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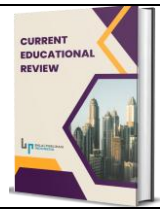

Mapping Research Trends on the Culturally Responsive Transformative Teaching (CRTT) Learning Model to Improve Critical Thinking Skills

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Abstract: This study aims to map research trends on the Culturally Responsive Transformative Teaching (CRTT) learning model in an effort to improve students' critical thinking skills from 2016–2025. The study was conducted through bibliometric analysis using data obtained from Google Scholar, processed with Publish or Perish, Dimensions.ai, and visualized using VOSviewer. A total of 200 documents were analyzed using the PRISMA flow to identify publication developments, source types, citations, and keyword relationships. The results show that the CRTT research trend has increased significantly in the last decade, with a dominance of scientific articles and an increase in citations on topics related to science learning, ethnoscience, cultural literacy, and the development of critical thinking skills. Keyword analysis revealed that terms such as curriculum, century skill, STEM, action, and lesson study have become important focuses in the development of CRTT. Network and overlay visualizations show a shift in research from conceptual studies to contextual implementation based on local culture and technology integration. These findings confirm that CRTT is a relevant pedagogical approach for building transformative, culturally responsive learning, and is effective in developing students' critical thinking skills in various educational contexts. This study provides a foundation for further research as well as practical recommendations for implementing the CRTT model in schools and developing a culture-based curriculum.

Keywords: Critical thinking; *Culturally Responsive Transformative Teaching* (CRTT); Culturally responsive curriculum; Ethnoscience

Introduction

The development of 21st-century education requires students not only to master academic content but also to possess higher-order thinking skills, such as critical, reflective, and creative thinking. These skills provide an essential foundation for navigating the complexity of information, technological advancements, and global social and cultural dynamics. Critical thinking skills are essential because they enable individuals to evaluate rationally, make logical decisions, and selectively filter information. According to Facione (2015), critical thinking is the ability to think reflectively and reason logically in making appropriate decisions. In the context of science and social studies, this ability enables students to analyze information, evaluate arguments, and draw conclusions based on valid evidence. The development of critical thinking skills is a primary focus in innovative learning models at various levels of education (Ennis, 2011; Fisher, 2009).

One approach that is rapidly developing and relevant to the context of multicultural education is Culturally Responsive Transformative Teaching (CRTT). This approach integrates two major concepts: culturally responsive pedagogy and transformative learning theory. Gay (2010) explains that culturally

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responsive learning places students' cultural backgrounds as the primary source of learning, while Mezirow (2000) emphasizes the importance of critical reflection to transform students' perspectives on their experiences. CRTT seeks to develop students' critical awareness of socio-cultural issues while fostering critical thinking skills rooted in local cultural values. In practice, CRTT can encourage students' critical thinking by: (1) identifying themselves (self-identification) as part of the learning process, (2) understanding local culture and background, (3) collaborating in knowledge construction, (4) critical reflection, and (5) transformative construction where students reapply their new understanding to the real world (Rahmawati et al., 2020). This model not only strengthens cognitive competence, but also supports the formation of character, cultural identity, and social awareness (Rahmawati et al., 2020; Gumilar & Isti, 2024).

Several studies have examined culturally responsive teaching (CRT), particularly in relation to improving critical thinking skills. However, research explicitly mentioning and implementing Culturally Responsive Transformative Teaching (CRTT) remains relatively limited. Most CRT research focuses on improving learning outcomes or critical thinking skills without exploring the elements of cultural transformation and critical reflection that are characteristic of CRTT (Safirah et al., 2024; Marlin & Idris, 2024; Kurniawan et al., 2024; Hermawan et al., 2025). Previous research has shown that implementing CRTT can increase student participation, ownership of the learning process, and critical and reflective thinking skills (Villegas & Lucas, 2002; Ladson-Billings, 2014; Hytten, 2015).

To date, research on CRTT remains scattered across various contexts and fields of study without a comprehensive synthesis. Several studies have focused on developing students' soft skills or cultural identity through CRTT in chemistry learning (Alamsyah et al., 2025; Bostwick et al., 2025). A mapping study or systematic literature review is needed to identify trends, focuses, methods, and research findings on CRTT in relation to the development of critical thinking skills. This article aims to map research trends on the Culturally Responsive Transformative Teaching (CRTT) learning model, which focuses on efforts to improve students' critical thinking skills. This study is expected to provide theoretical contributions in the form of understanding the direction of CRTT research development and practical contributions to the development of learning models relevant to the socio-cultural context of students in Indonesia.

