Improving Students' Science Literacy and Collaboration Skills Through Culturally Responsive Transformative Teaching Model with Podcasts and E-Assessment

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Abstract
This study was motivated by the low level of science literacy and collaboration skills among students. One effort to overcome this problem is to apply the Culturally Responsive Transformative Teaching (CRTT) model, which emphasizes active student involvement through the integration of cultural backgrounds and social interactions, supported by podcasts as a learning medium and e-assessment as a more effective evaluation tool. This study aims to analyze the effect of the CRTT model with podcasts and e-assessment on students' science literacy and collaboration skills. This study uses a quantitative approach with a quasi-experimental method and uses a pretest-posttest control group design. The sample consisted of 72 high school 11th grade students selected through cluster random sampling. Data were collected using science literacy tests and collaboration skill observations. Data analysis was performed using parametric statistical tests with hypothesis testing through MANOVA. The results of this study indicate a significant difference between students taught using the CRTT model assisted by podcasts and e-assessment and students not taught using this model and media. Applying the CRTT model with podcasts and e-assessment has been proven to improve students' science literacy and collaboration skills. The implications of this study indicate that the CRTT learning model, supported by digital media and e-assessment, can be an alternative strategy for teaching chemistry especially for reaction rate material.

1. Introduction

The rapid and unpredictable changes of the 21st century have affected various aspects of life, including education. Education plays a crucial role in fostering students' skills that enable them to adapt and respond effectively to changes that arise with the development of the times. Collaboration, critical thinking, communication, and creative thinking skills are skills that students must have in 21st century education to face the time (Sutrisna, 2021). In addition, science literacy skills are also one of the fundamental skills that students must master to face evolving global challenges (Aqilah et al., 2025; Tasquier et al., 2022). Science literacy is defined as the ability to understand and communicate scientific concepts and to apply scientific knowledge in problem solving. This ability supports informed decision making based on scientific considerations and awareness of personal and environmental contexts (Fadila et al., 2020; OECD, 2023).

Science literacy and chemistry learning have a direct relationship and application in daily life. Chemistry is one of the branches of natural science that has a close relationship with the phenomena of daily life, but many students view this subject as difficult and lacking in demand. These difficulties are mainly caused by chemical concepts at the submicroscopic level that cannot be observed directly. One of the chemical topics related to daily life is the rate of reaction. This material requires conceptual and contextual understanding to practice problem-solving skills (Fareza et al., 2024). Efforts to improve science literacy need to be accompanied by strengthening collaboration skills, considering that these two skills are intertwined in experiment-based science learning and problem-solving (Prayoga & Gading, 2023). Through collaborative activities such as discussions, assignments, exchange of ideas, and critical analysis of various viewpoints, students' scientific knowledge construction can develop more optimally through meaningful social interactions (Alfaeni et al., 2022; Oktaviani & Nur, 2022; Sihombing & Sihaloho, 2025).

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However, evidence from actual practice indicates that not all students demonstrate strong science literacy and collaboration skills. The 2022 PISA results recorded Indonesia's science literacy score of 383, a decrease of 13 points compared to 2018 and still below the OECD average of 476 points (Kemendikbudristek, 2023; OECD, 2023). This condition shows that the science literacy ability of Indonesian students in the context of international competition is still relatively low. In addition, several studies also show that students' collaboration skills are still relatively low. Most students still show a tendency to learn individually and emphasize the competitive aspect over cooperation (Firman et al., 2023; Rahmita & Yurnetti, 2025). The results of initial observations show that interaction and communication between students in the learning process are still limited, where students tend to discuss only with their classmates. This situation is affected by the way learning is implemented, which has not optimally facilitated collaborative activities. The low level of these two abilities can be caused by the application of a less innovative and collaborative learning model, which is only oriented towards memorization and repetition. This condition limits students' activeness in asking questions, communicating, and interacting during the learning process, and has not encouraged the formation of meaningful reading habits, so an appropriate learning design is needed. Therefore, the selection of learning models plays an important role in creating an active, meaningful, and contextual learning experience (Asri et al., 2024; Muliaman, 2021). Constructivist-based learning models can be used as a solution because they emphasize how individuals actively build their own knowledge through personal experiences and interactions with their environment. One of the constructivists learning models that effectively promotes students' literacy and collaboration skills is Culturally Responsive Transformative Teaching (CRTT).

