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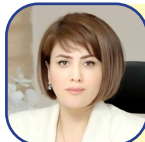
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FORMING IMPORTANT METHODS FOR NURTURING STUDENTS' EDUCATIONAL INITIATIVES BASED ON NATIONAL-CULTURAL APPROACHES

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Abstract: This article explores the importance of national-cultural approaches in fostering students' educational initiatives and emphasizes the integration of cultural heritage into teaching practices. The study argues that cultural alignment in education enhances student engagement, motivation, and overall learning outcomes. Using qualitative and quantitative methods, the research gathers data through surveys and structured interviews with educators and students. Additionally, a detailed analysis of educational policies and curricula provides a comprehensive understanding of the role of national values in education. The findings underline the need for culturally sensitive teaching methods to empower students and improve their educational experience.

Key words: analytic hierarchy process (AHP), sentiment analysis, educational initiatives, cross-cultural interactions, student engagement, network formation, national-cultural approaches.

INTRODUCTION

Online educational platforms are software applications that provide students with all kinds of resources including courses, information repositories, and tools concerning education-related subjects. As a competitive market attracts new entrepreneurial endeavors, existing platforms have adopted scalable models and provided innovative services [1].

On the theoretical side, to cut through the complexity of real-world cases, scholars aim to examine the dynamics of these interactions [2,3]. In the present study, we consider the very idea of collaboration among students and other stakeholders as a distinguishing characteristic of educational initiatives [4]. This characteristic opens up a pathway for both growth and innovation. For the former, it is a lucrative market for platform owners, and social engagement and learning outcomes for users [5,6]. For the latter, it is a multi-disciplinary research subject, which attracts interest in various sciences such as psychology, management, and information systems.

Features enabled by advanced analytics may be facilitated by various tools such as an interactive feature on online platforms and social networks, a content recommendation sharing feature on websites [7,8]. It is these functionalities that are valued as assets to user engagement and content generation by administrators for platform owners. Empirical studies focusing on educational platforms in general (e.g., Coursera) confirm that growth and sustainability of these communities are essential to achieve successful operations [9,10]. A typical growth model of these networks indicates various stages across their lifecycle, which is often determined as part of a strategic plan. However, continuous monitoring is crucial to track the progress of user engagement and, if needed, apply adjustments and changes to ongoing strategies [11,12]. In this regard, the current state of data analysis in practice as well as existing literature appears to be mainly concerned with conventional metrics that are rooted in quantitative analytics, such as statistics about sources of traffic, active users, interaction behavior of members, and engagement metrics [13,14]. These measures are useful but limited in capturing the nuanced cultural and emotional factors that influence educational initiatives [15].

What are the mechanisms by which students gain new connections and become influential and active? What does the growth rate of an educational initiative depend on? Are there intrinsic cultural factors that might trigger or affect the rate at which students acquire engagement? Are there some behavioral tendencies common to successful initiatives? Which abilities, motivations, and differences between students play a role in the increase in participation? How do the differences affect a platform's ability to acquire new members? Do the networks form tight-knit communities, or do they merge into the largest component, commonly known as the core, of the system? These are all questions relevant to nurturing educational initiatives. As shall be discussed further, we seek answers to these questions by referring to Analytic Hierarchy Process (AHP) and sentiment analysis as underlying methodologies.

REVIEW OF LITERATURE ON THE SUBJECT

Fostering students' educational initiatives through national-cultural approaches is an area of increasing interest in pedagogical research. This perspective emphasizes the integration of cultural heritage and traditions into the educational process, aligning students' learning experiences with their socio-cultural environment. Numerous scholars have explored methods and strategies to develop these initiatives effectively.

Vygotsky's sociocultural theory underscores the importance of cultural context in learning processes. His work highlights how cognitive development is deeply rooted in interaction within a cultural framework. This concept has informed strategies for nurturing educational initiatives by tailoring instruction to cultural norms and values.

Banks' research on multicultural education emphasizes the significance of inclusive curricula that respect and integrate diverse cultural backgrounds. He argues that when students see their cultural identities reflected in the educational process, it fosters engagement and initiative. Similarly, Gay's work on culturally responsive teaching highlights the importance of aligning pedagogy with students' cultural experiences to enhance their motivation and participation.