Method

This research method is descriptive and analytical, which aims to understand and describe research trends in the development of learning media with the Culturally Responsive Transformative Teaching (CRTT) model to improve critical thinking skills. The data used in this study were obtained from information sources indexed by Google Scholar using analysis tools such as Publish or Perish and Dimension.ai. To conduct a search in Google Scholar, keywords related to research trends on learning media with the Culturally Responsive Transformative Teaching (CRTT) model to improve critical thinking skills were entered (Khairani et al., 2025; Novela et al., 2025; Ahmad et al., 2024). In this study, an analysis was conducted on 200 documents that have been indexed by Google Scholar between 2016 and 2025. The Google Scholar database was chosen as a place to search for documents because Google Scholar applies consistent standards in selecting documents to be included in its index, and Google Scholar displays more documents than other leading databases, especially research in the field of education. To filter the data collected through Publish or Perish, researchers used the Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) guidelines.

Result and Discussion

This study aims to describe research trends on the development of learning media using the Culturally Responsive Transformative Teaching (CRTT) model to improve critical thinking skills, conducted from 2016 to 2025. The research documents were taken from 2016 to 2025. Figure 1, presented above, describes research trends on the development of learning media using the Culturally Responsive Transformative Teaching (CRTT) model to improve critical thinking skills.

This figure displays a graph depicting the number of publications related to the topic of CRTT and critical thinking from 2016 to 2025. The graph shows fluctuations in the number of studies each year but reveals a general pattern pointing to increasing academic interest in CRTT in developing critical thinking skills. In 2016, the number of publications was relatively low, then increased sharply in 2017, reaching an initial peak of around 35 publications. After that, there was a significant decline in 2018 and a low point in 2019. However, the trend rebounded in 2020, although there was a slight decline in 2021. From 2022 to 2023, the graph shows a steady increase, then reaches its second-highest peak in 2024 with approximately 35 publications. Projections for 2025 show a slight decline

but remain well above the initial publication figures of previous years.

Overall, this graph shows that research on the CRTT learning model and critical thinking skills has experienced consistent growth over the past decade. This indicates that this topic is gaining increasing attention as a relevant pedagogical approach, particularly in multicultural education and culturally based learning. This is in line with research (Mujriati & Astuti, 2025), which states that research on CRTT is increasing and distributed across various scientific fields, indicating growing academic attention to this model as a multicultural pedagogical strategy. From a pedagogical perspective, research (Prasad, 2025) also highlights the challenges in implementing critical thinking in culturally diverse classrooms, especially in the context of STEAM learning, reinforcing the relevance of CRTT as a framework capable of bridging cultural diversity and the development of critical thinking skills.

