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The effect of integrated learning on 21st century student skills: A protocol for systematic review and meta-analysis

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ADMINISTRATIVE INFORMATION

Support - University of Nusantara PGRI Kediri.

Review Stage at time of this submission - Formal screening of search results.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 12 August 2024 and was last updated on 12 August 2024.

INTRODUCTION

Review question / Objective The aim of this systematic review and meta-analysis is to evaluate whether integrated learning has affected 21st-century skills (critical thinking, creativity, communication, collaboration) in students over the past ten years. To this end, the proposed systematic review and meta-analysis will address the following question: Has integrated learning impacted 21st-century skills (critical thinking, creativity, communication, collaboration) in students over the past ten years?

Rationale The rationale for conducting this systematic review and meta-analysis was to address the critical need to understand the impact of integrated learning on 21st-century skills (critical thinking, creativity, communication, collaboration). The importance of these skills has led to a variety of intervention efforts, including the use of integrated learning; however, there is some doubt about the effectiveness of this approach. This review aims to consolidate the existing evidence

and provide a comprehensive assessment of how integrated learning impacts 21st-century skills. This comprehensive assessment can serve as a foundation to inform educational practice and policy, guide future research, and improve the design and implementation of integrated learning strategies to further enhance students' 21st-century skills.

Condition being studied Integrated learning as a cross-disciplinary approach by integrating content across multiple subjects is intended to enhance a variety of student skills. Evaluating the effectiveness of this approach in enhancing critical thinking, creativity, communication, and collaboration skills among students is necessary. By determining how well integrated learning supports the development of these skills, this review seeks to clarify its practical value in educational settings.

This comprehensive evaluation will help educators and policymakers make informed decisions about the adoption and implementation of integrated learning strategies. It will provide insight into

whether integrated learning is a significant and effective approach to developing essential 21st-century skills in students. Understanding the impact of integrated learning on these skills will contribute to improved educational practices and outcomes.

METHODS

Search strategy Based on preliminary studies, the concept of the term "integrated learning" can vary. Some terms that characterize integrated cross-disciplinary learning are: (1) integrated, (2) integration, (3) interdisciplinary, (4) multidisciplinary, (5) transdisciplinary, (6) cross-disciplinary, (7) theme, and (8) thematic.

Based on the above, the main terms for searching in this systematic literature review are::

1. Search term 1 (article title): integrated OR integration OR interdisciplinary OR multidisciplinary OR transdisciplinary OR cross-disciplinary OR theme OR thematic (to ensure crawling of integrated learning intervention data from various terms)

2. Search term 2 (article title): learning OR education OR curriculum (to ensure the scope of learning or education or curriculum)

3. Search term 3 (article title, abstract, keywords): communication OR creativity OR critical OR collaboration (to ensure related to 21st century skills output)

4. Search term 4 (article title, abstract, keywords): control OR experiment OR quasi (to ensure research on meta-analysis (consisting of controlled experimental research)).

Based on the main search terms above, adjustments were made according to the characteristics of the database providers using Boolean search as follows:

(1) Scopus

(TITLE (integrated OR integration OR interdisciplinary OR multidisciplinary OR transdisciplinary OR "cross disciplinary" OR theme OR thematic) AND TITLE (learning OR education) AND TITLE-ABS-KEY (communication OR creativity OR critical OR collaboration) AND TITLE-ABS-KEY (control OR experiment OR quasi)) AND PUBYEAR > 2014 AND PUBYEAR < 2025 AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (EXACTKEYWORD , "Collaboration") OR LIMIT-TO (EXACTKEYWORD , "Communication") OR LIMIT-TO (EXACTKEYWORD , "Creativity") OR LIMIT-TO (EXACTKEYWORD , "Critical Thinking") OR LIMIT-TO (EXACTKEYWORD , "Critical Thinking Skills"))

(2) Education Resources Information Center (ERIC) (title:(integrated OR integration OR interdisciplinary OR multidisciplinary OR transdisciplinary OR

"cross disciplinary" OR theme OR thematic)) AND (title:(learning OR education OR curriculum)) AND ((title:(communication OR creativity OR critical OR collaboration) OR abstract:(communication OR creativity OR critical OR collaboration) OR keywords:(communication OR creativity OR critical OR collaboration))) AND ((title:(control OR experiment OR quasi) OR abstract:(control OR experiment OR quasi) OR keywords:(control OR experiment OR quasi)))

(3) ProQuest

title(integrated OR integration OR interdisciplinary OR multidisciplinary OR transdisciplinary OR crossdisciplinary OR theme OR thematic) AND title(learning OR education OR curriculum) AND abstract(communication OR creativity OR critical OR collaboration) AND abstract(control OR experiment OR quasi)

(4) Sage Journal

title(integrated OR integration OR interdisciplinary OR multidisciplinary OR transdisciplinary OR crossdisciplinary OR theme OR thematic) AND title(learning OR education OR curriculum) AND abstract(communication OR creativity OR critical OR collaboration) AND abstract(control OR experiment OR quasi)

