Original Research Article

Utilization of The Lentera DESA Website in Blended Learning-Based Soil Fertility and Health Management Training in Yogyakarta

ABSTRACT

Knowledge of soil fertility and soil health management is essential, especially in Yogyakarta, where the soil fertility and health of rice fields are low. This study employed an experimental research design involving 715 farmers, with data collected in August 2022 and June 2023. The research explored the effectiveness of a blended learning training scheme, utilizing the Lentera DESA website as an online learning medium. The primary objectives were to identify factors that are related to the use of the Lentera DESA website and to examine the correlation between the duration of watching training videos and farmers' knowledge. Factor analysis was carried out using multiple linear and mediated regression analyses. Multiple linear regression analysis was conducted to examine whether there is a relationship between video viewing duration and increased knowledge. As a result, four factors directly relate to the use of the Lentera DESA website, namely re-login activity (P = 0.001), farmer age (P = 0.047), presence of info-session (P = 0.054), and smartphone ownership (P = 0.023). Mediated regression analysis revealed that re-login activity plays an essential role in increasing the utilization of the Lentera DESA website through both partial mediation and complete mediation. However, using the Lentera DESA website as an online training medium showed no significant correlation with increasing farmers' knowledge of soil fertility and soil health management.

Keywords: Lentera DESA; website utilization; experimental research; soil health and fertility; Yogyakarta.

1. INTRODUCTION

The rapid development of information technology, driven by the Industrial Revolution, has profoundly impacted the life patterns and the value order in society. One notable change is the increased use of the internet across all sectors of life, including information dissemination in Indonesia. According to the Indonesian Central Statistics Agency, household internet utilization rose from 73.75% in 2019 to 78.18% in 2020, and further to 82.07% in 2021 [1]. A survey by the Ministry of Communication and Information Technology in 2019 across 34 provinces in Indonesia found that the development of ICT has spurred growth in educational, social, cultural, and economic aspects in both urban and rural communities [2].

Farmers, as internet users, have a lot of information needs, ranging from agricultural cultivation techniques, soil fertility management, pest control, and post-harvest management to market information. The role of the internet is not only driven by the needs of farmers but also strengthened by the shortage of agricultural extension workers in Indonesia, who must act as initiators, facilitators, motivators, mediators, teachers, organizers, analysts, and change agents [3]. The digitalization of extension services combined with conventional counseling is often referred to as the blended learning method.

Soil fertility and soil health management are critical for farmers, especially in Yogyakarta. The soil will play an optimal role when its utilization is appropriate. If its utilization does not follow soil characteristics, this will decrease land quality, land productivity, and crop production [4]. Studies indicate that Bantul Regency has a moderate Soil Fertility Index of 0.72 [5]. Kulonprogo Regency has a stretch of territory from the coast to the hills with marginal soil conditions, and it has relatively low fertility due to its physical and chemical properties, which do not support plants [6]. Sleman generally faces a low fertility status [7], while Gunungkidul Regency faces limitations in soil fertility due to low C-organic nutrients and total N [8].

Yogyakarta City has 4% of arable land suitable for agriculture, primarily grumusol land, while other soils lack potential for agriculture [9]. The decline in soil fertility in Yogyakarta has led to a decrease in crop productivity, especially rice plants. In 2021, the productivity of rice plants in Yogyakarta reached 51.7 ku/ha, and then in 2022, it decreased to 50.64 ku/ha [10].

In response, the government of Yogyakarta issued a circular letter Number 7/SE/IV/2022, advocating for the use of balanced fertilizers and organic fertilizers to counteract declining agricultural productivity. Starting in 2022, the Faculty of Agriculture Gadjah Mada University has collaborated with the University of Passau, Germany, to provide training in soil fertility and health management in Yogyakarta through blended learning. This training combined face-to-face sessions (material and practice sessions) and learning via the Lentera DESA website, an educational online platform for agro-complex training and information. The Lentera DESA website offers three spaces for discussion, training, and information exchange. The Lentera DESA pilot program involved around 700 rice farmers spread across 46 villages in Bantul Regency, Sleman Regency, and Kulonprogo Regency. The dissemination process involved intensive training and introducing farmers to the three spaces in Lentera DESA.

