



Gamification and Marketing of Geotourism Destinations: Aras UNESCO Global Geopark in Iran

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Review Article

Received:

04-Aug-2024

Revised:

11-Oct-2024

Accepted:

19-Oct-2024

Published Online:

28-Feb-2025

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Abstract

We explore the impact of gamification on the marketing mix of geotourism destinations. This is a form of developmental research and is descriptive-analytical in nature and method. In the first phase, data were collected to develop an initial conceptual model through a semi-structured questionnaire and expert consultations, and the results were analyzed using thematic analysis. In the second phase, the initial conceptual model was tested in the Aras Global Geopark in Iran, the case study for this research, using a structured questionnaire and structural equation modeling. We find that gamification has a positive impact on the marketing mix of Aras Global Geopark, creating a unique experience for visitors by influencing elements such as product, price, promotion, place, people, process, and physical evidence. Moreover, it enhances visitors' awareness of the significance of geoheritage, contributing to the conservation of this valuable resource.

Keywords: Aras Geopark, Marketing Mix, Advertisement, Geoheritage, Geoconservation

Introduction

Tourism is a service industry that emphasizes the experiences created by tourists and service providers (Darban Astaneh *et al.* 2018; Mododi Arkhudi and Ferdowsi 2020 2021). In many tourism marketing studies, customer experience is considered a key factor in business success (Ghaderi *et al.* 2021; Ziari *et al.* 2019, 2020), contributing to customer loyalty to the destination (Karoubi & Ferdowsi 2021; Nemati *et al.* 2021; Jalali *et al.* 2017). One of the emerging practical concepts to enhance customer experience is gamification.

Gamification is defined as the application of game

design outside its original context (Deterding *et al.* 2011). In this regard, Maitland (2010) stated that modern visitors are no longer solely seeking well-known tourist attractions or specific destinations; they are not merely consumers of pre-packaged tourism products. The landscape of tourism and its methodologies are evolving, and gamification presents a significant opportunity to enhance the tourism experience. Employing techniques such as rewards and entertainment as incentives for various stakeholders, gamification aims to influence specific behaviors (Davoodi Ilkhechi and Ferdowsi 2023). It possesses the capability to enrich tourists' experiences in an innovative manner

by integrating game elements into tourism services (Negrusa *et al.* 2015). Within the tourism sector, gamification generates increased interest among certain visitors towards destinations, offering experiences and knowledge inaccessible through other means (Xu *et al.* 2017).

Examples of gamification in a geopark could include:

1. Interactive Guided Tours: Visitors use a mobile app that offers interactive challenges or quizzes related to the geosites they visit. Completing these challenges could earn them points or badges, which could be redeemed for rewards such as discounts at the visitor center or special recognition.

2. Scavenger Hunts: The geopark could organize scavenger hunts where visitors are tasked with finding specific geological features or completing certain activities. This would encourage exploration and engagement with the park's natural resources while making the experience fun and interactive.

3. Virtual Reality Experiences: Implementing virtual reality stations at key locations in the geopark could allow visitors to experience simulations of geological processes or historical events. This immersive experience would deepen their understanding and appreciation of the site's significance.

By incorporating such gamification strategies, the geopark can create a more engaging and memorable experience for its visitors.

Geotourism destinations play crucial roles as influential resources in tourism competition and maintaining a competitive position (Ziaee & Ferdowsi 2020). Geotourism, emerging as a new branch of tourism, has garnered attention from re-

searchers and tourists over the past two decades. Geotourism can gain a competitive edge through its positive social, environmental, economic, cultural, political, and technological attributes (Pourfaraj *et al.* 2019). Meanwhile, geoparks stand out as among the most significant geotourism destinations, designated with a focus on conserving geoheritage (Ferdowsi 2024 a,b). Geoparks possess geoheritage with scientific, ecological, aesthetic, cultural, and economic values (Pourfaraj *et al.* 2020), making them attractive destinations for tourists with diverse natural and cultural heritages (Briggs *et al.* 2023).

In this context, Aras Global Geopark, listed in UNESCO's Global Geoparks Network in 2023, presents a promising opportunity. Beyond its geotourism attractions, this area boasts historical and cultural landmarks such as Saint Stephanos Monastery and Khajeh Nazar Caravanserai. Hence, the trustees of Aras Global Geopark need to incorporate advertising and marketing strategies into their agenda, and gamification emerges as a tool that can effectively contribute. Studies focusing on the integration of gamification techniques within geopark marketing strategies are scarce. Existing literature predominantly explores the contributions of geoparks to earth sciences, geosciences, and geoheritage promotion (Catana & Brilha 2020). Alternatively, some research delves into the examination of individual geopark websites and their unique features (Wisnuadhi *et al.* 2022). The primary question of this research is: What impact do gamification plans and programs have on the marketing mix of geotourism destinations?

Conceptual Framework

Marketing of Geotourism Destinations

Martini (2000) suggested that geotourism could serve to finance geoconservation efforts, particularly in light of governmental limitations or po-

tential reluctance. Genuine geotourism entails an exploration and comprehension of the geological foundations of geosites and geomorphosites, along with their interpretive media and marketing, as well as the lives, work, collections, publications, artworks, field notes, personal papers, workplaces, residences, and even final resting places of geoscientists (Hose 2021).

The marketing of a geotourism destination should account for the abiotic features of landscapes and their interconnections with biotic and cultural elements. It should showcase activities where geodiversity serves as the focal point, as this is its distinguishing factor. Destinations lacking evidence of geodiversity and geoheritage in promotional materials and valorization efforts, offering only scenic enjoyment without fostering a deeper connection to the territory, cannot rightfully claim the title of geotourism destinations (Meira *et al.* 2021). While geoscientists should maintain scientific integrity, they must recognize that managing a geopark as a geotourism destination requires more than geological expertise; it necessitates collaboration and teamwork among professionals in marketing, management, communication, education, and other relevant fields (Meira *et al.* 2021). Marketing plays a pivotal and indispensable role in the effective management of geoparks, serving as a potent tool in achieving objectives within this domain (Molokac *et al.* 2023).

Gamification and Tourism Marketing

Gamification, as outlined by Deterding *et al.* (2011), refers to a motivational design technique that incorporates elements and mechanics commonly found in games into non-game contexts. Within the tourism sphere, gamification has been recognized as a tool with the potential to integrate augmented reality, virtual reality, and 3D technologies, thereby creating immersive and captivating experiences of tourist attractions (Xu *et al.* 2016). Its application extends to enhancing visitor expe-

riences in museums (Kasurinen & Knutas 2018) and festivals (Li *et al.* 2019), as well as bolstering brand awareness and loyalty towards destinations (Xu *et al.* 2017) and travel agencies (Abou-Shouk & Soliman 2021).

