2024

The Effects of Recasts on L2 Grammar: A Meta-Analysis

Ehsan Rassaei

Language Learning Journal, v52 n1 p16-36 2024 (Impact 2.77)

The present meta-analysis investigated the effects of recasts along with a number of moderating variables on L2 development by meta-analysing the results of 24 primary studies. The findings revealed an overall medium effect size for the effectiveness of recasts (g = 0.70, 95% CI = 0.48-0.93). Furthermore, the findings indicated that recasts are equally effective for the development of L2 explicit and implicit knowledge. The results also yielded strong effect sizes for the short-term and long-term effects of recasts in foreign language (FL) compared to second language (SL) contexts where weak effect sizes were obtained for both long-term and short-term effects of recasts. Contrary to expectations, the findings did not indicate a significant difference between the effectiveness of partial and full recasts. The findings of the present study, therefore, shed further light on the effectiveness of recasts and suggest that recasts are effective techniques for the development of implicit and explicit L2 knowledge in FL contexts. The findings indicate that instructional context plays the most significant role in the efficacy of recasts. The implications of the study and considerations for interpreting the results will be discussed in the paper in the light of some theoretical justifications as well as a number of limitations of the present meta-analysis.

Descriptors: Grammar, Second Language Learning, Second Language Instruction, Error Correction, Meta Analysis, Research Reports, Comparative Analysis, Effect Size, Instructional Effectiveness, Feedback (Response), Teaching Methods

Do AI Chatbots Improve Students Learning Outcomes? Evidence from a Meta-Analysis

Rong Wu; Zhonggen Yu
British Journal of Educational Technology, v55 n1 p10-33 2024 (IF 8.07)

Artificial intelligence (AI) chatbots are gaining increasing popularity in education. Due to their increasing popularity, many empirical studies have been devoted to exploring the effects of AI chatbots on students' learning outcomes. The proliferation of experimental studies has highlighted the need to summarize and synthesize the inconsistent findings about the effects of AI chatbots on students' learning outcomes. However, few reviews focused on the meta-analysis of the effects of AI chatbots on students' learning outcomes. The present study performed a meta-analysis of 24 randomized studies utilizing Stata software (version 14). The main goal of the current study was to meta-analytically examine the effects of AI chatbots on students' learning outcomes and the moderating effects of educational levels and intervention duration. The results indicated that AI chatbots had a large effect on students' learning outcomes. Moreover, AI chatbots had a greater effect on students in higher education, compared to those in primary education and secondary education. In addition, short interventions were found to have a stronger effect on students' learning outcomes than long interventions. It could be explained by the argument that the novelty effects of AI chatbots could improve learning outcomes in short interventions, but it has worn off in the long interventions. Future designers and educators should make attempt to increase students' learning outcomes by equipping AI chatbots with human-like avatars, gamification elements and emotional intelligence.

Descriptors: Artificial Intelligence, Synchronous Communication, Outcomes of Education, Educational Improvement, Student Improvement, Technology Uses in Education, Influence of Technology, Students, Higher Education, Primary Education, Secondary Education, Intervention

Exploring the Effects of Digital Technology on Deep Learning: A Meta-Analysis

Xiu-Yi Wu
Education and Information Technologies, v29 n1 p425-458 2024 (IF 7.65)

The impact of digital technology on learning outcomes, specifically deep learning, has been a subject of considerable debate and scrutiny in educational settings. This study aims to provide clarity by conducting a meta-analysis of empirical publications that examine students' deep learning outcomes in relation to digital technology. A comprehensive search of databases and a thorough literature review yielded 60 high-quality, peer-reviewed journal articles that met the inclusion criteria. Using Review Manager 5.4.1 software, a meta-analysis was conducted to assess the overall effectiveness of digital technology. The calculated effect size indicates a positive influence of digital technology on students' deep learning outcomes. Furthermore, a moderator variable analysis revealed several significant findings: (1) Different categories of digital technology tools have a favorable impact on deep learning outcomes; (2) The duration of digital technology treatment does not significantly affect deep learning outcomes; (3) Digital technology demonstrates a highly positive influence on deep learning within the humanities and social sciences disciplines; (4) Combining online and offline utilization of digital technology in education leads to a substantially greater enhancement in deep learning compared to relying solely on online methods; (5) The effectiveness of digital technology on deep learning is enhanced when accompanied by appropriate instructional guidance; (6) Utilizing digital technology in a systematic manner produces different outcomes compared to fragmented approaches, highlighting the importance of a cohesive implementation; (7) Integrating digital technology with collaborative learning has a more pronounced effect on deep learning compared to independent learning. These findings contribute to our understanding of the impact of digital technology on deep learning outcomes and underscore the importance of thoughtful integration and instructional support in educational contexts.

Descriptors: Learning, Technology Uses in Education, Outcomes of Education, Educational Technology, Instructional Effectiveness, Students, Educational Environment, Instructional Materials, Teaching Methods

The Effect of Mobile Learning on School-Aged Students' Science Achievement: A Meta-Analysis

Zehua Dong; Ming Ming Chiu; Shuqi Zhou; Zihong Zhang
Education and Information Technologies, v29 n1 p517-544 2024 (IF 7.65)

Building on past studies showing that mobile learning improves learning outcomes and differs within a domain (e.g., science), this meta-analysis models domain-specific differences (e.g., learning activities) that drive these differences in science performance. A systematic database search (i.e., Web of Science, JSTOR, ERIC, PsycINFO, ProQuest Dissertations, and ACM) identified controlled experiments. A meta-analysis determined the overall effect of mobile learning on 4,145 primary and secondary school students' science achievement, and tested for moderator effects across 57 effect sizes from 44 studies. Mobile learning increased science achievement (g = 0.857). Mobile learning's effect sizes were larger for (a) inquiry or game-based learning, than other learning activities; (b) biology, and progressively smaller for earth and space sciences, chemistry, and physics; (c) activities jointly led by students and teachers, followed by those led by students; and then those led by teachers; (d) collectivistic countries than individualistic ones; and (e) primary or middle school students. Intervention duration, device type, learning environment, and publication year showed no moderation effects. Hence, a comprehensive theory of mobile learning must include age, learning approach, subject area, user roles, and cultural values. These results also suggest that science educators using mobile learning might improve student learning by (a) integrating it with science inquiry or game-based learning, (b) starting with biology before other science topics, (c) using learning activities jointly led by students and teachers, (d) starting with primary or middle school, and (e) starting with students in countries with collectivist cultural values to help one another.

Descriptors: Educational Technology, Telecommunications, Handheld Devices, Science Education, Science Achievement, Elementary Secondary Education, Effect Size, Program Effectiveness, Learning Activities, Intellectual Disciplines, Geographic Location, Instructional Program Divisions

The Effects of Virtual Reality on EFL Learning: A Meta-Analysis

Xiang bin Qiu; Cheng Shan; Jin Yao; Qing ke Fu
Education and Information Technologies, v29 n2 p1379-1405 2024 (IF 7.65)

In recent years, an increasing number of teachers and researchers have used virtual reality (VR) to enhance English as a foreign language (EFL) learning, but the learning effects they found varied. Because of these differences, we conducted a meta-analysis. This study aims to compare the effectiveness of VR-based EFL learning methods with traditional EFL learning methods, and to determine what factors led to these results. We searched for articles published from 2015 to 2021 using Web of Science, ERIC, and Google Scholar. A total of 23 randomized controlled trials (RCTs) or quasi-experimental studies were included, and the effect size (ES) was calculated. The results show that the VR-based EFL learning method is significantly better than the traditional EFL learning method and has a small positive effect (g = 0.445). We also coded the characteristics of the samples to examine their moderating effect on the results. We found that educational levels, country/area, and EFL learning outcomes have significant differences that can explain the variance in ES among the samples. According to the analysis results, we also provide suggestions on which learning outcomes are most helpful, how to choose the best educational stages, learning materials, and type of VR to promote EFL learning performance, and directions for future research and practice.

Descriptors: Computer Simulation, English (Second Language), Second Language Learning, Technology Uses in Education, Instructional Effectiveness, Teaching Methods, Second Language Instruction

The Effects of Educational Robotics in STEM Education: A Multilevel Meta-Analysis

Fan Ouyang; Weiqi Xu
International Journal of STEM Education, v11 Article 7 2024 (IF 8.09)

Educational robotics, as emerging technologies, have been widely applied in the field of STEM education to enhance the instructional and learning quality. Although previous research has highlighted potentials of applying educational robotics in STEM education, there is a lack of empirical evidence to investigate and understand the overall effects of using educational robotics in STEM education as well as the critical factors that influence the effects. To fill this gap, this research conducted a multilevel meta-analysis to examine the overall effect size of using educational robotics in STEM education under K-16 education based on 30 effect sizes from 21 studies published between 2010 and 2022. Furthermore, we examined the possible moderator variables of robot-assisted STEM education, including discipline, educational level, instructor support, instructional strategy, interactive type, intervention duration, robotic type, and control group condition. Results showed that educational robotics had the moderate-sized effects on students' STEM learning compared to the non-robotics condition. Specifically, educational robotics had moderate-sized effects on students' learning performances and learning attitudes, and insignificant effects on the improvement of computational thinking. Furthermore, we examined the influence of moderator variables in robot-assisted STEM education. Results indicated that the moderator variable of discipline was significantly associated with the effects of educational robotics on STEM learning. Based on the findings, educational and technological implications were provided to guide future research and practice in the application of educational robotics in STEM education.

Descriptors: STEM Education, Robotics, Instructional Materials, Instructional Effectiveness, Elementary School Teachers, Secondary School Teachers

A Meta-Analysis of Effects of Self-Directed Learning in Online Learning Environments

Min Young Doo; Meina Zhu
Journal of Computer Assisted Learning, v40 n1 p1-20 2024 (IF 6.38)

Background: Online learning has become more prevalent over the past three decades, especially during the COVID-19 pandemic. Educators and scholars have increasingly emphasized the significance of self-directed learning (SDL) on successful learning outcomes in online learning environments. Objectives: The purpose of this study was to synthesize the research on the effects of SDL on learning achievement in online learning environments. Methods: This study synthesized the research findings on the effects of SDL on learning achievement in online learning environments using a meta-analysis method. We analysed 152 samples from 43 studies that have reported the effects of SDL on learning achievement or correlations in online learning. Results and Conclusions: The overall effect size of SDL on learning achievement in online learning showed a medium effect size (g = 0.508). The dimensions of SDL moderated the effects of SDL on learning achievement, and the effects of self-management were statistically smaller than motivation and self-monitoring. The types of learning achievement, learning domains, and participant levels did not moderate the effects of SDL on learning achievement. However, the effects of SDL on learning achievement in the cognitive domain were significantly smaller than the effects of SDL in the affective domain. What Are the 1 or 2 Major Takeaways from the Study? This study confirmed the importance of SDL in online learning environments. SDL can be effective for any learner group, not just for adult learners, in online learning environments. Online instructors should facilitate students' self-management to obtain successful learning achievement.

