Fostering Collaboration and Enhancing Student Learning Achievement through the Integration of Ethnoscience in the Common Knowledge Construction Model with Podcast Media

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# Fostering Collaboration and Enhancing Student Learning Achievement through the Integration of Ethnoscience in the Common Knowledge Construction Model with Podcast Media

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## Abstract

This study specifically investigates the impact of an ethnoscience-based Common Knowledge Construction Model (CKCM) learning approach integrated with podcast media on student learning outcomes and collaboration skills, concentrating on chemical bonding. The quasi-experiment research method was conducted in one of the private schools in Sukoharjo Central Java, involving 24 students in control and experimental classes. This research responds to skill demands in the 21st century to develop quality human resources by introducing innovations that integrate culture and technology into a learning system, focusing on enhancing students' soft skills, especially in collaboration. The results of the data analysis show that the learning model significantly influences student learning outcomes. However, the study indicates that this approach results in a slight improvement in students' collaboration abilities. Yet, further exploration and refinement may be necessary to enhance its effectiveness in fostering collaboration skills. This research contributes valuable insights for educators seeking innovative approaches to equip students with the skills needed to thrive in the contemporary education and employment landscape, such as competence, superiority, and competitiveness. Thus, the CKCM learning model has great potential to continue to be developed as a learning model that can answer the challenges of the 21st century.

Keywords: ethnoscience, podcast media, chemical bonding, common knowledge construction model learning models, fostering collaboration skills, learning outcome

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## 1. Introduction

The progress of 21st-century civilization is complex and comprehensive. Among the characteristics of globalization is the rapid development of science and technology followed by all its innovation and sophistication. This needs to be balanced with quality human resources. Education is an inventory of human resources (Syafii, 2022). In forming quality resources, well-managed and professional institutions are needed to provide superior output. Today's reality requires educational institutions to present a learning system that supports the 21st century

and creates superior-quality students. This is because the low quality of education can reflect the low quality of human resources, impacting all aspects of community life (Omayra, 2021). For example, in the 21st century, education is required to prepare students to face the world of work. Research (Ratih et al., 2021; Simanjuntak, 2023) explains that quality human resources are significant in an organization and company to achieve goals. Education is one way to fulfill the integrity of employees and ensure good work performance.

Based on the results of research by the International Institute for Management Development (IMD) World Rangking (wtr) in 2023, the competitiveness of Indonesia's human resources was ranked 47th, which was previously in 51st position out of 64 countries in the world (International Institute for Management Development, 2022). Despite the increase, Indonesia's position is still below that of other Asian countries such as Malaysia, Singapore, and Thailand. In realizing quality human resources and competing globally, education is the leading locomotive to realize these goals (Alek, 2022). However, according to data from UNICEF, around 4.1 million children in Indonesia, namely children aged 7-18 years, do not get an education or do not attend school due to various social problems. Children and adolescents who come from low-income families, people with disabilities, and those living in remote and disadvantaged areas of the country are most at risk of dropping out of school. Based on the Inter-Census Population Survey (SUPAS 2015) analysis, 57 percent of school-age children and adolescents with disabilities do not attend school. This is undoubtedly a real challenge because education problems are closely related to Indonesia's quality of human resources. (UNICEF, 2023)

Education, in the process, should encourage creativity, mastery, and the ability to develop science and technology, with morality as an essential reference (Halean, S., Kandowangko, N., & Goni, 2021). Education is also said to be a long-term investment in human resources. This is because education can expand knowledge and rationality and become a stimulant in creating renewal in all fields (Atmanti, 2005). Through education, the cultivation of values and ethics also plays a vital role in providing lessons and skills for students. Therefore, educational institutions must prepare graduate profiles with competencies relevant to the 21st century (Cintamulya, 2015). According to (UNICEF, 2007), There are ten reasons why education is said to be necessary. Among them are Related to financial stability and security, equality, independence as an effort to achieve dreams, securing the world, proving knowledge and confidence, part of society, part of national economic growth because educated people affect economic growth, and protection and prevention.

Efforts to improve the quality of education in a country affect the success of a nation's education (Kusuma & Subkhan, 2015). Innovation in education is a must because education is a means to shape humans into individuals ready to face the challenges of the times (Laili, 2022). (A. S. Setyaningsih, 2022) stated that the reasons for teacher innovation in learning, among other things, is a relationship between the demands of the world of work and the development of existing science and technology. In addition, research by (Mashudi, 2021) states that the abilities that students must have to be able to face the challenges of the 21st century are the ability to think critically and creatively, the ability to communicate effectively, the ability to innovate, the ability to solve problems, and the ability to collaborate.