Considering that gamification extends beyond traditional gaming contexts (Deterding *et al.* 2011) and companies are actively seeking tools to engage with users, including tourists (Xu *et al.* 2016), gamification emerges as a persuasive strategy employing game mechanisms such as points, leaderboards, achievements, badges, and rewards to influence user behavior (Hamari *et al.* 2014). Gamification impacts various areas including brand awareness, enhancing tourist experiences, fostering tourist loyalty, promoting entertainment and tourist engagement (Xu *et al.* 2016; Kaya & Eren 2023), encouraging sustainable tourist behaviors (Pasca *et al.* 2021), and more. One significant application of gamification in tourism lies in destination marketing. Destination management organizations (DMOs) can leverage gamification to enhance tourist experiences and increase satisfaction in their programs. The integration of game mechanisms into digital platforms, including DMO applications and city-specific apps, enables the attraction and retention of more visitors while providing providers with extensive data on tourist preferences, perceptions, feedback, and itineraries (Sigala 2015). Gamified programs find utility in various tourism-related sectors such as theme parks, museums, restaurants, and beyond (Farhadi & Tabrizi 2023).

Marketing Mix

The marketing mix serves as the cornerstone for marketers, encompassing a range of elements essential for the successful execution of marketing strategies and positioning (Ferdowsi *et al.* 2018a, b; Wardana 2018). According to Kotler & Armstrong (2016), it constitutes a toolkit of tactical instruments amalgamated by companies to elicit the

desired response from their target audience. Traditionally, the marketing mix comprises four fundamental components: product, price, place, and promotion (Motiei Langeroudi *et al.* 2017). Nevertheless, industry experts argue for the inclusion of three additional elements in service-oriented contexts, thus expanding it to the 7P's framework, which includes People, Process, and Physical Evidence (Prapanneitivuth 2015).

Product: Products encompass offerings tailored to meet market demands, ranging from tangible goods to intangible services, experiences, events, and even ideas. Not limited solely to physical entities, products also encompass the intangible benefits and experiences that companies provide to consumers (Kotler & Keller 2016). The diversity of tourism products attracts more tourists and can create positive feelings, encouraging them to return to the destination (Tsaour & Yan 2016). Since a tourism product is essentially an experiential one and is difficult to evaluate before purchase, tourists often exhibit heightened sensitivity to risks and uncertainties associated with tourism products (Tan & Ooi 2018). In this regard, the following hypothesis is proposed:

H1: Gamification measures in Aras Global Geopark have a positive effect on the product component of the marketing mix of geotourism destinations.

Price: Price, in essence, signifies the relative worth attributed to a product. It is important to note that this value doesn't necessarily correlate directly with the resources invested in producing the product (Ramli 2013). The price of products and services significantly influences the attraction of both future and current customers (Al Muala & Al Qurneh 2012), encompassing transportation expenses to the destination, accommodation, food, attractions, and tour service costs. In this regard, the following hypothesis is proposed:

H2: Gamification measures in Aras Global Geopark have a positive effect on the price component of the marketing mix of geotourism destinations.

Promotion: Promotion constitutes a pivotal component of the marketing mix, dedicated to activities aimed at informing, persuading, and reminding consumers about a company's brands and offerings (Tjiptono 2015). Utami (2016) further delineates three primary promotional tools frequently employed: advertising, direct selling, and sales promotion. Promotion in tourism serves to capture the interest of potential tourists and also affects the behavior of existing tourists. In this regard, the following hypothesis is proposed:

H3: Gamification measures in Aras Global Geopark have a positive effect on the promotion component of the marketing mix of geotourism destinations.

Place: Place refers to the physical infrastructure of a store, playing a pivotal role in shaping consumers' perceptions. It encompasses the strategic positioning of a store and its activities in providing the necessary service channels for consumers (Utami 2016). Indeed, the place serves as the exchange route through which a tourist can access a tourism product (Sadq *et al.* 2019). Additionally, due to the nature of tourism services, irrespective of the place of production or consumption, it entails the travel of customers to access the product (Cengiz & Yayla 2007). In this regard, the following hypothesis is proposed:

H4: Gamification measures in Aras Global Geopark have a positive effect on the place component of the marketing mix of geotourism destinations.

Process: Process variables encompass various indicators that can be gauged using the following metrics (Wardana 2018): a) Flow of activities; b) Task schedules; c) Routines. Given that tour-

ism is a diverse communication service, tailored to customers' specifications such as their desires, expectations, preferred delivery time, program duration, and more, there should be a high level of flexibility in the service delivery method and process (Sadq *et al.* 2019). Consequently, effective management of tourism service processes will elevate tourists' satisfaction levels and result in repeat visits and positive word-of-mouth advertising (Magatef 2015). In this regard, the following hypothesis is proposed:

H5: Gamification measures in Aras Global Geopark have a positive effect on the process component of the marketing mix of geotourism destinations.

People: People, also referred to as participants, are individuals employed by product or service providers, sales personnel, or those directly or indirectly engaged in the process (Kotler & Keller 2016). In the field of tourism, people are the most crucial element in the marketing of products and services. The actions of all employees typically impact the organization's performance and are considered key to the success of a business. Many services involve personal interactions between customers and employees and strongly influence consumers' perceptions of service quality (Agusdin *et al.* 2018). In this regard, the following hypothesis is proposed:

H6: Gamification measures in Aras Global Geopark have a positive effect on the process component of the marketing mix of geotourism destinations.

Physical Evidence: Physical Evidence, often overlooked yet crucial, refers to the tangible environment where interactions occur directly between businesses and consumers (Wardana 2018). Physical facilities play a pivotal role in securing the desired market share, as optimal positioning can establish a favorable corporate image among

consumers (Utami 2016). In the field of tourism, physical evidence relating to the tourism product includes the location, decor, and arrangement of the product, as well as people and anything else that may be related to the experience (Moorthi & Roy 2017). Physical evidence includes the provided environment, atmosphere, and layout of the accommodation that tourists experience and evaluate the quality-of-service delivery (Al Muala 2018). In this regard, the following hypothesis is proposed:

H7: Gamification measures in Aras Global Geopark have a positive effect on the physical evidence component of the marketing mix of geotourism destinations.