Descriptors: Electronic Learning, Independent Study, Virtual Classrooms, Academic Achievement, Self Management, Students, Teachers, Technology Uses in Education

Educational Technology Research during the COVID-19 Pandemic

Sijia Xue; Helen Crompton
Interactive Technology and Smart Education, v21 n1 p83-107 2024 (IF 8.10)

Purpose: This systematic review paper aims to examine extant empirical research involving educational technology during COVID-19 to provide an aggregated analysis of how the pandemic has influenced educational technology research. Design/methodology/approach: Using a Preferred Reporting Items for Systematic Reviews and Meta-Analysis systematic review and an integrative review methodology, 50 primary research studies were selected from ten top-ranked educational research journals. These studies were reviewed regarding research purposes, methodologies, instruments, educational level, geographical distribution, and findings of the studies. Findings: The findings reveal four emerging themes--influencing factors, effectiveness, challenges and teachers. The majority of the studies focused on higher education. Quantitative research design based on a questionnaire was the most adopted method of investigation by researchers. Research limitations/implications: Search parameters focused on the top 10 journals in the field of educational technology. Although this provides a level of quality, it narrowed the search. Practical implications: For practitioners and researchers, this study provides a summary of the field to better understand what knowledge we have gained on the use of educational technology to enable a more agile, knowledgeable response to education in future emergencies. Originality/value: This systematic review is unique in examining how the pandemic has influenced educational technology research. It also provides insight into gaps in the research that future researchers can use as a springboard to enable a more knowledge and a more agile approach to future emergencies.

Descriptors: Educational Technology, Educational Research, COVID-19, Pandemics, Influences, Barriers, Program Effectiveness, Faculty Development, Teacher Competencies, Access to Computers, Research Methodology, Elementary Secondary Education, Postsecondary Education, Foreign Countries

2023

A Meta-Analysis of the Effect of Virtual Reality Technology Use in Education

Yu, Zhonggen
Interactive Learning Environments, v31 n8 p4956-4976 2023 (IF 5.16)

With the rapid development of information technologies, virtual reality (VR) has caught much attention in education. However, scanty studies have been committed to a meta-analysis of its effect in education in terms of various components. This study, through a meta-analysis, systematically reviews the effect of VR technologies on educational outcomes in terms of various components. It concludes that VR technologies generally exert a strong and positive influence on educational outcomes despite some negative findings in their effect on anxiety, cognition, creativeness, gender differences, learning attitudes, learner satisfaction, and engagement. Future research could expand the research by including more publications and examine the effect of VR technologies on educational outcomes through interdisciplinary cooperation.

Descriptors: Literature Reviews, Computer Simulation, Educational Technology, Outcomes of Education, Technology Uses in Education

A Systematic Meta-Analysis of Blockchain Technology for Educational Sector and Its Advancements towards Education 4.0

Haque, Mustafizul; Kumar, V. Vijaya; Singh, Preeti; Goyal, Adheer A.; Upreti, Kamal; Verma, Ankit
Education and Information Technologies, v28 n10 p13841-13867 Oct 2023 (IF 7.65)

Now a days with the rapidly increasing development of technology and communication system, the implementation of blockchain is continuously increasing in various sectors. With the increase in massive data in educational sectors there arise a requirement of handling such enormous data. This can be easily and securely handled by blockchain technology due to its scalability, robustness, and resilience characteristics. In this paper, a methodology is presented for systematic meta-analysis of the blockchain applications, technologies, and integration of next-gen technologies for the deployment of education 4.0. The bibliometric analysis, the methodology is divided into three steps: selection strategy, inclusion strategy, and meta-analysis of research contributions are provided based on PRISMA-P. In the selection strategy, different research sources are searched. Selection and sorting of contributing research articles are performed in the inclusion strategy and finally, in a meta-analysis, the critical assessment of the educational management system and security aspects with blockchain deployment is performed. It was observed that most of the research contributions are theoretical concept based without any practical validations. From the results, it was also observed that the blockchain designs presented mainly focus on confidentiality, integrity, and availability. But apart from these, other security concerns such as scalability, flexibility, authorization, mutual authentication, attack resistant, etc. are not explored most. Further, the paper presented a critical analysis of next-gen technologies with blockchain for future education 4.0. This paper is focused to analyze the growing demand of the educational blockchain paradigm (EBP). For this paper presented a meta-analysis of existing research contributions concerning the application area, technology used, real-world examples, and next-gen technologies in education 4.0. Therefore, this paper will enlighten the focus of researchers for future research innovations.

Descriptors: Meta Analysis, Information Technology, Technology Uses in Education, Technology Integration, Bibliometrics, Confidentiality, Integrity, Information Security, Educational Research

The Effect of Web-Based Biology Learning Environment on Academic Performance: A Meta-Analysis Study

Vekli, Gülsah Sezen; Çalik, Muammer
Journal of Science Education and Technology, v32 n3 p365-378 Jun 2023 (IF 5.43)

The purpose of this study was to investigate the effectiveness of web-based biology learning environment in improving academic performance via a meta-analysis. In looking for the studies on web-based biology learning environment, several keyword patterns from the abstracts (e.g., Pattern 1: web-based learning and biology education) were recruited in well-known databases (e.g., ERIC, EBSCO, Springer Link). Finally, 22 papers were apparent for the current meta-analysis examining the effect of web-based biology learning environment on academic performance. All statistical data from the studies were initially inserted into an Excel sheet and then imported into comprehensive meta-analysis (CMA) statistics software to calculate Hedges' g values. The overall effect-size of web-based biology learning environment pointed to a "medium" effect. Also, it was found that the educational level and type of experimental design, as moderator variables, did not positively affect the students' academic performance along with web-based biology learning environment. In light of the findings, it can be concluded that web-based biology learning environment is somewhat effective at improving the students' academic performance. The current study recommends that further studies should be undertaken to deepen the implementation processes of the studies with extreme values and explore what makes them unique.

Descriptors: Academic Achievement, Biology, Science Instruction, Web Based Instruction, Instructional Effectiveness

Online versus Offline Peer Feedback in Higher Education: A Meta-Analysis

Jongsma, Mirella V.; Scholten, Danny J.; van Muijlwijk-Koezen, Jacqueline E.; Meeter, Martijn
Journal of Educational Computing Research, v61 n2 p329-354 Apr 2023 (IF 7.35)

In recent years, the technical possibilities of educational technologies regarding online peer feedback have developed rapidly. However, the impact of online peer feedback activities compared to traditional offline variants has not specifically been meta-analyzed. Therefore, the aim of the current meta-analysis is to do an in-depth comparison between online versus offline peer feedback approaches. An earlier and broader meta-analysis focusing on technology-facilitated peer feedback in general, was used as a starting point. We synthesized 12 comparisons between online and offline peer feedback in higher education, from 10 different studies. Moreover, we reviewed student perceptions of online peer feedback when these were included in the studies. The results show that online peer feedback is more effective than offline peer feedback, with an effect size of 0.33. Moreover, online peer feedback is more effective when the outcome measure is competence rather than self-efficacy for skills. In addition, students are mostly positive towards online peer feedback but also list several downsides. Finally, implications for online peer feedback in teaching practice are discussed and leads are identified for further research on this topic.

Descriptors: Peer Evaluation, Feedback (Response), Computer Mediated Communication, Technology Uses in Education, Educational Technology, Higher Education, Meta Analysis, Instructional Effectiveness, Effect Size, Outcome Measures, Competence, Self Efficacy, Academic Achievement, Student Attitudes

Effect of the Use of Six Thinking Hats Technique in Education on Academic Achievement: A Mixed-Meta Method Research

Dogan, Yunus; Cebenay, Merve; Yaman, Mehmet

Journal of Educational Technology, v19 n4 p59-68 Jan-Mar 2023 (IF 8.07)

As the world rapidly changes and develops, students are finding it increasingly difficult to achieve their goals. In this era where traditional education methods are being scrutinized for their impact on academic success, educators are exploring various teaching techniques to improve academic outcomes. The Six Thinking Hats Technique (STHT) is one of the teaching techniques. The study aims to examine the effects of STHT applications on the academic achievement of students through mixed-meta method. Meta-analysis is used for this purpose, which provides the analysis of quantitative data, and meta-thematic analysis, which provides the analysis of qualitative data, within the framework of the mixed-meta method. Quantitative data within the scope of meta-analysis were analyzed with the CMA and MetaWin programs. As a result of the analysis, the effect size was found to be g=1.071, which means a large degree of effect. This finding indicates that STHT applications have a significant positive effect on academic achievement. In the meta-thematic analysis process, the data were analyzed through the Maxqda program, and various codes were created in the context of the positive aspects of STHT. Several codes were identified, including the improvement of expressive skills, the acquisition of speaking skills while following social etiquette, the ability to articulate emotions, thoughts, dreams, impressions, and experiences, the opportunity to utilize debate and other discussion techniques, and the enhancement of communication abilities.

Descriptors: Thinking Skills, Teaching Methods, Academic Achievement, Instructional Effectiveness, Meta Analysis, Psychological Patterns, Personality

Meta-Analysis: The Influence of Local Wisdom-Based Learning Media on the Character of Students in Indonesia

Yusuf, Furtasan Ali

International Journal of Educational Methodology, v9 n1 p237-248 2023 (IF 0.67)

This research aims to prove and find out the influence of local wisdom-based learning media on the character of students in Indonesia. This research uses a quantitative method with a meta-analysis approach. The research data were analyzed using the 0.8.5 version of JASP software. The eligibility criteria used include: (a) The publications must be searchable in search databases such as Google Scholar, ERIC, DOAJ, Research Gate, and or ScienceDirect; (b) The publications are reputable indexed; (c) The publications must relate to learning media based on local wisdom and student character; (d) The publications must be in the range of 2015 to 2023; (e) The articles are worth (r), (t), or (F); (6) N = 30. The results of the analysis of 30 studies showed that there was a significant effect of learning media on the character of students in Indonesia ($z = 9.700$; $p < 0.001$; 95% CI [0.987; 1.487]). This effect is categorized as very strong (rRE = 1.237). This meta-analysis study is the result of accurate, valid, and representative research reviewed because publication bias was not detected. Thus, it can be concluded that learning media based on local wisdom has a big influence on student character.

