Investigating the Parametric Behavior of Monocrystalline PV Cells under Various Conditions

Lucia*, Dr. Lena
* University of Engineering and Technology, Peshawar (KPK), 25000, Pakistan
University of Engineering and Technology, Peshawar (KPK), 25000, Pakistan

KEYWORDS: Photo Voltaic PV Cell.

ABSTRACT

With the exhaustion of non-renewable energy sources, discovering savvy and productive interchange vitality assets is a noteworthy theme of research now days. Distinctive sustainable power source assets are under thought with sunlight based vitality being one of them. The primary accentuation is on growing new innovations for tackling sun's vitality proficiently. Sun oriented Photo Voltaic (PV) cell is one such innovation that chips away at the rule of photovoltaic impact, with the electric yield created by PV cell is straightforwardly impacted by the measure of light achieving the surface of cell, along these lines any interference that confines the light achieving the surface of cell influences the execution of cell contrarily. ID of those parameters which go about as deterrent amongst light and sun powered cell surface and abatement the proficiency of cell is critical before finding a way to kill them. Among a wide range of parameters the ebb and flow examine centre around the parameter that are straightforwardly impacted by natural in which these PV cells are introduced i.e. Light Intensity. In this examination tests were directed by utilizing different light intensities in changing amounts to watch their impact on PV cell yield. Results were gathered and contrasted with locate the most affecting residue on the wastefulness of the PV cells. The last outcomes plainly demonstrate an unfriendly impact of light intensity on PV cell. A huge change in productivity is likewise recorded with various light intensity levels.

INTRODUCTION

Most of the force to be reckoned with's necessities are as yet satisfied by petroleum products. The regularly expanding costs of non-renewable energy sources and their inescapable consumption alongside the harm that the use of these fills is causing to the earth have squeezed for request and the need to create elective vitality sources. Since late 90s numerous nations have begun changing to different means for delivering power with atomic vitality being the most quickly developing vitality source. In any case, with occurrences, for example, Chernobyl catastrophe and Fukushima fiasco there have developing concerns seeing utilization of atomic vitality as an elective vitality source. As of late numerous nations have ventured forward and started putting extensively in sustainable power sources. Morocco as of late finished its first period of the mega solar power plant named "Noor 1" which creates 160 MW with a definitive objective of 580 MW toward the finish of its fruition [1]. On 8 May 2016, Germany inexhaustible power age hit its pinnacle; the nation's sun based, wind, hydro and biomass plants were providing around 55 GW of the 63 GW being expended, or 87%. This prompted control costs being negative – the business clients were being paid to expend power [2].

Following the worldwide pattern of creating sustainable power sources, Pakistan too has started to put accentuation on sustainable power source. Pakistan has awesome potential for sun oriented vitality. On 29th May 2012, Pakistan initiated its first on-network sun based power plant in Islamabad with help of Japan International Cooperation Agency under Coolio Earth organization [3].

In May 2015, Quaid-e-Azam sunlight based stop started its activity with a limit of 100 MW which is relied upon to ascend to 1000 MW once the task is finished before the finish of 2016[4]. Punjab Vocational Training Council began the undertaking of preparing 2000 individuals in get together and establishment of sun powered board. A significant number of these individuals will be from zones where there are expanded power lacks [5].

Sun oriented vitality is inexhaustible and free. Sunlight based vitality innovations utilize the sun's vitality and light to give warm, light, high temp water, power, and notwithstanding cooling, for homes, organizations, and industry. There are an assortment of advancements that have been created to exploit sun based vitality. Sun oriented Energy Technologies [6]:

The points and destinations of this undertaking can be recognized as takes after:

To discover the impact of Light Intensity on the execution of a sun based photovoltaic cell.

EXPERIMENTAL SETUP

The exploratory setup utilized for this examination is indicated is Fig.1 involves halogen knobs every one of 500 watt, PV-Cell, Humidifier, Thermocouples, pyrano-meter and multimeter.

Fig. 1: Halogen Bulbs Using as a Solar Simulator and PV Panel

RESULT AND DISCUSSION

Just performing tests and getting comes about isn't sufficient. The outcomes got amid test should be deciphered and contrasted and some standard and with each other before coming to any strong, dependable conclusion.
Amid our examination, numerous tests were performed by changing light power and the outcome acquired were analysed by making charts in MS-Excel.

TESTING FOR LIGHT INTENSITIES

Diverse tests were directed on the sun powered board under various Light intensities conditions. After that consolidated and the outcomes were gathered. For output Solar mono-crystalline P-V Cell is examined under different light intensities and the data obtained is managed in the form a table and after it graphs was drawn from these tables.

Table-1: Power Output for 500 W/m^2 of Light Intensity level

Time	Temperature	voltage	time	Temperature	voltage
min	°C	volt	min	°C	volt
0	15.7	21.2	16	48.8	19.1
1	21.7	21	17	49.5	19
2	25.9	20.8	18	50.1	19
3	29	20.6	19	50.8	18.9
4	31.5	20.4	20	51.3	18.9
5	33.9	20.2	21	51.8	18.8
6	36	20.1	22	52.2	18.8

7	38	20	23	52.7	18.8
8	39.8	19.8	24	53.2	18.7
9	41.3	19.7	25	53.5	18.7
10	42.5	19.6	26	53.8	18.6
11	43.7	19.5	27	54	18.6
12	44.9	19.4	28	54.2	18.6
13	46	19.3	29	54.5	18.6
14	46.9	19.2	30	54.6	18.6
15	47.9	19.2	16	48.8	19.1

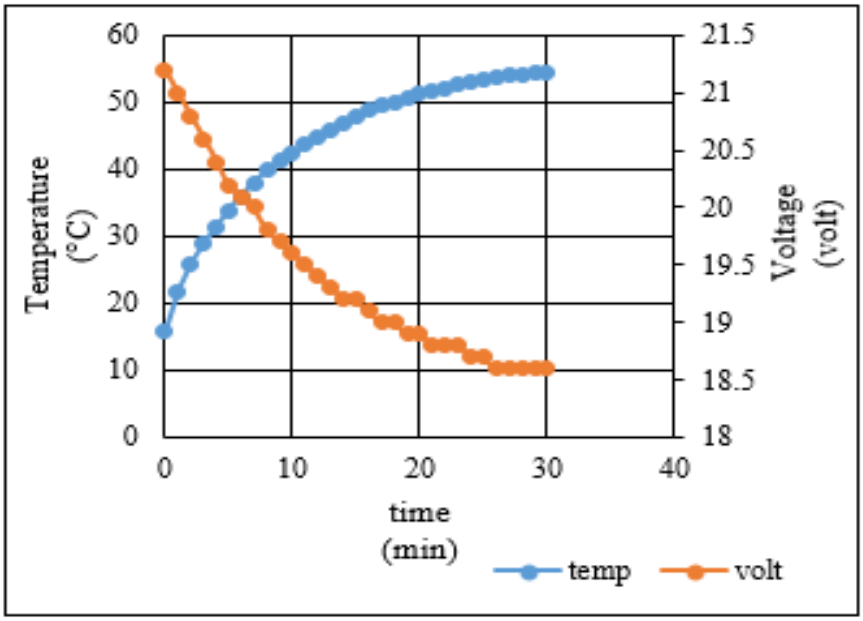


Fig. 2: Variation of Temperature and Voltage w.r.t Time for 500 W/m^2

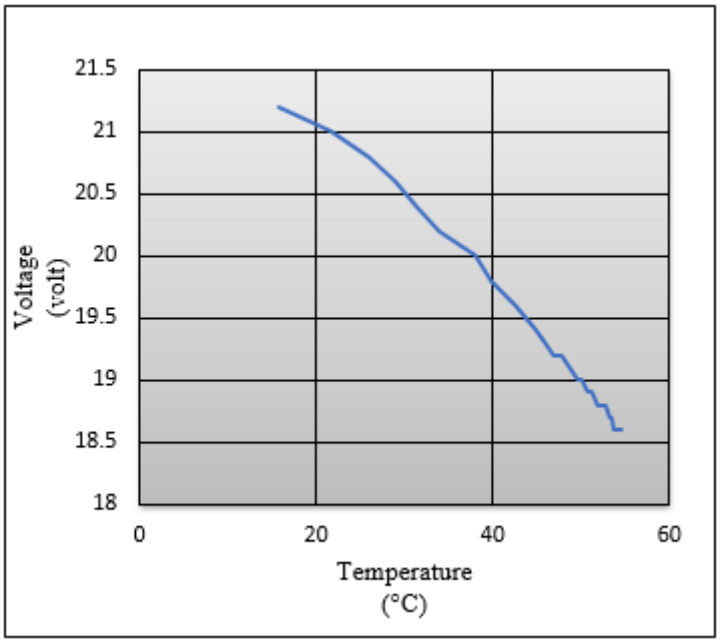


Fig. 3: Variation of Voltage w.r.t Temperature for 500 W/m^2

Table-2: Power Output for 1000 W/m² of Light Intensity level

Time	Temperature	voltage	time	Temperature	voltage
min	°C	volt	min	°C	volt
0	18.5	21.6	14	61.2	18.9
1	27.2	21.2	15	62.2	18.8
2	33.5	21.2	16	63.2	18.7
3	37.9	20.7	17	64.2	18.7
4	41.7	20.4	18	65	18.7
5	44.6	20.2	19	65.6	18.5
6	47.2	20	20	66.5	18.5
7	49.6	19.8	21	67.2	18.4
8	51.7	19.6	22	67.8	18.4
9	53.7	19.5	23	68.2	18.3
10	55.3	19.3	24	69	18.3
11	57	19.2	25	69.9	18.3
12	58.4	19.1	26	70.5	18.2
13	59.9	19	14	61.2	18.9

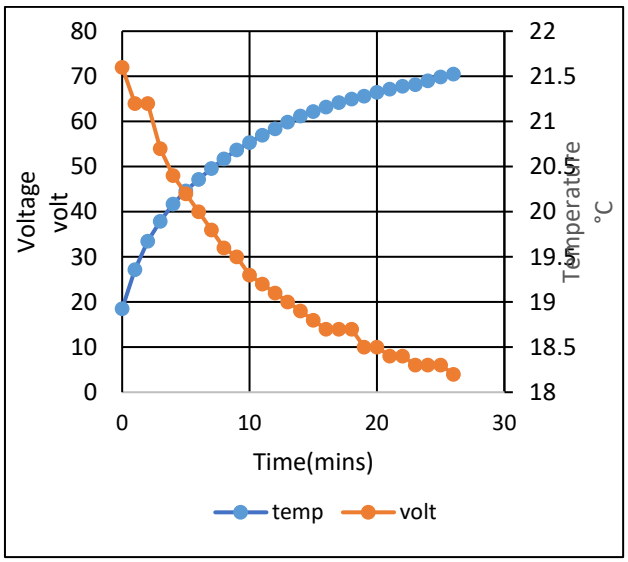


Fig. 4: Variation of Temperature and Voltage w.r.t Time for 1000 W/m²

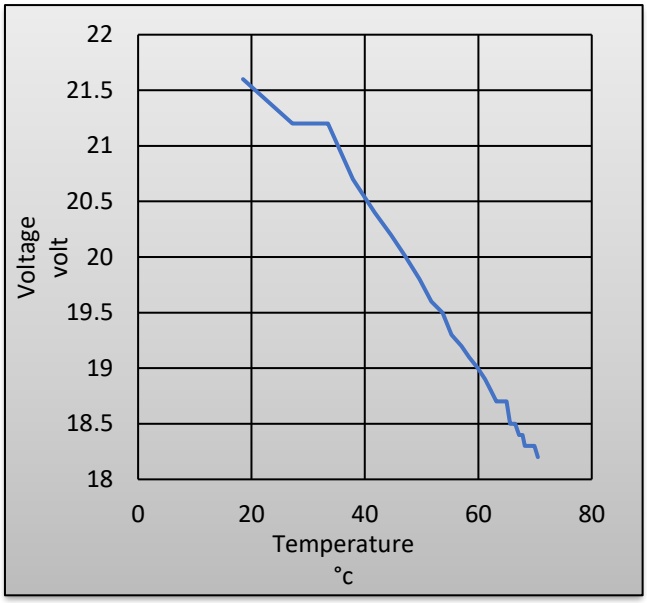


Fig. 5: Variation of Voltage w.r.t Temperature for 1000 W/m^2

The impact of power was controlled by changing the light force.
By looking at the outcomes it was discovered that by expanding the light force from 500 W/m2 to 600 W/m2 there was 14% expansion in control yield of board and by additionally expanding force from 600 W/m2 to 700 W/m2 the expansion in control yield was 19%.

FUTURE WORK

1) This examination was directed on monocrystalline board. A comparable test can be led on polycrystalline sun oriented boards and a near report should be possible between two sorts of board.

2) Test can be directed under regular daylight to get more exact outcomes.

REFERENCES

1. Arthur Neslen (2016) "*Morocco to switch on first phase of world's largest solar plant*". Accessed at, https://www.theguardian.com/environment/2016/feb/04/morocco-to-switch-on-first-phase-of-worlds-largest-solar-plant
2. Michael J.Coren (2016) "*Germany had so much renewable energy on Sunday that it had to pay people to use electricity*". Accessed at, http://qz.com/680661/germany-had-so-much-renewable-energy-on-sunday-that-it-had-to-pay-people-to-use-electricity/ [5.10.16]
3. Japan International Cooperation Agency (2012) "*Pakistan gets first on-grid solar power station*" Press release, Accessed at, http://www.jica.go.jp/pakistan/english/office/topics/press120529.html
4. Anwer Sumra (2015) "*Quaid-e-Azam Solar Park: Solar energy's 100MW to arrive in April*", Accessed at, http://tribune.com.pk/story/859627/quaid-e-azam-solar-park-solar-energys-100mw-to-arrive-in-april/ [27.3.15]
5. Pakistan Renewable Energy Society, (2013) "*Training on Solar Panel Assembling and Photovoltaic Installation*", Accessed at, http://www.pres.org.pk/category/renews/
6. Renewable Energy World (2015), "*Solar Energy Technologies*", Accessed at http://www.renewableenergyworld.com/solar-energy/tech.html

FOOD STANDARDS: UKRAINIAN REALITIES AND EUROPEAN REQUIREMENTS (ECONOMIC CONTEXT)

RAFAEL DÍAZ OLGA IVANOVA, MARCO ROSSI

Abstract

The systems of food safety management in the EU are analyzed and the components of these systems are defined. Standards on which food safety management systems are based on the stage of primary production, transportation and storage, processing of food products, wholesale and retail are classified. The main advantages of applying standards and schemes certification are determined. The main issues of the domestic enterprises of the food industry were identified, in particular: primarily raw material export of agro-industrial products instead of the offer of the end product, delay from the determined stages of the transition period to introducing food safety management systems based on the HACCP principles established by the law of Ukraine, etc. Proposed directions of development of food industry enterprises of Ukraine are offered.

Keywords: food standards, food safety, applying standards, agro-industrial products

Introduction

Within the conditions of search for effective models for business development and its further promotion at the European market, the issue of determining the level of harmonization of standards and the impact of this process on the structure of exports of domestic products abroad is becoming particularly acute. The food industry has always been considered a priority and strategically important sector for Ukraine, which, according to of the official site of the "Ukrainian Agrarian Council" Public Union provides domestic market with its products by 90% and forms more than 50% of foreign trade turnover from all agroindustrial products of Ukraine.[1] For example, international organizations such as Food and Agriculture Organization (FAO), as well as most leading experts, refer Ukraine, along with Brazil, Argentina and the Russian Federation, to countries with the greatest potential for agrarian development in the world.

Along with this, the strengthening of agriculture is a prerequisite for the development of the food industry. Given the importance of the food industry for the entire agrarian industrial sector of economy, to some extent, it is possible to consider the food industry as the locomotive for the development of the Ukrainian economy. The food industry comprises more than 40 branches of manufacture,

[1] *Ukraine's food industry provides a 90% domestic market // The official site of «Ukrainian Agrarian Council» Public Union // [Electronic resource]. – Access mode: http://milkua.info/uk/post/harcova-promislovist-ukraini-zabezpecue-vnutrisnij-rinok-na-90/*

about 25% of foreign direct investments are diverted every year, and more than 5,000 domestic enterprises deal with the manufacture of food products.[2]

According to the data of 2017, agricultural products were exported to: Asian countries – 42.6%, European Union – 32.4%, African countries – 14.2%, CIS countries – 7.6%, USA – 0.4%, and others countries – 2.8%. The top five countries-leaders, each of which acquired Ukrainian agrarian and food products for more than $ 1 billion in 2017 are India, the Netherlands, Egypt, Spain and China.[3]

Food industry of Ukraine has significant potential for further development and increase of exports to the EU countries. Harmonization of standards is one of the important aspects that contributes to the successful implementation of the business model, which leads to the "revival" of the economy.

We are sure that considering when choosing a business model is the fact that standards should be appropriate and harmonized giving the company additional advantages in entering new markets and conquering new customers.

European partners come to the conclusion that compliance with European standards for quality, safety and environmental friendliness of their imported products affects the level of food security of the EU states and is an indicator of social stability. This is one of the factors that determined the results of studies, according to which the introduction of standards – the second after the accumulation of capital, the growth factor of the economy.[4]

In this context, it is also essential to direct the efforts of scientists and practitioners to build a business model of this type, which, along with harmonization of standards, will require the creation of a value chain in the country, taking into account in-depth processing. Since such a kind of business models that will contribute to the "revival" of the economy, as it involves the creation of new jobs, the export of end products abroad, thereby achieving an increase in export earnings and ensuring general economic welfare.

That is why the selection of business models of enterprise development in the conditions of joining the European economic space should be based, first of all, on scientifically substantiated studies of the peculiarities of European requirements for food standards and Ukrainian realities of its harmonization.

---

[2] *Official site of the Ministry of Agrarian Policy and Food of Ukraine // [Electronic resource]. – Access mode: http://www.minagro.gov.ua/node/25237/*

[3] *Trofimtseva O. Ukrainian agrarian exports amounted to almost $ 18 billion in 2017 // Official site of the Ministry of Agrarian Policy and Food of Ukraine. // [Electronic resource]. – Access mode:http://www.minagro.gov.ua/node/25237/*

[4] *World Bank – Ukraine Partnership: Country Program Snapshot April 2015// [Electronic resource]. – Access mode: http://www.worldbank.org/content/dam/Worldbank/document/Ukraine-Snapshot-ukr.pdf/*

The purpose of the article is to analyze the systems of harmonization of food safety management in the EU, defining on this basis the main issues of domestic food industry enterprises and outline directions of their development.

Statement of basic materials

Aware of the responsibility for food safety and the obligation to comply with food security by domestic producers to the EU requires detailed quality control of each stage of the food chain (from growing and primary processing of raw materials to the sale and consumption of end products). Certainly, this is an extremely complicated model for business development, however it is the only way to achieve food security and open prospects for food exports in the context of European integration.

The results of the first steps of the reforms on both at the state level and at the enterprise level are the change in the structure of exports and its volumes. In particular, since 2016 there has been an increase in the share of processed products. In 2017, the export of Ukrainian agrarian and food products amounted to over $ 17.9 billion. This figure amounted to $ 15.5 billion last year. Nowadays, in the total volume of foreign trade in agrarian and food products, the share of exports is 79.4%. Cereal crops rank the first place in the export structure with the share of 36.2%, the second place - vegetable oils (25.1%), and the third – oil seeds with a share in the structure of 11.3%.[5]

However, according to experts, an increase in Ukrainian exports was not only due to these product groups. The supply of Ukrainian processed and food products has significantly increased. For example, the export of sweet butter, which grew by $ 92.2 million compared to 2016, sugar – by $ 49.7 million, extracts of malt, flour and cereals - by $ 48.8 million, legumes, fresh or chilled – by $ 44.3 million, frozen beef – by $ 39.2 million.

The pilot studies conducted by us show that the above data is further illustrated that in the country a number of food industry enterprises apply procedures based on the principles of the HACCP system and carry out their activities in accordance with the requirements of the EU. Nowadays, market requirements motivate and provide to some extent acceleration of the process of updating and modernizing the production facilities of food enterprises, increase compliance of manufacturers with the requirements of technological discipline, industrial sanitation and hygiene, intensify the study of international experience in the development and implementation of food safety and quality management systems based on HACCP principles.

In Ukraine, the implementation of standards is regulated by the Laws of Ukraine "On Safety and Quality of Food Products" and "On Children's Nutrition".

[5] *Trofimtseva O. Ukrainian agrarian exports amounted to almost $ 18 billion in 2017 // Official site of the Ministry of Agrarian Policy and Food of Ukraine. // [Electronic resource]. – Access mode:http://www.minagro.gov.ua/node/25237/*

These standards are mandatory, in particular, they reflect the following requirements for products as:[6]

1. Microbiological criteria: maximum permissible levels of residues of pesticides / antibiotics; pollutants (toxic elements, mycotoxins, radiology); nutritionals and flavorings.

2. Requirements for the manufacturer: proper hygienic / industrial / agricultural practices (GHP/GMP/GAP); traceability; HACCP (for operators of food market).

According to the law, market requirements are voluntary, among which are: product standards, certification of food safety management systems, certification of organic/natural products, standards of sustainable development.

Food safety management systems are practically worldwide recognized and used as a reliable method of protecting consumers from the dangers that food may encounter. The introduced food safety management systems require the legislation of the European Union, USA, Canada, Japan, New Zealand and many other countries. In our opinion, such attention to food safety management systems practically all over the world is explained by the fact that they are recognized and used as a reliable way to protect consumers from the dangers of which carries may be food products.

Therefore, currently existing food safety management systems are based on Hazard Analysis and Critical Control Points (HACCP) principles. In Fig. 1. the components of the development of standards and certification schemes in the field of food safety management are presented. We can note that the top of the standards is the best practices that have been formed on the basis of the laws, principles and schemes of certification.

As we can see in Fig. 1, the basis for establishing a food safety management system is legislation. So, at the level of the EU, a number of directives and regulations are actively being used in the course of product placement on the market and its subsequent circulation. Directive 2001/95/ EC of the European Parliament and of the Council introduces to function of "Rapid Alert System for non-food products posing a serious risk" – RAPEX. It was established for the purpose of the rapid exchange of information between EU Member States and the European Commission in case of product detection that poses a serious threat (direct link to the site RAPEX).[7]

The general procedure and conditions for the placement of products on the EU domestic market, handling of work of conformity assessment and accreditation and the market surveillance mechanism are outlined in the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 and

---

[6] *The Law of Ukraine "Infant Nutrition". // [Electronic resource]. – Access mode: https://zakon.rada.gov.ua/laws/show/142-16/*

[7] *The official site «Rapid Alert System for non-food products posing a serious risk» – RAPEX // [Electronic resource]. – Access mode: http://ec.europa.eu/consumers/archive/safety/rapex/index_en.htm)/*

Decision No 768/2008/EC of the European Parliament and of the Council of 9 July 2008.[8] [9]

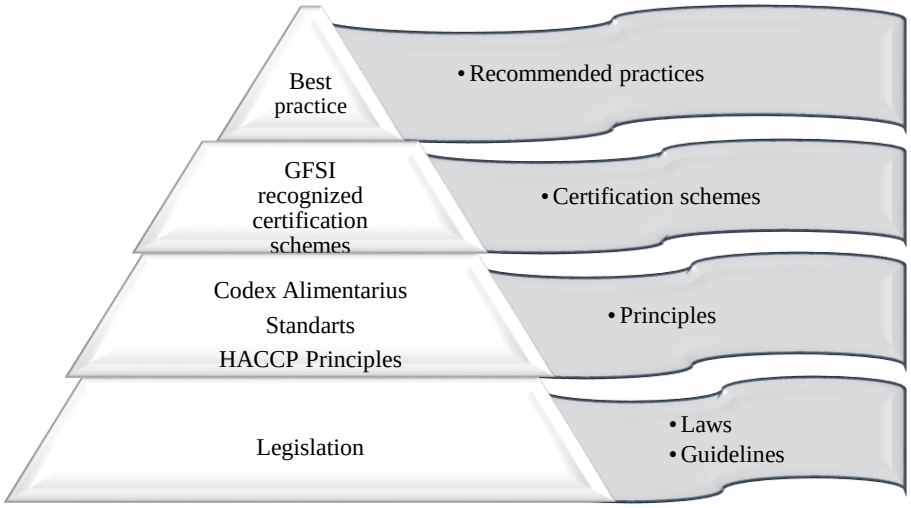


Fig. 1. Components of Food Safety Management Systems
[compiled by authors on the basis of "The official site Rapid Alert System"]

Harmonized standards can be developed by three independent standards bodies: The European Committee for Standardization (CEN); European Committee for Electrotechnical Standardization (CENELEC); The European Telecommunications Standards Institute (ETSI).

Whereas, conformity assessment procedures are carried out by the product manufacturer or by a third party responsible for such an assessment. The third party is the competent authority in each EU Member State.[10]

EU labelling indicates that the product meets all applicable requirements and has undergone a conformity assessment procedure. The packaging of goods placed on the market have to comply with the requirements laid down in European Parliament and Council Directive 94/62/EC of 20 December 1994 of the packaging and handling of packaging waste.

Environmental requirements for products delivered to the EU market consist of the following main elements:

---

[8] *Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 // [Electronic resource]. – Access mode:http://www.nostroy.ru/nostroy_archive/nostroy/804061826-05%20Reglament_ES_765_2008.pdf/*

[9] *Decision No 768/2008/EC of the European Parliament and of the Council of 9 July 2008 // [Electronic resource]. – Access mode:https://zakon.rada.gov.ua/laws/show/994_b42/*

[10] *The European Commission's priorities // [Electronic resource]. – Access mode: https://ec.europa.eu/commission/index_en/*

1. Regulation of trade in dangerous chemicals. Imports of dangerous chemicals in the EU are subject to control in accordance with the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade. The provisions of the Convention are implemented in the EU legislation by Regulation (EC) No 689/2008 of the European Parliament and of the Council of 17 June 2008 concerning the export and import of dangerous chemicals. All information on import requirements established for specific products is contained in the European Database Export Import of Dangerous Chemicals – EDEXIM.[11]

2. Control of the presence of persistent organic pollutants. EU policy is aimed at eliminating or minimizing the usage of these products in accordance with Stockholm Convention on Persistent Organic Pollutants and the Protocol to the Convention on Long-range Transboundary Air Pollution within the framework of the United Nations Economic Commission for Europe (UNECE). The basic legal document of the European Union - Regulation (EC) No 850/2004 of the European Parliament and of the Council of 29 April 2004.[12]

3. Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). REACH was introduced by Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006. It established a system for recording existing and new substances, as well as requirements for manufacturers of EU Member States and importers of EU products containing chemicals. REACH system is managed by the European Chemicals Agency (ECHA).[13]

4. Classification, labeling and packaging of substances and mixtures. Chemicals can be placed on the EU market if they are classified, labeled and packaged in accordance with the provisions of the Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008.[14]

5. Requirements for plant protection and biocides. In the EU, the placing of plant protection products on the market should be authorized in accordance with the provisions of the Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009. In turn, biocides (disinfectants, preservatives, non-agricultural pesticides), supplied to the EU market should comply with the requirements of the Directive 98/8/EC of the European

---

[11] *Joint Research Centre. Chemical Lists Information System (CheLIST) // [Electronic resource]. – Access mode: http://chelist.jrc.ec.europa.eu/*

[12] *The main requirements of the EU legislation for the safety and quality of goods // [Electronic resource]. – Access mode: https://ukraine-eu.mfa.gov.ua/ua/Ukraine+-+EU+export-import+helpdesk+/Non-tariff+regulation/Загальні+вимоги+ЄС+до+імпортованих+товарів/*

[13] *The official Site of the European Chemical Agency // [Electronic resource]. – Access mode: https://www.echa.europa.eu/*

[14] *Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 // [Electronic resource]. – Access mode: https://dokipedia.ru/document/5180851/*

Parliament and of the Council of 16 February 1998 and a few other legislative acts of the EU. Along with the above, the main environmental requirements also regulate the import into the EU of detergents, fertilizers, ozone-depleting substances, fluorinated greenhouse gases, extinct species of animals, waste, etc.

6. Requirements in the field of sanitary and phytosanitary measures. Goods imported into the customs territory of the EU should comply with the sanitary and phytosanitary requirements of the EU on the protection of human and animal health. These requirements are classified in the food and feed safety sectors, plant health and public health. SPS control is carried out by the competent authorities of the EU Member States, coordinated by the European Commission and the European Food Safety Authority.[15]

According to the EU legislation, food products imported into the EU must comply with the conditions, which include:

− general principles and requirements of food law (Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002);[16]

− registration by EU importers of suppliers of products from the country of origin of the goods;

− general rules of food hygiene and specific requirements for the hygiene of food products of animal origin;

− rules on microbiological criteria for food products;

− rules on residues of pesticides, veterinary drugs and contaminants in food;

− special rules for genetically modified food and feed, bio-proteins and new products;

− special rules for certain groups of food products (mineral waters, cocoa, quick-frozen food) and food products directed at specific groups of the population (products for infants and children);

− specific marketing requirements and labeling requirements, requirements for primary goods, feed and constituents of feed intended for specific nutritional purposes;

− general rules for materials intended to contact with food.

The next component of the system, in accordance with Fig. 1 there are principles that distinguish HACCP principles. HACCP (Hazard Analysis and Critical Control Points) is a scientifically grounded system that enables the production of safe products through the identification and control of hazardous factors. The HACCP system is the only food safety management system that has proven its effectiveness and accepted by international institutions.

---

[15] *The official Site of the European Food Safety Authority // [Electronic resource]. – Access mode: http://www.efsa.europa.eu/*

[16] *Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002// [Electronic resource]. – Access mode: https://www.fsvps.ru/fsvps-docs/ru/usefulinf/files/es178-2002.pdf/*

In Ukraine, the usage of the HACCP system is mandatory for all enterprises involved in the production or dealing with food products.

The HACCP concept was developed in the 1960s by the joint efforts of the Pillsbury Company, the US Army Laboratories and the National Aeronautics and Space Administration (NASA) while working on the American Space Program. NASA wished to have a system that guarantees the safety of foods consumed by astronauts in space with zero defects. The concept of HACCP was publicly announced in 1971 at a food safety conference. In the mid-80's the National Academy of Sciences of the United States proposed to introduce this system to service "terrestrial" consumers. In 1996, the final version of the system was approved by the President of the United States and recommended by the dhotellas of wide introduction initially at meat processing enterprises, and later - at all enterprises of the food industry. In 1993, the Codex Alimentarius Commission approved guidelines for the HACCP system.[17]

Over the 40-year-old use of the HACCP concept, it was based on the concept of total quality management (TQM) and it was determined that the HACCP system works best if it is based on the following basic principles:

1 – conducting analysis of dangerous factors;

2 – definition of critical points of control (CPC);

3 – definition of critical limits for CPC;

4 – establishment of a monitoring system for CPC;

5 – establishment of corrective actions if the monitoring results indicate a loss of control in the CPC;

6 – establishment of verification procedures to confirm the effectiveness of the HACCP system;

7 –establishment of a system of documentation and registration of data.

Advantages of using the HACCP system are multiple. The most important ones are:

• HACCP is a systematic approach covering all aspects of food safety, starting from growing, harvesting, purchasing raw materials to end-user usage;

• the use of HACCP will transfer emphasis from testing the final product to the use of preventive methods for ensuring safety during manufacture and sale;

• a properly conducted analysis of dangerous factors allows you to identify hidden dangers and direct the relevant resources to the critical points of the process;

• reduction of losses connected with product recall, penalties and legal claims;

• HACCP is able to integrate into the total management system, rather organically combining with other management concepts - quality management (ISO 9000 standards), environmental management (ISO 14000 standards), etc;

[17] *Sliva Yu. V., Shvets T.G. (2013), The current state of development of international and national regulatory frameworks on the food safety management system // [Electronic resource]. – Access mode: http://nd.nubip.edu.ua/2013_6/11.pdf/*

• HACCP usage can be useful for confirming the implementation of legislative and regulatory requirements, as in many countries HACCP is a mandatory statutory requirement.

