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The Level of Knowledge of Year 6 Students Regarding Urban Farming Through a Hydroponics Questionnaire

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Abstract

In modern agriculture, urban farming has gained prominence as a sustainable approach. This study, titled 'The Level of Knowledge of Year 6 Students Regarding Urban Farming Through a Hydroponics Questionnaire,' aimed to evaluate the hydroponics knowledge of Year 6 primary school students in urban and rural settings. The research involved 200 Year 6 students from primary schools in Malaysia, with 100 randomly selected from an urban school in Kuala Lumpur and 100 from a rural school in Negeri Sembilan. The primary objective is to assess their hydroponics knowledge using a 10-item Likert-scale questionnaire with response categories: agree, disagree, and uncertain. Data analysis, including a t-test and correlation in IBM Statistical Packages for Social Science (SPSS) Statistics 27.0, yielded intriguing results. Urban students scored slightly higher (min = 2.97) than their rural counterparts (min = 2.70), suggesting a comparable knowledge level. Additionally, no significant correlation was found between hydroponic knowledge and parents' socioeconomic status. These findings provide insights into primary school students' hydroponics knowledge, supporting educators in promoting sustainable agriculture in line with Sustainable Development Goal 2.0 (zero hunger). Hence, the surprise finding demands a detailed hydroponics study.

Keywords: Hydroponics, Urban Farming, Sustainable Agriculture, Sustainable Development Goal, Socioeconomic

Introduction

Investigating Year 6 primary school student's understanding of environmental concepts and practices, particularly in the context of hydroponics, this study sheds light on the significance of early environmental education, offering valuable insights into fostering sustainable awareness among young learners in line with global Sustainable Development Goals, notably Goal 2.0 - zero hunger. Although many research on urban farming at school Fifolt et al (2017); Wan Yusoff et al (2022) the research by Wibowo (2018) acknowledged that previous studies on school urban farming in Asia, especially Southeast Asia, have been limited, indicating a gap in the literature that needs to be addressed. This shows that the research should be extended. Additionally, elementary students noted needing urban agriculture for scientific inquiry,

psychological stability and stress reduction, and leisure and hobby purposes. The lower the grade, the more students perceived the necessity of urban agriculture (Lee et al., 2018).

Furthermore, many activities have taken place to increase students' knowledge of urban farming. The agroedu-tourism program has successfully increased participants' knowledge of hydroponics and urban farming (Priyanti et al., 2021). Incorporating hydroponics into the curriculum has been found to enhance students' understanding of geoscience and environmental studies, while also addressing issues of food justice and food insecurity within their communities Kudlats (2023), as evidenced by a study, that discovered that hydroponics programs help students develop environmental stewardship attitudes, such as nurturing plants and conserving energy (Ela et al., 2020). Bahaman et al (2010) found that both rural and urban youth have shown similar levels of acceptance, attitudes, and knowledge toward contract farming, which has the potential to attract more young individuals to engage in farming communities. However, Leslie and Lewis (2013) found that agricultural programs play a significant role in enhancing students' understanding of agriculture, with urban students generally exhibiting a higher level of agricultural literacy compared to their rural counterparts. Many factors can contribute to the knowledge of the students. Sridevi Krishnaveni and Arunachalam (2021) examined how parents' socioeconomic status impacts the knowledge of agricultural undergraduate students emphasizing the influence of family dynamics in urban farming education. While research by (Modupe et al., 2014) shows there is a significant difference between parents' educational qualifications and students' achievement in Agricultural Science.