Collaboration is one of the 4C skills (Communication, Teamwork, Critical Thinking and Problem Solving, and Creativity and Innovation). The ability to collaborate with others is a skill that students must have to live in the 21st century (E. Setyaningsih et al., 2022; Suryani & Saparuddin, 2022). Collaboration is a skill everyone must have to work together, tolerate effectively among team members, and train fluency in making decisions (Firman et al., 2023). In line with this, the results of a study by Anggelita et al. show that collaboration skills can influence problem-solving abilities. In the 21st century, students must gather information from various sources to generate new ideas and knowledge. This can be achieved through collaboration capabilities. Research by (Zahra et al., 2023) on collaborative skills positively correlates to student learning outcomes, where collaborative skills can be strengthened by dividing the class into groups and assigning students to participate in discussion activities. However, teachers often give individual assignments to students, which affects students' collaborative skills. Therefore, the education system needs to apply learning patterns that support student collaboration skills; one way is to use a suitable learning model, namely the Common Knowledge Construction Model (CKCM) learning model. The learning design of this model is closely aligned with constructivist learning theory. Constructing knowledge (learning) includes exploring, categorizing, construction, negotiation, translating, extending, reflecting, and assessing.

CKCM is a contextual-based learning model that integrates the environment with classroom learning. Chemistry itself is an abstract science and requires a strong level of understanding. Teachers must learn the difficulty of studying chemistry due to a lack of student communication (Hidayanti et al., 2020). This can result in misconceptions in students. However, the success of learning can be seen in student learning outcomes (Winkel, 1983). Lack of collaboration and student understanding of chemistry can affect student learning outcomes. The results of (Nurlita & Jailani, 2023) research show that collaboration skills can be improved through learning on a contextual basis. This is in line with the CKCM learning model. CKCM, with the constructivist-situated learning paradigm, prioritizes the learning process in groups. Students will work in groups to analyze phenomena, build conceptions, expand conceptions on socio-scientific issue (SSI) problems with cultural dimensions (ethnoscience), and end by evaluating and reflecting on conceptions and learning processes.

Previous studies show that many SSIs are relevant to chemical concepts. Chemistry-focused SSI is vital in developing the 21st century and has invaluable learning opportunities in chemistry learning and sustainable chemical literacy. Therefore, this study interpreted a learning model with SSI integrated into ethnoscience with the CKCM learning model. Furthermore, research by (Caymaz & Aydin, 2021) also shows that CKCM effectively improves students' cognitive and psychomotor abilities. In his study, it was explained that CKCM showed positive results on students' cognitive outcomes because the lessons conducted by CKCM provided a positive increase in students' scientific process skills. It can be said that the standard knowledge construction model includes the concept of scientific inquiry based on theoretical foundations. Therefore, the selection of the CKCM model is appropriate for this reason.

In addition, learning innovation also needs to be supported by digital technology,

which in this study applied learning media using ethnoscience-based podcasts. (Kurniawan et al., 2023; Muhson, 2010) states that well-designed learning media can help students digest and understand learning content. Podcasts are chosen because they are as flexible as learning media. Based on survey results, it is known that chemistry learning often uses YouTube as a learning medium. Technology in the chemistry learning process is important because, besides being attached to students, learning is also considered interesting and has a positive impact. Some applications of social media that have a positive effect on student learning outcomes include research by (Anggreani et al., 2023), Rahmawati et al.(2023), and Roudotul et al. (2023), which confirms that the role of technology and social media has a positive impact on students' chemistry learning processes. Research on the potential and benefits of digital media chemistry-based entertainment learning in the context of the 5.0 Era showed survey results that podcast media is considered suitable and has a positive impact. In line with this, research by (Suriani & Sukma, 2021) shows podcasts can affect student learning motivation and student learning outcomes. However, the selection of SSI will be better if it is adapted to the culture in the region, such as people's habits, while still integrating technology into it. (Ademola et al., 2023) have examined the relationship of learning with cultural and technological context on nuclear chemistry material to determine information retention by students taught nuclear chemistry using a cultural-techno-contextual approach with lecture methods and information retention by male and female students and the impact of gender interactions and methods on information retention by students. The results showed significant value for the first purpose. However, there was no gender difference in

this achievement of the experimental group. Within the limitations of the findings of this study, chemistry teachers should apply technology and use examples of local cultures around students to make the educational curriculum more accessible for students to understand starting in high school.

Therefore, this research is one of the innovations in the form of the application CKCM learning model based on ethnoscience in the form of pottery, batik, and mud culture with podcast media is expected to be more effective in influencing students' collaboration abilities and learning outcomes, as a 21st century learning innovation that can present a learning system that combines technology, collaboration, and Indonesian culture with students.

