College Choice Decisions: An Evaluation of Perna's Conceptual Model Across Populations and Cultural Contexts

V. Sanchez Padilla, Virginia Polytechnic Institute and State University; Universidad ECOTEC, Ecuador

V. Sanchez Padilla (Member, IEEE) is a doctoral candidate in the Engineering Education Department, College of Engineering at Virginia Polytechnic Institute and State University, Blacksburg, VA, USA. He holds a master's degree in telecommunications engineering with a concentration in wireless communications from George Mason University, VA, USA. He is certified in fieldbus networks and wireless network administration. His research interests lie in engineering and science education, technology management, and wireless network systems. Memberships include ASEE, IAENG, IEEE TEMS, and IEEE EdSoc.

Lisa Schibelius, Virginia Polytechnic Institute and State University

Lisa Schibelius (she/her) rhymes with rebellious - is a Doctoral Candidate in the Department of Engineering Education at Virginia Tech (VT). She holds both B.S. and M.S. degrees in Mechanical Engineering with an aerospace concentration from the University of South Alabama. Prior to beginning her studies at VT, she worked as an engineer for 4 years at Airbus in the retrofit of aircraft cabins with experience in project management, automation, airworthiness, and additive manufacturing. Her research interests are influenced by her experiences in industry and are centered on team dynamics, conflict management, professional skills development, and intercultural awareness. She aims to leverage her industry experiences to bridge academia and industry through her research, teaching practices, and interventions aimed towards student and faculty professional development. As an artist, she is also interested in art, creativity, and expression in engineering. Her research also centers on non-traditional methods, transformation, and critical reflection - aspiring for more equitable and inclusive practices in engineering.

College Choice Decisions: An Evaluation of Perna's Conceptual Model Across Populations and Cultural Contexts

Abstract

Understanding the factors that influence college choice decisions is critical for broadening participation in engineering programs and STEM education broadly. Studies have shown that college choice can be impacted by a host of factors beyond just interest, including socioeconomic status, contextual factors, institutional features, availability of resources, and cultural knowledge, to name a few. The conceptual model of college choice proposed by Perna is valuable in understanding the layers of choice, which can vary based on context and population. Perna's model outlines four major contexts that frame college choice decisions for the individual: 1) social, economic & policy, 2) higher education, 3) school and community, and 4) habitus, which is at the center. Studies that utilize Perna's model employ one of these contexts or a combination of them. This work reviews eleven studies that draw on Perna's model for understanding college choice decisions based on three research questions centered on both population and cultural context. These studies range from a host of contexts and populations to understand college choice, including K-12 students, undergraduate students, and historically underrepresented populations in engineering. Through our review of case studies and applied research, we compare constructs used in Perna's model, such as layers of habitus, school/community, higher education, and socioeconomic status to analyze studies according to a targeted population. We take a critical lens of the implementation of Perna's model for college choice and the ways in which particular populations as the focus of study highlight how minority and non-minority populations can be affected in their decisions to pursue a college degree. From our analysis, we encourage the readers to evaluate and consider elements from case studies to seek potential transferability or generalizations that this model brings based on context. Therefore, we recommend continuing to explore several lenses and factors using this model and complementing wherever possible with other frameworks or theories to deepen the perspective of college choice decisions and resultant conclusions and implications that can be drawn for certain populations.

Introduction

A population with access to higher education promotes development, prosperity, and sustainability in society [1]. Through extensive research and efforts toward the goal of reforming engineering, engineering education has seen focused efforts towards integrating concepts of sustainable development into engineering curricula [2]. This focused attention on research,

innovation, and strategic planning for the future also highlights the ways in which higher education can link professional trends and competitiveness to growth in the economy. However, not all members of society have access to the same benefits of higher education, including engineering, which faces distinct challenges with retention and broadening participation. Engineering been described as having a “chilly climate” [3] and “hostile environment” [4], especially for marginalized groups. Moreover, minorities and low-income students in particular face barriers in their pursuit of academic degrees because of high educational expenditures and financial stress, with particular challenges based on context and identity.

According to Song [5], while many definitions of minority status do not specifically mention race, minority status can be based on a variety of ”disadvantageous” factors, including sexual orientation and religion. This author asserts that a group of people who are relatively ’less fortunate’ than members of a dominating social group is referred to as being in a minority status. An ethnic minority, for example, can be a group of people of a specific race or nationality residing in a nation or region where the majority of the population is of a different race or nationality. Ethnic minority has frequently implied forms of marginality and disadvantage, frequently on the basis of their diversity, even though many definitions of the term do not state that such groups are, by definition, disadvantaged [5].