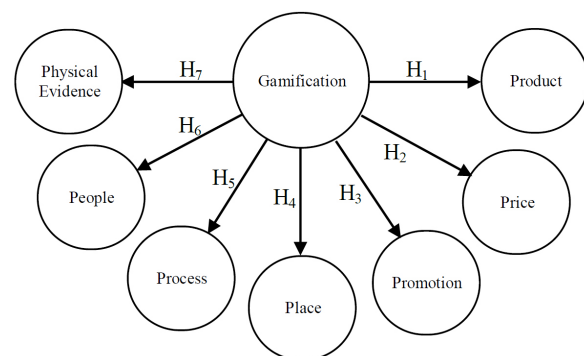


Figure 1. Research conceptual model.

In the following, the hypotheses proposed in the form of a conceptual model illustrating the influence of gamification on the marketing mix of geotourism destinations are depicted in Fig. 1.

Geopark Outline

The Aras UNESCO Global Geopark is located in Jolfa County in Iran (Fig. 2) and covers an area of 1670 km². The management of the Aras Global Geopark, similar to other geoparks in Iran, is under government control. Specifically, the management is organized as the Aras Global Geopark Office, operating under the Aras Free Zone Organization. Funding for this geopark comes partly from the revenues generated through fees for

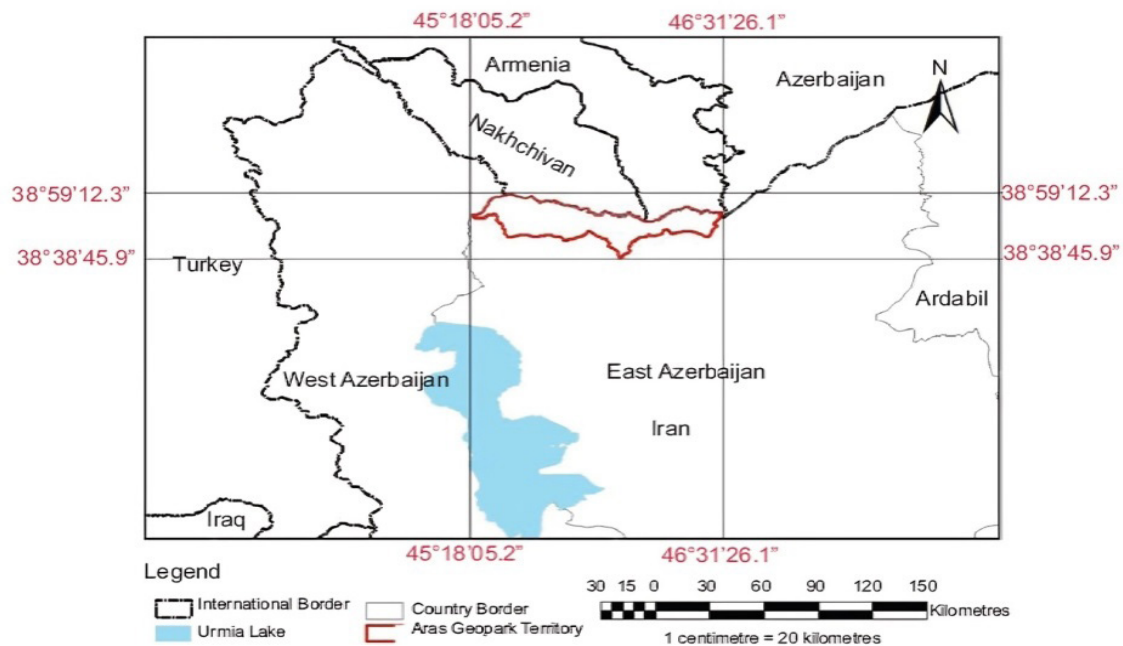


Figure 2. Geographical location of Aras Global Geopark in Iran (Sadry et al. 2022).

services provided to visitors, and partly from government budget allocations. This mixed model of service-based income and governmental support ensures the sustainability and development of the geopark.

Aras UNESCO Global Geopark is part of the Lesser Caucasus terrane, shaped by the collision of the Iran-Eurasia plates in the late Triassic and later, the Arabian-Central Iran microcontinents in the late Miocene. The Permian-Triassic Boundary, observable in the Geopark, is considered the most important geological feature with international significance (UNESCO 2023). The topography of Geopark is generally extremely steep, forming astonishing landscapes. The highest point in the Jolfa region is Kiyamaki Mount at 3,347 m, while the lowest points include the northern boundary and the Aras River valley at 720 to 390 m. Given its climate, the area has diverse vegetation, with the Aras Valley covered by subtropical trees, the western and middle parts dominated by steppe,

and the Arasbaran dense forests seen on the eastern slopes. The permanent snow line is located above an altitude of 3,000 m. The main river in the area is the Aras River, which forms the northern boundary of the Geopark with Armenia and the Nakhchivan Autonomous Republic (www.geoparkaras.com). The geosites of Aras Global Geopark are depicted in Figs.3 and 4.

The area has significant geotourism attractions due to its mountainous landscapes, outcropping of different sedimentary and igneous rocks, diversity in tectonic structures, semi-cold and semi-arid climate, and diverse flora and fauna. The main geosites in the Geopark include Kamtal, Marakan, Darediz, and Kiyamaki localities, which, given their diverse flora and fauna, are protected by the Iranian Department of Environment. Among the most notable geological features of the Geopark are the Paleozoic-Mesozoic sedimentary rock sequence, especially the conformity of Permian to Triassic sediments, which is very interesting