## 2. Method

This study uses a quasi-experimental research design that allows researchers to control as many variables as possible from the existing situation (Habibie et al., 2013). Experimental research is the most complete quantitative research approach, which meets all requirements to test causal relationships (Restu Arti Setia, 2012). In quasi-experimental research, it aims to find out between variables involving experimental groups and control groups. Therefore, quasi-experimental designs can be used for research that will investigate relationships between variables and clarify the causes of those relationships. The methodology is applied because the author will measure the influence of independent variables, namely the use of ethnoscience-based CKCM learning models with podcast media on dependent variables, namely learning outcomes and thinking collaboration abilities. The design used in this study is Posttest Only Control Group Design. Posttest Only Control Group Design is one of the quasi-experimental research designs that

is quite simple but powerful. The subjects in this study design were grouped into two or more groups, namely control and experiment. Posttest Only Control Group Design applied measurements to the study after treatment was given to each class. Therefore, this design is often considered to have the disadvantage of knowing the differences that may occur at the beginning of the study. However, this design is considered quite strong in research on the effect of a treatment that is applied differently, which will then be compared to the results of the posttest after the treatment.

**Table 1. Research Design**

| Group | n | Treatment | Posttest |
|---|---|---|---|
| Experiment | 24 | $X_1$ | $O_1$ |
| Control | 24 | $X_2$ | $O_2$ |

Information :

$X_1$ : Treatment in the experimental group (Learning with ethnoscience-based CKCM model with podcast media);

$X_2$ : Treatment in the control group (Learning with discovery learning model assisted by PowerPoint or PPT);

$O_1$ : Post-test in the experimental class;

$O_2$ : Post-test in the control class; and n = Number of samples.

The experimental group will receive learning treatment using the ethnoscience-based Common Knowledge Construction model (CKCM) with podcast media. In contrast, the control group will receive learning treatment using the discovery learning model assisted by PPT. CKCM is a learning model that constructs student understanding by integrating surrounding phenomena into learning. The CKCM learning model, which has an ethnoscience base, is applied by linking cultural and social phenomena in batik, pottery, and lapindo mud into chemistry learning. The CKCM syntax is

divided into four stages: exploring and categorizing, construction and negotiation, translating and extending, and reflecting and assessing. Podcasts are used as learning media that complement the learning system in this study. Students will see a podcast at the beginning of the lesson that contains material related to chemical bonds associated with the social and cultural phenomena of batik, pottery, and lapindo mud. Students then learn according to the existing CKCM syntax, assisted by student worksheets. Ethnoscience is applied not only to podcasts but also to student worksheets and posttests done by students. Ethnoscience is integrated into explanation through podcast media, where material content is associated with pottery, batik, and lapindo mud on chemical bond materials. When working on student worksheets, the questions also contain ethnoscience content. At the end of the learning outcomes, data collection through minimum competency assessment (AKM) questions also links the questions with ethnoscience. Therefore, in the experimental class, it is expected that the applied model and media can encourage collaboration skills by integrating cultural elements to increase student engagement and understanding compared to the control class that uses the discovery learning model and PPT media. After the learning process, the experimental and control classes will be compared with the results of collaboration skills and learning outcomes obtained based on the learning model prepared using Minimum Competency Assessment (AKM) questions and collaboration questionnaires by the observer.

The subjects in the study were X-C grade students and X-F grade students in one of the Sukoharjo Regency private high schools. The normality tests of the ten existing classes were then carried out from the daily test score data of students in each class to determine

which class would be the control and experimental classes. The normality test in each class is carried out to select classes with a normal distribution or from an average population. After the normality test was carried out, it was determined by random sampling of two classes designated as the control class and the experimental class. The random sampling results showed class F as the experimental class and class C as the research control class. The research sample was taken from a class of 24 students for the control and experimental groups. According to Borg and Gall (2007: 176), the existing sample is based on the criteria, which states that the sample needed ranges from 15 to 30 respondents in each group. In addition, Hajar 1996: 147 (Alwi, 2012) says that in educational research, especially experimental research, probability sampling is only sometimes necessary or may need help to select subjects from a larger population. In this case, researchers usually use available sampling (availability sampling), i.e., researchers utilize general subjects, such as a group of students in a particular class.

Data collection in this study was a posttest of student learning outcomes using Minimum Competency Assessment (AKM) questions with ethnoscience content of as many as 24 questions. Minimum competency assessment (AKM) questions are first tested for validity. The validity test is carried out using the Aiken method. Eight validators, teachers, and lecturers from Surakarta, Yogyakarta, and Malang have validated the Minimum Competency Assessment (AKM) question to be declared worthy as a research instrument. Non-test methods measure collaboration ability through collaboration questionnaires. Furthermore, the post-test results and collaboration questionnaires will be tested using SPSS. The prerequisite tests carried out were in the form of normality and homogeneity tests. Tests were carried out with independent sample t-tests for data samples that were normally distributed and homogeneous. In contrast, tests were carried out for data that were not normally distributed or homogeneous, using Mann-Whitney. Collaboration capabilities are measured based on the inductors in Table 2 and Table 3 by Widarti, A, et.al (2024), while the hypothesis used in this study is in Table 4.

