# Enhancing Collaboration Skills and Student Learning Outcomes Through the Implementation of an Ethnoscience-Based Common Knowledge Construction Model (CKCM) with Podcasts

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**A B S T R A K**

*Menanggapi tantangan pendidikan abad ke-21, pendidik harus menerapkan pendekatan inovatif untuk mengoptimalkan pembelajaran siswa. Menyadari pentingnya etnosains sebagai lensa budaya yang memperkaya pengetahuan tradisional, pembelajaran konstruktivis, yang difasilitasi melalui Model Konstruksi Pengetahuan Umum (CKCM), menjadi penting untuk mendorong pengembangan ide. Penggunaan podcast sebagai media pembelajaran semakin menjanjikan dalam meningkatkan pemahaman materi. Penelitian ini bertujuan untuk menganalisis dampak penerapan CKCM berbasis etnosains dengan podcast pada topik ikatan kimia. Jenis penelitian ini yaitu kuantitatif, dengan menggunakan desain quasi eksperimen dengan posttest only control group. Sampel dalam penelitian ini 61 siswa yang diambil dengan menggunakan teknik random sampling. Metode pengumpulan data menggunakan tes. Instrumen pengumpulan data menggunakan lembar soal tes. Teknik analisis data menggunakan analisis statistik inferensial. Hasil penelitian yaitu tidak ada perbedaan signifikan penerapan CKCM berbasis etnosains dengan podcast topik ikatan kimia. Meskipun tidak ada perbedaan yang mencolok, temuan ini memberikan jalan bagi penelitian di masa depan, mengeksplorasi perbedaan dalam keterlibatan siswa, pengembangan konten podcast, dan variasi dalam metodologi pengajaran. Eksplorasi ini dapat memberikan kontribusi wawasan berharga terhadap wacana yang sedang berlangsung mengenai strategi pendidikan yang efektif, memberikan manfaat bagi para pendidik dan peneliti yang bertujuan untuk meningkatkan hasil pembelajaran dalam pendidikan sains.*

**A B S T R A C T**

Responding to the challenges of 21st-century education, educators must implement innovative approaches to optimize student learning. Recognizing the importance of ethnoscience as a cultural lens that enriches traditional knowledge and constructivist learning, facilitated through the Common Knowledge Construction Model (CKCM), is essential to encourage the development of ideas. Using podcasts as a learning medium is increasingly promising in improving understanding of the material. This research analyzes the impact of ethnoscience-based CKCM with podcasts on chemical bonds. This type of research is quantitative, using a quasi-experimental design with a posttest-only control group. The sample in this study was 61 students, and it was taken using random sampling techniques. The data collection method uses tests. The data collection instrument uses test question sheets. The data analysis technique uses inferential statistical analysis. The research results show no significant difference in applying ethnoscience-based CKCM and podcasts on chemical bonds. While there are no striking differences, these findings provide avenues for future research, exploring differences in student engagement, podcast content development, and variations in teaching methodology. This exploration can contribute valuable educational insights to the ongoing discourse regarding effective strategies, providing benefits to educators and researchers aiming to improve learning outcomes in science education.

## 1. INTRODUCTION

Education is a place to develop self-identity to face all changes and problems with an open attitude. Education is expected to develop abilities and improve the quality of life and human dignity to realize educational goals (Utomo, 2013). One of the most important aspects of education management is related to human resources, both educators and education staff, who are involved and actively participate in educational activities (Debrah et al., 2021; Malikah & Wafroturrohmah, 2022). Therefore, in improving

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students' education quality, schools will become a central point to maximize the learning process (Ida et al., 2013). The school will be tasked with designing learning experiences that align with competent things by following the revolution's development (Rawung et al., 2021). The world of education in the 21st century is facing enormous challenges. Learning in the 21st century must prepare the younger generation to welcome information and communication technology advances in social life (Syahputra, 2022). In addition, educators must be able to provide 21st-century skills and learning tools that students will need to face every aspect of global life (González-pérez & Ramírez-montoya, 2022; Pratiwi et al., 2019). 21st-century skills are termed the 4Cs that students must have, namely communicating (Communication), collaborating (Collaboration), critical thinking (Critical Thinking), and being able to solve problems of creativity and innovation (Creativity)(Bricheno, 2013; Tight, 2021; Vila et al., 2021). Collaboration skills are one of the most critical 21st-century skills to develop; these skills will build student cooperation. Executive Development: Collaboration skills are needed so that students can play an active role in every activity and that good relationships between groups, mutual respect, and teamwork are established to achieve goals (Sirait et al., 2023).