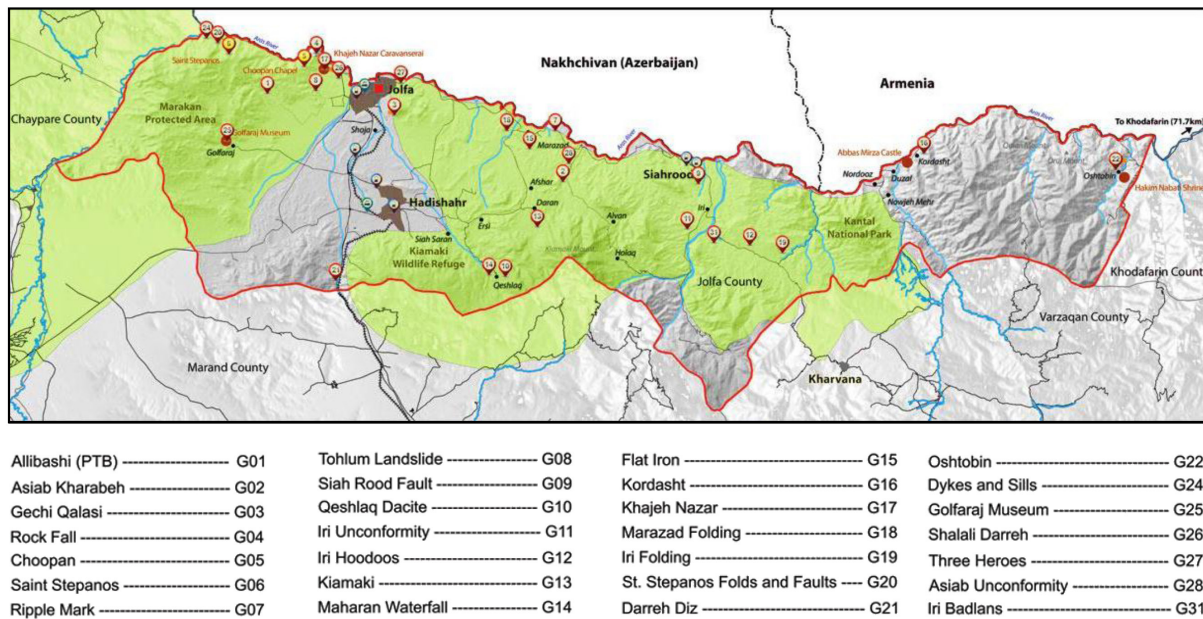


Figure 3. Geographical location of Aras Global Geopark in Iran (www.geoparkaras.com).



The calcite deposits of Gechi Qalasi spring are particularly colorful, featuring yellow, lemon, red, brown and white. It is one of many travertine springs in Aras UNESCO Global Geopark, Iran. The chemical precipitation of calcium carbonate minerals from these springs forms a sedimentary rock called travertine.

Bandlands geosite in Aras UNESCO Global Geopark, Iran. Bandlands are a type of dry terrain where softer sedimentary rocks and clay-rich soils have been extensively channels, separated by short, steep ridges.

Hoodoos are slim tall columns of sedimentary rocks left by erosion. This Hoodoo, carved from Miocene sediment, is found near the roads leading from Iri to Holoq and to Dastgerd in Aras UNESCO Global Geopark, Iran.

Figure 4. Some geosites of Aras Global Geopark (UNESCO 2023), retrieved from <https://www.unesco.org/en/igpp/geoparks/aras>.

for geologists, plutonic provinces, and extensive granitic rocks covering the eastern part of the area, volcanic and sub-volcanic provinces that form the Kiyamaki dome, compression regime resulting from Alpine Orogeny causing the development of different structural features such as faulting, thrusting, and folding of rocks, fossil site localities, mineral springs that deposit travertine, and finally, the Aras River and its related geomorphic features. Each of these phenomena can show different orogenic phases, their forming processes, and the life history of our planet (www.geopark-aras.com).

Materials and Methods

Our research falls under the category of developmental-applied research based on its purpose and descriptive-analytical research based on its nature and method. It is single-section research in terms of time, and combined research in terms of the method of data collection and analysis.

Data collection and analysis were conducted in two steps. In the first stage (qualitative stage), research indicators were formulated by questioning experts in the field of geotourism using a semi-structured questionnaire. The responses from the experts

were analyzed using thematic analysis. The concepts extracted from the interview texts were categorized into components of the conceptual model. These identified factors were then structured into a questionnaire and validated by resending it to the experts. Data collection was carried out in the second stage (quantitative stage) to test the initial conceptual model of the research in Aras Global Geopark, as a case study of the research. A structured questionnaire based on a 5-point Likert scale was prepared and completed by the respondents. The collected data were analyzed using the struc-

tural equation modeling technique (SmartPls software).

The statistical population in the qualitative stage of the research, which was taken into consideration to compile and validate the indicators of the initial conceptual model of the research, includes scientific and executive experts in the field of tourism and marketing in Iran. Sampling in the qualitative part of the research was done purposefully using the snowball technique. The interviews were conducted in Persian. The number of sam-

Table 1. Characteristics of the experts.

Row	Educational Level	Specialization	Occupation	Experience	Count
1	PhD	Tourism	University Lecturer	5 to 10 years	4
2	PhD	Marketing	University Lecturer	5 to 10 years	3
3	Master's	Geotourism	Tour Guide	3 to 5 years	3
4	Master's	Ecotourism	Tour Guide	3 to 5 years	2

ples based on theoretical saturation was equal to 12 people (Table 1) who were asked seven questions, to express the factors affecting the marketing of geoparks based on the seven components of the marketing mix.

The statistical population includes people who have sufficient knowledge about the subject of geotourism, either through expertise/related fields or at least three years of experience in activities related to geotourism. According to Hair *et al.* (2013), the sample size criterion should be assessed through power analysis for multiple regression models of each model. This study used a priori sample size calculator for structural equation modeling (SEM) (Soper 2024). This software requires input data such as the anticipated effect size, statistical power levels, the number of observed variables (all the measurement items/indicators) and latent variables (both endogenous and exogenous constructs) in the model, and the desired probability of detecting the minimum sam-

ple size for SEM technique (Cohen 2013). Given the number of observed ($N = 34$) and latent ($N = 8$) variables, the anticipated effect size ($d = 0.30$), the desired probability ($p = 0.05$), and the statistical power (0.95), a minimum sample size of 256 was required. Since the sample size of this study is 296, this requirement is met.

To ensure the validity of the questionnaire in the quantitative stage of the research, both divergent validity and convergent validity were assessed. The results of these assessments are presented in the findings section. Additionally, the reliability of the research was evaluated through factors such as the coefficient of factor loadings, combined reliability, and Cronbach's alpha. The outcomes of these analyses are described in the findings section.

Results

In the first stage of the research (qualitative stage), experts were consulted to identify the indicators

of the research conceptual model. The experts' responses were analyzed using thematic analysis, resulting in the identification of 28 basic themes. In this regard, following a deductive approach, the identified basic themes were categorized according to the components of the marketing mix. As

shown in Table 2, the 28 basic themes were assigned to the seven components of the marketing mix, including product, people, price, place, process, physical evidence, and promotion.

In the second stage of the research (quantitative stage), three parts were implemented to test the

Table 2. Indicators of the initial conceptual model of the research.