Descriptors: Meta Analysis, Values Education, Instructional Materials, Indigenous Knowledge, Foreign Countries, Classification, Research Reports

Effect of the Use of Augmented Reality Applications on Academic Achievement of Student in Science Education: Meta Analysis Review

Kalemkus, Jale; Kalemkus, Fatih
Interactive Learning Environments, v31 n9 p6017-6034 2023 (IF 5.16)

It was aimed to review the effect of the use of augmented reality applications on the academic achievement of students in science education in this study. In line with this aim, the experimental researches reviewing the effect of use of augmented reality applications within the scope of science course on student achievement were evaluated with meta-analysis method. 16 studies included into this research were accessed from ERIC, Google Scholar, ScienceDirect, SpringerLink, Taylor & Francis, Web of Science databases in line with certain criteria. In order to reach these studies from databases, the following key words were used: "'augmented reality' & 'achievement'" and "'augmented reality' & 'achievement & science'". "Funnel plot, Orwin's Fail-Safe N" and "Egger" tests were used for detecting the publication bias and it was determined that there is no publication bias. At the end of the meta-analysis, it was determined that the effect of the use of the augmented reality applications on the student achievement in the science course is moderate (d = 0,643) in favor of the experimental group. Thus, it was presented that the use of the augmented reality applications affects the student achievement positively in the science course.

Descriptors: Information Technology, Computer Simulation, Academic Achievement, Science Education, Research Reports, Journal Articles, Databases, Technology Uses in Education, Meta Analysis, Science Achievement, Correlation, Comparative Analysis, Teaching Methods

Effectiveness of Science-Technology-Society (STS) Approach on Students' Learning Outcomes in Science Education: Evidence from a Meta-Analysis

Dharel Acut; Ronilo Antonio
Journal of Technology and Science Education, v13 n3 p718-739 2023 (IF 2.20)

Scientific literacy development significantly impacts real-world outcomes, leading to scrutiny of instructional approaches for global reform in science education. This study aimed to determine the efficacy of the Science-Technology-Society (STS) approach in improving students' scientific learning outcomes. A quantitative research design, using meta-analysis guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol, was used to determine the effect sizes of previous studies on the STS approach's effectiveness in science learning and teaching. The study analyzed 16 effect sizes from 14 empirical studies from January 2017 to September 2022 using Harzing's Publish or Perish application and Comprehensive Meta-Analysis (CMA) software. Results showed that the STS approach significantly and positively impacts students' learning outcomes (g = 1.882), particularly psychomotor skills, affective domain, and cognitive skills. Moderator analysis showed that STS is an effective teaching strategy that yields similar positive results regardless of the assessed learning outcomes. The findings demonstrated that the STS approach facilitates students' development of scientific knowledge, skills, and mindset to innovate for real-world problems. These findings provided empirical information that are essential for learning analytics applications in predicting learners' performance and diagnosing instructional practices. Implications for future research and practice, as well as addressing publication bias, are highlighted in order to maximize the benefits of the STS approach in science education.

Descriptors: Science Education, Outcomes of Education, Scientific Literacy, Instructional Effectiveness, Science and Society, Science Instruction, Elementary Secondary Education, Foreign Countries, Psychomotor Skills, Affective Behavior, Thinking Skills

Effect of Chatbot-Assisted Language Learning: A Meta-Analysis

Zhang, Shunan; Shan, Cheng; Lee, John Sie Yuen; Che, ShaoPeng; Kim, Jang Hyun
Education and Information Technologies, v28 n11 p15223-15243 2023 (IF 7.65)

Chatbots have shown great potential for language learning. However, previous studies have reported mixed results on the efficiency of chatbot-assisted language learning (CALL). This study integrated the results of previous experimental studies on CALL by using meta-analysis to explore its effectiveness. A total of 61 samples from 18 studies were examined. The results showed that CALL had a moderate average effect (g = 0.527). In addition, nine potential moderating variables (educational level, target language, language domain, learning outcome, instruction duration, chatbot interface, chatbot development, task dominance, and interaction way) were identified and discussed. The results of this study provided insights into the use and design of chatbots for language learning.

Descriptors: Meta Analysis, Computer Assisted Instruction, Artificial Intelligence, Outcomes of Education, Second Language Learning, Second Language Instruction, Teaching Methods, Instructional Design, Instructional Effectiveness

The Impact of Summer Programs on Student Mathematics Achievement: A Meta-Analysis

Lynch, Kathleen; An, Lily; Mancenido, Zid

Review of Educational Research, v93 n2 p275-315 Apr 2023 (IF 15.24)

We present results from a meta-analysis of 37 contemporary experimental and quasi-experimental studies of summer programs in mathematics for children in grades pre-K-12, examining what resources and characteristics predict stronger student achievement. Children who participated in summer programs that included mathematics activities experienced significantly better mathematics achievement outcomes compared to their control group counterparts. We find an average weighted impact estimate of +0.10 standard deviations on mathematics achievement outcomes. We find similar effects for programs conducted in higher- and lower-poverty settings. We undertook a secondary analysis exploring the effect of summer programs on noncognitive outcomes and found positive mean impacts. The results indicate that summer programs are a promising tool to strengthen children's mathematical proficiency outside of school time.

Descriptors: Summer Programs, Mathematics Achievement, Meta Analysis, Grade Prediction, Elementary Secondary Education, Mathematics Activities, Summer Schools, Achievement Gains, Program Effectiveness, Effect Size, Outcomes of Education, Student Attitudes, Achievement Tests

Meta Analysis on Effects of Using 3D Printing in South Korea K-12 Classrooms

Lee, Dongkuk; Kwon, Hyuksoo
Education and Information Technologies, v28 n9 p11733-11758 Sep 2023 (IF 7.65)

Educational communities have expanded 3D printing in education, emphasizing the educational value of "creation" to develop the competencies required in the future. This study was conducted for the purpose of identifying the effect size by synthesizing prior studies on the effect of 3D printing in education. To achieve the goal, 26 research papers on 3D printing in education conducted in South Korea from 2014 to 2021 were selected and meta-analysis was performed. The results of meta-analysis are as follows. First, the overall effect size of 3D printing in education was 0.759, which was found to be a medium effect size. Second, the effect sizes for each categorical variable are as follows: both the affective domain and the cognitive domain showed medium effect sizes for the learning effects. Middle school showed a large effect size, and elementary school and high school had a medium effect size. Gifted students had a large effect size, and general students had a medium effect size. In terms of the concentrated subjects, mathematics showed a large effect size and science and technology showed a medium effect size. Single subject showed a large effect size and convergence education had a medium effect size. Both offline classes and blended classes showed increased effect sizes. Both the team activity and the individual activity showed a median effect size. The out-of-school program showed a large effect size, and the school program showed a medium effect size. 3D pens showed a large effect size, and 3D printers showed medium effect size. In terms of the modeling type, unstructured modeling showed a large effect size, as did semi-structured modeling, while semi-structured modeling showed a medium effect size. This study has implications for instructional design that can increase the effect of 3D printing in education.

Descriptors: Literature Reviews, Computer Peripherals, Printing, Educational Technology, Foreign Countries, Elementary Secondary Education, Academically Gifted, Mathematics, Science Education, Distance Education, Blended Learning

Effects of Game-Based Learning on Students' Computational Thinking: A Meta-Analysis

Lu, Zhuotao; Chiu, Ming M.; Cui, Yunhuo; Mao, Weijie; Lei, Hao
Journal of Educational Computing Research, v61 n1 p235-256 Mar 2023 (IF 7.35)

This meta-analysis determined game-based learning's (GBL) overall effect on students' computational thinking (CT) and tested for moderators, using 28 effect sizes from 24 studies of 2,134 participants. The random effects model results showed that GBL had a significant positive overall effect on students' CT (g = 0.677, 95% confidence interval 0.532-0.821) with significant heterogeneity among effect sizes. Among game types, role-playing yielded the largest GBL effect size, followed by action, puzzles, and adventures. Moreover, the effect of GBL on CT was weaker among students in countries that were more individualistic than others. Lastly, interventions between four hours and one week showed the largest GBL effect size, followed by those over four weeks, up to four hours, and between one week and four weeks.

Descriptors: Game Based Learning, Computation, Thinking Skills, Meta Analysis, Effect Size, Role Playing, Intervention, Elementary School Students, Middle School Students, High School Students, College Students, Kindergarten, Individualism

Effectiveness of Digital Educational Game and Game Design in STEM Learning: A Meta-Analytic Review

Gui, Yang; Cai, Zhihui; Yang, Yajiao; Kong, Lingyuan; Fan, Xitao; Tai, Robert H.
International Journal of STEM Education, v10 Article 36 2023 (IF 8.09)

Digital educational games exhibit substantial promise in advancing STEM education. Nevertheless, the empirical evidence on both the efficacy of digital game-based learning and its designs in STEM education is characterized by notable inconsistencies. Therefore, the current study aimed to investigate (1) the general effect of digital game-based STEM learning over STEM learning without digital game, and (2) the enhancement effect of added game-design elements against base game versions in STEM learning. Two meta-analyses were conducted in this study. Based on the 136 effect sizes extracted from 86 studies, the first meta-analysis revealed a medium to large general effect of digital game-based STEM learning over conventional STEM learning (g = 0.624, 95% CI [0.457, 0.790]). In addition, digital game-based STEM learning appeared to be differentially effective for different learning outcome, different types of game, and different subject. A total of 44 primary studies and 81 effect sizes were identified in the second meta-analysis. The results revealed a small to medium enhancement effect of added game-design elements over base game versions (g = 0.301, 95% CI [0.163, 0.438]). Furthermore, our results indicated that the game-design elements added for content learning were more effective than those added for gaming experience. Possible explanations for these findings, as well as the limitations and directions for future research were discussed.

