Journal of Engineering Science and Technology
Vol. 16, No. 2 (2021) 1311 - 1318

TEACHING MAKING DISHWASHING LIQUID TO INTRODUCE CHEMICAL TECHNOLOGY TO THE DEAF COMMUNITY

RILA MUSPITA[1,2], SYIHABUDDIN[1], ACHMAD HUFAD[1], ASEP BAYU DANI NANDIYANTO[1,*], RENO FERNANDES[4], AMIN AKBAR[5], TRYASTUTI IRAWATI BELLINY MANULLANG[1]

[1]Universitas Pendidikan Indonesia, Jl. Dr. Setiabudhi no 299, Bandung, 40154, Indonesia
[2]Universitas Negeri Padang, Jl. Prof. Dr. Hamka Air Tawar Padang, Indonesia
[2]Jurusan Psikologi, Universitas Negeri Padang
*Corresponding Author: nandiyanto@upi.edu

Abstract

The purpose of this research is to teach the deaf community to make dishwashing liquid soap to introduce applied chemical technology. Learning to make dishwashing liquid for the deaf community is not only improving their soft skills but also necessary to provide knowledge and understanding of the theory of applied chemistry. This research used pre-experimental one group pretest-posttest design method with eight subjects from the deaf community. Several steps were taken including providing a pretest, watching two videos that duration of 1 minute 26 seconds and 9 minutes 57 seconds using sign language, doing the posttest, and comparing the pretest and posttest. The results showed that deaf community understood that soap is a part of applied chemical technology. They could follow the steps learned and could make dishwashing liquid. The issue of learning for the deaf is not dependent on the simple or difficult materials given. The hypothesis that chemistry learning is difficult for deaf people to understand is likely to begin setback if the strategy can be modified to be as efficient as possible. Applied chemistry technology can be taught to deaf communities through video media using sign language adapted to the signs used on a daily basis.

Keywords: Chemical technology, Deaf community, Dishwashing liquid, Teaching

1. Introduction

Applied technology training is useful in society and can develop into products [1]. The deaf community can learn applied chemical technology so that natural materials can be converted into useful products. One of the chemical technologies that deaf community can learn is making dishwashing liquid. Learning how to make soap dishes for deaf is not just about improving soft skills, but also about having information and understanding of the principle of the activities conducted. The goal is to ensure that deaf people no longer consider chemistry to be a difficult subject to understand.

Several studies for deaf focus on improving soft skills by analyzing the effectiveness of video tutorials to improve skills in making snack bouquets for deaf children [2], vocational skills development models with an apprenticeship in home industries for deaf children [3], and the implementation of career guidance for deaf child labor distribution [4]. This study indicates that giving soft skills to the deaf has not supplemented by knowledge and understanding. So, it is necessary to study the knowledge and cognitive of deaf regarding the science that applies to daily life, in which this becomes the main objective in this study. One of which is making dishwashing liquid. In addition to improving soft skills and producing products, we also need to introduce applied chemical technology to the deaf community.

Teaching knowledge and understanding for deaf people can be achieved by modifying methods, strategies, and media. This can be conducted by using video media using sign language. Video media with sign language enables deaf people to receive complete information. Science learning media for children with special needs is specifically designed to develop their potential and abilities [5]. The advantages of video media are used as a way of receiving and transmitting complete messages by displaying objects, positions, and events with moving images in a comprehensive way [6]. In addition, consideration is given to choosing video media based on a willingness to provide a more concrete description in order to draw the attention of the subject [7].

2. Logical Framework

Dishwashing liquid is one of the applied chemical technologies with the following chemical reactions as shown in Fig. 1.

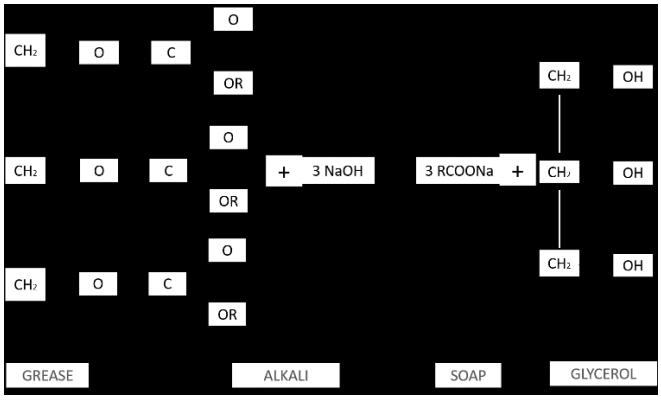

Fig. 1. Soap formation reaction.