The Culturally Responsive Transformative Teaching (CRTT) model builds upon the Culturally Responsive Teaching (CRT) approach. This model goes beyond merely focusing on knowledge transmission by fostering an inclusive and culturally relevant learning environment, while also encouraging students to actively engage in the learning process. The model also allows students to explore cultural diversity and understand their relationship to everyday life, as well as raise awareness of cultural shifts due to globalization (Rahmawati et al., 2019; Rasyada et al., 2025). In chemistry learning, this approach can be implemented through ethnoscience by linking local wisdom and community phenomena as a learning context (Widarti et al., 2025; Masayu, 2024). Based on the results of previous studies, it is shown that the CRTT model has the potential to improve cultural identity, understanding of chemical concepts, motivation, engagement, confidence, and courage to express opinions, including through the integration of traditional food-based ethnoscience articles such as peuyeum and mochi (Rahmawati et al., 2023; Rahmawati et al., 2020). In line with these findings, various studies report that culture-based learning not only enhances understanding of chemical concepts, but also fosters students' skills, soft skills, and science literacy because it is more contextual and meaningful (Wiradharma et al., 2021). The CRTT model demonstrates potential in enhancing students’ science literacy and collaboration skills through five stages of learning, namely self-identification, cultural understanding, collaboration, critical reflection, and transformative construction (Rahmawati et al 2020).

Meanwhile, life in the 21st century is accompanied by rapid technological advances and easier access to information for all groups. Therefore, the learning media used in the implementation of CRTT also needs to be adjusted to the times. One of the technologies that can be used is podcasts which are considered to be able to help students understand the material in a more interesting and contextual way and support learning flexibility because students can access the material anytime and anywhere through digital devices (Abdusshomad, 2025; Sari & Tuerah, 2023). As a complement to learning media that is adaptive to digital technology, assessment instruments are also needed that support the effectiveness and efficiency of the learning process. One form of assessment that is in accordance with current technological developments is e-assessment or electronic-based assessment, which not only makes it easier for teachers to assess, but also improves the quality of feedback for students through a systematic digital analysis. The use of e-assessment allows teachers to track the progress of student performance and analyze various assessment activities on an ongoing basis, so that misconceptions can be identified and addressed early (Ashari et al., 2023; Heil & Ifenthaler, 2023). In this study, e-assessment is integrated with the ethnoscience context of reaction rate material and presented in the form of contextual discourse that encourages students to analyze information in depth.

Although the CRTT learning model has been widely studied and proven effective in connecting learning to students’ cultural contexts, most research has focused on the model’s application in general classroom settings without integrating digital learning media. The use of podcast-based learning in CRTT remains limited, as does the alignment of CRTT with e-assessment as a technology-based evaluation tool. Furthermore, the integration of CRTT, podcasts, and e-assessment in chemistry education has not been extensively explored, indicating a research gap in the development of innovative, technology-supported culturally responsive learning.

This study aims to analyze the effect of implementing the CRTT learning model supported by podcast media and e-assessment on students’ science literacy and collaboration skills in reaction rate topics. This research is significant as constructivist approaches have been shown to effectively enhance students’ science literacy and collaboration skills, particularly when integrated with podcast media and e-assessment as learning and assessment tools that facilitate these improvements. This research is expected to contribute to the development of chemistry learning models and media.

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2. Method

This study employed a quantitative approach using a quasi-experimental method with a pretest-posttest control group design. The experimental group was given treatment using the CRTT learning model with podcast media, while the control group applied the discovery learning model with PowerPoint (PPT) media.

The population of this study consisted of 252 grade XI phase F students from one of the State High Schools in Karanganyar, Indonesia for the 2025/2026 school year who received chemistry materials. From the population of seven classes, two classes were taken to be used as research samples. The study employed a cluster random sampling technique. Before choosing a class, a test is carried out on the homogeneity of the population. Then two classes were randomly selected to be assigned as experimental and control groups. The sample comprised 36 students in the experimental group and 36 students in the control group.