Descriptors: STEM Education, Educational Games, Game Based Learning, Video Games, Instructional Effectiveness, Instructional Design, Outcomes of Education, Conventional Instruction, Intellectual Disciplines, Computer Games

Effect of Design-Based Learning on Achievement in K-12 Education: A Meta-Analysis

Delen, Ibrahim; Sen, Sedat

Journal of Research in Science Teaching, v60 n2 p330-356 Feb 2023 (IF 5.55)

Design-based learning (DBL) offers opportunities to support students' content understanding. Previous DBL studies reported different effect sizes by using the data from one participant group. The goal of this study was to conduct a meta-analysis that would give a comprehensive picture of how DBL is connected to student achievement in different disciplines. In addition, we explored the moderators influencing achievement in DBL for K-12 education. After investigating content-related gains in our meta-analysis on 37 individual articles with 52 effect sizes, we found that DBL had a positive and large effect ([g-bar] = 0.602) on achievement in K-12 education, and the effect size for science ([g-bar] = 0.703) was higher than mathematics ([g-bar] = 0.418) education. When considering the strong emphasis on science education in different DBL related frameworks and STEM (science, engineering, technology, and mathematics) education studies, this cumulative understanding could play an important role in the difference between science and mathematics. Studies that had control groups in the same school ([g-bar] = 0.703) had statistically significantly higher effect sizes compared to studies that included control groups from different schools ([g-bar] = 0.447). Studies with random assignment ([g-bar] = 0.258) had statistically significantly smaller effect sizes compared to studies with non-random assignment ([g-bar] = 0.623). In addition, the effect of DBL on achievement showed statistically significant differences among different countries. The remaining moderators (school level, content support, measurement type, and experimental design) did not show statistically significant differences in terms of the effect of DBL on student achievement. Our review presents evidence that participating in DBL activities supports student achievement after the intervention, but how students transfer their content gains in other situations needs convincing evidence. To overcome this challenge, future studies can prioritize how to support achievement in state mandated tests to understand DBL's effect on students' content gains in different learning situations.

Descriptors: Kindergarten, Elementary Secondary Education, Meta Analysis, Design, Teaching Methods, Effect Size, Academic Achievement, Correlation, Science Achievement, Mathematics Achievement, STEM Education, Comparative Analysis, Learning Activities, Evidence, Transfer of Training

Influence of Self-Directed Learning on Learning Outcomes in MOOCs: A Meta-Analysis

Doo, Min Young; Zhu, Meina; Bonk, Curtis J.
Distance Education, v44 n1 p86-105 2023 (IF 8.00)

Self-directed learning (SDL) is a critical success factor for massive open online course (MOOC) learners. This meta-analysis study examined the influence of SDL on learning outcomes in MOOCs by extracting the effect sizes of 60 samples from 14 studies published between January 2010 and April 2022. The results showed that the overall effects of SDL on learning outcomes in MOOCs have a medium effect size, which supports many previous studies that have reported positive effects of SDL on academic achievement in MOOCs. There was also a significant difference in the effect size of SDL on learning outcomes among adult learners, undergraduates, and middle and high school students. The influence of self-management on learning outcomes was significantly smaller than on motivation and self-monitoring. However, there were no significant differences in affective, cognitive, and behavioral learning domains in terms of the influence of SDL on learning outcomes.

Descriptors: Independent Study, MOOCs, Outcomes of Education, Educational Research, Effect Size, Academic Achievement, Adult Students, Undergraduate Students, Middle School Students, High School Students, Student Motivation, Self Management

A Meta-Analysis of School-Based Cyberbullying Prevention Programs' Impact on Cyber-Bystander Behavior

Torgal, Cagil; Espelage, Dorothy L.; Polanin, Joshua R.; Ingram, Katherine M.; Robinson, Luz E.; El Sheikh, America J.; Valido, Alberto

School Psychology Review, v52 n2 p95-109 2023 (IF 2.43)

Cyberbullying among youth is an emerging public health concern that has a wide array of deleterious outcomes. The current meta-analytic review synthesized school-based cyberbullying prevention programs' impact on promoting cyber-bystander intervention among K-12 students. As a result of exhaustive searches and a thorough screening procedure, a total of 9 studies were identified as eligible. Meta-analytic synthesis of the 9 studies involving 35 effect sizes demonstrated that overall, the treatment effect was not statistically significant (g = 0.29, SE = 0.14, p = .07, 95% CI [-0.03, 0.61]). Findings of the moderator analyses suggest that incorporating an empathy activation component in the prevention program was associated with better program effectiveness in promoting cyber-bystander intervention. Further, older age was found to be associated with better program outcomes. Findings of the current meta-analysis provide important insight for developing cyberbullying prevention programs that promote cyber-bystander intervention.

Descriptors: Bullying, Computer Mediated Communication, Prevention, Program Effectiveness, Audiences, Behavior, Empathy, Age Differences, Elementary School Students, Secondary School Students, Intervention, Program Content, Gender Differences, Effect Size, Self Efficacy, Educational Technology, Training

Use of Augmented Reality in Science Education: A Mixed-Methods Research with the Multi-Complementary Approach

Anil, Özgür; Batdi, Veli
Education and Information Technologies, v28 n5 p5147-5185 May 2023 (IF 7.65)

The present research is an examination of Augmented Reality (AR) applications in Science Education using the Multi-complementary Approach (McA). This incorporates multiple analyses: i) Pre-complementary: meta-analysis and meta-thematic analysis, ii) Post-complementary: an experimental design with a pre- and post-test control group and iii) Complementary: Merging the results of the first two stages, making it possible to work through the effectiveness of AR in science education more comprehensively and from a wider perspective. After initially providing information on the McA, the study presents the methodological process, the results and the conclusions in a step-by-step format within this framework. The literature review based on document analysis in the context of Science classes and carrying out instruction on "refraction, lenses and prisms" topics in Science education using AR applications, indicated that AR has both positive and meaningful effects on academic achievement, and on various variables that promote the teaching of Science. The complementary results that emerged in favour of AR shed light on its utilization in Science classes, and provide an incentive for a more widespread and systematic use of such methods in the teaching environment, in line with the need now increasingly expressed for these types of technologies in this digital age.

Descriptors: Computer Simulation, Science Education, Educational Technology, Physics, Science Achievement

Meta-Analysis Examining the Impact of Vocabulary Instruction on Vocabulary Knowledge and Skill

Cervetti, Gina N.; Fitzgerald, Miranda S.; Hiebert, Elfrieda H.; Hebert, Michael
Reading Psychology, v44 n6 p672-709 2023 (IF 1.43)

We report on a meta-analysis designed to test the theory that instruction that involves direct teaching of academic vocabulary and teaching strategies to determine the meaning of unknown words develops students' abilities to infer new words' meanings and builds students' overall vocabulary knowledge. We meta-analyzed 39 experimental and quasi-experimental intervention studies conducted in grades K-5 to examine the effects of these instructional approaches. Results indicate that interventions that targeted word meaning instruction do not show overall positive effects on measures of breadth of vocabulary knowledge. Although strategy interventions are effective in improving word solving skills on near transfer measures, strategy interventions do not significantly impact students' overall breadth of vocabulary knowledge. These findings suggest that direct teaching of vocabulary words may not be effective for building overall vocabulary knowledge among elementary-grade students. More research is needed to examine the potential of teaching strategies to determine the meaning of unknown words.

Descriptors: Meta Analysis, Vocabulary Development, Reading Instruction, Direct Instruction, Teaching Methods, Elementary School Students, Instructional Effectiveness, Reading Skills, Interrater Reliability, Effect Size, Semantics, Reading Strategies, Reading Comprehension

Panoramic Video in Education: A Systematic Literature Review from 2011 to 2021

Li, Wenhao; Qian, Li; Feng, Qinna; Luo, Heng
Journal of Computer Assisted Learning, v39 n1 p1-19 Feb 2023 (IF 6.38)

Background: Panoramic video as a novel instructional media with increasing educational application. However, empirical research on panoramic video instruction is mostly episodic with conditional and inconclusive results. Objectives: This study reviewed 10 years (2011-2021) of research on panoramic video in education to synthesize, meta-analyse, and critically evaluate the state-of-art research findings, which can inform future educational practice and research directions. Methods: Following the protocol of systematic review, this study selected 83 articles from four major research databases and analysed them from five interrelated aspects: instructional context, technological features, instructional design, research design, and instructional effect. A meta-analysis was also conducted to determine the overall effectiveness of panoramic video on education and the moderating factors. Results and Conclusions: The results revealed a rapid upward trend in publication since 2018 with unequal distribution among regions and learning domains. Despite the technical advancement in immersion and interaction, panoramic videos were found to mainly support the acquisition of content and factual knowledge through direct instruction, and lack in-video scaffolding and assessment. Moreover, many interventions were one-time, short-term studies that are susceptible of novelty effect. Lastly, an overall medium effect (g = 0.711) of panoramic video was reported and six significant moderating factors were identified based on the meta-analysis results. Major takeaways and implications: Panoramic videos are ubiquitously effective across grade levels, learning domains, and pedagogies, but are more suitable for teaching conceptual knowledge. Design features such as interaction, scaffolding, assessment, iteration, and video length deserve our special attention in panoramic video instruction.

Descriptors: Video Technology, Technology Uses in Education, Instructional Design, Research Design, Outcomes of Education, Meta Analysis, Instructional Effectiveness, Educational Trends, Educational Research, Direct Instruction, Scaffolding (Teaching Technique), Interaction

Does Motion-Sensing Technology Enhance Students' Learning? A Meta-Analysis

Yu, Qing; Yu, Kun
Journal of Educational Computing Research, v61 n7 p1359-1388 2023 (IF 7.35)

Body movements are regarded as part of the learning process. With the evolution of motion-sensing technology (MST) (e.g., Kinect, Xtion Pro, and Leap Motion), educational researchers try to explore the effect of MST on learning. However, the effect of MST on learning performance is still unclear. This is the first meta-analysis that aims to examine the effectiveness of MST on students' learning. A total of 48 effect sizes from 37 independent and high-quality studies are analyzed, and the result suggests that MST has an upper-medium effect on learning (SMD = 0.574, 95% CI = [0.450, 0.698], $p < 0.001$), particularly in the affective domain (SMD = 0.822). Moreover, three of eleven moderators (i.e., the subject, site of learning, and region) have moderating effects. The moderator analysis indicates that the following conditions are more conducive to MST-assisted learning: (1) 31[approximately]50 students, (2) middle school, (3) >1 month, (4) No-STEM subjects, (5) game-based learning, (6) small group + individual learning, (7) high embodied level, (8) classroom, and (9) Asia and Europe. Finally, the discussions, implications, limitations, and future research directions are put forward.