Consequently, HACCP is a management tool that provides a more structured approach to identifying dangers compared to traditional methods such as inspection or quality control. Along with this, it also covers the quality of management, involving all team members in the process and aimed to achieve long-term benefits by meeting the needs of consumers. For the effective use of this tool, it is essential to have a solid knowledge of the systems, system approach and optimization, which is schematically shown in Fig. 2

The use of the HACCP system allows enterprises to move from testing the final product to the development of preventive methods. According to the HACCP, the dangers are divided into three groups that may be of biological, chemical and physical origin.

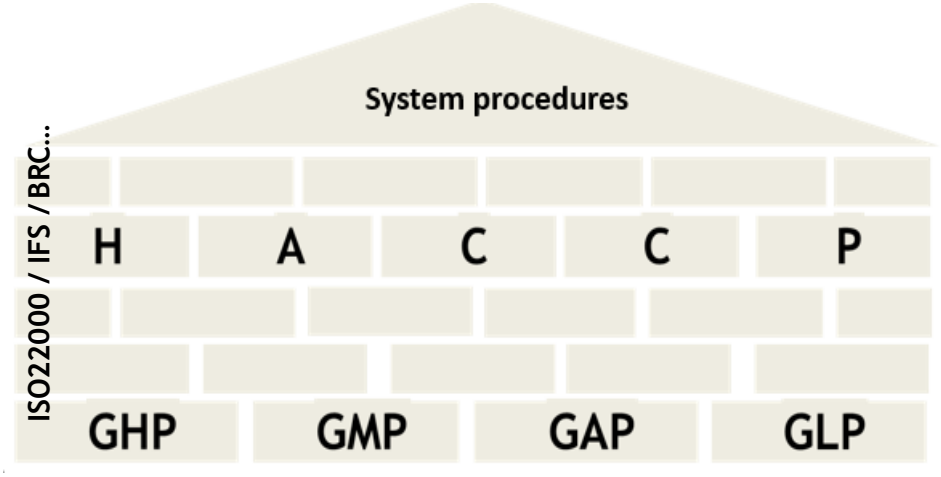


Fig. 2. Food safety management system [compiled by authors on the basis of 17-21]

The mandatory introduction of food safety management systems based on the HACCP principles is determined by the law of Ukraine, which establishes the stages of the transition period, which envisage:[18]

− **the first stage**, which is defined until 20.09. 2016 - use of programs of prerequisites of the HACCP system - all capacities;

− **the second stage**, which is defined until 20.09. 2017 - use of procedures based on the principles of the HACCP system in enterprises that carry out activities with food products which contain of unprocessed ingredients of animal origin (except for small capacities);

[18] *Susol N. (2017), The system of HACCP – is it imperative norm or requirement of market today? // [Electronic resource]. – Access mode: http://ena.lp.edu.ua:8080/bitstream/ntb/41965/2/2017_Susol_N-Systema_NASSR-imperatyvna_135-136.pdf/*

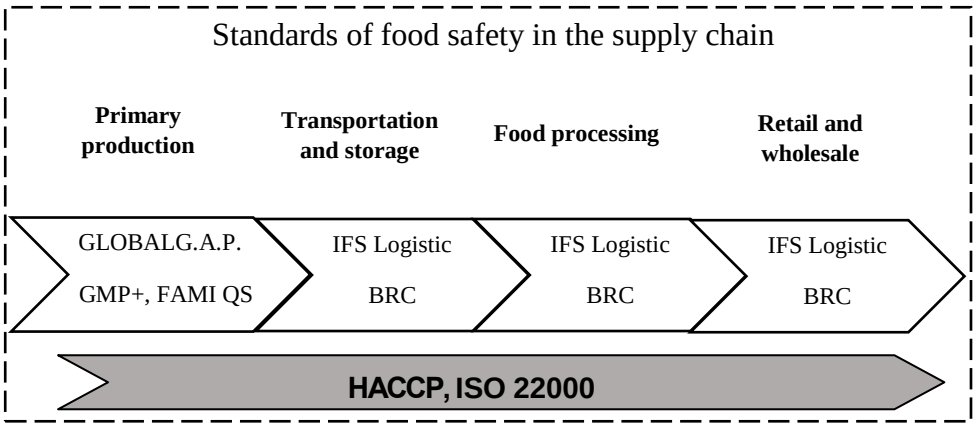
– **the third stage**, which is defined until 20.09. 2018 - use of procedures based on the principles of the HACCP system in enterprises that carry out activities with food products which do not contain unprocessed ingredients of animal origin (except for small capacities);

– **the fourth stage**, which is defined until 20.09. 2019 - use of procedures based on the principles of the HACCP system in small enterprises, including operators supplying food products to the end user, staff ≤10 employees, area ≤ 400 m^2, or not supplying food to the end user, staff ≤ 5 employees.

Such transitional periods are intended enabling market operators to reorient themselves in a timely manner to new market requirements and, if necessary, to optimize the production of food products in accordance with the legislation provisions.

It should be noted that nowadays more than 426 enterprises in Ukraine work in accordance with the requirements of the HACCP system. The Standards of the analysis system are actively used at the "Progress", "Svitanok", Kulindorovsky Factory of Bakery Products, Okhtyrsky Factory of Bakery Products, Bread Factory №76, and Bread Factory №77. Obviously, most executives understand that compliance of HACCP is a prerequisite for increased trust and, consequently, the attraction of new customers, so the introduction of standards for most businesses is a prerequisite for ensuring competitiveness and maintaining market positions.[19]

The HACCP system integrates the food safety standards in the supply chain, which are presented in more details in Fig. 3.



[19] *HACCP: More than 400 enterprises have introduced a control system in Ukraine/ Ukrainian national news. Information agency // [Electronic resource]. – Access mode: https://www.unn.com.ua/uk/news/1752975-nassr-v-ukrayini-ponad-400-pidpriyemstv-zaprovadili-sistemu-kontrolyu/*

Fig.3. 3 Standards for Food Safety Management Systems
[systematized by authors on the basis of 20][20]

It can also be noted that most retailers and large food companies (Unilever, Nestle, etc.) are demanding their suppliers to have a management system compliance certificate in one of the recognized GFSI (Global Food Safety Initiatives) standards and schemes certification.

Idea of GFSI «Once certified, accepted everywhere» is that companies that have been certified to meet one of the standards recognized by the GFSI do not need to be certified further by another equivalent standard. The mission of GFSI is to ensure continuous improvement of food safety management systems to ensure confidence in providing safe food to consumers around the world.

Regulation of standards and certification schemes and their recognition by the GFSI is based on the provisions of the Guidance Document GFSI (GFSI Guidance Document, version 6): part I – The Benchmarking Process; part II – Requirements for the Management of Schemes; part III – Scheme Scope and Key Elements; part IV – Glossary of Terms.

Nowadays recognized GFSI standards and certification schemes are following: FSSC 22000 (version October 2011); IFS Food Standard (version 6); BRC Global Standard (version 6); SQF CODE (7 видання, 2 рівень); Global Red Meat Standard (GRMS) (4 видання, версія 4.1); GLOBAL GAP (version 4); Canada GAP Scheme (version 6).

Thus, the leading food and ingredients companies recognize the approved GFSI standards and certification schemes, namely: McDonald's Corporation, Hormel Foods Corporation, AEON Co., The Coca-Cola Company, Carrefour SA Auchan, Wal-Mart Stores Inc., Campbell's Cargill Inc., Kraft Foods Inc. Migros, Burger King Corporation, METRO GROUP Groupe, Danone, Sodexo and others. The main benefits of using standards and schemes approved by the GFSI for manufacturers, food consumers and the country of manufacture are presented in Table 1.

Table 1. Main advantages of using standards and certification schemes*

Advantages of using standards and schemes approved by the GFSI		
For enterprises	**For consumers**	**For the country of origin**

[20] *Food safety: business development and consumer choice // [Electronic resource]. – Access mode: https://www.ifc.org/wps/wcm/connect/806e9e6b-cd3e-48f4-82f5-940bd2cdbdbc/FS+Brochure+RUS+March+2016.pdf?MOD=AJPERES*

*Developed by the authors

− increase reliability of safety of the finished product; − increase of safety of the food chain; − increase of competitiveness; − entry into new markets; − reduction of duplication of audits and improving efficiency	− increase of trust and confidence in the safety of products and services; − reduction of probability of contraction of a disease connected with dangerous products; − reduction of cases jof withdrawal and confiscation of products	− improvement of the health care; − stable compliance with the requirements of the legislation; − improving reputation

Certification schemes recognized by the GFSI are influential mechanisms for regulating the global food supply chain. Third party certification means that an independent organization has analyzed the processes of the company and independently determined the compliance of the management system with the safety and / or quality standards of food products.

Certification for compliance with leading internationally recognized management schemes reduces information asymmetry in supply chains, thereby contributing to the creation of an internationally comprehensible standard for the processing and production of food products.

Along with the above, it is worth pointing out FSSC 22000 scheme. It is designed for organizations to establish and continuously improve their management systems and good manufacturing practices.

The FSSC 22000 is a leading international certification scheme for food safety management systems, considering that:

1) fully includes existing ISO standards, industry specifications, HACCP;
2) fully recognized by the Global Food Safety Initiative;
3) allows to integrate food safety and quality management with other management systems such as environmental management, sustainable development management and occupational safety and health management;
4) is regulated by a non-profit fund and managed by an independent stakeholder council;
5) increases traceability throughout the supply chain of food products.

However, considering the peculiarities of the functioning of the food industry enterprises of Ukraine (according to official statistics, physically and morally outdated equipment in the processing industries of the agroindustrial complex is (65-75%), the average period of use of production technological lines reaches 12-15 years, and at certain enterprises – 25-30 years. In our opinion, it is rather difficult for such a short time allocated for the transition period to perform fundamentally new, specific imperative requirements. In particular, for the country as a whole and for the food industry, this is a challenge, since, apart from the inappropriate food safety legislation, issues with outdated equipment and financial support for this process should be addressed.

Along with this, practical experience shows that the implementation of HACCP systems at Ukrainian enterprises revealed a low level of industrial

sanitation and hygiene, technological discipline and insufficient knowledge of personnel about the HACCP system and GMP/GHP rules, and the lack of practical experience in their use. In most cases (up to 40%) reasons for the production of poor-quality or potentially dangerous food products lie in the negligence or lack of knowledge of specialists and workers, (up to 36%) due to non-compliance with the necessary technological parameters of the process, the absence of production regulations and sufficient technical equipment.

The situation is also complicated in technical regulation. The standardization of permissible doses and residual amounts and levels of various harmful substances in food products in Ukraine differs from the EU norms, which raises issues for conducting appropriate food testing for export. In the structure of most state testing laboratories there is a lack of modern equipment, they do not meet international standards, therefore certification at the national level is either very expensive or impossible at all.[21]

Fundamental technological upgrading and/or equipment replacement mainly take place at the large enterprises that already have access to European markets and significant foreign investment. Unfortunately, in the current economic constraints, small and medium enterprises, which are also adequately represented in the Ukrainian food industry, are deprived of technological opportunities for modernization. Therefore, most of such enterprises operate only on the domestic market.

However, with sufficient potential to strengthen the market position by increasing production and sales, these enterprises are promising objects for the implementation of the HACCP system. Obviously, the improvement of standards, schemes of norms and regulations is a necessary condition for the emergence of a solvent and at the same time very demanding European market. At the same time, and we are absolutely convinced, we should not ignore those powerful markets where it is possible to exist considerable demand for products of the Ukrainian food industry and at the same time entry barriers are much lower, including due to the lack of such meticulous quality control as Europe. These are primarily the countries of North Africa, Central and South-East Asia, the Persian Gulf, and among them are particularly the following: India, Indonesia, Myanmar, Thailand, Vietnam, etc. For reference: because of the religious beliefs of the Indian population (and this is more than a billion people) and other countries in Southeast Asia are vegetarians and get animal protein mainly due to the consumption of dairy products. Among the animals they consume only chickens, however, for the most part - such exotic species of fauna compare with us as: rats, bats, snakes, cockroaches, etc. Growth in the welfare of the population of Southeast Asia has contributed to the rapid growth in demand for dairy products, Australia and New Zealand have already become traditional suppliers to these

[21] *Sklyar D., Osipova M. (2016), Features of implementation of European standardization in agriculture and food industry of Ukraine, Scientific herald, №1, pp. 134-146. // [Electronic resource]. – Access mode: http://nbuv.gov.ua/UJRN/Nv_2016_1_12/*

markets. We believe that Ukrainian producers should also carefully study the possibilities of this market.[22]

Conclusion. The role of the food industry as determinants of the economic revival of Ukraine is unmatched in view of its close relationship with a large number of other industries, a significant amount of foreign direct investment, as well as unique opportunities not only for large but also for medium and small businesses. Particular attention in this context should be given to the development of such types of business models that are based on the export of end products abroad, which involves providing employment opportunities in Ukraine, and thus contributes to the growth of export foreign exchange earnings and the rise of the level of economic welfare of the population.

However, access to foreign markets for Ukrainian food producers is complicated by the fact that developed countries have established reliable security management systems for these products. These systems, based on the relevant laws, directives and regulations, are recognized and applied to protect consumers from the potential dangers, the source of which may be food products. For example, HACCP systems (Hazard Analysis and Critical Control Points) and GFSI (Global Food Safety Initiative) provide a fairly high level of control over identified dangers. Thus, enterprises of the food industry of Ukraine should to fulfill fundamentally new, specific imperative requirements in a short time to enter the developed solvent markets of European countries. Additional source of revenues, and perhaps a transitional stage for the formation of the necessary logistical and, above all, financial basis, may become less demanding for the quality and at the same time more capacious markets of the countries of North Africa, Central and Southeast Asia, as well as the Persian Gulf.

References

- Ukraine's food industry provides a 90% domestic market // The official site of «Ukrainian Agrarian Council» Public Union // [Electronic resource]. – Access mode: http://milkua.info/uk/post/harcova-promislovist-ukraini-zabezpecue-vnutrisnij-rinok-na-90/
- Official site of the Ministry of Agrarian Policy and Food of Ukraine // [Electronicresource]. Access mode: http://www.minagro.gov.ua/node/25237/
- Trofimtseva O. Ukrainian agrarian exports amounted to almost $ 18 billion in 2017 // Official site of the Ministry of Agrarian Policy and Food of Ukraine. //[Electronicresource].–Access mode:http://www.minagro.gov.ua/node/25237/

[22] *Tolok G. (2015), Ways of implementing the HACCP system: Ukrainian realitie, Food industry of agroindustrial complex. // [Electronic resource]. – Access mode: http://ena.lp.edu.ua:8080/bitstream/ntb/41965/2/2017_Susol_N-Systema_NASSR-imperatyvna_135-136.pdf/*

- World Bank – Ukraine Partnership: Country Program Snapshot April 2015// [Electronicresource].Accessmode: http://www.worldbank.org/content/dam/Worldbank/document/Ukraine-Snapshot-ukr.pdf/
- The Law of Ukraine "Infant Nutrition". // [Electronic resource]. – Access mode: https://zakon.rada.gov.ua/laws/show/142-16/
- Sliva Yu. (2015), Practical aspects of cooperation with the EU, Requirements of European retail chains to national agricultural and food products imported intotheEU,[Electronicresource].-Accessmode: https://cci.dp.ua/tl_files/data/study/FER(pdf)/Vimogi%20jevropejskix%20torgovix%20merezh%20do%20nacionalnoji%20silskogospodarskoji%20ta%20xarchovoji%20produkciji,%20scho%20importujetsja%20v%20JeS.pdf/
- The official site «Rapid Alert System for non-food products posing a serious risk» –RAPEX // [Electronic resource].–Accessmode: http://ec.europa.eu/consumers/archive/safety/rapex/index_en.htm)/
- Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 //[Electronic resource].–Access mode:http://www.nostroy.ru/nostroy_archive/nostroy/804061826-05%20Reglament_ES_765_2008.pdf/
- Decision No 768/2008/EC of the European Parliament and of the Council of 9July2008//[Electronicresource].–Access mode:https://zakon.rada.gov.ua/laws/show/994_b42/
- The European Commission's priorities // [Electronic resource]. – Access mode: https://ec.europa.eu/commission/index_en/
- Joint Research Centre. Chemical Lists Information System (CheLIST) // [Electronic resource]. – Access mode: http://chelist.jrc.ec.europa.eu/
- The main requirements of the EU legislation for the safety and quality of goods // [Electronic resource]. – Access mode: https://ukraine-eu.mfa.gov.ua/ua/Ukraine+-+EU+export-import+helpdesk+/Non-tariff+regulation/Загальні+вимоги+ЄС+до+імпортованих+товарів/
- The official Site of the European Chemical Agency // [Electronic resource]. – Access mode: https://www.echa.europa.eu/
- Regulation (EC) №1272/2008 of the European Parliament and of the Council of 16 December 2008 // [Electronic resource]. – Access mode: https://dokipedia.ru/document/5180851/
- The official Site of the European Food Safety Authority // [Electronic resource]. – Access mode: http://www.efsa.europa.eu/
- Regulation (EC) №178/2002 of the European Parliament and of the Council of 28 January 2002// [Electronic resource]. – Access mode: https://www.fsvps.ru/fsvps-docs/ru/usefulinf/files/es178-2002.pdf/
- Sliva Yu. V., Shvets T.G. (2013), The current state of development of international and national regulatory frameworks on the food safety

management system // [Electronic resource]. – Access mode: http://nd.nubip.edu.ua/2013_6/11.pdf/

- Susol N. (2017), The system of HACCP – is it imperative norm or requirement of market today? // [Electronic resource]. – Access mode: http://ena.lp.edu.ua:8080/bitstream/ntb/41965/2/2017_Susol_N-Systema_NASSR-imperatyvna_135-136.pdf/
- HACCP: More than 400 enterprises have introduced a control system in Ukraine/ Ukrainian national news. Information agency // [Electronic resource]. – Access mode: https://www.unn.com.ua/uk/news/1752975-nassr-v-ukrayini-ponad-400-pidpriyemstv-zaprovadili-sistemu-kontrolyu/
- Food safety: business development and consumer choice // [Electronic resource]. – Access mode: https://www.ifc.org/wps/wcm/connect/806e9e6b-cd3e-48f4-82f5-940bd2cdbdbc/FS+Brochure+RUS+March+2016.pdf?MOD=AJPERES
- Sklyar D., Osipova M. (2016), Features of implementation of European standardization in agriculture and food industry of Ukraine, Scientific herald, №1, pp. 134-146, [Electronic resource]. – Access mode: http://nbuv.gov.ua/UJRN/Nv_2016_1_12/
- Tolok G. (2015), Ways of implementing the HACCP system: Ukrainian realities, Food industry of agroindustrial complex, [Electronic resource]. – Access mode: http://ena.lp.edu.ua:8080/bitstream/ntb/41965/2/2017_Susol_N-Systema_NASSR-imperatyvna_135-136.pdf/
- The proposal: the main platform for agribusiness// [Electronic resource]. – Access mode: https://propozitsiya.com/ua/bezpeka-produktiv-harchuvannya-yak-vigrati-za-poganogo-rozkladu/

Safety Practices Among Primary School Children in Warri Metropolis: An Analytical Approach

Oliver Anthony*[1] & Oscar Patrick[2]
*[1&2]College of Education, Warri, Delta State, Nigeria

Keywords: Analysis; Safety practice; Observed; Primary School Children; Males and females.

Abstract

Accidents and injuries are almost inevitable in all human endeavours especially in children's activities. With the knowledge of safety practices, the rate of accidents and injuries occurrence is minimized. This study was designed to analyze the observed safety practices among primary school children in Warri Metropolis of Delta State. The survey research designed was adopted. A sample of 308 children from the upper primary classes and 40 teachers were randomly selected to participate in the study. The multi-stage sampling procedure was used. A structured and contently validated safety practice questionnaire (SP) with a reliability coefficient of 0.61 using the Cronbach alpha was used for data collection. Data analysis was carried out through percentages and chi-square test. Results from the study showed that the level of safety practice among primary school children was poor. No significant difference was found on the observed safety practices between male and female pupils in classroom and on the road to and fro school (P>1.9; 0.85 respectively, but there was significant difference in the observed safety practices on the playground and laboratory (P<5.36; 4.46) respectively in the study area. It found that male pupils were more safety conscious and classrooms (1.65>1.45) while female pupils were more safety conscious on playgrounds, laboratory and on the road to and fro school (1.49>1.36; 1.46>1.34 & 1.50>1.45) respectively. Continuous daily safety reminder talks to stimulate safety consciousness and practice were made among others as recommendation for the study.

Introduction

Accidents are almost inevitable in every work place including the school environment but with the knowledge and practice of safety, the rate of its occurrence is reduced to a minimum extent. Primary school children are one group of people that are highly exposed to accidents/injury both at home and at school. There is hardly any school day that passes without any case of accident(s) whether minor, serious or fatal among pupils particularly in Warri metropolis, Delta State.

The rate and severity of accidents and injuries occurrence to pupils/students in the school environment to a large extent depend on the level of safety practices and precaution taken by the children and even the school personnel. Thus, this study is aimed at examining safety practices among primary school pupils in Warri metropolis and its implications for safety education

Children attend both day and boarding school; however, whether they attend day or boarding school, they are all exposed to injury/accidents on daily/weekly basis within the school premises or on their way to school. Accidents usually occur among the pupils in any area of the school premises whether in the classroom, playground, laboratory, library, staircases, and restaurant or on the road when they fail to put safety into practice or when they practice safety in a very low extent (Odibo, 2010).

School age children have been reported to be highly impressionistic, experimentalist and prone to hazards and accidents during their school period and as such need more education and protection than adult. Thus, the emphasis on the inculcation of safety education in school environment portends great hope for the overall focus and goals of this study (Ogbalu, 2002; Igwe and Emeharole, 1993). Schools have been recognized according to Nwana (2007) as an extra-ordinarily effective setting, in which people's health is improved. Schools provide the most effective and efficient way of influencing the population, including young people. In this wise, the school (authorities, staff and students/pupils) and the community all have their different, but complementary roles to play in promoting safety in school.

Nigeria school age children who comprise about 20% of the total population, those of primary school age especially, are experimentalist, which for most times predisposes them to danger (Nwana,2007; Ogbalu, 2002; Okafor, 2000).

The National Policy on Education (1981 revised edition) confirmed that children in this age group are normally between ± 6-11 years. Okafor (2000) stressed that if all the school children are left to be killed, disabled, or handicapped through accidents or unwholesome behaviour, there will be no people to carry on developmental programmes in future. Therefore, effective teaching of safety in our schools is important and will be the solution to the accident problems or school safety (Igwe and Emeharole, 1993).

Safety is defined as the control of recognized hazards to achieve an acceptable level of risk. Safety according to Charles (2009) is further seen as the condition of a "steady state" of an organization or place doing what it is supposed to do.

Uchegbu, Ibeabuchi and Uzoho (2002) opined that it was becoming increasingly evident that the possession of certain basic knowledge about safety was essential to promote a sound programme of safety instruction in the nation's schools. Okafor (2010) and Ejifugha, (2002) reiterated that the necessity for a virile safety education programme for Nigeria schools calls for emphasis. It is also fundamental and basic for the promotion, protection and maintenance of the health of the school children as well as for the care of their health problem (Uchegbu, Ibeabuchi and Uzoho 2012). The schools are the most effective base for inculcating any desirable health and safety habits aimed at improving the life pattern of the general population.

Many inventions and activities would have been doomed to failure if principles of safety precautions had not been evolved. Despite these principles, the nature of accident problems worldwide has led to economic losses amounting to enormous injuries, deaths and damages to property. The major solution to accidents regardless of where it exists is through balanced safety education programmes (Nwankwo, Obananny, Amadi, Nwoke, Ikegwoha, Nwoga, &Nwabueze, 2009). Therefore, safety in school according to Ogbalu (2002) should be every one's foremost consideration. The primary aim of safety education or standard is to mitigate hazard so as to prevent accident/injury and promote the health status of individual, particularly students/pupils in schools. This aim is achieved when safety is implemented and practiced among school stakeholders. This study thus, seeks to examine the safety practices among primary school children in Warri Metropolis of Delta State.

Warri is the headquarters of Warri South Local Government Area in Delta State. The area is occupied by three major ethnic groups which are the Urhobos, Itsekiris and Ijaws. It is one of the biggest, popular and busiest cities in Delta State. There are different schools in Warri metropolis. The area has primary secondary and tertiary institutions. There are many primary schools (public and private) also in the city which provide an avenue for children (pupils) in, around and outside the city to be educated. Some of these children attend the normal day school while some are in boarder since some of these schools have boarding houses. Irrespective of the type of school the children attend, the fact remains that, all of them are at one time or the other exposed to hazards and risk especially when safety is not or is poorly observed.

Statement of the problem

Safety and safety education entail accident prevention in school and work place. On daily basis, accidents occur to children either on their way to school (road), on the school playground, in the classroom, staircases, during lunch or in their process of collecting water for drinking in the tap or well within or outside the school premises. Whenever these accidents occur from any of the above mentioned areas, pupils in most cases are reported injured which automatically lead to one form of losses or the other to school management, pupils' parents or both.

Observation, information and reports gathered from literatures, including school personnel and previous research studies showed that these accidents were mostly caused by pupils' carelessness (unsafe act) and sometime unsafe condition of the school environment. This to a large extent prompted, the researchers to ask if safety is practised among primary school pupils particularly those in Warri metropolis.

The main thrust of this study was to examine the extent of safety practices among elementary school pupils in Warri, Delta State. Specifically, the objectives of the study were to identify the safety practices among primary school children in classroom; on playground; in laboratory; on the road and as well examine the factors influencing safety practices among primary school children in Warri Metropolis, Delta State.
The following research questions were posted to help this investigation:

1. Do pupils practice safety in classrooms in Warri metropolis, Delta State?
2. What are the safety practices observed on playground among pupils in Warri metropolis, Delta State?
3. What are the safety practices observed in the laboratory among elementary pupils in schools in Warri metropolis, Delta State?

4. Are safety practices observed on the road to and fro school among pupils in Warri metropolis, Delta State?
5. What are the perceived factors influencing safety practices among pupils in Warri, Delta State?

The following null hypotheses were also formulated to guide the study:

Ho_1: There is no significant difference on the safety practices observed in classrooms between male and female pupils in Warri metropolis of Delta State.

Ho_2: There is no significant difference on the safety practices observed on playgrounds between male and female pupils in Warri metropolis of Delta State.

Ho_3: There is no significant difference between male and female pupils' safety practices observed in the laboratory in Warri metropolis, Delta State.

Ho_4: There is no significant difference between male and female pupils' safety practices observed on the road to and fro school in Warri metropolis of Delta State.

Significance of the study

This study is important to teachers, parents, pupils, safety professionals/practitioners and other members of the community who are concerned with the safety of children in and out of school environment.

It is hoped that this study may serve as a reference guide to all school teachers and administrators to make a constructive remark on the issue of school accidents and safety practices among school children in Nigeria, Delta State in particular especially Warri metropolis of Delta State.

Research methodology

This study was a cross sectional survey research designed to find out the extent of safety practices among primary school pupils and its implications for safety education. This designed was consider appropriate for the study since the researcher is not studying all the pupils but only generate data and describe from a cross section of the pupils' from the different areas/zones in Warri.

The population of this study comprised of public primary school pupils and teachers in Warri Metropolis of Delta State. The primary school pupils in Warri comprised of 17695 and 1069 teachers and 52 primary schools (Source: Local Education Authority (LEA) Warri South LGA, Delta State, 2018). The sample for the study consisted of 348 (308 pupils and 40 teachers) respondents randomly selected from 26 (i.e. 50% of the schools) primary schools in Warri Metropolis of Delta State. The respondents were selected from the upper primary classes (primary 4-6).

The multistage sampling technique which was made up of the purposive, simple and systematic sampling techniques was used in the study. In the first stage, the purposive sampling technique was used to select the six areas in Warri Metropolis, Delta State. In the second stage, the systematic sampling technique was used to select the 26 schools (50%) out of the total 52 primary schools in the metropolis base on area distribution. In the third stage, the simple random sampling technique through lucky dip system that contained Yes or No ballot papers was used to select the respondents (12 pupils except 4 schools were 11 pupils were selected) in each school. This summed up to the 308 respondents used in the study. One teacher each was selected from each school and an additional teacher each was picked from highly populated schools (14) to make up the forty (40) teachers selected for study.

Data were obtained from primary sources through the use of Safety Practices (SP) questionnaire directly administered to the respondents with the assistance of three trained research assistants. A 100% retrieval rate was achieved. The questionnaire consisted of 2-sections (A and B). Section A consisted of respondents' demographic data while Section B consisted of questions relevant to the study.

The instrument was validated using the content validity method. The instrument was subjected to proper validation at different intervals for scrutiny, correction of spelling, wording and content. The reliability of the instrument was established using the test re-test method of reliability. Twenty copies of the validated instrument were first administered to twenty respondents outside the sample area. Two weeks later, other twenty copies of the same validated questionnaire were re-administered to the same group of respondents. The two set of responses were collated and correlated using the Pearson Product Moment Correlation Coefficient (r). From the correlation, a correlation co-efficient of 0.76 level of relationship was observed which was considered appropriate for use. A relationship of 0.60 above is appropriate for use in any study (Elendu, 2010). Data were analyzed through descriptive statistics (frequency, mean and percentage) and chi-square test.

Results and discussion

Data gathered from respondents in this study were presented in the Table 2 - 15 below.

Table 1: Distribution of pupils' demographic data

Variables	Options	Frequency	Percentage	Total
Sex	Male	164	53.3	308
	Female	144	46.7	
Age Range	8-10yrs	79	25.5	308
	11yrs above	229	74.5	
Class	Primary 4	34	11.1	308
	Primary 5	137	44.5	
	Primary 6	137	44.5	
Mode of Transport to School	Trekking	215	70	308
	Public car/bus	31	10	
	Parent's vehicle	62	20	

Source :(Field survey, 2014)

In Table 1, the data presented showed the percentage distribution of pupil's demographic characteristics; 53.3% were male, while 46.7% were female.

On the variable of age range, the data presented shows that 79 (25.5%) of the pupils were within 8-10 years while 229 (74.5%) were 11 years and above.

On the variable of class, the data presented shows that 34 (11.1%) of the pupils were in primary 4, 137 (44.5%) primary 5 and 6 respectively. Lastly, on the mode of transportation to school, it was found that 215 (70%) pupils mainly trekked to school daily, 31 (10%) used public cabs/buses to school, while 62 (20%) of the pupils were transported to school by parents'/guidance vehicle.

Research Question 1:
Do pupils practice safety in classrooms in Warri metropolis, Delta State?

Table 2: Percentage distribution of pupils' safety practices in classroom in Warri, Delta State.

S/N	Item	Yes (%)	No (%)
1	Pupils do not pour water on classroom floor.	60 (16.7%)	248 (80.4%)
2	Playing with sharp objects is common among pupils in classroom.	196 (63.6%)	112 (36.4%)
3	Many pupils in my class throw objects like pen, rulers, books, small stones, etc around in the classroom.	199 (64.6%)	109 (35.4%)
4	Running up and down the staircases is not common among pupils in my school.	76 (24.6%)	232 (75.4%)

Response: Positive = 136 (44.2%); Negative = 172 (55.8%)
Source: (Field Survey, 2018)

The data analysis in Table 2, indicated that 60 (16.7%) out of the 308 of the respondents said that they do not pour water on classroom floor while 248 (80.4%) stated they do pour water on the classroom floor

In item 2, it was found from the analysis that pupils commonly play with sharp objects in classrooms as indicated by 196 (63.6%) of the respondents which was higher than 112 (36.4%) respondents who responded No. In item 3, the data analysis showed that many pupils often throw objects in the classroom as attested by 199 (64.6%) of the respondents which was higher than 109 (35.4%) of the respondents.

