Development and Implementation of Sharing and Jumping Task Learning Designs on the Topic of Salt Hydrolysis Using Natural Materials Indiactors to Develop Students' Collaborative Skills

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Abstract

The study, titled "Development and Implementation of Sharing and Jumping Task Learning Designs on the Topic of Salt Hydrolysis Using Natural Materials Indicators to Develop Students' Collaborative Skills," aimed to obtain an overview of the learning designs implementation and profiles of collaborative skills that grow based on the learning design of sharing and jumping tasks on the salt hydrolysis topic using natural ingredients indicators. The challenges of 21st-century talents, one of which is collaboration skills, motivated this research. Learning in schools remains teacher-centered, has not improved collaborative abilities, and material delivery is not contextual with everyday life, technology, and green chemistry/ESD. The method employed in this study was qualitative, involving transcript analysis and Student Worksheets (LKPD). The salt hydrolysis concept study sheet in textbooks and ebooks, the Lesson Plan (RPP) study sheet and teaching materials used by the teacher, interview guidelines, learning design validation sheets, LKPD analysis sheets, and data collection on learning through audio and video recordings, and modified learning observations in transcript form were the instruments used. According to the findings of this study, the learning design, which included student problems, predicted student responses, and anticipation/teacher support was created in three stages: introductory, core, and closing activities. The application of the learning design demonstrates that learning is student-centered. The profile of students' collaborative skills that increase in the implementation of learning designs that appear most frequently in sharing tasks 1, 2, and 3 is indicator 2, on sharing task 4 is indicator 1, on sharing task 5 is indicator 1, and indicator 3, and on the jumping task is indicator 2.

Keywords: Collaborative skills · Sharing and jumping task · Salt hydrolysis

INTRODUCTION

The study aimed to obtain an overview of the learning designs implementation and profiles of collaborative skills that grow based on the learning design of sharing and jumping tasks on the salt hydrolysis topic using natural ingredients indicators. The challenges of 21st- century talents, one of which is collaboration skills, motivated this research.The method employed in this study was qualitative, involving transcript analysis and Student Worksheets (LKPD).

According to the findings of this study, the learning design, which included student problems, predicted student responses, and anticipation/teacher support was created in three stages: introductory, core, and closing activities. The application of the learning design demonstrates that learning is student-centered. The profile of students' collaborative skills that increase in the implementation of learning designs that appear most frequently in sharing tasks 1, 2, and 3 is indicator 2, on sharing task 4 is indicator 1, on sharing task 5 is indicator 1, and indicator 3, and on the jumping task is indicator 2.

In this 21st century, the world is changing swiftly, particularly in the domains of economy, transportation, and technology, as well as communication and information. Anticipation is a 21st-century skill required to stay up with these changes. Critical thinking, collaboration, communication, innovation, and creativity are examples of 21st-century skills. Chemistry, being one of the science disciplines, plays a vital part in building 21st-century abilities. It is required to conduct scientific

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learning or learner-centered learning to acquire 21st-century abilities following the demands of the 2013 curriculum (Redhana, 2019).

Collaborative skills are one of the focuses of research conducted by researchers. Cooperation, according to Reed Z (in Verawati et al., 2020) is not only the definition of collaboration skills, but also the skills to engage with others by respecting differences, sharing strengths, and gaining information from others to solve a problem. According to Curran et al. (in Verawati et al., 2020) using collaborative skills learning, students may ask and answer questions, argue that build interpersonal interactions between students and teachers, and can assist students to improve comprehension of a concept. As stated by Binkley et al., and Grenstein (in Verawati et al., 2020) there are several indicators of collaborative skills, including asking friends or teachers when they don't understand, being able to speak and have opinions, showing respect for the opinions of others, working together to solve problems, sharing work among group members effectively, demonstrating concern for friends, and guiding others to reach common goals As a result of past research findings, collaboration skills in chemistry learning offer an alternate solution.

Based on the reasons above, it is vital to improving the learning design by strengthening students' collaboration skills. The sharing and jumping task learning design is one of the learning designs employed. Learning by sharing and jumping task designs, according to Maasaki (in Verawati et al., 2020), may create a learning atmosphere, share perspectives, and appreciate each other's differences. According to (Fatimah et al., 2018) task sharing is a shared challenge in small groups to facilitate slow children in learning so that they arehelped by other friends. While the jumping task attempts to present students with difficulties outside of textbooks, it is also designed for children who learn rapidly so that they may think critically and are not bored while studying.

