Housewives' Knowledge on Energy Conservation

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Open Access Article

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Abstract:

Households, including energy users, are quite large. Households also contribute to the energy crisis. Housewives, as managers of energy use and regulators of household expenses, are expected to play their role in helping to reduce energy consumption in an energy-efficient manner. Housewives very much need knowledge of energy conservation because they are the closest to the business of using energy in the house. The purpose of this study was to determine the knowledge of housewives about energy conservation. This study uses a quantitative approach. The data obtained were analyzed descriptively. The research was carried out in the city of Palembang. The population of this study was housewives in Palembang, amounting to 50 people in the research sample. Research respondents are domiciled in Ario Kemuning sub-district housing. The research sample was taken using a random sampling technique. Collecting data using a questionnaire distributed to respondents at the research location. The data analysis technique is a descriptive quantitative method, which looks for the average value and standard deviation. The results showed that the knowledge of housewives about energy conservation as a whole was in a good category in terms of 6 levels of knowledge, namely knowing, understanding, applying, analyzing, synthesizing, and evaluating. However, in the thesis aspect, namely connecting with the existing knowledge logic components, it is still low, with an average score of 2.86. The aspect of understanding is in the highest category, gaining a score of 3.52. Research on the knowledge of housewives on energy conservation has not been done, especially for the six steps of knowledge. For this reason, theoretically, it needs to develop an instrument of knowledge for all steps. It is recommended that housewives are given further education about energy-saving knowledge and behavior in the form of presentations that are easy to understand in the form of teaching materials or learning media.

Keywords: knowledge, housewives, energy, energy conservation.

家庭主妇的节能知识

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摘要：
包括能源用户在内的家庭规模很大，家庭也助长了能源危机。家庭主妇作为能源使用的管理者和家庭开支的监管者，有望在帮助以节能方式减少能源消耗方面发挥作用。家庭主妇非常需要节能知识，因为她们更接近家中的能源使用业务。这项研究的目的是确定家庭主妇的节能知识。本研究采用定量方法。对获得的数据进行了描述性分析。这项研究是在巨港市进行的。这项研究的人口是巨港的家庭主妇，在研究样本中达到 50 人。研究受访者居住在阿里奥哥文宁街道住宅。研究样本采用随机抽样技术。使用分发给研究地点的受访者的问卷收集数据。数据分析技术是一种描述性的定量方法，它寻找平均值和标准偏差。结果表明，家庭主妇的节能知识在认识、理解、应用、分析、综合、评价 6 个知识层次上总体处于良好的范畴。但是，在论文方面，即与已有的知识逻辑组件的连接上，仍然很低，平均得分为 2.86。理解方面是最高的，得分为 3.52。家庭主妇的节能知识研究还没有做，尤其是六步知识。因此，从理论上讲，它需要为所有步骤开发一种知识工具。建议以教材或学习媒体的形式，以通俗易懂的演示形式对家庭主妇进行节能知识和行为的进一步教育。

关键词： 知识，家庭主妇，能源，节能。

1. Introduction

Human life requires energy. Energy is used to facilitate and make smoothly and for the comfort of human life. In households, energy is used quite a lot, especially for electrical energy, gas, and water.

National energy consumption reached 868.5 million barrels of oil equivalent (BOE) in 2018. In terms of electricity use in Indonesia, according to data from the General Plan of Electricity Supply (RUPTL) 2018-2027, PT PLN (Persero) said the household sector is the main user of national electricity and is projected to double over the next decade (Figure 1).
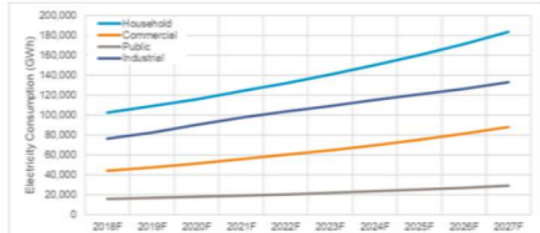

Figure 1. Projected use of electricity in Indonesia

A total of 14.76 percent of that amount was consumed by the household sector, which identified 10 household appliances with high energy consumption, responsible for 98 percent of the energy consumption of the household sector in Indonesia (Table 1) (Nurwini, 2018). Equipment with the highest penetration rate: 100% - lighting, 93% - TV, ironing - 70%, rice cooker and refrigerator - 69%, fan - 64%, water pump - 35%, washing machine - 29%, and dispense - 20%.

A household manager and household expense manager need to know and understand energy consumption. Knowledge and understanding of energy consumption will impact the magnitude of family spending, the energy crisis, and global warming (Ramli, 2018).

