Research Article

REVEALING OF PERCEPTIONS, CONCEPT MASTERY AND ACTION OF CHEMISTRY TEACHERS' TOWARDS PROBLEMS OF PLASTICS DEBRIS

[1,*]Jeckson Siahaan, [1]Supriadi and [2]Zulhan

[1]Chemistry Education Study Program, Faculty of Teacher and Training, University of Mataram, Indonesia
[2]Faculty of Mathematics and Natural Sciences, University of Mataram, Indonesia

Abstract

This research aims to reveal the perceptions, concept mastery and respondent action on micro plastics toward plastics in their surroundings. The subject of this research is chemistry teachers (n = 42) and university prospective teachers (n = 60) from Mataram city and suburb, Lombok Island Indonesia. The study focus on microplatics, including discussion about the definition, awareness, man and seawater biota health problem and chemistry concept. The data gained were analyzed by using descriptive-statistics. In this research, mix of qualitative-quantitative descriptive methods were implemented (conducted in two sessions of online learning) and observation offline meeting to do assessment that used instruments such as essay test, questionnaire sheets and CCTV recording in order to collect data. Our results show that the lesson was well received by teachers and student teachers, who also thought it was fascinating and positive. Respondents' understanding was boosted by incorporating different viewpoints on microplastics. From this work, we expect some of them will be ready to be hero/heroines to battle plastics debris due to reach zero plastics waste.

Keywords:

INTRODUCTION

Plastic waste is a serious problem globally since few years ago because one of its properties such chemically undegradable. This is followed by increasing of production of plastic materials from year to year and as a consequence increasing of plastic waste in our ecosystem because of the less understanding of society about its danger impact to our life and also because of mismanagement in plastic waste issue[1]; [2]; [3]. Increasing of utilization of plastics products cause increasing in production of plastics debris from year to year, As a figure, consumption of plastics in Indonesia reach 10 kg per capita per year, so we can predict how huge the plastics debris could be produced [4-6]. The volume of production and utilization of plastics materials do not followed by good waste management and suitable, such implementation of 3R/4R in a strike way, so this causes accumulation of plastics debris in ocean environment [7]. As a consequence of this issue, the accumulation of microplastics raise significantly. Far more, we can find microplastics in all parts of sea water column even in the sediment over the world. Another impact of microplastics on our life environment is that the microplastics, by weathering processes, could decompose building block of polymer to give CO_2 to sea water environment and directly disturb the equilibrium of CO_2 atmospheric and sea water. This has strong relation with global warming. It means, sea water is now role as a source of CO_2 to atmosphere. At the meanwhile, plastics debris in the ocean are dominated by plastics that come from runoff or landfill via rivers[8]. Surely, this happens because of the less/low literation of society about the impact of waste on environment. Refers to assumption of Environmental Ministry, every day an Indonesian produces about 0.8 kg wastes include plastics waste; if we calculate there are 189,000 tons of wastes per day.

Apart of the total these wastes are directly through out to aqua environment and eventually end in the ocean. The results of research which has conducted by [9]. ; Indonesia could not manage plastics waste at all. Of 3.8 million tons of plastics waste, 3.2 million tons end in the ocean every year. In another place, study by UNEP in 2015 said that the world produced as 280 million tons various plastics products for various utilization, and of this number only a little was recycled[10]. The most important point we have to understand why this problem happens massively. Let's back to our life style in this era. Almost everybody in the world relates to plastics products in daily life activities. Plastics become important component in our modern life right now and plastics have been replacing the role of wood and metals because of their good properties such as light and strong, corrosive resistant, transparent and easy to be colored, and also show as a good enough insulation. To emphasize this issue, we have to know that plastics waste is very danger to life ecosystem (sea, land, and atmosphere). According to Clean Water Action, about 267 species had been experienced bad impact of plastics waste, they were 86% of sea turtles, 44% sea birds, and 43% sea mammal. These sea species died because of choked, hungry, infection even sink. For examples, in 2010, a gray whale (Eschrictiusrobustus) has found died in coastal area Puget Sound, Washington, USA. After autopsy, it was found some unbelievable things in its stomach such as hot pant, golf ball, more than 20 pieces of plastic bags, small towel, cellophane tape, even operation glove. About two years ago, it was also found the same thing in Thailand where a sperm whale died on the beach and in its stomach was pound some kilograms of various kind of plastic waste. In the same year, some months after, it was found a sperm whale died on the beach in Wakatobi, South West Sulawesi and its stomach was filled by more than 5 kg of plastics waste from various types [11]; [12]. Currently, microplastics are the real problems in our environment and our life actually. When degradation processes of macro plastics into micro plastics were undergoing, there were emitting of some additive compounds to surrounding. It