Salt hydrolysis is one of the learning materials that students struggle with. According to (Qardasih, 2013) this occurred owing to several circumstances. First, in terms ofexternal influences, instructors' learningapproaches are less diverse. Second, internal variables include pupils' lack ofinterest, information, and preparedness to study.

Students' difficulties learning about salt hydrolysis will result in poor learning outcomes. This is in line with the theory of (Akbar, 2016; Hasanah & Oktavia, 2019; Prasetya et al., 2019; Sunarya, 2012) that there are stillstudents whose scores do not meet the KKM (Minimum Completeness Criteria). During the learning process, students are more focused on remembering definitions and solving issues using practical formulae without grasping the concept, such as applying aformula to calculate the pH of a salt solution. Furthermore, (Wahyuningsih et al., 2014) claim that one of the students' poor understandings of the idea of salt hydrolysis is the outcome ofteacher-centered learning.

To avoid this, learning about salthydrolysis must be accompanied by a practical. The practicum learning method will have a good influence on students' learning performance since practicum allows you to see students' laboratory abilities as well as their interpersonal intelligence (Astuti et al., 2019).

Practicum is one method fordeveloping students' process skills, improving students' abilities connected to information, attitudes, and skills, andteaching students how to solve problems (Ratmini, 2017). Thus, researchers will use practicum to help students strengthen their process skills. There are various issues in the practicum, such asthe existence of substances that are not in the laboratory, preventing them fromcarrying out the practicum, and the available instruments are also quite limited. To address this issue, an ecologically charged practicum will be employed in this research, employing elements found in the environment(Mastura et al., 2017; Susanti et al., 2018). Researchers conduct practicums utilizing indications obtained from natural materials to eliminate or replace hazardous chemicals and minimize theirusage and production.

According to an earlier study (Y. Verawati et al., 2020) on the issue of salthydrolysis, the sharing and jumping tasklearning design can increase students' collaboration skills. The difference between previous research and what theresearchers did is those previous researchers used universal pH indicators to determine the nature of salt solutions,whereas the researchers used universal pH indicators, indicators of naturalingredients turmeric and purple cabbage, and salt found in everyday lifesuch as table salt and baking soda.

Based on the background described,the researchers designed collaborative learning sharing and jumping tasks on salt hydrolysis learning materials with natural ingredient indications, so that students could comprehend the issues presented and build student-centered learning. "Developing and Implementing Sharing and JumpingTask Learning Design on the Salt Hydrolysis Topic Using Natural Materials Indicators to Grow Students' Collaborative Skills" is the title of the research to be conducted.

Acid-base indicators are substancesthat vary in color based on the quantity of H^+ in the solution (Whitten et al., 2014). In acidic and basic solutions, indicators can have distinct hues (Chang, 2010). The advantages of indicators are that they are simple to see,efficient to employ, practical, and simple to use (Lestari, 2016). Hibiscusflowers, hydrangea flowers, red cabbage, turmeric, hibiscus flowers, sappan wood, and other plants can be used as indicators. Turmeric, which is derived from natural substances, may beused as an indication that becomes yellow in acidic solutions and brownish red in alkaline solutions.

According to (Chang & Overby,2010; Whitten et al., 2014) salt hydrolysis refers to the interaction of anions or cations of salt with water.Hydrolysis salts are salts whose anions derive from a weak acid and whose cation comes from a weak base (Petrucci, 2011). This occurs when these ions combine with water (hydrolysis) to create H_3O^+ ions, OH^- ions, or both. The pH of a solution can be affected by salt hydrolysis. The pH of a salt solution may be qualitatively predicted by examining the salt's cationsand anions. Four types of salts may be distinguished based on thecategorization of acids and bases, namely:

1. Salts are derived from strong acids and strong bases;
2. Salts of strong acids and weak bases;
3. Salts are derived from weak acidsand strong bases;
4. Salt of a weak acid and a weak base.