Based on Government Regulation (PP) Number 70 of 2009 on Energy Conservation, energy conservation is defined as a systematic, planned, and integrated effort to conserve domestic energy resources and improve the efficiency of their utilization.

Energy conservation is an attempt to reduce energy consumption by using little energy from an energy service. This can be achieved by using energy more efficiently (Zehner, 2018).

Housewives who have knowledge of energy conservation contribute to family education to be energy efficient. The housewife plays an important role in educating her child to use energy efficiently. According to Husin (2019), parents educate children to save water through supervision, reprimand, reminding of examples, and explanation. Families have ecosystem components that, if utilized to the maximum, lead to educational achievement. Transferring knowledge, values, and skills flows like that or intentionally done by parents (Husin et al., 2020).

Energy conservation is linked to behavioral change. Simple behavior in the energy conservation framework can be abbreviated to 3M: deadly, plucking, and regulating (Siregar, 2018). Concern for energy should depend on how far the parents' knowledge of energy conservation and how widely they have insight into the science (Nafisah & Zafi, 2020).

Parental/housewife knowledge of energy conservation is important so that energy consumption carried out in households can be reduced due to energy-efficient behavior (Hanif et al., 2021).

Knowledge is all that is known about a particular object. According to Soekidjo (2017), knowledge can be interpreted as the result of humans' sensing or knowing one or more people or objects through their sense organs (eyes, nose, ears, etc.) to produce knowledge that is influenced by the intensity of attention and perception of objects. A person's knowledge is mostly acquired through the sense of hearing and the sense of sight. A person's knowledge is mostly acquired through the sense of hearing and the sense of sight. So, knowledge is a variety of things acquired by a person through his five senses (Yuliana, 2017).

Aspects of knowledge are divided into six levels. According to Donsu and Jenita (2017), knowledge exists at the stages of knowing, understanding, analyzing, applying, synthesizing, and assessing.

Level of Knowledge: According to Soekidjo (2017), a person's knowledge of an object has a different intensity or level. There are six levels of knowledge: knowledge, comprehension, application, analysis, synthesis, and evaluation.

Knowledge results from curiosity through sensory processes, especially in the eyes and ears, on certain objects. Knowledge is important in forming open behavior (Donsu & Jenita, 2017).

Based on Government Regulation (PP) Number 70 of 2009 (ESDM, 2009) on Energy Conservation, energy conservation is defined as a systematic, planned, and integrated effort to conserve domestic energy resources and improve their utilization efficiency.

Energy conservation or energy spying itself is an action to reduce the amount of new, renewable, and non-renewable energy used for the sake of the survival of humans and the surrounding environment. Energy savings can be achieved by efficient energy use, where the same benefits are obtained by consuming less energy or reducing consumption and activities that use energy. In addition, saving household electricity can help withstand the rate of global warming.

Energy conservation is often referred to as the 'fifth fuel,' the other four being the so-called primary or 'fossil' fuels of coal (solid), oil (liquid), gas, and nuclear/hydroelectric energy. This emphasizes the importance of reducing the amount of energy used, not only nationally but also internationally. Energy conservation is using energy more efficiently (using less energy for continuous service) or reducing the number of services used (e.g., by driving less). Energy conservation is part of the concept of eco-sufficiency (Nurwini, 2018).

2. Research Methods

This study is quantitative research. The research method is transcription. The research was conducted at a household in Ario Kemuning, Palembang. The variable of this research is the knowledge of housewives on energy conservation. The population of this research is housewives in Palembang, taking people who live in housing. The sample was taken from 50 houses with 50 housewives as research respondents. The data were collected with a questionnaire. The sample was selected randomly. The data analysis techniques are editing, coding, and inference conclusions.

The question is 30 points. The research includes six levels of housewives' knowledge of energy conservation: knowledge, understanding, implementation, analysis, thesis, and evaluation. This type of data is in the form of interval data from the highest to the lowest. For determining housewives' knowledge level, a 4-point Likert scale is used. A very high score (ST) is 4, high (T) is 3, enough (CT) is 2, and low (R) is 1. The grouping of the scores is done by determining the interval of scoring. It can be seen that the average score obtained, if it is 3.51-4, is in the very high category. If the score is 3-3.5, it is in the high category. If the score is 2.99-2.50, it is in the low category, and the score in the range of 2.50-1 is in the very low category.

3. Findings

The results of calculating the data obtained from the questionnaires can be seen in Table 1.