On the other hand, in specific settings, such as the United States, underrepresented ethnic minority students are defined as students with origins from African, Chicano/Latino, and Native American descent [6]. Appelhans et al. [7] argue that a challenge is to avoid assuming that all students of color are underprepared or ”disadvantaged”. The risk lies in the possibility that this terminology will be coupled with racial minorities long after corrective and financial actions have been taken and leaving these groups vulnerable to a continuous questioning of their qualifications as they pursue their professional careers [7]. Thus, we are mindful of the use of our language and generalizations of populations in this study and highlight the critical challenge and importance of context in understanding marginalized identity and the influence on student college choice and academic pursuits.

For students of low economic status, which can sometimes intersect with minority status, a factor to consider for the pursuit of higher education is financial strain. Some students have the opportunity to mitigate this through student loans, which help with the payment of tuition, fees, books, and several other aspects related and unrelated to the educational process [8]. This can help students in the pursuit of their studies, but is not always seen as a feasible option depending on perceived cost benefits or societal norms. Factors beyond perceived financial attainment of a degree also impact students pursuit of higher education and choice in engaging in two versus four year college degree programs in STEM. In addition, certain factors, such as the desire to pursue a degree, achieving a high GPA for application processes, or even having the opportunity to select the college or academic program they would like to, can influence the process of obtaining a college education. In STEM-related programs, it is well documented that minorities, first-generation, and low-income students in the United States face particular struggles in higher education related to high costs of registration or a lack of mastery or skills development during their K-12 coursework [9].

These types of barriers can limit college education choices, and despite efforts to broaden participation in engineering and STEM more generally, improvements are still needed to meet the

demands for the engineering workforce. Particularly in engineering, students can be influenced by societal norms, expectations, and perceptions of engineers - thus, defining and limiting the ways in which students pursue academic degrees [10]. Barriers to college choice and pursuit of engineering can be influenced by perceived fit into and sense of belonging engineering degree program, identity perceptions of who can be an engineer and more [11]. Beyond these struggles, interest is only one factor that influence college choice, in addition to family influence, and it is important to consider the contextual factors for specific populations that can influence or hinder college choice decisions.

The purpose of this study is to highlight the ways in which contextual factors and identity, such as minority status and cultural context can impact college choice decisions. This review approaches the conceptual model proposed by Perna [12], which incorporates constructs pertinent to post-secondary education choices and preferences. It draws on four contextual layers (Figure 1), with distinctions across students in variables that comprise elements that influence a decision about college choice decision. It regards the determinations about registering college, leading the individual to aspire to a specific college as decisive elements of the broader student-college-choice construct and process. The importance of this conceptual model for college choice decisions relies upon understanding and analyzing critical forecasters of university predisposition, exploration, and choosing. Particularly, the focus is on how these can be interpreted for students of varying populations and contexts - depending on how they are defined and included in study design. This is just one approach to highlight the contextual challenge in efforts towards broadening participation in engineering.

Perna's Conceptual Model

A conceptual model was presented by Perna [12] to examine the factors that shape the college choice decisions of individuals based on different contextual layers. The author's idea was based on literature that analyses how criteria, such as sufficient knowledge of the academic and financial requirements, influence decisions to pursue college education. She gathered prior studies that categorize disciplinary approaches based on economic and sociological variables, complemented by frameworks that address social and cultural capital. This type of analysis, which includes diverse groups associated with ethnic minorities and low-income families, is supported by additional research that focuses on quantitative and qualitative techniques. This research emphasizes stages that influence the decision-making process when choosing a college, such as interest in pursuing an academic program, searching for relevant information, and the choice for enrolling.

Perna's work reviews economic models of human capital investment and sociological-cultural approaches that also contribute to these decisions. She points out that human capital models do not necessarily reflect perfect or complete information on post-secondary options, which affect college choice. However, rational evaluations and decision making are based on the available information associated with benefits and costs. Her research emphasizes how sociological models place a strong emphasis on social and cultural capital, including language skills and cultural knowledge that influence educational goals and the social ties formed via interactions with others in order to access resources and support. Therefore, this model comprises these elements according to contextual layers, such as the habitus of the individuals (e.g., demographic

characteristics, cultural and social capital), school/community context (e.g., resources, structural supports, barriers), higher education contexts (recruitment, location or features of the institution), and socioeconomic and policy context (e.g., economics and public policy). These components are highlighted in Figure 1.