According to (Petrucci, 2011; Verawati, 2019), the salthydrolysis reaction can be categorized into three categories: not hydrolyzed,entirely hydrolyzed, and partially hydrolyzed, depending on the kind of cation and anion. Based on the previousdescription of salt hydrolysis types, the following conclusions can be drawn in tabular form:

Table 1. Salt types that undergohydrolysis

Hydrolysis Type	Acids and Bases Forming Salts	Species That React With Water	Properties of Salt Solutions
Not hydrolyzed	Strong acid and Strong base	Not reacting	Neutral
Partially	Strong acid and weak base	Cation	Acid
	Weak acid and Strong base	Anion	Base
Total	Weak Acid and Weak Base	Cations and anions	Acid or base or neutral

METHODS

The method used in this study was aqualitative method with a Didactical Design Research (DDR) design. It is explained by (Suryadi, 2013) that there are three stages of didactic research,namely:

1. Analysis of the didactic situationbefore learning
2. Analysis of the didactic situationduring learning
3. Analysis of the didactic situationafter learning.

For the data processing, Transcript Based Lesson Analysis (TBLA) and LKPD analysis (student worksheets) were used in this study. Following are the research instruments used:

1. Study Sheet for the Concept of Salt Hydrolysis in Chemistry Textbooks and E-books
2. RPP (Lesson plans) StudySheets and Teaching Materials Used by Teachers
3. Interview Guidelines
4. Validation Sheet
5. Data Collection RegardingLearning was performedthrough Audio and Video Recordings and Learning Observations
6. Student Worksheet AnalysisSheet (LKPD)

This study's data analysis was divided into several stages. Accordingto (Suryadi, 2013) didactic researchhas three stages: analysis of the didactic situation before learning, analysis of the didactic situation during learning, and analysis of thedidactic situation after learning.

Following the analysis, the researcher used Transcript Based Lesson Analysis to record the learning(TBLA). The purpose of this TBLA analysis is to determine whether collaboration indicators are met duringthe learning process. Furthermore, an analysis was performed based on the LKPD completed by students to determine their learning profile of students.

RESULTS AND DISCUSSION

This study's learning design is didactical design research (DDR). This design is a series of relationships between students and the content that describes the didactic relationship (HD), the pedagogical relationship between students and the teacher (HP), and the didactic and pedagogical anticipation (ADP) that was developed (Suryadi, 2013). The sharing and jumping tasklearning method was created in responseto the student's learning issues with salthydrolysis. The difficulty of students is evaluated based on an examination of the salt hydrolysis concept in textbooksand chemistry ebooks in relation to the grid of essential salt hydrolysis concepts, an examination of lesson plans and teaching materials used by teachers to determine the suitability of components in lesson plans, and an examination of the essential concepts ofteaching materials used by teachers. In addition, interviews were conducted with high school chemistry professors and students who have studied salt hydrolysis material to determine the challenges of learning about salthydrolysis.

The results of the examination of essential concepts in the teacher's teaching materials are excellent becausethere are essential concepts that researchers expect to construct learningdesigns. The teaching materials employed by instructors have a problemin that they are still missing in-depth concerning the setting in everydaylife/technology/green chemistry/ESD related to salt hydrolysis: 1) Learning is carried out with an environmental approach; (2) The learning model used is the concept and process model, the learning method used is discussion and question and answer; (3) The concepts studied are the determination of a strong acid, a weak acid, a strong base, and a weak base, theacidic or basic nature of salt, and the types of salts that are hydrolyzed; (4) Students' active participation is quite good; (5) Students' difficulties, namely,students' in complete comprehension ofthe determination of weak acids, strongacids, weak bases, and strong bases; and (6) How to address issues using a conceptual approach. The lecture approach is more commonly employed in the learning process carried out by teachers.

To understand more about the difficulties in learning about salt hydrolysis, interviews with students who have studied the process were performed. The interview's outcomes are as follows: (1) The concepts that have been researched about the definitions of "hydrolysis" and "salt hydrolysis", the types of hydrolyzed salts, the nature of the hydrolyzed salts,and the determination of pH; (2) Students have difficulties in determining weak acids, strong acids, strong bases, and weak bases, as well as writing salt hydrolysis reactions; however, students quickly comprehend determining pH, determining the natureof hydrolyzed salts, and types of hydrolyzed salts. (3) Overcoming difficulties in grasping the topic thatstudents face by practicing a large number of questions, watching learningvideos on *YouTube*, reading informationon the internet and textbooks owned bystudents, asking friends, and taking extra tutoring outside of school.