Soap is an alkaline salt of fatty acids and is produced according to the reaction of fatty acids [8]. The soap formation reaction produces soap as the main product and glycerol as a by-product [9]. Soap is formed through a reaction between alkaline oil (which produces soap) and the alkalis (used are NaOH and KOH) [10]. Using KOH produces a softer and more liquid soap [11].

3. Research Method

This study used pre-experimental one group pretest-posttest design method means that the study does not have a control group [12]. This study only used pretest-treatment-posttest. The subject of this study were eight people from the deaf community. There were only eight subjects because the number of people with hearing impairments is limited. There were four steps taken during the experiment, which are providing a pretest on understanding, giving two videos, namely an introduction to applied chemical technology with a duration of 1 minute 26 seconds and a video tutorial for making dishwashing liquid with a duration of 9 minutes 57 seconds using sign language, doing the posttest, and comparing the pretest and posttest results.

Data collection of knowledge and cognitive is quantitative. Data collection about knowledge using the scoring rubric where "Yes" gets 1 point, and "No" gets 0. Meanwhile, for the cognitive scoring system, for each correct answer the value is 2, and the wrong answer gets 1, no answer gets 0.

The knowledge questions as follows:

1) Do you know what soap is?
2) Have you ever made dishwashing liquid?
3) Do you know what ingredients needed to make dishwashing liquid?
4) Do you know the tool for making dishwashing liquid?
5) Does making soap require salt?
6) Is Sodium Chloride salt?

Meanwhile, for understanding data, the questions are:

1) Name 2 examples of soap!
2) What is the soap formation reaction called?
3) Is soap a chemical industry?
4) Name examples of the chemical industry!
5) What are the ingredients for making dishwashing liquid soap?
6) What are the tools needed for making dishwashing liquid soap?
7) What is another name for Sodium Chloride?
8) What is the name of the substance that removes dirt?
9) What is the name of the foaming agent for soap?
10) What is the name of the substance to make the beast into tiny bubles?

Furthermore, to see the output of the products made by the subject, we observed the activity videos created by the subject, which are given. In short, the illustration of the making dishwashing liquid process is shown in Fig. 2.

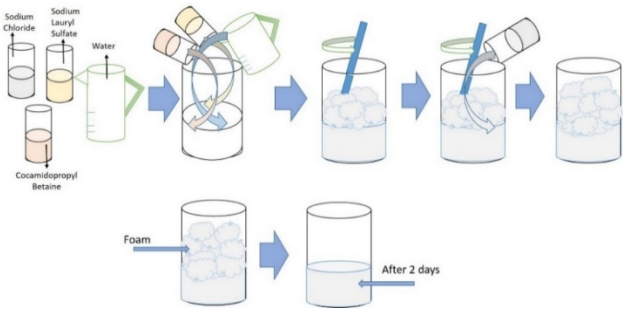

Fig. 2. Making Dishwashing Liquid Process

4. Results and Discussion

4.1. Experimental result

Soap is an alkaline metal material with a long acid chain. In this process, the fatty acids will be hydrolyzed by alkalis to form glycerin and soap [13]. In general, soap making based on alkaline hydrolysis and saponification reactions [14]. As shown in the following reaction:

$$C_3H_5(OOCR)_3 + 3NaOH \rightarrow 3NaOOCR + C_3H_5OH \quad (1)$$

(Glycerol) (Sodium hydroxide) (Soap)

The making soap in this experiment using anion-type surfactants, namely Sodium Lauryl Sulfate (SLS) and Cocamidopropyl betaine. Mixing SLS, Cocamidopropyl betaine, and water create a foamy and watery mixture. Meanwhile, to make the concentration thick, sodium chloride was added. The substance used as a thickener is electrolyte salts such as sodium chloride [15]. Sodium chloride is the essential substance to thicken the soap [16]. The following chemicals used is shown in Fig. 3.