Component	Code	Indicators
Gamification	G1	The scientific value of geopark for gamification plans
	G2	The ecological value of geopark for gamification plans
	G3	The aesthetics value of geopark for gamification plans
	G4	The cultural value of geopark for gamification plans
	G5	The economic value of geopark for gamification plans
	G6	The educational value of geopark for gamification plans
Product	P1	(.Natural attractions (including waterfalls, caves, mountains, forests, biodiversity, etc
	P2	(.Artificial attractions (including museums, theme parks, stores, etc
	P3	(.Heritage/Cultural attractions (including castles, tombs, monuments, etc
	P4	Events and festivals
Price	P5	Attracting investors and providing facilities and equipment
	P6	Uniqueness of services and products
	P7	Provisioning discounts and special offers
	P8	Encouraging people to visit through group tours
Promotion	P9	Generating positive word-of-mouth advertising
	P10	Attracting event organizers to the geopark location
	P11	Quality of public relations accountability
	P12	Promotional efforts and activities through social media
Place	P13	Spatial distribution of services within the geopark
	P14	Accessibility of routes and transportation facilities within the geopark
	P15	Quality of service and accommodation facilities within the geopark
	P16	Quality of infrastructure within the geopark
Process	P17	Management process for visitor arrivals and departures
	P18	Management process for tours and activities within the geopark
	P19	Security management within the geopark
	P20	Education and information dissemination process
People	P21	Performance of geotourism guides within the geopark
	P22	Performance of geopark service center employees
	P23	Performance of geopark managers and decision-makers
	P24	Interaction between local residents and tourists within the geopark
Physical Evidence	P25	Appearance of buildings and structures within the geopark
	P26	Quality of design and layout of geopark spaces
	P27	Quality of signage within the geopark
	P28	Natural characteristics of places and spaces within the geopark

initial conceptual model: 1) fitting the measurement model; 2) fitting the structural model; and 3) evaluating the overall fit of the model.

Fitting the measurement model: The fit of the measurement model was assessed by examining the reliability and validity of the research constructs. Three reliability criteria (coefficients of factor loads, Cronbach's alpha, and Composite reliability) as well as convergent validity and divergent validity, were employed to evaluate the fit of the measurement model.

A) Reliability: To assess the reliability of the measurement model, factor loadings, Cronbach's alpha, and composite reliability were calculated as follows:

Coefficients of factor loads: The reliability of each index refers to the amount of factor loads of each of the observed variables. This is used to determine how acceptable the measurement indices (observed variables) are for measuring hidden variables. An acceptable value is at least 0.3, while factor loads in the range of 0.4 to 0.5 indicate a medium level of significance. In confirmatory factor analysis, values of factor load higher than 0.5 indicate a strong significance level and high correlation between the observed variables and the factor, indicating a well-defined structure (Kalan-tari 2013). Fig. 5 illustrates the measurement model of the impact of gamification on the marketing mix of Aras Global Geopark. The results of the confirmatory factor analysis and the analysis of the coefficients of factor loads show that the factor load of all indicators is more than 0.5, indicating that they are able to measure the construct with high correlation.

Cronbach's alpha: This criterion is used to measure reliability and the internal stability evaluation index. Internal stability indicates the degree of correlation of a construct and its related indicators. For variables with a small number of questions,

the alpha coefficient value of 0.6 is the minimum threshold for reliability, and values higher than 0.7 are considered acceptable (Davari and Rezazadeh 2013). In the current research model, the alpha coefficient value for all research components has been calculated to be greater than 0.7, indicating the acceptable reliability of the measurement model (Table 3).

Composite reliability (CR): This criterion offers an advantage over Cronbach's alpha coefficient as it evaluates the reliability of constructs based on their correlation with each other, rather than in absolute terms. Both criteria are utilized to enhance the reliability assessment. A composite reliability value above 0.7 for each construct indicates appropriate internal stability for measurement models, while a value below 0.6 suggests inadequate reliability (Davari and Rezazadeh 2013). In the current research, the composite reliability values for the components were calculated to be above 0.7, indicating the acceptable reliability of the measurement model (Table 3).

Convergent validity: After examining the reliability criterion, the second criterion for assessing the fit of the measurement model is convergent validity. This involves investigating the average variance extracted (AVE), which assesses the correlation between each construct and its indicators (Davari and Rezazadeh 2013). The AVE criterion indicates the average variance shared between each construct and its indicators, with a value of 0.4 or higher considered sufficient. In the current research, the convergent validity value for the components was calculated to be above 0.4, indicating the adequacy of convergent validity for the measurement model (Table 3).

Divergent validity: The third criterion for assessing the measurement model is divergent validity, which is evaluated using the reciprocal factor loads method and the Fornell and Larcker method. In the reciprocal factor loads method, the correla-

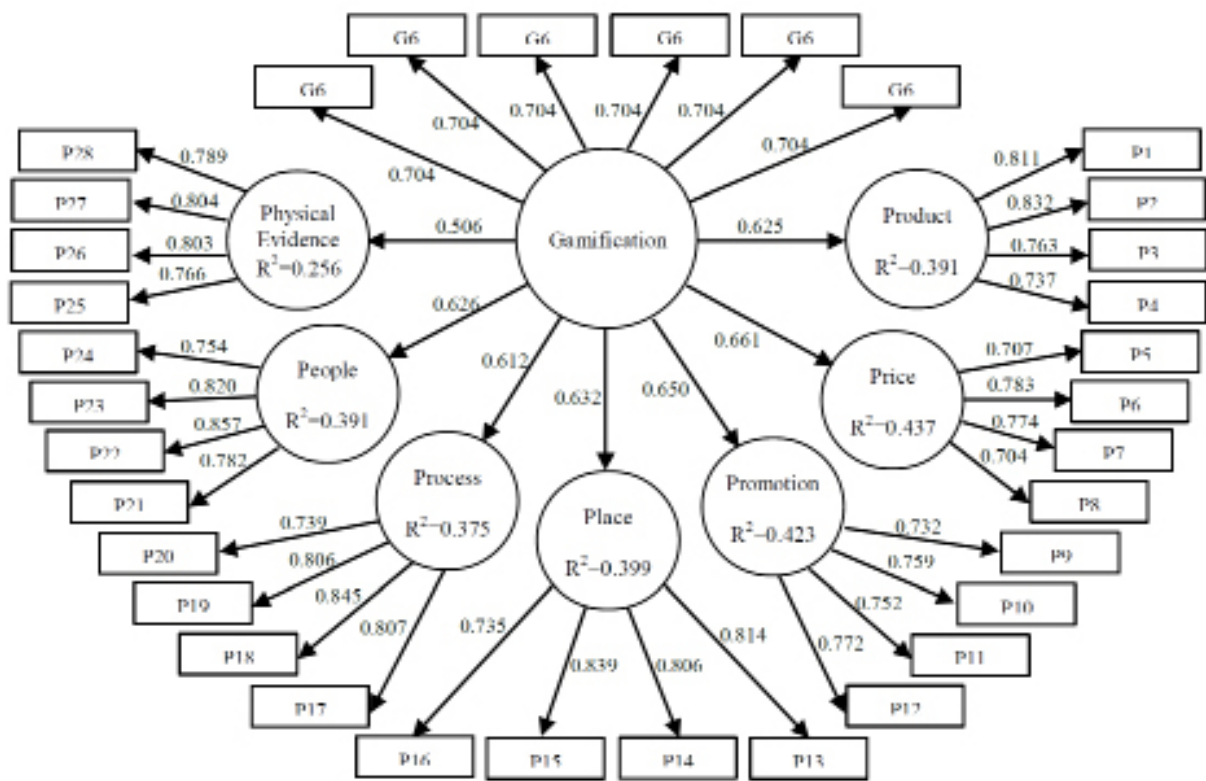


Figure 5. Measurement model.