Constructivist learning involves students applying existing real-world knowledge and experience, learning to hypothesize, testing their theories, and finally drawing conclusions from their findings (Sugrah, 2020; Tsai et al., 2023). One constructivist learning model that effectively encourages students' collaboration skills is the Common Knowledge Construction Model. The results of previous studies show that the Common Knowledge Construction Model (CKCM) is one of the potential constructivist-based learning models for developing student literacy through dimensions of scientific competence such as scientific thinking habits, conceptual understanding, scientific attitudes, critical thinking, self -awareness, argumentation and working in groups (Haydari & Costu, 2021; Pan et al., 2023). Learning will be more meaningful by integrating understanding and knowledge of socio-scientific issues (SSI), especially in the local cultural dimension (ethnoscience)(Rahayu, 2020). The development of ethnoscience-based CKCM based on local SSI problems is an alternative to increase the meaningfulness of learning for students while overcoming problems in contextualizing chemistry learning from a local cultural perspective. Ethnoscience-based learning that does not separate science, culture, local wisdom, and the community can be used as a learning approach to increase student interest or motivation and student learning achievement towards science. With ethnoscience, students do not view science as a foreign culture that they learn but are seen as part of the existing local culture and wisdom. This method can be taught with student-centered learning to improve student responses to science and increase the practical usefulness of science, human values, and the relationship between individuals and the environment (Sidiq, 2014).Research by(Vinet & Zhedanov, 2011)shows that learning with an ethnoscience approach is based on recognizing culture as a fundamental (fundamental and important) part of education as an expression and communication of ideas and knowledge development. The ethnoscience integrated science learning model is feasible to be used in the learning process, and can improve student learning outcomes and students' creative thinking abilities(Damayanti et al., 2017).In addition, there was an influence of ethnoscience integrated Problem Based Learning on the understanding of concepts of Blora State MA students (Ramandanti & Supardi, 2020).

Meanwhile, innovative learning, in addition to the application of learning models, is used in the learning process. Chemistry learning must be able to integrate contextual chemistry problems and present them to the sophistication of 21st-century learning technology. As a product of 21st-century technology, social media can be used to learn chemistry (Rahmawati et al., 2023).Educators can apply podcast media; Using podcasts in science learning can improve students' understanding, communication skills, and analytical thinking skills(Haka et al., 2023). The research results conducted by Mayangsari & Tiara (2019)revealed that developing podcast media as an information technology-based learning medium can improve student learning outcomes. This is in line with research conducted by Enny et al (2023), who found an influence on the use of the STAD learning model with the help of podcasts on student chemistry learning outcomes of class XI acid-base theory material. The success of the learning process can be measured from the success of students participating in learning activities (Sanusi, 2016). Student learning achievement is measured by student attitudes, values, and activeness (Sanusi, 2016). This success can be seen from the level of understanding of the material and student learning achievement towards chemical bond materials. Chemical bonding materials are abstract and far from everyday experience, for example, one cannot see atoms, structures, and how to react with other atoms (Octaviany & Majid, 2017). This causes chemical bonds to become material that is difficult for students to understand, so chemistry learning outcomes decrease. Activeness is an important element to support student success in learning and get maximum learning results (Enawaty & Rasmawan, 2005). The higher the level of activeness expected, the greater the results obtained. There are several indicators of collaboration skills such as cooperation, communication, and every student discussion activity in the learning process. The main

objective of this study is to find out whether the application of the CKCM learning model containing ethnoscience with the help of podcasts affects students' learning outcomes and collaboration skills on chemical bond materials. This research is important because the constructivist approach effectively influences student learning outcomes on chemical bond materials(Umi Roufatuz Zahro, 2020). In addition, using Podcast media as a learning platform is also quite effective in measuring student learning outcomes (Yuliyanto, 2018). This research is expected to produce breakthroughs in learning models and learning media that instructors and students on chemistry learning materials can use.