Given these circumstances, an in-depth analysis is necessary to evaluate the impact of soil fertility and health management training conducted through blended learning in Yogyakarta by the University of Passau, Germany, and the Faculty of Agriculture, Gadjah Mada University. This research focuses on analyzing the use of the Lentera DESA website, the factors influencing its use, and its effect on farmers' knowledge levels after attending blended learning training.

2. METHODOLOGY

This research employed a descriptive method analysis with a quantitative approach, complemented by a qualitative approach based on an experimental research design. The study was conducted in 46 villages across three districts in Yogyakarta: Bantul District, Kulonprogo District, and Sleman District. Pre and post-training data were collected in August 2022 and June 2023. Respondents (715 farmers) were randomly sampled at the farmer group level.

A total of 715 farmers were divided into two treatment groups, both receiving blended learning training on soil fertility and health management. Treatment group 1 received training for one day, while treatment group 2 received training for two days, which included additional training materials on the use of the Paddy Soil Test Kit. All farmers participating in the training were given free access to the Lentera DESA website for online training.

Group	Time 1		Time 2
Treatment Group 1	O1	X	O2
Treatment Group 2	O1		O2

Information:
O = observation or measurement
X = treatment (blended learning training)

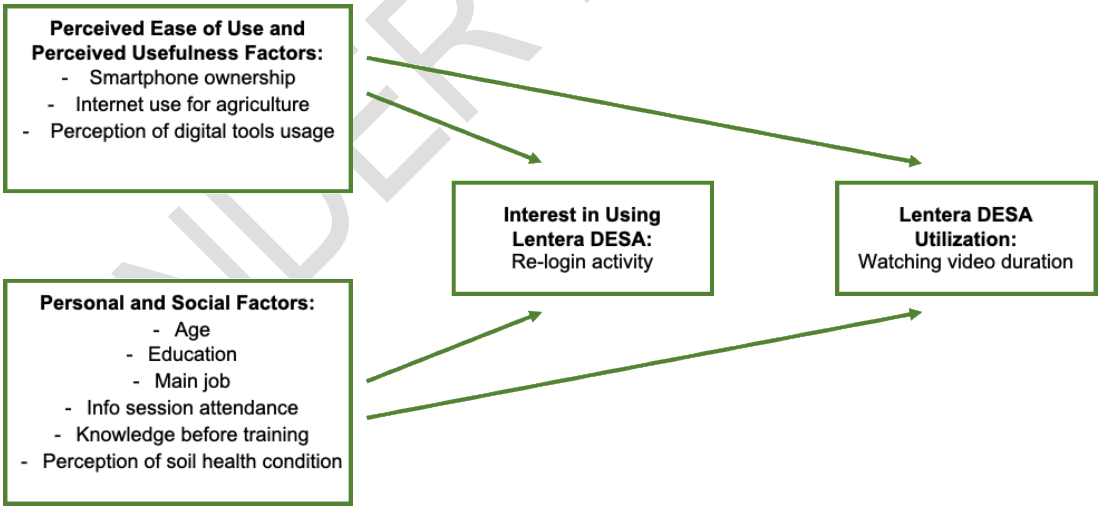

Fig. 1. Research Framework

To identify the factors relating to the use of the Lentera DESA website, a mediated regression analysis was conducted. This analysis was based on the Technology Acceptance Model, which explains that technology adoption is influenced by the perceived ease of use and perceived usefulness, and mediated by user interest [11]. A multiple linear regression analysis

was carried out to examine the relationship between the duration of watching the Lentera DESA video and increased knowledge.

3. RESULTS AND DISCUSSION

Davis describes the process of technology adoption, emphasizing that the main determinant of whether users will adopt new technologies is their overall interest in the use of the latest technology [11]. This interest is influenced by two main factors, namely perceived ease of use and perceived usefulness. Perceived usefulness refers to user's perception of how useful a technology can be to help them achieve their goals, while perceived ease of use refers to their perception of user-friendliness. In addition, social factors can also influence users' interest in using a technology [12].