**Table 2. Collaboration Capability Indicator**

| Syntax | Aspects | Indikator | Number of Question |
|---|---|---|---|
| Exploring and categorizing | Communication Skills | Listening and Speaking | 6 |
| Construction and negotiation | Interaction Skills | Participate Contribute | 5 |
| Translating and extending | Committed Skills | Acceptance Motivation | 5 |
| Reflecting and assessing | Responsible Skills | Responsibility | 4 |

**Table 3 Collaboration Skills Instrument Grid**

| Indicators | Statement |
|---|---|
| Listening | Listen to ideas submitted by friends in the group. |
| | Not interrupting a friend's opinion when arguing in completing a task |
| Speaking | Awareness conveys ideas for the benefit of the group. |

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| Indicators | Statement |
|---|---|
| | Ask for feedback during discussions. |
| | Speak politely to friends in the group. |
| | Respond to the opinions/ideas of friends in the group. |
| Participate | Be in a group during task completion. |
| | Together, solve the difficulties facing the group. |
| | Invite friends in the group to participate. |
| Contribute | Help a friend who is having difficulty completing a task. |
| | Share learning resources with the group |
| Motivation | Encourage group mates to do tasks |
| Acceptance | Appreciate the work/effort of friends in the group. |
| | Not dictating to friends to do their job. |
| | Do not discriminate against friends when working in groups. |
| | Receive feedback from friends in the group. |
| Responsibility | Complete tasks on time |
| | Correct errors/shortcomings in the tasks that have been done |
| | Presenting arguments scientifically |
| | Provide the right solution to complete the task. |

**Table 4. Research Hypothesis**

| $H_0$ | $H_1$ |
|---|---|
| Applying the ethnoscience-based CKCM learning model with podcast media does not affect learning outcomes and collaboration capabilities. | Applying ethnoscience-based CKCM learning models with podcast media influences learning outcomes and collaboration skills. |

## 3.  Result and Discussion

Before testing the effect of the ethnoscience-based CKCM learning model with podcast media on student learning outcomes, prerequisite tests in normality and homogeneity tests were performed to establish which test statistics were required. The normality test is carried out to determine whether the data obtained is usually distributed. The normality test is also a requirement for parametric tests. The non-parametric test is used if the data is not normally distributed. Average distributed data means that it has a normal distribution and is considered representative of the population. For homogeneity tests, it is essential before comparing two groups in this study so that the difference is not caused by differences in primary data (inhomogeneity of the groups being compared) (Usmadi, 2020). Normally distributed and homogeneous data will be tested independently by sample t-test. In contrast, data that is not normally distributed or homogeneous will be carried out with the Whitney test. In this study, a Shapiro-Wilk-type normality test was conducted. The Shapiro-Wilk normality test is considered adequate and valid for small samples (Quraisy, 2022). Both normality and homogeneity tests are carried out on data on student learning outcomes and student collaboration skills as analyst prerequisite tests. The sample is said to be expected if the significance level is ≥ 0.05. Similarly, the homogeneity test considers the sample homogeneous if the significance obtained is ≥ 0.05.

### a.  Testing the Value of Learning Outcomes

The results of the post-test normality test of student learning outcomes are stated in Table 5.

**Table 5. Normality Test Result**

| Class | Sig | Dec |
|---|---|---|
| Experimental | 0.354 | Normal |
| Control | 0.145 | Normal |

Based on the normality test results shown in Table 5, the post-test results of the experimental and control classes obtained a significance value of $\geq 0.05$. Therefore, it can be concluded that the data is normally distributed or that the sample comes from a normally distributed population. Furthermore, a homogeneity test was carried out to determine whether the sample group of data taken went from a population with the same variance (Sianturi, 2022). The following data on the homogeneity test results of post-test learning outcomes are shown in Table 6.

**Table 6. Homogeneity Test Result**

| Class | Sig | Dec |
|---|---|---|
| Experimental | 0.197 | Homogeneous |
| Control | 0.192 | Homogeneous |

Based on the results of the homogeneity test shown in Table 6, it can be seen that the significance value obtained is $\geq 0.05$. This indicates that the experimental and control classes' posttest results are homogeneous. Furthermore, static analysis was carried out using an independent parametric sample t-test. The following data on the results of the independent sample t-test post-test value of learning outcomes are shown in Table 7.

**Table 7. Independent Sample T-Test Results**

| Posttest | Sig. (2-tailed) | Dec |
|---|---|---|
| Hasil Belajar | 0.029 | H0 was rejected |

Based on the results of the independent sample t-test in Table 7, it is known that the value of Sig. (2tailed) is 0.029. The significance value is $0.029 < 0.05$, so it can be concluded that $H_1$ is accepted and $H_0$ is rejected. Then, from these results, it can be stated that the ethnoscience-based CKCM learning model with podcast media affects student learning outcomes.