Data collection in this study was carried out through e-assessment using test and non-test instruments in the form of observation methods. The e-assessment in this study uses CemyTest, which is an automated assessment platform designed to assist chemistry teachers in evaluating students' answers accurately and efficiently. The test method is in the form of 15 pretest questions and 15 posttest questions, both in the form of multiple choice. Test questions are used to measure students' science literacy abilities made based on indicators from Shwartz, Ben-Zvi, and Hofstein (2006) which includes aspects of content, context, and Higher Order Learning Skills (HOLS) as listed in Table 1. Meanwhile, observations were carried out to assess students' collaboration skills with the help of two observers. Collaboration indicators based on Wiyarsi et al. (2020) include communication skills, interaction skills, commitment skills, and responsible skills as listed in Table 2. Before being applied in the study, the test and non-test instruments were validated by two experts and analyzed using the Gregory formula.

Table 1. Science Literacy Indicators

Indicators	Sub-Indicators	Number of Question
Chemical Content Knowledge	Explain the dynamics of chemical processes and reactions based on chemical concepts	5
Chemistry in Context	Use chemical understanding to interpret everyday life phenomena and cultural contexts	6
Higher Order Learning Skills (HOLS)	Analyze problems based on data and draw conclusions based on chemical concepts	4

Table 2. Collaboration Indicators

Aspect	Sub-Indicators	Number of Question
Communication Skills	Listening and Speaking	6
Interaction Skills	Participate and Contribute	5
Committed Skills	Motivation and Acceptance	5
Responsible Skills	Responsibility	4

The data on science literacy and collaboration skills obtained were then processed using SPSS 27 software. The hypothesis was tested using MANOVA which began with a prerequisite analysis, namely the normality, homogeneity, and homogeneity test of the variance-covariance matrix. To see the magnitude of the increase in science literacy skills before and after the learning model is applied, the N-Gain Score is calculated using the following formula.

$$N - Gain = \frac{Sposttest - Spretest}{Smaksimal - Spretest} \quad (1)$$

The results of the N-Gain calculation were interpreted based on the classification criteria proposed by Hake (1998) as follows: high ($N - gain > 0,70$), medium ($0,30 \leq N - gain \leq 0,70$), low ($N - gain < 0,30$).

3. Results and Discussion

3.1. Result

3.1.1. Science Literacy Data and N-Gain Scores

The following are the results of testing pretest-posttest scores of science literacy ability and N-Gain scores to see an improvement in science literacy skills after being given treatment. Based on the results of the science literacy test in the experimental and control classes in the pretest-posttest, Table 3 can be seen. The average

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value of science literacy ability in the experimental class before the pretest was 34.44 and after the treatment (posttest) was 80.55. Meanwhile, for the control class, the average value of science literacy ability before treatment (pretest) was 36.85 and after treatment (posttest) was 70.93. Based on posttest scores, the experimental class tended to have a higher average than the control class. This is reinforced by the results of the N-Gain calculation or the improvement of students' science literacy skills in the control and experimental classes as shown in the following Table 4.

Table 3. Description of Science Literacy Test Score Data

Test	Class	Minimum	Maximum	Mean
Pretest	Experimental	13	60	34.44
	Controls	13	60	36.85
Posttest	Experimental	47	100	80.55
	Controls	27	100	70.93

Table 4. Results of N-Gain Value

Class	Minimum	Maximum	Mean	Criteria
Experimental	0.11	1.00	0.71	Height
Controls	0.15	1.00	0.56	Medium

Based on the results of the N-Gain calculation, it is known that the N-Gain score of the experimental class is superior to the control class, which is 0.71 at the high criteria. Meanwhile, the N-Gain score in the control class was obtained at 0.56 in the medium criteria. This shows that the improvement of science literacy skills in the experimental class is better than the control class.

3.1.2. Collaboration Skill Data

Collaboration skills scores were obtained through assessments from observers during learning discussions with 20 statements based on collaboration indicators. Tabel 5 are the results of the students' collaboration skills assessment.

Table 5. Description of Collaboration Skills Data

Class	Minimum	Maximum	Mean
Experimental	52	75	64.94
Controls	51	73	61.22

Based on collaboration skills data on Table 5, the average collaboration score in the experimental class was obtained of 64.94 while the control class obtained an average of 61.22. The results suggest that the collaboration score of the experimental class tends to have a higher average than that of the control class.

3.1.3. Analyst Prerequisite Test

Hypothesis testing using inferential statistics with MANOVA tests. Before conducting hypothesis testing, analysis prerequisites were carried out including normality, variance homogeneity, and variance-covariance matrix homogeneity.