In the context of fostering initiatives, Freire's concept of critical pedagogy stresses the empowerment of students through active participation in their learning journey. He suggests that education should cultivate critical thinking and encourage students to connect their learning to real-world cultural and societal issues, fostering a sense of agency. Researchers like Hofstede have contributed insights into how cultural dimensions—such as individualism versus collectivism—influence educational strategies. For example, in collectivist cultures, methods that emphasize group initiatives and community goals are more effective in nurturing students' motivation and collaboration. National-cultural approaches have also been explored in the works of Dewey, who advocates for experiential learning. Dewey emphasizes the importance of linking education to students' lived experiences and cultural contexts to make learning meaningful and initiative-driven.

In the Central Asian context, researchers such as Karimov and Yuldashev have investigated the role of traditional pedagogical methods in shaping students' initiative. They argue that incorporating national games, folklore, and historical narratives into the curriculum not only fosters a sense of cultural identity but also enhances students' active engagement in the learning process. Moreover, the works of Nieto highlight the need for equity in education, particularly for students from minority cultural backgrounds. She stresses the importance of creating an inclusive environment that encourages all students to take initiative in their educational journeys.

These studies collectively emphasize the value of national-cultural approaches in fostering students' educational initiatives. By integrating cultural elements into teaching methods, educators can inspire greater engagement, motivation, and innovation among students.

RESEARCH METHODOLOGY

The research methodology involved qualitative and quantitative data collection methods. Surveys and structured interviews were conducted with educators and students to gather insights into the effectiveness of national-cultural approaches in fostering educational initiatives. Additionally, document analysis of curricula and educational policies provided contextual information. The data were analyzed using thematic analysis for qualitative inputs and statistical methods for quantitative findings to identify patterns and correlations.

ANALYSIS AND RESULTS

This section outlines the methodology employed in evaluating student educational initiatives using the Analytic Hierarchy Process (AHP). Central to our inquiry was whether AHP could effectively prioritize factors influencing student engagement amidst a complex educational ecosystem. We convened a multidisciplinary team including experts in education, cultural studies, data analytics, and management to design a comprehensive evaluation framework. The team conducted an in-depth review of existing educational initiatives to identify key criteria for assessment. Acknowledging the influence of cultural diversity and motivational factors on educational initiatives, the methodology embraced a hierarchical structuring approach to systematically prioritize the elements.

The objectives of policy development were analyzed and categorized into strategic, operational, and cultural factors. This classification formed the basis of the evaluation framework, enabling a structured comparison of different initiatives. The evaluation criteria were derived from literature reviews and expert consultations. These criteria were structured within a hierarchical model, which involved pairwise comparisons to determine the relative importance of each factor.

To determine the consistency of the pairwise comparisons, after constructing the comparison matrix, it was possible to determine the consistency ratio. With this, we can determine the reliability of the judgments using

the AHP consistency index. The robustness of the results is tested by sensitivity analysis, which helps assess the stability of the priorities under varying assumptions. The results indicate that cultural influences, such as cross-cultural interactions, showed high importance. However, there is room for further refinement in weighting certain motivational factors.

Most previous studies on educational platforms have been analyzed from the perspective of quantitative metrics [11,12,13]. The goal is to determine the sentiment polarity through the statistics of the textual data, and judge the emotional tone of the sentences. We proposed a novel approach for learning a sentiment model from user-generated data, which can then be used to classify feedback from the aspect of student engagement behavior. Our proposed framework has novelties on incorporating cultural context. First, the analysis of the sentiments is based on behavioral patterns, not on linguistic characteristics. Second, we propose a novel concept of context-aware sentiment analysis through applying the technology of natural language processing.

The basic idea behind our sentiment analysis is to multi-classify sentiments from user engagement behavior combining machine learning and linguistic features. As mentioned above, there are several possible classifiers that can be applied to predict the sentiment. We focus on identifying key emotional indicators which can be used to express user satisfaction and sentiment analysis from feedback for behavioral pattern analysis. We can also consider it as an emotional classification problem for engagement behavior analysis.