(5) Taylor and Francis Group

[[Publication Title: integrated] OR [Publication Title: integration] OR [Publication Title: interdisciplinary] OR [Publication Title: multidisciplinary] OR [Publication Title: transdisciplinary] OR [Publication Title: crossdisciplinary] OR [Publication Title: theme] OR [Publication Title: thematic]] AND [[Publication Title: learning] OR [Publication Title: education] OR [Publication Title: curriculum]] AND [[Abstract: communication] OR [Abstract: creativity] OR [Abstract: critical] OR [Abstract: collaboration]] AND [[Abstract: control] OR [Abstract: experiment] OR [Abstract: quasi]] AND [Article Type: Article] AND [Publication Date: (01/01/2015 TO 12/31/2024)]

(6) Wiley

"integrated OR integration OR interdisciplinary OR multidisciplinary OR transdisciplinary OR crossdisciplinary OR theme OR thematic" in Title and "learning OR education OR curriculum" in Title and "communication OR creativity OR critical OR collaboration" in Abstract and "control OR experiment OR quasi" in Abstract

Participant or population Participants in this research target are students from childhood to undergraduate students.

Intervention Comparison of the results of 21st century skills (critical thinking, creativity, communication, collaboration) of students in the implementation of Integrated Learning

interventions (cross-disciplinary) compared to conventional learning or traditional curriculum (mono-disciplinary).

Integrated learning will be the intervention group. This learning focuses on the concept of cross-disciplinary learning. The cross-disciplinary in question lies in the content, material, or learning discipline. Cross-disciplinary related to teacher collaboration is not included in this study. Integration of two or more forms of learning strategies or integration of two or more forms of learning media is not a consideration. Even so, if there is an intervention to integrate two or more learning media, but containing the content of two or more disciplines will be a consideration. For example, augmented reality media is integrated with pdf-based teaching materials, but in the media there are two or more disciplines included, for example there are arts and sciences.

Comparator Conventional learning or traditional curriculum will be the control group/comparator. This learning is learning that is carried out daily at the research location and is based on mono-disciplinary. If in a research location the conventional learning is already cross-disciplinary, it will be excluded.

Study designs to be included Included studies were Randomized Controlled Trials.

Eligibility criteria The search inclusions for articles include:

1. Academic journal publications, to ensure that the results are accountable
2. Research articles, to obtain specific data about randomized control design
3. Peer reviewed journals, to ensure quality and validity
4. In English, to ensure accessibility, consistency, standardization of terminology, and availability of literature
5. Published in the last 10 years, to ensure data up-to-dateness and data relevance
6. Contains elements of critical thinking, creativity, communication, collaboration, to ensure that the dependent variables are those components.

Information sources The database providers used in this study consist of: (1) Scopus, (2) Education Resources Information Center (ERIC), (3) ProQuest, (4) Sage Journal, (5) Taylor and Francis Group, and (6) Wiley.

Main outcome(s) The main outcome is data on the significance of changes in critical thinking, creativity, communication, collaboration skills after

integrated learning was implemented compared to the control group.

Additional outcome(s) The additional results are:

1. Previous researchers' creations in combining disciplines, what alternative subjects are combined
2. Integrated learning can have an effect on what student abilities besides critical thinking skills, creativity, communication, collaboration skills
3. Distribution of countries that implement this intervention
4. Trends in the years of implementation of this intervention
5. Levels of education that implement this intervention
6. Challenges and opportunities for implementing this intervention.

Data management Data Management Steps are as follows:

1. After the search terms are finalized, the next step is to conduct searches using the previously mentioned database providers, following the established inclusion criteria.
2. After the search phase, data will be compiled by the assistant team (non-authors) and duplicate data will be removed.
3. After data compilation, the authors will review the abstracts to check their relevance, focusing at least on the experimental design and randomized control design, and then proceed to download the full articles.
4. After downloading the full articles, the following checks will be made: (1) whether the intervention and control groups meet the criteria, (2) whether the dependent variables are critical thinking skills, creativity, communication, and collaboration skills, and (3) whether there are data tabulations for mean, standard deviation, and sample size (n).
5. If the article passes the fourth stage, data tabulations for mean, standard deviation, and sample size for both the integrated learning intervention group and the control group regarding critical thinking skills, creativity, communication, and collaboration skills will be performed.
6. After data tabulation, further analysis will be conducted.

Quality assessment / Risk of bias analysis Data analysis will be assisted using the ReviewManager 5.4 application. The risk of bias will be observed using a funnel plot graph against the distribution of symmetrical patterns of research points. The level of confidence is 95%, checking heterogeneity using the results of Chi Square and I Square.

Strategy of data synthesis Random or fixed model analysis will be carried out according to the

results of the heterogeneity level, then the total effect size (SMD) will be analyzed from various research results related to similar dependent variables, this process is to understand the magnitude of the difference or relationship between the experimental and control groups and the Z score to assess the statistical significance of the effect size.

Subgroup analysis None.

Sensitivity analysis None.

Language restriction English.

Country(ies) involved Indonesia.

Other relevant information None.

Keywords integrated learning; interdisciplinary; curriculum; communication; creativity; critical thinking; case-control; meta-analysis.

Dissemination plans The results of this systematic review and meta-analysis will be disseminated through publication in academic journals, presentations at conferences, posting on online platforms to ensure broad access and impact.

Contributions of each author

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