This salt hydrolysis material's learning design is divided into three stages. Introductory activities in learning design are related to the theory-based perception of acids and bases.Researchers motivate students by asking questions about salt examples ineveryday life. The core activity stages consist of stimulation (sharing task-1), problem statement (sharing task-2), data collecting (sharing task-3), data processing (sharing task-4), verification(sharing task-5), and jumping task.

In the sharing task-1 activity, students were requested to write down the practical work procedures based on the researcher's demonstration. Becausestudents were still confused when askeda question, the researcher suppliedguidelines on how to write a salt hydrolysis reaction, determine the nature of the hydrolyzed salt solution, and the type of salt hydrolyzed while sharing task-1. In the sharing task-2 activity, students are asked to formulate problems based on demonstrations that have been carried out by researchers onchemicals that will be used during practicum. The researchersdemonstrated using a salt solution of CH_3COONa, while in practicum students used a solution of NaCl (table salt), NH_4Cl, $NaHCO_3$ (baking soda), and CH_3COONH_4.

In task-3 sharing activities, students entered the breakout room fordiscussions through zoom meetings. Students carried out practical work at school with chemical solutions of NaCl(table salt), NH_4Cl, $NaHCO_3$ (bakingsoda), CH_3COONH_4, purple cabbage,and turmeric indicators and tools provided by researchers. Meanwhile, students who carried out practical workat home, used a solution of NaCl (table salt), $NaHCO_3$ (baking soda), purple cabbage indicator, and turmeric indicator which the researchers have instructed them to prepare beforehand. When carrying out the practicum, the researcher also took turns in each groupbreakout room to monitor the course ofthe practicum, as well as monitor the students who carried out the practicum at school. Monitoring is carried out by researchers to minimize the difficulties experienced by students.

Students were asked to determine the type of the hydrolyzed salt solution based on the written salt hydrolysis reaction in the sharing task-4 activity. Students have difficulty writing the salthydrolysis reaction and determining theanion and cation of the salt. Theresearcher provides instructions for determining the anions and cations that create salts and then providesinstructions for anions derived from strong acids or weak acids, and cations derived from strong bases or weak acids. When students have been given instructions, it will be easier for them towork on sharing task 4.

Students were expected to map the salt used in the lab to the acid-basecharacteristics of the solution and determine the type of salt that was hydrolyzed in the sharing task-5activity. Students were perplexed when establishing the nature of table salt sincethe pH they measured was 6, even though table salt has a pH of 7. Students were required to write down the acidic salt found in the fertilizer throughout the jumping task. Ifstudents struggle to determine what saltis in the jumping activity, the researcher suggests searching the internet for whatfertilizers are acidic, then looking for the pH and salt level of the fertilizer. Due to time constraints, the results of this jumping assignment were not presented in front of the class. As aresult, many students continue to respond to the jumping task in ways that the researcher did not anticipate.

Students were requested to concludeand deliver the salt hydrolysis information during the generalization stage. Due to lack of time, there was only one person who could provide conclusions based on his talks with group members and researchers. In the closing activity, theresearcher briefly confirmed the salt hydrolysis material. Because it was already 08.40 a.m., the researchersconcluded once again and included an explanation of the salt hydrolysis material. Learning was discovered to be student-centered following the deployment of the learning design. The graph below demonstrates this result.