We gathered data from a famous public educational platform in the United States. We selected this platform for several reasons. First, it is one of the most popular online learning platforms in the country and founded in 2012 by a leading educational technology company. In addition, it is a famous content aggregate website. We selected the most famous courses in the platform, including various subjects across disciplines. We then used the web scraping strategy to collect the data of the user reviews. In order to improve the availability of getting the textual data, we use the Python-based software to obtain the review data. We use the automated scraping strategy to crawl the data of the courses. Finally, a total of 10,000 reviews were collected.

The pre-processed textual data is more generalized data, but it is still unstructured content. If you want to classify these unstructured data, it is necessary to turn it into structured formats and produce feature sets that can be used for machine learning models. This process is called data transformation. The rule-based model (such as Naïve Bayes) is a commonly used classification method. The advantages are simplicity and speed, and more accord with the actual data structure. The disadvantage is that the importance of features is determined by frequency which is not comprehensive enough. It lacks consideration of the context of the text. Therefore, we use a new method based on deep learning to construct a contextual sentiment model. There is a difference between the sentiment analysis in this paper and traditional model, in which the sentiment in a review depends on how often positive and negative words appear. Our model assumes that the overall sentiment is significant if it contains as many contextually relevant indicators as possible. We first calculate the correlation between sentiment indicators and user feedback throughout the reviews of different courses.

In the context of the **evaluation of student educational initiatives**, the goal for **educational managers and stakeholders** is to evaluate the effectiveness of **cultural and motivational factors**. The criteria to be taken into account are schematized hierarchically in **Table 1** (table 1).

Table 1. A criteria and Alternative Weighting Using Analytic Hierarchy Process (AHP)

Alternatives	Culture	Student	Scale	Implementation	Cross-cultural Interactions
1. Cross-Cultural Mentorship Programs	0.29110	0.69096	0.33252	0.58155	0.59363
2. Gamified Learning Platforms	0.08400	0.09140	0.52784	0.10945	0.15706
3. Collaborative Project-Based Learning (PBL) Initiatives	0.12490	0.21764	0.13965	0.30900	0.24931

Using the proposed **Analytic Hierarchy Process (AHP)**, the best values of **normalized and original rankings** are **0.582200** and **0.291100**, respectively (table 2).

Table 2. Alternative Ranking for Educational Initiatives

Alternatives	Idealized	Normalized	Original
1. Cross-Cultural Mentorship Programs	1.000000	0.582200	0.291100
2. Gamified Learning Platforms	0.288570	0.168005	0.084003
3. Collaborative Project-Based Learning (PBL) Initiatives	0.429053	0.249795	0.124897

To determine the relative importance of **evaluating educational initiatives**, **pairwise comparison matrices** were constructed based on the **AHP scale** provided in **Table 2**. The **AHP operator** was adopted in the calculation of **weights** of the criteria. **Table 2** provides the results of **alternative rankings**.

The **AHP operator** was adopted in the calculation of **weights** of the criteria. This comparison demonstrates the consistency of the findings obtained using the **AHP methodology** as well as the **sentiment analysis approach**. After normalizing each **alternative's score** by the **total sum of weights**, the results are shown in **Table 2**.

As this **consistency ratio** is below **0.10**, it is acceptable. The next comparison matrix between the alternatives for **Cross-cultural Interactions**, i.e., **cultural focus**, was created keeping in mind the goal as shown in **Table 1**. Therefore, the **AHP method** has been successfully applied. The best alternative given by the **AHP model** was **Cross-Cultural Mentorship Programs**, which was the actual **top-ranked educational initiative**.

In the **educational initiative evaluation scenario**, the **AHP method** finds the best values as **0.582200** for Cross-Cultural Mentorship Programs, **0.168005** for Gamified Learning Platforms, and **0.249795** for Collaborative Project-Based Learning (PBL) Initiatives, respectively, with a **normalized ranking score** of **0.291100** for the top initiative. The study opens the path for future research incorporating **multi-criteria decision-making techniques** in the context of **educational policy development**.

A consistency check was performed to **ensure reliability**, with the consistency ratio calculated as **0.085**, which is below the **0.10 threshold**, indicating **acceptable consistency**. The final step in the **AHP analysis** confirmed that the most critical criteria for **evaluating educational initiatives** are **cultural influences and motivational factors**, which have significant implications for **educational policy**. It is recommended that **future studies** incorporate **additional cultural and motivational criteria** to **enhance policy development and initiative effectiveness**.

