

## The role of digital innovation, local wisdom, and human resources in developing Gayo coffee educational tourism in Takengon, Indonesia



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### ABSTRACT

The aim of this study is to integrate three strategic dimensions, namely digital innovation, local wisdom, and human resource quality, into the development of educational tourism. The research introduces a new perspective by examining eco-educational tourism in the organic Gayo coffee farming sector in Indonesia. Data were obtained from 150 respondents, including eco-tourism actors and managers, coffee farmers, tourism-based micro, small, and medium enterprises, visitors of educational coffee tourism, and other tourism stakeholders. The findings show that tourist attractions, digital innovation, and human resource quality significantly contribute to the development of educational tourism. However, digital innovation and tourist attractions are not yet fully optimized to enhance destination attractiveness. Tourist attractions mediate the relationship between human resource quality and educational tourism development, but they do not mediate the relationships involving digital innovation or local wisdom. In general, agricultural educational tourism can be applied to various types of commodities. Nevertheless, tourism operators should carefully integrate local wisdom into the design of tourist attractions to ensure cultural authenticity and strengthen visitor engagement.

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### 1. Introduction

Indonesia is an agricultural country rich in natural and cultural wealth, with coffee being one of its globally recognized commodities (Neilson et al., 2018). Among Indonesia's notable coffees is Gayo Coffee, which originates from the Gayo Highlands in Takengon, Central Aceh (Andini et al., 2021). This coffee possesses a distinctive flavor and has garnered international acclaim, including Geographical Indication (GI) certification and recognition for its organic practices (Zinsli, 2023). As a result, Gayo Coffee has evolved into not only an export commodity but also an educational and ecotourism attraction, often referred to as Eco Edu Tourism. With the rise of sustainable tourism trends, the potential for developing Gayo Coffee Eco Edu

Tourism is becoming increasingly promising (Jaya et al., 2020). However, the success of this development relies on key factors, such as digital innovation in tourism promotion and services, the unique cultural identity rooted in local wisdom, and the quality of local human resources (HR) who can manage these opportunities in a professional and sustainable manner. Despite its significant potential, the advancement of coffee-based educational tourism in Takengon faces several challenges. These include limited adoption of digital technology, insufficient integration of local wisdom values within tourism concepts, and a lack of competent human resources for organizing enjoyable and educational experiences. Therefore, it is essential to further examine how these three factors influence the development of Gayo Coffee Eco Edu Tourism, considering tourist attractions as intervening variables that can strengthen the relationship between these factors and overall tourism development.

Based on the Pre-Survey, the phenomenon of this research problem is (1) a Lack of digitalization in the promotion and services of Gayo coffee tourism in

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Takengon, so that the reach of tourists, especially the younger generation and foreign tourists, is still limited. (2) Local wisdom has not been fully integrated into the educational tourism experience, even though Gayo cultural values have great potential to be a differentiator and unique attraction. (3) The quality of local human resources in managing educational tourism is still low, especially in terms of hospitality, foreign languages, and understanding of ecotourism. (4) Suboptimal tourist attractions, both in terms of presentation, infrastructure, and educational narratives, cause the tourist experience to be less than optimal. This phenomenon highlights the need to thoroughly analyze the impact of digital innovation, local wisdom, and human resource quality on Eco Edu Tourism development, exploring how tourist attractions serve as intervening variables that reinforce this influence.

Recent research shows that digital innovation (e.g., use of social media, e-commerce, Internet of Things, virtual reality) plays an important role in expanding market access and strengthening the attractiveness of tourist destinations (Oncioiu and Priescu, 2022). In the context of educational tourism and ecotourism, digitalization can enhance the tourist experience and support community-based destination marketing (Zhang and Deng, 2024). Local wisdom includes cultural practices, values, and traditions that can enrich tourism narratives (Pratiwi and Wikantiyoso, 2022). In the context of Gayo coffee, Gayo community traditions, organic farming systems, and traditional ceremonies are authentic content that integrates the form of educational tourism. The quality of human resources (knowledge, skills, hospitality, managerial abilities) plays a vital role in creating superior tourism services. Especially in areas such as Takengon, the capacity of local human resources in managing tourist attractions and innovation determines the success of ecotourism development. Tourist attractions are a connecting factor between inputs (such as digital innovation, human resources, and local wisdom) and the success of destination development. Elements of attraction can be nature, culture, educational experiences, and social interactions.

This study presents several key innovations: 1) It integrates three main strategic dimensions—digital innovation, local wisdom, and human resource quality—that have not previously been examined together in the context of organic coffee-based eco-educational tourism, particularly in the Gayo highlands of Takengon. 2) The use of tourist attractions as an intervening variable introduces a new analytical framework that investigates how these internal factors influence tourism development through tourists' perceptions and experiences of destination attractions. 3) Gayo organic coffee-based eco-educational tourism has not been extensively explored in academic literature as a model of educational tourism rooted in environmentally friendly agricultural practices, agroforestry, and

Gayo cultural values. 4) The findings of this study have the potential to create a conceptual framework for developing sustainable tourism destinations in other regions that boast strong local products and distinctive cultural characteristics.