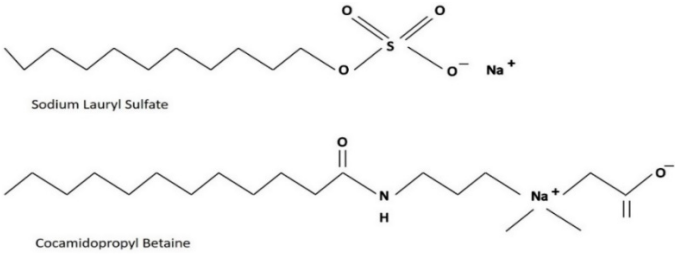

Fig. 3. Chemical structure of the foaming agents in dishwashing liquid.

One side of the of sodium lauryl sulfate and Cocamidopropyl betaine structure is hydrophobic which is in the form of carbon chains while the other side is hydrophilic. The hydrophilic side will be approximated by Na+ or sodium chloride.

4.2. Demographic Data

This study examined eight deaf people with an age range of 20 to 50 years who were members of the deaf community Gerakan untuk Kesejahteraan Tunarungu Indonesia (GERKATIN); Movement for the Well-Being of Deaf Indonesians with 70-100 dB loss of hearing. This condition is classified as severe based on the World Health Organization international standard classification in 2005, namely mild hearing

impairment ranging from 20-40 dB, moderate 41-55 dB, moderately severe 56-70 dB, severe 71-95 dB, and very severe above 95 dB [17]. Subjects do not use hearing aids, so they communicate using sign language. The sign language used is Indonesian Sign Language (BISINDO). BISINDO is used more by deaf people than other sign languages [18]. In order to provide information to deaf people with disabilities, it is given visually and clarified through sign language aids [19].

4.3. Knowledge of applied chemical technology

Table 1 describes the initial conditions for the subject's knowledge of applied chemical technology. Eight subjects consisting of WG, DD, AF, CN, LF, SN, NH, and RU have different initial abilities. WG answered questions with a score of up to 60%, DD got a score of 50%. AF with a score of 20%, CN got a score of 60%, LF with a score of 60%, SN with a score of 60%, NH with a score of 40% and RU with a score of 40%.

Table 1. Comparison of the pretest and posttest result of the subject.

No.	Subject	Before Giving Experimental Demonstration	After Giving Experimental Demonstration
1	WG	60%	100%
2	DD	50%	100%
3	AF	20%	100%
4	CN	60%	100%
5	LF	60%	80%
6	SN	60%	100%
7	NH	40%	80%
8	RU	40%	60%

After explaining through video using sign language, there are differences in the subject's knowledge of applied chemical technology (see Table. 1). WG answered questions with a score of 100%, DD got a score of 100%. AF with a score of 100%, CN got a score of 100%, LF with a score of 80%, SN with a score of 100%, NH got a score of 80% and RU got a score of 60%.

4.4. Teaching Process

Table 2 explains the comparison of the subject's understanding of applied chemical technology and the introduction of dishwashing liquid. Data in the initial conditions, the subject got varied scores, namely 2, 1, and 0. While after learning almost no subject got 0. However, for theoretical questions such as “What is the soap formation reaction called?”, “What are the ingredients for making dishwashing liquid soap?”, “What is the name of the substance that removes dirt?”, “What is the name of the foaming agent for soap?”, and “What is the name of the substance to make the beast into tiny bubbles?” the subjects moderately made mistakes in answering the questions. This is affected by the limited language skills associated with conceptual reading comprehension that deaf people have. The impact of deafness is the obstruction of verbal/oral communication, both expressively (speaking) and receptively (understanding other people's speech) so that it also has an impact on the education and learning process for deaf disabilities [20].

Simple questions as in Table 2 are "name 2 examples of soap", "Is soap a chemical industry", and "name examples of the chemical industry". Furthermore, the questions in Table 1 with the answer "yes" or "no" with an average deaf disability almost get a perfect score.

Apart from the knowledge and understanding that learning in this study resulted in dishwashing liquid products. Deaf people can follow the steps in video 2 that the researcher gave. The dishwashing liquid is successfully made and can be used.

Therefore, we can observe that the problem of learning for deaf disabilities does not lie in the ease or difficulty of the learning materials provided. However, the method of delivery should be made as simple as possible so that it is easily understood by deaf people. Additionally, the process of conveying information must be concrete and contextual [21-23]. The assumption that chemistry learning is difficult for deaf people to understand is likely to begin to setback if the delivery strategy can be changed to be as simple as possible.

