievement gains. Nearly two-thirds of the studies in my review emanate from the United States and the United Kingdom. Several of the studies are from natural- and physical science. Social constructivism is the dominating pedagogical belief and the most frequent study design is the quasi-experiment.

It remains unclear whether peer teaching stimulate students' deep level learning. The reason for this uncertainty is that several of the included studies for review are methodologically weak and limited. Future research on the effects of peer teaching would methodologically gain from a participatory action research approach in the humanities and social sciences.

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Disclosure statement

No potential conflict of interest was reported by the author.

Notes on contributor

Martin Stigmar is an associate professor in pedagogy and head of the University Center for Educational Development at Linnaeus University, Sweden. His current research is on peer teaching, flexible learning, and quality in higher education.

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