Engaging children in gardening, including hydroponic learning, has shown promise in increasing their consumption of fruits and vegetables, a critical aspect of nutritional education, as indicated by (Davis et al., 2015). However, the implementation of hydroponic cultivation in schools is not without its challenges, including time constraints and associated costs, as noted by (Ohly et al., 2016; Burt et al., 2018). Therefore, hydroponics represents a crucial step toward achieving the goals of sustainable urban agriculture. This innovative approach involves cultivating plants without soil, relying on the water as the growth medium, and holds the potential to significantly enhance productivity and ecological balance, as advocated by (Zhang et al., 2019)

This study contributes to the growing trend of urban farming as it offers a multitude of advantages, including cost savings for urban residents and the promotion of sustainable agricultural practices. Hydroponics has been highlighted as a groundbreaking innovation in agriculture, enabling faster growth and higher yields in controlled environments, as evidenced by research from (Barbosa et al., 2015; Wallace, 2015; Stephen et al., 2021). Additionally, hydroponic systems are considered highly efficient for vegetable production in industrial settings, as demonstrated by (Huo et al., 2020). While previous studies have highlighted the positive impact of hydroponics on students' understanding of environmental concepts, there remains a gap in the literature regarding the potential challenges and constraints, such as time constraints and associated costs, in implementing hydroponic cultivation in school settings. Hence, urban farming stands at the forefront of the global effort to secure our food supply.

Considering this background, the purpose of this research seeks to address several key objectives:

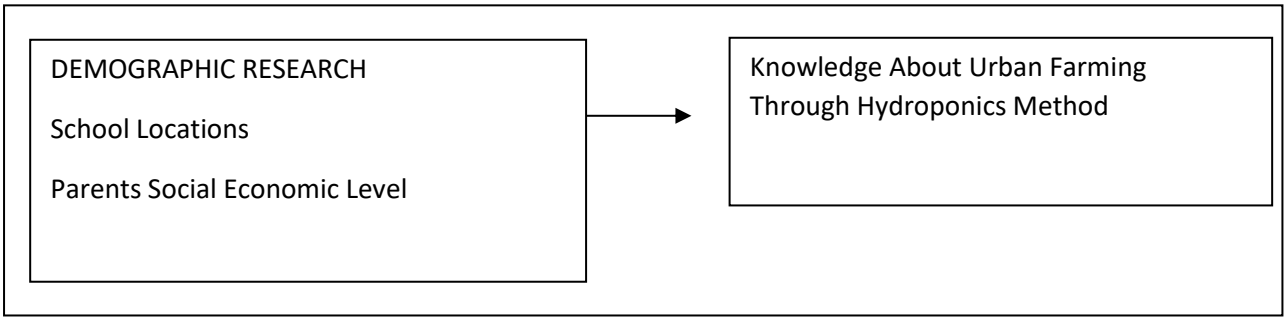
1. Identify the extent of hydroponics knowledge among Year 6 students.
2. Investigate variations in hydroponics knowledge among Year 6 students in urban schools located in Kuala Lumpur and rural schools in Negeri Sembilan.

3. Explore the correlation between hydroponics knowledge among Year 6 students and the socioeconomic status of their parents.

Through this study, the researcher aims to contribute valuable insights into the role of hydroponic education in enhancing environmental awareness among our youth, ultimately supporting the broader goals of sustainable urban agriculture and food security.

Research Framework

This research framework provides a structured approach to investigating the level of knowledge of Year 6 students regarding urban farming through hydroponics. It sets the stage for designing a questionnaire that can assess the student's understanding, and it considers theoretical perspectives that may influence knowledge acquisition in this context. The framework also acknowledges assumptions and limitations that should be considered during the research process.



Exploring the influence of parents' socioeconomic status on students' knowledge of Urban Farming

In a study conducted by Krishnaveni and Arunachalam (2021), they investigate how parents' socioeconomic status affects their understanding of urban farming, highlighting the crucial role of family dynamics in shaping the education of agricultural undergraduate students in India. They explore the influence of family background on the learning outcome of agricultural undergraduate students in Indian conditions. It emphasizes the significant role of the family in teaching social, economic, technical, and moral concepts to children for better living. The study focuses on various aspects of family background, including economic stability, parental involvement, and educational status, and their impact on the educational environment. The research findings highlight the positive correlation between family occupational status, parenting style, and parents' involvement in their children's education with the students' learning outcomes. The study rejects the null hypothesis, indicating that these factors do influence the educational achievement of agricultural undergraduates.