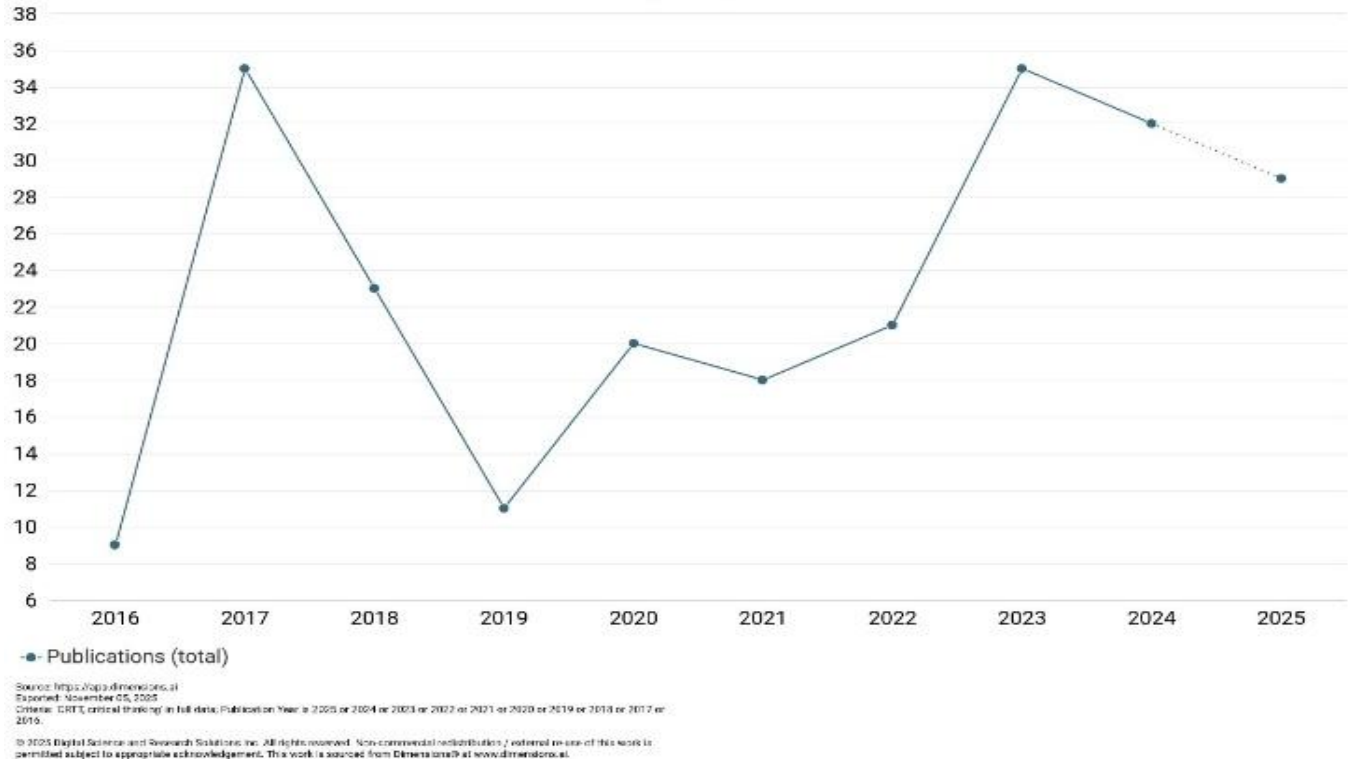

Figure 1. Research trends on learning media using the Culturally Responsive Transformative Teaching (CRTT) model to improve critical thinking skills.

Table 1. Research trends on learning media using the Culturally Responsive Transformative Teaching (CRTT) model to improve critical thinking skills Research Based on Publication Type

Publication Type	Publications
Article	107
Edited Book	60
Chapter	29
Monograph	29
Proceeding	6
Preprint	2

Publication data indicates that research trends related to learning media using the Culturally Responsive Transformative Teaching (CRTT) model to enhance critical thinking skills have developed through various scientific channels. The dominance of articles (107 publications) confirms that CRTT is a topic that is increasingly being researched, both through empirical studies and theoretical analysis, making it an important part of the discourse on multicultural education and critical pedagogy. Furthermore, the presence of 60 edited books indicates that CRTT is also developing at the conceptual level and is compiled in a collection of expert writings, reflecting the strengthening of theoretical foundations and diverse perspectives in studying culturally responsive education. Publications in the form of book chapters and monographs, totaling 29 each, indicate the deepening of subtopics and the presentation of comprehensive studies on the implementation of CRTT, including the design of culture-based learning media and its role in facilitating critical thinking skills. Meanwhile, the relatively small number of proceedings (6 publications) indicates that CRTT research is more directed towards formal

publication channels than conference presentations, although it still indicates exploratory interest in academic forums. Two preprints highlight the emergence of cutting-edge research that is currently undergoing formal publication, demonstrating that the CRTT discourse continues to evolve in line with current dynamics in education. Overall, this distribution reflects that CRTT research has reached a level of academic maturity and continues to develop both theoretically and empirically, while strengthening its relevance in developing learning media capable of fostering critical thinking skills in multicultural contexts (Rahmawati et al., 2020; Khairani et al., 2025).