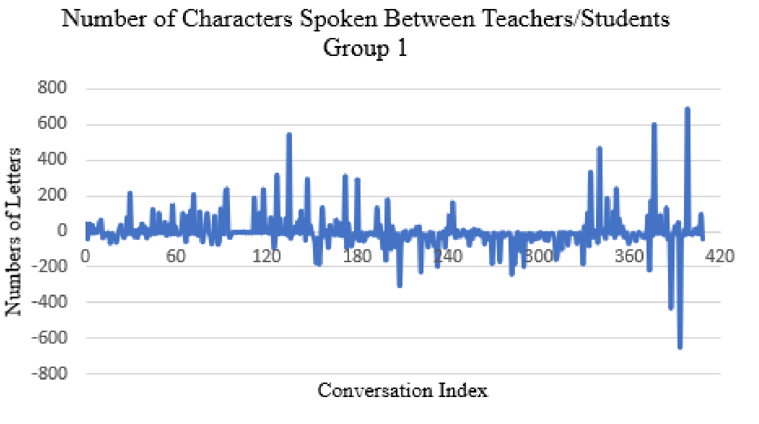

Figure 1. The Number of Characters Spoken Between Teachers/Students in Group 1

The graph represents the number of characters exchanged between students and teachers during the learning process. The graph shows the teacher who talks a lot, while the graph below represents the student who talks a lot. When the preliminary activity is between 1 and 94 on the conversation index, the teacher dominates speaking. Students talk a lot on a scale of 95 to 150. Students dominate indexes 151–156 because they address issues relatedto choosing the formulation of the problem. The practice of determining the properties of salt solutions dominates the indexes 157 to 280. At indexes 281 to 316, students are dominated by discussions related to sharing tasks-4. At indexes 317 to 348, students are still dominated by certain indexes in sharing tasks-5. At indexes 349 to 371, students are dominated by students, but several times the teacher gives explanations related to jumping tasks. The index 372 to 408 is dominated by the teacher because the teacher makes conclusions with students and confirms them.

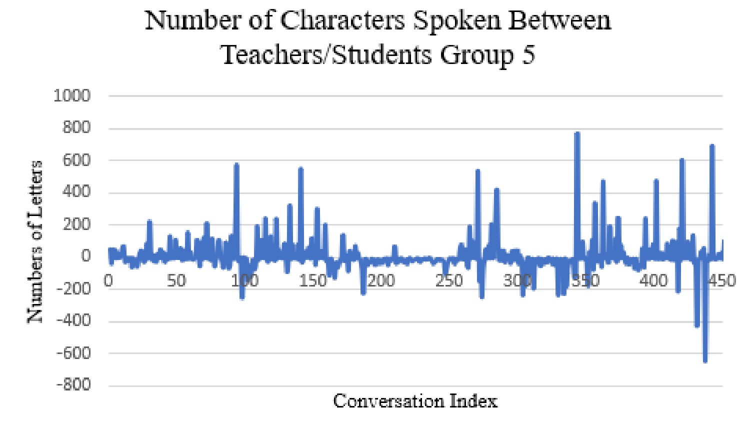

Figure 2. The Number of Characters Spoken Between Teachers/Students in Group 5

The teacher dominates speakingduring the introductory learningprocess, which occurs between conversation indexes 1 and 93. Many students speak on the index from 94 to 156. Students dominated indexes 157 to171 because they discussed deciding theformulation of the problem (shared task2), and students dominated indexes 172to 256 because they carried out practicum on establishing the properties of salt solutions (sharing task 3). Students dominate discussions about sharing task -4 at indexes 257 to 330. Students continue to dominate indexes 331 to 371, as well as the indexes 372 to 416. The teacher is dominated in speaking at the index 417 to 453 because the teacher draws conclusions and confirms them.

Even though the graph is slanteddownward, speaking is dominated bystudents. These findings suggest that learning leads to student centering, as indicated by the increased frequency ofstudents speaking during the learning process. The findings of the identification ofcollaborative skills in sharing task 1 aredepicted in the image below.

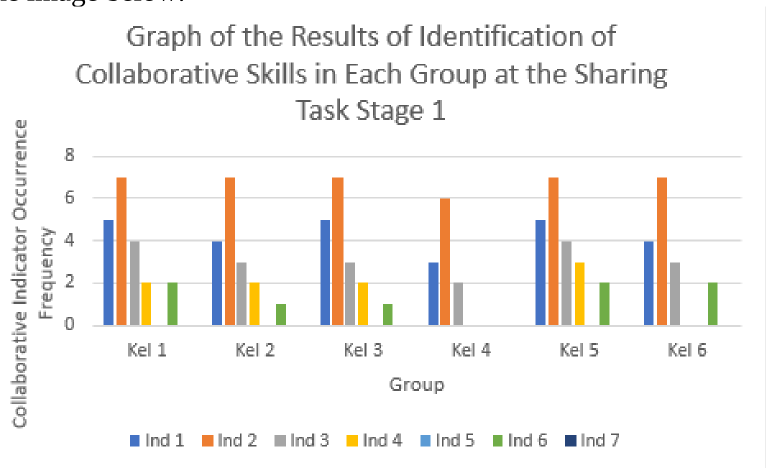

Figure 3. Graph of the Identification Results regarding the Collaborative Skillsin Each Group at the Stage of Sharing Task 1