Corresponding Author: Jeckson Siahaan,
Chemistry Education Study Program, Faculty of Teacher and Training, University of Mataram, Indonesia

is devastated, when microplastics reach chain food in seawater; microplastics could be ingested by biota in seawater such as fishes and eventually beingconsume by human. This could be happened because sea water biota (for example, fishes) think that microplastics are their pray (miss feeding) or could not distinguish microorganisms from microplastics. This becomes one of bad impacts of microplastics on our life; even we can say danger[13-18]. Many sources of microplastics that are contaminant environment have been identified, some origin from big size plastics degradation, like bag and food packaging, or microplastics which is produced for special utilization, for examples, abrasive or as additive ingredient in cosmetics, such as microbeads that function as scrubbing for skin [25], [26]. Another important source of microplastics is laundry of clothing or apparel or outfit which are made from synthetic fibers and or mixing of natural and synthetic fibers, both from manual and laundry machines in domestic society or in laundry business and or from synthetic clothing industry [27]; [28]; [29]. Washing of materials made from synthetic fibers as a source of microplastics pollution. He said that "one single garment can release more than 1900 microplastics fibers for every washing and that all garment release more than 100 microplastics fibers per liter waste water from laundry[30].

Microplastics emission caused by washing process of synthetic fibers found as one of primary sources of microplastics and contributed about 35% of microplastics emission in the sea water. The first synthetic fibers that were noted from clothing that washed in washing machine had been found in mud sedimentation and its products and in waste water treatment. Then, microplastics were detected in various samples which were collected from beaches and estuary and sediment sub-tidal in UK. However, the first study that clearly showed how washing synthetic clothing caused microplastics pollution was one of Browne et al. Through forensic analysis for microplastics taken from sediment that collected from all over beaches in the world (Australia, Oman, Chile, Philippines, Portugal, USA, Mozambieq, UK and many more), microplastics were found in proportion of polyesther, and acrylic are used in clothing same with the proportion that was found in waste contaminated habitat.

Some biological factors can increase bioavailability of microplastics for ocean organisms: various densities of microplastics lead microplastics could be find different areas in the water column and benthic sediment. When microplastics interact with planktonic and particles of sediment, both suspension and deposit feeders can get risk accidentor selectively ate sea debris. However, the relative impact seem variety in spectrum of particles size of microplastics in relation with affected organisms which depends on the size of microplastic particles[31]. Microplastics in upper end spectrum with size (1 – 5 mm) are most probable to be eaten and digested by sea biota. For example, [32] have isolated pellet and fragments from sea bird's stomach. Particles with size <20 μm are actively eaten by small invertebrates [29], but they then excreted it [33]. [34] studied that nanoparticles size can be translocate and the simulation model indicates that polystyrene nanoparticles can be sorb into lipid membrane of organisms leads to change the structure of membrane and protein membrane activities, so the cell function will be changed too [35]. If this happens continued, so there will be some probability consequences, such as annihilation/extinction of some sea biota both microbiota and its bigger predators, include fishes.

Chemistry teachers in Senior High School have students (teenagers) who are very important to be filled with knowledge of this issue in order to reach zero (plastics)waste. This position is very strategic regarding to spread some efforts to solve this issue. So, the Chemistry teachers can be said as an agent of change to make this world free from plastics waste. Undoubtedly, if they seriously to do this, we can say that they are "hero"/"heroine" of plastics waste and need to be supported and appreciated highly.

METHODS

This descriptive research aims to reveal the relation among comprehension learning materials about (micro)plastics, picking answer for questionnaire regarding to (micro)plastics, and taking action of respondents toward plastics debris in their surrounding by implementing ofexpository and observation methods. Research method applied expository online lecture learning approach and observation method used questionnaire sheets and CCTV due to collect data about: a) the comprehension of respondents on (micro)plastics learning material and its impact on our whole life, b) choosing answer of questionnaire regarding to comprehension learning material about (micro)plastics, and c) taking action of respondents toward (plastics)debris in their surrounding.