Table 2. Top 10 Sources Title Research trends on learning media with the Culturally Responsive Transformative Teaching (CRTT) model to improve critical thinking skills

Name	Publications	Citations	Citations Mean
Jurnal Penelitian Pendidikan IPA	11	58	5.27
Advances in Social Science, Education and Humanities Research	5	8	1.60
AIP Conference Proceedings	4	8	2.00
Advances in Intelligent Systems and Computing	4	35	8.75
Springer International Handbooks of Education	4	3	0.75
Lecture Notes in Computer Science	3	11	3.67
Terminology and Lexicography Research and Practice	3	29	9.67
Lecture Notes on Data Engineering and Communications Technologies	3	23	7.67
INKUIRI Jurnal Pendidikan IPA	3	5	1.67
Journal of Youth and Adolescence	2	82	41.00

Based on the distribution of publication outlets, it appears that research on Culturally Responsive Transformative Teaching (CRTT) and critical thinking skills has spread across various reputable journals and proceedings, indicating academic growth and the strengthening of CRTT's position as an established field of study. Highly published and citation-rated journals such as the Journal of Youth and Adolescence, the Journal of Science Education Research, and several international proceedings indexed by Springer and AIP demonstrate that the topic of CRTT attracts the attention of not only local researchers but also the global scientific community. The high citation rate in certain outlets, such as the Journal of Youth and Adolescence, with an average of 41 citations per article, indicates that studies on cultural responsiveness, transformative pedagogy, and the development of critical thinking skills have received widespread resonance in multicultural education discourse (Gay, 2018; Ladson-Billings, 2021). Furthermore, the presence of publications in technology proceedings such as Lecture Notes in Computer Science and Lecture Notes on Data Engineering and Communications Technologies demonstrates that CRTT integration is also evolving toward digital media and technology-based learning innovations (Rahmawati et al., 2020). Overall, this distribution pattern demonstrates that CRTT research has developed both theoretically and empirically and further emphasizes its relevance in developing learning media capable of fostering critical thinking skills in multicultural contexts.

Table 3. Top 10 Citations on Trends in Learning Media Research with the Culturally Responsive Transformative Teaching (CRTT) Model to Improve Critical Thinking Skills Research Year 2016-2025

Cites/year	Year	Author	Title
34.00	2024	Tiera Chante Tanksley	"We'rechangingthesystemwith this one": Black students using critical race algorithmic literacies to subvert and survive AI-mediated racism in school
29.00	2023	Yuli Rahmawati, Alin Mardiah, Elisabeth Taylor, Peter Charles Taylor, Achmad Ridwan	Chemistry Learning through Culturally Responsive Transformative Teaching (CRTT): Educating Indonesian High School Students for Cultural Sustainability
18.00	2024	Dwiarini Yuendita, Dina Dina	Development of Chemical Literacy Book on Local Wisdom of Madura Culture Based on Augmented Reality (AR)
16.00	2023	Heni Yunilda Hasibuan, Encep Syarifudin, Suherman, Cecep Anwar Hadi Firdos Santosa	Ethnoscience as the Policy Implementation of Kurikulum Merdeka in Science Learning: A Systematic Literature Review

Cites/year	Year	Author	Title
14.80	2020	Yuli Rahmawati1, Achmad Ridwan, Sylvia Faustine, Pramita Cucu Mawarni	Pengembangan soft skills siswa melalui penerapan culturally responsive transformative teaching (CRTT) dalam pembelajaran kimia
11.50	2021	Hikmawati, I Wayan Suastra, Ketut Suma, A.A. Istri Agung Rai Sudiatmika, Rohani	The Effect of Problem-Based Learning Integrated Local Wisdom on Student Hots and Scientific Attitude
10.50	2023	Yuyun Elizabeth Patras, Ai Juliani, Nina Nurhasanah, Arifin Maksum, Rais Hidayat	A Review of Culture-Based Learning at Primary Level in Indonesia
10.44	2016	RF Callaway	A correlational study of teacher efficacy and culturally responsive teaching techniques in a southeastern urban school district
10.00	2023	Laras Kusuma Wardani, Bakti Mulyani, Sri Retno Dwi Ariani, Sri Yamtinah, Mohammad Masykuri, Maria Ulfa1, Ari Syahidul Shidiq	The Effect of an Ethnochemistry-based Culturally Responsive Teaching Approach to Improve Cognitive Learning Outcomes on Green Chemistry Material in High School
7.29	2018	YJ Nutti	Decolonizing Indigenous teaching: Renewing actions through a Critical Utopian Action Research framework