In item 4, the analysis showed that running up and down the staircases is school is common among pupils since 232(75.4%) of the respondents who indicated No to the statement against 76 (24.6%) of the respondents who indicated Yes to the statement.

From the above analysis, it was observed that the percentage of the respondents who responded positively to various statement options is lower. This means that primary school pupils in Warri metropolis do not practice safety in classroom as most of their practices are negative (172/ 55.8%).

Research Question Two
What are the safety practices observed on playground among pupils in Warri metropolis, Delta State?

Table 3: Percentage distribution of observed safety practices on play grounds among pupils in Warri metropolis

S/N	Item	Yes (%)	No (%)
1	Pupils run without control on playground in my school.	170 (55.2%)	138 (44.8%)
2	Pupils don't do warm up in our school before their normal physical activities.	118 (38.3%)	190 (61.7%)
3	Horse play (rough play) is common among pupils on playground.	199 (64.6%)	109 (35.4%)
4	Many pupils push each other when doing sports on school playground.	201 (65.3%)	107 (34.7%)
5	Throwing of objects on the playground is common among school children.	208 (67.5%)	100 (32.5%)

Response: Positive = 129 (41.9%); Negative = 179 (58.1%)
Source: (Field survey, 2018).

The data presented in Table 3, shows percentage distribution of observed safety practices on playground among pupils. It was found that pupils in Warri Metropolis often run without control on playground as (55.2%). pupils do not warm up before their normal physical activities (61.7%), whereas horse play which is unsafe practices is common (64.6%). It was also revealed that 65.3% of the respondents agreed that many pupils push each other when doing sports on school playground; again, 67.5% as against 32.5% respondents agreed that throwing of objects on the playground is common among school children.

From the analysis above in Table 3, it can be concluded that the observed safety practices among pupils on playgrounds is poor as the total negative response is 179 (58.1%).

Research Question 3
What are the safety practices observed in the laboratory among elementary pupils in schools in Warri metropolis, Delta State?

Table 4: Percentage distribution of observed safety practices on laboratory among pupils in Warri Metropolis.

S/N	Item	Yes (%)	No (%)
1	Many pupils talk while in the school laboratory.	193 (62.8%)	115 (37.2%)
2	Pupils don't put on (wear) their lab coat to the laboratory	67 (21.8%)	241 (78.2%)
3	Pupils switch off every electrical gadget after using the laboratory.	122 (39.6%)	186 (60.4%)
4	Pupils throw objects in the laboratory.	195 (63.2%)	113 (36.8%)
5	Pupils play with objects and chemicals they see in the school laboratory without teacher instruction.	172 (56%)	136 (44%)

Response: Positive = 145 (47.1%); Negative = 163 (52.9%)
Source: (Field Survey 2018)

In Table 4, the data presented shows the percentage distribution of observed safety practices in school laboratory among pupils in Warri Metropolis, Delta State. From the data analysis in the table, it was observed that many of the pupils are not quiet while working in the laboratory (62.8%), lab coats are not worn to the laboratory (78.2%), do not switch off electrical gadgets after use (60.4%), objects are thrown in the laboratory (63.2%) and that pupils play with objects and chemicals they see without teacher's instructions (56%).

On the whole, it is observed that the safety practices observed by pupils on the laboratory are poor, as most of the pupils do not observed safety rules in the laboratory as the responses indicated negative (163 /52.9%).

Research Question Four
Are safety practices observed on the road to and fro school among pupils in Warri metropolis, Delta State?

Table 5: Percentage distribution of pupils' observation of safety practices on the road to and fro school in Warri metropolis.

S/N	Item	Yes (%)	No (%)
1	Many pupils don't look left, right and left before crossing the road when going or coming from school.	94 (30.6%)	214 (69.5%)
2	Pupils usually run along the road on their way to or from school.	210 (68.2%)	98 (31.8%)

3	Pupils get to the zebra crossing point before crossing	85 (27.6%)	223 (72.4%)
4	Pupils don't walk on their left hand side of the road while trekking to and from school.	217 (70.5%)	91 (29.5%)

Response: Positive = 122 (39.6%); Negative = 186 (60.4%)
Source: (Field Survey, 2019).

The data presented in table 5 above revealed that 69.5% of the respondents agreed that many pupils look their left, right and left before crossing on their way to and fro school as against 30.5% who said they don't. It was found that pupils usually run along the road on their way to or from school (68.2%), whereas 72.4% said pupils do not get to the zebra crossing point before crossing. Also, 50.8% of the respondents agreed that pupils do not walk on their left hand side of the road while trekking to and from school. From what is revealed above, it can be concluded that pupils observed safety on the road to and fro school is poor as negative response is higher (186 /60.4%) than the positive response (122 /39.6%).

Research Question Five
What are the perceived factors influencing pupils' safety practices in Warri Metropolis, Delta State?

Table 6: Percentage distribution of perceived factors influencing pupils' safety practices in Warri?

S/N	Items	Agree (%)	Disagree (%)
1	Lack of safety education programme.	25 (62.5%)	15 (37.5%)
2	Poor safety supervision/monitoring by school staff.	29 (72.5%)	11 (27.5%)
3	Lack of safety knowledge by pupils	25 (62.5%)	15 (37.5%)
4	Lack of safety tips in school premises	25 (62.5%)	15 (37.5%)
5	Low level of safety instruction by teacher	21 (52.5%)	19 (47.5%)
6	Absent of safety club for pupils in school	25 (62.5%)	15 (37.5%)
7	Poor level of indiscipline for pupils who disregard safety instructions.	31 (77.5%)	9 (22.5%)

Source: (Field Survey, 2019)

The data presentation and analysis in Table 6, shows the percentage distribution of perceived factors influencing pupils safety practices in Warri, Delta State. From the analysis, it was found that all the above listed are perceived factors influencing the pupils safety practices since the percentage "agree" is higher than percentage "disagree". But highest of them was poor level of indiscipline for pupils who disregarded safety instructions (77.5%); next to poor supervision/monitoring by school staff (72.5%), followed by lack of safety knowledge by pupils (62.5%), lack of safety tips in school premises (62.5%), absent of safety club for pupils in school (62.5%) and low level of safety instructions by teachers (52.5%).

Table 7-9: Percentage distribution of teachers' attestation to pupils' observation and level of safety practices in Warri, Delta State.

Table 7

S/N	Question	Yes %	No %	Total
1	Do your school pupils observe safety rules such as do not throw stones; do not run on the staircase?	23 (57.5%)	17 (40.5%)	40

Table 8

S/N	Question	Sometimes (%)	All the time (%)	Not at all (%)
1	How often do you see them observing safety rules?	35 (87.5%)	5 (12.5%)	-

Table 9

S/N	Question	Low (%)	Average (%)	High (%)
1	What is their level of safety practices?	13 (32.5%)	27 (67.5%)	-

The data analysis of Tables 7-9 showed teachers responses of pupils' observation of safety rules and level of safety practices in Warri, Delta State. From the above analysis, it was found in Table 7 that pupils observe safety rules in the school as stated by 57.5% of the teachers who responded yes to the question.
In Table 8, it was found that pupils observed safety rules sometimes in the school as said by 87.5% of the teachers while in Table 9, the data analysis shows that pupils level of safety practices is average. This was

confirmed by 67.5% of the teachers who indicated that option in their responses against 32.5% of the respondents who ticked low level of safety practices.

Null Hypothesis One
There is no significant difference on the safety practices in classroom between male and female pupils in Warri, Metropolis of Delta State.

From the chi-square (χ^2) analysis it was found that the mean scores of males and females who responded to the question were 1.65 and 1.45 respectively with the male being than the mean bench mark indicating more safety consciousness than the female. However, from the chi-square ($\boldsymbol{\chi^2}$) analysis, the χ^2 calculated value (1.9) was less than the chi-square ($\boldsymbol{\chi^2}$)critical table value (3.84) under degree of freedom (df) 1 at 0.05 level of significance. Thus, the null hypothesis stated was retained. This means that there is no significant difference between the male and female pupils' safety practices observed in classrooms in Warri Metropolis, Delta State.

Null Hypothesis Two
There is no significant difference between male and female pupils safety practices observed on playground in Warri, Delta State.

From the chi-square (χ^2) analysis, it was found that the mean scores of males and females who responded to the question were 1.36 and 1.49 respectively. Thus, the safety practice observed on playgrounds for both male and female pupils was poor. From the chi-square ($\boldsymbol{\chi^2}$) analysis the $\boldsymbol{\chi^2}$calculated value (5.36) was greater than the chi-square ($\boldsymbol{\chi^2}$)critical table value (3.84) under degree of freedom (df) 1 at 0.05 level of significance. Thus, the null hypothesis stated was rejected. This means that there is significant difference between male and female pupils' safety practices observed on playgrounds in Warri Metropolis, Delta State even though both of their safety practices were poor.

Null Hypothesis Three
There is no significant difference between male and female pupil's safety practices observed in the laboratory in Warri, Delta State.

From the chi-square (χ^2) analysis, it was found that the mean scores of males and females who responded to the statement items were 1.34 and 1.46 respectively. Both mean scores were below the bench mark (1.5) though the female (1.46) is higher than the male (1.34). The analysis showed that the chi-square ($\boldsymbol{\chi^2}$) calculated value (4.46) was greater than the chi-square ($\boldsymbol{\chi^2}$)critical value (3.84) under degree of freedom (df) 1 at 0.05 level of significance. Thus, the null hypothesis stated was rejected. This means that there is significant difference between male and female pupils' safety practices observed in laboratory in Warri Metropolis, Delta State.

Null Hypothesis Four
There is no significant difference between male and female pupils' safety practices observed on the road to and from school in Warri, Delta State.

From the chi-square (χ^2) analysis, it was found that the mean scores of males and females who responded to the statement items were 1.45 and 1.50 respectively, with the female mean score being equal to the mean belch mark (1.5) indicating an average safety practice while the male (1.45) was a little below the mean bench mark (1.5) on road to and fro school safety practices observed. However, from the chi-square analysis, it was revealed that the chi-square ($\boldsymbol{\chi^2}$) calculated value (0.85) was less than the chi-square ($\boldsymbol{\chi^2}$)critical value (3.84) under degree of freedom (df) 1 at 0.05 level of significance. Therefore, the null hypothesis stated was retained. This means that there is no significant difference between the male and female pupils' safety practices observed on the road to and fro school in Warri Metropolis, Delta State.

Discussion of findings

The findings from the study (Table 2) revealed that pupils in Warri metropolis observed safety practice in classroom is poor (172/ 55.8%). However, the result showed that the common unsafe practices of pupils in classroom in Warri metropolis based on their responses in descending order were pouring water on classroom floor, running up and down the staircase, playing with sharp objects and throwing objects like pen, small stones, rulers, etc around in the classrooms. These findings confirmed Charles (2009) Jeraen, Boogard, Nigland and Gerard, (2010) in their studies titled "Safety versus security in free protection planning"; and "Health benefits of cycling with regard to overweight" respectively. In their studies which focused on prevalence of injuries among

primary school pupils, they found that most injuries occurring to elementary school pupils happened in classrooms especially when there is poor class supervision.

The findings from Table 3 revealed that primary school pupils' level of safety practice on school playground is low (179 / 58.1%). It was also found that most school pupils do not warm up before participating in actual exercise activities, push and throw objects, involve in horse play run without control on playground in school. This mainly occur during free and rest period. This results from their psychological (intuitive) nature of play which is common with their ages. This finding re-affirm Odibo, Sanubi and Egenege (1995) notion when they noted that the need for safety education in the primary school becomes more important owing to the fact that children by nation love play and if left unguided or unsupervised safety wise, it lead to increase rate of accidents/injuries in the school premises.

The finding (Table 5) revealed that primary school pupils' observation of safety practices on road to and from school in Warri metropolis is poor (186/60.4% negative response). This indicates that typical safety culture has not been imbibed by the pupils in the study environment. Again, the result (Table 13) showed no significant difference in the observed safety practices on the road to and fro school between male and female pupils in the study area (**P**> 0.85). This suggests that both the male and female pupils exhibit similar and same level of safety habit/consciousness at this level. This confirmed the reason why Okafor (2000) states that all children should be guided to learn and obey all traffic regulations, learn to attract the attention of other road users, etc. irrespective of their sexes.

The finding (Table 4) shows pupils' observed safety practices in the laboratory are also relatively poor (163/52.9% negative response). This act seemed to be against laboratory safety regulation set for pupils. However, because children are so inquisitive that they want to experiment with everything within their reach, they tend to demonstrate this act forgetting the fact that accidents emanate from several factors as spelt out by Heinrich (1959) sequence of events-Domino theory of accidents causation. This finding support the opinion of Okafor (2000), Ogbalu (2002) and Nwana (2004) which stated that Nigerian school age children who comprised about 20% of the total population especially, those of primary school age are experimentalist, which for most times predisposes them to danger particularly when they fail to put safety into practice in and outside the school environment.

The findings from the chi-square analysis further, showed significant difference between male and female pupils' observed safety practices in the school laboratory (P<4.46). It was found that female pupils' observed safety practices in the laboratory were higher than male pupils' observed safety practices. This findings confirmed the result of Ayanniyi, Mahmound, Olatunji and Ayanniyi (2009) which indicated that ocular injury resulting from unsafe practices was higher in boys (male pupils) than girls (female pupils) who are within the age range of 5-13 years.

From the foregoing, it is observed that while male pupils were more safety conscious in some area of the school (classrooms), the female pupils are more safety conscious in other areas of the school (on the playgrounds, in the laboratory, and on the road to and fro school). This indicates that there is gender difference in pupils observed safety practices. It thus reveals that school administrators/teachers school be gender sensitive when it comes to safety issues in school. This confirmed the International Labour Organization (ILO) (2013) observed ten (10) keys for gender sensitivities in Occupational Safety and Health Practices in its guidelines for gender mainstreaming in Occupational Safety and Health all settings. In the same vein, Okoya (2009) affirmed that there should be gender differences in the application of preventing discipline practices among principals of secondary schools in Nigeria.

Onuzihike (2000) assured that safety education enables children to take things easy, by being careful, obeying rules and regulations and reading meaning to sign pasted in school premises such as don't touch any chemical on this laboratory tables, don't run on the corridor, staircase or in the class; don't throw objects, wearing shoes, boots, slippers where and when necessary, observing road signs and highway code such as zebra crossing, flyovers, school sign, etc irrespective of gender.

In terms of factors affecting safety practices of pupils in Warri, it was found that lack of safety education, programme, poor safety supervision/monitoring by staff, lack of safety knowledge by pupils, lack of safety tips in school premises, absent of safety club for pupils in school, low level of safety instruction by teachers, and poor level of discipline for pupils who disregard safety instruction were perceived factors hindering the pupils level of safety practices in school. This simply suggests the reason for low level of their safety practices in classroom, playground, laboratory and on the road to and fro school. This finding justify Nwankwo (2003) 1st,

6th, 8th and 10th highlight of barriers to school safety practice. This finding also confirmed the sequence of event-Domino theory of accidents causation by Henrich (1959) and the undated Domino sequence theory propounded by Bird and Loftus (1975) which stated that lack of control by management permits basic causes (personal and job factors), that lead to immediate causes (substandard/unsafe practices/conditions/errors) which are the proximate cause of the accidents which result in loss (minor, serious or catastrophic).

Implications

This study has revealed that safety practice for both male and female pupils in the study area is poor. The implication of this is increase in the rate of school accidents among school pupils and high level of absenteeism and aggravation of poor public image for both teachers and other school stake holders.

There is therefore for a high need for safety instruction imbedded into the school curriculum, parent and teachers encouraging pupils/wards to participate actively in safety activities organized within and outside the school.

Again, as observed in the study, male pupils are more careless safety wise than female, thus, teachers should be careful and bear in mind gender sensitivity and safety consciousness when assigning activities to students/pupils in schools.

Conclusion

From the findings in the study, the following conclusions were drawn.

- Pupils in Warri metropolis observed safety practices in classroom, playground, laboratory and on the road to and fro school is low.
- There is no significant difference on the male and female pupils' observed safety practices in classroom and playground but there are differences on the male and female pupils' observed safety practices in laboratory and on the road to school.
- The males are more safety conscious than female in the classroom, while the females are more safety conscious than males in the laboratory, on the playground and on the road to and fro school in Warri Metropolis.
- The low safety practice of male and female pupils in the school premises and on the road is not caused by the pupils only but by several factors such as poor safety supervision/monitoring of the pupils by school staff, lack of/ineffective safety education programme, poor safety knowledge and consciousness of the pupils, absent of safety club for pupils in school, low level of safety instruction by teachers, lack of safety tips on school premises and poor level of discipline to pupils who disregard safety instructions in the school by school authority.

Based on the findings and conclusions, the following recommendations were made;

1. There should be proper and continuous emphasis on need for safety and safety practices by teachers to pupils on a daily basis in the assembly and few minutes' safety reminder talk by class teachers immediately after assembly before the first period on daily basis. This will help to instill safety consciousness in the pupils.
2. Safety tips in all aspects of the school environment and activities such as the classroom, playground, laboratory, library, staircases, canteen, road etc. should be clearly written out with easy understandable terms to the pupils' level of comprehension and posted in all the strategic areas of the school to regularly keep pupils reminded of the need and types of safety practices expected from them.
3. There should be strict monitoring and supervision of pupils' safety practices/acts by all teachers in the school. Teachers in the process should effect immediate corrections on any unsafe practices/behaviours observed in pupils.
4. There should be safety monitoring team set up by government through school authority/management to help monitor the safety act of pupils and teachers on daily basis. Report should be sent to the school authority on daily basis who will in turn give feedback to government on weekly/monthly basis to help determine pupils' level of safety practices.
5. There should be sanction on teachers whose class pupils are found injured more than once in a week due to unsafe practices. This will help the teachers to strictly and properly monitor their pupils' safety practices without objection.
6. Primary school safety club should be set up in every school and pupils should be made to play active role in the club. This will help to internalize in the pupils, safety acts and practices and as well effect safety consciousness in them.

7. Strict implementation and discipline should be effected or given to pupils instantly or in the assembly ground for disregarding safety instruction set out in the school. This will help other pupils to learn how to be safety conscious by obeying safety rules and regulations.
8. Safety education in the school curriculum should be taught by trained health and safety education teachers with the aim of changing pupils' unsafe behaviour to safe behavioural practices. This will help to inculcate safety into the pupils' philosophy of life since children at this at age are easily amenable to instruction. This will have a carryover value to adult life.

Contribution to Knowledge

This study has opened a new horizon to researchers and scholars particularly in the field of school safety practice and accident prevention.

References

[1] Ayanniyi, A.A., Mahmoud, O.A Olatunji, F.O. and Ayanniyi, R.O. (2009).Pattern of ocular trauma among primary school pupils in Illorin, Nigeria. Africa journal of medical science, 38(2) 193-196.
[2] Bird, F.E. and Loftus, R.G. (1976).Loss of control management. Loganville Georgia.52 Institute Press.
[3] Centers for Disease Control and Prevention, National Center for Injury Prevention and Control (2011). WISQARS Leading Causes of Nonfatal Injury Reports. Retrieved January 12, 2019 fromhttp://webappa.cdc.gov/sasweb/ncip/nfilead200 1.html
[4] Charles, G.O. (2009). Safety versus security in fire protection planning. The American Institute of Architects: Knowledge Communities. Retrieved January 12, 2019 fromwww.google.com.
[5] Ejifugha, A. U. (2002). The status of school health programme in secondary schools in Imo State. Nigeria School Health J., 3:142-146.
[6] Elendu, I.C. (2010). Fundamentals of Research and Statistics for students in Human Kinetics and other Educational disciplines. Port-Harcourt: Glory of the Latter House Publisher.
[7] Federal Highway Administration (2012).Proven Safety counter measures. Roundabout. Retrieved February, 2, 2019 fromwww.google.com.
[8] Heinrich, H.N. (1959). Industrial accident prevention. 4th edition, New York: McGraw – Hill.
[9] Igwe, O.M.B & Emeharole,P.O. (1993). Fundamentals of Health Science for Senior Secondary Schools. 1st Edition, Obosi, Nigeria, pp:26-30.Pacific Publishers.
[10] International Labour Organization (2013).Ten Keys for Gender Sensitive in Occupational Safety and Health Practice. Guidelines for Gender Mainstreaming in OSH. Programme on safety and Health at work and the Environment. (Safework).Retrieved February, 12, 2019 from www.google .com.
[11] Jeraen, J.H., Boogaard, H., Nijland, H., and Gerard, H. (2010).Do the health benefits of cycling outweigh the risks? Environmental health perspectives. Retrieved February, 2, 2019 fromwww.google.com.
[12] Local Education Authority (LEA) Warri South LGA, Delta State, 2013).
[13] Nwana, O.C. (2007). Health Promotion and Environment. Nigeria Journal. Health Promotion., 3:9-15.
[14] Nwankwo, B.O (2003). Occupational health and industrial safety-concepts and principles.. pp:54-67. (1stEdn).Owerri: Concave Publishers.
[15] Odibo, A. A. (2010). Philosophy of safety education. An unpublished lecture note for degree students.
[16] Odibo, A. A., Sanubi, B.O. &Egenege, J. A. (1995).Health and safety education.A functional approach including first aid procedures. Warri: COEWA Publishers.
[17] Ogbalu, A.I (2002). Guide to health education programmes in the schools. Nigeria. School Health Journal., 3:142-146.
[18] Okafor, J.O, (2000). Functional approach to school health education. 2ndEdn.,Anambra, Erudite Publishers, pp: 96-101.
[19] Okoya, P.O. (2009). Gender Difference in the Application of Preventive Discipline Practices among Principals of Secondary Schools in Nigeria.Journal.of Social. Science. 20(1): 49-53
[20] Oluwande, P.A., (1998). Provision of environmental health facilities for healthful school living in Nigeria. Nigeria School Health Journal., 1:27028
[21] Onuzulike, N.O., (2000). Awareness of Health Promotion strategies among public health officers in Owerri municipal council. Nigeria Journal.Health Education., vol. 11 (no2) 9:254 - 257.
[22] Onuzulike., N.O. (1997). A Handbook of Safety Education. (1stEdn) Owerri, pp: 35-40.Mantle Publishers.
[23] Uchegbu., J.N., W.C. Ibeabuchi and C. Uzoho (2002). School and community health.(2ndEdn).Onii Publishing House, Owerri, pp:78-89.
[24] World Health Organization (2008).Violence, injuries and disability. Biennial 2006 – 2007 report. World Health Organization, Geneva.

Tetragonal Polar Magnet VOSe2O5: A Study of Néel-type Skyrmion Lattice and Magnetic Behavior

Dr. Alexander Schmidt
Institute of Environmental Sciences, University of Heidelberg, Heidelberg 69120, Germany

Abstract: The paper attempts to study inter-state differentials in occupational/industrial classification of the Chamar caste workers in India using the latest 2011 Census data. The Chamar, the numerically the largest and the most widely distributed SC caste in India, is still dominantly agricultural by occupation and rural by residence. Only slightly higher than two-fifths of their worker were engaged in non-farm activities, against this the share of such workers was nearly three-fourths for Balmiki workers.

There were, of course, wide inter-state differentials on this count. In some states like Himachal Pradesh the share of cultivators among the total Chamar workers was as high as two-fifths. In contrast, in Bihar seven of each ten Chamar workers were employed as agricultural/casual labourers. On the whole, in eight states, the majority of the Chamar workers was employed in farm sector, and in remaining 17 states and four union territories the reverse was true of the Chamar workers. However, in the former category of states, more than seven of each ten (73.0 per cent) of total Chamar population was residing. Evidently, the dominant majority the Chamar households in the country was employed in farm sector, where wages were generally low and working conditions poor.

Keywords: Numerical dominance, Work participation rates, Landless labourers, Non-farm employment, occupational diversification.

Date of submission: 08.08.2019 Date of review: 21.08.2019 Date of acceptance: 27.08.2019

Introduction

The Chamar caste is numerical the largest and geographically the most widely distributed of the castes listed in the VIII Schedule of the Indian Constitution under the Article 341 for taking special welfare measures for socio-economic upliftment of former untouchable castes and communities. Initially, stigma of untouchability in the traditional hierarchy of castes in India was the basic criterion to include or exclude castes in the scheduled list of castes, but today the list include castes that never faced untouchability. Presently, there are, in all, nearly 600 castes among the scheduled castes in India. However, 16 top ranking castes of them, each having at least three million persons, shared together 127.9 million or 63.5 per cent of 201.4 million SC population of India in 2011.

The Chamar caste, the largest scheduled caste in India with a population of 46.72 million making more than one-fifth or 23.2 per cent in total scheduled caste (SC) population in India in 2011 and distributed in 25 states and four union territories in 2011, is differently called in different areas and as such include many sub-groups. In Gujarat, Karnataka and Maharashtra, they are notified with Bhambi; and Jatva, Mochi/Muchi, Satnami, and Raidas would prefer an identity distinct from the Chamar (Singh, 1993:302). They make first ranking SC caste in 184 districts (excluding 11 districts, having a population of less than 1,000 persons) of ten states

and one union territory. Their share in total SC population of respective districts ranged from a high of 91.8 per cent in Kabeerdham (Chhattisgarh) to a low of 14.7 per cent in Godda (Jharkhand). Further, the Chamars made majority SC caste (more than 50.0 per cent) in 109 districts of India in 2011. Seventy-eight of them were distributed in three states of Uttar Pradesh (48 districts), Madhya Pradesh (21 districts) and Chhattisgarh (10 districts). The rest were distributed in Haryana, Bihar, Punjab, Rajasthan, Himachal Pradesh and NCT of Delhi. The Chamars were though predominantly rural by residence (more than 80.0 per cent living in rural areas), had low female literacy (45.0 per cent against 48.0 per cent for all SCs) and agricultural (only 42.0 per cent workers engaged in non-farm factor against 43.0 per cent for all SCs), but more organized and assertive in political and social terms. The Dalit Panthers Movement started in the early 1970s in Maharashtra has made their youth radical and highly assertive. Over the period, they have mastered in identity politics using leaders such as B.R. Ambedkar and Jyotiba Phule as their icons. Their widespread geographical distribution and numerical dominance over the other SC castes in several states and their sub-regions helped them in this context. The electoral successes of Bahujan Samaj Party (BSP) under Mayawati, who hails from the Chamar caste, exemplify this well. BSP made early inroads in power politics in some states and finally succeeded in gaining political power Uttar Pradesh. In 21 districts of the country, the Chamar make more than three-fourths in total SC population there. Definitely, this goes in their favour so far as the electoral politics is concerned. Being traditionally landless, they were engaged in skin and hide and in agriculture as labourers. Presently, they are employed as daily-wage worker, cultivators, household industry workers, leather work and shoe-makers. In Himachal Pradesh, they are now engaged in masonry, carpentry, basketry and rope-making. Kurils of Madhya Pradesh have adopted modern occupations. Education has improved and they are now shifting to urban areas. The teachers, administrators, engineers, doctors, defence personnel and white-collar workers from amongst them are the harbingers of modern inter-community linkages, cutting across community barriers. Some of them have emerged as political leaders both at the national and state levels. Given different historical background, some of the states and union territories have done relatively better than others for their welfare.

In the light of above statements, it would be interesting to examine inter-state differentials in occupation structure of the Chamars in India by using data/information available from the 2011 Census, the latest in the series. The latest picture is a cumulative effect of the effects made by different individuals and individual households, on the one hand, and

the different state/union territory governments, on the other hand, for their socio-economic upliftment since Independence. In which of the states/union territories, the occupational structure of the Chamars is more diversified than the others and why makes an important question? Answering such a question will help in reassessing as well as re-defining the programmes and policies framed by different state and union territory governments for their socio-economic upliftment.

For the purpose, the data have been picked up from the Census of India, *Special Tables on Scheduled Castes, 2011* by taking the state as a unit of data analysis and mapping. In 2011, there were 28 states and seven union territories in India, and the Chamar caste was distributed in 25 states and four union territories. In the states of Sikkim, Nagaland, and Arunachal Pradesh and the union territories of Puducherry, Lakshadweep, Andaman and Nicobar Islands, the Chamar caste was not notified. In fact, in Nagaland, Arunachal Pradesh, Lakshadweep, and Andaman and Nicobar Islands, scheduled castes were not at all notified in 2011.

Since, the Census of India stopped publishing individual SC caste-wise data on the occupational structure of SC population in India at the district level after 1981 Census, we are handicapped in extending this study to the district level. Further, the Census of India divides workers into two categories: *main* and *marginal* workers. Those working for major part of the reference period of six months or more are termed as 'main' workers, those, who had not worked for the major part of reference period (worked less than six months), termed as 'marginal' workers and a person who had not at all worked during the entire reference period as a 'non-worker'. Accordingly, 58.2 million or about 71.0 per cent of 82.3 million SC workers were classified as the 'main' workers, and remaining 24.1 million or 29.0 per cent as 'marginal' workers. The present study will focus only on the occupational/industrial classification of the 'main' workers.

Before moving further to analyse the data on occupational structure of the Chamars at the state level, we shall compare occupation structure of the Chamars with other nine major SC castes in India to see where the Chamar caste stands among the major SC castes in India in terms of their occupational diversification.

The Chamars in comparison to other major SC castes

Adi Dravida, Balmiki, Chamar, Dhobi, Madiga, Mahar, Mala, Dusadh and Pasi were the nine top ranking SC castes in India at the time of 2011 Census. Each having more than 5.0 million persons and their combined population made 105.7 million, their share made 52.5 per cent in

total SC population of India. Geographically speaking, Adi Dravida, Mala, and Madiga castes were mainly concentrated in south Indian states, Mahar caste mainly in Maharashtra and Chhattisgarh, Balmiki, Chamar, and Dhobi in north Indian states, and Dusadh and Pasi in Uttar Pradesh and Bihar states.

In 2011, nearly one-half or 49.8 per cent of total 'main' workers in India were engaged in non-farm activities. The national averages for SC main workers was 43.4 per cent, for non-SCs 54.4 per cent, and for nine top ranking SC castes 41.1 per cent. It means, the top ranking SC castes in India have the least diversified occupational structure in comparison to both the non-SC and rest of the SC castes. The combined share of non-farm employment was 45.7 per cent for remaining more than five hundred SC castes in India (Table 1). One can safely infer that dominant majority of SC workers are still engaged in agricultural operations mostly as agricultural labourers and thus rural by residence.

There were, of course, wide inter-caste differentials in structural composition of workers among nine top ranking castes. The share of non-farm employment ranged from a high of 74.2 per cent for the Balmikis to a low of only 25.4 per cent for the Madigas, differing nearly by three times. Traditionally, Balmikis are engaged in sweeping and scavenging. Against this, Madigas, mainly concentrated in Andhra Pradesh and Karnataka, are traditionally agricultural labourers. In 2011, dominate majority of their workers (65.5 per cent) were engaged as agricultural labourers. This proportion was only 22.1 per cent for Balmikis.