Table 6. Recapitulation of Normality Test Results

Variable	Class	N	Significance	Results	Conclusion
Science Literacy	Experimental	36	0.247	H_0 accepted	Normal
	Controls	36	0.054	H_0 accepted	Normal
Collaboration Skills	Experimental	36	0.343	H_0 accepted	Normal
	Controls	36	0.541	H_0 accepted	Normal

Data normality was assessed using the Shapiro–Wilk test, as it is appropriate for small sample sizes. As shown in Table 6, the experimental and control groups obtained Sig. > 0.05, indicating that the data on science literacy and collaboration skills are normally distributed. Following this, a homogeneity test was performed, the results of which are shown in Table 7.

Table 7. Recapitulation of Variance Homogeneity Test Results

Variable		Significance	Results	Conclusion
Science Literacy	based on mean	0.393	H_0 accepted	Homogeneous
Collaboration Skills	based on mean	0.529	H_0 accepted	Homogeneous

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The homogeneity test results show significance values of 0.393 for science literacy and 0.529 for collaboration skills, both indicating Sig. > 0.05, which confirms homogeneous variances between the experimental and control groups. Furthermore, the Variance-Covariance Matrix Homogeneity test using Box's M statistic yields a significance value of 0.074 (Sig. > 0.05), indicating that the variance-covariance matrices across groups are homogeneous.

3.1.4. Hypothesis Test

Since the data satisfy the assumptions of normality and homogeneity, hypothesis testing was subsequently conducted using MANOVA.

Table 8. Hypothesis Test Results with MANOVA

Test Parameters		Significance	Results	Conclusion
Multivariate Test	Pillai's Trace	0.000	H_0 rejected	There is a difference
	Wilks'Lambda	0.000	H_0 rejected	There is a difference
	Hotelling's Trace	0.000	H_0 rejected	There is a difference
	Roy's Largest Root	0.000	H_0 rejected	There is a difference
Test of Between Subject Effect	Science Literacy	0.000	H_0 rejected	There is a difference
	Collaboration Skills	0.002	H_0 rejected	There is a difference

The results of the hypothesis test in Table 8, Multivariate Test produced a value of Sig. 0.000. This indicates that H_0 was rejected because the Sig. < 0.05 with the conclusion that there was an influence of the application of the CRTT learning model assisted by podcasts and e-assessments on students' science literacy and collaboration skills simultaneously. The effect of independent variables on each dependent variable can be seen in the results of the Between-Subject Effect Test. The significance value in science literacy and collaboration skills is the same, which is 0.000 where the two values are Sig. < 0.05. This indicates that H_0 is rejected, leading to the conclusion that the implementation of the podcast-assisted CRTT learning model and e-assessment has a significant effect on students' science literacy, as well as on their collaboration skills.

3.2. Discussion

The CRTT model is a learning model that has the potential to improve students' chemical knowledge, soft skills, identity, and character (Rahmawati et al., 2020). This model also encourages students to explore the relationship between chemistry curriculum content, local cultural practices, and everyday chemical phenomena. The CRTT learning model is developed based on the Culturally Responsive Teaching (CRT) approach in the framework of transformative learning, which consists of five stages, namely self-identification, cultural understanding, collaboration, critical reflection, and transformative construction. In previous studies, this learning model was successfully applied by investigating the effects of CRTT learning in the context of local culture such as traditional *peuyeum* food, *moci* Sukabumi, and Sundanese regional traditions. The results of the study confirm the effectiveness of CRTT learning, providing a deeper conceptual understanding, cultural identity, and curiosity (Rahmawati et al., 2020; Rahmawati et al., 2023). Learning that integrates understanding and knowledge of local cultural dimensions (ethnoscience) offers students opportunities to actively engage in scientific activities and gain direct learning experiences within the context of local wisdom. The concepts that students receive will be easy to remember and better understand the material being studied. In addition, culture-based learning models are important for fostering students' social-emotional well-being, which includes cultural identity, self-efficacy, and social relationships, which ultimately positively impacts students' cultural skills, awareness, literacy, and learning outcomes (Rasyada et al., 2025). In this study, CRTT was combined with ethnoscience content in the form of the tradition of betel chewing, fermented sticky rice, and traditional drinks of ginger tea which were packaged in contextual learning. The effectiveness of learning based on local culture provides better science literacy skills through aspects of conceptual understanding, active engagement, and critical thinking, as the learning process becomes more meaningful for students (Pratama et al., 2023; Rozi et al., 2025).