Accessing the influence of school location on students' knowledge of urban farming. A Comparative Study Between Urban and Rural Areas

Urban farming is becoming increasingly significant due to the rapid growth of urban populations in developed countries like Japan and Singapore. Economic factors, such as reducing living expenses and saving costs on food, were found to be significant motivators for individuals to engage in urban farming activities.

Urban farming can be utilized as a mechanism to attract more youth to engage in agricultural communities in Malaysia. The study by Bahaman et al (2010), results show no significant differences in acceptance, attitudes, and knowledge between rural and urban youth. Hence, further research can explore the factors influencing youth acceptance and knowledge

regarding contract farming. Through this additional research, we can gain insights into how to attract more youth to agricultural communities in Malaysia.

The study Leslie and Lewis (2013), aimed to assess the level of agricultural literacy among third and fourth-grade students in urban and rural areas before and after participating in an agricultural program. The research used a pretest and posttest based on the Food and Fiber Systems Literacy Framework to measure students' agricultural knowledge. The findings showed that students' agricultural knowledge increased after participating in the agricultural program. Urban students had a higher mean score on both the pretest and posttest, indicating a higher level of agricultural literacy compared to rural students. The study concluded that agricultural programs increase students' knowledge of agriculture, and urban students generally have a higher level of agricultural literacy than their rural counterparts.

Gartaula et al (2020), research states that rural students scored higher in informal knowledge and lower in formal results. They often have connections to agriculture, helping on family farms. In contrast, urban students had fewer ties to agriculture. Informal knowledge tended to increase with age, indicating more experience.

Hydroponics in Education

In the study by Wan Yusoff et al (2022), secondary school students in Malaysia demonstrated significant improvement in their knowledge of STEM education and hydroponic systems through project-based learning with hydroponic kits. This approach also exposed students to identifying and resolving hydroponic-related issues, fostering both knowledge acquisition and a heightened interest in science. Meanwhile, Wagner et al (2021) research delved into the influential factors, benefits, challenges, and experiences surrounding the utilization of Hydroponic Shipping Container Farms (HSCF) in schools, highlighting the advantages such as school recognition as pioneers of advanced technology and increased funding for STEAM activities associated with HSCF research. Guasti and Bei (2021) conducted a survey-based study assessing the impact of utilizing hydroponic greenhouses in classrooms on student perceptions. Administered to seven schoolteachers, the results revealed that incorporating vegetable garden or hydroponic greenhouse management into the curriculum can positively impact student dietary habits. The questionnaire used in their study provided positive indications that classroom experiments involving plant growth help students become more aware of food-related issues and nutrition, ultimately enhancing their understanding of the environment. Suryani et al (2020) conducted research on environmental conservation through hydroponics and analyzed the environmental awareness of primary school students. Employing qualitative methods, they used purposive sampling and interviews to assess student categories and their environmental priorities. The results of Suryani et al.'s (2020) research illustrate that hydroponics programs with a floating raft system can inculcate environmental conservation attitudes among primary school students. These attitudes include a strong emphasis on plant care, contributing to the formation of a school culture centred on fundamental values. Hartadiyati et al (2020) aimed to measure student comprehension through teaching activities involving compost tea and hydroponic systems. They administered a Sustainable Development test before and after these activities to gauge student comprehension improvement. The study showed an enhanced understanding of Sustainable Development among students. Pomoni et al (2021) conducted a study comparing the advantages and disadvantages of hydroponics to conventional farming, using tomatoes and cannabis as case studies. The research revealed that hydroponics offers numerous

advantages, such as soilless cultivation and resource efficiency, but also comes with challenges like high investment costs and technical knowledge requirements.

In summary, past studies collectively highlight the multifaceted factors influencing students' understanding of hydroponic methods and underscore the crucial role of educators in fostering environmental appreciation and enhancing student knowledge. However, a comprehensive analysis of each questionnaire item to assess the depth of student comprehension remains a potential avenue for future research.