Table 2. Comparison of subjects.

No.	Question	Subject							
		LF		SN		NH		RU	
		Wo	W	Wo	W	Wo	W	Wo	W
1	Name two examples of soap!	2	2	2	2	2	2	2	2
2	What is the soap formation reaction called?	0	2	0	2	0	2	0	2
3	Is soap a chemical industry?	2	2	2	2	2	2	2	2
4	Name examples of the chemical industry!	1	2	1	2	2	2	1	2
5	What are the ingredients for making dishwashing liquid soap?	0	2	0	2	0	2	0	2
6	What are the tools needed for making dishwashing liquid soap?	0	2	0	2	0	2	0	2
7	What is another name for Sodium Chloride?	2	2	2	2	0	2	2	1
8	What is the name of the substance that removes dirt?	1	2	1	2	0	2	1	1
9	What is the name of the foaming agent for soap?	1	2	1	1	0	1	1	1
10	What is the name of the substance to make the beast into tiny bubbles?	1	2	1	1	0	1	1	1

Table 2. (continued).

No.	Question	WG		DD		AF		CN	
		Wo	W	Wo	W	Wo	W	Wo	W
1	Name two examples of soap!	2	1	2	2	2	2	2	2
2	What is the soap formation reaction called?	0	1	2	2	1	2	2	2
3	Is soap a chemical industry?	2	1	2	2	2	2	2	1
4	Name examples of the chemical industry!	1	2	1	2	1	1	1	1
5	What are the ingredients for making dishwashing liquid soap?	0	2	1	2	1	2	1	1
6	What are the tools needed for making dishwashing liquid soap?	0	1	1	2	1	2	1	1
7	What is another name for Sodium Chloride?	0	1	1	2	1	2	1	1
8	What is the name of the substance that removes dirt?	0	1	1	2	1	1	1	1
9	What is the name of the foaming agent for soap?	1	1	1	1	1	1	0	1
10	What is the name of the substance to make the beast into tiny bubbles?	1	1	0	2	1	1	0	1

5. Conclusion

The results show that deaf community understand that soap is part of applied chemical technology, follow the steps learned, and could make dishwashing liquid. Applied chemistry technology can be taught to deaf communities with video media using sign language which is adapted to the daily used signs.

Acknowledgements

We would like to acknowledge Sekolah Pasca Sarjana Universitas Pendidikan Indonesia and Universitas Negeri Padang for supporting this research. We would also like to thank GERKATIN Padang for assisting this experiment.

References

1. Salamah, S.; Sulistiawati, E.; and Aktawan, A. (2018). Pelatihan teknologi kimia terapan pembuatan sabun cair cuci piring, sabun mandi herbal dan tepung ampas kelapa ibu-ibu 'aisyiyah ranting Perumnas Condong Catur, Depok, Sleman. *Jurnal Pemberdayaan: Publikasi Hasil Pengabdian Kepada Masyarakat*, 1(2), 465-472.
2. Aulia, C.R.; and Marlina, M. (2019). Efektivitas video tutorial untuk meningkatkan keterampilan membuat snack bouquet pada anak tunarungu. *Ranah Research: Journal of Multidisciplinary Research and Development*, 1(4), 1045-1051.
3. Hidayat, D.S.; Rakhmat, C.; Fattah, N.; Rochyadi, E.; Nandiyanto, A.B.D.; and Maryanti, R.; (2020). Understanding Archimedes law : What the best teaching strategies for vocational high school students with hearing impairment. *Journal of Technical Education and Training*, 12(1), 229-237.
4. Anggara, E.B.R. (2019). Studi deskriptif implementasi bimbingan karir terhadap penyaluran tenaga kerja anak tunarungu pasca SMALB. *Jurnal Pendidikan Khusus*, 11(1), 1-15.
5. Fajrie, N.; and Masfuah, S. (2018). Model media pembelajaran sains untuk anak berkebutuhan khusus. *Bagimu Negeri: Jurnal Pengabdian Kepada Masyarakat*, 2(1), 9-19.
6. Pribadi, B.A. (2017). *Media dan teknologi dalam pembelajaran.* Jakarta: Prenada Media.
7. Nurdin, S.; and Andriantoni. (2016). *Kurikulum dan pembelajaran.* Jakarta: Rajawali Pers.
8. Sukeksi, L.; Sidabutar, A.J.; and Sitorus, C. (2017). Pembuatan sabun dengan menggunakan kulit buah kapuk (ceiba petandra) sebagai sumber alkali. *Jurnal Teknik Kimia USU*, 6(3), 8-13.
9. Fatoni, R.; and Fatimah, S. (2017). Pengembangan Ekonomi Kreatif Melalui Pembuatan Sabun Cair; Sebuah Upaya Pemberdayaan Anggota Aisyiah Di Wilayah Solo Raya. *Proceeding The 6th University Research Colloquium*, Magelang: 9 September 2017, 149-152.
10. Widyaningsih, S.; Chasani, M.; Diastuti, H.; and Rahmayanti, E. (2019). The storage time on the characteristic of liquid dishwashing liquid from nyamplung seed oil (Calophyllum inophyllum L) and its antibacterial activity. *IOP Conference Series: Materials Science and Engineering*, 509(1), 1-7.