The learning activities at the sharing task 1 stage show that the most identified collaborative indicators are group 5 for the five indicators. Indicator1 appears 5 times, indicator 2 appears 7 times, indicator 3 appears 4 times, indicator 4 appears 3 times, and indicator 6 appears 2. However, Indicator 5 and indicator 7 have not appeared on sharing task 1. This is because the teacher continues to dominate the learning process by demonstrating the determination of the acid-base characteristics of the salt solution and briefly explaining the salt's hydrolysis reaction to determine the nature and type of the hydrolyzed solution. The results of identifying collaborative skills in sharing task 2 areas follows.

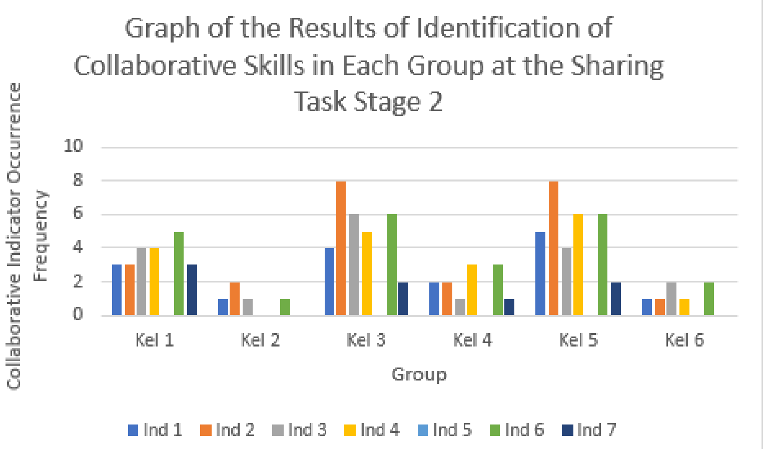

Figure 4. Graph of the IdentificationResults regarding the Collaborative Skills in Each Group at the Stage of Sharing Task 2

The learning activities at the sharing task 2 stage show that the most identified collaborative indicators aregroup 5 for the six indicators. Indicator 1 appears 5 times, indicator 2 appears 8 times, indicator 3 appears 4 times, indicator 4 appears 6 times, indicator 6 appears 6 times, and indicator 7 appears2 times. Since students are still workingon their LKPDs by discussing and writing about them, indicator 5 has not appeared in sharing task 2. As soon as students complete their practicum, Indicator 5 starts to appear.The outcomes of the collaborative skills sharing task 3 are as follows.

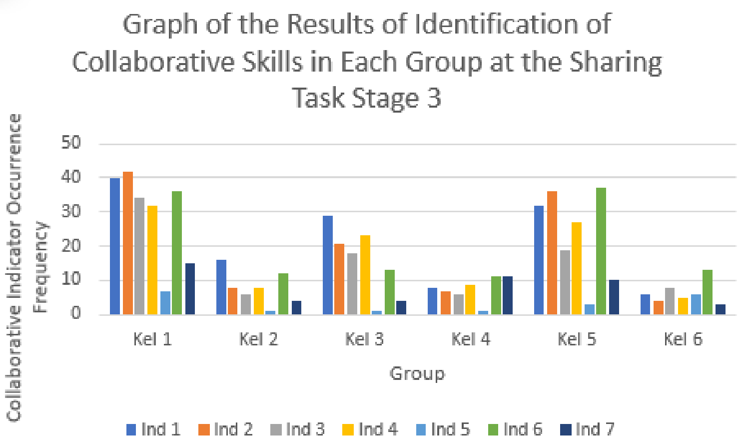

Figure 5. Graph of the IdentificationResults regarding the Collaborative Skills in Each Group at the Stage of Sharing Task 3

The learning activities at the sharing task 3 stage demonstrate that group 1 for the seven indicators is the most identified collaborative indicator. Indicator 1 appears 40 times, indicator 2 appears 42 times, indicator 3 appears 34 times, indicator 4 appears 32 times, indicator 5 appears 7 times, indicator 6 appears 36 times, and indicator 7 appears 15 times. As students begin to carry out practicum, indicator 5 appears in sharing task 3. The outcomes of the collaborative skills sharing task 4 are asfollows.