## 2. METHODS

The research method used is quasi-experimental research. According to Creswell(Dwi et al., 2022)experimental research is helpful for determining cause-and-effect relationships between variables. The experimental class will be given treatment for applying the podcast-based ethnoscience CKCM learning model. Meanwhile, the control class will apply conventional learning with the Discovery Learning model. Both classes will be given a posttest after learning is complete. The data obtained will be processed and analyzed to determine the influence of Podcast as a chemistry learning medium using the ethnoscience-laden CKCM learning model. The research design used in this study is a posttest-only control design.

**Table 1.** Research Design

| Class | N | Treatment | Post-test |
|---|---|---|---|
| Controls | 30 | X1 | O1 |
| Experimental | 31 | X2 | O2 |

Information: = Learning treatment with expository learning model with Power-Point media and textbooks; = Treatment of learning with the Common Knowledge Construction Model learning model containing ethnoscience based on Podcast; = Post-test (control group); = Post-test (experimental group). The population in this study is all grade X students of one of the public high schools in Surakarta in the 2023/2024 school year consisting of ten classes. The samples in this study were two classes, namely class X E1, containing 30 students as an experimental class applying the CKCM learning model containing Podcast-based ethnoscience and class The sampling uses a random sampling technique. This technique is done by testing normality in a population. If the sample has met the normality requirements, then the sample will be selected twice randomly to determine two classes. Data collection techniques applied include test methods. The test method is in the form of an initial assessment of 15 questions and a posttest of 24 questions, both in the form of multiple choice. Test questions in the form of multiple choice are used to measure learning outcomes. Indicators of collaboration based on Wiyarsi, A., Prodjosantoso, AK, Nugraheni, ARE (2020) include communication skills, interaction skills, commitment skills and responsible skills as shown in Table 2.$X_1 X_2 O_1 O_2$.

**Table 2.** Collaboration Indicators

| CKCM Syntax | Collaboration Indicators | | |
| | Aspect | Indicators | Number of questions |
|---|---|---|---|
| Exploring and categorizing | Communication Skills | Listen Speak | 6 |
| Constructing and Negotiation | Interaction Skills | Participate Contribute | 5 |
| Translating and extending | Committed Skills | Motivation Acceptance | 5 |
| Reflecting and assessing | Responsible Skills | Responsibility | 4 |

Data processing of learning outcomes tests and collaboration skills begins with testing the statistical requirements needed as a basis for hypothesis testing, including normality tests, homogeneity tests, Mann Whitney non-parametric tests. This was chosen because by the opinion(Dwi et al., 2022)the data obtained was tested through inferential/probability statistics where these statistical techniques were used to analyze sample data and the results would be applied to the population.

## 3. RESULT AND DISCUSSION

**Results**

Data acquisition based on the value of learning outcomes in both classes in chemical bond subjects. This research was carried out in 6 meetings. Researchers have adjusted the findings of this study using experimental methods, in this method using two classes, namely experimental and control classes. The experimental class will be given a podcast-based ethnoscience CKCM learning model and the control class applies conventional learning. This study used one shot only or posttest only control design. The following are the results of testing students' posttest scores and collaboration skills. The effect of the podcast-based CKCM learning model on student learning outcomes.

**Table 3.** Post-test Value Data Description

| Class | Lowest Value | Highest Rated | Average |
|---|---|---|---|
| Experimental | 43.14 | 76.47 | 54.118 |
| Controls | 41.18 | 64.71 | 56.167 |

Based on the test of learning outcomes in the experimental class and the control class in the post-test can be seen in Table 3. The average score of learning outcomes in the experimental class was 54.118 while the control class was obtained 56.167. From this gain, the average difference between the experimental and control classes was 2.049. Based on test scores, learning outcomes of experimental classes tend to have lower averages than control classes.