Table 3. Cronbach's alpha, Composite reliability, Convergent validity, Divergent validity (Fornell-Larker method).

Component	Cronbach's alpha	Composite reliability (CR)	Average variance extracted (AVE)	Gamification	Promotion	Physical Evidence	Process	Price	Product	People	Place
Gamification	0.859	0.895	0.587	0.766							
Promotion	0.747	0.840	0.568	0.650	0.754						
Physical Evidence	0.801	0.870	0.625	0.506	0.538	0.791					
Process	0.812	0.877	0.640	0.612	0.666	0.648	0.800				
Price	0.729	0.831	0.552	0.661	0.738	0.501	0.565	0.743			
Product	0.794	0.866	0.619	0.625	0.634	0.438	0.525	0.631	0.787		
People	0.817	0.880	0.647	0.626	0.665	0.652	0.747	0.578	0.501	0.804	
Place	0.811	0.876	0.639	0.632	0.649	0.671	0.712	0.608	0.485	0.682	0.799

tion between the indicators of a construct with that construct is compared to the correlation between the indicators of a construct with other constructs. If it is found that the correlation between an indicator and a construct other than its own is higher than the correlation with its own construct, it indicates a lack of validity. The row of the mutual factor loading matrix represents the indicators, while the columns represent the constructs in the research model. The values in this matrix indicate the correlation between the indicators and the constructs (Abasi Esfanjani 2017). Since the correlation values between the factor loads of the items related to each construct in the current research are higher than the correlation of those items with other constructs, this demonstrates the appropriate divergence of the model using the first method.

In the second method of assessing divergent validity (Fornell-Larcker), the relationship between a construct and its indicators is compared to the relationship between that construct and other constructs. Acceptable divergent validity indicates that a construct interacts more strongly with its indicators than with other constructs. This is examined using a matrix where the values represent the correlation coefficient between the constructs and the square root of the AVE values for each construct. According to Table 3, since the square root of the AVE values for each construct, located on the main diagonal of the matrix, is greater than the

correlation values between them, which are situated in the lower and right-hand cells of the main diagonal, it can be concluded that in the current research, the constructs of the model exhibit stronger interactions with their indicators than with other constructs. In other words, the divergent validity of the measurement model is suitable.

Fitting the structural model: After confirming the acceptability of the measurement model, the fit of the structural model needs to be examined. Unlike assessing the fit of the measurement model, which considers the relationships between latent variables and manifest variables, assessing the fit of the structural model involves examining the relationships between latent variables themselves. For this purpose, criteria such as t-values, R^2 , Stone-Geisser (Q^2), and the redundancy criterion is investigated.

Significant t-values: The evaluation of the structural model's fit relies on t-values as a fundamental criterion. A value exceeding 1.96 signifies the validity of the relationship between constructs, confirming research hypotheses at a 95% confidence level. Fig. 6 displays the t-values for assessing the structural aspect of the research model. As all values surpass 1.96, this indicates the significance of the paths and the adequacy of the research's structural model.

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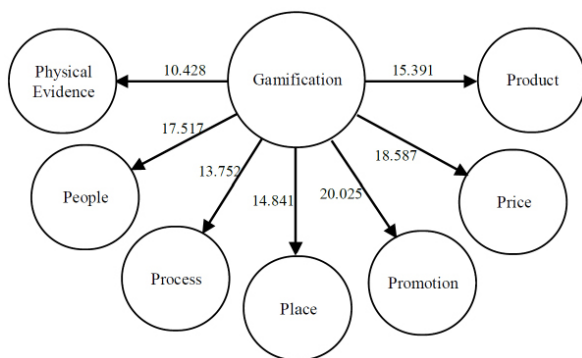


Figure 6. Structural model in the form of significance of path coefficients.

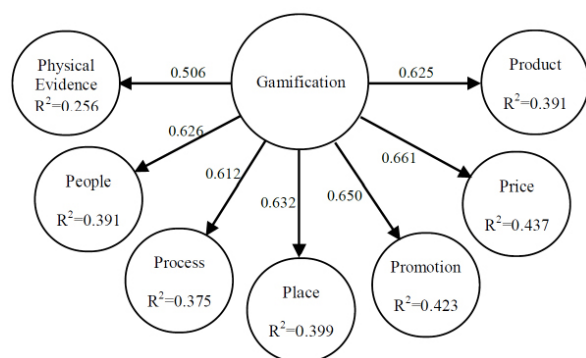


Figure 7. Structural model in the form of path coefficients.

sessing the fit of the structural model is the examination of the determination coefficients (R^2) related to the endogenous (dependent) variables of the model. This criterion is used to connect the measurement part and the structural part of structural equation modeling and expresses the effect of an exogenous variable on an endogenous variable. For this criterion, the three values are 0.19, 0.33,

and 0.67 as the criterion values for weak, medium, and strong values of R^2 (Chin 1998). The coefficient of determination values is presented in **Table 4** and Fig. 7. Considering that the value of for product, price, promotion, place, process, and people variables is more than 0.33 and only for the physical evidence variable is more than 0.19, so the fit of the structural model is confirmed.

Table 4. Q^2 , R^2 , Redundancy.