**b. Collaboration Capability Value Testing**

Collaboration skills fit into the 21st century 4C term that students must have. In learning, collaboration is cooperation to help complete specific tasks to obtain the same goal (Rahayu et al., 2019). (In this study, the measurement of collaboration ability used non-test instruments in the form of collaboration ability questionnaires. Student collaboration ability scores obtained from experimental and control classes will be tested to determine the effectiveness of the influence of ethnoscience-based CKCM learning models with podcast media on student collaboration abilities. The following normality test data on student collaboration ability scores are shown in Table 8.

**Table 8. Normality Test Result**

| Class | Sig | Dec |
|---|---|---|
| Experimental | 0.001 | Normal |
| Control | 0.275 | Anormal |

The normality test results in Table 8 show that the significance value of the experimental and control classes obtained is $< 0.05$. This shows that the data on the value of collaboration capabilities acquired is distributed elsewhere. Furthermore, homogeneity tests are carried out on samples to determine whether population variants are

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the same or not. The homogeneity test data of collaboration capability values are shown in Table 9.

**Table 9. Homogeneity Test Result**

| Class | Sig | Dec |
|---|---|---|
| Experimental | 0.002 | Not Homogeneous |
| Control | 0.006 | Not Homogeneous |

Based on the homogeneity test in Table 9, it was found that the experimental class and control class obtained a significance value of < 0.05. This means that the data on the value of collaboration capabilities acquired is heterogeneous. Therefore, the statistical analysis used in the next test uses the Mann-Whitney test. Data from the Mann-Whitney test are shown in Table 10.

**Table 10. Mann Whitney Sample Results**

| Posttest | Sig. (2-tailed) | Dec |
|---|---|---|
| Collaboration skills | 0.45 | $H_0$ was accepted |

Based on the results of the Mann-Whitney test, Table 10 shows that the significance (2-tailed) obtained is 0.45. This means that if the importance of $\geq 0.05$ is high, it can be concluded that H0 is accepted and H1 is rejected, or it can be said that the ethnoscience-based CKCM learning model with podcast media does not significantly affect student collaboration skills.

## c. The Effect of Ethnoscience-Based CKCM

Learning outcomes are values obtained as a measure of students' abilities against something that has been learned. Learning outcome scores are obtained through post-test score data that has been carried out both in the control class and experimental class. The post-test questions are represented by 24

(twenty-four) question items, each indicator consisting of Minimum Competency Assessment (AKM) questions containing science. The following is the average score of the experimental class and control class posttest results presented in Figure 1.
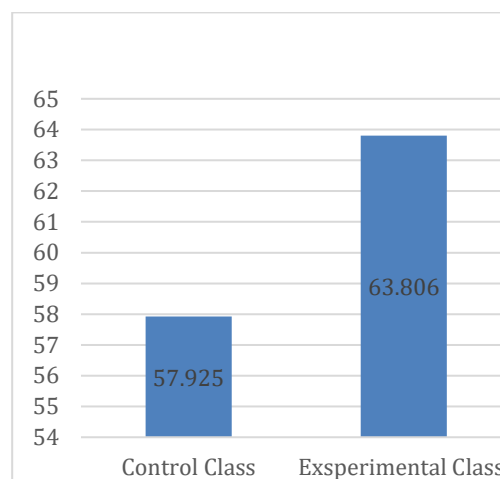


**Figure 1. Average Post-Test Scores of Learning Outcomes**

Figure 1 shows the accumulated post-test mean scores of the control and experimental classes. The average post-test score of the practical class was 63,806 while the average post-test score of the control class was 57,925. From these data, it can be seen that the average post-test score of the experimental class is higher than the average value of the post-test of the control class. This is because the value of student learning outcomes can increase due to the influence of using ethnoscience-based CKCM learning models with podcast media given to experimental courses. This study's results align with research by (Salsabiila et al., 2024) that the application of CKCM provides positive results on student learning outcomes. CKCM is a constructivist learning model, which is learning that integrates science with everyday life. This study presents the CKCM learning model by containing contextual content in the form of ethnoscience and social issues in pottery, batik, and lapindo mud

culture. This is the expression by Karimi et al. (2021), which states that contextual learning focuses on conveying relevant knowledge between concepts and students' lives. Students can better understand the chemical bond material learned because the CKCM learning model presents a learning system that integrates the surrounding environment in the form of culture into chemical bond material.

Integrating ethnoscience and social issues into the learning system in this study allows students to be critical and open to the phenomena around them. By including cultural elements and social phenomena, namely in the form of batik, pottery, and lapindo mud in chemical bonding materials, students will be able to reason the material easily on things that are close to students' daily lives. For example, the batik dyeing process involves chemical bonds between compounds in dyes. Students will logically understand the material directly with the natural phenomena they encounter, likewise in other methods such as batik mordanting, chemical bonds in cotton fabrics, the danger of contamination of batik color waste, and so on.