Data shows that research on CRTT and culture-based learning has a strong scientific impact, reflected in the high average annual citations of several publications. The highest-cited article, such as that by Tanksley (2024), demonstrates that critical literacy regarding algorithms and technological bias is a relevant emerging issue in the context of cultural justice. While not directly addressing CRTT, this research expands the scope of culturally responsive pedagogy to include AI, critical literacy, and the struggles of Black students, thus enriching the theoretical foundations of critical culture-based learning. Research by Rahmawati et al. (2023) holds a prominent position with high citations because it explicitly examines chemistry learning through CRTT, demonstrating that this model can foster cultural sustainability while enhancing students' critical and reflective thinking skills. This study strengthens the evidence that CRTT is effective when applied to learning media based on local wisdom and science.

Other studies, such as Yuendita & Dina (2024) and Hasibuan et al. (2023), indicate that innovative media such as Augmented Reality and ethnoscience are beginning to be integrated with culture-based approaches. This collaboration between digital learning and culture reinforces CRTT's position as an approach that is both adaptive to technological developments and relevant for developing higher-order thinking skills. Classical research, such as that by Rahmawati et al. (2020), has also been highly influential, outlining the role of CRTT in developing students' soft skills through chemistry learning. This publication has become a fundamental reference in the CRTT literature in Indonesia. Meanwhile, a study by Callaway (2016) provided the initial foundation for the relationship between teacher efficacy and culturally responsive teaching practices, which then became the basis for developing CRTT implementation in the following decade.

Furthermore, research by Wardani et al. (2023) and Hasibuan et al. (2023) shows that the integration of ethnoscience and local culture into the curriculum is a strong trend that aligns with CRTT principles and has been proven to improve cognitive learning outcomes and critical thinking skills. In a global context, Nutti's (2018) article on decolonizing Indigenous teaching emphasizes the urgency of a culturally responsive learning approach as an epistemological strategy to empower communities and strengthen cultural identity in education.

Overall, the ten most highly cited publications demonstrate that research on CRTT is not only developing quantitatively but also making significant contributions to the theory and practice of multicultural education. The high number of citations demonstrates that CRTT is seen as a relevant, innovative, and impactful approach to developing learning media capable of strengthening students' critical thinking skills in culturally diverse environments.

Table 4. Keywords in research trends on learning media with the Culturally Responsive Transformative Teaching (CRTT) model to improve critical thinking skills Research Years 2016-2025

Terms	Occurrences	Relevance
Curricula	5	4.52
Preparation	3	3.87
Way	4	1.91
Century Skill	3	1.89
CRTT Metric	4	1.86
STEM	3	1.82
Meta Analysis	3	1.76
Course	4	1.75
Action	5	1.59
Lesson Study	3	1.57

Keyword analysis shows that research trends on learning media using the Culturally Responsive Transformative Teaching (CRTT) model are increasingly focused on strengthening curriculum aspects, teaching preparation, and course design. The dominance of the terms "curricula" and "preparation" demonstrates that CRTT implementation requires curriculum reconstruction that integrates students' cultural contexts and teachers' readiness to design transformative learning experiences. The emphasis on "Century Skills" indicates that CRTT is seen as relevant in developing 21st-century skills, particularly critical thinking, creativity, and cultural reflection, as confirmed by a meta-analysis showing that contextual and reflective learning approaches significantly contribute to students' critical thinking skills (Abrami et al., 2015). The emergence of the term "CRTT Metric" indicates a growing need for evaluation instruments that can more accurately measure the effectiveness of CRTT implementation, while the emergence of the keyword "STEM" reflects a strong trend toward integrating science, technology, and culture through ethnoscience approaches and local culture-based transformative learning (Handayani et al., 2022). Furthermore, the terms action and lesson study indicate that much CRTT research is developed through classroom action research and teacher collaboration to improve cultural practices in learning, as reflected in research on teacher competency development in culture-based learning (Rahmawati et al., 2021). Overall, this keyword pattern confirms that CRTT research has moved from the basic implementation stage to strengthening methodologies, instruments, and curriculum integration as a systematic effort to improve students' critical thinking skills in multicultural contexts (Rahmawati et al., 2023)