**Table 4.** Normality Test of Learning Outcomes

| Class | N | Sig. | Results | Conclusion |
|---|---|---|---|---|
| Experimental | 30 | 0.001 | H0 rejected | Abnormal Data |
| Controls | 31 | 0.022 | H0 rejected | Abnormal Data |

Based on the results of normality tests in the experimental and control classes in Table 4. It is known that all experimental (0.001) and control (0.022) classes have Sig values. < 0.05. So, it can be concluded that the data is not normally distributed or the sample comes from a population that is not normally distributed.

**Table 5.** Homogeneity Test of Learning Outcomes

| Class | N | Sig. | Results | Conclusion |
|---|---|---|---|---|
| Experimental | 30 | 0.004 | H0 rejected | Non-homogeneous data |
| Controls | 31 | | | |

Based on the data above, the homogeneity test of learning outcomes in the experimental class and the control class, it was found that both Sig. < 0.05, then Ho was rejected so that the experimental and control classes were not homogeneous. These results will further process the data with non-parametric statistics (Mann-Whitney test).

**Table 6.** Whitney Mann Test Learning Outcomes

| Class | N | Sig. | Results | Conclusion |
|---|---|---|---|---|
| Experimental | 30 | 0.119 | H0 Accepted | There is no significant difference |
| Controls | 31 | | | |

Based on the table above, the results of the Mann-Whitney test on the gain score of the learning outcomes test produce a probability value (sig) of > 0.05, namely (0.119 > 0.05) which means that in general, there is no difference in learning outcomes and is quite significant between the experimental class and the control class. The value of collaboration skills in the experimental and control classes can be seen in Table 7. The average collaboration score in the experimental class was obtained 66.9 while the control class obtained 68.5. From this gain, the average difference between the experimental and control classes was 1.6. Based on collaboration scores, experimental classes tend to have lower averages than control classes.

**Table 7.** Description of Collaboration Value Data

| Class | Lowest Value | Highest Value | Average |
|---|---|---|---|
| Experimental | 61 | 76 | 66.9 |
| Controls | 60 | 78 | 68.5 |

**Table 8.** Normality Test of Collaboration Skills

| Class | N | Sig. | Results | Conclusion |
|---|---|---|---|---|
| Experimental | 30 | 0.049 | H0 rejected | Abnormal Data |
| Controls | 31 | 0.038 | H0 rejected | Abnormal Data |

Based on the results of normality tests in the experimental class and control class in Table 8. It is known that all experimental (0.049) and control (0.038) classes have Sig values. < 0.05. So, it can be concluded that the data is not normally distributed or the sample comes from a population that is not normally distributed.

**Table 9.** Homogeneity Test of Collaboration Skills

| Class | N | Sig. | Results | Conclusion |
|---|---|---|---|---|
| Experimental | 30 | 0.187 | H0 Accepted | Homogeneous Data |
| Controls | 31 | | | |

Based on the data above, the homogeneity test of learning outcomes in the experimental class and the control class, it was found that both Sig. > 0.05 then Ho was accepted so that the experimental class and the control class were homogeneous.

**Table 10.** Mann Whitney Test of Collaboration Skills

| Class | N | Sig. | Results | Conclusion |
|---|---|---|---|---|
| Experimental | 30 | 0.306 | H0 Accepted | There is no significant difference |
| Controls | 31 | | | |

Based on the table above, the results of the Mann-Whitney test on the gain score of the learning outcomes test produce a probability value (sig) of > 0.05, namely (0.306 > 0.05) which means that in general there is no difference in learning outcomes and is quite significant between the experimental class and the control class.