Figure 1 explains how the usability, personal, and social factors influence farmers' interest in using the Lentera DESA website. Farmer's interest is measured by their desire to re-access the website, indicated by user re-login activities. This interest then affects the use of the Lentera DESA website, which is measured by the duration of time farmers spend watching training videos. Ideally, this interest should encourage farmers to use the website, refers to as actual system use [11].

The majority of farmers in the study were male (89%) with an average age of 51 years or older. Over 50% of farmers have also completed education at the senior secondary level. Regarding smartphone ownership, 83.50% of farmers personally own smartphones. After attending face-to-face training, farmers were given access to online training through the Lentera DESA website. As a result, 50.91% of the farmers logged into the Lentera DESA website. However, only 13.57% of farmers watched the training videos, with varying durations (Table 1).

Table 1. Farmers Watch Lentera DESA Videos in Minutes

Watching Duration	Numb. of Farmers	Precentage (%)
<2	36	37.11
2 – 5	36	37.11
6 – 10	9	9.28
11 – 20	7	7.22
>20	9	9.28
TOTAL	**97**	**100**

Table 1 shows that 97 farmers watched a training video through the Lentera DESA website. Of the 97 farmers, about 60% watched videos with a duration of less than 5 minutes. Meanwhile, less than 30 farmers watched videos for more than 5 minutes. A total of 9 farmers watched training videos for more than 20 minutes. Based on the training video duration data in Table 1 It can be assumed that farmers who watched training videos for 20 minutes had watched as many as three training videos.

3.1 Farmers' Knowledge After Training

Farmers' knowledge of the agricultural production process plays an important role. According to [13], knowledge results from a person's cognitive experience. Based on the definition, farmers acquire knowledge through their experiences during the agricultural cultivation process. The more cognitive experiences they have, the more knowledge they gain. Farmers' knowledge in soil fertility and soil health management results from learning and experiencing blended learning-based training, measured by the accuracy of their answers to interview questions. These questions include the function of macronutrients for rice plants. Interviews revealed that farmers were more knowledgeable about the functions and symptoms of macronutrient deficiency N compared to other macronutrients. Farmers explained that the symptoms of N deficiency are the easiest to observe and measure. Plants deficient in N exhibit more yellow leaves because N is essential for the leaf color formation [14].

The knowledge transfer encompasses the training and learning activities carried out by farmers. Knowledge transfer consists of five elements: the tendency to source incentives, the existence and enrichment of communication channels, the source of individual knowledge, the tendency to receive individual acceptance incentives, and the individual absorptive capacity [13]. The existence and enrichment of the communication channel is the most critical factor in knowledge transfer [13]. Interviews indicated that farmers in Yogyakarta have enriched communication channels through communication with agricultural extension workers and other farmers. This transfer of knowledge between agricultural extension workers and farmers is an implementation of the duties and functions of extension workers as educators and facilitators.

Meanwhile, knowledge transfer between farmers constitutes horizontal knowledge exchange. This process involves the comparative communication of farmers in groups, communication between individual farmers, games, and competitions [15]. In Yogyakarta, farmers have established extensive knowledge exchange through group comparison and communication between individual farmers.

3.2 Determinant Factor of Lentera DESA Website Watching Duration

Table 2. Multiple Linear Regression Result

Variable	Regres. Coeff	P-Value	Significance
Re-login activity (X1)	111.675	0.001	***
Age (X2)	3.097	0.047	**
Info-session attendance (X3)	47.857	0.054	*
Smartphone ownership (X4)	48.398	0.023	**
Education	18.988	0.229	NS
Internet usage for agri. information	6.267	0.816	NS
Perception of digital tools usage	8.498	0.614	NS
Perception of soil health condition	0.652	0.978	NS
Knowledge before training	8.034	0.538	NS
Main job	-25.368	0.429	NS
Constanta	**-261.924**		

Information
* : significant at 10% alpha
** : significant at 5% alpha
*** : significant at 1% alpha
NS : non-significant

Estimated model

$$Y = -261.924 + 111.675X1 + 3.097X2 + 47.857X3 + 48.398X4$$

The results of the multiple linear regression test indicate that four factors affect the duration use of the Lentera DESA website, namely re-login activities, farmer age, presence of info-sessions, and smartphone ownership.