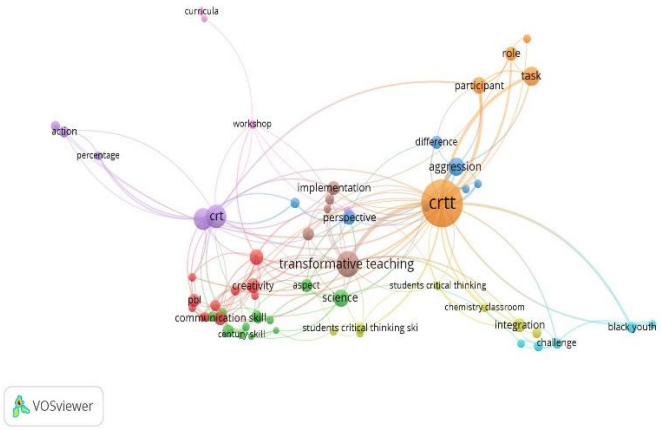

Figure 2. Network visualization in learning media research using the Culturally Responsive Transformative Teaching (CRTT) model to improve critical thinking skills

Figure 2 shows the results of a bibliometric mapping visualization using VOSviewer, showing the relationships between keywords in research related to Culturally Responsive Transformative Teaching (CRTT). Several main clusters are represented by different colors. The orange cluster centers on the word "crtt," which is closely related to concepts such as transformative teaching, participant, task, and aggression. The purple cluster shows the relationship between "crt" and terms such as action, curriculum, and workshop, indicating the research's focus on the development and implementation of culturally responsive curricula. The red and green clusters highlight the relationship between CRTT and the context of science education, project-based learning (PBL), and 21st-century skills such as creativity, communication skills, and critical thinking. For example, research (Susilowati et al., 2023) shows that the PBL model integrated with CRT is highly effective in improving students' critical thinking skills through classroom action research. Likewise, the application of CRT (not specifically CRTT) has been shown to enhance students' creativity in elementary mathematics lessons by taking into account their cultural backgrounds (Nurramadhani et al., 2022). Meanwhile, the light blue cluster connects CRTT to social issues such as integration, challenge, and Black youth. Overall, this map shows that CRTT research is developing in various directions, including pedagogical aspects, curriculum implementation, and its relevance to developing students' critical thinking skills and social justice in education.

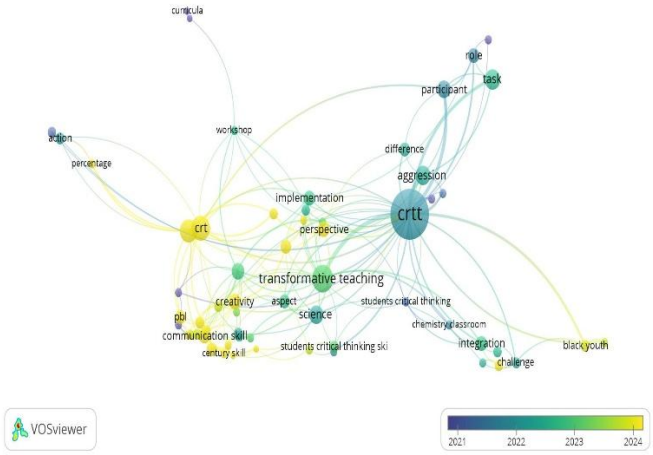

Figure 3. Overlay visualization in learning media research using the Culturally Responsive Transformative Teaching (CRTT) model to improve critical thinking skills

The image above is a visualization of a network overlay resulting from a bibliometric analysis using VOSviewer, depicting the temporal development of keywords in research related to Culturally Responsive Transformative Teaching (CRTT). The colors on the map indicate the average year of keyword emergence, with blue representing earlier research (around 2021) and

yellow indicating more recent research (around 2024). Keywords such as crtt, transformative teaching, and science emerged as central links, indicating that this topic has been a continuing focus in recent research. Terms such as communication skills, creativity, and century skills (in yellow) indicate the latest research direction linking CRTT to the development of 21st-century skills and students' critical thinking. Meanwhile, keywords such as action, curriculum, and workshop (in blue) illustrate earlier themes that emphasize conceptual approaches and training. Overall, this map demonstrates that the trend in CRTT research has evolved from conceptual studies to contextual implementation in science learning and strengthening students' critical thinking skills.