Takengon, the home of Organic Gayo Coffee, has significant potential for developing sustainable tourism focused on education and environmental conservation, known as eco-education tourism. This study aims to explore how local wisdom integrates into tourism development. For example, Gayo farmers traditionally cultivate coffee using an intercropping system called "tumpangsari," which involves growing coffee alongside perennial plants such as avocado, leucaena (lamtoro), and various hardwood species. Additionally, farmers in Takengon practice circular farming by repurposing coffee waste, livestock manure, and leaves to create both liquid and solid fertilizers. These sustainable farming methods reflect valuable local wisdom that can serve as both a unique attraction and an educational component in the development of eco-education tourism in Takengon.

The theories utilized in this study include: 1) Community-Based Tourism (CBT) discusses the pivotal role of local communities in managing tourism. In this research, the participation of regional actors such as coffee farmers and MSMEs (micro, small, and medium enterprises) is viewed as an integral component in driving ecotourism. Community participation has long been advocated as an essential part of sustainable tourism development. This approach is considered effective in increasing community support by mitigating the negative impacts of tourism while simultaneously strengthening its positive outcomes (Okazaki, 2008). 2) Dynamic Capability Theory, developed by Teece (2018) emphasized that ecotourism managers must consistently demonstrate the ability to sense, seize, and transform both internal and external resources and competencies to adapt swiftly to the rapidly evolving digital technology landscape. This landscape includes the use of digital platforms for marketing, online booking systems, and other technological advancements that are increasingly shaping the tourism industry. 3) The third theoretical foundation is the Local Wisdom Theory, which explores local agricultural resources in Gayo, such as organic coffee and its associated agrarian culture. Examples include traditional intercropping techniques (tumpangsari) and the local coffee brewing method known as kopi tarik. These unique cultural tourism attractions, born out of local wisdom, are a testament to the richness and diversity of our cultural resources

The success of tourism development is primarily influenced by the quality of human resources (HR), particularly in terms of service, education in tourism, and hospitality. This study offers an overview of how the quality of local human resources can support the development of educational and ecological tourism (Bindawas, 2025). Tourist attractions play a crucial role as an intervening variable in the relationship

between the various factors studied and the development of eco-educational tourism. This research aims to investigate whether—and how—tourist attractions mediate or enhance the effects of digital innovation, local wisdom, and human resource quality on the development of Gayo Coffee tourism. The promotion of eco-educational tourism based on Gayo Coffee has the potential to stimulate local economic growth by creating jobs, increasing community income, and expanding markets for local products. This research is significant as it provides strategic direction for designing inclusive and sustainable tourism development policies. The limited studies that comprehensively examine the relationships among digital innovation, local wisdom, human resource quality, and tourist attractions specifically in the context of eco-educational tourism in Takengon add considerable academic and practical value to this research.

## 2. Research methods

This study utilizes a quantitative approach with a causal research design. It aims to examine the impact of independent variables—Digital Innovation (ID), Local Wisdom (KL), and Human Resource Quality (HR)—on the development of Eco Edu Tourism for Organic Gayo Coffee (PEET) in Takengon. In this framework, Tourist Attractions (DTW) serve as an intervening variable. The population for this study includes actors and managers involved in Gayo coffee ecotourism, coffee farmers, tourism-based MSME (Micro, Small, and Medium Enterprises) participants, visitors of coffee education tourism, and tourism stakeholders in the Takengon area of Central Aceh, Indonesia. The sampling method employed is purposive sampling, based on the following criteria: 1) Participants must be active in the development or management of Gayo coffee tourism. 2) They should have at least one year of experience in the ecotourism or coffee farming sector. 3) Participants must be willing to complete the research questionnaire.

The number of samples needed for this study using the formula from Hair et al. (2019) for SEM-PLS, which suggests a requirement of 5 to 10 times the number of indicators. For example, if there are 30 indicators, the minimum number of respondents required would be 150. The data collected for this research were primary, gathered through a questionnaire. Each construction was measured using a 5-point Likert scale, where one indicates "Strongly Disagree" and five indicates "Strongly Agree."

The questionnaire was developed based on relevant indicators derived from existing theories and research findings. Each variable was measured using the following indicators: 1) Digital Innovation (ID) This includes the use of information technology, digital marketing, and online reservation systems. 2.) Local Wisdom (KL), This encompasses local cultural values, community traditions, and the preservation of local knowledge in tourism. 3) Quality of Human

Resources (HR), This refers to the competence, tourism knowledge, and service skills of individuals in the industry. 4) Tourist Attractions (DTW): This includes aspects such as uniqueness, beauty, and educational experiences that attract visitors. 5) Development of Eco-Educational Tourism (PEET). This focuses on increasing visitor numbers, enhancing visitor satisfaction, ensuring environmental sustainability, and boosting the local economy. Data analysis was conducted using the Structural Equation Modeling (SEM) approach, specifically with SmartPLS (Partial Least Squares). This model is particularly suitable for exploratory research when working with a limited sample size and complex models involving latent variables. Research Hypotheses for the Study:

**H1:** Digital innovation has a positive effect on tourist attractions.

**H2:** Local wisdom has a positive effect on tourist attractions.

**H3:** The quality of human resources has a positive effect on tourist attractions.

**H4:** Tourist attractions have a positive effect on the development of eco-educational tourism.

**H5:** Digital innovation has a direct effect on the development of eco-educational tourism.

**H6:** Local wisdom has a direct effect on the development of eco-educational tourism.

**H7:** The quality of human resources has a direct effect on the development of eco-educational tourism.

**H8:** Tourist attractions mediate the effect of digital innovation on the development of eco-educational tourism.

**H9:** Tourist attractions mediate the effect of local wisdom on the development of eco-educational tourism.

**H10:** Tourist attractions mediate the effect of human resource quality on the development of eco-educational tourism

## 3. Findings

### 3.1. Measurement Model

#### 3.1.1. Outer model

All indicators and constructions are valid and reliable. Evaluation of the outer model is summarized in Table 1.

The results of the measurement model testing using the PLS-SEM approach indicate that all constructs in this study meet the validity and reliability criteria. The outer loading values for all indicators are above 0.70, demonstrating a substantial contribution to their respective constructions. Moreover, the Average Variance Extracted (AVE) values are all greater than the 0.50 threshold, signifying good convergent validity for each construct (Hair et al., 2019). Additionally, Composite Reliability and Cronbach's Alpha values for all constructs exceed 0.70, indicating that they all

possess internal consistency. The results of the discriminant validity test, conducted using the Fornell-Larcker approach, also show that all constructs in the research model meet the established criteria (Table 2). Specifically, the square root of the AVE (the diagonal value) is greater than the correlation values of other constructs in the same row or column. The constructions of Tourist Attraction, Eco Edu Tourism, Digital Innovation,

Local Wisdom, and Human Resources each have a square root AVE value above 0.74. In contrast, their highest correlations with other constructs remain below this value. This indicates that each construction in the model has a clear empirical distinction from the others, confirming that discriminant validity in this model has been adequately satisfied.

**Table 1:** Outer loading, Cronbach's alpha, composite reliability, AVE

Construct	Indicator	Outer loading	AVE	Composite reliability	Cronbach alpha
Tourism attraction	DTW1	0.782	0.592	0.813	0.712
	DTW2	0.738			
	DTW3	0.786			
Digital innovation	ID1	0.865	0.697	0.874	0.788
	ID2	0.834			
	ID3	0.805			
Local wisdom	KL1	0.893	0.692	0.870	0.782
	KL2	0.846			
	KL3	0.750			
Eco-edu tourism	PEET1	0.796	0.606	0.822	0.702
	PEET2	0.813			
	PEET3	0.723			
Human resources	SDM1	0.720	0.547	0.784	0.717
	SDM2	0.761			
	SDM3	0.731			

**Table 2:** Fornell-Larcker criterion

Construct	Tourism attraction	Eco-edu tourism	Digital innovation	Local wisdom	Human resource
Tourism attraction	0.769				
Eco-edu tourism	0.502	0.779			
Digital innovation	0.124	0.309	0.835		
Local wisdom	0.213	0.147	0.084	0.832	
Human resources	0.432	0.593	0.214	0.287	0.740

### 3.1.2. Inner model

The R-squared value indicates that other constructs in the model can explain 19.6% of the variation in the Tourist Attraction variable. In contrast, the remaining variation is due to factors outside the model. The adjusted R-squared value is 17.9%, which reflects consistent results after accounting for the number of predictors used. In contrast, the Eco Edu Tourism construct has an R-squared value of 46.1% and an adjusted R-squared value of 44.6%. This data indicates that nearly half of the variation in this variable comes from the constructions included in the model. Overall, these findings suggest that the model has moderate predictive power for the development of eco-educational tourism, while its predictive power for tourist attractions is relatively weak. However, the model remains relevant both theoretically and practically.

### 3.1.3. Structural model

Hypothesis testing involves examining the path coefficient, t-statistic, and p-value generated from the Partial Least Squares Structural Equation Modeling (PLS-SEM) analysis. The path coefficient reflects the direction and strength of the relationship between constructs. In contrast, the t-statistics and p-value assess the statistical significance of this relationship. A hypothesis is considered significant if the t-statistic is  $\geq 1.96$  and the p-value is  $\leq 0.05$ , at a

significance level of 5% (Hair et al., 2019). This analysis helps determine the extent to which the independent variable influences the dependent variable, either directly or through a mediating variable. Below are the results of the hypothesis testing from this study. Fig. 1 shows the results of the structural model for hypothesis testing.

Based on the results of the hypothesis testing (Table 3), there are five significant relationships, and five others are not important. Considerable relationships include: the influence of HR on Tourist Attractions ( $\beta = 0.398$ ;  $p = 0.000$ ), SDM towards Eco Edu Tourism ( $\beta = 0.441$ ;  $p = 0.000$ ), Tourist Attractions towards Eco Edu Tourism ( $\beta = 0.302$ ;  $p = 0.000$ ), Digital Innovation for Eco Edu Tourism ( $\beta = 0.182$ ;  $p = 0.000$ ), and the indirect influence of human resources on Eco Edu Tourism through Tourist Attractions ( $\beta = 0.120$ ;  $p = 0.03$ ). Meanwhile, hypotheses that are not supported by the data include the direct influence of Digital Innovation and Local Wisdom on Tourist Attractions, as well as on Eco Edu Tourism, and indirect influence through mediation. Thus, there are five accepted hypotheses and five rejected ones.