Descriptors: Human Body, Motion, Information Technology, Computer Software, Middle School Students, Game Based Learning, Cooperative Learning, Technology Uses in Education, Foreign Countries, Academic Achievement

Effects of Mind Mapping-Based Instruction on Student Cognitive Learning Outcomes: A Meta-Analysis

Shi, Yinghui; Yang, Huiyun; Dou, Yi; Zeng, Yong
Asia Pacific Education Review, v24 n3 p303-317 Sep 2023 (IF 3.04)

Mind mapping is a visualization tool used in instruction that can be applied by learners to generate ideas, take notes, organize thinking, and develop concepts. Instruction using mind mapping is becoming increasingly commonly used in education. However, research has produced inconsistent results regarding the effectiveness of mind mapping-based instruction on student learning outcomes. Using the meta-analysis of 21 studies, this study investigates the overall effectiveness of the mind mapping-based instructions on students' learning outcomes in comparison with that of traditional instruction. Mind mapping-based instruction has been found to have a more positive influence on students' cognitive learning outcomes than traditional instruction. Analysis of moderator variables suggests that the subject matter and educational level are important factors in the effectiveness of mind mapping-based instruction. Lower-grade students are more susceptible to the influence of mind mapping-based instruction than higher-grade students, and mind mapping-based instruction helps students improve their cognitive learning outcomes in all subjects, especially in the Science, Technology, Engineering, and Math disciplines.

Descriptors: Cognitive Mapping, Educational Strategies, Cognitive Processes, Academic Achievement, Instructional Effectiveness, Control Groups, Conventional Instruction, Instructional Program Divisions, Students, Student Improvement, Science Instruction, Technology Education, Engineering Education, Mathematics Instruction, Visualization, Learning

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Yu, Qing; Yu, Kun
Journal of Educational Computing Research, v61 n7 p1359-1388 2023 (IF 7.35)

Body movements are regarded as part of the learning process. With the evolution of motion-sensing technology (MST) (e.g., Kinect, Xtion Pro, and Leap Motion), educational researchers try to explore the effect of MST on learning. However, the effect of MST on learning performance is still unclear. This is the first meta-analysis that aims to examine the effectiveness of MST on students' learning. A total of 48 effect sizes from 37 independent and high-quality studies are analyzed, and the result suggests that MST has an upper-medium effect on learning (SMD = 0.574, 95% CI = [0.450, 0.698], $p < 0.001$), particularly in the affective domain (SMD = 0.822). Moreover, three of eleven moderators (i.e., the subject, site of learning, and region) have moderating effects. The moderator analysis indicates that the following conditions are more conducive to MST-assisted learning: (1) 31[approximately]50 students, (2) middle school, (3) >1 month, (4) No-STEM subjects, (5) game-based learning, (6) small group + individual learning, (7) high embodied level, (8) classroom, and (9) Asia and Europe. Finally, the discussions, implications, limitations, and future research directions are put forward.

Descriptors: Human Body, Motion, Information Technology, Computer Software, Middle School Students, Game Based Learning, Cooperative Learning, Technology Uses in Education, Foreign Countries, Academic Achievement

Game-Based Learning for Students' Computational Thinking: A Meta-Analysis

Ma, Jingsi; Zhang, Yi; Zhu, Zhifang; Zhao, Sunan; Wang, Qiyun
Journal of Educational Computing Research, v61 n7 p1430-1463 2023 (IF 7.35)

Computational thinking (CT) education has drawn increasing attention from educators and researchers. This study conducted a meta-analysis of 27 empirical studies to examine the effectiveness of game-based learning (GBL) for fostering students' CT. The effects of various factors on the learning process for acquiring CT were also examined. The results showed that (a) conducting GBL can foster students' CT, and the overall effect was at the upper-middle level (Hedges' g = 0.600, 95% CI [0.465, 0.735], p < 0.001). (b) Furthermore, conducting GBL can improve students' CT concepts (Hedges' g = 0.916, 95% CI [0.410, 1.423], p < 0.001), CT skills (Hedges' g = 0.494, 95% CI [0.389, 0.600], p < 0.001), and CT perspectives (Hedges' g = 0.927, 95% CI [0.039, 1.816], p < 0.05). (c) Additionally, game mode, teaching context, and participant characteristics have positive effects on CT. Based on the findings, it is suggested that using more unplugged games and video games, designing collaborative game activities, and tailoring approaches according to gender difference and programming experience can effectively promote CT. The results have significance for fostering students' CT in GBL; it is further suggested that instruction processes be rationally designed.

Descriptors: Game Based Learning, Computation, Thinking Skills, Instructional Effectiveness, Skill Development, Student Characteristics, Context Effect, Video Games, Educational Games, Gender Differences, Instructional Program Divisions, Programming, Experience

The Effects of Educational Robotics in STEM Education: A Multilevel Meta-Analysis

Fan Ouyang; Weiqi Xu
International Journal of STEM Education, v11 Article 7 2024 (IF 8.09)

Educational robotics, as emerging technologies, have been widely applied in the field of STEM education to enhance the instructional and learning quality. Although previous research has highlighted potentials of applying educational robotics in STEM education, there is a lack of empirical evidence to investigate and understand the overall effects of using educational robotics in STEM education as well as the critical factors that influence the effects. To fill this gap, this research conducted a multilevel meta-analysis to examine the overall effect size of using educational robotics in STEM education under K-16 education based on 30 effect sizes from 21 studies published between 2010 and 2022. Furthermore, we examined the possible moderator variables of robot-assisted STEM education, including discipline, educational level, instructor support, instructional strategy, interactive type, intervention duration, robotic type, and control group condition. Results showed that educational robotics had the moderate-sized effects on students' STEM learning compared to the non-robotics condition. Specifically, educational robotics had moderate-sized effects on students' learning performances and learning attitudes, and insignificant effects on the improvement of computational thinking. Furthermore, we examined the influence of moderator variables in robot-assisted STEM education. Results indicated that the moderator variable of discipline was significantly associated with the effects of educational robotics on STEM learning. Based on the findings, educational and technological implications were provided to guide future research and practice in the application of educational robotics in STEM education.

Descriptors: STEM Education, Robotics, Instructional Materials, Instructional Effectiveness, Elementary School Teachers, Secondary School Teachers

Effects of Technology Application on Museum Learning: A Meta-Analysis of 42 Studies Published between 2011 and 2021

Xu, Wei; Dai, Tao-Tao; Shen, Zhi-Yi; Yao, Yu-Jia
Interactive Learning Environments, v31 n7 p4589-4604 2023 (IF 5.16)

In recent years, more and more technical tools have been introduced into various museums, bringing new opportunities and challenges for the research of museum learning. Whether the application of these technologies can effectively improve the effects of museum learning has become a major problem perplexing museum learning researchers. In this paper, a meta-analysis method is used to analyze and evaluate the 42 experimental or quasi-experimental studies on the technology application in the field of museum learning in the past decade. The results show that the technology application has a moderate or higher effect on museum learning, moreover, the age of learners, the type of technology, the type of museum and the visiting pattern of museum will significantly affect the effectiveness of technology on the museum learning. Therefore, the museum institutions can learn from excellent cases to accelerate the application of museum technology, give priority to the construction of digital resources, continue to promote the specialisation of museum technology application, and better play the role of technology in museum education.

Descriptors: Museums, Educational Technology, Technology Uses in Education, Program Effectiveness, Age Differences, Institutional Characteristics, Exhibits

Effectiveness of Interventions That Foster Reading Motivation: A Meta-Analysis

van der Sande, Lisa; van Steensel, Roel; Fikrat-Wevers, Suzanne; Arends, Lidia
Educational Psychology Review, v35 n1 Article 21 Mar 2023 (IF 11.11)

Many students have low reading motivation. Based on (reading) motivation theories, several mechanisms are distinguished that can foster reading motivation. Our goal in this meta-analysis was to examine the effects of theory-driven reading motivation interventions in school on students' reading motivation and reading comprehension as well as to test which mechanisms are particularly effective in fostering motivation and comprehension. We conducted a literature search in ten online databases and identified 39 relevant effect studies. Positive effects on affirming motivations (d = 0.38), extrinsic motivations (d = 0.42), combined motivations (d = 0.17), and reading comprehension (d = 0.27) were found. The effect on undermining motivations (d = -0.01) was not significant. In particular, interventions that aimed to trigger interest had positive effects on affirming motivations and reading comprehension. Furthermore, effects on affirming motivations were larger if the total duration of the intervention was longer and if the share of boys in the sample was higher. Interventions delivered by researchers had larger effects on reading comprehension than interventions delivered by teachers. Finally, effects on reading comprehension were larger for primary schoolers than for secondary schoolers and larger for typical readers than for struggling readers. Implications for practitioners, policymakers, and researchers are discussed.

Descriptors: Reading Motivation, Student Motivation, Reading Comprehension, Student Interests, Educational Methods, Age Differences, Elementary Secondary Education, Reading Skills, Intervention, Program Effectiveness

Analysing the Impact of Artificial Intelligence and Computational Sciences on Student Performance: Systematic Review and Meta-Analysis

García-Martínez, Inmaculada; Fernández-Batanero, José María; Fernández-Cerero, José; León, Samuel P.

Journal of New Approaches in Educational Research, v12 n1 p171-197 2023 (IF 4.66)

Artificial intelligence (AI) and computational sciences have aroused a growing interest in education. Despite its relatively recent history, AI is increasingly being introduced into the classroom through different modalities, with the aim of improving student achievement. Thus, the purpose of the research is to analyse, quantitatively and qualitatively, the impact of AI components and computational sciences on student performance. For this purpose, a systematic review and meta-analysis have been carried out in WOS and Scopus databases. After applying the inclusion and exclusion criteria, the sample was set at 25 articles. The results support the positive impact that AI and computational sciences have on student performance, finding a rise in their attitude towards learning and their motivation, especially in the STEM (Science, Technology, Engineering, and Mathematics) areas. Despite the multiple benefits provided, the implementation of these technologies in instructional processes involves a great educational and ethical challenge for teachers in relation to their design and implementation, which requires further analysis from the educational research. These findings are consistent at all educational stages.

Descriptors: Artificial Intelligence, Computation, Academic Achievement, Meta Analysis, Student Attitudes, Learning Motivation, STEM Education, Technology Uses in Education, Teaching Methods, Effect Size, Student Improvement, Program Effectiveness, Educational Benefits

Meta-Analysis of STEM Learning Using Virtual Reality: Benefits across the Board

Cromley, Jennifer G.; Chen, Runzhi; Lawrence, LuEttaMae
Journal of Science Education and Technology, v32 n3 p355-364 Jun 2023 (IF 5.43)

The use of virtual reality (VR) in formal education has burgeoned in recent years, with enthusiastic uptake by teachers and instructors across a wide range of subject areas and academic disciplines. We conducted a systematic meta-analysis of effects of VR on Science, Technology, Engineering, and Mathematics learning from middle school through postsecondary education. Eighteen published journal articles met inclusion criteria, yielding 52 effects from 2214 participants. VR has an overall positive effect on learning of g = 0.33, with the largest significant moderator effects for redesign of VR, classroom settings, science learning, desktop displays, and all types of learning outcomes (factual, conceptual, and transfer). Results depart somewhat from Howard's (2019) and Wu et al.'s (2020b) meta-analyses of VR across learning and treatment, multiple domains, and ages; in our study, desktop VR showed larger effects than head-mounted display, and we found positive effects for all learning outcome types. One trend within studies showing the largest effects is the inclusion of active learning techniques, which may shift learners' focus from interesting but irrelevant details to the most learning-relevant aspects of the VR learning environment.