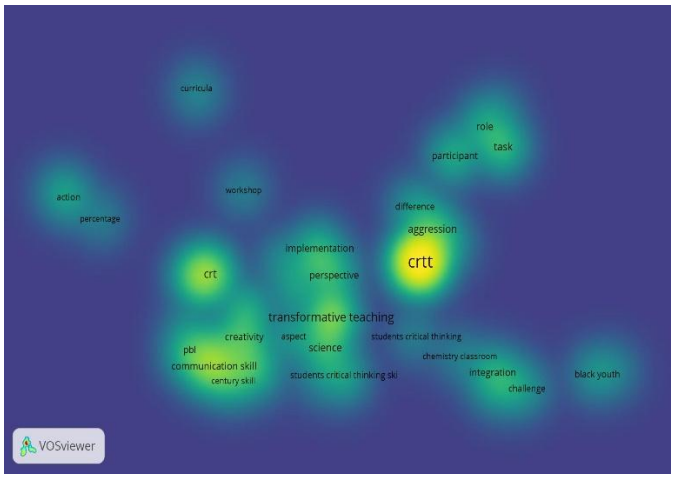

Figure 4. Density visualization in learning media research using the Culturally Responsive Transformative Teaching (CRTT) model to improve critical thinking skills

The image above is a density visualization map generated by VOSviewer, illustrating the intensity of occurrence and relationships between keywords in research on Culturally Responsive Transformative Teaching (CRTT). Yellow indicates areas with high density or the most frequently appearing topics, while green to blue indicate lower frequency of occurrence. The keywords "crtt," "crt," and "transformative teaching" are the most dense, indicating that they are the primary focus and central linkages in the research. Supporting keywords such as science, communication skills, creativity, and student critical thinking appear around them, indicating that CRTT is widely studied in the context of developing 21st-century skills and science learning. For example, research by Arifin et al. (2024) developed a socio-scientific issues-based learning tool within the CRTT framework and found that this learning medium is practical and valid for improving students' scientific literacy and critical thinking skills contextually with contemporary social issues. Areas with medium density such as integration, challenge, and black youth indicate topics that are beginning to develop in the context of social and educational justice. Overall, this map shows that CRTT's research focus is centered on developing transformative learning models that are culturally responsive and oriented towards improving students' critical thinking skills.

Conclusion

The research results show that the research trend on Culturally Responsive Transformative Teaching (CRTT) in the context of improving critical thinking skills continued to experience significant growth between 2016 and 2025. Bibliometric analysis reveals that research related to CRTT has grown not only in the number of publications, but also in theoretical depth and variety of application contexts. The predominance of scientific articles in publications demonstrates that CRTT has become a significant focus in the discourse on multicultural education and 21st-century learning. Findings from keyword analysis, network analysis, and temporal visualization indicate that CRTT research has shifted from conceptual studies to more practical implementations, including integration with STEM, ethnoscience, digital media, socio-scientific issues, and the development of CRTT effectiveness evaluation instruments.

Through a synthesis of various publications, it is clear that CRTT contributes significantly to improving students' critical thinking skills, scientific literacy, creativity, and cultural awareness. This model encourages transformative learning through critical reflection, collaboration, and the reinterpretation of student experiences based on local cultural values. Furthermore, CRTT has proven relevant in addressing the challenges of cultural diversity in the classroom, while simultaneously supporting the goals of the Independent Curriculum and multicultural education. Thus, this study emphasizes the importance of CRTT as a strategic pedagogical approach that needs to be continuously developed, both through curriculum improvement, strengthening teacher competencies, and developing innovative, culture-based learning media. Further studies are needed to strengthen the instruments for measuring CRTT's effectiveness and expand the study to other, more diverse educational contexts.

The main conclusions of the study may be presented in a short Conclusions section, which may stand alone or form a subsection of a Discussion or Results and Discussion section

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Conceptualization, methodology, formal analysis, investigation, resources, writing—original draft preparation, writing—review and editing, visualization R.A.A.

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