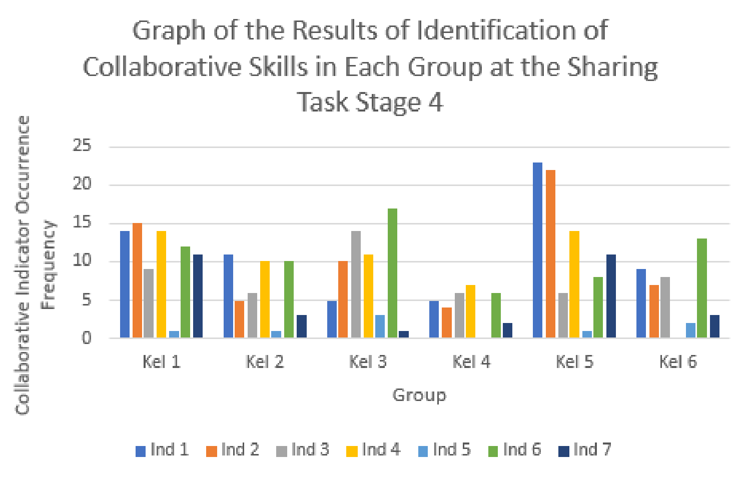

Figure 6. Graph of the Identification Results regarding the Collaborative Skills in Each Group at the Stage of Sharing Task 4

The learning activities at the sharing task 4 stage revealed that group5 for the seven indicators is the most identified collaboration indicator. Indicator 1 is shown 23 times, indicator 2 is shown 22 times, indicator 3 is shown 6 times, indicator 4 is shown 14 times, indicator 2 is shown once, indicator 6 is shown 13 times, and indicator 7 is shown 11 times. The outcomes of the identification of collaborative skills in sharing task 5 are as follows

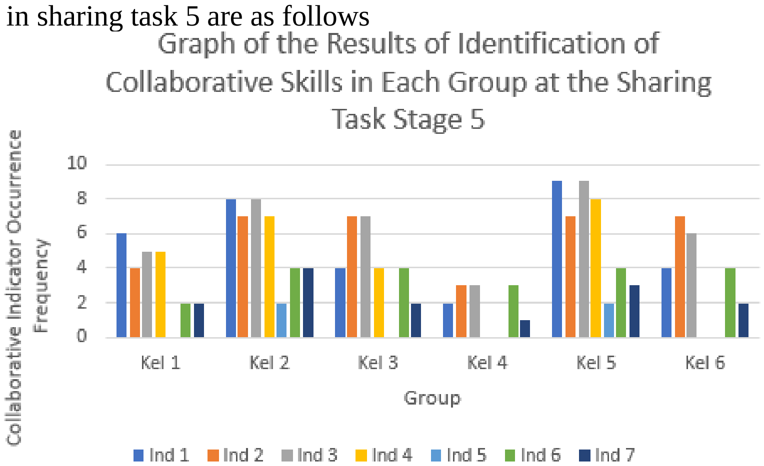

Figure 7. Graph of the Identification Results regarding the Collaborative Skills in Each Group at the Stage of Sharing Task 5

The most identifiedcollaboration indicators are group 5 for the seven indicators, according to learning activities at the stage of sharingtask 5. Indicator 1 appears nine times, indicator 2 seven times, indicator 3 ninetimes, indicator 4 eight times, indicator 5 twice, indicator 6 four times, and indicator 7 three times. The findings of theidentification of collaborative skills in the jumping task are presented in the graph below.