In addition, in pottery culture, starting from the process of making pottery, how clay can be formed into pottery of economic value, the process of burning tiles and the chemical bonds in them, the hydrolysis process in clay soil, the constituent minerals and bonds, and bonds that affect the properties of the treasury. Then, the phenomenon of lapindo mud, for example, related to the chemical content of lapindo mud, the productivity of lapindo mud, the potential use value of lapindo mud, and studies of efforts to recover lapindo mud contamination water. These phenomena can be related to chemical bond materials, namely elemental stability, ionic bonds, and covalent bonds. This is because chemical processes in

the form of chemical bonds also cause phenomena that occur on social and cultural issues described. With a learning system like this, students will more easily understand the material because they feel that chemistry, considered abstract material and challenging, turns out to be close to their daily lives.

This research's findings align with (Taşdere & Kaya, 2023), which is concerned with increasing contextual understanding of the material, the density of liquids, and buoyant force using CKCM. As a result, CKCM can develop the conceptual level of students' cognitive structures regarding the density of liquids and buoyancy forces. This is certainly in line with the results of this study, where the CKCM model can provide more understanding to students, as evidenced by better learning outcomes from classes with discovery learning models. Further, (Çalik & Cobern, 2017) state that CKCM is based on phenomenography. This is by the design of the learning model applied in this study, where the CKCM learning model is integrated with surrounding cultures and phenomena.

Research conducted by (Bakırcı et al., 2017) regarding the influence of the Common Knowledge Construction Model (CKCM) model on the views of sixth-grade students regarding the Nature of Science (NOS). The results showed that the learning model oriented to the Common Knowledge Construction model (CKCM) was more effective in improving the experimental group's view of NOS, where CKCM could construct students' in-depth understanding of the level of imaginary and creative aspects of NOS. This is in line with the results of this study because students gain a more profound experience with CKCM learning than with discovery learning. (Haydari & Costu, 2021) stated that the CKCM learning model can strengthen students' contextual understanding

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of biodiversity because of the influence of integration between learning materials and contextual phenomena. This is because of the influence of integration between learning materials and contextual phenomena. (Rubiyati, 2023) also states that contextual learning, which is applied in its learning system, can improve student learning outcomes. Furthermore, research conducted by (Habibie et al., 2013) noted that the presentation of contextual phenomena could improve student learning outcomes, with classical completeness reaching 87.50% and classical absorption reaching 80.13% and the results of student activity analysis at 91.67% with excellent categories.

The contextual phenomenon chosen in this study is ethnoscience. In ethnoscience, culture becomes part of the science learning process, which will be a model for classifying environments or social situations to provide an understanding of science (Annisa et al., 2021). Research by (Jacinda et al., 2023) states that ethnoscience-based learning is very influential in creating meaningful learning to increase students' understanding of the material because of the relationship between culture and the surrounding environment. In tune with research by (Wardani et al., 2023), they stated that culture-based ethnochemical approaches make learning more meaningful and can improve student learning outcomes. Research findings in this study align with research by (Putri et al., 2022), who state that ethnoscience integration in learning also affects student learning outcomes and is effective if applied to all science-related subjects. (Prasetya et al., 2022) also noted that ethnoscience is a reasonably practical approach used in science content (science) where students will learn science directly connected to everyday life's culture. This is supported by research by (Trianah, 2020),

who found that ethnoscience-based learning models are more effective than conventional learning models in science process skills and can increase students' mastery of chemical materials. This is also because ethnoscience content in learning can increase student interest and motivation, affecting learning outcomes in science (Shidiq, 2016).

The 21st century is dominated by technology in various aspects of life. This is the basis for this study to integrate technology such as podcasts into the learning process. This study integrates local culture and combines technology to complement the learning innovations. According to (Susilo et al., 2018), learning media that contain sound and display components that are developing today provide many opportunities for students to explore the subjects concerned better. (Basenko & Baskakova, 2021) research confirms that podcast technology has much potential for further development. In line with research by (Widarti et al., 2024) stated that podcasts as digital entertainment-based learning media are appropriate to be applied because they have a positive impact. Research on the use of podcasts as a learning medium has been carried out before, including by (Ramadhani et al., 2023), who use podcasts as learning media in Indonesian subjects; (Nurin Shabrina et al., 2023), who developed video podcasts as geography teaching media, and (Syahputra & Novrianti, 2022) developing podcasts as learning media for high school students based on information and communication technology. Podcasts were chosen because of their design as a flexible and continuous learning medium, meaning that in their use, students can repeat the material anytime they want.