11. Sari, T.I.; Kasih, J.P., and Sari, T.J.N. (2010). Pembuatan sabun padat dan sabun cair dari minyak jarak. *Jurnal Teknik Kimia*, 17(1), 28-33.
12. Yusuf, A.M. (2016). *Metode penelitian kuantitatif, kualitatif & penelitian gabungan*. Jakarta: Prenada Media.
13. Amalia, R.; Paramita, V.; Kusumayanti, H.; Wahyuningsih, W.; Sembiring, M.; and Rani, D.E. (2018). Produksi sabun cuci piring sebagai upaya peningkatkan efektivitas dan peluang wirausaha. *Metana: Media Komunikasi Rekayasa Proses dan Teknologi Tepat Guna*, 14(1), 15-18.
14. Onyegbado, C.O.; Iyagba, E.T.; and Offor, O.J. (2002). Solid soap production using plantain peel ash as source of alkali. *Journal of Applied Sciences and Environmental Management*, 6(1), 73-77.
15. Kurniawati, Y., Wardoyo, S.E.; and Arizal, R. (2017). Optimasi penggunaan garam elektrolit sebagai pengental sampo bening cair. *Jurnal Sains Natural*, 5(1), 30-41.
16. Sumanto; Ruwana, I.; Widodo, B.; and Sudiasa, N. (2018). Pembuatan sabun di desa torongrejo kota batu. *Industri Inovatif: Jurnal Teknik Industri*, 8(2), 43-46.
17. Chen, Y.; Lu, Y.; Kuyaxi, P.; Cheng, J.; Zhao, J.; Zhao, Q.; and Yuan, H. (2018). Identification of pathogenic genes of nonsyndromic hearing loss in Uyghur families using massively parallel DNA sequencing technique. *Disease Markers*, 2018, 1-9.
18. Handhika, T.; Zen, R.I.M.; Lestari, D.P.; and Sari, I. (2018). Gesture recognition for Indonesian Sign language (BISINDO). *Journal of Physics: Conference Series*, 1028(2018), 1-8.
19. Swanwick, R. (2017). Translanguaging, learning and teaching in deaf education. *International Journal of Multilingualism*, 14(3), 233-249.
20. Hernawati, T. (2007). Pengembangan kemampuan berbahasa dan berbicara anak tunarungu. *Jurnal JASSI_anakku*, 7(1), 101-110.
21. Susialita, T. (2016). The development of audio-visual student portfolios (LKS) contextual teaching and learning-based (CTL) on sound chapter of science subject for deaf students. *Jurnal Pendidikan IPA Indonesia*, 5(2), 192-198.
22. Maryanti, R.; Hufad, A.; Sunardi; and Nandiyanto, A.B.D. (2020). Understanding Covid-19 particle contagion through aerosol droplets for Students with special needs. *Journal of Engineering Science and Technology* (*JESTEC*), 15(3), 1909-1920.
23. Maryanti, R.; Hufad, A.; Sunardi; Nandiyanto, A.B.D.; and Manullang, T.I.B. (2020). Understanding coronavirus (COVID-19) as a small particle to students with special needs. *Horizon*, 2(1), 121-130.