Descriptors: Literature Reviews, STEM Education, Computer Simulation, Middle Schools, High Schools, Postsecondary Education, Outcomes of Education, Active Learning, Educational Environment

Divergence and Convergence of Young Children's Touchscreen Learning: A Meta-Analysis Review

Li, Qinglong; Wei, Yonggang; Peng, Yanqi; Su, Lin; Song, Haidan
Education and Information Technologies, v28 n6 p7703-7724 Jun 2023 (IF 7.65)

Touchscreen devices have become the mainstream terminals for human-information interaction and have great appeal to children. Scholars still have disputes on the effects of touchscreen learning in young children aged three to six. This study aims to investigate whether touchscreen devices can promote young children's learning achievements, and to explore the mechanism triggering young children's touchscreen learning. Fifteen articles involving 5075 participants were included into the meta-analysis, in which corresponding combination of effect size and sub-group analysis were conducted. The result indicates that touchscreen learning can promote young children's learning achievements in general. Subject is a significant moderator for young children's touchscreen learning. Touchscreen devices has the best positive effect on young children's visuo-spatial ability, but little on literacy and arithmetic ability. The advantages of touchscreen learning for young children's academic performance could be maintained compared with different traditional teaching methods, and lasted throughout the whole stage aged three to six. There is a contradiction between embodied cognition theory and cognitive load theory in explaining young children's touchscreen learning. The Embodied Cognitive Load Theory and three types of learning (sensorimotor load superiority learning, processing load superiority learning, and double loads learning) were put forward as the theoretical assumption to explore the mechanism and convergence of young children's touchscreen learning.

Descriptors: Young Children, Electronic Learning, Meta Analysis, Technology Uses in Education, Tablet Computers, Spatial Ability, Literacy Education, Mathematics Education, Arithmetic, Academic Achievement

A Critical Analysis of the Effects of Twitter on Student Engagement and Grades

Alshaye, Ibrahim Abdullah; Tasir, Zaidatun; Jumaat, Nurul Farhana
Contemporary Educational Technology, v15 n3 Article ep437 2023 (IF 4.46)

Social media, such as Twitter, have skyrocketed in popularity over the past few years. In fact, social media have been widely used by students and instructors as teaching and learning tools. In response to the increasing use of Twitter in the educational field, we have collected ten studies between 2011 to 2020 in order to assess the relationship between social media, specifically Twitter, and students' engagement and grades. We have conducted a meta-analysis to provide empirical evidence concerning the impact of Twitter on student engagement and achievement. Furthermore, we have utilized the manual approach of content analysis in order to code these articles. Overall, metadata suggests that Twitter has a stronger impact on student engagement than on grades. Nevertheless, its impact is not necessarily positive, especially on grades.

Descriptors: Social Media, Learner Engagement, Grades (Scholastic), Correlation, Educational Technology, College Students, Secondary School Students, Student Motivation, Student Attitudes, Cooperation, Student Participation

Self-Directed Learning, Academic Achievement and Motivation: A Meta-Analytical Study

Yurdal, Mustafa Onur; Toraman, Çetin
Alberta Journal of Educational Research, v69 n2 p233-253 2023 (IF 0.24)

This study is a meta-analytical examination of the relationships between academic achievement, motivation, and self-directed learning. It aims to review scientific studies investigating how self-directed learning readiness relates to both motivation and academic achievement to find a common effect level and to synthesize the study results. According to the meta-analytical results, it can be seen that academic achievement increases in line with an increase in the level of self-directed learning readiness. The results reveal that the relationship between self-directed learning and both motivation and academic achievement, which are two important indicators of the educational process, constitutes an important structure. It is recommended that relational studies conducted at the K-12 level of the relationship between self-directed learning and motivation should be compared with the results of this study through a separate meta-analysis.

Descriptors: Independent Study, Academic Achievement, Motivation, Relationship, Learning Readiness

Effects of Games in STEM Education: A Meta-Analysis on the Moderating Role of Student Background Characteristics

Arztmann, Michaela; Hornstra, Lisette; Jeuring, Johan; Kester, Liesbeth
Studies in Science Education, v59 n1 p109-145 2023 (IF 9.25)

Game-based learning has proven to be effective and is widely used in science education, but usually the heterogeneity of the student population is being overlooked. To examine the differential effects of game interventions in STEM (Science, Technology, Engineering and Mathematics) related subjects on diverse student groups, a meta-analysis has been conducted that included 39 studies that compared game-based learning interventions with traditional classrooms in primary and early secondary education. We found moderate positive effects on cognition (g = 0.67), motivation (g = 0.51), and behaviour (g = 0.93). Additionally, substantial heterogeneity between studies was found. Moderator analyses indicated that primary school students achieve higher learning outcomes and

experience game interventions as more motivating than secondary school students, whereas gender did not have any moderating effect. There were too few studies reporting information on the remaining moderators (socioeconomic status, migration background, and special educational needs) to include them in a multiple meta-regression model. Therefore, we assessed their role by separate moderator analyses, but these results need to be interpreted with caution. Additional descriptive analyses suggested that game-based learning may be less beneficial for students with low socioeconomic status compared to students with high socioeconomic status.

Descriptors: Elementary School Students, Secondary School Students, STEM Education, Games, Student Characteristics, Game Based Learning, Intervention, Cognitive Processes, Outcomes of Education, Motivation Techniques, Student Motivation, Socioeconomic Status, Special Education, Migration

Effects of Worksheets on Problem-Solving Skills: Meta-Analytic Studies

Widodo, Sri Adi; Wijayanti, Astuti; Irfan, Muhammad; Pusporini, Widowati; Mariah, Siti; Rochmiyati, Siti

International Journal of Educational Methodology, v9 n1 p151-167 2023 (IF 0.67)

The purpose of this study was to compile and statistically analyze the results of research studies that examined students' problem-solving skills in worksheets. The research method used was a meta-analysis. The study search was conducted from 2013 to 2022 in Google Scholar and the Garuda portal databases. The search yielded 40 studies that met the inclusion criteria for extraction from research and development, experimental, and quasi-experimental. From the extracted results, 45 comparisons of data were examined. Microsoft Excel was used to calculate the effect size of the problem-solving worksheet. This study yielded a value of 1.281 for the entire study, indicating that the worksheet had a significant and positive impact on students' problem-solving skills. The results indicate the need to develop worksheets to improve students' problem-solving skills.

Descriptors: Worksheets, Problem Solving, Meta Analysis, Effect Size, Instructional Effectiveness, Thinking Skills, Elementary School Students, Junior High School Students, High School Students

The Effectiveness of Machine Translation in Foreign Language Education: A Systematic Review and Meta-Analysis

Lee, Sangmin-Michelle
Computer Assisted Language Learning, v36 n1-2 p103-125 2023 (IF 8.22)

With a significant number of students using machine translation (MT) for academic purposes in recent years, language teachers can no longer ignore it in their classrooms. Although an increasing number of studies have reported its pedagogical benefits, studies have also revealed that language teachers are still sceptical about using MT for various reasons. Most of all, they have limited trust in MT quality and the effectiveness of using MT in foreign language (FL) learning. Hence, the current study examined these issues to provide an overview and a guide to language teachers regarding the use of MT in FL education. The study examined 87 MT studies related to FL education published between 2000 and 2019. It employed both systematic review (primary) and meta-analysis (secondary) as research methods for a robust data analysis. The results showed that the number of publications in this area has increased in recent years and that MT quality has been significantly enhanced. Most studies also reported the positive impacts of using MT in FL learning, particularly for writing. However, this study also found that students had mixed emotions about MT and that there are disparities in perceptions between instructors and students. Based on the results, the present study presents several pedagogical implications and suggestions for future research on MT.

Descriptors: Instructional Effectiveness, Teaching Methods, Translation, Second Language Learning, Second Language Instruction, Computational Linguistics, Meta Analysis, Research Reports, Research Methodology, Outcomes of Education

The Landscape of Technology Research in Special Education: A Bibliometric Analysis

Gamze Inci; Hasan Köse
Journal of Special Education Technology, v39 n1 p94-107 2024 (IF 2.77)

This study analyzes information accumulated in WoS databases on special education and technology with bibliometric methods. Bibliometric analyses, seen as an alternative to systematic literature reviews, meta-analysis, and meta-synthesis, contribute to determining essential actors in the field by analyzing the publication and citation trends, the stage of the research topic, and trends in the volume of publications. Furthermore, bibliometric analysis can reveal the collaboration structure between institutions and authors and identify the most frequently studied topics, top-producing authors, institutions, and journals in a field. In the study, we analyzed 4493 articles published in Social Sciences Citation Index (SSCI), Emerging Sources Citation Index (ESCI), Social Sciences Index Expanded (SCI-Expanded), and Arts & Humanities Citation Index (AHCI) databases using the co-authorship and co-occurrence analysis method. Also, we used frequency analysis in publications and citations related to special education and technology research to determine the situation. The main findings of the research are that the literature on the use of technology in special education: (a) has grown steadily over the years, particularly since 2003; (b) research topic foci have changed over the years; (c) articles are published in different journals, particularly special education journals; (d) produced by authors from a wide variety of countries; and (e) published by research groups with limited contact with other research groups.

Descriptors: Special Education, Educational Technology, Educational Research, Technology Uses in Education, Periodicals, Journal Articles, Authors, Geographic Location, Bibliometrics

Meta-Analysis of the Impact of Geospatial Technologies on Learning Outcomes

Ma, Qianyi; Duan, Yushan; Yao, Zeyang

Education and Information Technologies, v28 n12 p15739-15764 2023 (IF 7.65)

Many scholars have been using geospatial technologies (GST) to improve students' learning outcomes in the Web 2.0 age. However, many studies focus on the effectiveness of GST on cognitive domain of learning outcomes, which poses challenges to GST efficacy evaluation. This study aims to examine the effectiveness of GST on students' learning outcomes and identify potential moderators through meta-analysis. The results indicate that GST has a positive effect on students' learning outcomes on a medium scale, while its effects on the cognitive domain were more significant than the non-cognitive domain. Moreover, we identified variable factors such as participant's country/region, education level, intervention duration, and type of geospatial technology to analyze whether the four moderator variables had an impact on the effectiveness of GST. The moderator analysis results show that GST's effectiveness on students' learning outcomes depended on participants' country/region, intervention duration and type of geospatial technology. This means that participants' country/region, intervention duration and type of geospatial technology had a significant effect on GST's effectiveness, while students' education level did not have a major impact. Thus, geography educators should promote a pedagogical model with GST, and take into account the individuals' country/region, while setting a reasonable intervention time of using GST in teaching. Teachers should also be flexible in using different types of geospatial technologies to achieve positive students' learning outcomes.

