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Instructional Strategies in Computer-supported Collaborative Learning: A system Review and Meta-analysis

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ADMINISTRATIVE INFORMATION

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 11 November 2024 and was last updated on 11 November 2024.

INTRODUCTION

Review question / Objective This study reviewed the empirical research literature on the application of certain instructional strategy in CSCL environment over the past 15 years (2010-2024) and systematically analyzed instructional strategies. At the same time, this study tested the overall effectiveness of instructional strategy on CSCL and analyze various moderating variables affecting its effect.

Rationale Articles and related information were obtained according to the PRISMA protocol, which included assessing whether the articles met the requirements for analysis according Children 2024,11,41 3 of 20to specific standards. This process is divided into three parts: search, screening, and coding. This study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis statement for the selection and use of research methods.

Condition being studied Computer-Supported Collaborative Learning has been widely recognized as an effective pedagogical approach in a variety of domains . But research findings indicate that not all learners are able to successfully learn in CSCL setting . For in-stance, Chiu and Hsiao demonstrated that almost 70% of the collaborative groups were classified as “passive or reticent” and “frequently off-task”. So simply providing online collaboration tools for students to freely discussion and collaborate is insufficient , most students might show a low level of participation and interactivity during the collaborative learning process without proper guidance and support . Therefore, the support and intervention of instructional strategies are indispensable for the development of effective CSCL. However, not all instructional strategies significantly contribute to student learning outcomes in CSCL setting. In addition, factors such as technical characteristics and subject characteristics will also have a certain impact on the effectiveness of instructional strategies in the CSCL environment.

METHODS

Search strategy The following search terms were used: a. “computer-supported collaborative learning”; b. “instructional strategy” or “teaching strategy” or “teaching approach” or “teaching method” or “pedagogy” or “teaching model”.

Participant or population For the school period, 49% researches(n=25) focused on colleges, 29% researches focused on middle school students and 22% researches focused on elementary school students. Most of studies used college students as participants.

Intervention Research used certain instructional strategy on computer-supported collaborative learning to promote learning effect.

Comparator No specific instructional strategies are used to support student learning in computer-supported writing learning.

Study designs to be included Research focuses on the effect of certain instructional strategy on learning outcome.

Eligibility criteria 1.Written in English；2.Empirical study；3.Participants are students in k-12 education or college students；4.Research was conducted in CSCL environment；5.Research focuses on the effect of certain instructional strategy on learning outcome.

Information sources Articles were retrieved from the core collection of the Web of Science online data-base, ScienceDirect full-text database, EBSCO database, and SpringerLink.

Main outcome(s) Meta-analysis results indicated that instructional strategies had a significant large positive effect on learning performance in CSCL. There was no significant differ-ence in the role of macro, micro and blend strategies in the CSCL environment. Among them, collaborative scripts were used most frequently and had a significant positive impact on learning performance. The combination of inquiry learning and scripts has the most positive effect on the learning effect of CSCL. Online learning platforms were the most commonly used technology and had the greatest impact on CSCL. VR technology and games were rarely used in CSCL, but they had a moderate effect size on learning performance. Research focuses most on students' academic achievement in CSCL. The application of instructional strategies in CSCL had the most positive effect on engagement.

Additional outcome(s) But there was relatively little effect on affection, which may be due to the fact that there were fewer studies that focus on students’ affection. In addition, most studies focused college students, but middle school students had the largest effect on learn-ing. Finally, subject, sample sizes, intervention duration and synchronous or not had no moderating effect on learning performance.

Data management Literature management using Endnote X9, data analysis using comprehensive meta-analysis (CMA version 3.0) software.

Quality assessment / Risk of bias analysis All articles are from the SSCI indexed dataset.

Strategy of data synthesis We conducted a meta-analysis of empirical research published between 2010 and 2024 to understand the effectiveness of various instructional strategies in CSCL environment. Some articles included more than one dependent variable related to CSCL outcomes, so we treated these as separate studies. A total of 119 studies from 51 articles reported the statistics needed to calculate the effect size. Sample size(N), mean value (Mean), standard deviation (SD), p-value, or t-value were extracted from the experimental group and the control group or before and after for a single group in the study. According to criteria of Cohen , $g<0.2$, $0.2<g0.8$ represent small, medium and large effects, respectively. In this study, $g=0.769$, $p<0.001$, so instructional strategies in computer-supported collaborative learning setting have a significant medium positive impact on students’ learning.

Subgroup analysis This study tested the overall effectiveness of instructional strategy on CSCL and analyze various moderating variables affecting its effect. There were no heterogeneity in the instructional strategy, subjects, sample size and intervention duration. There were heterogeneity in school period, learning performance and technology type.

Sensitivity analysis Sensitivity analysis was not performed in this study.

Language restriction This article is written in English.

Country(ies) involved China.

Keywords Computer-supported collaborative learning, Instructional strategies, System review, Meta-analysis.

Dissemination plans I'm going to submit it for a conference paper.

Contributions of each author

Author 1 - Yilong Pu - Author 1 drafted the manuscript.
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