## 3.2. Empirical discussion

The results of the first hypothesis test (H1) indicate that digital innovation does not have a significant effect on tourist attractions. The path coefficient is 0.031, the t-statistic is 0.368, and the p-value is 0.357 (greater than 0.05). These findings

suggest that the presence of digital innovations—such as information technology, online promotional platforms through social media, and other digitized services—has not yet succeeded in enhancing the

perceived attractiveness of a tourism destination. Although this result is inconsistent with some previous studies, it aligns with the findings of Lubis et al. (2022).

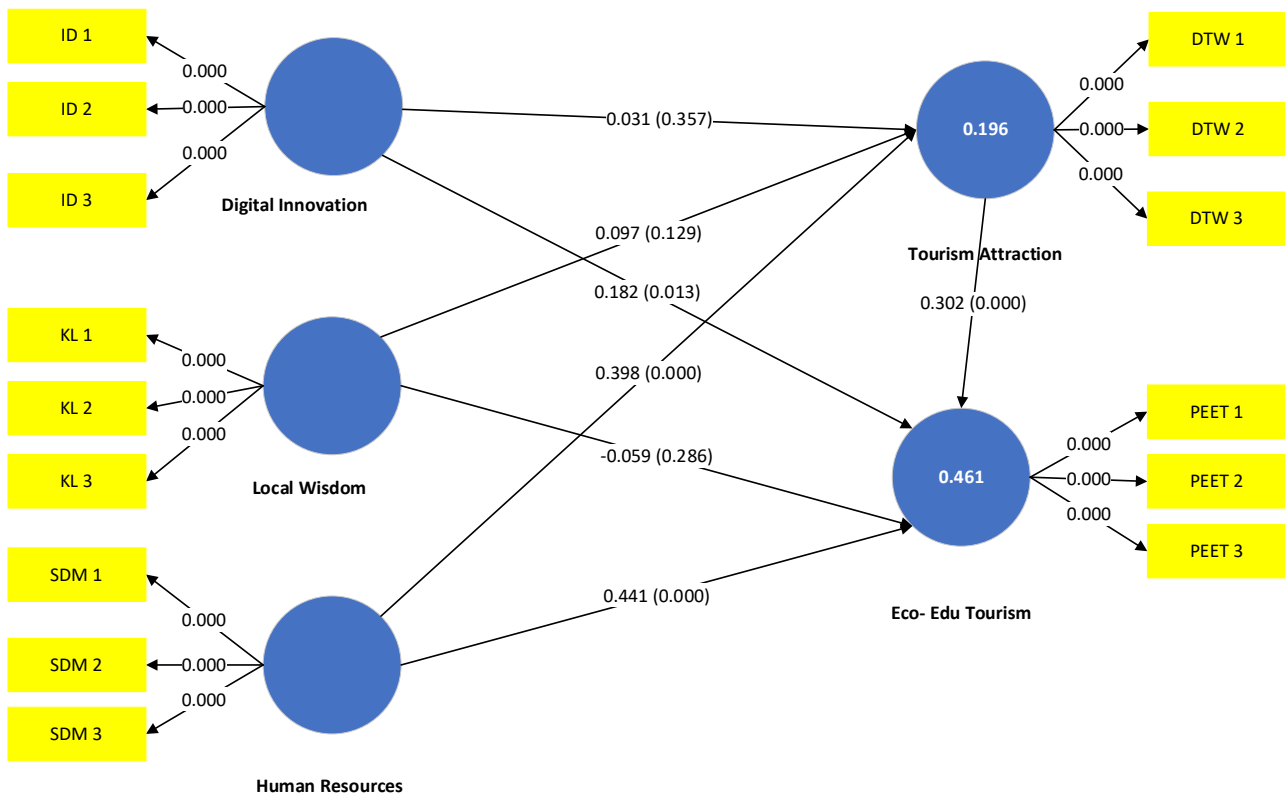


Fig. 1: Structural model results

Table 3: Hypothesis testing

Hypothesis	Variable	Path coefficient	T-statistic	P-value	Decisions
H1	Digital innovation → tourism attraction	0.031	0.368	0.357	Not supported
H2	Local wisdom → tourism attraction	0.097	1.131	0.129	Not supported
H3	HRM → tourism attraction	0.398	4.901	0.000	Supported
H4	Tourism attraction → eco-edu	0.302	3.391	0.000	Supported
H5	Digital innovation → eco-edu	0.182	2.240	0.000	Supported
H6	Local wisdom → eco-edu	-0.059	0.565	0.286	Not supported
H7	HRM → eco-edu	0.441	6.625	0.000	Supported
H8	Digital innovation → tourism attraction → eco-edu	0.009	0.352	0.362	Not supported
H9	Local wisdom → tourism attraction → eco-edu	0.209	1.106	0.155	Not supported
H10	HRM → tourism attraction → eco-edu	0.120	2.782	0.030	Supported