Research Methods

Research Design

The design of this study employs a survey methodology. Survey methods are utilized to procure data from a sample using a questionnaire form. The purpose of this research is to identify the level of knowledge of hydroponic methods among sixth-year primary school students from primary schools in Malaysia.

Sample and Sampling Method

Simple random sampling was executed in this study. According to research by Noraini (2010), sampling necessitates a researcher's consideration in selecting individuals to be included in the sample, based on their understanding of the research objectives.

Moreover, the sample size utilized in this study exceeds the size recommended by Krejcie and Morgan (1970); Cohen et al (2000), and this sample can also be generalized to a larger population. Employing a survey design, a random sample of 100 students from an urban school in Kuala Lumpur, Malaysia, and 100 students from a rural school in Negeri Sembilan, Malaysia participated in the study.

Research Instruments

The instrument's validity was ensured through content validation by specialists and adaptation for primary school students based on previous research. Reliability was assessed using Cronbach's alpha coefficient, with a value exceeding 0.60 in line with recommendations by (Pallant, 2010). The questionnaire was then administered to a substantial sample of 50 respondents from each school to generate more robust data, aligning with the suggestion of Coakers et al (2009) for larger sample sizes in factor analysis. This study employs a questionnaire as its instrument. SPSS software was utilized to analyze data from questionnaires distributed to the two schools. The questionnaire comprises three sections: Section A pertains to the demographic information of respondents, including gender, ethnicity, mother's occupation, and father's occupation. Section B of the questionnaire addresses the level of knowledge of hydroponic methods among sixth-year primary school students. This section contains 10 types of questions, according to Majid (1998), the research instrument is pivotal in attaining the objectives of a study. The instrument also serves as a measurement tool used to quantify the variables under examination.

Data Analysis

This research employs both descriptive and inferential design methods to acquire precise and accessible information that is relevant to the predefined research objectives. Data were analyzed employing SPSS software version 27.0. The data were subjected to both descriptive analysis and inferential analysis, which consisted of independent samples t-tests and Spearman-rho correlations.

The Findings of the Study and Discussion

Descriptive Analysis

These findings address the first research question. Descriptive analysis was executed to observe Year 6 students' knowledge level regarding hydroponic methods. Knowledge level was measured based on questions posed through the questionnaire. Students' knowledge concerning hydroponic methods is presented in Section B. The knowledge level was measured based on the interpretation of the mean, segmented into three levels. These levels are agreed (3), disagree (2), and uncertain (1). Table 4.1 exhibits detailed scores for the presented knowledge levels.

Table 4.1

Descriptive analysis of students' knowledge level of hydroponic methods.

No	Item	Frequency and Percentage (S)	(TS)	(TP)	Minimum Score	Standard Deviation	Interpretation
1.	I know the basic needs of plants.	199	1	0	3.00	0.071	HIGH
2.	I understand the meaning of hydroponics.	199	1	0	3.00	0.071	HIGH
3.	I know the purpose of hydroponic techniques.	101	99	0	2.51	0.501	MODERATE
4.	I know which plants are suitable for hydroponic cultivation.	199	1	0	3.00	0.071	HIGH
5.	I understand that hydroponic cultivation produces high-quality plants.	139	47	14	2.63	0.613	MODERATE
6.	I know that setting up hydroponic systems is easy.	192	8	0	2.96	0.196	MODERATE
7.	I understand that hydroponic cultivation is cost-effective.	87	113	0	2.44	0.497	LOW
8.	I know that hydroponic systems provide adequate nutrients for my plants.	200	0	0	3.00	0.000	HIGH

No	Item	Frequency and Percentage (S)	(TS)	(TP)	Minimum Score	Standard Deviation	Interpretation

9.	I believe hydroponic cultivation is suitable for all types of plants.	183	17	17	2.83	0.559	MODERATE
10.	I am aware that hydroponic systems require a lot of electricity.	200	0	0	3.00	0.000	HIGH

Based upon Table 4.1, there are 10 question items regarding students' knowledge. Five items achieved a high-level mean value, four items were at a moderate level, and one item was at the lowest level. Item 7, which states, “I know hydroponic plants require high costs,” obtained the lowest mean (min=2.44, SD=0.497), wherein none of the study samples (0%) chose uncertain, 113 disagreed, and 87 agreed.