Firstly, for comprehension is conducted through two sessions of online lecture (cause of pandemic covid-19) followed with essay test. Secondly, for picking of answer for questionnaire is done with questionnaire sheets, and the thirdly for taking action is conducted in a space that had been set with some debris and waste bins in some spots where the respondents sit and with CCTV, so we can find the real situation of respondents' action naturally. The two last activities have been conducted through offline way with straight rules of pandemic conditions. Sample of this research is 102 respondents which consist of thirty male respondents and seventy two female ones. Next, each gender of respondents consist of eighteen male chemistry teachers and twelve male students. Female respondents consist of twenty four female chemistry teachers and fourtheyeight chemistry students. All teachers are alumni of Chemistry Education Study Program, the Faculty of Teacher and Training, The University of Mataram who are distributed randomly in Senior High Schools in Mataram town and suburb. At the meanwhile, all students are actively studying in Chemistry Education Study Program, the Faculty of Teacher and Training, The University of Mataram

RESULTS AND DISCUSSION

Here is the result of essay test for comprehension of learning material of microplastics that coverage definition, impacts and danger of micro plastics on our life such in air, landfill, and aquatic ecosystem (ocean). Based on the results of data essay test of 102 respondents, it is found that as 23.5% (24 respondents) of them are categorized very understand, 58% (59 respondents) understand enough, 18.6% (19 respondents) less understand, and 0% do not understand at all. Figure 2 shows the results of essay test. Score <25 is categorized "do not understand at all", 25 – 59 is less understand, 60 – 75 is understand enough, and > 75 is categorized very understand.
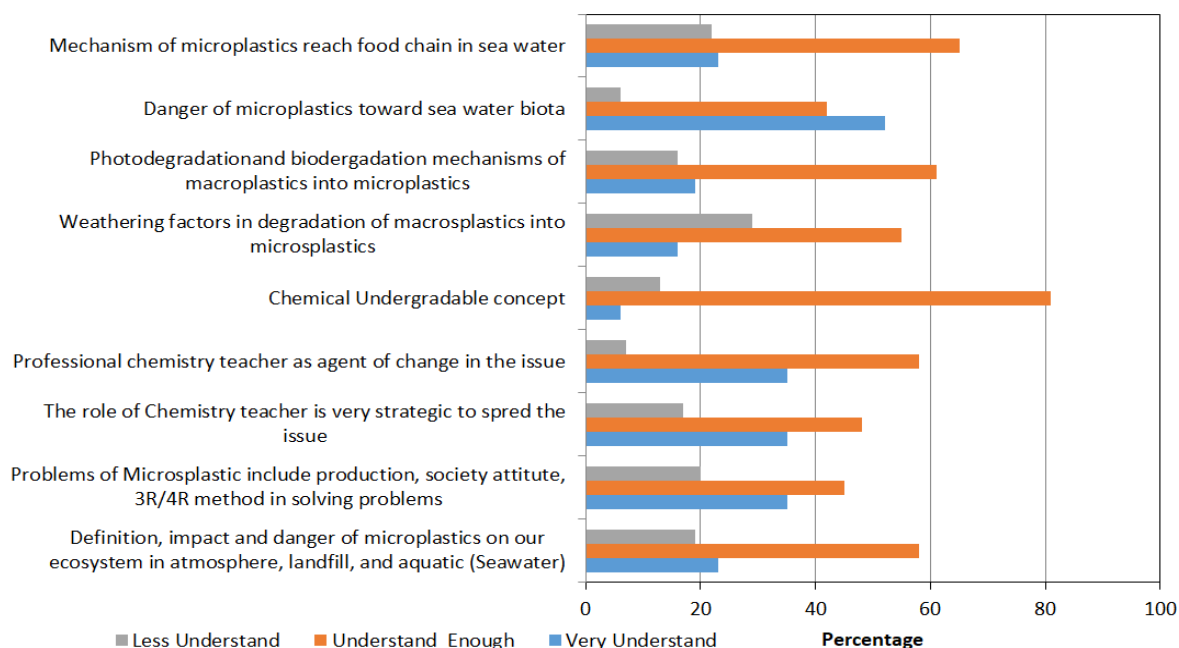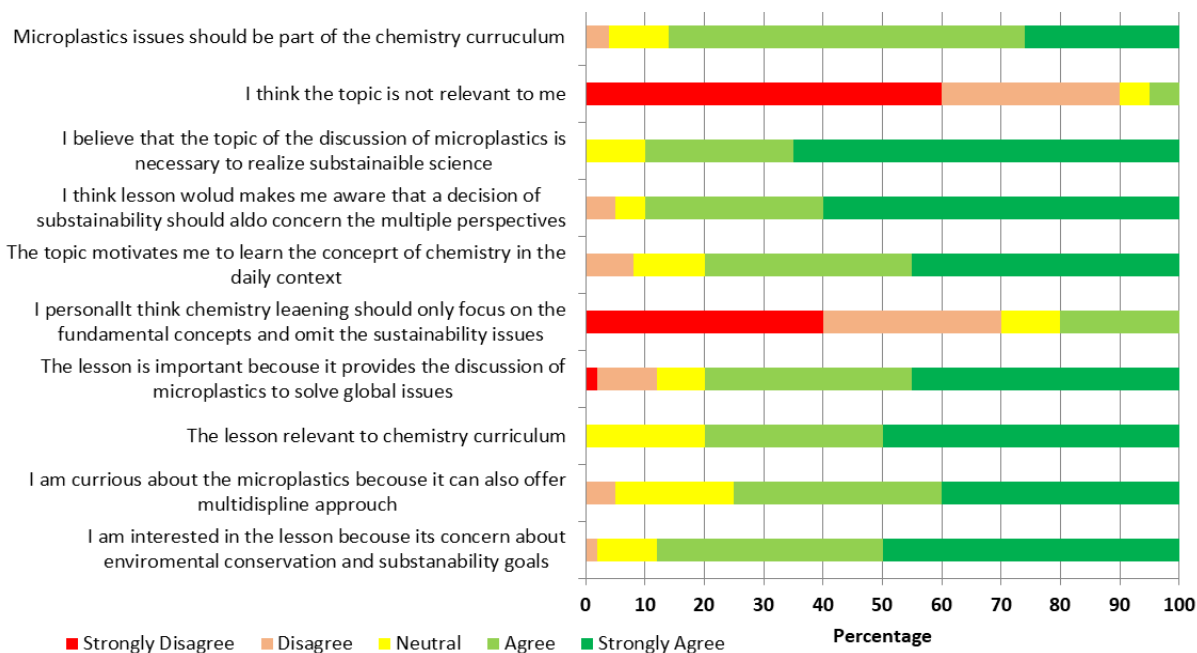
Figure 1.Respondents" comprehension