Table 1. The score of data on the number of housewives in energy concerts

No.	Indicator	Score	SD
1	*Knowledge:* Knowing new information based on senses	3,26	0,39
2	*Understanding:* Mentioning, deciphering, identifying, mentioning examples, drawing conclusions	3.52	0,32
3	*Application:* Applying the known principle to other situations or conditions, using formulas, laws, methods	3,18	0,36
4	*Analyzing:* Looking for relationships between components of a component in an object or problem that is known to distinguish, separate, group, and create a chart (diagram) against the knowledge of the object	3,09	0,34
5	*Thesis:* Summarizing or putting in a logical relationship the component of knowledge that it already has.	2,86	0,41
6	*Evaluating:* Justifying or assessing a particular object. Assessment based on a self-determined criterion or norms	3,16	0,29
	Average Score and Deviation Standard	3,11	0,35

The study obtained an average score of 3.11. Thus the knowledge of housewives is included in the high category

According to Table 1, the respondents know information about energy saving but do not know much about energy conservation. Almost all of them are fully aware of energy-saving-related household goods and appliances and know the meaning of energy saving. The average score is 3.26. The respondents can explain and demonstrate energy-saving behavior, energy-saving benefits, and the amount of household expenditure related to energy consumption. The score is quite high, which is 3.52.

The respondents apply their knowledge on ways and efforts for energy conservation, such as arranging houses so that air circulation flows directly, causing fresh air and separating energy use inside and outside the house, such as vehicles. They say that a big house is a big expense. Undisciplined energy saving will impact fluctuations in spending. The smarter energy-efficient household appliance choice, the less energy consumption. The more committed to energy saving, the lower the cost of energy use. The average score obtained is 3.18.

Regarding the analysis, the respondents understand that a large, tall house can affect air circulation in the house and provide coolness. Multiplying plants in the environment around the house will provide coolness so that the use of air conditioning during the day can be reduced or not used. They also know various energy-

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saving behaviors, including not being wasteful in water use and managing the use of controlled gas for cooking. The average score obtained is 3.09.

Regarding the thesis, the respondents realized that understanding energy and what objects or equipment are needed in the house that uses energy is required. They can categorize groups of household appliances that are classified as high and low in energy consumption. They see the importance of avoiding buying high energy consumption equipment. House size impacts the cost of energy consumption, and global warming and climate change are the results of uncontrolled energy consumption. The obtained average score is 2.86.

Regarding the assessment, the respondents answered that using LED lights is more efficient and consumes power for two or three activities, including efficient behavior in using energy. Opening windows is better to reduce/avoid the use of air conditioning. Houses that use LED lights show that their residents understand the concept of energy saving and adjust the temperature of the air-conditioned room to a temperature limited to comfort. The average score obtained is 3.16.

4. Discussion

We identified motivating potential energy savings needed strategically to influence energy consumption and socio-demographic attributes of a single household. However, the results showed that efforts to influence the behavior of apartment residents to reduce domestic energy consumption were not successful. Therefore, behavior modification through iterative implementation is required (Erell et al., 2018; Jakučionytė-Skodienė et al., 2022; Spandagos et al., 2021).

Jakučionytė-Skodienė et al. (2022) found important aspects of improving climate-friendly behavior with benefits and high behavior costs such as time and money. Therefore, there is a need for policies to reduce high-cost behaviors that are not climate-friendly.

The steps for conserving home energy are by grouping lifestyles and analyzing the hierarchical cluster by looking at the behavior of electricity use and household characteristics in annual electricity consumption. The results showed that household characteristics were better than electricity usage characteristics (Bogin et al., 2021).

Creating a model of electricity consumption is based on demographic data. Demographic factors affect energy consumption, such as age, occupancy rate, number of children and bedrooms and are compared with electricity consumption per household (Ali et al., 2022).

Bogin et al. (2021) compared two clustering approaches to grouping populations based on lifestyle using hierarchical cluster analysis: electricity usage behavior (EUB) and household characteristics (HCH). The HCH approach appears to be better than the EUB in classifying households into different subgroups of the same size and with significantly different annual electricity consumption.

The analysis of residential energy consumption forecasting from a single household perspective shows that housing energy consumption forecasting for individual single homes is feasible. However, its accuracy is highly dependent on the variability of household behavior (Zhang et al., 2018).

Spandagos et al. (2021) use two types of energy-saving interventions: from the economic (gifts and penalties) and social (peers) aspects. Peer pressure was very influential for changes in energy-saving behavior. The characteristics that influence it are household characteristics (openness to change and environmental awareness and targeted behavior (efficiency or conservation).

Słupik et al. (2021) studied how to encourage energy-saving behavior for residents at home. This study aims to determine consumers' behavior, motives, and beliefs in optimal and economical energy management and identifies individual preferences of energy consumers: knowledge, social influence, investment, and energy change.