Table 1: India: Work participation rates of main workers of nine top ranking SC castes in accordance to farm and non-farm sector employment, 2011

SC Caste Name	Main Workers	Farm sector workers	Per cent	Non-farm sector workers	Per cent
Adi Dravida	3,043,414	1,475,393	48.48	1,568,021	51.52
Balmiki	1,702,927	438,748	25.76	1,264,179	74.24
Chamars	11,911,351	6,882,462	57.78	5,028,889	42.22
Dhobi	1,165,121	578,237	49.63	586,884	50.37
Madiga	3,253,435	2,426,846	74.60	826,589	25.40
Mahar	3,461,749	1,999,117	57.75	1462,632	42.25
Mala	2,345,637	1,648,280	70.27	697,357	29.73
Dusadh	1,077,138	792,806	73.60	284,332	26.40
Pasi	1,627,892	1,176,604	72.28	451,288	27.72
Sub-Total	29,588,664	17,418,493	58.87	12,170,171	41.13
Remaining SC Castes	28,594,817	15,538,552	54.34	13,056,265	45.66
Total	58,183,481	32,957,045	56.65	25,226,436	43.35

Of the nine major SC castes, the Balmikis, the Adi Dravidas and the Dhobis/Dhobas are three SC communities, in whose case the majority of workers were engaged in non-farm economic activities. Balmikis are traditionally engaged in sweeping and scavenging, which are low paid tertiary activities. During the British rule in India, they were recruited in defence services to perform these traditional services. After independence, with urban-industrial development there has been rapid in urbanization in India, creating a huge demand for their traditional services as sweepers and scavengers. This played an important role in residential shift from rural to urban areas and change of their occupation structure. Reservation of jobs in public sector units for scheduled caste workers in post-Independence period also played an additional role in their shift of resident and occupations. That is why, Balmikis are more urbanized and employed in non-farm activities than other major SC castes. Whereas, socio-cultural movements in south India especially in Tamil Nadu, where are the Ad Dravidas are highly concentrated happened the downtrodden castes including the Adi Dravidas in their socio-economic transformation (see Kshirsagar, 1994:380-390). While the reverse was true of Madigas, Malas, Dusadhs and Pasis. However, one- third or 33.1 per cent of Pasis workers were cultivators and only about two-fifths working as landless agricultural labourers. Within this group, the Dhobis and the Chamars are the two other castes among whom about one-fifth or more workers are engaged as cultivators. It means sizable share of Pasis, Dhobis and Chamars households own land or cultivate land on rent, providing them prestige and power animating from landownership in rural communities.

Briefly, the majority of SCs workers are still engaged in farm sector activities, engaged mainly as low paid agricultural workers. Of course, there are wide inter-caste differentials in this context. Of the nine top ranking castes, the three castes namely Adi Dravidas, Balmikis and Dhobis/Dhobas have the majority of their workers employed in non-farm activities; while the reverse is true for remaining six castes namely, Madigas, Malas, Chamars, Mahars, Dusadhs and Pasis. However, Pasis and Chamars from the latter and Dhobis/Dhobas from the former group have a good share of workers engaged as cultivators. This adds not only to their income but also prestige and power in rural society.

In the following, occupational/industrial composition of workers belonging to the Chamar caste are discussed in details at the state level. It is to be noted here that earlier the Census of India was classifying and publishing industrial classification of individual SC castes up to the district level. However, the practice was discontinued after the 1981 Census. In absence of requisite data, we are forced to restrict our discussions to the state level.

Occupational/Industrial Structure of the Chamars

Chamars, in contrast to Balmikis/Bhangis, are predominantly rural by residence, have relatively low female literacy and high male-female literacy differentials and employed mostly as the agricultural labourers (Table 2).

Table 2: Comparative picture of urbanization, general literacy, female literacy and occupational diversity between all SCs and Chamars, 2011

Caste	Urbanization	General Literacy	Female Literacy	Non-farm employment
Chamar	19.46	58.08	45.28	42.22
All SCs	23.60	56.50	48.30	43.35
Non-SCs	35.20	66.09	59.40	54.41

Note: All figures are in percentage. Literacy rate has been computed on the basis of total population in place of excluding 0-6 age-group population.

Table 10: Classification of states/union territories in accordance to work participation rates of Chamars, 2011

Level/per cent	Name of State/Union Territory
High (>40.0%)	Manipur (49.5), Kerala(46.9), Mizoram (46.8), Tamil Nadu (45.7), Daman & Diu* (40.5) **Total=5**
Moderate (40.0-30.0%)	Karnataka(38.2),Maharashtra(37.9), Andhra Pradesh (35.6), Dadra & N.Haveli* (35.3), Goa (35.0),Chandigarh*(34.1),Gujarat (33.4), Tripura (32.9), Assam (30.4) **Total= 9**
Low(< 30.0%)	NCT of Delhi*(29.4),Chhattisgarh (29.1), Madhya Pradesh (28.7), Punjab(28.6) Rajasthan(28.5),West Bengal(27.8), Himachal Pradesh(25.3),Uttarakhand (25.0),Odisha(24.9),Jammu &Kashmir (24.4), Haryana (23.9), Meghalaya (22.3), Uttar Pradesh (20.5), Bihar (18.6), Jharkhand (16.3) **Total=15**

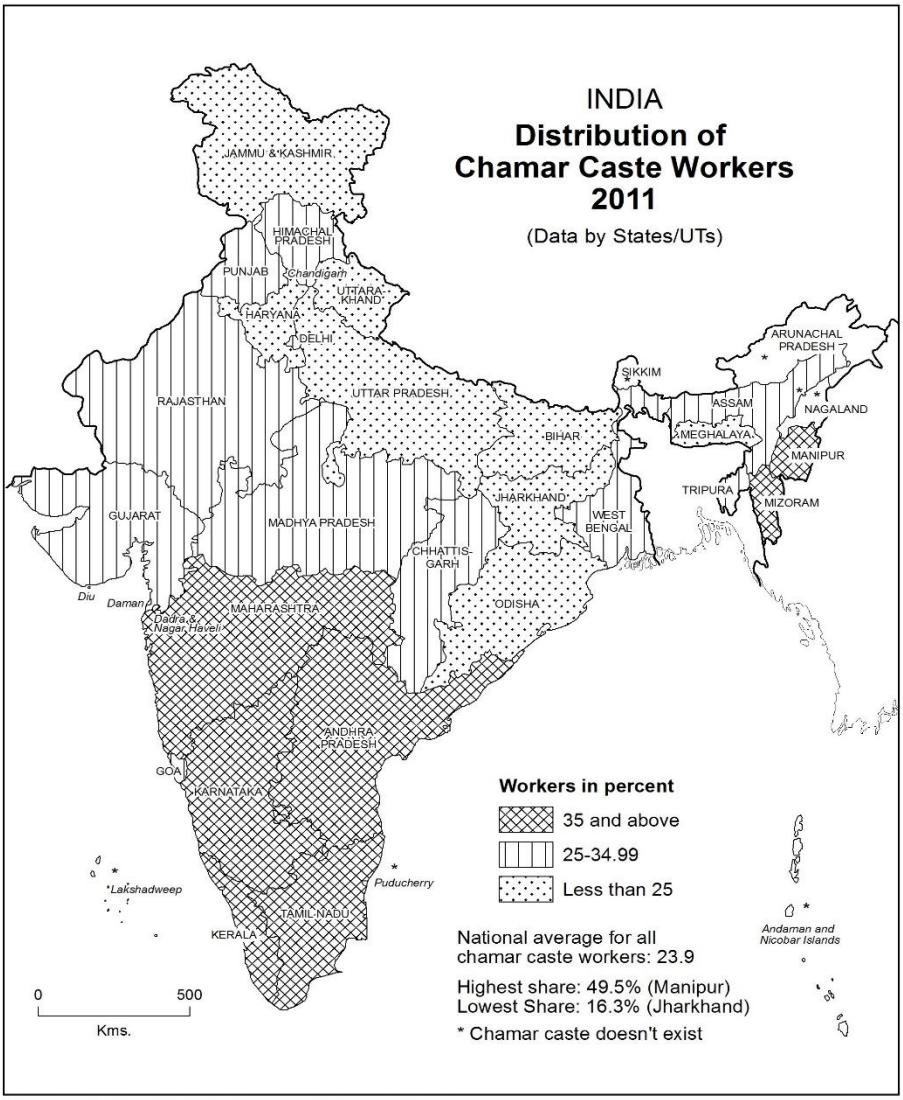
Average: 24.1

*Notes:1.*Union Territories, 2. Figures in parenthesis indicate to workers as percent to total population*

The work participation rate of the Chamars (about 24.0 per cent) was quite low. This indicates to a high dependency ratio among the Chamars. In other words, there were three dependents on one Chamar worker. Against this, there were less than two persons dependent on one Madiga worker. The latter caste is mainly concentrated in south India and the former in north India.

What explains the low work participation rates among the Chamars? It seems that these is a marked outflow of economically the most active workforce from the backward states like Bihar, Uttar Pradesh, and Jharkhand, where Chamars are highly concentrated, to the developed states and their metropolitan cities to work leaving behind their families at the native place. This results in low work participation rates of Chamars in states, which are economically backward but having high concentration of the Chamars. Low work participation rates of Chamars in states like Uttar Pradesh, Bihar, West Bengal, and Rajasthan speaks of this.

Another explanation, needing further investigation, may be that the Chamars being a relatively better-off caste of SCs in India can afford to keep their school/college going children off the labour force.



* Courtsey: Mr. Mohan Singh, Cartographer, for designing the map.

FIG. 1

Of course, there are wide inter-state differentials in work participation rates of the Chamars. It ranged from a high of 49.5 per cent in Manipur to a low of only 16.3 per cent in Jharkhand, the respective shares the two states by three times (Table 3). In four states and one union territory, where was work participation rate of Chamars higher than 40.0 per cent, the total population of Chamars is very low. Total population of Chamars in these states ranged from a high of 525 persons in Tamil Nadu to 131 persons in union territory of Daman & Diu. In these states, most of the Chamars are either working as migrant labourers or central government employees including defense personnel including stationed armed forces for the national security.

Table 3: India: Inter-state differentials in percentage of the Chamar workers and their distribution in broad industrial/sector categories, 2011					
State/UT	Worker	Cultivators	Agri. Labourers	Household industry workers	Other workers
Jharkhand	16.31	14.25	29.14	3.35	53.26
Bihar	18.62	8.78	69.86	2.33	19.02
Uttar Pradesh	20.46	25.34	38.66	2.96	33.03
Meghalaya	22.34	5.81	3.10	1.94	89.15
Haryana	23.90	7.34	32.40	2.03	58.23
Jammu and Kashmir	24.45	25.09	5.07	1.49	68.23
Odisha	24.88	22.82	27.51	5.94	43.74
Uttarakhand	24.97	10.57	33.17	2.38	53.88
Himachal Pradesh	25.27	39.76	4.28	1.54	54.42
West Bengal	27.83	7.20	44.19	5.36	43.25
Rajasthan	28.55	31.22	18.63	3.28	46.88
Punjab	28.59	3.98	22.53	4.03	69.45
Madhya Pradesh	28.71	22.18	44.71	3.80	29.31
Chhattisgarh	29.14	30.64	42.72	0.70	25.94
Assam	30.39	15.01	12.79	3.68	68.52
Tripura	32.92	2.89	4.97	2.26	89.89
Gujarat	33.36	12.73	42.04	0.90	44.34
Goa	34.96	3.22	0.51	1.88	94.39
Andhra Pradesh	35.58	1.70	7.48	13.59	77.24
Maharashtra	37.91	12.69	26.60	4.83	55.88
Karnataka	38.23	13.25	59.49	1.58	25.68
Tamil Nadu	45.71	3.33	2.92	5.00	88.75
Mizoram	46.81	14.55	3.45	0.00	80.00
Kerala	46.86	1.03	2.06	0.00	96.91
Manipur	49.47	25.53	2.13	1.06	71.28
Union Territories					
NCT of Delhi	29.39	0.22	1.00	2.23	96.55
Chandigarh	34.11	0.20	0.30	0.89	98.61
Dadra & N. Haveli	35.29	5.95	2.46	0.00	91.58
Daman & Diu	40.46	0.00	0.00	0.00	100.00
All Chamars	23.90	19.81	37.97	2.95	39.27
All SCs	28.89	16.43	40.22	2.81	40.54
All Non-SCs	29.99	26.86	18.73	3.78	50.63

In another seven states and two union territories, where work participation rate of Chamars ranged between 30.0 and 40.0 per cent, Andhra Pradesh, Tripura, Goa and Dadra and Nagar Haveli belong to a category of states/union territories where total population of Chamars was relatively small. Whatever little number of persons was there, they were living and working in urban areas, mostly engaged in urban services relating to sanitation. In Karnataka, Maharashtra, Gujarat, Assam, and Chandigarh (UT), where Chamars have relatively higher concentration, present a contrasting picture. In Karnataka, Maharashtra and Gujarat, Chamars were dominantly rural and agricultural. Against this, in Chandigarh (UT) and Assam, they were

highly urbanized and engaged in non-farm activities. In states of southern and western India, Chamars are enumerated with Bhambi/Bhambhi and Chambhar castes. However, in Andhra Pradesh the Chamars and Chambhars are notified separately.

In remaining fourteen states and one union territory (i.e. NCT of Delhi), where the Chamars were highly concentrated, their participation rates are low. Their combined strength in these areas was about nine-tenth of total Chamars in India. In all these states except Meghalaya, population of Chamars was quite large but work participation rate low. States and UTs in this category were distributed in northern, central and eastern India.

On the whole, the dominant majority of Chamar workers (57.8 per cent) were engaged in farm activities, mainly as agricultural labourers. Nonetheless, about one-fifth or 19.8 per cent of their total (main) workers were cultivators in 2011. Only a tiny share of their worker (about 3.0 per cent) was engaged in household industries. In fact, in post-green revolution phase traditional household industries registered a sharp decline in rural India, forcing many SC rural artisan households, earlier engaged in traditional activities like skin tanning, shoe-making, rope-making, carpentry and so on, to join agriculture as labourers. Increase in agricultural wages and the decline in demand for traditional household industry products, in combine, contributed to this. In 2011, 57.8 per cent of the Chamar workers were employed in farm sector and remaining 42.2 per cent as non-farm workers. Of course, there were wide inter-state variations in this context.

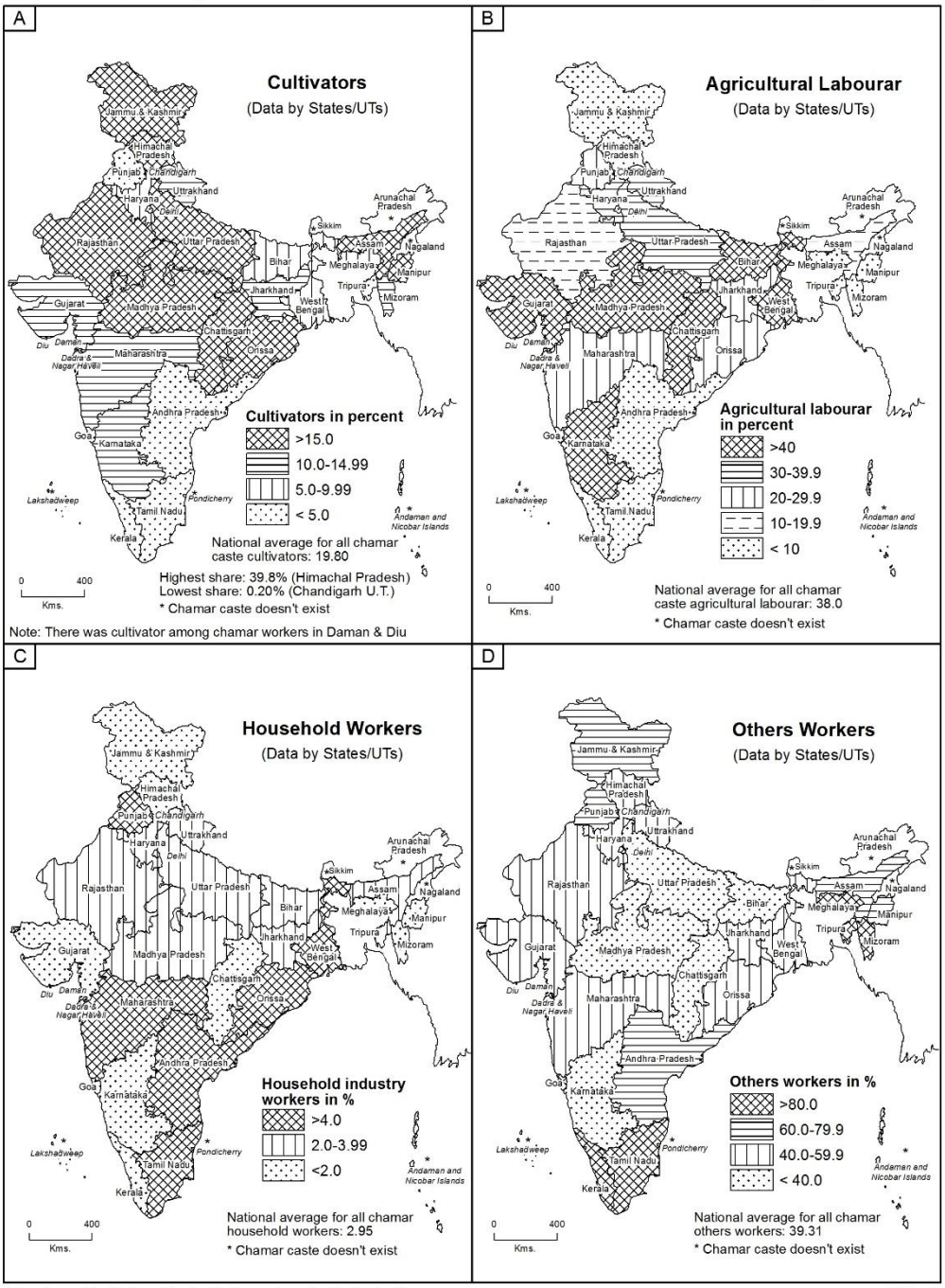
The share of cultivators in total Chamar workers ranged from a high of about two-fifths (39.8 per cent) in Himachal Pradesh to a low of less than 2.0 per cent in Andhra Pradesh, and all union territories recording nil or a negligible share of such workers in total Chamar workers. In six states of Himachal Pradesh, Rajasthan, Chhattisgarh, Manipur, Uttar Pradesh and Jammu and Kashmir, the share of cultivators in total workers was one-fourth or higher. In another two states (Odisha and Madhya Pradesh), this share was more than one-fifth. In this way, about one-third of total 25 states having Chamar population in 2011 had the share of Cultivators among Chamar workers was higher than the average for all the Chamars in India. Except Manipur, all other such states were located in north and central India. In contrast, ten states of Bihar, West Bengal, Haryana, Punjab, Tripura, Meghalaya, Goa, Andhra Pradesh, Tamil Nadu and Kerala had this share of less than one-tenth. In south India, it is only Karnataka, where this share was higher than one-tenth but lower than the national average for the Chamars. Against this, Punjab had this share lowest of all the north India states, even less than one-half of Bihar, having the highest share of farm workers among Chamars in India. Briefly, the share of

cultivators among the Chamar workers was higher in north Indian states and the lower in south Indian states. The share of cultivators among the Chamar workers finds a positive association with historical factors and success of land distribution among SCs under land ceiling act, while showed a negative association with degree of urbanization in states and union territories of India.

Inter-state variation in the share of the Chamar agricultural/casual labourers was much higher than that of Chamar cultivators. It ranged from a high of about 70.0 per cent in Bihar to less than one per cent in Goa. The union territories, in general, had a very low share of such workers. The two states, Bihar and Karnataka, had the dominate share of Chamar workers in agriculture as the labourers. In another four states (Madhya Pradesh, West Bengal, Chhattisgarh, and Gujarat), this share was more than two-fifths in total workers. Also, the share of such workers was quite high in Uttar Pradesh. In all, seven states had this share higher than the average for the Chamar workers in India. Notably, however, the average share of agricultural labourers (38.0 per cent) among the Chamars was lower than the average for all SCs (40.0 per cent) in India. This is associated mainly with the higher share of cultivators among the Chamars in comparison to all SCs in India. The non-SC castes had this share less than one-fifth.

On the other side, all the union territories along with states in northeast and south India, except Karnataka, recorded low to very low share of such workers among the Chamars. In seven states of Meghalaya, Tripura, Mizoram, Manipur, Goa, Tamil Nadu, and Kerala, the share of agriculture labourers among Chamars was less than 5.0 per cent. Himachal Pradesh from northwest Indian states is also included in this category. In all these states, except Himachal Pradesh the total population of the Chamars is generally small. Briefly, states in the Indo-Gangetic plains, in general, had higher proportion of agriculture labourers among the Chamar workers, while the reverse was true for all the union territories and states located in northeast and south India. Further, in states having relatively higher share of cultivators among the Chamar workers, the share of agriculture labourers in total Chamar workers was relatively low to very low.

INDIA: Occupational/Industrial Distribution of Chamar Caste Workers, 2011



* Courtsey: Mr. Mohan Singh, Cartographer, for designing the map.

FIG. 2

Only a small fraction (2.93 per cent) of the Chamar workers was engaged in household industries. However, the average share for Chamar workers was slightly higher than that for all SC castes (2.81 per cent). Notably, the share Non-SC castes was higher (3.78 per cent) than the Chamars and all SCs both. Among states, the share of such workers among the Chamars ranged from a high of about 14.0 per cent in Andhra Pradesh to nil in Mizoram and Kerala. Among union territories, Dadra and Nagar Haveli and Daman & Diu also recorded nil share of such workers. It was only in the four states of Andhra Pradesh, Odisha, West Bengal and Tamil

Nadu, the share of such workers among Chamars was 5.0 per cent or more. Assam, Jharkhand, Maharashtra, Rajasthan, and Punjab are others states, where was the share of Chamar workers in household industries was between 3.0 and 5.0 per cent. In India, under the impact of rapid urbanization and modernization there has been a sharp decline in demand for goods produced in traditional household industries, wherein were employed, at one point of time, a large number of SC households.

The share of 'other workers'[1] among the Chamars varied widely among the states and union territories. 39.3 per cent being the all India average for all Chamars workers, the share ranged from a high of cent per cent in Daman and Diu to a low of only 19.0 per cent in Bihar. All the four union territories had this share of more than 90.0 per cent. Among states, there were as many as sixteen states, where the share of such workers was higher than one-half, and in another four states (Odisha, West Bengal, Rajasthan, and Gujarat) it was higher the average for all the Chamars in India. In remaining five states of Bihar, Uttar Pradesh, Madhya Pradesh, Chhattisgarh and Karnataka, this share was quite low. In these states, only three or less among each ten Chamar workers were employed in non-farm activities. This indicates to very poor economic conditions of the Chamars in these states. In 2011, these states, in combine, had nearly 70.0 per cent total Chamars in India.

Table 4: Classification of States/UTs in accordance to the majority of the Chamar workers employed in farm and non-farm activities, 2011

Having majority worker in the farm sector	Having majority workers in the non-farm sector
Bihar (78.7), Chhattisgarh (73.4), Karnataka (72.7), Madhya Pradesh (66.9), Uttar Pradesh (64.0), Gujarat (54.5), West Bengal (51.4), Odisha (50.3) **Total=8**	Daman&Diu(100.0),Chandigarh(99.5),NCT, Delhi(98.8),Kerala(96.9),Goa(96.3),Tamil Nadu (93.8),Tripura (92.2), Dadra & Nagar Haveli (91.6), Meghalaya(91.1), Andhra Pradesh (90.8), Mizoram (80.0), Punjab (73.5), Manipur (72.3), Assam (72.2), Jammu & Kashmir (69.8), Maharashtra(60.7), Haryana (60.3), Jharkhand (56.6), Uttarakhand(56.3), Himachal Pradesh (56.0), Rajasthan (50.2) **Total=21**

Note: Figures in parentheses indicate to percent in total main workers.

On the whole, in eight states the majority of the Chamar workers was employed in farm sector activities, and in remaining 17 states and four union territories the reverse was true of the Chamar workers (see Table 4). In the former category of states, 73 per cent of total Chamars were residing, while remaining 27 per cent were living in the latter category of states/UTs.

[1] The category of 'other workers' included those engaged in manufacturing industries, plantation, trade and commerce, transport, storage and communications, and other services.

Evidently, the dominant majority the Chamar households in the country was employed in farm sector activities.

Conclusion

The majority of SCs workers are still engaged in farm sector activities, engaged mainly as low paid agricultural workers. Of course, there are wide inter-caste differentials in this context. Of the nine top ranking castes, the three castes namely Adi Dravidas, Balmikis and Dhobis/Dhobas have the majority of their workers employed in non-farm activities; while the reverse is true for remaining six castes namely, Madigas, Malas, Chamars, Mahars, Dusadhs and Pasis. However, Pasis and Chamars from the latter and Dhobis/Dhobas from the former group have a good share of workers engaged as cultivators. This adds not only to their income but also prestige and power in rural society.

The Chamar, the largest and most widely distributed SC community in India, had low work participation rates. Their work participation rate of 24.0 per cent indicates to a high degree of dependency ratio among them. Low work participation rate was more evident in the case of economically backward states like Uttar Pradesh, Bihar, Madhya Pradesh and Rajasthan, where the Chamar population has a very high concentration. The reverse was true of union territories and states having a low concentration of Chamars. States in northeast and south India represent this category. The majority of the Chamar workers was employed in farm sector especially as agricultural labourers. However, in some states like Himachal Pradesh the share of cultivators in total Chamar workers was as high as two-fifths. In contrast, in Bihar seven of each ten Chamar workers were employed as agricultural/casual labourers. On the whole, in eight states, the majority of the Chamar workers was employed in farm sector, and in remaining 17 states and four union territories the reverse was true of the Chamar workers. However, in the former category of states, more than seven of each ten (73.0 per cent) of total Chamar population was residing. Evidently, the dominant majority the Chamar households in the country was employed in farm sector.

References

Singh, K.S (1993), *People of India: National Series Vol. II- The Scheduled Castes*, published by Oxford University Press, Delhi on behalf of Anthropological Survey of India, p.302.

Kshirsagar, R.K.(1994), *Dalit Movement in India and its Leaders,1857-1956*, Prints Publications Pvt. Ltd., New Delhi, pp.379-406.

Pemahaman Metafora: Studi pada Lirik Lagu Pelangi di Matamu

Rachel Yvette Lawson

Faculty of Cultural Studies, Highland University, Edinburgh, UK

Abstrak : Artikel ini ditulis guna membahas tentang pengertian metafora, jenis – jenis, dan contoh majas metafora pada lirik lagu pelangi di matamu. Dengan adanya artikel ini, semoga dapat membantu pembaca agar dapat lebih memahami penjelasan tentang metafora itu sendiri.

BAB I

PENDAHULUA

Metafora merupakan salah satu majas atau gaya bahasa yang melukiskan sesuatu dengan perbandingan langsung dan tepat atas dasar sifat yang sama atau hampir sama. Ciri majas ini adalah menggunakan kata kata kiasan dan terdapat pilihan kata yang menyamakan sesuatu dengan sesuatu yang lain. Dalam menyamakan atau membandingkan sesuatu, majas metafora menggunakan perbandingan langsung tanpa diikuti kata pembanding *seperti, bagai, bak,* atau *laksana.* Majas metafora itu sendiri masuk dalam kategori majas perbandingan.

Gaya bahasa Metafora banyak dipakai dalam berbagai karya sastra dimana tujuannya untuk mengungkapkan suatu makna dengan penekanan pada kesan yang akan ditimbulkan. Selain itu, penggunaan Metafora juga ditujukan untuk mengatasi keterbatasan pilihan kata dan juga bentuk ekspresi seorang penulis.

Ciri-ciri majas Metafora adalah sebagai berikut:

1. Menggunakan kata-kata atau frasa yang memiliki makna kiasan untuk menyamakan atau membandingkan suatu objek dengan objek lainnya.
2. Membandingkan suatu objek atau keadaan dengan memakai perbandingkan langsung tanpa adanya kata pembanding seperti kata bagaikan, laksana, atau bak.
3. Tidak menggunakan kata penghubung atau konjungsi pada kalimat-kalimatnya.

Jenis-Jenis Metafora

1. Metafora antropomorfik (*anthropormic metaphor)*

Metafora ini menyatakan ekspresi yang mengacu pada benda-benda tidak bernyawa dilakukan dengan mengalihkan atau memindahkan dari tubuh manusia atau bagian-bagiannya, dari makna atau nilai dan nafsu-nafsu yang dimiliki manusia

Contoh:

- Pohon nyiur melambai-lambai
- Cintanya bersungut-sungut.

2. Metafora kehewanan (*animal metaphor)*

Jenis metafora ini menggunakan binatang atau bagian tubuh binatang untuk pencitraan sesuatu yang lain. Pada umumya didasarkan atas kemiripan bentuk yang cukup jelas sehingga kurang menghasilkan daya ekspresifitas yang kuat.

Contoh:

- Untuk mengumpat atau memarahi seseorang karena perbuatannya digunakan tuturan metaforis “anjing, babi, kerbau kamu”. Dalam konteks ini seseorang dipadankan sebagai “babi atau anjing” karena watak atau perbuatannya.
- “telur mata sapi”

3. Metafora dari konkret ke abstrak (*from concert to abstract)*

Metafora jenis ini dapat dinyatakan sebagai kebalikan dari hal yang abstrak atau samar diperlakukan sebagai sesuatu yang bernyawa sehingga dapat berbuat secara konkret atau bernyawa.

Contoh:

- “bintang pelajar, bintang lapangan”

Seseorang siswa yang cerdas di sekolah (sebagai sesuatu yang konkret/nyata) dinyatakan sebagai *bintang pelajar* (sebagai sesuatu yang samar atau abstrak).

4. Metafora sinestesis (*synesthetic metaphor)*

Metafora jenis ini pada dasarnya adalah suatu pemindahan atau pengalihan dari pengalaman yang satu ke pengalaman yang lain, atau dari tanggapan yang satu ke tanggapan yang lain. Misalnya, “kulihatsuara”. Secara umum suara adalah sesuatu yang bisa didengar. Namun, dalam tuturan ini “suara” diperlakukan sebagai sesuatu yang dapat dilihat.

Contoh:

1. Matanya sejuk menatapku.
2. Pahit getirnya kehidupan.

BAB II

ISI

Pada BAB ini akan dibahas tentang analisis unsur majas metafora pada lirik lagu pelanggi di matamu. Tidak hanya itu, penulis juga akan mengupas makna yang ada pada majas tersebut.

Berikut lirik lagu Pelangi Di Hatimu :

Pelangi Di matamu

Jamrud

30 menit kita disini
tanpa suara
dan aku resah
harus menunggu lama..
kata darimu
mungkin butuh kursus
merangkai kata,
untuk bicara
dan aku benci
harus jujur padamu,
tentang semua ini
jam dinding pun tertawa,
karna kuhanya diam
danmembisu
ingin kumaki
diriku sendiri yang tak,
berkutik di depanmu
ada yang lain
disenyummu
yang membuat lidahku
gugup tak bergerak
ada pelangi di bola matamu
dan memaksa dirituk bilang"aku sayang padamu"

ada pelangi di bola matamu ,

dan memaksa diri berkata aku sayang padamu.

Lambang dan simbolpelangi dipilih dengan citraan penglihatan menggambarkan ada keindahan yang romantis di mata kekasihnya. Pranggapannya pelangi adalah peristiwa alam yang indah berwarna warni yang dalam mitos di Jawa sebagai tempat jalan bidadari cantik dari kahyangan yang sedang mandi di telaga. Metafora itu sengaja dipakai untuk menggambarkan kecantikan alami yang dimiliki seorang wanita seperti gambaran bidadari.

jam dinding pun tertawa,
karna kuhanya diam
danmembisu

pada lirik ini juga menggunakan citraan penglihatan yang seolah – olah benda mati dapat bergerak dan tertawa seperti manusia pada umumnya.pengibaratan jam dinding yang tertawa ini digunakan untuk menertawakan si pengarang lagu karena tidak pernah berani untuk menyampaikan isi hatinya kepada perempuan yang di cintainya.