These studies emphasize that while digitalization plays a vital role in increasing tourist interest, it cannot be effective on its own. It correlates with skilled human resources capable of managing digital tools effectively to create a more engaging tourism experience. Therefore, a new approach is needed to develop digitalization that goes beyond mere promotion and focuses on enriching the visitor experience. For example, offering educational insights into coffee cultivation for visitors to Gayo Coffee Eco Edu Tourism could significantly increase the destination’s attraction value. The development of Gayo Coffee Eco Edu Tourism should integrate educational and cultural digital content into its tourism strategy. For instance, interactive documentary videos showcasing the stages of organic coffee cultivation and processing, personal stories from local coffee farmers, and the traditional values and cultural heritage of the Gayo community

can be displayed. Additionally, technologies such as augmented reality (AR) can complement coffee tourism sites. Visitors could scan QR codes to view interactive visualizations of the history of Gayo Coffee or simulations of the roasting process. These efforts would position digital innovation not just as a promotional tool but also to enhance the educational and cultural value of the Gayo Coffee plantation attractions.

The findings of the second hypothesis test (H2) reveal that local wisdom does not significantly impact tourist attraction, indicated by a path coefficient of 0.097, a t-statistic of 1.131, and a p-value of 0.129 (greater than 0.05). This data suggests that, although local wisdom is theoretically crucial for defining a tourism destination's identity and uniqueness, its influence was not substantiated in this study. This outcome contrasts with several earlier investigations. Possible explanations for this

result align with the research conducted by [Tanjung et al. \(2021\)](#). These studies suggest that the ineffectiveness may stem from the inadequate presentation of local wisdom as captivating tourist attractions, a lack of interest among tourists in local cultural values, and insufficient interpretation of artistic elements. Such factors can impede the practical exposure and appreciation of local wisdom within the tourism experience.

In the context of Gayo Coffee Eco Edu Tourism, these findings suggest that while the Gayo community boasts a rich cultural heritage, including unique traditions and local practices, these values have yet to be effectively transformed into engaging tourism activities. Local knowledge in coffee processing is not a priority as a supplementary aspect, rather than being central to the educational tourism experience. These findings suggest that management needs to integrate the cultural values of the Gayo people into tourism products in a way that resonates with visitors, especially younger generations and tourists from outside the region who may be unfamiliar with Gayo culture. This underscores the necessity to strengthen the narrative surrounding local wisdom to enhance the destination's appeal. For instance, traditional coffee farming practices passed down through generations, ceremonial coffee harvest rituals, and the Gayo community's philosophy of living in harmony with nature could serve as meaningful content. Tourism experiences such as "Learning Traditional Coffee Farming" or "Cultural Tours and the Philosophy of Gayo Coffee" could be developed into innovative attractions that draw interest.

The findings from the third hypothesis test (H3) reveal that the quality of human resources (HR) has a significant and positive impact on tourist attraction, evidenced by a path coefficient of 0.398, a t-statistic of 4.901, and a p-value of 0.000 (less than 0.05). This data suggests that higher-quality human resources involved in tourism management and service delivery increase the appeal of a destination for visitors. Competent human resources lead to enhanced visitor satisfaction and foster more favorable perceptions of the destination. These results align with previous research by [Jawabreh \(2021\)](#) and [Kapa et al. \(2022\)](#), which highlighted the critical role of human resource competence in the realm of educational tourism. Consequently, investments in training, education, and the empowerment of human resources are vital for the successful advancement of tourism development initiatives.

To develop Organic Gayo Coffee Eco Edu Tourism, it's essential to focus on capacity building for human resources, particularly for tour guides and Gayo coffee farmers. Additionally, local MSMEs in the tourism area can help promote the destination by selling Gayo coffee products. By strengthening the skills of these individuals, we can significantly enhance the overall appeal of the Gayo Coffee tourism experience. The results of the fourth hypothesis test (H4) indicate that Tourist Attraction

has a positive and significant influence on the Development of Eco Edu Tourism, with a path coefficient of 0.302, a t-statistic of 3.391, and a p-value of 0.000 ( $< 0.05$ ). This finding suggests that the higher the attractiveness of a tourism destination, the greater the potential for successful development of educational and ecological tourism (Eco Edu tourism) ([Farrell and Runyan, 1991](#))

Tourism managers are encouraged to design tour packages that present coffee plantations not merely as recreational sites, but also as engaging open-air learning environments. For example, visitors can participate directly in the organic coffee farming process and learn about agroforestry practices. To further enhance the authenticity and cultural richness of the experience, it is recommended to use local guides. The attractiveness of Eco Edu tourism in Gayo is not solely derived from what visitors see, but also from how the experience is delivered and felt.

The results of the fifth hypothesis test (H5) indicate that digital innovation has a positive and significant direct effect on the development of eco-educational tourism. The path coefficient is 0.182, the t-statistic is 2.240, and the p-value is 0.000 (which is less than 0.05). This finding suggests that implementing digital innovations—such as social media, online educational platforms, augmented reality, online booking systems, and virtual tours—can effectively support the growth of eco-educational tourism. This result aligns with a study conducted by [Moro and Rita \(2018\)](#), which shows that digitalization facilitates the broader, faster, and more interactive dissemination of educational and ecological values of tourism destinations. As a result, it significantly enhances both the attractiveness of these destinations and tourists' understanding of their offerings.