Based on Table 3, the implementation of the CRTT model supported by podcast media and e-assessment positively contributes to the enhancement of students' science literacy in reaction rate topics. This improvement is reflected in the experimental group's mean pretest score, which increased from 34.44 to 80.55 in the posttest. Furthermore, the N-Gain data presented in Table 4 indicate that the experimental group achieved a high level of improvement (0.71), whereas the control group showed a moderate increase (0.56). These findings are supported by the results of the Test of Between-Subjects Effects using MANOVA, which yielded a significance value of 0.000 (< 0.05), thereby leading to the rejection of the null hypothesis.

This result confirms that there is a significant difference in science literacy between the experimental and control groups. In addition, the Test of Between-Subjects Effects for collaboration skills also revealed a significant effect of the podcast-assisted CRTT model and e-assessment, as indicated by a significance value of 0.002 (< 0.05). Consistent with these results, Table 5 shows that the experimental group obtained a higher

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average collaboration score (64.94) compared to the control group (61.22). These findings indicate that CRTT learning designs systematically encourage meaningful social interaction through group discussions, exchange of ideas, and collaborative problem-solving. This result is consistent with previous studies, which show that the integration of local culture-based content in learning opens up space for students to share perspectives and experiences, thus strengthening communication skills, cooperation, and shared responsibility (Oktaviani et al., 2025; Ridwan, 2025).

In this study, the CRTT learning model in the experimental classroom was superior to the Discovery Learning model in the control class. Discovery learning is more universal and emphasizes direct exploration and student independence. However, this method does not explicitly integrate learning processes that emphasize the value of diversity. In contrast, CRTT not only emphasizes knowledge transfer but also the strengthening of students' cultural identity, so that it can increase students' emotional and intellectual engagement (Rasyada et al., 2025). Although the control class and the experimental class had the same learning objectives, the main difference lay in the models and media used, namely CRTT assisted by podcast media in the experimental class and discovery learning with PowerPoint media only in the control class. These differences in treatment affect students' science literacy and collaboration skills. In the experimental class, learning is carried out based on the CRTT syntax which has five stages through the Student Worksheet.

In the first stage (self-identification), students work on pretest questions with ethnoscience content to identify students' initial knowledge. The second stage (cultural understanding) emphasizes science literacy indicators in the form of knowledge of chemical and chemical content in context, which helps students understand the concept of reaction rate, its factors, and reaction order through local cultural phenomena that are integrated in ethno-chemical texts on student worksheets and culture-based podcast media. Podcast media acts as a flipped classroom tool that is given 1-2 days before learning, so that students have initial provisions and the learning process in the classroom is more optimal than control classes that receive material directly during learning. The integration of ethno-chemical texts also enriches students' insights into local culture and chemical concepts, making learning more meaningful. This approach encourages increased active involvement of students in building knowledge through contextual experiences (Rahmawati et al., 2023).

In the third stage of CRTT learning, which is collaboration, students work in groups to analyze ethno-chemical texts and discuss chemical concepts from various cultural perspectives. This activity contributes to the development of science literacy indicators in the aspect of Higher Order Learning Skills (HOLS), especially the ability to access information, analyze scientific problems, and communicate the results of discussions. At this stage, the aspect of collaboration skills is strongly emphasized where students solve culture-based problems presented in the LKPD through small group work. The process encourages students to actively exchange understandings and perspectives, so that social interaction and participation in group discussions increases. The integration of local cultural contexts, such as the tradition of betel chewing, making fermented sticky rice, and ginger tea, makes the learning process more contextual and encourages a two-way dialogue between teachers and students that links academic concepts with real experiences.

Collaboration at this stage is based on social constructivism. The goal is to foster students' appreciation of cooperation and promote acceptance of cultural differences and other differences (Rahmawati et al., 2023; Tamani et al., 2025)). The fourth stage (critical reflection) strengthens the HOLS aspect of science literacy through the discussion of chemical issues relevant to culture and daily life, so that students are able to reflect on the application of chemistry concepts and evaluate various viewpoints objectively. At this stage, the collaboration aspect can also be fulfilled. Furthermore, in the fifth stage (transformative construction), students integrate science literacy indicators that include content, context, and HOLS by writing the results of group discussions as a construct of ethno-chemistry based conceptual understanding. At this stage, students construct their understanding and engage in critical reflection on their values through the CRTT learning experience.