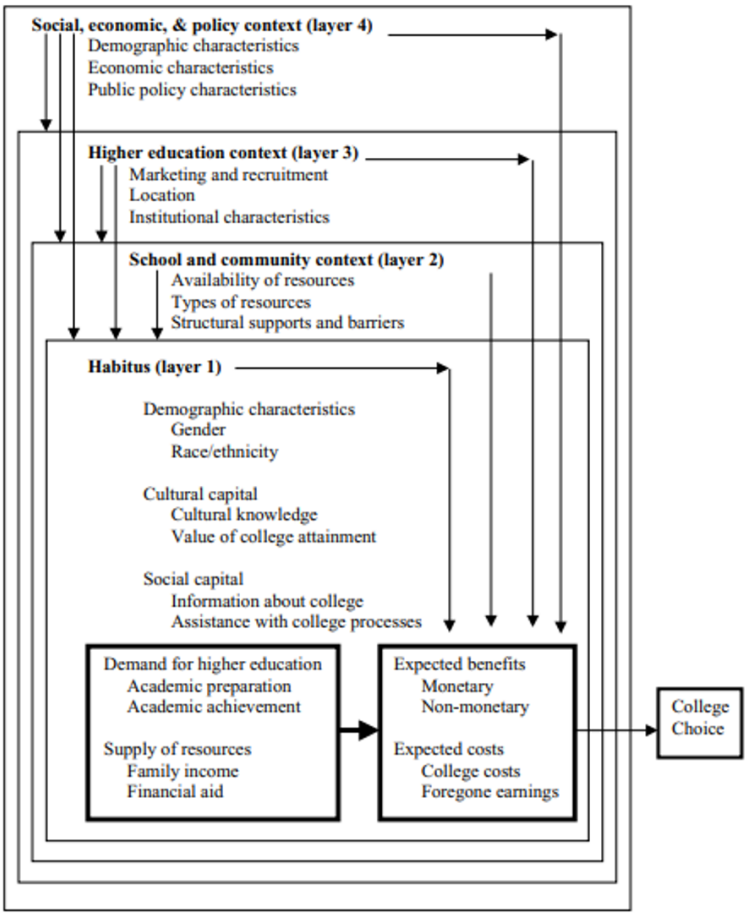

Figure 1: *Components of Perna's conceptual model of college choice [12]*

Methodology

For our study, we aimed to review literature that was anchored in Perna's model, with a particular focus on case studies within the scope of STEM education. Our purpose is to approach STEM broadly, as an umbrella that includes engineering education, which relates in multidisciplinary aspects and tasks related to science, technology and mathematics. Studies that use Perna's model solely in engineering with various cultural contexts are limited, and the inclusion of studies in STEM more broadly aided in conducting this review with population and cultural context as a focus. Perna's model allows us to relate college choice according to its constructs and contextual layers. In particular, we are focused on population and context in the application of Perna's model. For our review, we include studies with populuation focus from the K-12, undergraduate students, and historically underrepresented populations in engineering. To determine how this model performs in broader contexts, we propose the following three research questions (RQs)

with their respective justification:

- RQ1: How do case studies focusing on historically underrepresented populations in engineering align with Perna's model to understand college choice decisions?

  Justification: To investigate the rationale for using Perna's model to identify the factors influencing college choice decisions in minorities and comparable groups.

- RQ2: Which populations outside the North American region are college choice decisions influenced by socioeconomic status or family influence?

  Justification: With the purpose of exploring college choice, we use this research question to look at other contexts that based their investigations on Perna's model, particularly those in settings outside the United States. We aim to demonstrate how the constructs involved in the layers are adaptable for analyzing subjective realities.

- RQ3: How do researchers apply Perna's model to focus on populations more broadly (i.e. those that may not traditionally be defined as minorities)?

  Justification: Our goal is to determine the extent that the conceptual model applies for groups of people who are not classified as minorities, yet face obstacles like financial issues or social vulnerability.