DAFTAR PUSTAKA

https://www.maxmanroe.com/vid/umum/majas-metafora.html

https://lirik.kapanlagi.com/artis/jamrud/pelangi-di-matamu/

file:///C:/Users/acer/Downloads/19334-49807-1-SM.pdf

https://www.seputarpengetahuan.co.id/2017/03/pengenalan-jenis-jenis-metafora-dalam-semantik.html

Mengurai Makna Metafora dalam Yukiguni oleh Yasunari Kawabata

Fiona Isabelle O'Connor

Faculty of Cultural Studies, St. Andrews University, St. Andrews, Scotland

ABSTRAK

Bahasa merupakan bagian yang sangat penting dalam sebuah karya sastra. Bahasa bisa digunakan untuk menyampaikan apa yang ingin disampaikan oleh si pengarang. Gaya bahasa adalah cara seorang pengarang untuk menyampaikan isi cerita dan juga dapat memberikan efek tertentu pada karya sastra yang ia buat.

PENDAHULUAN

Bahasa mempunyai peran penting dalam kesuksesan sebuah karya sastra. Karya sastra yang baik biasanya menggunakan bahasa sebagai bagian penyampaian pesan dari gagasan dan imajinasi penulis sastra. Akan tetapi, berbeda dengan bahasa yang digunakan sehari – hari, bahasa dalam karya sastra mempunyai kekhasan sendiri menurut (Aminuddin, 2011;25). Maksudnya bahwa bahasa dalam dunia kesusastraan memang berbeda dengan bahasa yang kita gunakan dalam percakapan sehari – hari, alasannya karena bahasa sastra sudah dimodifikasi sesuai kebutuhan, emosi, dan imajinasi pengarang untuk memunculkan apa yang ingin ia tonjolkan dalam sebuah karya sastra yang menjadi nilai estetika tersendiri, sementara bahasa sehari – hari adalah tuturan – tuturan yang muncul untuk memenuhi proses komunikasi dan menyampaikan informasi yang bersifat sementara.

Dalam penelitian ini, gaya bahasa yang akan diteliti adalah gaya bahasa metafora atau yang disebut dengan istilah inyu (隠 喩). Metafora adalah gaya bahasa yang digunakan untuk mengumpamakan suatu hal yang lain karena adanya kesamaan.

ISI

1. **Bentuk de aru**

Metafora bentuk ini merupakan bentuk dasar dari metafora yang bisa digambarkan dengan struktur 「ＡはＢである」, yaitu dimana A merupakan subjek yang dibicarakan atau yang diumpamakan, sementara B yaitu subjek perbandingan. Seperti pada kalimat dari data 1 berikut ini :

国境の長いトンネルを抜ける雪国であった。

(Keluar terowongan panjang, kereta api memasuki daerah salju).

Ungkapan metafora 「である」seharusnya didahului dengan menggunakan partikel 「は」 namun, pada data ini tidak digunakan. Partikel 「は」 yang seharusnya digunakan sebagai penanda objek yang dibandingkan dalam ungkapan metafora tidak digunakan melainkan ditemukan adanya objek berpartikel lain yang diikuti kata benda sebelum diakhiri dengan penanda「である」. Seperti pada data 1 yaitu 「国境の長いトンネルを抜ける雪国であった」, pada data tersebut digunakan partikel 「を」pada objek sebelumnya berupa kata benda 「長いトンネル」yang kemudian diikuti dengan kata kerja yang menghubungkan dengan objek yang dibandingkan yaitu 「雪国」. Penggunaan partikel「を」merupakan penanda adanya aktifitas yang terjadi pada objek yang dibandingkan dengan objek keduanya. Hal tersebut menandakan bahwa ungkapan metafora bentuk「である」 tidak harus dengan partikel 「は」, yang menentukan adalah adanya objek yang dibandingkan dan objek pembandingnya. Dalam data ini, juga ditemukan bahwa penanda bentuk「である」selalu di diawali dengan kata benda, seperti pada data 1 yaitu 「雪国であった」 yang merupakan kata benda, begitu pula pada data 8 yaitu 「素人である」, pada data 10 berupa「天国の時である」, dan pada data 14 berupa 「朝であった」. Jadi bisa disimpulkan bahwasanya pada metafora bentuk ini kebanyakan adalah digunakannya kata benda yang mengikuti bentuk 「である」.

2. **Bentuk penghubung**

Berdasarkan teori yang diungkapkan oleh Seto, pada unsur pembentuk metafora bentuk penghubung, hanya salah satu unsur saja yang mengandung makna metafora. berikut adalah :

contoh data yang ditemukan:

夜の底が白くなった。

Kolong malam menjadi putih.

Dari keempat data yang ditemukan peneliti, semuanya sesuai dengan kriteria yang menunjukkan bahwa ungkapan tersebut merupakan metafora bentuk penghubung. Seperti pada data 2, yaitu 「夜の底」dimana pada data tersebut subjek yang memmpunyai makna metafora adalah soko 「底」 yang berarti kolong muncul sesudah kata yoru

「夜」 yang mempunyai makna malam. Partikel「の」 pada data 2 memberikan unsur ungkapan metafora pada kata soko 「底」yang berarti kolong. Maka partikel「の」 bukanlah menjadi partikel yang menjelaskan mengenai kepemilikan melainkan menjadi partikel metafora yang membuat makna ungkapan 「夜の底」yang jika diartikan adalah kolong malam, maka partikel の」 tersebut membuat makna kolong yang seperti apakah yang dimiliki oleh malam.

3. Bentuk kata sifat

Dari tabel di atas, ditemukan 15 data yang berupa ungkapan metafora berbentuk kata sifat. Pada ungkapan tersebut, subjek dibandingkan dengan kata sifat yang tidak seharusnya dimiliki oleh ungkapan tersebut. Kata sifat tersebutlah yang membuat ungkapan tersebut menjadi ungkapan metafora. Namun ada pula ungkapan metafora yang setelah kata sifat metaforisnya, ungkapan tersebut diikuti oleh subjek kata benda yang juga berperan menjadi makna metafora (Diniswari, 2012:56). Untuk menunjukkan perbedaannya, dapat

dilihat pada data 3, 「悲しいほど美しい声」. Pada data tersebut kata sifat 「美しい」 merupakan kata sifat yang sering kali digunakan untuk mewujudkan hal-hal dengan unsur yang menunjukkan kecantikan dan keindahan. 「美しい」 biasanya digunakan untuk menunjukkan kecantikan wajah seseorang maupun menunjukkan keindahan pemandangan atau hal-hal yang indah lainnya. Sedangkan pada data ini, kata sifat 「美しい」disandingkan dengan kata benda 「声」yang mempunyai arti suara. Dalam hal ini, 「声」suara yang adalah hal yang tidak berwujud dan tidak kasat mata di sandingkan dengan kata sifat 「美しい」yang memiliki makna indah. Maka ketika dua subjek tersebut digabungkan, unsur-unsur pembentuknya akan membentuk ungkapan metafora yang tergolong dalam metafora bentuk kata sifat. Jadi pada metafora bentuk kata sifat, objek penyusunnya selain kata sifat itu sendiri berupa kata benda dan kebanyakan dalam satu ungkapan tidak menutup kemungkinan munculnya lebih dari satu kata sifat.

4. Bentuk kata benda

Kata benda tersebut membentuk makna baru yang tidak sama dengan makna leksikalnya.

Contoh pada data 22:

渡り鳥でさと自ら嘲るように言う臨時雇いの番頭だ

った。

Dengan bangga menyebut dirinya burung yang berpindah-pindah (musiman). Pada metafora bentuk kata benda ini, penenliti menemukan 1 buah data yang menunjukkan bentuk dan karakteristik yang sama dengan definisi metafora bentuk ini. Pada data 22, yaitu 「渡り鳥」yang mempunyai arti burung musiman. Dalam data tersebut, kosa kata 「渡り鳥」 yang merupakan gabungan dari kata kerja wataru 「渡る」 yang

mempunyai arti menyeberang dan kata benda tori「鳥」yang mempunyai arti burung. Gabungan dari dua unsur pembentuk tesebut membentuk satu kata benda baru yang memiliki makna metafora yang terkandung di dalamnya.

5. Bentuk kata kerja

Pada metafora bentuk ini, peneliti menemukan 4 buah data ungkapan metafora bentuk kata kerja, salah satunya pada data5:

島村は彼女のうちになにか澄んだ冷たさを新しく見つけて、鏡の曇って来るのを拭おうともしなかった。

(Cermin yang menggelap.)

Pada ungkapan metafora bentuk kata kerja ini, kata kerja yang digunakan tidak lagi memiliki makna yang sesuai dengan makna leksikalnya, kata kerja tersebut tidak digunakan untuk menjelaskan predikat suatu kalimat melainkan digunakan sebagai pembanding subjek yang seolah-olah memiliki fungsi penggunaan kata kerja yang sama. Hal tersebut bisa dilihat dari data nomor 5 yaitu 「鏡の曇って来る」.Pada data tersebut, kata kerja 「曇 っ て 来 る 」 yang mempunyai makna menggelap dibandingkan sesudah kata benda 「鏡」 kagami yang mempunyai arti cermin. Dari gabungan kedua kata tersebut, ditemukan makna ungkapan metafora cermin yang menggelap. Dalam hal ini, kata kerja sering berpasangan dengan subjek lain yang dapat membantunya memunculkan ungkapan metafora yang terkandung di dalamnya dan jarang berdiri sendiri.

Akan tetapi meskipun harus dengan bantuan unsur pembentuk yang lain, titik fokus pembentukan maknanya adalah dari kata kerja yang membentuknya. Kata kerja yang digunakan oleh penulis untuk menggambarkan suatu kejadian ternyata tidak hanya berfungsi sebagai kata keterangan saja melainkan digunakan untuk menyampaikan maksud-maksud tertentu oleh penulis. Biasanya, kata-kata kerja yang dipakai adalah kata kerja yang jarang digunakan untuk menjelaskan maupun menggambarkan situasi maupun kata benda yang mengikuti. Hal itu merupakan cara penulis memunculkan makna yang berbeda dari kata kerja aslinya. Kata kerja tersebutlah yang akan berperan memberi makna metafora pada ungkapan tersebut.

DAFTAR PUSTAKA

Akira, Nakamura. 1985. 比喩表現辞典. Tokyo: 角川書店.

Al-Ma'ruf, Ali Imron. 2009. Stilistika Teori, Metode, dan Aplikasi Pengkajian Estetika Bahasa. Solo: Cakra Books Solo.
file:///C:/Users/user/Downloads/19015-23063-1-PB.pdf

The Evolution of Governance: Algorithmic Decision-Making as the New Normal

Author: Alexander Owen Clark

Artificial Intelligence (AI) has risen to the forefront of public discourse. The recent rise of big data and computational techniques have brought about new opportunities for participation, organizing and collective action by citizens. If the 20th century engineers of consent had magnifying glasses and baseball bats, those of the 21st century have acquired telescopes, microscopes and scalpels in the shape of algorithms and analytics. These new technologies hold incredible promise for human welfare. They offer us powerful new ways to achieve our shared commitments to each and every one of the Sustainable Development Goals (SDGs), a set of 17 socioeconomic, political and environmental objectives forming and structuring the development agenda of the next 11 years. Against this background, a question one may ask is: what role can algorithms play to make this world a better place? Can algorithms of the Big Data era, and the opportunities, risks and questions they raise, be leveraged as forces of positive disruption?

These Technologies have reconfigured aspects of the public sphere, but perhaps not always in the way that many would like. They have become a key logic governing the flows of information on which we depend and have impinged on how people seek information, how they perceive and think about the contours of knowledge, and how they understand themselves in and through public discourse, providing a means to know what there is to know and how to know it. Yet, it is important to consider who is included in this new configuration, who is not, and how this is like or unlike previous instantiations. We are even invited to formalize ourselves into knowable categories and encouraged to choose from the menu offered, so as to be correctly anticipated by the system and provided the right information, the right recommendations, and the right people. It is important that we conceive of this entanglement not as a one-directional influence, but as a recursive loop between the calculations of the algorithm and the "calculations" of people.

To assess the implications of algorithms and other advanced analytics, a useful approach is UNESCO's Internet Universality ROAM principles. These principles urge that digital development be aligned with human Rights such as freedom of expression, privacy and equality; Openness with regards to knowledge, open data as well as open and pluralistic markets; Accessibility in regard to research, human resources, access to data, multilingualism and hardware; and Multi-stakeholder governance to guide the ensemble of values, norms, policies, regulations, codes and ethics that govern the development and use of algorithms. Tensions exist between some of these concepts. Ensuring the transparency of an algorithmic system might come at the expense of its resilience, whilst ensuring fairness may necessitate a relinquishing a degree of privacy.

Moreover, various approaches to reduce risks and increase the benefits of algorithmic decision-making (and, in particular, algorithmic selection) have been identified, ranging from market mechanisms at one end, to command and control regulation by state authorities at the other. The diversity and quantity of viable governance options (e.g. self-organisation by individual companies; (collective) industry self-regulation; co-regulation – regulatory cooperation between

state authorities and the industry) highlight that there are no one-size-fits-all solutions for the governance of algorithms. In addition, they demonstrate that governance of algorithms (and by algorithms) goes beyond regulating (the design and implementation of) code and the technology itself and involves a wider evidence-based approach relying on risk and impact assessments, organizational approaches, and business models and strategies.

This paper will provide an introduction to the social and cultural forces shaping the construction, institutionalization, operation, and uses of algorithms. In so doing, it will explore how algorithms relate to political issues of modernization, power, democratic debate, inequality and the impact of algorithms in social media, journalism, education, healthcare, policing, and computational technologies. Further it will explore whether and how the future of algorithms, or the future with algorithms, can be crafted such that their development and deployment— from their design to their use, including control, evaluation, auditing, governance—be based on and foster core democratic values such as accountability, transparency, participation, and collaboration. In doing so, it will focus on algorithms affecting public life and policies to maximize benefit for citizens, or 'public good algorithms'. This initiative builds on the success of deep Learning Indaba held in Kenya and South Africa in 2019, 2018 and 2017. The Deep Learning Indaba is an organization whose mission is to Strengthen African Machine Learning.

Serum Selenium and Its Impact on Children with Sickle Cell Anemia in Benin City, Nigeria

Gabriel Oswald[1], Margaret Odell[1] & Andrew Atkinson*[1]
[1]Department of Child Health, University of Benin Teaching Hospital, Benin City, Edo State, Nigeria

Keywords:
sickle cell anaemia, oxidative stress, children, serum selenium.

Abstract

Background

Selenium is an integral component of several antioxidant enzymes especially glutathione peroxidase and plays a role in countering oxidative stress. Sickle cell anaemia (SCA) is a genetic disorder characterized by the presence of two mutant haemoglobins (HbSS). Individuals with SCA have chronic oxidative stress even in steady state which predisposes them to selenium deficiency.

Method

Children aged 1 – 16 years who are attending the Paediatric sickle cell clinic and age and sex matched haemoglobin AA controls were recruited for the study. An interviewer administered questionnaire was used in obtaining information from the participants; their anthropometric parameters were measured while blood was collected for serum selenium levels and Packed Cell Volume. The data was analysed using Statistical Package for Scientific Solutions (SPSS) version 21.

Results

Children with SCA had a significantly lower serum selenium level than controls($p < 0.0001$) The mean serum selenium levels of subjects were lower, though not significantly, in females, lower maternal educational status, lower socioeconomic class, lower haematocrit levels and in stunted and underweight children.

Conclusion

The mean serum selenium levels of children with sickle cell anaemia were significantly lower than children without sickle cell anaemia and the prevalence of selenium deficiency was very high

Introduction

Selenium is a micronutrient necessary for the normal functioning of humans and animals and is believed to be one of the most effective antioxidants in clinical settings.[1] It is an integral component of several antioxidant enzymes especially glutathione peroxidase (GPx)[2] and plays a role in countering oxidative stress, repairing cell membranes damaged by lipid peroxidation, modulation of body's response to infections, improvement in fertility, cardiovascular health and cancer prevention.[2,3]

There is no global consensus on the cut off for selenium deficiency in man because of the wide variations in selenium intake, content in food, soil and serum levels in human populations all over the world.[3] However, it is postulated that a serum selenium level of ≥70 µg/L is the minimum concentration required for maximal expression of plasma/serum seleno-protein containing enzymes like GPx while other researchers have stated that serum levels of 90-100 µg/L reflects selenium adequacy.[4] Inadequate dietary intake and increased consumption from sepsis and chronic oxidative states can lead to low selenium levels[5] which is associated with increased susceptibility to disease. Extremely low levels (< 20 µg/L) as seen in some areas of China can result in Keshan disease (endemic cardiomyopathy) or Kashin Becks disease (endemic chronic degenerative osteoarthropathy).[5]

Sickle cell anaemia (HbSS) is an inherited chronic haemolytic anaemia contributing to 5% of under-five deaths on the African continent.[6] Nigeria has the highest incidence of sickle cell anaemia which amounts to about 3%.[7] Individuals with Sickle cell anaemia (SCA) have chronic oxidative stress in steady state which worsens with crises. The mechanisms by which reactive oxygen species (ROS) are generated in SCA include recurrent ischaemia-reperfusion injury following vaso-occlusion, excessive levels of cell free haemoglobin as a result of the ongoing chronic haemolysis in SCA, and the chronic pro-inflammatory state characteristic of the disease. These processes generate reactive oxygen species that lead to multiple pathophysiologic pathways whose final outcome is accelerated haemolysis, endothelial damage, reduced levels of Nitric Oxide (a potent vasodilator), and

hypercoagulability. These mechanisms in turn, fuel a vicious cycle that leads to worsening vaso-occlusion, generation of more ROS and subsequent chronic organ dysfunction. In this way, important antioxidants to mitigate the effects of chronic oxidative stress (e.g. selenium) may become depleted. In addition, patients with SCA are prone to recurrent infections and sepsis which may also result in low levels of selenium.

Studies have shown that serum selenium levels are lower in individuals with sickle cell anaemia compared to those without, even in steady state.[8-10] Most of these studies were either in adults or in a mixed population involving adults and a few children. To the best of the researchers' knowledge, no study has been carried out in Nigeria specifically in children. This study was therefore done to determine the serum selenium levels in children with SCA in steady state.

Materials and methods

This is a descriptive cross sectional study carried out in the Paediatric sickle cell clinic of the University of Benin Teaching Hospital (UBTH), Benin City, Edo State and the Sickle Cell Centre (SCC) in Benin City, from August, 2016 to January, 2017.

Study Subjects and Controls

Children with SCA aged 1 to 16 years were recruited consecutively from the clinic for the study. Age and sex-matched Hb AA children attending the general practice clinic of UBTH for medical examination (for school entry) as well as Hb AA siblings that accompanied the SCA children that were attending clinic were recruited as controls within the study period.

An interviewer administered questionnaire was used to obtain information from the subjects. The fathers' profession and mothers' level of education were used in determining the socioeconomic class of the participants according to the method described by Olusanya *et al.*[11] Information on the number of vaso-occlusive crises, clinic attendance and packed cell volume over the past 6months was obtained from the patients and caregivers which was confirmed by the information in the case notes. Physical examination was carried out by the researchers and documented.

The participants were weighed using a Seca® scale (Secagmbh & co, Germany) with a sensitivity of 0.1kg. The scale was calibrated on each clinic day using a known weight. Children less than 2 years old were weighed naked (in a Bassinet scale) while older children were weighed wearing light clothing.

The height/length was taken using a stadiometer, with the child standing barefoot, legs together, upright and gazing straight ahead. Measurements were taken to the nearest centimetre. For children aged <2years, recumbent length was taken using an infant measuring board placed on a flat surface. The BMI of a child was calculated using the formula: [Weight (kg)/ (Length/Height)^2(m^2)]. Height for age Z-score (HAZ), weight for age Z-score (WAZ) and Body Mass Index Z- score were calculated for all the participants using the 2005 WHO anthro-calculator in comparison to the National Centre for Health Statistics (NCHS) standard population. Malnutrition (stunting, underweight and wasting) was defined as HAZ ≤ -2, WAZ ≤ -2 and BMI ≤ -2 respectively.

Blood samples were obtained from any peripheral vein on the upper limb for estimation of the packed cell volume, serum selenium levels and haemoglobin electrophoresis (for the controls alone). Selenium was assayed by a Chemical Pathologist using Flame atomic absorption spectrometry (AAS).

Ethical clearance was obtained from the Ethics and Research Committee of the UBTH **(ADM/E22/A/VOL.VII/1270)** and the Ethics Committee of the Hospital Management Board, Ministry of Health, Edo State **(HM.1208/146)**. A written consent was obtained from the caregivers of the participants.

The data obtained were analyzed using Statistical Package for Scientific Solutions (SPSS) version 21.0 (IBM SPSS version 21.0). Continuous variables were presented using means± (SD) while categorical variables were presented as frequencies and percentages. Student t-test was used to compare means of continuous variables while differences in means between three or more groups were analyzed using analysis of variance (ANOVA) test.

Chi-square statistical test of significance was carried out where applicable for categorical variables. Spearman Ranks Correlation was used to determine association between serum selenium levels and nutritional status and bone pain crises episodes. The level of significance was set at $p<0.05$ and confidence level at 95%.

Results

A total of 72 Hb SS patients and 72 Hb AA controls were recruited for this study.
The study population consisted of 45 males (62.5%) and 27 females (37.5%) in both study groups with a M:F of 1.7:1. The mean age of the subjects with Hb SS was 7.29 ± 4.46 years (range 1-16 years), while that of the Hb AA controls was 7.25 ± 4.45 years. There was no statistically significant difference between their mean ages (t = 0.58 *p* = 0.954).

A higher proportion of the subjects were of a low SEC (41.7%) as opposed to the control group where the highest proportion (40.3%) belonged to the middle SEC. There was however no statistically significant difference in the SEC of the subjects and controls (χ^2= 0.747, p=0.690)

The socio demographic characteristics of the study participants are shown in Table 1

Table 1: Sociodemographic Characteristics of the Study Subjects and Controls

Characteristics	**Subjects n=72 (%)**	**Controls n =72 (%)**	χ^2	**p value**
Age Group (years)				
<5	26 (36.1)	26 (36.1)		
5 – 9	21 (29.2)	21 (29.2)		
10 – 14	21 (29.2)	21 (29.2)	0.00	1.00
≥15	4 (5.6)	4 (5.6)		
Gender				
Male	45 (62.5)	26 (36.1)		
Female	27 (37.5)	21 (29.2)	0.00	1.00
Socioeconomic class				
Upper	18 (25.0	16 (22.2)		
Middle	24 (33.3)	29 (40.3)	0.747	0.69
Lower	30 (41.7)	27 (37.5)		

The mean weight (SD) of the HbSS children was 23.25 ± 11.88kg as against 28.27 ± 15.61kg obtained from the control group. The difference in the mean weight of the subjects and controls was statistically significant (p = 0.035). The mean height of the subjects was lower than that of the controls but the difference was not statistically significant (p = 0.159).

The mean values of other anthropometric parameters such as the weight for age z-score (WAZ), height for age z score (HAZ) and body mass index z score (BMIZ) were likewise higher in the control group and the difference was statistically significant. This is shown in table 2.

Table 2: Anthropometric measurements in subjects and controls

Characteristics	**Hb SS children (mean±SD)**	**Hb AA children (mean±SD)**	**T**	**p value**
Weight (kg)	23.25 ± 11.88	28.27 ± 15.61	-2.15	0.035*
Height (cm)	119.76 ± 24.77	125.48 ± 26.25	-1.42	0.159
WAZ	-0.65 ± 1.45	0.61 ± 1.39	-5.20	<0.0001*
HAZ	0.13 ± 1.88	1.41 ± 1.96	-4.25	<0.0001*
BMIZ	-0.98 ± 1.36	-0.32 ± 1.93	-2.35	0.021*

**p = < 0.05*

The mean serum selenium level of the Hb SS children was 53.98±8.52 µg/L (range 30.00-74.00 µg/L) while that of the Hb AA children was 67.13±5.93µg/L (range 53.80-82.60 µg/L). The difference was statistically significant (t = -10.03, *p* < 0.0001).

The prevalence of selenium deficiency among Hb SS children using serum selenium levels of >70µg/L as a reference cut off point[4] was 90.3% and was significantly higher than the 16.7% observed in the Hb AA children. (p<0.0001) This is shown in table 3.

TABLE 3: Prevalence of Selenium Deficiency in the study subjects and control group.

Selenium deficiency	Hb SS children n = 72 (%)	Hb AA children n = 72 (%)	χ^2	p value
Present (≤ 70µg/L)	65 (90.3)	12 (16.7)	78.41	<0.0001*
Absent (≤ 70µg/L)	7 (9.7)	60 (83.3)		
Total	72 (100)	72 (100)		

p = < 0.05

The mean serum selenium level of the male subjects (55.38 ± 7.28 µg/L) was higher than that of the female subjects (51.63 ± 9.98 µg/L), but the difference was not statistically significant. Subjects within the age group of 14 – 16 years had a lower mean selenium levels, which was not statistically significant, in comparison with other age groups.

The mean selenium levels of the subjects from high socioeconomic class (55.48 ± 9.68µg/L) was higher than that of those from the middle socioeconomic class (54.88 ± 8.42µg/L), which in turn was higher than that of those from the low socioeconomic class (52.98 ± 8.52 µg/L) but the difference was not statistically significant. A similar trend was observed with maternal educational status, in which children of mothers with tertiary level of education had the highest mean serum selenium level. The difference was however, not statistically significant. Subjects with haematocrit of less than 27% had a lower mean serum selenium level compared with those with a higher haematocrit level. The difference was however not statistically significant. This distribution is shown in table 4.

TABLE 4: Comparison of the subjects' Mean serum selenium levels across Sociodemographic and clinical characteristics.

Characteristics	Mean (SD)	n	F/t	p value
Sex				
Male	55.38 (7.275)	45	1.84	0.07
Female	51.63 (9.986)	27		
Age group (years)				
<5	53.51 (9.132)	26		
5 – 9	55.31 (7.317)	21	0.721	0.543
10 – 14	54.24 (8.757)	21		
>14	48.62 (10.176)	4		
Socioeconomic class				
High	55.48 (9.681)	18		
Middle	54.88 (8.419)	24	0.961	0.388
Low	52.98 (8.524)	30		
Maternal education				
Primary	53.01 (7.476)	15		
Secondary	53.26 (8.459)	31	0.553	0.578
Tertiary	55.38 (9.270)	26		
Haematocrit level (%)				
<27	53.46 7.930)	48	-0.721	0.473
≥27	55.00 (9.702)	24		

Apart from BMIZ the mean serum selenium levels of malnourished subjects were lower than those with normal nutritional status. There was no correlation between mean serum selenium levels and the nutritional status of the subjects.

There was a very weak correlation, which was not statistically significant, between the mean serum selenium level of the children with SCA and the number of bone pain crises over the past 6months. (r = 0.011, p = 0.929) These findings are shown in Table 5.

Table 5: Correlation (Spearman Rank) between mean serum selenium levels and nutritional status and bone pain episodes of the subjects

Characteristic	Mean serum selenium (µg/l) Mean±SD	r_s	p value
WAZ			
Severely underweight/underweight	49.89 ± 11.24	0.125	0.297
Normal	54.64 ± 7.92		
HAZ			
Severely stunted/stunted	50.60± 9.65	0.145	0.224
Normal	54.52± 8.27		
BMIZ			
Severely thin/thin	54.27 ± 9.31		
Normal	53.83 ± 8.40	0.011	0.928
Overweight/obese	55.40 ± 9.90		
Bone pain episodes			
0	54.05 ± 8.05		
1 – 3	53.74 ± 9.06	0.011	0.929
4 – 6	56.47 ± 7.91		

Discussion

The mean serum selenium level of 53.98±8.52 µg/L in children with sickle cell anaemia in this study was significantly lower than that of their Hb AA counterparts (67.13±5.93 µg/L), which is in keeping with the studies by Hamdy *et al*[8] in Egypt, Nnodim *et al*[9] in Imo state, Olaniyan *et al*[12] in Oyo state and Idonijie *et al*[10] in Edo state in Nigeria. Reduced selenium levels in SCA have been ascribed to chronic oxidative stress (even in patients in steady state) resulting from increased release of ROS due to repeated cycles of ischaemia and reperfusion, infections and haemolysis. The ROS released overwhelm available antioxidants including selenium. There is also an increased resting metabolic rate and resting energy expenditure in SCA with subsequent increased turnover of macro- and micronutrients and subsequent depletion of micronutrients like selenium which is an important antioxidant.[13] It can then be inferred from this study that there is increased oxidative stress in the children with SCA as compared to their Hb AA counterparts. Adelakun *et al*[14] however reported absence of increased markers of oxidative stress in children with SCA. The disparity between their conclusion and the finding suggested in this study may be because they only evaluated children <48 months while children aged 1-16 years were evaluated in this study. There is worsening oxidative stress and increased demand for antioxidant protection in children with SCA as they grow older[15]. Moreover, the sample size used by Adelakun *et al* [14] was very small (23) and might not be representative of children with SCA.

The mean selenium levels of children with SCA (53.98±8.52 µg/L) in this study was comparable to the findings in the study by Olaniyan *et al*[12] (55±4.0 µg/L) but were lower than the mean values recorded by Nnodim *et al*[9] (60.69±3.12 µg/L) and Idonijie *et al*[10] (60.98±7.29 µg/L). Hamdy *et al*[8] on the other hand had remarkably lower serum selenium levels than what was seen in this study (29.8±20.80 µg/L). These variations in the serum selenium levels reported in all these studies may be a reflection of the fact that serum selenium levels are influenced by intake in the diet which varies based on geographical location.

There was no significant gender difference in the mean selenium level in this study, which is comparable with the findings of Ubesie et al in Enugu, Nigeria[16] and Nhien et al in Vietnam.[17]Nhien et al however, reported a higher mean selenium level in males, though not significant, which is in consonant with the finding of this study. Krittaphol *et al*[18] and Amare *et al*[19] reported a significantly higher serum selenium level in males. Sources of selenium in diet are available to both sexes and it is not expected to differ between them but a sex-linked hormonal influence was postulated to be responsible for the higher levels in males.[19]

No significant difference was found in the mean serum selenium levels between the various age groups of the subjects but the mean level of children aged 14years and above was lower than other age groups. This finding may be a reflection of the increasing metabolic demand for growth and oxidative stress often found in older children with SCA.[20]

The absence of a significant difference in the mean selenium levels based on the haematocrit of the subjects could not be corroborated by other studies as there was no previous study found to compare with. The observation of a higher serum selenium levels in subjects with higher haematocrit (>27%) may indicate a relationship which needs further evaluation. Oxidative stress is a known contributory factor to both anaemia and depletion of anti-oxidants but other factors such as increased haemolysis, reduced production of red blood cells also play a role in anaemia. These other contributors of anaemia other than oxidative stress may account for the absence of a significant association between anaemia and serum selenium levels.

There was no correlation between the serum selenium levels and the number of vaso-occlusive crises (VOCs) experienced by the subjects. This may be because several other factors predispose to vaso-occlusive crises in these children e.g. dehydration, infections. Repeated VOCs result in depleted antioxidant status because of increased production of ROS. Whether depleted selenium levels would then in turn result in VOC is not clearly stated in the literature. No other study to the knowledge of the researchers has evaluated the relationship between selenium and VOCs in children. However, Fasola*et al*[21] in Ibadan showed that adult patients who had >3 VOCs in the preceding year had markedly reduced mean total antioxidant status (< 1.00 mmol/L) as compared to those who experienced less than 3 VOCs (>1.00mmol/L). They concluded that a pro- oxidant environment was conducive for crises. The difference in this current study from Fasola*et al*[21] may be related to the difference in the age group studied and the fact that only selenium was measured in this study while all biologic components that have antioxidant capacity including selenium were taken into cognizance in the study by Fasola *et al*.