Component	R^2	Q^2	Redundancy
Product	0.39	0.23	0.24
Price	0.44	0.23	0.24
Promotion	0.42	0.22	0.24
Place	0.40	0.24	0.26
People	0.39	0.24	0.25
Process	0.38	0.22	0.24
Physical Evidence	0.26	0.15	0.16

Stone-Geisser (Q^2): This measure determines the predictive power of the model, and the models that have an acceptable structural fit should be able to predict the indicators related to the endogenous structures of the model. This means that if in a model, the relationships between the structures are correctly defined, the structures can sufficiently influence each other's indicators and in this way, the hypotheses can be correctly confirmed. For this criterion, three values are 0.02, 0.15, and 0.33 as the criterion values for weak, medium, and strong values of Q^2 (Henseler 2009). If the value of Q^2 becomes zero or less than zero in the case of an endogenous structure, it indicates that the relationships between other structures in the model and the endogenous structure are not well explained (Davari & Rezazadeh 2013). According to Table 4, the value of Q^2 for all endogenous structures of the model is greater than 0.15. Therefore, the research model has a suitable structural fit.

Redundancy criterion: This criterion is obtained from the product of the common values of the structures in their corresponding R^2 values and indicates the amount of variability of the indices of an endogenous structure that is affected by one or more exogenous structures. For the redundancy criterion, its positivity is considered. Regarding the criterion value for this index, it is an unstat-ed number, and the average redundancy index is a general measure of the quality of the structural model that is used for all endogenous structures and is calculated only for use in the formula for calculating the overall model fit and the goodness of fit index (GOF). Redundancy criterion values are presented in Table 4.

Fitting the general model: To check the fit of the overall model, only one criterion called GOF is used, which controls both parts of the measurement model and the structural model. Three values of 0.01, 0.25, and 0.36 have been introduced as

weak, medium, and strong values for GOF (Wetzels 2009). This criterion is calculated through the following equation (1):

$$\text{GOF} = \sqrt{\text{average}(\text{Comunality}) \times R^2} \quad \text{Eq.1}$$

The average R^2 of hidden variables is equal to 0.319. Additionally, the mean commonality (community values) of hidden variables is equal to 0.613. Therefore, the GOF value of the overall model is equal to 0.442, indicating that the fit of

the overall model is strong.

After confirming the proper fit of the research model, the research hypotheses can be tested accordingly. The results of the hypothesis testing are presented in Table 5.

According to Table 5, since the path coefficients for the components of product, price, promotion, place, people, process, and physical evidence are all greater than 0.4, and the t-statistics for these

Table 5. Hypothesis resting results.

Hypotheses	Relationship	Path Coefficient (β)	t-value	Relationship Significance	Hypothesis Outcome
H1	Gamification \rightarrow Product	15.391	0.625	Significant	confirmed
H2	Gamification \rightarrow Price	18.587	0.661	Significant	confirmed
H3	Gamification \rightarrow Promotion	20.025	0.650	Significant	confirmed
H4	Gamification \rightarrow Place	14.841	0.632	Significant	confirmed
H5	Gamification \rightarrow People	17.517	0.626	Significant	confirmed
H6	Gamification \rightarrow Process	13.752	0.612	Significant	confirmed
H7	Gamification \rightarrow Physical Evidence	10.428	0.506	Significant	confirmed

factors exceed 1.96, all research hypotheses were confirmed. Thus, gamification initiatives can have a positive and significant impact on the marketing mix of Aras Global Geopark.

Discussion

The potential for implementing gamification strategies in the Aras Global Geopark is intrinsically linked to the characteristics of its visitor demographic. Due to the rugged and non-vehicle-accessible nature of many geosites, a significant portion of the park's visitors consists of young individuals capable of navigating challenging terrains. This demographic primarily includes children, teenagers, and young adults, groups that are typically highly receptive to interactive and gamified experiences, particularly those involving virtual elements. Given the strong interest of these age

groups in engaging with game-based and interactive activities, integrating gamification into the geopark's offerings would align well with the preferences of its core visitors. Moreover, the geopark has already established a foundation for engaging these groups through various educational and experiential programs. These include geotourism education initiatives in schools, structured visits by children and teenagers to visitor centers within the geopark, and field trips for school and university students. These existing programs underscore geopark's commitment to engaging younger audiences and highlight its ability to employ innovative methods to enhance their experience. Furthermore, the necessary infrastructure and technical resources for implementing gamification are readily available in Iran, and the management of the geopark has demonstrated the expertise required

to successfully execute such initiatives. Given these factors, both the visitors and the administration are well-positioned to embrace and benefit from gamification, as well as other advanced marketing and engagement strategies.

This research aimed to investigate whether the potential of gamification could be utilized to enhance visitor engagement and experience in the geopark. According to the research findings, the implementation of gamification programs in Aras Global Geopark has the most positive impact on the price component with a path coefficient of 0.661. The price of products and services has a significant impact on attracting future and current customers (Al Muala & Al Qurneh 2012) and determines the competitiveness of a destination against others (Kamau *et al.* 2015). The price component is defined through four indicators, including: “Attracting investors and providing facilities and equipment”, “Uniqueness of services and products”, “Provisioning discounts and special offers”, “Encouraging people to visit through group tours”. Gamification programs can encourage investors to invest in the region by creating more attractiveness. The attraction of capital and the subsequent increase in facilities and equipment in the region have led to competition between service providers, which in turn lead to price adjustments. Additionally, gamification programs can enhance the uniqueness of products and services offered by Aras Global Geopark, justifying prices compared to other regions. Furthermore, trustees of Aras Global Geopark, by designing and implementing games that offer prizes in the form of discounts and special offers to visitors, can enhance visitor satisfaction with product and service prices. Also, group-oriented games resulting in group discounts can positively impact visitor satisfaction by reducing prices. These findings align with those of Xu *et al.* (2014), Huang *et al.* (2019), and Polo Peña *et al.* (2024), who have highlighted that gamification of services in destinations enhances communica-

tion between tourists and service centers, provides opportunities for active user participation and offers unique and appealing experiences.

Also, the findings of the research showed that the implementation of gamification programs in Aras Global Geopark has a positive effect on the promotion component with a path coefficient of 0.650. Promotion is a way of communication to inform and persuade visitors to evaluate the usefulness of tourism (Ukaj 2014), and in the meantime, the element of advertisement in the tourism industry is the most used among other promotion policies (Aldebi & Aljboory 2018). The promotion component is defined through four indicators including: “Generating positive word-of-mouth advertising”, “Attracting event organizers to the geopark location”, “Quality of public relations accountability”, and “Promotional efforts and activities through social media”. By creating attractiveness, gamification programs can cause positive word-of-mouth advertising and, as a result, attract tourists to the region, which in turn makes events and festivals welcome to the region. In addition, the use of game-based applications makes providing information about the destination more attractive for those interested. Companies active in the field of tourism can also implement their advertisements in the game process so that they can be seen and noticed much more than other methods. These findings are consistent with the research results of Farhadi & Tabrizi (2023) and Alčaković *et al.* (2017). They have stated that using advertising games on mobile phone platforms or websites is one of the effective methods in tourism marketing. Also, sharing tourist experiences on these platforms is much more effective than advertising in the media. An example of these applications is the city of Ireland, which was provided by the National Tourism Development Organization (Xu *et al.* 2017).