Descriptors: Meta Analysis, Geographic Information Systems, Instructional Effectiveness, Outcomes of Education, Teaching Methods, Intervention, Instructional Program Divisions, Place of Residence, Technology Uses in Education

A Systematic Literature Review on Augmented Reality in Mathematics Education

Bulut, Mehmet; Borromeo Ferri, Rita
European Journal of Science and Mathematics Education, v11 n3 p556-572 2023 (IF 1.10)

Technology, in particular augmented reality (AR), has the potential to greatly enhance interactive learning environments for mathematics in both classrooms and other teaching environments. The purpose of the present study was to investigate existing literature on AR in mathematics education. We selected papers from 10 databases, Scopus, Web of Science Core Collection, ERIC, IEEE Xplore Digital Library, Teacher Reference Center, SpringerLink, zbMATH Open, Taylor & Francis Online Journals, JSTOR, and MathSciNet. From these databases, 42 related studies were selected by the method of preferred reporting items for systematic reviews and meta-analysis (PRISMA2020). The results from all the papers showed positive outcomes as a result of AR implementation in mathematics education. They were also analyzed into different themes according to quantitative and qualitative criteria. The advantages and challenges of AR usage in mathematics education are also discussed in detail.

Descriptors: Literature Reviews, Computer Simulation, Mathematics Education, Meta Analysis, Educational Technology, Geometry, Mathematical Concepts, Instructional Effectiveness

A Meta-Analysis of Writing Treatments for Students in Grades 6-12

Graham, Steve; Kim, Young-Suk; Cao, Yucheng; Lee, Will; Tate, Tamara; Collins, Penelope; Cho, Minkyung; Moon, Youngsun; Chung, Huy Quoc; Olson, Carol Booth

Journal of Educational Psychology, v115 n7 p1004-1027 Oct 2023 (IF 6.00)

There is considerable concern that many adolescents do not attain the writing competence needed to be successful in school, their personal lives, or the workplace. Ensuring that students acquire this competence is a basic responsibility of schools. In order to meet this objective, teachers need access to effective practices for teaching writing. In this meta-analysis, we examined if teaching writing improved the writing and reading of students in Grades 6-12, and what specific writing treatments enhanced students' writing. Our review included writing treatments tested using an experimental or quasi-experimental design (with pretests) and published and unpublished studies, and computed effect sizes (ESs) for all writing and reading outcomes assessed. Across 406 independent comparisons, yielding 3,514 ESs involving 52,529 students, teaching writing had a positive and statistically detectable impact on students' writing (ES = 0.47) and reading (ES = 0.22). Moreover, a variety of different writing treatments improved students' performance on writing measures. Across all writing outcomes, statistically detectable effects (presented in parentheses) were obtained for comprehensive writing programs (0.47; which included the process approach to writing), strategy instruction (0.76), digital writing tools (0.31), transcription instruction (0.71), computer-assisted instruction (0.32), teaching critical/creative thinking skills for writing (0.27), emulating good models of writing (0.46), feedback (0.34), goal setting (0.44), prewriting activities (0.49), grammar instruction (0.77), sentence instruction (0.73), inquiry (0.92), observing writers/readers, peer assistance (0.41), summarization instruction (0.49), and text structure instruction (0.39). Implications for practice, research, and theory are discussed.

Descriptors: Meta Analysis, Writing Instruction, Intervention, Secondary School Students, Writing Achievement, Reading Achievement, Effect Size, Teaching Methods, Instructional Effectiveness

The Peace Education Concept and Practice at Universities: A Systematic Review

Yedi Purwanto; Suprapto; Dicky R. Munaf; Hasan Albana; Lisa'diyah Marifataini; Imran Siregar; Sumarni

Cogent Education, v10 n2 Article 2260724 2023 (IF 1.96)

Peace education has long been integrated into the higher education curriculum to equip students from diverse cultural backgrounds, languages, religions, regions, and lifestyles with the knowledge, skills, and values necessary to foster a culture of harmony and prevent future conflicts. This systematic research examines the peace education concept and practice in action from various universities in the world garnered from research articles published within the last 5 years between 2017 and 2021. This study uses international database in the form of articles in Scopus journals using such keywords in the Scopus database (scopus.com). The keywords we used were "peace education and higher education", "peace education and university", "peacebuilding and higher education", and "peacebuilding and university". Articles from many databases are selected using Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) approach. From the results of the review of 10 articles, this study explores four emerging themes on peace education concept and practice which include 1) universities collaborating to develop peace programs; 2) peace education teaching; 3) peace education curriculum; and 4) peace education hidden curriculum. The analysis result shows that peace education needs to be prioritized to create a safe, harmonious, and peaceful atmosphere among students and all academic society members. This article is helpful for universities, particularly to help develop peace values in education.

Descriptors: Peace, Teaching Methods, Educational Practices, Research Reports, Universities, Higher Education, Program Development, Safety, Educational Environment, Institutional Cooperation, Hidden Curriculum, Information Retrieval

Educational Games Promote the Development of Students' Computational Thinking: A Meta-Analytic Review

Sun, Lihui; Guo, Zhen; Hu, Linlin
Interactive Learning Environments, v31 n6 p3476-3490 2023 (IF 5.16)

The cultivation of computational thinking (CT) skills is a key issue in talent cultivation today. This study reported a meta-analysis of 22 empirical studies to determine the effectiveness of using educational games to improve students' CT skills and the influence of various factors in instructional design on acquiring CT skills. The results showed that: (a) educational games can promote the improvement of students' CT skills (Hedges' g = 0.766, p = 0.000); (b) the overall effect is at the upper-middle level (95%CI [0.580, 0.951]); (c) The positive connection between educational games and CT skills is affected by sample size, grades level, game usage mode, and game tools. Controlling the class size to less than 50 students and the reasonable choice of game tools and usage modes are more conducive to promoting students' CT skills. In sum, we suggested that the educational game teaching process should be rationally planned, and technology should be fully utilized to develop students' CT skills. The above findings are of great significance to promote the improvement of students' CT skills through educational games in the future.

Descriptors: Educational Games, Computation, Thinking Skills, Literature Reviews, Instructional Design, Technology Uses in Education, Instructional Program Divisions

Using Gamification to Support Learning in K-12 Education: A Systematic Literature Review

Hojjat Dehghanzadeh; Mohammadreza Farrokhnia; Hossein Dehghanzadeh; Kiumars Taghipour; Omid Noroozi

British Journal of Educational Technology, v55 n1 p34-70 2024 (IF 8.07)

Using gamification to support learning in K-12 education has received much attention from scholars in recent years. However, there is still a lack of comprehensive understanding of how gamification should be used to effectively enhance the learning experiences of K-12 students. The purpose of this review was to synthesize research findings on the use of gamification in K-12 education and to propose an evidence-informed framework. This framework will guide teachers and scholars in developing gamified learning environments that are effective in improving K-12 students' learning. In this regard, 54 empirical studies (out of 907 peer-reviewed articles), dating from 2008 through 2021, were reviewed using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guideline. The findings were systematically categorized into four essential dimensions of learning environments inspired by Biggs' 3P teaching and learning model, ie, 'individual factors', 'environmental factors', 'learning process' and 'learning outcome'. The review yielded rich findings concerning each dimension, providing K-12 teachers and scholars with a comprehensive overview of research findings on using gamification for educational purposes. Meanwhile, the findings indicated the lack of empirical studies regarding constructively aligned gamified courses, in which the different dimensions of the adopted framework are implemented and evaluated coherently. The paper concludes by presenting several suggestions and directions for future research to address this shortcoming.

Descriptors: Gamification, Educational Games, Elementary Secondary Education, Learning Experience, Educational Environment, Outcomes of Education, Cognitive Development, Student Behavior, Student Motivation, Learner Engagement, Competition, Students

Educational Technology Research during the COVID-19 Pandemic

Sijia Xue; Helen Crompton
Interactive Technology and Smart Education, v21 n1 p83-107 2024 (IF 8.10)

Purpose: This systematic review paper aims to examine extant empirical research involving educational technology during COVID-19 to provide an aggregated analysis of how the pandemic has influenced educational technology research. Design/methodology/approach: Using a Preferred Reporting Items for Systematic Reviews and Meta-Analysis systematic review and an integrative review methodology, 50 primary research studies were selected from ten top-ranked educational research journals. These studies were reviewed regarding research purposes, methodologies, instruments, educational level, geographical distribution, and findings of the studies. Findings: The findings reveal four emerging themes--influencing factors, effectiveness, challenges and teachers. The majority of the studies focused on higher education. Quantitative research design based on a questionnaire was the most adopted method of investigation by researchers. Research limitations/implications: Search parameters focused on the top 10 journals in the field of educational technology. Although this provides a level of quality, it narrowed the search. Practical implications: For practitioners and researchers, this study provides a summary of the field to better understand what knowledge we have gained on the use of educational technology to enable a more agile, knowledgeable response to education in future emergencies. Originality/value: This systematic review is unique in examining how the pandemic has influenced educational technology research. It also provides insight into gaps in the research that future researchers can use as a springboard to enable a more knowledge and a more agile approach to future emergencies.

Descriptors: Educational Technology, Educational Research, COVID-19, Pandemics, Influences, Barriers, Program Effectiveness, Faculty Development, Teacher Competencies, Access to Computers, Research Methodology, Elementary Secondary Education, Postsecondary Education, Foreign Countries

A Meta-Analysis of Mental Rotation in the First Years of Life

Enge, Alexander; Kapoor, Shreya; Kieslinger, Anne-Sophie; Skeide, Michael A.
Developmental Science, v26 n6 e13381 2023 (IF 4.33)

Mental rotation, the cognitive process of moving an object in mind to predict how it looks in a new orientation, is coupled to intelligence, learning, and educational achievement. On average, adolescent and adult males solve mental rotation tasks slightly better (i.e., faster and/or more accurate) than females. When such behavioral differences emerge during development, however, remains poorly understood. Here we analyzed effect sizes derived from 62 experiments conducted in 1705 infants aged 3-16 months. We found that male infants recognized rotated objects slightly more reliably than female infants. This difference survives correction for small degrees of publication bias. These findings indicate that gender differences in mental rotation are small and not robustly detectable in the first months of postnatal life.