This study, anchored in Perna's model seeks to highlight the ways in which contextual factors and identity, such as minority status and cultural context can impact college choice decisions. Utilizing available academic resource databases and suggestions from Grant & Booth [13], we sought to conduct this overview by approaching well-recognized and high-quality databases like Scopus and Web of Science. We concatenated terms, presenting the most relevant using wildcards and filtering to search sources published between 2017-2023:

- *Model*: "Perna's model", "Perna's conceptual framework", "Perna's framework".
- *Orientation*: "college choice", "college decision", "influencing college", "pursue college".
- *Type of work*: "case study", "application", "funding", "research".
- *Scenario*: "United States" "Asia", "Latin America", "minorities", "worldwide".

We first selected journal articles, and after a procedure of exclusion of non-relevant work (i.e., that referenced Perna's model but not as an essential framework to address a broad issue), we considered peer-reviewed conference publications. We did not consider theses and dissertations as the selected databases do not index these works. Following the screening process, we identified eleven sources for this overview, evaluating three publications from 2017; four from 2020 and 2021; and four from 2022. These publications are pertinent to our work since they employed Perna's model to address factors that affect college choice in prospective higher education students.

Though we offer an evaluation of Perna's model and the ways in which it is used across contexts and populations - the scope of our study is limited. It is important to note that Perna's model is just one approach for understanding college choice and decision-making processes. Researchers have utilized several other conceptual and theoretical frameworks to understand college choice

decisions; some highlight inequities and systemic barriers in engineering enrollment, while others center on the influence of identity and perceptions of engineering. For example, social cognitive career theory is one approach that also frame college choice decisions, based on interest, experience, background, and a host of factors [14].

Findings

From our review, we found several case studies and applications that utilize Perna's conceptual model - resulting in the eleven studies included in our review from the K-12 to undergraduate context. Following the screening, we focused solely on the studies shown in Table 1, which offer insight from different populations and contexts. Populations from these studies include minorities and underrepresented population - defined based on the particular cultural context. These cases also consider college choice decision that are experienced in different scenarios, in which factors such as socioeconomic situation, immigration status, and race/ethnicity play a role and align with the key elements asserted by Perna's conceptual model. Constructs and methods that influence college choice range from geographic location, parenthood involvement, high school experiences, and conditions, to mention a few.

Discussion

From the resulting eleven studies included in our review, we explore the ways in which Perna's model is applied in these studies based on each of the three research questions.

RQ1: How do case studies focusing on historically underrepresented populations in engineering align with Perna's model to understand college choice decisions?

The primary motivations for employing Perna's model differ depending on the objectives of the researchers, who may choose to investigate factors that impact admission to a specific academic program or higher education institution based on the contexts detailed in its layers. For instance, in their research on youth raised in foster care, Gross et al. [20] took into account the construct of habitus in order to compare this population with others who have not undergone the same situation and explore how the former cope with college readiness and enrollment.

The sampling characteristics for this study were centered on women, who were categorized based on their race/ethnicity and disability degree. The data presented their academic preparation attached with GPAs and college aspirations according to their math skills. This work has a strong quantitative design component that contributes to provide a dataset considering youth in foster care. They analyzed financial issues, college aspirations, and academic self-concept using a regression model. Further significant variables, such academic support, the inclusion of certain majors or fields related to engineering and STEM, and further information regarding the participants' immigrant status, could be analyzed to supplement this type of work.

Additionally, there is research that examines immigration-related issues that influence college choice in the US setting and presents this status as an advantage. Lauderdale & Heckman [22] uses the National Longitudinal Survey of Youth dataset from 1997-2013. Similar to Gross et al. [20], this study matches the contextual layers of Perna's human capital theory model by using