3.2.1 Re-login Activity

Before watching the training video, the website system requires farmers to log in. This makes re-login activity one of the influential factors. The regression coefficient indicates that farmers who re-login will watch the video for 111 seconds or almost 2 minutes. This aligns with the duration data collected from the Lentera DESA website system. As explained above, every farmer who wants to re-access the training video must log in again on the Lentera DESA website. Based on the log-in activity, the Lentera DESA website can track re-entries, allowing to use these activities as evaluation material. However, in qualitative interviews, many farmers reported forgetting their usernames and passwords to re-access Lentera DESA.

3.2.2 Farmers' Age

Most farmers (93.57%) are in the productive age category (15-64 years old). According to multiple linear regression test results, farmer's age positively correlates with the duration of watching the video after training. Thus, older farmers tend to watch training videos for longer. The coefficient for age influence on the duration of watching videos is 3.09735, indicating that farmers who are one year older will watch videos for 3 seconds longer. This could be because older individuals take longer to process the information compared to younger individuals [16]. Older farmers may also have more time than younger farmers who often also work in other jobs beside farming.

3.2.3 Info session anttendance

The info session activity was a counseling activity related to using internet media for agriculture. This activity was carried out before the training activity. Of the respondent farmers, 420 (58.74%) attended these info sessions. The purpose of the info sessions was to improve farmers' digital literacy, enabling them to understand, analyze, and filter information from digital media, including agricultural websites [17]. Farmers with higher digital literacy are more effective and efficient in searching for agricultural information online. Multiple linear regression analysis showed that attending the info session is related to the duration of farmers watching videos; farmers who attended the info session watched videos for 48 seconds longer than those who did not attend the info session. Individuals with higher digital literacy more frequently use the internet use as a source of information [17,18]. This finding suggests that info session activities can also be adopted in a similar blended learning training model as they enhance farmers' digital literacy and inform farmers about the importance of the internet as a source of information.

3.2.4 Smartphone ownership

Access to internet media requires a smartphone as the primary tool. Interviews conducted with 715 farmers revealed that 83.50% of farmers already personally owned a smartphone, while 16.50% did not but possibly had smartphone access within their family. Multiple linear regression analysis found that smartphone ownership is positively related to the duration of watching training videos. This means that farmers who personally own a smartphone tend to watch training videos with a longer duration (48 seconds longer) than farmers without. This indicate that a person will be happier to use digital learning media if they have easy access [19].

3.3 Mediator Effect of Re-login Activity to Lentera DESA Website Watching Duration

Based on the results of multiple linear regression analysis in Table 2, re-login activities have a considerable effect on the duration of watching Lentera DESA videos. This re-login activity is then used as a mediator variable to analyze its impact on other factors when using the Lentera DESA website. The analysis yielded the following results.

Table 3. Mediated Regression Analysis Result

Variable	P-Value			Type of Mediation
	Y=re-login	Y=watching duration	Sobel Test	
Re-login activity	-	0.001***	-	-
Age	0.019**	0.047**	0.000***	Partial
Info-session attendance	0.040**	0.054*	0.004***	Partial
Smartphone ownership	0.528	0.023*	0.124	No mediation
Education	0.005***	0.229	0.002***	Complete
Internet usage for agri. information	0.002***	0.816	0.006***	Complete
Perception of digital tools usage	0.320	0.614	0.002***	Complete
Perception of soil health condition	0.681	0.978	0.002***	Complete
Knowledge before training	0.061*	0.538	0.000***	Complete
Main job	0.314	0.429	0.005***	Complete

Information
* : significant at 10% alpha
** : significant at 5% alpha
*** : significant at 1% alpha

3.3.1 The Effect of Partial Mediation

The mediator variable is considered a partial mediation when the influence of the independent variable on the dependent remains significant, with or without the mediator variable. In this context, partial mediation occurs for the age and info session attendance variables. This means regardless of the inclusion of the mediation variable (re-login), the independent variable (age and info session attendance) still influences the variable of the duration of video watching.