According to the findings of the research, the im-

plementation of gamification programs in Aras Global Geopark has a positive effect on the place component with a path coefficient of 0.632. Places are exchange paths through which a tourist can access a tourism product (Sadq *et al.* 2019). The place component is defined through 4 indicators including: “Spatial distribution of services within the geopark”, “Accessibility of routes and transportation facilities within the geopark”, “Quality of service and accommodation facilities within the geopark”, “Quality of infrastructure within the geopark”. Gamification programs, such as location-based augmented reality games, can display places and their access routes in an attractive way, entertaining visitors. In this way, visitors’ satisfaction with the quality-of-service places and infrastructure is improved. These findings are consistent with the research results of Alčaković *et al.* (2017), Farhadi & Tabrizi (2023), and Ali (2020). They believe that the opinions recorded by tourists in game-based programs provide information about attractions, food quality, service costs, infrastructure quality, accommodation quality, transportation, etc., which is useful for organizations. Destination management can be the basis for improving the tourist experience.

Also, according to the research findings, the implementation of gamification programs in Aras Global Geopark has a positive effect on the people component with a path coefficient of 0.626. People are the most important element in the marketing of products and services and strongly influence the consumer’s perception of service quality (Agusdin *et al.* 2018). The people component is defined by four indicators including: “Performance of geotourism guides within the geopark”, “Performance of geopark service center employees”, “Performance of geopark managers and decision-makers”, “Interaction between local residents and tourists within the geopark”. Guides, employees of service centers, managers, and decision-makers can improve the quality of their

performance in the eyes of visitors and increase their satisfaction by providing services and information through game-based applications. Also, game-based applications can provide information to local people about how to properly treat tourists and welcome them, which will increase visitor satisfaction. The findings of the research showed that the implementation of gamification programs in Aras Global Geopark has a positive effect on the product component with a path coefficient of 0.625. The product component is defined through 4 indicators including “Natural attractions (including waterfalls, caves, mountains, forests, biodiversity, etc.)”, “Artificial attractions (including museums, theme parks, stores, etc.)”, “Heritage/Cultural attractions (including castles, tombs, monuments, etc.)”, “Events and festivals”. The use of gamification programs in physical or online form has made visiting many cultural, artificial, and natural attractions, as well as events and festivals, more attractive, which naturally has a greater impact on attracting tourists. In a way, through the game, information is presented to visitors in a more attractive and entertaining way, providing a different experience for them. These findings are consistent with the research results of Xu & Buhalis (2021), Remus-Ion *et al.* (2018), Yılmaz & Coşkun (2016). They have stated that the implementation of online and physical games in events and programs for visiting attractions can be used to attract and create diverse experiences, fostering a sense of curiosity among tourists.

Also, according to the findings of the research, the implementation of gamification programs in Aras Global Geopark has a positive effect on the process component with a path coefficient of 0.612. The process expresses how to produce and provide services to tourists (Sadq *et al.* 2019), and effective management of processes affects tourist satisfaction (Magatef 2015). The process component is defined through 4 indicators including: “Management process for visitor arrivals and

departures”, “Management process for tours and activities within the geopark”, “Security management within the geopark”, “Education and information dissemination process”. Gamification can act as an educational and informative tool, teaching tourists about culture, art, climate, endangered species, fossils, etc. Also, by using gamification programs (virtual programs), it is possible to track the number of tourists entering the destination and even their location on the map, which can be used in the process of ensuring the security of tourists and the local community. These findings are consistent with the research results of Xu *et al.* (2017), Alčaković *et al.* (2017), Yılmaz & Coşkun (2016), and Xi & Hamari (2019). They have stated that the use of gamification programs can be employed in experiential education and providing information and awareness about tourism destinations and brands. According to the research findings, the implementation of gamification programs in Aras Global Geopark has a positive effect on the physical evidence component with a path coefficient of 0.506. Physical evidence related to the tourism product includes the place, decor and layout of the product, people, and anything else that may be related to the experience (Moorthi & Roy 2017). The component of physical evidence is defined through 4 indicators including: “Appearance of buildings and structures within the geopark”, “Quality of design and layout of geopark spaces”, “Quality of signage within the geopark”, “Natural characteristics of places and spaces within the geopark”. Gamification programs, in the form of entertaining designs and colorings, can make the appearance of buildings, signs, furniture, etc. more attractive. In this way, visitors’ satisfaction with the quality of spaces and physical signs can be increased.

Conclusion

The current research aimed to explore the impact of gamification plans and programs on the mar-

keting mix of geotourism destinations. We find that implementing gamification initiatives can positively influence various components of the marketing mix in geotourism destinations, encompassing product, price, place, people, promotion, process, and physical evidence. Given that geological phenomena in geotourism destinations, such as geoparks, may not always captivate ordinary visitors, gamification tools can be utilized to create engaging and enjoyable conditions, thereby enhancing visitor experiences. Absolutely, integrating gamification concepts, whether in physical or online formats, within geotourism destinations significantly enhances visitors’ learning experiences and stimulates their interest in geoheritage. This transformative experience can potentially alter visitors’ attitudes and behaviors toward recognizing the significance and value of geoheritage. Consequently, besides enhancing visitor experiences, the ultimate outcome is an improvement in the conservation of geoheritage. Thus, the use of gamification tools extends beyond marketing and advertising; its primary objective is to foster visitor interest and awareness regarding the importance of geoheritage, thereby justifying its management and conservation.

In conclusion, while the research findings are specific to Aras Global Geopark in Iran, it is pertinent to note that the insights derived from this study are applicable to geotourism destinations worldwide. Therefore, leveraging gamification tools in the marketing of geotourism destinations, including geoparks, can enrich visitor experiences, elevate marketing mix factors, and enhance awareness regarding the conservation of geoheritage. These findings contribute to advancing theoretical and practical knowledge in the marketing of geotourism destinations, underscoring the significance of this research.

Conflict of Interest

The authors declare that there are no conflicts of interest associated with this study.

Authors' Contributions

All authors have contributed equally to the conception, design, writing, and revision of this manuscript.

Declaration of Generative AI and AI-assisted technologies in the writing process

Statement: During the preparation of this work the author(s) used ChatGPT in order to improve language, grammar or structure. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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