No significant correlation between serum selenium levels and nutritional status was observed in the subjects. The mean selenium levels were lowest amongst SCA children who were underweight and in those who were stunted. This may infer variability in the magnitude of the deficiency in the macro-nutrients in comparison with the micro-nutrients in the subjects. Other studies have also reported absence of correlation between nutritional status and selenium levels.[16,17,19]

Although the mean serum selenium levels increased with increasing socioeconomic status, the difference was not statistically significant. This finding is similar to that of Krittaphol *et al*[18] in Thailand. The reason for this finding may be that the children across all the SECs are exposed to similar foods in this locale that probably have the same selenium content. There have been no studies to the knowledge of the researchers that has correlated socioeconomic status with serum selenium levels in children with SCA. Bates *et al*[22] found that there was a higher plasma selenium concentration in children from higher socioeconomic classes in the general population. The reasons put forward for this finding is that children from higher socio-economic class were exposed to a richer diet comprising more of animal proteins which are a better source of selenium. No other study has established this link.

Ninety percent of the Hb SS children compared to about 20% of the Hb AA children were deficient in selenium, with levels lower than the suggested range of 70-100µg/L[4] required for selenium adequacy and maximal expression and function of the selenoproteins.[23] No other study amongst children with SCA has compared the mean selenium levels with any reference point. This may be because there are no generally accepted reference values.

The mean serum selenium levels of the controls in this study (67.13±5.93 µg/L) is comparable to the findings amongst controls in Edo state (65.75±5.49 µg/L) [10] and Imo state (67.42±1.35 µg/L) [9] both in Nigeria but lower than the values reported in Sudan (85.40±8.82 µg/L) [24]. This low selenium levels even among children without SCA in the Nigerian studies might suggest low selenium content in the diet and soil in this locale. However, Kolawole *et al*[25]showed that the selenium content in soil in some parts of Southern Nigeria were within the mean global range of selenium in soil. The contribution of selenium content of locally available diet to this finding has not been evaluated in this locale.

Conclusion

The mean serum selenium level of children with sickle cell anaemia was significantly lower than that of children without sickle cell anaemia and the prevalence of selenium deficiency was very high in the subjects. The mean

serum selenium levels of subjects were lower, though not significantly, in females, lower maternal educational status, lower socioeconomic class, lower haematocrit levels and in stunted and underweight children. Further studies with larger sample size to ascertain the association between serum selenium levels and these parameters is recommended.

Authors' contributions: GO participated in the conception, design of the work, analysis and interpretation of data, drafting of the manuscript.

MO participated in the conception and design of the work, interpretation of the data, revising the manuscript.

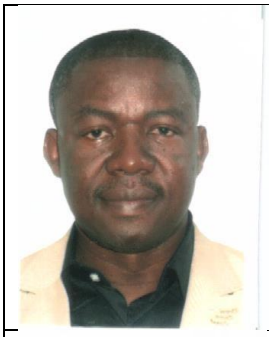
AA participated in the interpretation of the data, revising the manuscript. All authors participated in the final approval of the manuscript and agreed to be accountable for all aspects of the work.

References

1. Heyland DK, Dhaliwal R, Suchner U, Berger MM. Antioxidant nutrients: A systematic review of trace elements and vitamins in the critically ill. Intensive Care Med 2005; 31: 321-37
2. Gill H, Walker G. Selenium, immune function and resistance to viral infections. Nutrition and Dietetics 2008; 65(3):S41-S47
3. Fairweather-Tait SJ, Bao Y, Broadley MR, Berry R, Ford D, Hesketh JE *et al.* Selenium in Human Health and Disease. Antioxid. Redox Signal 2011:14(7):1337-1383. doi:10.1089=ars.2010.3275 (accessed 26thOctober 2014)
4. Neve J. Human Selenium Supplementation as assessed by changes in Blood Selenium concentration and Glutathione Peroxidase activity. J Trace Elem Med Biol 1995; 9(2): 65-73
5. Ge K, Yang G. The epidemiology of selenium deficiency in the etiological study of endemic disease in China. Am J ClinNutr 1993; 57(S2): S259-S263
6. Ohene- Frempong K. Global Burden of Sickle Cell Disease. SCDAA – convention 41st Annual Convention/ Moving Forward: "Advocating for New discoveries. Advancements and Breakthroughs" 2013
7. Odunvbun ME, Okolo AA, Rahimy CM. Newborn screening for sickle cell disease in a Nigerian Hospital. Public Health 2008; 122(10): 1111-1116.
8. Hamdy MM, Mosallam DS, Jamal AM, Rabie WA. Selenium and vitamin E as antioxidants in chronic haemolytic anaemia: are they deficient? A case-control study in a group of Egyptian children. J Adv Res. 2015 Nov; 6(6): 1071–1077. http://dx.doi.org/10.1016/j.jare.2015.01.002. Accessed 4th march 2015
9. Nnodim J, Samuel M, Dioka CE, Onah C, Ihim A, Atuegbu C. Trace elements deficiency in patients with Homozygous Sickle cell disease. British Journal of Medicine and Medical research 2014; 4(21):3878-3883 doi 10.9734/BJMMR/2014/7489
10. Idonijie BO, Iribhogbe OI, Okogun GRA. Serum trace elements levels in sickle cell disease patients in an urban city In Nigeria. Nature and science 2011; 9(3): 67-71 (ISSN: 1545-0740. http://www.sciencepub.net (Accessed 3rd December 2014)
11. Olusanya O, Okpere E, Ezemokhai M. The importance of social class in voluntary fertility control in a Developing Country. West Afr J Med. 1985; 4:205-212.
12. Olaniyan MF. Investigation of some biochemical parameters in subjects with Hb SC and Hb SS in Saki West Local Government- a Rural Community in Nigeria. Am J Biomed Sci 2016; 8(3): 237-246
13. Okochi VI, Okpuzor J. Micronutrients as therapeutic tools in the management of Sickle cell disease, Malaria and Diabetes. Afr J Biotech 2005; 4(13):1568-1579
14. Adelakun A, Ajani O, Ogunleye T, Disu E, KosokoA, Arinola G. Respiratory burst enzymes and oxidant antioxidant status in Nigerian Children with sickle cell disease. Brit Biotech J 2014; 4(3):270-278
15. Nur E, Biemond BJ, Otten HM, Brandjes DP, Schnog JJB, the CURAMA Study Group. Oxidative stress in sickle cell disease; pathophysiology and potential implications for disease management. Am J Hematol 2011; 86: 484-489
16. Ubesie AC, Ibe BC, Emodi IJ, Iloh KK. Serum selenium status of HIV-infected children on care and treatment in Enugu, Nigeria. S. Afr J Child Health 2017; 11(1): 21-25
17. Nhien NV, Khan NC, Ninh NX, Huan PV, Hop LT, Lam NT *et al.* Micronutrient deficiencies and anaemia among preschool children in rural Vietnam. Asia Pac J ClinNutr 2008; 17(1):48-55
18. Krittaphol W, Bailey KB, Pongcharoen T, Winichagoon P, Thomas C, Gibson RS. Primary school children from North east Thailand are not at risk of selenium deficiency. Asia Pac J ClinNutr2006; 15(4):474-481.

19. Amare B, Moges B, Fantahun B, Tafess K, Woldeyohannes D, Yismaw G *et al.* Micronutrient levels and nutritional status of school children living in North West Ethiopia. Nutr J 2012; 11:108. http://doi.org/10.1186/1475-2891-11-108
20. Al-Saqladi AWM, Cipolotti R, Fijnvandraat K, Brabin BJ. Growth and nutritional status of children with homozygous sickle cell disease. Ann Trop Ped 2008; 28: 165-189
21. Fasola F, Adedapo K, Anetor J, Kuti M. Total antioxidants status and some haematological values in Sickle cell disease patients in Steady state. J Natl Med Assoc 2007; 99(8):891-893
22. Bates CJ, Thane CW, Prenctice A, Delves HT, Gregory J. Selenium status and associated factors in a British National Diet and Nutrition Survey: young people aged 4-18y. Eur J ClinNutr 2002; 56: 873-881.
23. The British Nutrition Foundation. Briefing Paper: Selenium and Health. London: High Holborn House 2001
24. Khalid AA, Idris OF. Assessment of renal function test, copper and selenium levels in Homozygous Sickle Cell Disease Patients at Aljazeera state in Sudan. Br J Med Health Res. 2015; 2(6): 46-51
25. Kolawole SE, Obueh HO. Relationship between soil contents and plasma levels of selenium, chromium and manganese in healthy adult Nigerians. Afr J Biotechnol 2013; 12(34):5339-5346.

Author Bibliography

	Anthony O. Atimati Senior Lecturer in the University of Benin and Honorary Consultant, Department of Child Health, University of Benin Teaching Hospital, Benin City, Edo State, Nigeria
	Magdalene Oduvbun Senior Lecturer in the University of Benin and Honorary Consultant, Department of Child Health, University of Benin Teaching Hospital, Benin City, Edo State, Nigeria
	Gold Osueni Consultant Department of Child Health, University of Benin Teaching Hospital, Benin City,

	Edo State, Nigeria

Optimizing MQCL Performance in Hard Turning of 90CrSi Steel Using Nanofluids

Thomas Michael Davidson[1], Richard Quentin[*1] & Theodore Lee[2]
[1]Department of Manufacturing Engineering, Faculty of Mechanical Engineering, Thai Nguyen University of Technology, Thai Nguyen, 250000, Vietnam
[2]Mechanical Workshop, Thai Nguyen University of Technology, Thai Nguyen, 250000, Vietnam

ABSTRACT

The present work shows an experimental investigation on the effect of minimum quantity cooling lubrication (MQCL) during hard turning of 90CrSi steel (60-62 HRC). The cooling strategy created by Ranque-Hilsch vortex tube combined with MQL ideal to from MQCL technique. Moreover, Al_2O_3 nanoparticles are suspended in soybean-based fluid to improve the lubricating character and retain the environmental friendly character. The response parameters, including cutting force and surface roughness are studied. The results of this work show that cutting performance of coated carbide tools improves due to the better cooling and lubricating effect. In addition, MQCL using Al_2O_3 nanofluid reduces the cutting forces significantly and shows the worse surface roughness compared MQCL with pure fluid. The promising results when using MQCL technique in hard machining will be a big step toward green manufacturing

Keywords: Hard turning, MQCL, soybean oil, Al2O3 nanoparticles, nanofluid, machining.

INTRODUCTION

In recent years, hard turning has gained much attention due to the growing demand of high productivity, good surface quality, and manufacturing cost reduction. Also, the use of cutting fluids can be eliminated or minimized to give out the environmental friendly characteristics [1]. The inserts with geometrically defined cutting edges are used directly for machining hardened materials with the hardness of 45–70 HRC [2]. In the earliest type, hard turning processes were carried out under dry condition, which showed the obvious cost benefits from the usage elimination of cutting fluids. Due to the high hardness materials, the high-grade inserts such as coated cemented carbide, ceramics, (P)CBN (Polycrystalline Cubic Boron Nitride), PCD (Cubic Boron Nitride) tools are always required [3–7]. However, the very high cutting temperature causes rapid wear rate, which shortens the tool life as well as limits the cutting condition [4]. To remain the environmental friendly characteristics and overcome the drawbacks of dry turning, minimum quantity lubrication (MQL) was proposed and developed with the use of small amount of cutting fluid with oil mist form, directly sprayed to contact zone to bring out the high lubricating efficiency. The significant reduction of friction coefficient, cutting forces, cutting temperature, and tool wear, as well as the improvement of surface quality and tool life was proven by numerous studies [8-11], but low cooling effect is still the main drawback of MQL technology in machining hard materials. On the other hand, the use of vegetable oils as MQL base fluid to retain the environmental friendly character faces the difficulty because of the low ignition temperature [12]. To develop MQL technique assisted for hard cutting, minimum quantity cooling lubrication (MQCL) technique is developed to solve the low cooling problem. Some studies had been made to study the effects of MQCL performance on machining difficult-to-cut materials, but 2 the cooling effect is generated by the cooling property of the base fluid [13-16]. From the literature review, the combination of MQL method with Ranque-Hilsch vortex tube to form MQCL device used for hard cutting is a new topic, which brings out superior cooling and lubricating effects to improve machining performance [17]. The nano additives suspended in MQCL base fluid are also the new research trend, which is needed to study. Hence, the authors are motivated to make the study of MQCL performance in hard turning of 90CrSi steel. Moreover, the effects of Al_2O_3 nanofluid in MQCL technique on hard turning are also investigated.

MATERIAL AND METHODS

2.1. Experiment set up

2.1.1. Experiment devices

The CS-460x1000 Chu Shing lathe was used to conduct the experiments. Tungaloy CNMG120404-TM T9125 tungsten carbide inserts with coating layers of CVD Al_2O_3/TiCN were utilized. The PCLNR 2020 K-16 tool holder (KYOCERA Precision Tools, Inc.) was used.

The MQL system includes: The MQCL system includes Frigid-X Sub-Zero Vortex Tool Cooling Mist System (made by Nex Flow™, Richmond Hill, Canada), compressed air, pressure stabilization device, soybean oil, and Al2O3 nanoparticles. Measuring equipment consists of Kistler quartz three-component dynamometer (9257BA), SJ-210 Mitutoyo (made by Japan) for surface roughness, data acquisition system A/D DQA N16210 (made by National instruments, USA), and DASYlab 10.0 software. The experimental set up is shown in Fig.1. Al_2O_3 nanoparticles with the average size of 30 nm were made by Soochow Hengqiu Graphene Technology Co., Ltd (Fig.2). In this study, 90CrSi steel with the hardness of 60-62 HRC was used. The workpiece diameter is 40 mm with the chemical composition (Table 1). To ensure uniform suspension of Al2O3 nanoparticles in soybean oil, the prepared nanofluids are kept in Ultrasons-HD ultrasonicator (JP SELECTA in SPAIN), generating 600W ultrasonic pulses at 40 kHz, and the time for the concentration 3.0wt% in 6 hours.

Table 1 – Chemical composition in % of 90CrSi steel

Element	C	Si	Mn	Ni	S	P	Cr	Mo	W	V	Ti	Cu
Weight (%)	0.85-0.95	1.20-1.60	0.30-0.60	Max 0.40	Max 0.03	Max 0.03	0.95-1.25	Max 0.20	Max 0.20	Max 0.15	Max 0.03	Max 0.3

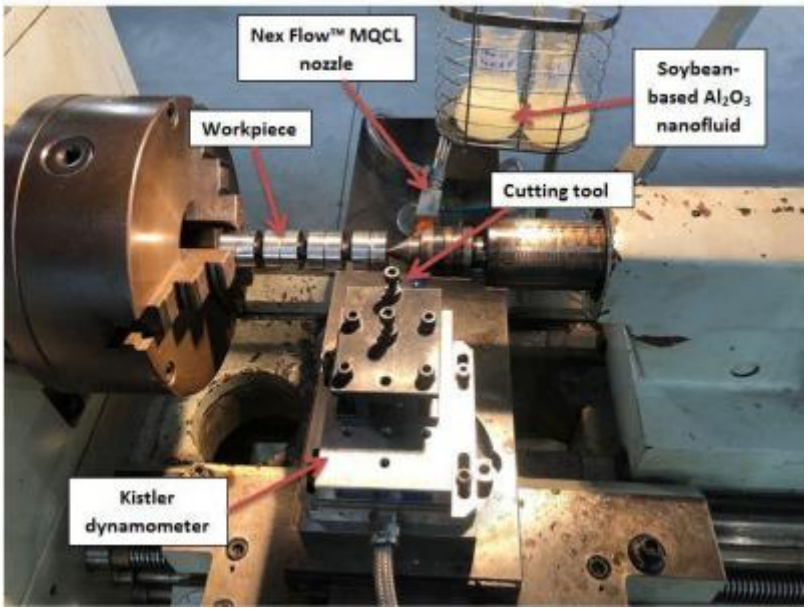


Figure 1. The experimental set up

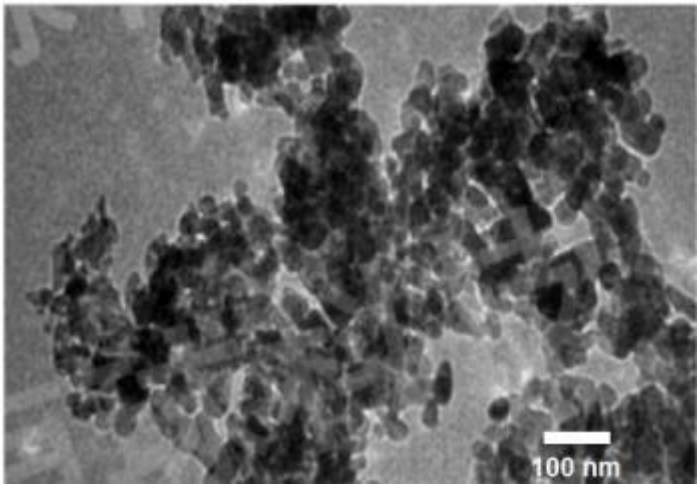


Figure 2. TEM image of Al2O3 nanoparticles [18]

2.1.2 Experiment design

The cutting condition is given by Table 1. The depth of cut and the feed rate are fixed at 0.15 mm and 0.1 mm/rev. The parameters of MQCL system are air pressure of 6 Bar, flow rate of 30 ml/h, and the temperature of output cool air 4–8 °C with the room temperature 24–27 °C. Each experimental trial is repeated by three times under the same cutting parameters and takes the average values for cutting forces and surface roughness. Hard turning process is conducted under MQCL condition with soybean-based fluid and soybean-based nanofluid.

Table 1. Cutting condition

Control factor	
Cutting speed (V_c), *m/min*	120; 170
Nanoparticle	Al_2O_3
Nano concentration (*wt%*)	0; 3
Base fluid	Soybean oil
Cooling and lubricating condition	MQCL

RESULTS AND DISCUSSION

The cutting force components F_x, F_y, F_z in MQCL hard turning with different cutting speeds are given by Figs. 3-5. The surface roughness R_a, R_z are shown in Figs. 6-7.

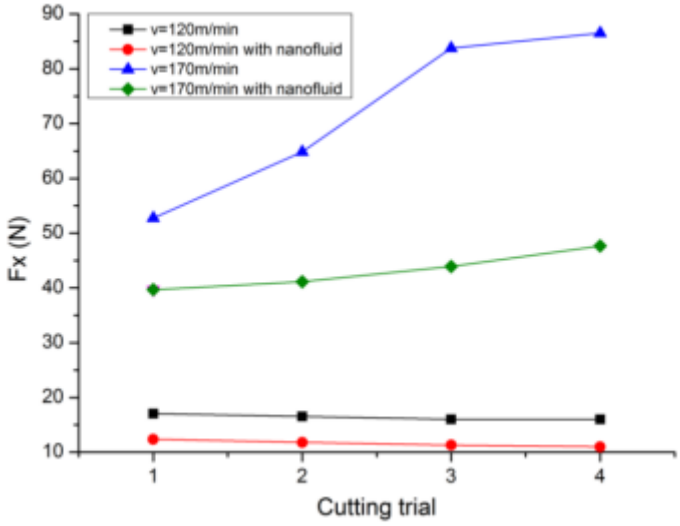


Figure 3. Cutting force F_x in MQCL hard turning

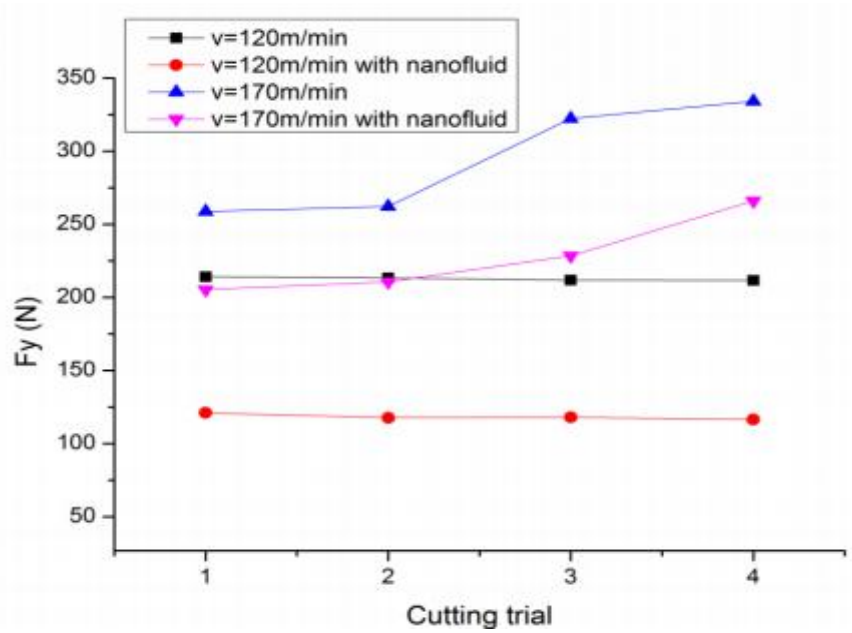


Figure 4. Cutting force Fy in MQCL hard turning

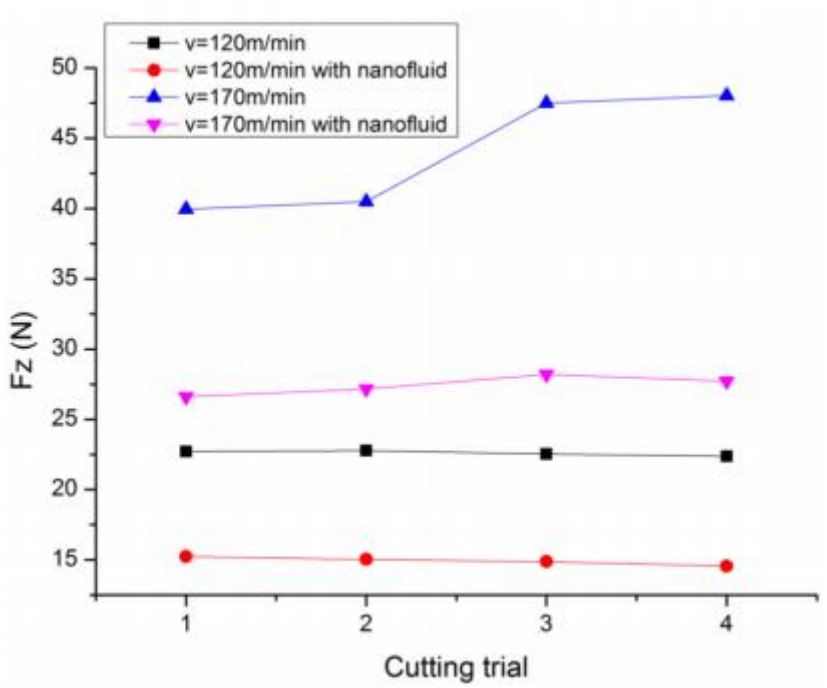


Figure 5. Cutting force F_z in MQCL hard turning

From the obtained results, it clearly indicates that the cutting forces increase with the rise of cutting speed from 120 m/min to 170 m/min. Also, the cutting force components F_x, F_y, F_z under MQCL condition using Al_2O_3 soybean-based nanofluid significantly reduce when compared to MQCL condition using soybean-based fluid. The main reason is the better lubricating performance of Al2O3 nanofluid caused by the "rolling effect" of Al2O3nanoparicles. The rolling contact instead of sliding one in cutting zone contributes to decrease the friction coefficient much [12]. Furthermore, at cutting speed of 170 m/min, the high rate of rising cutting forces is observed from MQCL using soybean-based fluid (Figs. 3-5), which is contrary to the case of MQCL with nanofluid. Accordingly, Al_2O_3 nanoparticles suspended in soybean-based fluid used in MQCL strongly influence on cutting forces and they show the effectiveness in stabilizing cutting force components [19-20].

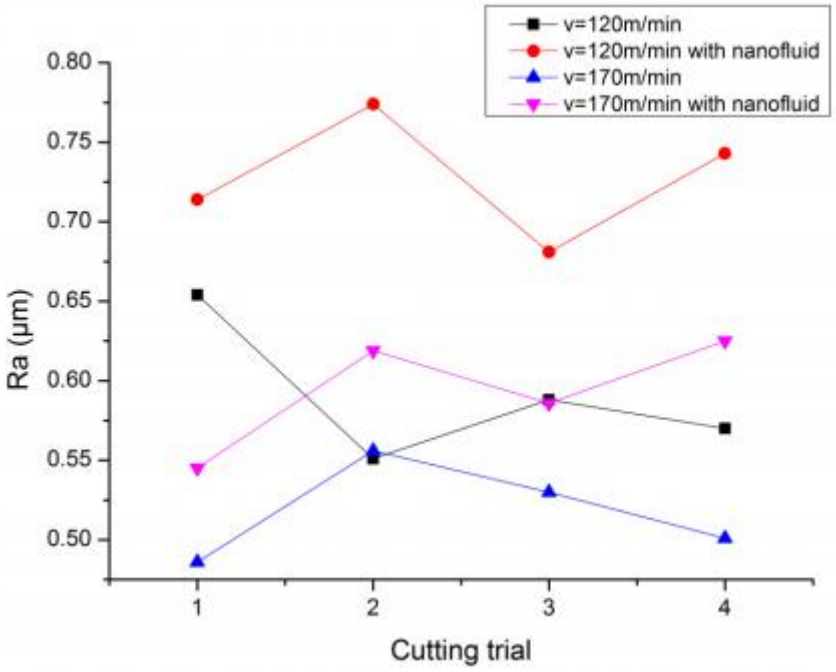


Figure 6. Surface roughness R_a in MQCL hard turning

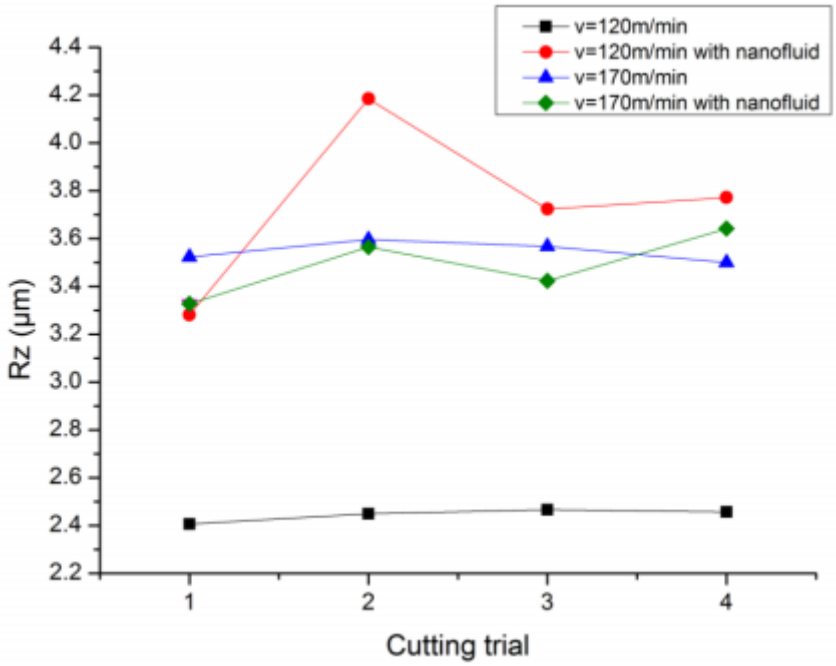


Figure 7. Surface roughness R_z in MQCL hard turning

From Figs. 6-7, surface roughness R_a, R_z in MQCL with soybean-based fluid is better than that with Al_2O_3 soybean-based nanofluid, especially at cutting speed of 120 m/min. It can be explained that the presence of large amounts of nanoparticles suspended in cutting fluid increases collision and impedance among the particles and asperities, which in turn results in worse surface quality [20]. Therefore, the use of large concentration of nanoparticles exhibits the effect on the reduction of cutting forces but causes the negative effect on surface roughness.

CONCLUSION

The application of MQCL technique using soybean oil as the base fluid contributes to improve the cutting performance of carbide inserts in hard turning due to the significant enhancement of thermal conductivity and

lubricating effects. The performance of Al_2O_3 nanofluid in MQCL method is studied. From the experimental results, it could be concluded that MQCL method with Al2O3 nanofluid exhibits the better lubricating effect as well as the reduction of friction coefficient than that with pure fluid, from which the cutting forces much reduce. This comes from the rolling effect of Al_2O_3 nanoparticles in soybean oil. The large nano concentration of 3.0 wt% in MQCL fluid indicates the worse surface roughness than that of pure fluid due to collision and impedance among the particles and asperities. Moreover, the use of ordinary air based on Ranque-Hilsch vortex tube rather than CO_2 or nitrogen to create the cooling air, which combines with MQL to from MQCL technique. It is the novelty of the paper that the manufacturing cost is reduced and the device requirements assisted to hard machining can be simplified. In addition, the soybean oil, a vegetable oil, is successfully applied to hard turning as the based fluid of MQCL technique, which will be a big step toward sustainable production.

In further research, more investigations will be concentrated on optimizing nanoparticle concentration and its effect on surface quality. In addition, more focus will be given to investigate the influence other variables like feed rate, depth of cut and the parameters of MQCL using nanofluid.

ACKNOWLEDGMENTS

The work presented in this paper is supported by Thai Nguyen University of Technology, Thai Nguyen University, Vietnam.

REFERENCES

[1] Kumar, C.S.; Patel, S.K. Effect of WEDM surface texturing on Al2O3/TiCN composite ceramic tools in dry cutting of hardened steel. Ceram. Int. 2018, 44, 2510–2523. doi:10.1016/j.ceramint.2017.10.236.

[2] Davim, J.P. Machining of Hard Materials; Springer-Verlag London Limited: London, UK,2011.

[3] Bouacha, K.; Yallese, M.A.; Mabrouki, T.; Rigal, J.-F. Statistical analysis of surface roughness and cutting forces using response surface methodology in hard turning of AISI 52100 bearing steel with CBN tool. Int. J. Refract. Metals Hard Mater. 2010, 28, 349–361. doi: 10.1016/j.ijrmhm.2009.11.011.

[4] Zhang, K.; Deng, J.; Meng, R.; Gao, P.; Yue, H. Effect of nano-scale textures on cutting performance of WC/Co-based Ti55Al45N coated tools in dry cutting. Int. J. Refract. Metals Hard Mater. 2015, 51, 35–49. doi:10.1016/j.ijrmhm.2015.02.011.

[5] Liu, Y.; Deng, J.; Wang, W.; Duan, R.; Meng, R.; Ge, D.; Li, X. Effect of texture parameters on cutting performance of flank-faced textured carbide tools in dry cutting of green Al2O ceramics. Ceram. Int. 2018, 44, 13205–13217. doi:10.1016/j.ceramint.2018.04.146.

[6] Xing, Y.; Deng, J.; Zhao, J.; Zhang, G.; Zhang, K. Cutting performance and wear mechanism of nanoscale and microscale textured Al2O3/TiC ceramic tools in dry cutting of hardened steel. Int. J. Refract. Metals Hard Mater. 2014, 43, 46–58. doi:10.1016/j.ijrmhm.2013.10.019.

[7] Su, Y.; Li, Z.; Li, L.; Wang, J.; Gao, H.; Wang, G. Cutting performance of micro-textured polycrystalline diamond tool in dry cutting. J. Manuf. Process. 2017, 27, 1–7. doi:10.1016/j.jmapro.2017.03.013.

[8] Duc, T.M; Long, T.T. Investigation of MQL-Employed Hard-Milling Process of S60C Steel Using Coated-Cemented Carbide Tools. J. Mech. Eng. Autom. 2016, 6, 128–132.

[9] Abdul Sani, A.S.; Rahim, E.A.; Sharif, S.; Sasahara, H. Machining performance of vegetable oil with phosphonium- and ammonium-based ionic liquids via MQL technique. J. Clean. Prod. 2018, 209, 947–964. doi:10.1016/j.jclepro.2018.10.317.8

[10] Joshi, K.K.; Kumar, R.; Anurag. An Experimental Investigations in Turning of Incoloy 800 in Dry, MQL and Flood Cooling Conditions. Procedia Manuf. 2018, 20, 350–357. doi:10.1016/j.promfg.2018.02.051.