3.3.2 The Effect of Complete Mediation

The mediator variable is considered a complete mediator when the influence of the independent variable on the dependent variable is significant only through the mediator. Without the mediator variable, the independent variable becomes insignificant. Complete mediation of the re-login variable was observed for education, main job, knowledge before training, perception of soil fertility, the use of the internet for agriculture, and the perception of digital tools. Mediation variables are important for developing social research science practice [20]. By knowing the role of mediator variables in the social research model can increase the complexity of influence relationships, aiding the development and evaluation of research outcomes [20].

In this study, the re-login activity served as a mediator for nearly all independent variables. This suggests that the mediator variable (re-login activity) can describe farmers' interest in using the Lentera DESA website as a new technology media in accordance with the concept of technology acceptance model theory. In addition, the mediator variable (re-login activity) also influences the use of the Lentera DESA website, which is depicted by farmers' video-watching activities. Based on these findings, a strategy to increase the use of the Lentera DESA website could involve enhancing farmers' interest in using the Lentera DESA website after training.

3.4 The Correlation Between the Duration of Watching Videos on the Lentera DESA Website and Increasing Farmers' Knowledge

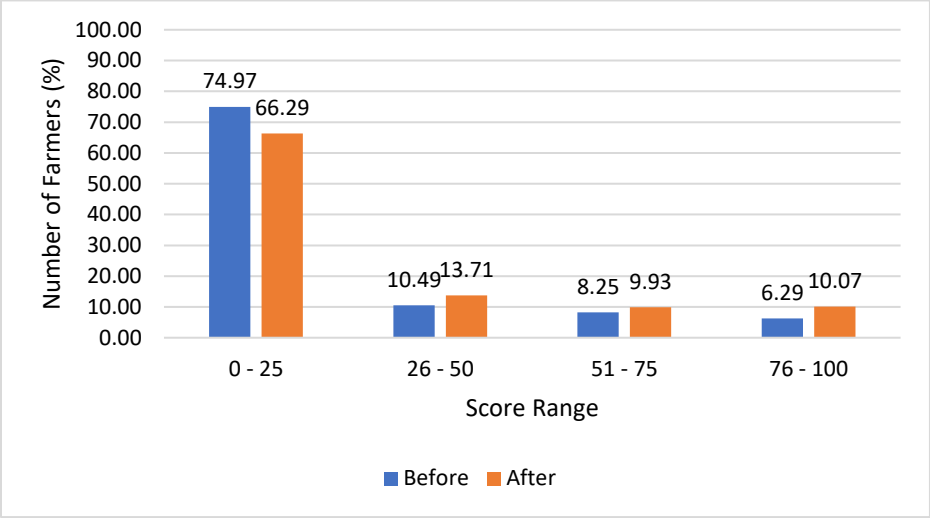

Fig. 2. Farmers' Knowledge – Before and After Training

Farmers' knowledge related to fertility management and soil health was measured before and after the training using the same set of questions. Based on the scores and percentages of farmers' knowledge in Figure 2, the results indicate an increase in farmers' knowledge of fertility and soil health management. This section explores whether this increase in knowledge is related to the use of the Lentera DESA website. The following are the results of the analysis of the correlation between the use of the Lentera DESA website and the increase in farmers' knowledge.

Table 4. Results of Knowledge Relation Analysis after Training

Variable	P-Value	Significance
Knowledge before training (X1)	0.000	***
Video watch duration (X2)	0.232	NS
Treatment groups (X3)	0.020	**

Information
* : significant at 10% alpha
** : significant at 5% alpha
*** : significant at 1% alpha
NS : non-significant

3.4.1 Farmers' Knowledge before Training

The analysis in Table 4 shows that the P-value for farmers' knowledge before training to knowledge after training is 0,000, indicating an increase in farmers' knowledge from before training to after training. These results suggest that blended learning increases knowledge. Education and training are essential for developing human resources, especially intellectual ability and human personality. Improvement of intellectual ability and personality can lead to higher work productivity, better decisions, increased work motivation, and effective communication [21].