Table 4.2
Overall standard deviation of students' knowledge level on hydroponics.

CONSTUCT	N	MEAN	Standard Deviation	MIN INTERPRETATION
KNOWLEDGE	200	2.834	0.160	MODERATE

Referring to Table 4.2 in its entirety, the knowledge level of hydroponics among sixth-grade primary school students resides at a moderate stage. Consequently, this indicates that the sixth-grade students possess a middling level of knowledge in hydroponics. The total mean score for this level is 2.834, and the standard deviation is 0.160.

T-test Analysis

Variations in hydroponics knowledge among Year 6 students in urban schools located in Kuala Lumpur and rural schools in Negeri Sembilan.

In this section, the discussion is centered upon the first hypothesis of the study, which posits: H01: There is no significant difference between the mean scores of hydroponic knowledges among students in urban schools located in Kuala Lumpur and rural schools in Negeri Sembilan.

Table 4.3
Levene's test value for hydroponic knowledge among students by city.

Dependent variable	F value	Significance Level
Students' level of hydroponic knowledge.	12.197	0.01

The independent-sample t-test involves several stages of data analysis, namely group statistics and the application of Levene's test. Group statistics present the mean values, standard deviations, and standard errors of the mean for the two sample groups being tested. The difference between the two means dictates the subsequent process for the independent-samples t-test, specifically, Levene’s test. Levene’s test provides F statistics and significance level (p-value). The F statistics and p-value serve as the criteria for determining the type of t-test for equality of means that should be employed, which is the t-test for equal variances. This test is employed because the assumption is that variances are equal, and the obtained significance level is 0.00, which is lower than alpha 0.05.

The data analyzed to test this hypothesis are the total mean scores for the student groups in Kuala Lumpur and Negeri Sembilan. Levene's test for equality of variances shows that the F value is 12.197 and the significance level (p-value) is 0.01. The p-value is smaller than alpha 0.05. Based on this value, it is assumed that population variances are not equal. Since the p-value for Levene's test is less than 0.05, the t-test data is derived from the equal variances not assumed values. Consequently, the t-value is -21.790 with 175 degrees of freedom. The p-value is 0.000.

The study result is significant (t=-21.790, df=175, p<0.05) and falls in the region of rejection for the null hypothesis. Hence, the null hypothesis is rejected. Thus, there is a significant difference in knowledge level between students in urban schools located in Kuala Lumpur and rural schools in Negeri Sembilan. The mean score for knowledge level for urban students (mean= 2.97) is higher than that for rural students (mean=2.70). This implies that the knowledge level of urban students is higher compared to rural students.

Table 4.4
Test results are shown below.

	CITY	N	Mean	Std. Deviation	Std. Error Mean
LEVEL OF KNOWLEDGE	Rural Area	100	2.7000	.10150	.01015
	Urban Area	100	2.9680	.06946	.00695

Correlation Analysis

Relationship between hydroponics knowledge among Year 6 students and the socioeconomic status of their parents

H03: There exists no significant correlation between the mean level of hydroponic knowledge and parents' socioeconomic status.

The variable of the parents' socioeconomic status is measured on an ordinal scale, while the mean score of knowledge level is gauged on an interval scale. Consequently, the Spearman Rho Correlation Test is employed to analyze the relationship between the mothers' and fathers' socioeconomic status and the students' knowledge concerning hydroponic methods. According to Table 4.8, the Spearman Rho Correlation Test displays a correlation coefficient value between the fathers' socioeconomic status and the student's knowledge of hydroponic methods, where r = 0.283. This r-value indicates a weak positive relationship.

r = .280, N = 200, p = .000 between students' level of knowledge on hydroponic methods and their fathers' socioeconomic status.