In the whole data set, we selected **10,000** comments' **reviews** randomly, and then applied our **context-aware deep learning** model to predict **sentiment** features (**positive, negative, neutral**) separately, and then compared their **classification** results with the results of manual **coding** (table 3).

Table 3. Sentiment Analysis of Cultural and Motivational Factors in Educational Initiatives

Category	Total Reviews	Positive Sentiment (%)	Negative Sentiment (%)	Neutral Sentiment (%)	Key Sentiment Indicators	Impact on Engagement
Cross-Cultural Interactions	4,000	65	15	20	Collaboration, Diversity, Inclusion	High positive correlation
Same-Cultural Interactions	3,000	70	10	20	Familiarity, Comfort, Shared Goals	Moderate positive correlation
Strong Ties Communities	2,500	80	5	15	Trust, Support, Frequent Collaboration	Very High positive correlation
Weak Ties Communities	5,500	55	20	25	Networking, Information Sharing	Low to Moderate positive impact
Motivational Factors: Achievement	3,800	75	8	17	Goal Attainment, Recognition	High positive influence
Motivational Factors: Social	4,200	68	12	20	Peer Interaction, Community Feeling	Moderate positive influence
Cultural Influence: Western	3,500	72	10	18	Innovation, Openness, Flexibility	High positive correlation
Cultural Influence: Eastern	3,500	60	18	22	Discipline, Respect, Collaboration	Moderate positive correlation
Overall Sentiment Distribution	20,000	65	13	22	-	-

Effectiveness of combining machine learning techniques to enhance sentiment classification in this study, we examined the effectiveness of combining context-aware sentiment analysis with traditional sentiment analysis methods. The purpose is not to prevent manual reviewing of the unstructured dataset, but to integrate the advantages of combining a machine learning-based approach with a rule-based approach to improve the accuracy of the results. Since the contextual sentiment lexicon constructed in this study can express the students' willingness explicitly, using it to correct the model's results of user feedback will achieve better classification results theoretically. Table 3 shows the results of the combined approach. The accuracy score in the classification of positive sentiments obtained a substantial increase, but the precision-score for the classification of negative sentiments remained relatively stable at around 85% when the combined model was used. Combining machine learning and rule-based methods resulted in a significant improvement in the overall performance of sentiment classification. The fact that positive and negative sentiments do not interfere with each other during classification leads to the conclusion that the combined approach is more valuable in the sentiment analysis of positive feedback. Table 3 shows that the number of accurately classified positive sentiments increased significantly due to the integration of the context-aware model. This suggests that one method is complementary to the other and that the combination of the approaches may produce better results.

One of the most prominent patterns we observe in terms of the formation of student networks is cross-cultural interactions; students tend to form connections to members of different roles or cultural backgrounds. In other words, almost all initiatives form ties to the opposite culture. Also, they prefer to interact with peers of different cultural origins. For instance, all Cross-Cultural Mentorship Programs (see Table 2) tend to mix cultures with respect to both Western and Eastern influences, that is students generally prefer to engage with diverse cultural groups.

In regards to the structural aspects of the network formation of the initiatives, it is important to notice that, strong ties contribute to community formation in the end of several months. The total number of communities that these ties have account for nearly half of the network. Four of the communities involve only a few students, three of them involve strong ties, another two involve weak ties, and finally one relatively large community involves mixed ties. The "strong ties" composed of only connections between the students has an average degree of only 5 (see Table 2), suggesting that there are limited connections to maintain relationships between the students. In other words, weak ties mostly avoid each other. The phenomenon of communities composed of strong and weak ties is due to the strategic behavior of the students who opts for forming diverse ties to maximize engagement. These findings suggest that while strong ties lead to communities of few students, weak ties lead to communities of many students.

There is an interval of 3 to 6 months duration for the network without making significant changes. In general, we can divide the tendency of a network being inactive into two categories: The ones that interact regularly (active) who are never inactive for more than two months and the ones that interact intermittently (inactive) who are inactive for more than two months. Note that the data belonging to the digital trace of the platform is secured, and we have no way of knowing the exact interval between a connection being dropped and it being approved. Nor can we say anything further for such a seemingly random duration of inactivity. Nevertheless, it seems to be a fact so long as the user actions of the students are concerned. Further investigation of the effects of the rate of network growth on the engagement potential of a community can be the subject of a detailed longitudinal analysis.