[11] Tunc, L.T.; Gu, Y.; Burke, M.G. Effects of Minimal Quantity Lubrication (MQL) on Surface Integrity in Robotic Milling of Austenitic Stainless Steel. Procedia CIRP 2016, 45, 215–218. doi:10.1016/j.procir.2016.02.337.

[12] Duc, T.M; Long, T.T; Ngoc, T.B. Performance of Al2O3 nanofluids in minimum quantity lubrication in hard milling of 60Si2Mn steel using cemented carbide tools. Advances in Mechanical Engineering 2017, 9, 1–9. doi:10.1177/1687814017710618.

[13] Maruda, R.W.; Krolczyk, G.M.; Feldshtein, E.; Nieslony, P.; Tyliszczak, B.; Pusavec, F. Tool wear characterizations in finish turning of AISI 1045 carbon steel for MQCL conditions. Wear 2017, 372, 54–67.

[14] Maruda, R.W.; Krolczyk, G.M.; Feldshtein, E.; Pusavec, F.; Szydlowski, M.; Legutko, S.; Sobczak-Kupiec, A. A study on droplets sizes, their distribution and heat exchange for minimum quantity cooling lubrication (MQCL). Int. J. Mach. Tools Manuf. 2016, 100, 81–92.

[15] Maruda, R.W.; Krolczyk, G.M.; Wojciechowski, S.; Zak, K.; Habrat, W.; Nieslony, P. Effects of extreme pressure and anti-wear additives on surface topography and tool wear during MQCL turning of AISI 1045 steel. J. Mech. Sci. Technol. 2018, 32, 1585–1591.
[16] Maruda, R.; Krolczyk, G.; Niesłony, P.; Krolczyk, J.; Legutko, S.; Krolczyk, G. Chip Formation Zone Analysis During the Turning of Austenitic Stainless Steel 316L under MQCL Cooling Condition. Procedia Eng. 2016, 149, 297–304.
[17] Dong, P.Q.; Duc, T.M.; Long, T.T. Performance Evaluation of MQCL Hard Milling of SKD Tool Steel Using MoS2 Nanofluid. Metals 2019, 9, 658.
[18] Duc, T.M.; Long, T.T.; Chien, T.Q. Performance Evaluation of MQL Parameters Using Al_2O_3 and MoS2 Nanofluids in Hard Turning 90CrSi Steel. Lubricants 2019, 7, 40.
[19] Akhil Garg, Shrutidhara Sarma, B.N. Panda, Jian Zhang, L. Gao. Study of effect of nanofluid concentration on response characteristics of machining process for cleaner production. Journal of Cleaner Production 2016, 135, 476-489, DOI: 10.1016/j.jclepro.2016.06.122.
[20] Cong Mao, Jian Zhang, Yong Huang, Hongfu Zou, Xiangming Huang and Zhixiong Zhou. Investigation on the Effect of Nanofluid Parameters on MQL Grinding. Materials and Processes 2013, 28, 436-442, DOI: 10.1080/10426914.2013.763970

Analisis Gaya Bahasa: Metafora dalam Kalimat

Isla Natalie Harper

School of Humanities, University of Adelaide, Adelaide, Australia

ABSTRAK

Bahasa adalah lambang bunyi atau simbol yang di gunakan sebagai komunikasi satu dengan yang lain. Bahasa terdiri atas kata-kata atau kumpulan kata.Bahasa. menurut Plato, Bahasa pada dasarnya yaitu pernyataan pikiran atau gagasan seseorang dengan perantaraan nama benda atau yang lain dan ucapan yang merupakan cermin atau pantilan dari ide seseorang. Penutur menggunakan bahasa untuk menyampaikan gagasan, pikiran, dan perasaan dalam berbagai . Pada dasarnya berbicara, tapi tidak semua orang berbicara dengan cara tersirat atau tidak langsung, banyak orang yang tidak suka berbelit-belit dan lebih suka berbicara secara langsung apa yang dia maksud kepada lawan bicara.

PENDAHULUAN

Majas metafora merupakan majas yang melukiskan atau menggambarkan sesuatu dengan perbandingan langsung dan tepat atas dasar sifat yang sama atau hampir sama. Dalam maksud lain, majas metafora adalah pemakaian kata atau kelompok kata yang bukan arti sebenarnya. Ciri majas yaitu menggunakan kata kiasan dan ada pilihan kata yang menyamakan sesuatu dengan yang lainnya. Dalam membandingkan sesuatu, majas metafora menggunakan perbandingan langsung tanpa diikuti kata pembanding *seperti, bagai, bak,* atau *laksana.* Majas metafora itu sendiri masuk dalam kategori majas perbandingan.

Metafora adalah penggunaan bahasa atau pun kata-kata frase maupun kalimat yang digunakan untuk mengungkapkan kepada personal ataupun kelompok secara langsung dan bukan dengan arti yang sebenarnya. Makna dalam hal ini biasa dijelaskan untuk mengungkapkan sebuah makna yang berlebih-lebihan,

namun makna kiasan tersebut sungguh tidak telalu sulit untuk menjelaskan dan mengartikan apa arti dari kata-kata yang dimaksudkan.

Metafora dapat digunakan atau difungsikan dalam arti yang sangat luas. Kata lain metafora dapat berdiri sendiri sebagai kata tunggal, akan tetapi metafora dapat dibatasi oleh sebuah konteks .Metafora merupakan bagian y ang sangat penting dalam pengetahuan berbahasa. Hampir semua kata bisa dipakai secara luas, arti kata yang sesuai metafora adalah sebagai kata yang mempunyai bernilai. Hampir semua kata yang memiliki makna atau arti bernilai, dan makna atau arti bisa dipakai sesuai dengan kegunaannya atau fungsinya. Dalam berjalannya waktu, metaforis mampu mengambil alih arti yang sesungguhnya sehingga lebih dikenal dengan makna metaforisnya daripada arti yang sebenarnya, ssehingga menjadi arti atau makna yang baru.

PEMBAHASAN

1. Ayah dan Ibu sangat menyayangi buah hatinya

   Dalam kalimat di atas menggambarkan bahwa orang tua yang sangat menyayangi buah hati,kata buah dan hati sendiri sangat bertentangan bagi orang yang tidak memahaminya. pada kata Buah hati tersebut bukan berarti orang tua tersebut itu menyayangi buah yang pada dasarnya bisa di artikan buah-buahan dan hati bisa di sebut hati yang terdapat pada anggota tubuh. Kalimat tersebut mempunyai arti lain yaitu ayah dan ibu yang sangat menyayangi anaknya.

2. Si jago merah berhasil melahap hampir semua perumahan yang ada di Depok

   Dalam kalimat di atas menggambarkan bahwa si jago merah telah menghabiskan perumahan di depok. Kalimat tersebut bukan berarti si jago

merah yang bisa di sebut sebagai hewan awan. Jika orang yang tidak tahu akan mengartikan bahwa sijago disebut ayam. Tetapi kata si jago merah tersebut adalah api, kenapa api di sebut jago merah karena api mudah membakar sesuatu di sekitarnya dengan cepat sehingga di sebut si jago merah.

3. Salah satu sikap baik adalah memiliki perasaan yang rendah hati

   Dalam kalimat di atas menggambarkan bahwa bersikap baik adalah sikap yang rendah hati. Pada kalimat tersebut bukan berarti seseorang tersebut mempunyai hati yang rendah atau hatinya berada di titik bawah sehingga di sebut rendah hatinya. Pada kata rendah hati bukan semata-mata hatinya berada di bawah tapi rendah hati pada kalimat tersebut berartikan baik hati, kenapa sepeti itu, karena orang baik tidak ada yang sombong sehingga kata lain dari baik hati yaitu rendah hati bukan tinggi hati.

4. Kita harus mampu belajar untuk berlapang dada dalam menerima setiap ujian hidup

   Dalam kalimat tersebut menggambarkan harus mampu berlapang dada dalam menerima ujian hidup. Pada kalimat tersebut bukan berarti seseorang yang berlapang dada, dadanya harus berlapang-lapang seperti lapangan. Pada kata lapang dada tersendiri mempunyai arti lain yaitu ikhlas, karena orang yanng ikhlas pasti akan dengan mudah menerima segala sesuatu yang dihadapinya. Sehingga berlapang dada lebih tepat menjadi kata lain dari ikhlas. Jadi kalimat tersebut bisa menjadi kita harus mampu belajar untuk ikhlas dalam menerima setiap ujian hidup.

5. Orang yang memakai kacamata sering dijuluki kutu buku

Dalam kalimat tersebut mengatakan memakai kacamata sering di sebut kutu buku. Pada kalimat tersebut bukan semata-mata orang yang memakai kacamata berkutu buku. Kata kutu dan buku tersendiri bisa di artikan kutu yang berada di rambut dan buku bisa di artikan buku yang di dalamnya terdapat bacaan. Kata kutu buku ini sebenarnya yaitu orang yang suka membaca atau orang penyuka buku sehingga di artikan kutu buku karena saking seringnya membaca dan membawa buku mengakibatkan mata min. Jadi kalimat tersebut bisa menjadi orang yang memakai kacamata sering disebut penyuka buku atau penggemar buku.

6. Nunung adalah kembang desa yang tidak ada tandingannya

Dalam kalimat tersebut menggambarkan nunung sebagai kembang desa yang tidak ada tandingannya. Pada kata kembang desa bukan berarti kembang yang sebenarnya adalah tumbuhan dan desa adalah desa atau tempat tinggal. Pada kalimat kembang desa tersebut sebenarnya adalah wanita tercantik. Karena arti kembang tersendiri yaitu bunga, karena menurut manusia bunya itu identik dengan indah atau cantik. Sehingga kalimat tersebut menjadi nunung adalah wanita tercantik yang tidak ada tandinganya.

7. Kasus kopi sianida akhirnya dibawa ke meja hijau

Dalam kalimat tersebut menggambarkan bahwa kasus kopi sianida berlanjut ke meja hijau. Pada kata meja hijau bukan berarti bisa diartikan menjadi meja yang berwarna hijau walaupun makna sebenarnya adalah meja yang berwarna hijau, akan tetapi makna kiasan diartikan sebagai pengadilan atau proses hukum. Sehingga kalimat tersebut menjadi kasus kopi sianida akhirnya di bawa ke pengadilan atau poses hukum.

KESIMPULAN

Metafora adalah pemakaian kata atau kelompok kata yang tidak menggunakan arti sebenarnya melainkan sebagai gambaran atau lukisan yang mendasarkan persamaan atau perbandingan menurut Moeliono (2008:580). Menurut Harimurti kridalaksana (2003:106) merupakan pemakaian kata atau ungkapan lain untuk objek atau konsep lain berdasarkan kias atau persamaan. Ullman (1972:203) berpendapat bahwa metafora adalah penggunaan kata atau ungkapan lain untuk objek atau konsep lain berdasarkan kias atau persamaan. Metafora, mengandung unsur-unsur yang kadang-kadang tidak disebutkan secara eksplisit. Definisi metafora menurut Beekman dan Callow(1974) adalah suatu perbandingan yang implisit. Metafora menurut Pradopo (1994:66) merupakan bentuk perbandingan dua hal secara langsung, tetapi dalam bentuk yang singkat.

DAFTAR PUSTAKA

https://brainly.co.id/tugas/1123975

https://dosenbahasa.com/contoh-majas-metafora

https://repository.widyatama.ac.id/xmlui/bitstream/handle/123456789/8436/Bab%202.pdf?sequence=7

http://rezaekaw.blogspot.com/2016/06/makalah-metafora-semantik_21.html

Tantangan Penerjemahan Metafora dalam Perspektif Linguistik

Amelia Claire Norton

Faculty of Humanities, Bristol University, Bristol, UK

Abstrak

Pada jurnal yang berjudul "Konsep Teori dan Kesulitan Penerjemahan Metafora dalam Bidang Linguistik" ini, membahas semua hal tentang metafora di dalam bidang linguistik. Mulai dari pengertian umum sampai dengan pengertian metafora menurut para ahli. Serta semua kesulitan yang dihadapi saat melakukan penerjemahan metafora. Metode yang digunakan dalam penulisan jurnal ini adalah metode deskriptif. Diharapkan setelah membaca tulisan ini, pembaca dapat lebih memahami tentang metafora.

Kata kunci :*metafora, linguistik, konsep*

Pendahuluan

Dalam kehidupan sehari hari metafora dijadikan sarana untuk mengenalkan suatu objek atau konsep baru yang memiliki makna lebih tepat dan sesuai. Seperti halnya Metafora dalam puisi. Ia lebih mengutamakan agar kesan yang didapat bisa menjadi puitis dan memiliki makna yang mendalam. Meski sudah sering digunakan, tetap saja metafora disebut sebagai ekspresi yang misterius. Karena maknanya sulit dijelaskan, apalagi diterjemahkan. Sehingga metafora dipandang sebagai bagian paling sulit dalam tugas penerjemahan.

Menurut Newmark (1998: 104), masalah utama dalam penerjemahan secara umum adalah pemilihan metode penerjemahan bagi sebuah teks, sedangkan masalah penerjemahan yang paling sulit secara khusus adalah penerjemahan metafora. Sebagai akibatnya, terdapat dua pandangan yang bertentangan secara ekstrim mengenai metafora. Menurut Dagut (1987: 25), di satu pihak, tidak sedikit ahli penerjemahan, seperti Nida, Vinay and Darbelnet, yang menganggap metafora tidak bisa diterjemahkan. Namun di pihak lain, beberapa tokoh, seperti Kloepfer dan Reiss, menganggap bahwa metafora, sebagai bagian dari Bahasa dan tetap bisa diterjemahkan.

Didukung oleh beberapa sumber lain menjelaskan bahwa, meskipun sebagian metafora harus diterjemahkan secara hati-hati, majas ini tetap bisa diterjemahkan. Selain kedua pihak yang bertentangan di atas sebelumnya, tidak sedikit pakar penerjemahan yang tidak ingin terlibat

dalam persoalan penerjemahan metafora. Akibatnya, teori dan kajian tentang penerjemahan metafora yang tersedia sangat minim dan sedikit.

Pembahasan

Ahli penerjemahan yang pertama kali berkontribusi secara signifikan bagi penerjemahan metafora adalah Dagut, Newmark dan Larson. Menurut Dagut (1987: 28), metafora adalah sebuah penyimpangan kreatif terhadap sistem semantis. Oleh karena itu, secara teoritis, metafora tidak memiliki ungkapan yang sepadan dalam bahasa lain. Jika penerjemahan terminologi-terminologi yang diinstitusionalkan, seperti polisemi dan idiom dilakukan melalui substitusi (menemukan dan mengedit padanan-padanan yang telah tersedia dalam Bsa), penerjemahan metafora merupakan aktivitas penciptaan ulang (a re-creation job). Dengan kata lain,penerjemah harus mereproduksi metafora-metafora yang berterima dalam konteks linguistik dan budaya BSa. Aspek-Aspek yang Memengaruhi Pemilihan Strategi PenerjemahanMetafora :

1. Tujuan Penerjemahan

Penerjemahan pada dasarnya bertujuan untuk menghasilkan suatu teks bagi pembaca kalangan tertentu di lingkungan tertentu. Maksud dan tujuan penerjemahan tersebut merupakan factor utama yang secara signifikan mempengaruhi prinsip yang digunakan penerjemah.

2. Pembaca Target

Setiap penerjemahan berorientasi pada publik BSa, karena menerjemahkan adalah tindakan untuk menghasilkan teks bagi publik bahasa tertentu untuk tujuan tertentu dan kelompok pembaca tertentu dalam lingkungan tertentu (Kelompok Bahasa Sasaran).

3. Jenis Teks

Keputusan tentang pendekatan penerjemahan yang akan digunakan tidak terlepas dari faktor jenis teks. Semua teks memiliki fungsi ekspresif dan informatif. Namun salah satu fungsi ini akan berperan dominan, sedangkan dua lainnya bersifat tambahan. Ketika menerjemahkan karya sastra, penerjemah harus mereproduksi bentuk dan isi BSu tanpa mengganggu “rasa” budaya TSu. Di sisi lain, penerjemahan karya ilmiah dan laporan teknis, yang fungsi didominasi oleh fungsi informatif, harus menggunakan register yang tepat. Sedangkan pada teks vokatif, gaya yang dominan adalah persuasif atau imperatif. Oleh karena itu, terjemahan yang berhasil untuk teks jenis ini adalah yang memicu tanggapan yang diinginkan dari pembaca teks sasaran.

Metafora pada awalnya juga dianggap sebagai simile eliptis; artinya, metafora dari bentuk “X adalah Y” dapat dialihkan secara langsung dengan simile dari bentuk “X adalah seperti Y”. Pandangan Aristoteles tentang metafora ini berdasar pada ciri objektif. Jadi, pengalihan metafora kepada simile menandakan bahwa metafora dapat mengurangi daftar persamaan di antara objek-objek. Pandangan kedua tentang metafora dinamai pandangan romantis sebab berhubungan dengan pandangan romantis tentang imajinasi pada Abad ke-18 dan pada Abad ke-19 (Saeed, 1997: 303). Dalam pandangan romantis, metafora berintegrasi dengan bahasa dan pikiran sebagai suatu cara untuk memahami dunia. Metafora dalam pandangan ini menjadi bukti tentang peran imajinasi dalam membangun konseptualisasi dan pernalaran. Tegasnya, dalam metafora ini tidak ditemukan perbedaan yang jelas antara bahasa harfiah dan bahasa figuratif. Berdasarkan pendapat di atas, sekarang telah diterima secara luas bahwa metafora tidak ditafsirkan sebagai simile.

Metafora mencakup suatu pemetaan yang lebih rumit antara ranah sumber dan ranah sasaran. Ahli psikologi dan ahli bahasa beranggapan bahwa metafora merupakan alat yang penting pada kognisi dan komunikasi sebab menawarkan cara-cara yang kurang akrab dalam mengonseptualisasikan sesuatu yang akrab. Dalam linguistik kognitif, metafora ialah keadaan dua-arah (two-wayaffair) dari metafora bahasa ke metafora konseptual, atau dari metafora konseptual ke metafora bahasa. Contohnya, ahli bahasa kognitif menggunakan kehadiran metafora yang berlimpah dan sistematis dalam bahasa sebagai dasar untuk mengendalikan keberadaan metafora konseptual yang menerangkan peralihan dari bahasa ke pikiran

Makna tersirat dari bentuk metafora didasarkan pada makna asosiatif sejalan dengan yang disarankan Leech (1997:12-30). Ada tujuh tipe makna konseptual, yaitu makna konotatif, makna stilistik, makna afektif, makna reflektif, makna kolokatif, makna tematik, makna stilistik. Lima dari tujuh tipe makna itu diklasifikasikan sebagai rujukan makna asosiatif.

(1)Tuturan metafora bermakna konotatif apabila maksud yang disampaikan secara metaforis sesuai dengan apa yang dijadikan dasar dalam bahasa itu. Dengan kata lain makna konotatif adalah aspek makna sebuah atau sekelompok kata yang didasarkan atas perasaan atau pikiran yang timbul pada pembicaraan dengan pendengar.

(2)Tuturan metafora bermakna stilistik apabila tuturannya bermaksud mengkomunikasikan gambaran atau keadaan sosial. Misal penggambaran sifat, kepribadian dan keadaan.

(3)Tuturan metafora bermakna afektif biasa digunakan untuk mengutarakan perasaan, tingkah laku, atau keadaan pribadi penutur.
(4)Tuturan metafora bermakna reflektif dimaksudkan untuk menunjukkan simbol lingual bermakna ganda dan makna ekspresi tersebut telah ada sebelumnya.
(5)Tuturan metafora yang bermakna kolokatif apabila tuturan disampaikan dengan maksud untuk hal-hal yang berkonteks kultural dan sosial.

Ada dua hal pokok yang perlu dipahami saat mengaitkan makna ini, yaitu (1) interpretasi pesan, (2) penafsiran maksud (Leech, 1997:12-30). Makna metafora jenis ini lebih ditekankan pada penentuan maksud dan makna oleh penutur. Berorientasi pada pesan apa yang ditransfer secara metaforis oleh penutur kepada lawan tuturnya, sesuai dengan situasi, peristiwa, dan lokasi tutur yang dimaksud.

Dasar pemahaman metafora didasarkan atas kalimat penutur dan interpretasi didasarkan atas maksud metafora yang disampaikan. Dalam hal ini ada kaitannya antara penutur (encoder) dengan lawan tutur (decoder). Makna metafora sangat berkaitan antara makna harfiah dan makna figuratifnya. Hubungan antara makna harfiah dan makna figuratif yang terdapat di metafora merupakan versi pendek dalam satu kalimat, dan maknanya saling berpengaruh secara kompleks.

Terdapat tiga penyebab sulitnya penerjemahan metafora. Pertama, seperti dijelaskan oleh Dagut (1987: 24), metafora dalam BSu,pada hakikatnya, merupakan unsur semantik yang baru. Akibatnya, BSa tidak memiliki padanan untuk metafora itu. Kedua, metafora merupakan bagian dari sebuah bahasa, dan semua bahasa pada hakikatnya tidak dapat terpisahkan dari budaya. Akibatnya, sebagian besar metafora sangat sarat dengan nilai-nilai budaya. berdasarkan hal tersebut, metafora hanya dapat dipahami jika nilai-nilai budaya yang berkaitan dengannnya telah terlebih dahulu dipahami. Ketiga, metafora merupakan sarana untuk mengungkapkan makna secara kreatif, singkat, dan padat. Oleh karena itu, agar mampu menerjemahkan metafora, penerjemah harus mampu menulis secara kreatif.

Senada dengan itu, Larson (1998: 275-276) menjelaskan enam penyebab sulitnya memahami dan menerjemahkan metafora. Penyebab pertama adalah citra yang digunakan dalam metafora mungkin tidak lazim digunakan dalam BSa. Kedua, topik metafora tidak selalu dinyatakan dengan jelas. Ketiga, titik kesamaannya terkadang implisit, sehingga sulit diidentifikasi atau mengakibatkan pemahaman yang berbeda bagi penutur bahasa lain. Keempat, perbedaan budaya BSu dan BSa dapat membuat penafsiran yang berbeda terhadap titik kesamaan.

Ke lima, BSa mungkin tidak membuat perbandingan seperti yang terdapat pada metafora TSu. Keenam, setiap bahasa memiliki perbedaan dalam penciptaan dan penggunaan ungkapan.

Metafora bukan sekadar ekspresi linguistik semata. Melainkan sebuah penyampaian dalam sistem konseptual. Menurut pandangan para ahli, metafora tidak hanya terbatas pada karya sastra atau ekspresi puitis semata. Metafora lebih luas dari itu. Metafora merupakan konsep yang luas dan terdapat dalam penggunaan di keseharian, seperti waktu, keadaan, perbuahan, sebab akibat, dan tujuan. Contohnya ungkapan waktu adalah uang.

Perlu dicatat bahwa dalam linguistik kognitif terdapat tiga hipotesis dasar yang pada hakikatnya merupakan bentuk penolakan tokoh-tokoh linguistik kognitif terhadap rancangan sintaksis dan semantik yang berpengaruh kuat pada pada masa itu, yaitu tata bahasa generatif dan semantik keadaan-kebenaran. Ketiga hipotesis itu ialah (1) bahasa bukanlah piranti kognitif yang mandiri, (2) tata bahasa adalah konseptualisasi, dan (3) pengetahuan bahasa bersumber dari pemakaian bahasa (Croft dan Cruse, 2004: 1—4). Hipotesis pertama menerangkan bahwa pengetahuan bahasa sejatinya adalah sama dengan representasi struktur konseptual lain, dan proses penggunaan pengetahuan itu tidak berbeda dengan kemampuan kognitif yang digunakan manusia di luar ranah bahasa. Pada hipotesis kedua, proses kognitif yang menguasai pemakaian bahasa, khususnya konstruksi dan komunikasi pada makna bahasa, pada prinsipnya adalah sama dengan kemampuan kognitif lainnya.

Hipotesis yang ketiga menjelaskan bahwa kategori dan struktur dalam semantik, sintaksis, morfologi, dan fonologi dibentuk oleh kognisi manusia tentang ujaran khusus. Penelitian ini menggunakan teori Metafora Konseptual yang bersumber dari rancangan linguistik kognitif. Ciri penting dari teori ini adalah pemanfaatan aspek tertentu dari ranah sumber atau ranah sasaran yang berperan pada metafora. Artinya, jika disarankan bahwa metafora konseptual dapat dinyatakan dengan A ADALAH B, ini tidak berarti bahwa seluruh konsep A atau B yang tercakup dipilih sebagai aspek tertentu. Lakoff dan Johnson (1980: 117) memberi ilustrasi pada metafora hipotesis seperti CINTA sebagai PERJALANAN, WAKTU sebagai UANG, dan ALASAN sebagai PERANG. Pada metafora itu, fokus definisi ialah tingkat ranah pengalaman dasar seperti cinta, waktu, dan alasan. Pengalaman ini kemudian dikonsepkan dan dibatasi dengan bertumpu pada ranah pengalaman dasar seperti perjalanan, uang, dan perang.

Ciri konvensional memunculkan isu baru pada metafora. Ciri kesistematisan mengacu pada cara bahwa metafora tidak hanya menata butir perbandingan tunggal; ciri ranah sumber dan

ranah sasaran bergabung sehingga sebuah metafora dapat diperluas, atau mempunyai logika internalnya sendiri. Ciri asimetri mengacu pada cara bahwa metafora bersifat langsung. Metafora tidak membuat perbandingan simetris antara dua konsep dalam menetapkan butir persamaan. Metafora memancing pendengar untuk mengalihkan ciri sumber kepada ciri sasaran. Ciri abstraksi dikaitkan dengan asimetri. Metafora menggunakan sumber yang lebih konkret. Dalam penelitian ini, metafora cinta dianalisis dengan menggunakan skema-citra.

Tanpa penggunaan skema-citra sukar bagi siapa pun untuk memahami pengalaman. Alasannya, karena pengalaman fisik manusia hadir dan bertindak pada dunia karena menyerap pengalaman, memindahkan tubuh, mengerahkan dan mengalami daya. Manusia membentuk struktur konseptual dasar yang digunakan untuk menata pikiran melintasi rentang ranah yang lebih abstrak. Johnson (1987), seperti dikutip oleh Saeed (1997: 308), mengusulkan skema-citra sebagai suatu level struktur kognitif yang lebih primitif yang mendasari metafora dan menyajikan hubungan sistematis yang teratur antara pengalaman badan dan ranah kognitif yang lebih tinggi seperti bahasa.

Kesimpulan

Untuk memahami sebuah metafora, sebaiknya tidak dibaca secara harfiah, tetapi dibaca secara figuratif. Kalau dipahami secara harfiah, metafora dinilai melanggar norma interpretasi dan menghasilkan anomali semantis, sebab sebuah kalimat harus relevan dengan konteks. Begitu metafora sudah dikenali akan tampak persamaan makna umum di antara kedua tipe makna ini, yaitu makna harfiah dan makna figuratif. Relasi metaforis dibentuk oleh pemetaan pada ranah sumber dan pada ranah sasaran. Makna yang baru, atau makna figuratif, pada ranah sumber dapat dipahami dengan baik karena makna ini dipetakan ke dalam ranah sasaran (makna harfiah). Singkatnya, peralihan sifat sasaran kepada sumber telah menciptakan perspektif baru pada sumber. Lebih jauh, metafora memiliki ciri kekovensionalan, kesistematisan, asimetri, dan abstraksi.

Daftar Pustaka

Pardede, Parlindungan. 2013. *Penerjemahan Metafora*. Diakses 27 April 2019. https://www.researchgate.net/publication/259469138_Penerjemahan_Metafora

Universitas Islam Negeri Malang. Diakses 27 April 2019. http://etheses.uin-malang.ac.id/1842/5/09410137_Bab_2.pdf

Universitas Sumatera Utara. Diakses 27 April 2019. http://repository.usu.ac.id/bitstream/handle/123456789/57473/Chapter%20II.pdf?sequence=4&isAllowed=y

Widjajanti, Anita. *Menguak Metafora Dalam Pembelajaran Sastra*. Diakses 27 April 2019. https://jurnal.unej.ac.id/index.php/JP2/article/view/847/661

Universitas Dian Nuswantoro. *Repository Dokumen Ajar*. Diakses 27 April 2019. http://dinus.ac.id/repository/docs/ajar/metafora.pdf

KAJIAN METAFORA DALAM PUISI SURAT CINTA OLEH W.S. RENDRA

Grace Eleanor Young
Student, Department of Japanese Studies, International University of Tokyo, Tokyo, Japan

ABSTRAK

Paper ini membahas mengenai analisisi metafora dalam petikan puisi yang berjudul "Surat Cinta" karya W.S Rendra. Dalam puisi tersebut menggambarkan perasaan cinta yang kuat yang akhirnya penyairpun menikah dengan pujaan hatinya itu. Dalam karya-karya puisi yang modern, banyak sekali ditemukan jenis metafora yang tidak konvensional sebagai hasil upaya kreatif dari penyair. Jenis metafora ini bersifat original. Jenis tersebut hanya dimiliki oleh penyairnya saja.

PENDAHULUAN

Hendy (1991:69) mengemukakan bahwa metafora berasal dari kata meta dan phoreo yang berarti bertukar nama atau perumpamaan. Metafora adalah majas perbandingan langsung, yaitu membandingkan sesuatu secara langsung terhadap penggantinya. Kajian-kajian terhadap metafora sebagai gaya bahasa, sebagaimana disampaikan Saeed (2005:346), pada umumnya menggunakan pendekatan yang didasarkan oleh dua pandangan yang cukup berbeda. Pendekatan pertama didasarkan oleh pandangan klasik (*Classical View*) terhadap metafora. Pandangan klasik ini sudah muncul sejak terbitnya tulisan Aristoteles (384-322 SM) tentang metafora. Aristoteles memandang metafora yaitu sebagai satu jenis hiasan tambahan pada penggunaan bahasa yang ada pada kehidupan sehari-hari. Metafora dianggap sebagai alat retorik yang hanya digunakan pada saat-saat tertentu untuk mencapai efek tertentu. Oleh karena itu, setiap para pendengar menangkap ujaran metafora, ia akan menangkapnya sebagai bentuk ujaran yang aneh (anomalous) sehingga ia harus berusaha berfikir untuk dapat memahami makna apa yang terkandung dalam ujaran tersebut.

Pendekatan kedua yaitu didasari oleh pandangan romantik (*Romantic View*). Aliran metafora ini sangat berbeda dengan pandangan sebelumnya. Dalam pandangan romantik ini, metafora merupakan wujud integral dari bahasa dan pikiran sebagai sebuah cara pencarian pengalaman. Sebuah bentuk metafora dipandang tidak hanya sebagai refleksi dari bagaimana penuturnya menggunakan bahasa, tetapi juga sebagai refleksi dari bagaimana pikiran-pikiran penuturnya. Sebagaimana juga disampaikan oleh Freeborn (1996:63) bahwa George Lokaff dan Mark Johnson, sebagai penganut pandangan romantik, mengakui metafora bukan hanya sekedar alat imajinasi puitik dan hiasan retorik semata saja, tetapi juga meresap dalam kehidupan sehari-hari.