Table 4.6
Spearman Rho Correlation

Variable		Level of Knowledge
Parent's Socioeconomic Status.	Spearman Correlation (r)	0.283
	p	0.000
	N	200

* Significant at the level p< 0.05

Discussion of Study Findings

Based on the study findings. the knowledge level of students concerning hydroponic methods is perceived as vitally important for environmental sustainability. The overall analysis results regarding students' knowledge of hydroponic methods demonstrate a moderate level (Min=2.834, SP=0.160). A high minimum score indicates that students possess knowledge about hydroponic methods, particularly their strengths and limitations, concurrently demonstrating student awareness and applicability of this method. Stephen et al., 2021 found that integrating a school-based hydroponic planting program with health promotion activities significantly improved various aspects of early adolescent students' well-being, including green space use, competence, dietary habits, and resistance to substance use, indicating the feasibility and applicability of these interventions in urban areas This shows that hydroponics can also give impact to student's knowledge on health. In addition, (Ela et al., 2020) found that hands-on activities, such as working with hydroponics and compost tea, can effectively enhance students' knowledge and awareness of Sustainable Development

The study findings indicate a significant disparity between the hydroponic knowledge levels of students in urban schools located in Kuala Lumpur and rural schools in Negeri Sembilan. The study by Leslie and Lewis (2013), concluded that agricultural programs contribute to increasing students' knowledge of agriculture, and urban students generally have a higher level of agricultural literacy than their rural counterparts.

The socio-economic status of parents and the student's knowledge level about hydroponic methods, a weak positive relationship was discovered, revealing that fathers' socio-economic status does not significantly influence the knowledge level of sixth-year primary school students. Meanwhile, research done by Krishnaveni and Arunachalam (2021), highlights the positive correlation between family occupational status, parenting style, and parents' involvement in their children's education with the students' learning outcomes.

Conclusion

These findings impart crucial implications for relevant parties to collaboratively enhance practices in preserving the environment. Regarding the knowledge aspect of this study, it was found that sixth-year students in both cities possess a moderate level of knowledge about hydroponic methods. This study aids researchers in assessing the student's knowledge level and in innovating to enhance said knowledge level. It is proposed that subsequent studies should investigate all schools in the capital cities of states across Malaysia. In addition, regarding the knowledge aspect of this study and the socioeconomic of their parents, future studies might also consider the demographic factor according to parents' income status should be wider. Furthermore, it is suggested that upcoming studies should facilitate activities utilizing hydroponic kits and assess students' knowledge levels before and after the activities, in a bid to augment knowledge and subsequently boost interest and practice among students towards the environment. Thus, deficiencies in this study are hoped to be explored from a broader perspective, such as attitudes and motivations, to serve as a guide for the enhancement of subsequent research, ensuring continuity in empowering environmental sustainability.

This research contributes both theoretically and contextually to the existing body of knowledge in several ways. Theoretically, it adds to the understanding of how hydroponics education can influence primary school students' knowledge, particularly in diverse urban and rural settings. By employing a Likert-scale questionnaire, this study offers a quantitative measure of hydroponics knowledge among Year 6 students, which can serve as a baseline for

future research in educational psychology and agricultural education. Contextually, the findings of this research hold significance for policymakers, educators, and stakeholders involved in curriculum development and sustainable agriculture initiatives in Malaysia and similar regions. By identifying comparable levels of hydroponics knowledge between urban and rural students and debunking assumptions regarding the influence of socioeconomic status, this study underscores the importance of inclusive and targeted educational interventions to foster sustainability awareness among young learners. Overall, this research underscores the crucial role of primary education in nurturing a generation well-equipped to address global challenges such as food security and environmental sustainability.

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