There is a good percentage gain between knowledge of climate change and carbon issues and the desire to apply good knowledge. However, the individual performance in saving heating energy has not yet reached the target. Therefore, policymakers and researchers must develop comprehensive plans to meet the net zero target (Khanam & Reiner, 2022).

Spandagos et al. (2021) explore social and economic influence interventions to save cooling energy in urban housing so that the behavior changes. Two interventions are used: one based on social influence (peer pressure) and one based on economic instruments (rewards and penalties). The survey results prove that peer pressure is influenced by the type of behavior targeted (efficiency or conservation) and is more influential than household characteristics (openness to change and environmental awareness).

According to Xu et al. (2021b), residents' energy conservation behavior strategies are critical to countering the effects of growing energy demand. Energy policy implementation - Household Energy Saving Option (HESO) is proposed. HESO is an options-based strategy that offers buyers (i.e., households) the opportunity to earn rewards, depending on whether they can achieve their predetermined energy-saving goals. The results show that HESO has a positive effect on promoting home electricity savings.

According to Xu et al. (2021a), housing contributes to global energy. This study is innovative research with market-based household energy-saving options. The results show that market-based energy-saving interventions need to be facilitated.

People who live in the research location have various economic conditions. However, the household appliances used on average are owned by the respondent's household. Not all respondents have air conditioning and water pumps because not all can finance them. According to Nurwini (2018), in addition to the knowledge factor, several factors determine

energy consumption in the household sector: demographics, economy, technology, and lifestyle.

The economic factor is household income, where families with higher incomes consume more energy than those with lower incomes. In addition, some factors influence the inefficient use of electricity: income factors, demographics, trust, traditional buildings, laziness, habits, and lack of concern for the environment (Permatasari et al., 2018; Husin & Saleh, 2019). Energy conservation is an efficient and rational energy use activity without reducing the use of energy that is necessary (Sawitri, 2020).

Energy conservation can be taught in various ways. Energy literacy research has a 24.3% effect on energy-saving behavior; 75.7% is influenced by other variables that affect energy-saving behavior (Al Bahij et al., 2020).

Specific knowledge of the environment is obtained by trying to learn and practice in formal and informal schools, the family, and the community (Husin, 2019).

School education institutions provide knowledge about energy conservation through the Adiwiyata program and in the school curriculum. The basic application of energy-saving values includes: (1) developing a green education curriculum through energy conservation materials (saving, wise, and smart in using energy) and (2) developing the concept of energy-saving living habits in two directions (Husin et al., 2020).

Public awareness of the poor consumption of electrical energy in the household is one of the causes of the high level of wasted energy use. People who know an object will easily realize and implement what they know. Energy can also be conserved by structuring the air in the occupied house by regulating the flow of air circulation that enters the room from many road lanes.

Conservation education is experimental learning. This program focuses on: 1. Supporting ecological concerns; 2. Providing opportunities to acquire knowledge, values, behaviors, commitments, and abilities; 3. Creating a positive lifestyle (Al Bahij et al., 2020).

Efforts to save energy can be made with electronic goods at home. The actions are to turn off the air conditioner in a room where there is no one, bathroom lights not in use, televisions not watched, water faucets not in use, and use natural heat as a heat source and drain. The phone charger is removed when the charge is full. One of the most massive and global energy conservation efforts is Earth Hour, where humans, for one hour, from eight-thirty to nine-thirty at night, turn off all electric power except in strategic public places such as hospitals and public roads.

5. Conclusion

Based on the results of the research and discussion, it was found that the overall knowledge of housewives on energy conservation was in the high category. This knowledge can be seen in five aspects: knowing,

understanding, applying, analyzing, synthesizing, and evaluating. The highest score obtained was on understanding energy conservation (an average score of 3.52), while the lowest score was on synthesizing, i.e., putting a logical relationship on existing knowledge such as relating it to the linkage of energy saving/conservation with global warming and climate change. The average score obtained is 2.86. The line of future research that has not been researched yet is to highlight six levels of knowledge more deeply. Furthermore, much research is needed on different views and actions of the haves, namely the residences of elite and rich housing groups and housing groups of middle, low, and very low economic groups. This research recommends education and training to the community to conserve energy in the home, especially to save or reduce energy use, e.g., reducing the use of air conditioning, electricity, water, and gasoline.

6. Limitations and Further Study

This research has several limitations. The method used is quantitative because the sample is only 50 housewives in one housing location. This does not answer the wider representativeness of the sample. The research instrument needs further development, and more research is needed for variative respondent backgrounds. The strength of this research is the research of housewives' knowledge of energy conservation in the form of developing question instruments that explore six aspects of knowledge.

Acknowledgments

Authors' Contributions

Zainal Arifin and Rahmi Susanti collected and entered the data.

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