Evaluating knowledge improvement is also a measure of training effectiveness. According to [22] evaluation involves measuring knowledge, skills, and habit patterns post-training. This evaluation is helpful for organizers as it provides feedback for further training innovations. Thus, the measurement of knowledge in this study is also a form for the assessment of training effectiveness. Although there has been an increase in knowledge, the increase is relatively small. This finding serves as an evaluation point and a basis for the formulation of training strategies to optimize knowledge enhancement in the future.

3.4.2 Duration of Watching Lentera DESA Videos

The duration of watching the Lentera DESA video has a significance value of 0.232, indicating no correlation with the improvement of farmers' knowledge in fertility management and soil health. While Table 4 shows an increase in farmers' knowledge scores, this increase is not linked to the duration of video watching. Likely, this is due to the low duration of farmers watching videos, which mostly ranges from 2 to 5 minutes. Given that training videos range from 4 to 15 minutes,

most farmers did not complete the training videos. The training studied here used a blended learning approach, thus knowledge changes are not only influenced by the duration of watching videos; face-to-face learning also plays an important role in increasing farmers' knowledge.

In this training, face-to-face sessions were conducted first, followed by online learning adhering to the concept of blended learning. Face-to-face learning in this training, in addition to material presentation, also provided farmers with practice sessions. These sessions included the practice of making organic fertilizers and pesticides, the practice of soil testing using a paddy soil test kit, and the practice of calculating fertilizer needs. Interviews revealed that farmers found these practical exercises beneficial for understanding, as hands-on practice reinforced learning. Thus, much of the knowledge gain occurred in face-to-face learning.

Online learning served as a supplementary tool, helping farmers to recall training material. Additionally, it provides farmers with further information that has not been conveyed during face-to-face training. Farmers' use of online training videos can be optimized in order to achieve knowledge improvement also through online learning. This could be achieved by regular monitoring and continuous engagement with farmers to ensure farmers continue to access the Lentera DESA website after the training. This monitoring effort could be carried out by website admins who routinely follow up with farmers through WhatsApp messages or by organizing similar training sessions in collaboration with agencies such as the Agricultural Extension Center or the local Agriculture Office.

3.4.3 Treatment Groups

Table 4 shows that the training treatment group is significantly related to the improvement of farmers' knowledge in soil fertility management and soil health. Farmers in the 2-day training group experienced a greater increase in knowledge compared to those in the 1-day training group. The 2-day training provided additional knowledge and skills, particularly in soil testing, and allowed farmers to experiment with the soil test kit. The soil test material was revisited again in the online learning *section* to aid farmers in recalling the material. Based on this, it is important to consider the duration and material delivered during face-to-face learning. Effective and extensive face-to-face training, combined with practical exercises, ideally enhances trainees' knowledge [23].

The analysis indicates that the use of the Lentera DESA website, measured by the duration of watching videos, has no relationship with the increase in existing knowledge of blended learning. The increase in knowledge in this training scheme is largely explained by the face-to-face training. Therefore, in blended learning training, the difference between face-to-face training and online training is urgent, and both complement each other and cannot be separated. The limitations of the face-to-face training method can be mitigated by online training and vice versa, to achieve the training goals more effectively.

4. CONCLUSION

Through blended learning training, farmers understand the importance of macronutrients for plants. They can easily explain the management and practices necessary for soil fertility and health management. Factors directly affecting the use of the Lentera DESA website are re-login activities, farmer age, info session attendance, and smartphone ownership. Mediated regression analysis revealed that the mediator variable in the form of re-login activities plays an important role in increasing the utilization of the Lentera DESA website. The use of the Lentera DESA website as an online learning medium has no correlation with the improvement of farmers' knowledge in fertility management and soil health. Face-to-face training in blended learning plays a significant role in increasing farmers' knowledge.

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