Figure 2. Responses of participants toward issues

From the graph above, of 102 respondents only 3 respondents who categorized very understand. For categorized understand enough there are 37 respondents and 62 respondents are categorized less understand, and there is no respondent is categorized as "do not understand at all". From this results it is found that the average score of respondents' comprehension is 50.73. In general this is categorized low. It is important to detail about these scores relates to gender, because it is connected to the behave/action of respondents towards (plastics) waste. As summary of data above, we can classify the total results as follows: (a). two female and one male respondents getscore > 75that is very understand, (b). Twentythree female and fourteen male respondents get score 60 –74 that is understand enough, (c) fourtysix female and seventeen male respondents get score 25 – 59that is less understand, and (d) none of both gender get score< 25that is do not understand at all.

From this figure, we can simplify conclude that female respondents get higher score than male ones. This accords to the number of respondents of both gender. Refers to the results above, that the only two of respondents who could reach category very understand and they are female. At the meanwhile, there are 23 female respondents reach category understand enough, and 46 female respondents are in category less understand, and the rest there is no female respondent in category "do not understand at all".Further, for male respondents; there are 14 in category understand enough and 17 male respondents are in less understand category. As well as female teachers, there is no male teacher in category "do not understand at all". Of 102 samples which consist of 31male respondents and 71 female ones, seeminglyin general there is no strong relation significantly between gender and score. This possible happens because they do not have a good knowledge about microplastics or because this is a new knowledge and

issue since they all know about the impact of (macro/mega)plastics on our ecosystem in general. It may be happened because they did not follow the online lecture seriously or some others reasons, such as some barriers in conducting online learning, for examples, type of gadget and platform and disturbing for stability of internet signal as very often happens. Then, let see the relation between the scores and picking respond of questionnaire about plastics debris (perception). Here we have 15 items statement which are derived from learning material as indicators and refers to questions in essay test. In general, there is no strong relation about comprehension and perception in picking of answer on questionnaire instruments. This could be happened because of two possibilities; a. respondents think that they are really enough understand, and b. respondents picked the answer in questionnaire sheets with no seriously thinking as this often happens in questionnaire picking; simplify just thick it (Figure 2). Respondents" responses as perception toward learning activities of plastics waste are divided into three categories, they are: 1. Teachers" motivation in learning (items 5, 6 and 10), 2. Students" perceptions toward the relevant topics into curriculum (items 1, 2, and 8), 3. Students" perception toward the important of the topic regarding to multidiscipline approach and multi perspektives to solve global issues