Descriptors: Meta Analysis, Cognitive Processes, Spatial Ability, Age Differences, Infants, Gender Differences, Effect Size

The Flipped Classroom in Second Language Learning: A Meta-Analysis

Vitta, Joseph P.; Al-Hoorie, Ali H.
Language Teaching Research, v27 n5 p1268-1292 Sep 2023 (IF 4.18)

Flipped learning has become a popular approach in various educational fields, including second language teaching. In this approach, the conventional educational process is reversed so that learners do their homework and prepare the material before going to class. Class time is then devoted to practice, discussion, and higher-order thinking tasks in order to consolidate learning. In this article, we meta-analysed 56 language learning reports involving 61 unique samples and 4,220 participants. Our results showed that flipped classrooms outperformed traditional classrooms, g = 0.99, 95% CI (0.81, 1.17), z = 10.90, p < 0.001. However, this effect had high heterogeneity (about 86%), while applying the Trim and Fill method for publication bias made it shrink to g = 0.58, 95% CI (0.37, 0.78). Moderator analysis also showed that reports published in non-SSCI-indexed journals tended to find larger effects compared to indexed ones, conference proceedings, and university theses. The effect of flipped learning did not seem to vary by age, but it did vary by proficiency level in that the higher proficiency the higher the effects. Flipped learning also had a clear and substantial effect on most language outcomes. In contrast, whether the intervention used videos and whether the platform was interactive did not turn out to be significant moderators. Meta-regression showed that longer interventions resulted in only a slight reduction in the effectiveness of this approach. We discuss the implications of these findings and recommend that future research moves beyond asking whether flipped learning is effective to when and how its effectiveness is maximized.

Descriptors: Flipped Classroom, Second Language Learning, Conventional Instruction, Age Differences, Language Proficiency, Program Effectiveness, Video Technology, Interaction, Intervention, Student Characteristics, Research Methodology, Elementary Secondary Education, Postsecondary Education, English (Second Language), Chinese, Japanese, Korean

Neural Machine Translation in Foreign Language Teaching and Learning: A Systematic Review

Klimova, Blanka; Pikhart, Marcel; Benites, Alice Delorme; Lehr, Caroline; Sanchez-Stockhammer, Christina

Education and Information Technologies, v28 n1 p663-682 Jan 2023 (IF 7.65)

Nowadays, hardly anyone working in the field of foreign language teaching and learning can imagine life without machine translation (MT) tools. Thanks to the rapid development of artificial intelligence, MT now most widely assumes a new form, the so-called Neural Machine Translation (NMT), which offers the potential for a wide application in foreign language learning (FLL). Therefore, the purpose of this review study is to explore different approaches to the efficient implementation of NMT into FLL and provide specific pedagogical implications for best practices. The PRISMA methodology for systematic reviews and meta-analyses was strictly followed. The search was conducted in two well-established databases, specifically Scopus and Web of Science, to generate sufficient data from research articles for further analysis. The findings of this systematic review indicate that NMT is an efficient tool for developing both productive (speaking and writing) and receptive (reading and listening) language skills, including mediation skills, which are relevant for translation. Moreover, the results show that NMT tools are especially suitable for advanced learners of L2, whose higher proficiency level enables them to critically reflect on the output of NMT texts more than beginners or lower-intermediate learners. Thus, the findings of this review study reveal that NMT has valuable implications for L2 pedagogy since it can serve as a very powerful online reference tool for FLL provided that teachers introduce students to its benefits but also limitations by implementing various teaching approaches.

Descriptors: Translation, Computational Linguistics, Second Language Learning, Second Language Instruction, Best Practices, Meta Analysis, Research Reports, Databases, Language Skills, Skill Development, Teaching Methods, Receptive Language, Expressive Language, Language Proficiency, Artificial Intelligence

A Systematic Literature Review of Chinese Music Education Studies during 2007 to 2019

Yang, Yang; Welch, Graham
International Journal of Music Education, v41 n2 p175-198 May 2023 (IF 2.57)

Based on findings from a large meta-data-based literature survey, this article is intended to provide a comprehensive synthesis of key features of China's music education system as seen through the lens of n = 116 major research studies, drawn from a total of N = 3,257 high-impact Chinese journal articles published during 2007 to 2019. The synthesis suggests that (1) education reform, aesthetic education, Chinese traditional music and cultural identity were found to be the most prominent topics across all levels of formal music education; and (2) in most studies, government financial support, policy priorities, curriculum enforcement and paedagogical innovation are proposed as general cures to address perceptions of an unsatisfactory situation within music education. However, (3) by relating these findings to national statistics, a clear gap is identified between several research studies and actual social contexts, suggesting a possible deviation of academic communities from realistic educational and social challenges. Thus, external validity issues related to these studies are also discussed critically, along with their potential influence on views of what counts as Chinese music education in domestic and international research communities.

Descriptors: Music Education, Research Reports, Teaching Methods, Curriculum Development, Social Environment, Instructional Innovation, Validity, Foreign Countries, Meta Analysis, Educational Change, Research Problems, Elementary Secondary Education, Higher Education, Budgets, Research Methodology, Preschool Education, Informal Education, Music Teachers, Special Education, Music Therapy, Teacher Qualifications, Professional Education, Teacher Education Programs

Universities Australia 2017-2020 Indigenous Strategy: A Meta-Synthesis of the Issues and Challenges

Anderson, Peter J.; Yip, Sun Yee; Diamond, Zane M.

Higher Education Research and Development, v42 n4 p785-800 2023 (IF 4.97)

The University Australia (UA) 2017-2020 Indigenous Strategy has offered Australian universities a focus that would work to increase Indigenous participation in the higher education sector in Australia. Despite the high-level involvement and detailed monitoring by Universities Australia as the sector's peak body, Australia's universities have not made significant progress in achieving the targets in the strategic plan. Using a meta-synthesis methodological approach, we provide an overview of published reviews and research on increasing Indigenous participation in the higher education sector in Australia, with particular reference to the three initiative foci and targets in the UA 2017-2020 Indigenous Strategy. Findings revealed that Indigenous students' experiences at university, the shortage of Indigenous academics, and the embedment of Indigenous knowledge and perspectives are significant elements that affect the achievement of the UA targets. We conclude by discussing the implications and gaps in the existing UA strategies and offering recommendations to enable higher educator stakeholders to progress the Indigenous Strategy agenda.

Descriptors: Universities, Indigenous Populations, Foreign Countries, Educational Attainment, Access to Education, Equal Education, Meta Analysis, Strategic Planning, Higher Education, Self Concept, Academic Ability, Student Attitudes, Student Participation, College Attendance, Academic Support Services, College Faculty, Teacher Characteristics, Faculty Recruitment, Faculty Workload, Cultural Awareness, Indigenous Knowledge, Culturally Relevant Education, Barriers

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Meets WWC Standards with or without Reservations	2
Does not meet standards	1

AUTHOR	
Barron, Daniel D.	135
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AI in Indian Libraries: Prospects and Perceptions from Library Professionals

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A. Subaveerapandiyan; Alfian Akbar Gozali - Online Submission, 2024

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This study explores the perspectives of Indian library professionals on the use of artificial intelligence (AI) in libraries. It aims to understand their knowledge, awareness, and views on AI and its challenges and opportunities. The research adopts a quantitative approach, using a closed-ended survey to collect data from 386 library professionals…

Descriptors: Foreign Countries, Libraries, Academic Libraries, Librarians

Making and Using AI in the Library: Creating a BERT Model at the National Library of Sweden

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Haffenden, Chris; Fano, Elena; Malmsten, Martin; Börjeson, Love - College & Research Libraries, 2023

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Descriptors: Foreign Countries, Artificial Intelligence, Models, Languages

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Natal, Gerald R.; Remaklus, David - College & Research Libraries, 2023

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Descriptors: Academic Libraries, Experiential Learning, Art Education, College Programs

Adoption of Robots in Open and Distance Learning University Libraries: A Global Overview Based on Review of Literature

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Adeyinka, Tella - Journal of Library & Information Services in Distance Learning, 2023

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The use of robots in open and distance learning university libraries is a relatively new and innovative concept that has emerged in recent years as a response to the increasing demand for remote access to library resources and services. However, there seem to be limited studies that focused on the adoption of robots in open and distance learning…

Descriptors: Robotics, Distance Education, Ethics, Library Services

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This study aims to investigate university library directors' perceived importance of antiplagiarism practices through plagiarism software and guidance-based programs. The study also qualitatively explores the barriers faced by university librarians in combating plagiarism practices. The authors used a mixed-method research design to examine their…

Descriptors: Foreign Countries, Library Personnel, Administrator Attitudes, Research Libraries

Use of E-Library Services by Postgraduate Students at Mzuzu University

Peer reviewed

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Hamis Lack Abdullah; Winner Dominic Chawinga; George Theodore Chipeta - New Review of Academic Librarianship, 2023

Paperpile

Mzuzu University Library provides various e-library services to postgraduate students. However, a minimal amount is known regarding the use of these e-library services by postgraduate students. This mixed methods quantitative study aimed to investigate postgraduate students' use of e-library services. The findings reveal that 95% of postgraduate…

Descriptors: Telecommunications, Library Services, User Needs (Information), Academic Libraries

More than a Decade Later: Library Web Usability Practices at ARL Academic Libraries in 2007 and 2020

Peer reviewed

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Chen, Yu-Hui; Germain, Carol Anne; Rorissa, Abebe – College & Research Libraries, 2023

Paperpile

This study compares library web usability practices in 2007 and 2020 at academic libraries that are institutional members of the Association of Research Libraries. The authors performed chi-square and t-tests to determine whether there were differences in establishing policies/standards/guidelines (PSGs), conducting usability tests, and providing…

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Data can come in the form of text, observations, figures, images, numbers, graphs, or symbols. For example, data might

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Data in Libraries

data in school?

7 Examples of Student Data

- Demographic Information. ...
- Academic Performance Data. ...
- Behavioral Data. ...
- Attendance Records. ...
- Social-Emotional Learning Data. ...
- Health and Wellness Data. ...
- Technology Usage Data.

3 common categories of data analytics?

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the 5 methods of Analysing data?

Data analysis techniques:

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- Monte Carlo simulation.
- Factor analysis.
- Cohort analysis.
- Cluster analysis.
- Time series analysis.
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