**Discussion**

The effect of the podcast-based ethnoscience learning model on student learning outcomes.The Common Knowledge Construction Model learning model is one of the constructivist-based learning models that has the potential to develop students' literacy skills through scientific competencies such as scientific thinking habits, conceptual understanding, scientific attitudes, critical thinking, self-awareness, argumentation and working in groups(Haydari & Costu, 2021). The CKCM learning model consists of four stages, namely exploring and categorizing, constructing and negotiating, translating and extending, as well as reflecting and assessing(Yıldırım & Bakırcı, 2019). CKCM learning resulted in a better conceptual understanding of the theme of "water pollution"(Haydari & Costu, 2021; Kiryak & Çalik, 2018). The study recommended using the CKCM series of learning processes for different science topics and varied grades and courses. This research applies a constructivist learning model, namely the ethnoscience-based CKCM model with the help of podcasts; in the learning process students will understand and learn about chemical materials by relating them to everyday life. Learning by integrating understanding and knowledge of socio-scientific issues (SSI), especially in the local cultural dimension (ethnoscience) can help students in processing information(Rahayu, 2020). Ethnoscience in this study includes batik, pottery, and lapindo mud, which are associated in chemical bonding materials. The effectiveness of local culture-based learning, it provides better learning outcomes because learning takes place more meaningfully for students(Aza Nuralita, 2020; Pratama, 2023). Learning outcomes are competencies or the achievement of student skills after going through learning activities designed and implemented by teachers in a particular school and class (Ali & Setiani, 2018; Ayu, 2022; Tika & Agustiana, 2021). Learning outcomes can be achieved through three categories of domains, namely cognitive, affective, and psychomotor domains. The

process of taking data in this study is in the form of cognitive types through posttest results of learning results using multiple-choice questions in the form of AKM totaling 24 questions. The values obtained will then be used in prerequisite tests using normality tests and homogeneity tests. The normality test is used to test whether the observed data has a normal distribution. At the same time, the homogeneity test is used to determine whether several population variants are the same. Based on the results of the tests that have been carried out, it is clear that applying the ethnoscience-laden CKCM learning model with the help of Podcasts does not significantly influence student learning outcomes. This is shown by the results of the Mann-Whitney test on the gain score of the learning outcomes test, namely Sig. 0.119 > 0.005, so that H0 is accepted. This means there is no significant difference in learning outcomes between the experimental and control classes. The constructivist approach is a learning approach that can be developed for students (Adriantoni & Syafitri, 2019). The constructivist approach begins with students' initial knowledge, and then students are faced with other circumstances that cause conflicts in their minds. In addition, the results of science students learning using a constructivist approach to learning at a significant level are 5% better than students learning in conventional ways(Damayanti et al., 2017; Suryadi, 2009).

Two main factors affect student learning outcomes, namely factors that come from the students themselves (raw input) and environmental factors (environmental information), both natural and social environments; the success of learning activities will depend on the factors that influence it (Ali & Setiani, 2018). The discovery learning model has an influence on student learning outcomes because this learning model has advantages so that students are motivated to be active in understanding the concepts learned, namely at the time of data collection accompanied by group discussions, the discovery process, which is the hallmark of this model will increase student creativity in the problem-solving process, and the discovery process is carried out in the surrounding environment and supported by literature studies to support the learning process. So, the learning process using the discovery learning model emphasizes that students learn actively and can understand concepts well in the learning process (Ali & Setiani, 2018).

Discovery learning models applied to control classes tend to be more effective than constructivist learning models. The results of the study showed that there was a significant difference in support in the experimental group given the Discovery Learning model compared to the control group regarding the average academic achievement, learning retention score, and perception of skill score inquiry, both at the cognitive and affective level(Fitri & Derlina, 2015; Indriana et al., 2021). Discovery learning model influences student achievement in knowledge and skills in salt hydrolysis materials (Kurnianto & Masykuri, 2016). However, the discovery learning model does not affect learning achievement in the attitude aspect of salt hydrolysis material. The CKCM learning process and the discovery learning model influence student learning outcomes; this can be seen from the significant increase in learning outcome scores. The difference can be seen from the influence of student learning outcomes using the discovery learning model and the influence of student learning outcomes using the CKCM learning model can be seen from the final average of students in the control class more significant than the experimental class, namely the control class has an average of 56.167 and the experimental class 54.118.