Sebagai sebuah bentuk ungkapan, metafora juga memiliki bagian-bagian sebagai unsur atau komponen pembangunnya. Sehubungan dengan itu, Pradopo (2005:66-67) menyebutkan bahwa metafora terdiri dari dua bagian (term), yaitu term pokok (principal term) dan term kedua (secondary term). Term pokok disebut juga tenor, term kedua disebut

juga vehicle. Term pokok (tenor) menyebutkan hal yang dibandingkan, sedang term kedua (vehicle) adalah hal yang dipakai untuk membandingkan. Di muka telah dijelaskan bahwa gaya bahasa, termasuk metafora, merupakan cara khas penyair menggunakan bahasa untuk menyampaikan pikiran dan perasaannya pada orang lain (pembaca). Setiap penyair yang kreatif akan mencari dan menemukan keaslianya (karekteristiknya) masing-masing dalam bertutur. Kenyataan ini mengakibatkan lahirnya begitu banyak corak dan ragam gaya bahasa, khususnya metafora. Hal ini karena gaya bahasa kiasan, khususnya metafora, seolah-olah merupakan ladang subur bagi para penyair untuk berkreasi menciptakan ungkapan-ungkapan yang khas dan berdaya ungkap kuat tanpa melupakan estetika

METODE PENELITIAN

Penelitian ini menggunakan metode penelitian deskriptif, yaitu menggambarkan metafora dalam puisi “Surat Cinta” karya W.S Rendra.

PEMBAHASAN

Puisi adalah salah satu cabang sastra yang menggunakan kata-kata, rima, dan irama sebagai media penyampaian untuk membuahkan ekspresi, ilusi dan imajinasi. Dalam sebuah puisi, keindahan ilusi, penataan unsur bunyi merupakan gambaran dari gagasan penyairnya. Adapun syair dari puisi “Surat Cinta” karya W.S Rendra sebagai berikut.

Melihat setiap bait puisi yang berjudul “Surat Cinta” ini dapat ditarik sebuah simpulan, yaitu tema dari puisi ini menceritakan perjalanan kisah cinta sang penyair dengan wanita pujaannya (Dik Narti) mulai dari awal mengagumi, lalu mengutarakan cinta, dan kemudian melamar sampai menikahi sang pujaan hato. Hal itu dapat dilihat pada penggalan bait-bait berikut.

Kutulis surat ini
kala hujan gerimis
bagai bunyi tambur mainan
anak-anak peri dunia yang gaib.
Dan angin mendesah
mengeluh dan mendesah
Wahai, Dik Narti,
aku cinta kepadamu!
.....
Wahai, Putri Duyung,
aku menjaringmu
aku melamarmu

Pada bait tersebut menggambarkan perasaan cinta yang kuat dari penyair kepada Dik Narti, dengan mengutarakan kejujurannya bahwa ia mencintai Dik Narti. Pada bait selanjutnya juga menggambarkan bahwa si penyair memilih Dik Narti dan berniat untuk melamarnya pada kata: /*aku menjaringmu*/ */aku melamarmu*/.

Selanjutnya ada kutipan yang menggambarkan penyair pada akhirnya menikahi Dik Narti dan berharap Dik Narti menjadi ibu dari anak-anaknya. Kutipan puisi tersebut sebagai berikut.

Wahai, Dik Narti,
kupinang kau menjadi istriku!
.....
Wahai, Dik Narti,
kuingin dikau
menjadi ibu anak-anakku!

Dalam puisi "Surat Cinta" ini sangat terlihat jelas gambaran bagaimana kisah cinta seorang penyair dengan Dik Narti mulai dari awal mengagumi yang terdapat pada tiap bait puisi, hingga ia menikah yang terdapat pada tiap-tiap bait dalam puisi tersebut. Kekuatan cinta tergambar sangat kuat dalam puisi ini. Diksi yang digunakanpun sangat cermat, mulai dari urutan kata serta kekuatan magis dari kata-kata tersebut, sehingga menghasilkan puisi yang memiliki keindahan mempesona dengan keromantisannya.

Pada bait keempat dalam puisi tersebut tergambar gaya bahasa hiperbola. Kekuatan cinta aku lirik telah direstui oleh malaikat yang berjumlah lusinan. Hal ini terlihat dalam kutipan bait berikut.

Selusin malaikat
telah turun
di kala hujan gerimis.
Di muka kaca jendela
mereka berkaca dan mencuci rambutnya
untuk ke pesta.
Wahai, Dik Narti,
dengan pakaian pengantin yang anggun
bunga-bunga serta keris keramat
aku ingin membimbingmu ke altar
untuk dikawinkan.

Kutipan di atas menggambarkan kekuatan "cinta aku" dan lirik dilebih-lebihkan seolah disaksikan oleh lusinan malaikat yang siap mengiring pesta perkawinan dan dituntun kekasihnya ke langit untuk menjalankan perkawinan suci. Demikian juga pada bait keenam tergambar gaya bahasa metafora-hiperbola. Kekuatan cinta yang dapat mengalirkan semangat kehidupan yang kuat mampu mengirimkan berjuta jarum ke langit sehingga melahirkan hujan sebagai pertanda restu langit yang suci. Terlihat dalam kutipan bait berikut.

//Semangat kehidupan yang kuat/ bagai berjuta-juta jarum alit/ menusuki kulit langit:/ kantong rejeki dan restu wingit./ Lalu tumpahlah gerimis./ Angin dan cinta/ mendesah dalam gerimis./ Semangat cintaku yang kuat/ bagai seribu tangan gaib/ menyebarkan seribu jarring/ menyergap hatimu/ yang selalu tersenyum padaku.//

Secara metafora, Rendra menggambarkan keindahan "Narti" sebagai putri duyung dengan segala pesona yang ada. Seperti terlihat dalam bait berikut.

// Engkau adalah putri duyung/ tawananku./ Putri duyung dengan suara merdu lembut/ bagai angin laut,/ mendesahlah bagiku!/ Angin mendesah/ selalu mendesah/ dengan ratapnya yang merdu. / Engkau adalah putri duyung/ tergolek lemas/ mengejap-ngejapkan matanya yang indah/dalam jaringku./ Wahai, Putri Duyung,/ aku menjaringmu/ aku melamarmu/

Kutipan di atas menggambarkan kekaguman penyair pada kekasih yang dimetaforiskan seperti putri duyung. Suara putri duyung yang diasosiasikan-personifikasi, seperti angin laut yang mendesah. Puisi "Surat Cinta" tersebut terdiri atas delapan bait. Tiap bait terdiri atas baris yang berbeda-beda. Dalam setiap bait terdapat kata yang diawali dengan huruf besar hanya pada kalimat tertentu, untuk menunjukkan kesatuan maknanya. Sajak yang digunakan bebas, artinya tidak berpegang pada pola tertentu. Hal ini jelas, karena bila diperhatikan secara keseluruhan, puisi tersebut bersajak sebagai berikut :

Bait pertama : b-a-b-aa-b-c
Bait kedua : bb-aa-b-e-a-b-c
Bait ketiga : bb-aaaa
Bait keempat : a-c-b-aaa-b-c-aaa
Bait kelima : ccc-bbb-a-b-a
Bait keenam : a-bbbb-a-b-a-bb-cc
Bait ketujuh : ccccc-aa-cc-aa-cccc
Bait kedelapan : bbbb-aaa-b-cc

Dengan demikian dapat dikatakan, bahwa puisi Rendra tersebut sajaknya adalah bebas, karena tidak berpegang pada pola persajakan yang tetap.

SIMPULAN

Menafsirkan puisi yaitu membebaskan imajinasi untuk mengartikan setiap kata-kata yang tertuang sebagai kekuatan yang mempunyai makna dan menangkap pesan yang ingin disampaikan oleh penyairnya. Seperti puisi "Surat Cinta" tersebut mengandung makna cinta yang sangat kuat dan menceritakan perjalanan kisah cinta sang penyair dengan wanita pujaannya (Dik Narti) mulai dari mengagumi, mengutarakan cinta kemudian melamar, dan pada akhirnya mereka menikah. Selain itu puisi ini juga dilapisi dengan diksi yang sangat cermat, mulai dari urutan kata serta kekuatan magis dari kata-kata tersebut, sehingga menghasilkan puisi yang memiliki keindahan dengan keromantisannya. Sebuah puisi dengan gaya bahasa yang kuat, permainan bunyi yang rapi, dan metafora yang mempesona dengan penggambaran imaji visual yang membangun keutuhan puisi. Pesan yang dapat diambil dari puisi ini yaitu, kekuatan cinta yang kuat, dalam realitas kehidupan sehari-hari sering kali menjadi pemicu tragedi sosial, maka dari itu penting untuk disadari bahwa cinta memang bermata dua. Artinya seseorang yang sedang dilanda cinta dapat melakukan apa pun demi cintanya.

DAFTAR PUSTAKA

Remy, Sylado, (2004). *Puisi mbeling* (edisi ke-Cet. 1). Jakarta: Kepustakaan Populer Gramedia.

https://edoc.pub/ebook-kumpulan-puisi-ws-rendra-pdf-free.html diakses tanggal 25-04-2019.

https://www.ilmusiana.com/2015/05/majas-metafora-pengertian-dan-contoh.html diakses tanggal 25-04-2019.

https://www.puisi.co/surat-cinta-karya-w-s-rendra/ diakses tanggal 25-04-2019.

Kajian Unsur Metafora pada Lirik Kokoronotomo oleh Itsuwa Mayumi

Lucas Edward Harrison

Department of International Relations, Global University, New York, USA

ABSTRAK : The interpretation of methaphor symbolys on kokoronotomo song lyrics. Journal Article. Departement Of Japanese Studies Faculty Of Humanities. Dian Nuswantoro University. The investigated issues in this research are the meaning of metaphor on kokoronotomo song lyrics and how feel that was felt by mayumi itsuwa the song lyrics that was created in the album. Providing data method with library research was used in this research. In the other hand, semiothic method (signified and signifier) was used to analyze the data. Data from the kokoronotomo song popularized by Mayumi Itshuwa was taken from the internet.

Key words : life metaphor, song lyric, meaning, analysis.

Karya sastra merupakan sebuah bentuk seni yang dituangkan melalui bahasa. Karya sastra terdiri dari berbagai bentuk, yaitu puisi,prosa maupun drama. Sebuah karya sastra dianggap sebagai bentuk ekspresi sang pengarang. Sastra itu dapat kisah rekaan melalui pengalaman batin (pemikiran dan imajinasinya), maupun pengalam empirik (sebuah potret kehidupan nyata baik dari sang penulis maupun realita yang terjadi di sekitarnya) dari sang pengarang. Melalui karya sastra pengarang dapat dengan bebas berbicara tentang kehidupan yang dialami oleh manusia dengan berbagai peraturan dan norma-norma dalam interaksinya dengan lingkungan sekitar, sehingga dalam karya sastra terdapat makna tertentu tentang kehidupan. Manusia bisa menuliskan sebuah karya sastra yang dapat dinikmati oleh banyak orang yaitu lagu. Lalu Apa sih lagu ? lagu merupakan gubahan seni nada atau suara dalam urutan,kombinasi,dan hubungan temporal untuk menghasilkan gubahan musik yang mempunyai kesatuan dan kesinambungan. Dan ragam nada atau suara yang berirama disebut juga dengan lagu. Lagu dapat dinyanyikan secara solo,berdua,bertiga atau beramai-ramai. Dalam sebuah lagu terdapat banyak sekali aliran yang dibawakan. Seperti pop,regge,rock,jazz,dangdut,keroncong, dan masih banyak lagi. Lagu merupakan karya sastra yang sangat familiar dan disukai oleh banyak orang. Pada setiap lagu pasti terdapat sebuah pesan moril yang terkandung di dalamnya. Yang sengaja disematkan oleh sang penulis supaya sang pendengar tau apa isi dari lagu ini dan pesan apa yang terkandung didalamnya.

Sebuah lagu merupakan hasil salah satu jenis karya sastra yaitu puisi yang kemudian dilagukan. Lagu umunya berisi tentang permasalahan kehidupan manusia. Permasalahan ini dapat berypa permasalahan yang terjadi dalam dirinya sendiri dan permasalahan antar individu satu dengan yang lain dalam kehidupan masyarakat. Permasalahan yang dialami oleh para meruoakan hasil imajinasi yang diperoleh pengarang dari pengalaman dan penghayatan tentang kehidupan. Lagu termasuk dalam sebuah karya sastra kerena memenuhi kriteria yang khas sastra, karena bahasa dan kata-kata dalam puisi merupakan perwakilan pengalaman batin dari penyair,sehingga bahasanya cenderung lebih exspresif. Sebagai sebuah karya sastra, lirik lagu juga memiliki sebuah keistimewaan dalam pengungkapan bahasanya. Ia tidak terlalu terikat oleh aturan-aturan kebahasaan. Ketentuan ini berlaku karena bahasa karya sastra adalah litentia poetarum yang menjelaskan bahwa kebebasan pengarang atau penyair dalam menggunakan bahasa. Seperti yang pernah diungkapkan oleh Riffatere (1978 : 2) bahwa dalam bahasa sastra sering terjadi penyimpangan makna bahasa yang terjadi karena adanya konvensi ketak langsungan ekspresi, yakni diplacing of meaning (penggantian makna),distorsing off meaning (penyimpangan arti), dan creating of meaning (penciptaan makna baru). Dari ketiga konsep tersebut sangat berkaitan dengan penggunaan unsur metafora yang banyak terdapat dalam unsur karya sastra.

Dalam tulisan karya sastra ini akan membahas tentang penggunaan unsur metafora dalam sebuah lagu yang berjudul “KOKORO NO TOMO”. Lagu ini merupakan sebuah karya sastra yang diciptaka oleh Itsuwa Mayumi dan dipopulerkan oleh beliau pada tahun 1982 melalui sebuah album yang bernama Shiosai. Di negara asalnya yaitu Jepang, lagu ini tidak terlalu terkenal, namun di negara kita yaitu Indonesia lagu ini sangat terkenal dan sangat familiar di telinga masyarakatnya. Lalu pada tahun 2005 lagu ini diproduksi ulang di negara Indonesia dalam sebuah album yang bertajuk “Charity Sumatra Earthquake yang menggandeng penyayi papan atas Indonesia yaitu Delon. Pada tahun yang sama Itsuwa mengeluarkan album dengan nama Mayumi the best - kokoro no tomo yang menunjukan bahwa lagu ini memiliki peran penting dalam kehidupan Itsuwa Mayumi. Lagu ini memiliki makna yang bercerita tentang sebuah motivasi hidup yang dijalani dengan rasa kasih sayang. Tujuan dari peneliatian saya ini adalah untuk menganalisis unsur-unsur yang terdapat dalam lyric lagu KOKORO NO TOMO.

1. Teori Metafora :

Metafora merupakan sebuah ilmu yang memiliki fungsi sebagai ungkapan perbandingan langsung, dan tidak menggunakan pembanding (seperti, bagaikan dan sebagainya). Karya sastra merupakan sebuah wadah atau tempat orang-orang kreatif berkarya, berexspresi, dan menuangkanya kedalam beberapa bentuk karya sastra. Karya sastra banyak sekali macamnya, ada prosa,puisi,cerpen,lagu dan masih banyk lagi. Diantara semua itu ada satu karya satra yang memiliki peminat paling banyak, yaitu lagu. Lagu sangat disukai oleh orang-orang karena mudah diterima oleh manusia. Didalam lagu pun banyak sekali genre atau aliranya. Sehingga manusia bisa memilihnya seperti yang ia sukai. Lagu disukai oleh semua kalangan mulai dari anak kecil hingga orang dewasa sekalipun. Lagu biasanya ditulis berdarsarkan sebuah pengalaman dari si penulisnya. Kemudian setelah diperdengarkan dan disebarluaskan ke masyarakat umum, orang menjadi tau isi dari lagu tersebut dan kadang juga ada seseorang yang merasakan bahwa apa yang ia sedang rasakan sama seperti lyric yang dalam lagu tersebut. (Hermintoyo, 2014:1), nyanyian atau lagu adalah ungkapan perasaan manusia, dinyanyikan. Dan didengarkan orang juga sebagai simbol kesenangan dan kesedihan. Sehingga, seseorang akan mendengarkan lagu sesuai dengan perasaan yang sedang dialaminya. Biasanya bahasa yang digunakan dalam sebuah lirik lagu merupakan bahasa kiasan, yaitu sebuah bahasa yang memiliki makna konotatif. Maka dari itu biasanya lirik lagu memiliki bahasa-bahasa yang penuh exspresi dan sedikit berbeda dengan bahasa yang kita pergunakan sehari-hari. Namun jika kita mau sedikit berfikir, sebenarnya itu semua memiliki makna yang sama seperti bahasa yang kita pergunakan sehari-hari.

1.1 Teori Semiotika :

Semiotik merupakan ilmu yang menelaah sebuah tanda (simbol,index,icon) dan karya seni merupakan komposisi tanda baik secara verbal maupun non-verbal. Richad Rudner Dalma & Schueller,(9167: 93-94) dalam tulisanya mengatakan :

Semiotika adalah ilmu atau teori tanda. Dari sudut pandang dimasukanya estetika dalam bidang semiotik, karya seni dapat dipahami sebagai tanda yang dalam kasus sederhana itu sendiri merupakan sebuah struktur tanda – tanda. Artinya pekerjaan seni juga dapat dikaji dengan semiotika karena dianggap sebagai struktur tanda atau suatu tanda.

Semiotika memiliki dua cabang besar yang menjadi sebuah akar perkembangan ilmu itu sendiri. Pertama adalah semiotika yang dikembangkan oleh Ferdinand de Saussure (1857-1931) dan Charles Sander Peirce (1839-1914). Bagi Saussure semiotika adalah sebuah ilmu umum tentang tanda, sedangkan Pierce mengartikan semiotika lebih ke logikanya (doktrin formal tentang tanda-tanda).

1.2 Pergeseran Makna / penggantian makna :

Perubahan penggunaan kata-kata yang biasanya hingga tahapan makna modern menjadi berbeda dengan makna yang sesungguhnya. Dalam arti mengganti kata-kata sebenarnya dengan majas,ritme dan kata-kata ambigu atau tidak jelas.

1.3 Pengertian Heuristik Dan Hermeneutik

Heruistik merupakanseni dan ilmu pengetahuan yang berhubungan dengan suatu penemuan. Heuristik yang berkaitan dengan pemecahan masalah adalah cara menunjukan pemikiran seseorang dalam melakukan proses pemecahan sampai masalah tersebut berhasil dipecahkan.

Hermeneutik adalah salah satu jenis filsafat yang mempelajari tentang interpretasi makna, nama hermeneutika diambil dari bahasa yunani yaitu menafsirkan,memberi pemahaman atau menerjemahkan.

Heuristik dan hermeneutik biasanya digunakan dalam sebuah penganalisisan isi dari sebuah karya-karya satra. Heuristik dan hermeneutik sangat erat hubunganya dengan pendektan semeotika, dan hubungan keduanya sering disebut dengan hubungan gradasi. Karena apabila kegiatan pembacaan hermeunitik harus didahului dengan pembacaan heuristik.

Contoh Penerapan Heuristik :

Ia menggeliat merayap keluar kegelapan. Penerapan heuristik terdapat pada kata menggeliat, kata menggeliat biasanya dipergunakan untuk mengebutkan kegiatan manusia saat bangun tidur.

Contoh Penerapan Hermeneutik :

Ia menggeliat merayap keluar kegelapan. Penerapan hermeneutik terdapat pada kata menggeliat. Pembacaan untuk memaknai bukan secara linguistik. Langkah hermeneutik dilakukan untuk memaknai kata menggeliat yang dipergukan selain untuk kegiatan manusia. Yaitu hewan seperti ular.

1.4 Rumusan Masalah

Berdasarkan latar belakang masalah diatas maka, penulis merumuskan masalah sebagai berikut :

A. Apakah Lyric lagu (KOKORO NO TOMO) mengandung unsur metafora ? lalu lirik yang manakah yang terdapat unsur metaforanya ?

1.5 Tujuan

Berdasarkan permasalahan akan dibahas maka tujuan penelitian ini adalah mendeskripsikan :

A. Unsur metafora yang terkandung dalam lyric lagu KOKORO NO TOMO.
B. Menganalisis makna yang terdapat pada lagu KOKORO NO TOMO dengan menggunakan teori Heuristik, Hermeneutik dan teori pergeseran makna.
C. Makna Denotasi, Konotasi dalam teori semiotika yang terdapat pada lagu KOKORO NO TOMO.

1.6 Metode penelitian kualititatif

Metode yang digunakan penulis yaitu metode kualitatif karena penulis lebih menekankan pada aspek pemahaman secara mendalam terhadap suatu masalah dari pada melihat permasalahan untuk penelitian generalisasi. Metode penelitian ini lebih suka menggunakan teknik analisis mendalam (in-depth analysis), yaitu mengkaji masalah secara kasus perkasus karena metodologi kualitatif yakin bahwa sifat suatu masalah satu akan berbeda dengan sifat dari masalahnya lainya.

1.7 Ancangan

Penulis menggunakan ancangan simiotik karena penelitian ini menggunakan sistem tanda atau teori tentang pemberian tanda.

1.8 Cara Penelitian :

Peneltian ini menggunakan beberapa tahap yakni pengambilan data, penganalisisan data dan mengolah metode data dengan beberapa metode analisis.

1.9 Kerangka Analisis

Keras (2009), mengemukakan bahwa masalah bentuk kata lazim dibicarakan dalam tatabahasa setiap bahasa. Bagaimana bentuk seuah kata dasar, bagaimana menurunkan kata baru dari bentuk kata dasar atau gabungan dari bentuk - bentuk dasar biasanya dibicarakan secara terperinci dalam tatabahasa. Maka terlebih dahulu memperkenalkan makna kata yang dibedakan atas makna yang bersifat denotasi dan konotasi.

Menurut Harley (1995), makna denotasi dari sebuah kata yaitu intinya, makna yang paling mendasar, semua orang mengerti dan setuju dengan makna kata secara denotasi. Contohnya, makna denotatif dari kata “anjing” merupakan makna inti dari kata anjing sebagai hewan itu adalah berhubungan antara kata dan kelas object tersebut.

Setiap kata memiliki denotasi, maka seorang penulis harus mempersoalkan mengenai kata yang dipilihnya sudah tepat atau belum. Ketepatan pilihan kata itu tampak dari kesanggupanya untuk menuntun pembaca pada gagasan yang ingin disampaikan, yang tidak memungkinkan intepretasi lain selain dari sikap pembicara dan gagasan yang akan disampaikan.

1.10 Teknik Analaisis Data :

Menurut para ahli sastrawan, banyak sekali yang mengungkapkan pendapatnya mengenai teori semiotik. Dan diantara teori-teori tersebut dalah sebagai berikut :

C.S Peirce, mengemukakan bahwa teori segitiga atau trianggle meaningyang terdiri dari tiga elemen utama yaitu Sign,Object dan Interpretant.

Ferdinant De Sausure (1857-1913), mengemukakan bahwa semiotik terbagi menjadi dua bagian yaitu di kotomi yaitu penanda (signifier) dan pertanda (signnified). Penanda dilihat sebagai bentuk atau wujud fisik dapat dikenal melalui wujud karya arsitektur, sedang pertanda dilihat sebagai makna yang terungkap melalui konsep,fungsi dan nilai-nilai yang terkandung dalam arsitektur.

Roland Barthes (1915-1980), dalam teorinya tersebut barthes mengembangkan semiotika menjadi dua tingkatan yaitu denotasi dan konotasi. Denotasi adalah tingkat pertandaan yang menjelaskan hubungan penanda dan petanda pada realitas, menghasilkan makna eksplisit, langsung dan pasti. Sedangkan konotasi adalah sistem petandaan yang

menjelaskan hubungan penanda dan petanda yang didalamnya berisi makna yang tidak eksplisit, tidak langsung dan tidak pasti.

Roland Barthes adalah penerus dari pemikiran Ferdinant De Sausure. Sausure tertarik pada cara kompleks pembentukan kalimat menentukan makna, tetapi kurang tertarik pada kenyataan bahwa kalimat yang sama bisa saja memiliki makna yang berbeda pada orang yang berbeda dan dengan situasi yang berbeda pula. Roland barthes meneruskan pemikiran tersebut dengan menekankan interaksi antara teks dengan pengalaman personaldan kultural penggunanya. Interaksi antara konvensi dalam teks dengan koonvensi yang dialami dan diharapkan oleh penggunanya. Gagasan Barthes ini dikenal dengan nama “order of sicnification”, mencakup denotasi (makna sebenarnya sesuai dengan kamus) dan konotasi (makna ganda yang muncul dari pengalaman cultural dan personal). Disinilah titik perbedaan pemikiran antara Roland Barthes dan Ferdinant De Sausur, meskipun Barthes tetap menggunakan istilah signifier dan signified milik Sausure.

1.11 Data

A. Makna Denotasi

Berikut adalah contoh penganalisisan data yang menggunakan beberapa teori yaitu Heuristik, Hermeneutik, pergeseran makna (Denotasi dan Konotasi).

Lagu kokoro no tomo beserta lirik lagu dan artinya. Lagu ini karya dari Itshuwa Mayumi (1982).Lyric lagu KOKORO NO TOMO sebagai berikut :

Anata Kara Kurushimi O Ubaeta sono toki
Watashi nimo ikiteyuku yuuki ga waite kuru
Anata to deau made wa kodoku na sasurai-bito
Sono te no nukumori o kanji sasete

Kala itu mampu kulepaskan kepedihan dari hatimu
Semangatkupun bergelora menapaki jalan hidup ini
Sebelum berdua denganmu, kesepian aku berkelana
Biar kurasakan hangatnya jemarimu.

Aiwa itsumo rarabai
Tabi ni tsukareta toki
Tada kokoro no tomo to

watashi o yonde

Cinta senantiasa (meninabobokan)
Tatkala lelah dalam perjalanan
Ingatlah diriku sebagai (teman hati)

Shinjiau koto sae dokoka ni wasurete
Hito wa naze sugita hi no shiawase oikakeru
Shizuka ni mabuto tojite kokoro no doa o hiraki
Watashi o tsukandara namida fuite
Bahkan hati yang saling percaya entah terlupa dimana
Mengapa orang-orang mengejar kebahagiaan yang telah berlalu
Pejamkan matamu perlahan dan singkapkan jendela hatimu
Raih tanganku dan usap air matamu

Ai wa itsumo rarabai
Anata ga yowai toki
Tada kokoro no tomo to
Watashi o yonde
Cinta senantiasa (meninabobokan)
Tatkala engkau lemah
Ingatlah diriku sebagai (teman hati)

Aiwa itsumo rarabai
Tabi ni tsukareta toki
Tada kokoro no tomo to
Watashi o yonde
Cinta senantiasa (meninabobokan)
Tatkala engkau lemah
Ingatlah diriku sebagai (teman hati)

B. Makna Konotasi

"TEMAN HATIKU"
Pada saat itu aku mampu mengobati kesedihan yang ada di dalam hatimu
Setelah itu aku menjadi lebih bersemangat lagi untuk menjalani kehiudupan ini.
Sebelum aku bersamamu, aku merasa kesepian saat menjalani hidup ini.
Aku ingin merasakan hangatnya pelukanmu
Bahkan sebuah kepercayaan yang dulu pernah ada diantara kita,kini kepercayaan itu telah menghilang entah kemana ?
Kenapa orang-orang hanya mengejar kebahagianya yang telah berlalu,
pejamkanlah matamu secara perlahan kemudian bukalah pelan-pelan pintu hatimu kemudian genggamlah tanganku dan usaplah air matamu.
Rasa cinta yang telah kau berikan untuku,membuatku menjadi terlena.
Dimanapun kamu berada sekarang, aku akan tetap ada di dalam hatimu

C. Makna Heuristik

Di atas terdapat data yaitu berupa liric lagu yang memiliki kata yang mengalami pengulangan beberapakali. Yaitu kata "meninabobokan" yang terdapat pada setiap reff dari lagu Kokoro No Tomo. Sang pencipta lagu ingin menyampaikan kepada kita semua bahwa ia pernah merasakan bagaimana rasanya dicintai oleh seseorang hingga ia menjadi terlena.

D. Makna Hermeunitik

Lalu kemudian terdapat sebuah kalimat yang mengalami pengulangan hingga berkali-kali pada setiap reff lagu Kokoro No Tomo. Yaitu, "ingatlah aku sebagai teman hatimu". Maksud atau tujuan dari sang pencipta lagu Kokoro No Tomo tersebuat yaitu ia ingin menyampaikan bahwa. Dimanapun sekarang seseorang yang dulu mencintainya, ia akan tetap selalu ada didalam hatinya.

E. Unsur Pergeseran Makna

Lagu Kokoro No Tomo jika dianalisis menggunakan unsur pergeseran makna, maka dari setiap liric lagu ini dapat mendeskripsikan bagaimana perasaan sang pencipta

lagu Kokoro No Tomo pada waktu itu. Dia memberitahukan tentang keluh kesahnya yang berawal dari hati dan perasaan hingga dapat tertuang kedalam sebuah lirik lagu dan memiliki makna yang sangat mendalam. Liric-liric lagu yang terdapat didalamnya bisa dikatakan hampir mirip dengan puisi karena memiliki makna yang sangat mendalam. Contoh analisisnya yaitu sebagai berikut :

Jika dianalisis lebih mendalam disitu dapat kita simpulkan bahwa pada waktu itu sang penulis sedang merasakan gundah gulana dan kesepian. Lalu kemudian setelah itu datanglah seseorang yang mampu membuatnya menjadi tidak kesepian lagi dan membuat kehidupanya menjadi berwarna. Sang penulis merasa bahagia karena dicintai hingga ia pun terlena karena sebuah rasa tersebut. Hingga ia berucap bahwa dimanapun ia kini berada, ia akan tetap selalu ada di dalam hatinya.

F. Unsur Metafora dan Personifikasi

しんじあうことさえどこかにわすれて

いとわなぜすぎたひのしあわせおいかける

Kutipan lyric diatas menggunakan metafora natural simbol dan memiliki makna kurang lebih seperti ini.

“Bahkan hati yang saling percaya terlupa entah dimana

Mengapa orang-orang mengejar kebahagiaan yang telah berlalu”

Sesuatu yang telah berlalu kita bisa menggambarkanya seperti angin,sesuatu yang tabu. kemudian kita hanya bisa merasakanya saja tanpa bisa menggenggamnya. Dan seperti itulah masalalu atau sesuatu yang telah berlalu. Kita hanya bisa mengingatnya tanpa bisa merasakanya kembali seperti yang pada saat itu kita alami dan rasakan.

静かに間ぶととじてこころのどあをひかり

Penggalan lyric diatas memiliki makna personifikasi yaitu :

“Pejamkan matamu perlahan dan singkapkan jendela hatimu”

Disitu terdapat 2 kata yaitu jendela hati, padalah seperti yang kita tahu bahwa jendela merupakan sebuah benda mati dan hati merupakan organ tubuh manusia yang mana hati adalah sesuatu yang hidup. Jika disatukan seperti diatas maka kata “Jendela Hati” masuk kedalam majas personifikasi, yaitu benda mati yang seolah-olah hidup.

1.12 Cara penelitian

Penelitian ini menggunakan metode beberapa tahap, yaitu metode pengambilan data,analisis data,dan metode hasil analisis dari data.

1.13 Kesimpulan

lagu ini dianalysis menggunakan beberapa teori seperti metafora, hermeunitik, heruistik, personifikasi. Dan unsur pergesran makna. Berdasarskan analysis diatas dapat saya simpulkan bahwa lagu kokoronotomo ini mengisahkan tentang seseorang yang kehilangan kekasihnya dan ia merasakan kesedihan dan merindukanya untuk kembali bersamanya seperti dahulu kala.

1.14 Sumber Data

Dalam penelitian ini penulis menggunakan data sekunder. Karena penulis memperoleh data

data dari bebapa artikel di internet.

- https://jaririndu.blogspot.com/2011/11/teori-semiotik-menurut-para-ahli.html
- http://komplitpendidikn.blogspot.com/2017/01/teori-semantik-dan-pragmatik.html
- http://viskypasaribu.blogspot.com/2015/06/makna-denotasi-dan-konotasi-dalam.html
- https://id.wikipedia.org/wiki/Hermeneutika
- https://zenodo.org/record/2631232#.XL1Ye-gzbIV