This research aligns with (Susilowati et al., 2020), who show that podcasts are helpful as a learning supplement for students. This is supported by research by (Enny et al., 2023),

who found that podcast media can influence learning outcomes because students are trained independently to construct knowledge, understanding, and cooperation among students. Suitable learning media will support the learning process well. According to research by (Mayangsari & Tiara, 2019), podcasts are compelling enough to increase students' interest in learning. High interest in learning will affect student learning outcomes (Aprijal et al., 2020). Therefore, according to the results of this research, the application of the ethnoscience-based CKCM learning model assisted by podcast media is the right combination of learning innovations to be applied according to (Yamtinah et al., 2023) which state that essential components in the educational curriculum include learning methods and media. This shows that podcast media has succeeded in bringing a positive influence on the learning process. (Aurelliana et al., 2022) In their research on the impact of podcasts on student learning motivation, it is stated that good intonation and the ability to create pleasant situations in podcast audio presentations are factors in the acceptance of podcasts as student learning motivation in learning.

### d. The Influence of Ethnoscience-Based CKCM Learning Model with Podcast Media

The collaboration capability measurement instrument was developed in the form of a questionnaire that consisted of 20 (20) statements. Observers carry out assessments during learning discussions.
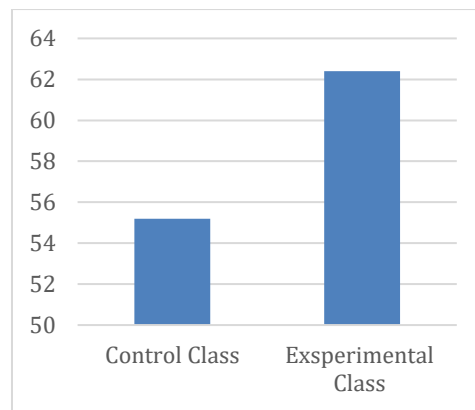


**Figure 2. Average Score of Collaboration Capabilities**

Figure 2 shows that the average value of student collaboration ability in the experimental class is greater than the average value obtained by control class students. Practical courses that received ethnoscience-based CKCM learning model treatment with podcast media received higher average scores than control classes that received discovery learning model treatment. The CKCM learning model and the discovery learning learning model have very different characteristics. The CKCM learning model trains students to construct their syntax knowledge independently (Al Munawarah, 2024). In the discovery learning learning model, the teacher will explain the material first at the beginning of learning.

Quantitatively, the value of collaboration ability obtained in the experimental class was higher than in the control class. This shows that the ethnoscience-based CKCM model with podcast media has a higher influence than the discovery learning learning model. The CKCM learning model with extraordinary features trains students in student engagement, collaboration, negotiation, and communication-related to socio-scientific issues (Özden & Yenice, 2020), which are integrated into chemical bonding materials. However, the statistical analysis shows that the ethnoscience-based

CKCM learning model with podcast media does not significantly influence student collaboration skills. So, it can be concluded that the learning model applied to the experimental and control classes has the same effect on student collaboration abilities. This is also in line with research conducted by (Putra et al., 2020) regarding the influence of discovery learning models on 21st-century skills, showing that discovery learning significantly influences collaboration abilities. Furthermore, research by (Albina, 2022) also indicates that discovery learning can improve students' collaboration skills.

According to (Tambusaii, 2019), to foster collaboration ability in learning, the right learning design is described as a learning atmosphere that supports students' collaboration in small groups. This is in line with the learning concepts applied in this study. Students in the experimental and control classes were divided into 4 (four) groups in a differentiated manner based on cognitive abilities. This shows that both practical and control classes have learning designs that support improving student collaboration skills. Differentiated group division is applied as a means to meet the cognitive needs of each different student. Furthermore, the results of a study by (Adila & Mawardi, 2023) show that collaboration skills and student learning outcomes can be improved through differentiated learning. This indicates that the existence of differentiated grouping also affects the increase in student collaboration ability in control classes and experimental classes.

The three main characteristics of discovery learning, according to (Svinicki, 1998), that relate it to cognitive theory are 1) emphasis on active learning, 2) development of meaningful learning, and 3) ability to change attitudes and values towards the subject and self as problem solvers. This

shows that proper discovery learning will form a student's personality with these three abilities, in this case, active learning, where student activeness affects student collaboration abilities. This aligns with research by (Saroi, 2017) who found that collaborative learning needs to be applied to increase student activeness in the learning process. This strengthens why, in this study, the influence of the discovery learning learning model has an equally strong impact on students' collaboration abilities.

This research implies the relevance and compatibility of 21st-century life skills in the form of student collaboration abilities integrated into innovative conceptions of learning systems applied in study groups to ethnoscience-based CKCM learning models with podcast media. The needs of 21st-century education are illustrated in research designs that can present learning systems combining technology and culture with the output of student thinking constructs through the learning step of the CKCM model. Learning outcomes are measured as a symbol of the success of a learning system.

The CKCM learning model that applies in this research can practically guide students' mindsets to be independent, open, creative, critical, and curious about the material taught through its syntax. In the first syntax, namely exploring and categorizing, students will practice synthesizing information related to the material to be discussed. Furthermore, in the second syntax, namely construction and negotiation, students will be trained to construct their understanding of chemical bonding material through social phenomena and cultural elements presented in this learning model. Then, the third syntax is translating and extending, where students expand and translate their knowledge and understanding of socio-scientific issues (SSI), especially in

the cultural dimension (ethnoscience) presented. The last syntax is reflecting and assessing where students will reflect constructive impressions on the material that has been learned. In its implementation, students learn in groups to discuss and follow the existing learning. With this, students' collaboration skills are also trained in the learning system.