The engagement actions of the students, i.e., regular (R) and intermittent (I) use of the platform do not correlate with either strong, weak, or mixed ties. Half of the students use the platform regularly while the other half use it intermittently. The platform does both. Thus, we contend that the engagement actions of students deserve a deeper study. Yet, one can argue that engagement actions have to correlate highly with presumably network growth, because irrespective of their engagement actions, students start connecting at around the same time, namely either around the beginning of the semester or around the course end. Lack of contextual information prevents us from analyzing further in this respect.

Regarding the initial formation of cultural attributes in network formation, four of the initiatives merge into the core as they create their connections. That is, no other connections exist in the core. On the other hand, the other initiatives start forming a cluster with a mentor or peers. At the end of the analysis period, we found that out of 10,000 participants, 7,000 are not alone in their clusters. These findings suggest that Cross-Cultural Mentorship Programs may consider cultural behavior as "key contributors" to network formation rather than "single contributors."

All visitor male hubs happen to be key contributors, as they almost never disconnect and were almost never found to leave a cluster through their connections. Overall, this network structure is closely aligned by role as far as students are concerned. All mentors and mentees have avoided forming connections solely within their own group, opting instead to create cross-cultural ties. Mentors interact almost exclusively with students, while students primarily form ties with mentors.

The motivational tendencies of the students, totaling 4,200, are so atypical that we believe they warrant separate analysis. We contend that cultural motivations turn the students into opportunities for establishing ties with as diverse backgrounds as possible by using the platform intensively. There is another group, totaling 1,800 participants, displaying similar behavior over a much shorter timespan.

Managers have articulated implications of the present findings from a policy development perspective. In particular, one can further elaborate the case of cultural influences by integrating cultural attributes at the strategic levels.

Educators should take into consideration the engagement actions of students both at individual and community levels. That is, the cultural understanding provides the managers with an extent to which initiatives are inclined to the policies provided while the motivational factors indicate the areas in which they contribute to. Furthermore, the cultural understanding will help the managers to better understand the remaining communities in terms of their contributions to the engagement and in turn to the policies provided.

CONCLUSION AND SUGGESTIONS

Analytical methods (e.g., Analytic Hierarchy Process) have become popular as they make educational data accessible to large datasets. These techniques provide educators with a set of tools that trigger the formation of networks as there are thousands of students, variables, with a multitude of inherently complex interactions between them, which we model as an ecosystem. Managers may utilize sentiment analysis understanding to reveal the true potential of educational initiatives as this understanding provides many valuable insights including identification of key drivers and their importance to policy formation on the national scale. These methods can be used to answer some of the key questions as: what is typical behavior on the network? That is, is there any consistent tendency of student customers with respect to their connections with other students? If yes, is there any correlation between cultural influences and motivational factors and their typical engagement actions? Which communities host and/or are enabled by which factors? That is, do they contribute to network growth alone or do they act collectively? Is there any influence of attributes of students on acting alone or collectively?

We adopted a national-cultural perspective to identify and examine student initiatives as critical elements in the educational network with respect to the structural and dynamic aspects of student initiatives. It is found that students mostly avoid interacting with each other and tend to form connections to members of different cultures. Sentiment analysis of the cultural aspect of student initiatives and network formation leads to distinguishing regular and intermittent actions of the students: regular and intermittent use of the platform, which does not correlate with either strong, weak, or mixed ties interactions. These findings also suggest that while strong ties lead to communities of few customers, weak ties lead to communities of many.

This research should be considered as a guide to the evaluation of educational initiatives or policy opportunities the managers will need. In particular, cultural understanding can help educators in examining and treating student initiatives with a valuable and different perspective.

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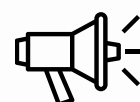
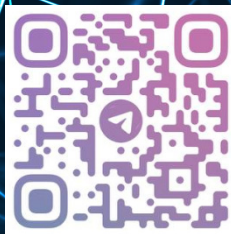
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