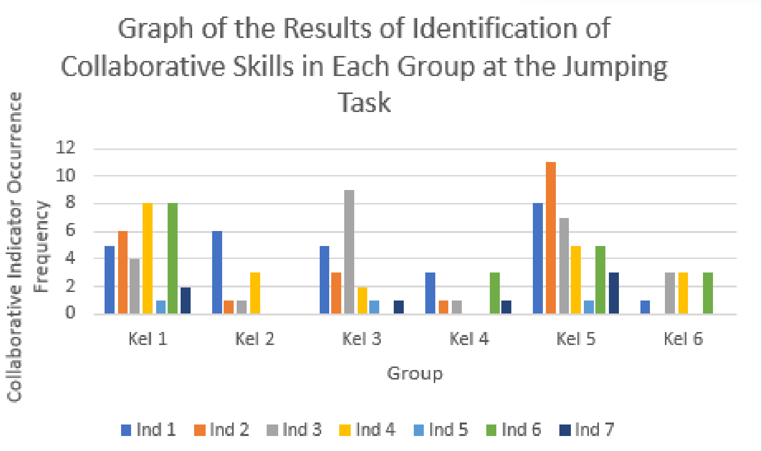

Figure 8. Graph of the IdentificationResults of Collaborative Skills in Each Group at the Jumping Task Stage

Learning activities at the jumping task stage show that the most identified collaborative indicators aregroup 5 for the seven indicators. Indicator 1 appears 8 times, indicator appears 11 times, indicator 3 appears 7 times, indicator 4 appears 5 times, indicator 5 appears 1 times, indicator 6 appears 5 times, and indicator 7 appears3 times.

As indicated by the learning profile of students based on the LKPD, the analysis of collaborative skills insharing activities and jumping tasks is quite good. Those who participate in PTMT learning provide better answers than students who participate in online learning. The number of students who received the highest score from sharingtask 1 to sharing task 4 was B (not fulfilling the keyword), however, thenumber of students who received the highest score from sharing task 5 and jumping task was C (not meeting the keyword, but provide the answers).

CONCLUSION

The following conclusions are reached as a result of the findings and discussion in this research.

1. Design of sharing and jumping task learning on the topic of salt hydrolysis is obtained using natural ingredient indicators to develop students' collaborative skills based on an analysis of salt hydrolysis concepts in chemistry textbooks and ebooks, and analysis of lesson plans and teaching materials used by teachers and students, and an analysis of interview results from teachers and students. Student situations/issues/problems, predictions of student answers, and anticipation/teacher assistance comprise the learning design. This learning design is devided into three stages: preliminary activities that discuss Arrhenius' concepts of acids and bases, determination of strong acids, weak acids, strong bases, and weak bases, comprehension of neutralization reactions, and motivations related to the benefits of salt hydrolysis in everyday life. The very next stage includes core activities related to sharing task1 (writing down the stages ofwork to determine the acid-baseproperties of salt solutions and observations based ondemonstrations made by theteacher), sharing task 2 (formulating problems based ondemonstrations), sharing task 3 (doing practical work and writing down observations), and sharing task 4 (writing the salt hydrolysis reaction andanalyzing the nature and types ofhydrolyzing), sharing task 5 (presenting the results of the practicum), jumping task (finding salt in acidic fertilizers) and closing activities.
2. Three stages, namely preliminary activities, coreactivities (sharing and jumping tasks), and closing activities, make up the outcomes of theimplementation of the sharingand jumping task learning design. Students are actively involved in each learning activity during the implementation process,including writing practical worksteps (sharing task 1), formulating problems based on demonstrations that have been performed (sharing task 2), conducting practicum, and writing observational data (sharing task 3), determining thenature of the salt solution based on the salt hydrolysis reaction (sharing task 4), and presenting the practicum results by mapping the chemicals in the practicum used with the nature of the hydrolyzed salt solution aswell as the type of hydrolyzed salt and determining the salt in acidic fertilizers (jumping task).Many students actively engagedin

conversation with one anotherin their groups, between groups,and with the teacher throughout the learning process. Based on the implementation's results, it can be said that learning is oftenstudent-centered. This isbecause, as is evident from the graph of the number of characters spoken between teachers and students, speaking by students dominates the learning process. Despite the fact that the student characters on the graph are shorter than theteacher. In this case, teachers utilize high-quality graphics to explain and guide learning.

3. The profile of students' collaborative skills that improveas a result of the implementationof the learning design's sharing task and jumping task on sharingtask 1, sharing task 2, andsharing task 3 are indicator 2, sharing task 4 is indicator 1, sharing task 5 is indicator 1 and indicator 3 and the jumping task is indicator 2.

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