Following the learning activities, students are given posttest questions to measure the improvement of science literacy in the context of culture and daily life. In this study, both pretest and posttest were conducted using e-assessment as part of the learning evaluation strategy. Through e-assessment, students get direct feedback on their learning outcomes, especially on material that has not been optimally understood. This feedback is the basis for students to reflect and improve their understanding independently. In addition, e-assessments allow teachers to identify students' learning strengths and weaknesses more accurately and efficiently. This information is used as a basis for evaluating and improving further learning. This is consistent with previous research showing that the application of e-assessment not only functions as an assessment tool, but also as a means of learning that supports the continuous improvement of student understanding (Ashari et al., 2023; Pusa & Dinçer, 2025).

The integration of podcast media complements the learning system developed in this study because it is in line with the characteristics of today's students who are familiar with digital technology. The application of the podcast-mediated CRTT learning model integrates culture in students' daily lives with scientific knowledge in greater depth. Through this learning, students are instilled with the habit of thinking scientifically as well as

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gaining meaningful learning experiences. The incorporation of elements of local culture with learning technology creates a 21st-century learning pattern that is adaptive to global challenges without neglecting local values (Fatihatussa'adah et al., 2024; Salsabiila et al., 2024). This approach encourages students to develop critical thinking skills in understanding chemical concepts and relating them to the context of daily life, while increasing cultural insight and technological literacy.

The findings of this study show that the integration of local culture through podcast media is able to improve students' understanding of chemistry which is reflected in improving science literacy, as well as developing collaboration skills through discussion activities and group work. The findings of this study strengthen previous research indicating that the use of podcasts in learning positively influences students' interest, learning motivation, and conceptual understanding, as students are encouraged to independently construct knowledge, deepen understanding, and foster collaboration (Sari & Tuerah, 2023; Widarti et al., 2024).

3.3. Implications

The application of the Culturally Responsive Transformative Teaching (CRTT) model encourages more active student involvement in the learning process through stages that are oriented to the student's experience and cultural context. This engagement is evident during group discussion activities, when students exchange ideas, express opinions, and build knowledge collaboratively based on their initial understanding. This process allows for the construction of knowledge in a meaningful way, not just passive receipt of information. The implications of these findings suggest that the use of the CRTT model supported by podcasts and e-assessment positively influences the development of students' science literacy and collaboration skills. The higher achievement observed in the experimental group indicates that the integration of instructional models and learning media encourages students to actively construct their understanding of chemistry concepts within contexts that are relevant to their experiences and cultural backgrounds. Moreover, integrating local wisdom into the learning process motivates students to further deepen their understanding, making the learning experience more meaningful (Safitri et al., 2024). Overall, the results of this study demonstrate that the CRTT model assisted by podcast media represents an effective form of instructional innovation, consistent with Yamtinah et al. (2023), who emphasize that teaching methods and learning media are essential components of the educational curriculum.

3.4. Limitations

This study is still limited to the local cultural context of the Solo Raya region, which enables meaningful integration between cultural values and chemistry learning while also opening opportunities for further exploration in diverse cultural settings to examine broader applicability. Moreover, the focus on specific chemistry topics indicates the need for future studies to extend implementation across a wider range of subject matter and to develop more varied and interactive learning designs. Overall, the results of the analysis confirm that the implementation of CRTT with podcasts and e-assessments is a meaningful contribution to the development of innovative learning practices in chemistry education.

4. Conclusion

The Culturally Responsive Transformative Teaching (CRTT) learning model influences students' science literacy and collaboration skills. This effect is reflected in the higher mean posttest and N-Gain scores achieved by the experimental group compared to the control group. In addition, the MANOVA results confirm that the implementation of the CRTT model with podcasts and e-assessment significantly affects students' science literacy and collaboration skills. These findings confirm that the integration of culturally responsive learning supported by digital technology is an effective learning strategy for improving students' science literacy and collaboration skills.

Author Contributions

All authors have equal contributions to the paper. All the authors have read and approved the final manuscript.

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Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/ or publication of this article.

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Data Availability

The datasets generated during and/ or analyzed during the current study are available from the corresponding author on reasonable request.

Declaration on AI Use

The author(s) declare that no artificial intelligence (AI) or AI-assisted tools were used in the preparation of this manuscript.

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