Furthermore, the application of technology in podcast media complements this learning system. Innovative learning is needed to balance the learning atmosphere of today's students. Students need to become more familiar with technology, especially gadgets. So, incorporating technology elements into the learning system is the right thing. Therefore, the learning system developed in this research becomes a practical and innovative learning system that can be applied in schools. Based on the results of this study, the integration of education contextually through local culture with technology can be one of the efforts to create conditions for new educational patterns with modern competitiveness. This is also one of the contributions to the formation of higher education in the world through the introduction of an innovative education system that is expected to have the potential to advance education in Indonesia progressively.

Research related to the development of contextual learning models on social and cultural issues has been carried out a lot; however, the CKCM learning model still needs further research. Therefore, this study modifies the CKCM learning model based on ethnoscience and social phenomena. This research combines culture with technology to create learning system innovation. This can be a new example for educators when designing learning systems. In this study, batik and pottery, related to chemical bonding materials, were chosen as cultures to be studied and raised. Social issues in the form

of lapindo mud are a phenomenon that is familiar to us. Through this, students will learn social and cultural issues around their relationship with chemistry.

So that students not only know and understand the material but also become open and critical in responding to the surrounding phenomena. Technology in the form of podcasts is incorporated into the learning process that reflects the learning patterns of the 21st century, which are close to technology. This is a complete package of the learning system needed today. The flow of globalization that needs to be controlled and selected quickly can hurt students. Therefore, this learning system is expected to train students' thinking in learning material and facing their daily lives. Furthermore, cultural elements and social phenomena applied in learning can also foster students' insight into local culture and existing social issues while still familiarizing them with podcast technology as a learning medium in this research.

The implications of these findings suggest that while effectively applied models improve academic achievement, further attention, and refinement may be needed to improve collaboration skills. The high scores observed in the experimental class demonstrate the potential of ethnoscience-based CKCM learning models to contribute positively to collaborative abilities. The findings of this study also meet the needs of 21st-century learning related to "The 4Cs," including soft collaboration skills that students must have (Shidiq, 2019). It is hoped that the learning system in this finding can form students who can collaborate in the global order. On the other hand, the findings of this study are relevant to the educational needs of the 4.0 era, including educator skills with technology involvement in the learning process. Reorientation of curriculum

development with a technology base is needed to prepare students to compete in the global era. Schools and educators must be able to determine how the educational process will be organized. Teachers must have soft skills and novelty in arranging a meaningful learning process integrated with cultural values and social issues in students' daily lives. The study is a valuable resource for educators, offering alternative learning models that successfully integrate cultural and technological elements to improve learning outcomes.

This study showed no significant effect on students' collaboration skills, although the experimental class score was better qualified. Moving forward, it is recommended that future research delve deeper into the factors influencing collaboration skills within this model. Exploring variations in instructional strategies, student engagement, and the nature of collaborative activities may provide valuable insights for refining the model. Additionally, educators are encouraged to consider adopting and adapting this innovative learning approach, recognizing its potential to enrich the educational experience.

## 4. Conclusion

The result of implementing the ethnoscience-based Common Knowledge Construction Model (CKCM) learning model with podcast media significantly influences student learning outcomes, underscoring the effectiveness of integrating local culture and technology into the learning system. This finding as an innovative approach contributes positively to the learning process, enhancing students' understanding of the subject matter. However, the measured soft skill of collaboration yielded insignificant results despite the experimental class scoring higher than the control class. Furthermore, the study

findings regarding integrating local culture and technology into the learning system align with education's goals and objectives in growing human resources. This is because the findings on student learning outcomes show that learning outcomes have been achieved optimally. After all, the teaching and learning process is carried out effectively and efficiently.

Considering the results of the research carried out in this study, the teaching model should be enriched with various learning system innovations that can present a learning atmosphere that continues to develop dynamic and exciting. As a young generation, the high interest of students in using technology-based media is a new opportunity for educators to create innovative learning media. In addition, the success achieved in testing the effectiveness of ethnoscience-based CKCM influence with podcast media on the learning outcomes of chemical bond material can add to existing teaching methods. This study can also improve the quality of teaching and learning in the classroom because its approach combines science, culture, and technology.

Continuous exploration and improvement of such alternative models contribute to the evolution of effective educational strategies, fostering a dynamic and engaging learning environment for students. Learning with contextual phenomenon-based CKCM can be applied to all chemicals related to everyday life. However, researchers who want to use this contextual learning should consider the appropriate material and, to perfect the research, consider the advantages and disadvantages.

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