The development of Gayo Coffee Eco Edu Tourism necessitates the incorporation of digital innovations into its management systems. This statement includes the establishment of online booking platforms, e-ticketing solutions, and digital feedback mechanisms to enhance the ongoing digital transformation efforts that tourism managers have yet to implement fully. To facilitate this process, the government could collaborate with universities to offer technical assistance ([Huang et al., 2023](#); [Mohamed Hashim et al., 2022](#)) and guidance in the digitalization of Eco Edu tourism management processes

The results of the sixth hypothesis test (H6) show that local wisdom does not have a significant direct effect on the development of Eco Edu tourism, with a path coefficient of -0.059, a t-statistic of 0.565, and a p-value of 0.286 ( $> 0.05$ ). These findings suggest that, despite the considerable potential of the Gayo community's local wisdom as a source of cultural richness, these values have not yet been fully integrated into the practical development of Gayo Coffee educational tourism.

The current tourism management has not yet succeeded in transforming local wisdom from

merely traditional symbols into meaningful and memorable visitor experiences. However, this research finding also highlights the untapped potential of local wisdom to create such experiences. This potential may be attributed to several other factors, such as the less appealing presentation of local wisdom within tourism attractions, as well as the potentially low interest of tourists in local cultural values—as noted in previous studies by Purwoko et al. (2022) and Uslu et al. (2020). These findings serve as a critical reflection that local wisdom must be packaged more engagingly and creatively. This is not just a suggestion, but a pressing need to convey its value and meaning effectively. Such efforts are essential to ensuring that local wisdom.

The findings from the seventh hypothesis test (H7) reveal that the quality of human resources (HR) has a positive and significant direct impact on the development of eco-educational tourism. This is evidenced by a path coefficient of 0.441, a t-statistic of 6.625, and a p-value of 0.000 (which is less than 0.05). These results highlight the vital importance of HR quality in the successful advancement of eco-educational tourism initiatives. The competencies of HR in areas such as tourism service delivery, educational facilitation, and cultural interpretation are essential for crafting meaningful and memorable tourism experiences (Sulaiman Al Jahwari et al., 2016; Salazar, 2012). Furthermore, these findings suggest that the effectiveness of educational tourism is not solely dependent on natural beauty and cultural richness; rather, it is significantly shaped by the professionalism of individuals directly engaged in tourism operations, including coffee farmers, tour guides, local MSME participants, and tourism managers.

The findings from the seventh hypothesis test (H7) indicate that the quality of human resources (HR) has a positive and significant direct impact on the development of eco-educational tourism. The data show a path coefficient of 0.441, a t-statistic of 6.625, and a p-value of 0.000, which is less than 0.05. These results underscore the crucial role that HR quality plays in the successful advancement of eco-educational tourism initiatives. The competencies of HR in areas such as tourism service delivery, educational facilitation, and cultural interpretation are essential for creating meaningful and memorable tourism experiences (Sulaiman Al Jahwari et al., 2016; Salazar, 2012). Furthermore, these findings suggest that the effectiveness of educational tourism is not solely dependent on natural beauty and cultural richness; rather, it is significantly influenced by the professionalism of individuals directly involved in tourism operations, including coffee farmers, tour guides, local MSME participants, and tourism managers.

The results of the eighth hypothesis test (H8) reveal that Tourist Attraction does not mediate the effect of Digital Innovation on the Development of Eco Edu Tourism, with a mediation path coefficient of 0.009, a t-statistic of 0.352, and a p-value of 0.362

(> 0.05). This finding indicates that the implementation of digital technology at the Organic Gayo Coffee destination has not yet succeeded in enhancing the visitor experience to a level that significantly contributes to the attractiveness of the educational tourism destination. In other words, while the current application of digital technologies has not provided sufficient added value to enhance the destination's tourist appeal meaningfully, this finding underscores the importance of further research and development in digital innovation for the tourism industry.

The results of the ninth hypothesis test (H9) reveal an unexpected outcome: Tourist Attraction does not mediate the effect of Local Wisdom on the Development of Eco Edu Tourism. The mediation path coefficient is 0.209, the t-statistic is 1.106, and the p-value is 0.155 (> 0.05). This finding challenges the theoretical belief that local wisdom enhances tourist attraction and thereby supports the development of eco-educational tourism, as it was not statistically supported in the context of this study.

This finding has significant implications for future research and tourism development strategies. It may be since the cultural values and local traditions of the Gayo community have not been adequately managed or integrated into tourism practices, resulting in their limited impact on the development of educational coffee tourism. It may also indicate that local wisdom has thus far been presented in a superficial manner—merely as an accessory—rather than as a central and meaningful component of the educational tourism experience.

The results of the tenth hypothesis test (H10) demonstrate that Tourist Attraction significantly mediates the effect of Human Resource (HR) Quality on the Development of Eco Edu Tourism. The mediation path coefficient of 0.120, a t-statistic of 2.782, and a p-value of 0.030 (< 0.05) confirm this finding. It is not just about the direct impact of HR quality on Eco Edu tourism development, but also its indirect effect through the enhancement of tourist attractions. This complex relationship means that competent human resources can shape positive visitor perceptions of the destinations, specifically within the Gayo Coffee educational tourism context, which ultimately contributes to the success of tourism development.