DESCRIPTIVE ANALYSIS STATISTICALLY

Descriptive statistic is used to analyze data in the way to descript or to figure collected data as a real without making a conclusion in general or not to generalize (Sugiyono, 20217). In this research, existing data used table and data analysis used the highest score, the lowest, mean, deviation standard , and percentage calculation. To reveal the relation among comprehension, choosing questionnaire, and the taking action of respondents toward this issue, it was set a space where there were some plastics debris we poured in some spots surrounding and a litter bin. To observe the real condition we used CCTV. In this part we would like to discuss based on gender and focus on items 12, 13, 14, and 15 of questionnaires. Firstly, for female respondents.There are 36of them thrown the rubbish into the litter bin before they take seat for essay test, questionnaire, and lunch. Actually, they did not just thrown the rubbish from their seat, but also from other seats. These persons get score vary; 12 respondents get score 57.5 for comprehension where 6 of them said that they do not understand about item 12 to 15 and the other 6 answered very understand. The other 24 respondents give various answers for item 12 to 15. For questionnaire items12, 13, 14, and 15 they picked scale 3(understand enough) and for items 14 and 15 they picked 4 (very understand). They look consistence for taking care of rubbish; after activities finish, they also thrown the rubbish into the litter bin and showed accord with their comprehension. However, after all activities finished there were 35respondents followed to take care of rubbish. Only three of respondents are consistence with their comprehension (score >75), picking of questionnaire scale 4 (very understand) and taking care of rubbish. The rest showed inconsistence in comprehension(18 respondents get score 57.5 and the other 14 get score 25 – 40)and in picking questionnaire for item 12, 13, 14, and 15 where they picked not understand at all, in fact they also taking care of rubbish after activities. Secondly, of31 male respondents, there are 11 (36%) persons taking care of rubbish and thrown it into the litter bin. These 11 respondents get score 40 - 45 for comprehension, and most of them picked scale 4 for those four items of questionnaire (items 12 – 15).The rest

20 respondents get score higher than those 11 ones (67%) for comprehension, and in picking questionnaire answer they picked scale 4 for all items include for items 12, 13, 14, and 15, but they did not collect rubbish Frankly to say, this is seeminglyquite inconsistence. Of those 20 respondents, six of them get high score of comprehension, 75, 65, 60, 60, 55, and 55 respectively and the rest 14 get score 50. Refers to results above, it seems there is no clear relation among those three variables. It looks independent each other. How comes this happened? We expect a good-match relation among them. However, the fact is quite far from expectation. This could be happened because of online lecture did not give a satisfy result. As we know it is not easy to do online learning; some barriers raised there.Also, as often happens, in picking questionnaire, respondents do not consider seriously to pick the suitable answer because there is no consequence of this picking for them. Even this happens also if instrument research is validated before to deliver to respondents. This always becomes uncertainty condition in social research. Why there is must based on gender?. Researchers expect it will be found "man toxic", because in general, in our culture it seems that job or task has gender. For example, for washing, cleaning, kitchen activities, and some likely job or task are the responsibility of female. This phenomenon still exist till now even for young and well educated parents

Conclusion

Result of this research showsan inconsistence relation among the three variables. We conclude that this research must be improved in the next time, for example, lecture must be offline meeting and also should be added with socialize the issue deeper and "to beg" or "to touch" their mindset that this is important for respondents to pick the suitable questionnaire correctly. At the meanwhile, in order to encourage respondents for taking care rubbish in their surrounding, it's needed to do such a training and to encourage them that this issue is an emergency to be solved for better life now and in the future. The result also showed that female respondents are easier or more sensitive to follow a good way regarding to collect rubbish from their surrounding than male ones and no exception wether they are teachers or students.

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