The effect of the podcast-based CKCM learning model on student collaboration skills. Learning in the 21st century is oriented towards activities to train skills in students by leading to the learning process. Learning can be interpreted as an educator's effort to provide stimulus, guidance, direction and encouragement to students so that learning activities are in accordance with the objectives. Learning, in this definition, is not a process of learning knowledge but a process of knowledge formation by students through their cognitive performance (Permana et al., 2021). Therefore, the learning system in the 21st century is no longer teacher-centered learning but student-centered learning. It aims to provide learners with skills in thinking and learning skills in the 21st century, including Communication, Collaboration, Critical Thinking, and Problem-Solving Creative and Innovative/Inventiveness, and Innovation (Bricheno, 2013; Mardhiyah et al., 2021; Vila et al., 2021). The contribution of collaboration skills to improving concepts and knowledge is inseparable from the learning model used. As in this study, ethnoscience-laden CKCM learning is used with the help of podcasts. CKCM-based learning is constructivist learning based on learning that occurs through the active involvement of students in the construction of meaning and knowledge (Sugrah, 2020; Yıldırım & Bakırcı, 2019). This learning provides group projects that lead to the development of social regulation, especially in intergroup discussion activities. During discussion activities, students learn how to respect the opinions and answers of others, evaluate each group's problems with others, and help other students in the group when answering questions from other groups. These activities can improve aspects of social regulation. Improving aspects of social regulation will impact improving students' collaborative skills. Student collaboration skills are related to learning outcomes. High student collaboration skills and student learning outcomes are also high. Increasing students' collaboration skills in group work is accompanied by improving student learning outcomes (Nuriyani et al., 2021; Taufiqurrahman, 2023). Found that the application of learning carried out

collaboratively (collaboratively) can increase students' cognitive learning achievement (knowledge) from 34.38% to 62.50%. Student learning outcomes in applying collaborative learning models have increased from 55% to 81% (Nuriyani et al., 2021; Tristanti & Suharta, 2018). Based on the results of tests that have been conducted, the application of the ethnoscience-laden CKCM learning model with the help of Podcasts does not significantly influence students' collaboration skills. This is shown by the results of the Mann-Whitney test, which obtained a significant value of 0.306 so that it can be concluded that, in general, there is no difference in learning outcomes and that it is quite significant between the experimental class and the control class. It was supposed that there was no significant difference in student collaboration skills given the treatment of the podcast-mediated ethnoscience-based CKCM learning model with students given the discovery learning model assisted by PPT media. So, it can be concluded that the CKCM learning model and discovery learning can affect students' collaboration skills. The results of this study show that discovery learning is more influential than learning models on collaboration skills. This can be seen from the average value of collaboration obtained by the control class, which is 68.5, and the experimental class is 66.9. The Discovery Learning model is able to improve students' collaboration skills (Pramudyanti et al., 2020). Collaboration skills are important for learners to help learners stay competitive, and working together will facilitate problem-solving (Rusmalinda & Rahmadani, 2022). The discovery learning model can improve problem-solving skills and train independent and active students. This happened in research researchers conducted that discovery learning models influence students' collaboration skills.

## 4. CONCLUSION

Based on the research that has been done, it can be concluded that there is no influence or no significant difference between the control group and the experimental group with the application of the podcast-based ethnoscience CKCM learning model on student learning outcomes and collaboration skills. Although there is no difference, both treatments contribute well. Researchers have also discussed the results of these findings by comparing them with previous studies. These findings suggest that the applied ethnoscience CKCM learning model, combined with podcasts, may not be significantly different from traditional methods in influencing student learning outcomes and collaboration skills. Educators and curriculum developers should consider these results when choosing and implementing learning models and media assistance. Additionally, as a recommendation for future research, it is advisable to explore and compare the effectiveness of alternative learning models and media, considering various factors such as student engagement, instructional strategies, and content delivery. Further investigation into the nuanced aspects of ethnoscience, podcast development, and teaching methodologies may provide valuable insights for refining educational approaches. Teachers are encouraged to stay ahead of evolving research in this field to make informed decisions when selecting and adapting learning models for their students.

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