This result is consistent with the findings of the third hypothesis. The development of eco-edu tourism is highly dependent on how the destination is designed and delivered through the involvement of professional human resources (Cordova-Buiza et al., 2025). Therefore, it's crucial to emphasize the need for strengthening the capacity and competence of human resources. This must be considered a key agenda to ensure that tourism managers can optimize the growth and impact of Gayo Coffee educational tourism.

Key to this study's findings is the pivotal role of digital innovation in advancing Eco Edu tourism. Local wisdom, while important, needs to be

presented in an appealing and meaningful manner. These insights are particularly relevant for developing countries with robust coffee cultures, like Ethiopia, Colombia, and Vietnam. By harnessing digitalization in marketing and operations, coffee plantations in these regions can be reimaged as tourist and educational hotspots.

Countries with a strong coffee culture are often home to unique local wisdom in farming systems and coffee processing. This knowledge can be a powerful draw for educational tourism. While agricultural-based educational tourism can complement various commodities, the local wisdom must take center stage. In the context of Gayo, this could mean showcasing the tumpangsari intercropping method, the traditional kopi tarik brewing technique, and other distinctive local practices that define the region. Human resources are a critical investment; therefore, training in tourism services should be an integral part of any strategy to develop eco-educational tourism. Lastly, as digitalization continues to evolve rapidly, especially with the widespread adoption of artificial intelligence (AI), such technologies must be embraced in the development of the tourism business sector. This emphasis on embracing digital tools motivates the audience and prepares them for the future of Eco Edu tourism.

#### 4. Conclusion and suggestions

In general, the success of *Eco Edu tourism* development does not solely depend on natural or cultural potential but is also largely determined by the quality of human resources delivering tourism services and the way Gayo Coffee tourism attractions in Takengon are effectively packaged. It is recommended that managers of Gayo Coffee educational tourism destinations develop integrated digital platforms such as a website, mobile application, and social media that not only provide marketing information but also present engaging educational content. This content should be so compelling that it sparks the interest and excitement of every potential visitor.

Furthermore, the local wisdom of the Gayo community is not just a component but the very essence of the educational tourism experience. It should be highlighted and incorporated as an authentic part of the tourism experience. The traditions of organic coffee farming, ceremonial practices, communal values, and the local philosophy of harmonious living are not just key educational materials but the heart and soul of the tourism framework. We should all feel a deep respect and appreciation for this rich cultural heritage.

At a global level, the potential for eco-educational tourism rooted in local wisdom is vast. This approach can be adopted in various countries that possess unique agricultural potential and rich cultural heritage. Nations with strong agrarian traditions can adapt the approach developed in Takengon to suit their local commodities—such as

strawberries, tea, chocolate, grapes, and others. The essential requirement is that local wisdom embedded in farming systems and processing methods must be effectively presented as compelling tourism attractions. This global potential should inspire us all to work towards a more sustainable and culturally rich tourism industry.

#### List of abbreviations

AI	Artificial intelligence
AR	Augmented reality
AVE	Average variance extracted
CBT	Community-based tourism
DTW	Tourist attractions (daya tarik wisata)
DPPM	Direktorat Penelitian dan Pengabdian kepada Masyarakat
GI	Geographical indication
HR	Human resources
HRM	Human resource management
ID	Digital innovation (inovasi digital)
KL	Local wisdom (kearifan lokal)
MSME	Micro, small, and medium enterprises
PEET	Eco-educational tourism for organic Gayo coffee
PLS-SEM	Partial least squares structural equation modeling
SDG-4	Sustainable development goal 4
SDM	Human resources (sumber daya manusia)
SEM	Structural equation modeling

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#### Compliance with ethical standards

#### Ethical considerations

This study was conducted in accordance with the ethical standards for research involving human participants. All participants were informed about the purpose of the study and voluntarily agreed to participate. No identifying personal data was collected, and all responses were kept confidential and used solely for research purposes.

#### Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

#### References

- Andini R, Muzaifa M, Marlina L, Sulaiman MI, Jaya R, Muslih AM, and Widayat HP (2021). Making biodiversity work for coffee production. A case study of Gayo Arabica coffee in Indonesia.



- MOJ Ecology & Environmental Science, 6(4): 156-162.  
<https://doi.org/10.15406/mojes.2021.06.00228>
- Bindawas AM (2025). Promoting sustainable tourism through employee skills: Contextualizing quality education and the human resource management perspective (SDG-4). *Sustainability*, 17(2): 748.  
<https://doi.org/10.3390/su17020748>
- Cordova-Buiza F, Medina-Viruel MJ, and Pérez-Gálvez JC (2025). Community-based rural tourism: A mapping technique analysis study from 2005 to 2023. *Humanities and Social Sciences Communications*, 12: 527.  
<https://doi.org/10.1057/s41599-025-04746-7>
- Farrell BH and Runyan D (1991). Ecology and tourism. *Annals of Tourism Research*, 18(1): 26-40.  
[https://doi.org/10.1016/0160-7383\(91\)90037-C](https://doi.org/10.1016/0160-7383(91)90037-C)
- Hair JF, Risher JJ, Sarstedt M, and Ringle CM (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(1): 2-24.  
<https://doi.org/10.1108/EBR-11-2018-0203>
- Huang CC, Li SP, Chan YK, Hsieh MY, and Lai JCM (2023). Empirical research on the sustainable development of ecotourism with environmental education concepts. *Sustainability*, 15(13): 10307. <https://doi.org/10.3390/su151310307>
- Jawabreh OA (2021). Tourists and local community of the case study Aqaba Special Economic Zone Authority (ASEZA). *Geo Journal of Tourism and Geosites*, 35(2): 490-498.  
<https://doi.org/10.30892/gtg.35229-676>
- Jaya R, Ferizal M, Ardiansyah R, Mirza I, Ismail M, and Rahmah FFF (2020). Sustainability design for development of Gayo's Science Park's. IOP Conference Series: Earth and Environmental Science, 418: 012087.  
<https://doi.org/10.1088/1755-1315/418/1/012087>
- Kapa MG, de Crom EP, and Hermann UP (2022). An exploration of tourist guides' competencies to create memorable tourist experiences. *GeoJournal of Tourism and Geosites*, 44(4): 1350-1358. <https://doi.org/10.30892/gtg.44421-953>
- Lubis A, Apriliya I, Harahap PAO, and Lubis NW (2022). Model of strengthening the economy of rice field agro-tourism in the pasar Melintang village. *Jurnal Ekonomi*, 11(3): 352-358.
- Mohamed Hashim MA, Tlemsani I, and Duncan Matthews R (2022). A sustainable university: Digital transformation and beyond. *Education and Information Technologies*, 27(7): 8961-8996.  
<https://doi.org/10.1007/s10639-022-10968-y>  
**PMid:35340534 PMCID:PMC8935252**
- Moro S and Rita P (2018). Brand strategies in social media in hospitality and tourism. *International Journal of Contemporary Hospitality Management*, 30(1): 343-364.  
<https://doi.org/10.1108/IJCHM-07-2016-0340>
- Neilson J, Wright J, and Aklimawati L (2018). Geographical indications and value capture in the Indonesia coffee sector. *Journal of Rural Studies*, 59: 35-48.  
<https://doi.org/10.1016/j.jrurstud.2018.01.003>
- Okazaki E (2008). A community-based tourism model: Its conception and use. *Journal of Sustainable Tourism*, 16(5): 511-529. <https://doi.org/10.1080/09669580802159594>
- Oncioiu I and Priescu I (2022). The use of virtual reality in tourism destinations as a tool to develop tourist behavior perspective. *Sustainability*, 14(7): 4191.  
<https://doi.org/10.3390/su14074191>
- Pratiwi MA and Wikantiyoso R (2022). Local wisdom as cultural resilience on tourism activities. *Local Wisdom Scientific Online Journal*, 14(1): 95-105.  
<https://doi.org/10.26905/lw.v14i2.6857>
- Purwoko A, Nurrochmat DR, Ekayani M, Rijal S, and Garura HL (2022). Examining the economic value of tourism and visitor preferences: A portrait of sustainability ecotourism in the Tangkahan protection area, Gunung Leuser National Park, North Sumatra, Indonesia. *Sustainability*, 14(14): 8272.  
<https://doi.org/10.3390/su14148272>
- Salazar NB (2012). Community-based cultural tourism: Issues, threats and opportunities. *Journal of Sustainable Tourism*, 20(1): 9-22.  
<https://doi.org/10.1080/09669582.2011.596279>
- Sulaiman Al Jahwari D, Sirakaya-Turk E, and Altintas V (2016). Evaluating communication competency of tour guides using a modified importance-performance analysis (MIPA). *International Journal of Contemporary Hospitality Management*, 28(1): 195-218.  
<https://doi.org/10.1108/IJCHM-02-2014-0064>
- Tanjung IS, Tanjung H, and Wibowo YS (2021). Development of tourism communication model based on local wisdom in Padangsidempuan. *Budapest International Research and Critics Institute-Journal (BIRCI-Journal)*, 4(4): 9877-9885.
- Teece DJ (2018). Business models and dynamic capabilities. *Long Range Planning*, 51(1): 40-49.  
<https://doi.org/10.1016/j.lrp.2017.06.007>
- Uslu A, Alagöz G, and Güneş E (2020). Socio-cultural, economic, and environmental effects of tourism from the point of view of the local community. *Journal of Tourism and Services*, 11(21): 1-21. <https://doi.org/10.29036/jots.v11i21.147>
- Zhang Y and Deng B (2024). Exploring the nexus of smart technologies and sustainable ecotourism: A systematic review. *Heliyon*, 10(11): e31996.  
<https://doi.org/10.1016/j.heliyon.2024.e31996>  
**PMid:38882334 PMCID:PMC11177145**
- Zinsli MJ (2023). Authorizing the 'taste of place' for Galápagos Islands coffee: Scientific knowledge, development politics, and power in geographical indication implementation. *Agriculture and Human Values*, 40(2): 581-597.  
<https://doi.org/10.1007/s10460-022-10364-9>