Table 1: *Summary of the studies selected to answer the RQs*

Works based on the conceptual framework of Perna's model				
Author(s) / Year	**Purpose**	**Population / Contexts**	**Constructs / Methods**	**Implications for practice or research**
Acevedo-Gil, 2017 [15]	To know Latinos' college choices within the unequal distribution of institutional resources in K-12 educational systems.	Latino student population.	Institutional and individual variables.	Registrations information reveal an urgent understanding of complex postsecondary options for Latinos.
Bennett, 2022 [16]	To examine how private institutions adopted test-optional undergraduate admissions policies in two academic periods.	Comparative interrupted time series analysis.	Surveys.	To evidence potential and limitations of adopting test-optional methods to enhance equity in admission processes.
Gannon, 2022 [17]	To explore how rural students in southeastern and south-central Kansas understand college choice process.	Three participants from a rural-serving high school, varying post-secondary attainment levels, and colleges attended.	Research site and membership role.	To inform college, high school faculty, and staff of their influence on rural students' college choice process.
Gao & Ng, 2017 [18]	To theorize and disaggregate the interaction among types of capital and the multiplicative capital effects on college enrollment.	216 college students of Korean origin studying in China.	Social and cultural capital, educational aspirations.	Active collaboration of parents in the preparation of the college education of their children.
Grant & Roberts, 2022 [19]	To investigate rural students' college decisions based on financial status and social capital.	Undergraduates of an R1 Southeastern US university.	Depicted in the Table 3 of the paper.	Students highly affected by the state policy environment wherein they live.
Gross et al., 2020 [20]	To understand how youth raised in foster care housing compared their peers in preparation, selection, registration, and financing for their university choices.	Women population described classified in race/ethnicity and disability condition.	Economic distress, degree attainments, and academic self-concept.	Further research on financing college base on aid studies.
Knight et al., 2020 [21]	Explore relationships between high school geographical variation and engineering enrollment.	Virginia public high schools.	Gender, race/ethnicity, socioeconomic status; characteristics of high school and community context.	Inequality in engineering enrollment based on high school geographic location and intersecting identities.
Lauderdale & Heckman, 2017 [22]	To examine immigrant advantage related to school achievement.	Surveys that included African American and Hispanic/Latino individuals.	Family income and networth, cognition, GPA, probability of degree.	Influence of parent education for insights if the variable divides in mother college and father college, to know the impact of parental education.
Moore, 2022 [23]	To know how dual participation formed students' selection to attend the host institution after their high school graduation.	Former Dual Enrollment (DE) participants who chose to re-enroll with the host institution.	Dual enrollment programs in the setting of the Appalachia Community College.	To provide insight for community college administrators pursuing to recruit previous dual enrollment students.
Ngan & Khoi, 2021 [24]	To test factors that influence the choice of university in Vietnam.	Ho Chi Minh City Industrial University students.	Future career expectation, university reputation, enrollment opportunity, individual capacity, and group references.	Main view of students going to university diverts from a good goal towards finding a job in the future and improving knowledge.
Vaziri et al., 2020 [25]	To explore the factors that influence the enrollment from rural students into an engineering program.	High school or community college students from rural communities from the SouthWest Virginia.	Interviews and workshops in three study phases.	To illustrate obstacles towards engineering education, including low rates of high school completion, expenditures, and a lack of alternative career choices.

regression analysis to explore variables concerning family income, cognition skills, GPA, and degree achievement from their parents. They describe how other authors adapted the model to explore decisions in higher education, remarking the elements of economic and sociological aspects as decisive factors. Their statistical models separated the participants by race to show random effects through regression on grade attainment. Their regression models remarked that the immigration status of their parents represented that children from immigrants have an

"*immigrant advantage*" in education achievement after controlling economic and sociological factors (e.g., cultural capital). Even though the dataset did not precisely control the geographical location of the participants, the authors acknowledged the need for information based on the county level, including the participants' country of origin

Following the US context, proposed conceptual frameworks have adapted from the elements and concepts from Perna's model. Acevedo-Gil [15] sought a contextualization of the college choice of Latino students belonging to a K-12 educational system with an uneven distribution. This framework aligns with constructs, starting from the decision to apply to college and pursue an undergraduate degree, passing through the college information searching, obstacles' anticipation, planning/applying and choosing a college, dealing with conflicts while attending and finishing college - with self-advocacy and peer support. These elements interact with each other through a mesh topology. The authors emphasize the need to evaluate the level and role of counseling for higher education in order to support low-income Latino prospective students with their university aspirations. This work remarks misconceptions from K-12 educators about Latino students as prospective candidates to pursue college studies.

Although not included in our review of case studies using Perna's model focused on historically underrepresented populations in engineering, of note is a study highlighting black children's access to and experiences in STEM and the influence on their potential to enter engineering [26]. This literature review was anchored in Perna's conceptual model, highlighting contextual factors and barriers to engineering for this population in particular - pointing to systematic challenges for broadening participation in engineering beyond factors such as interest.

Furthermore, we emphasize the importance of context and population focus and ways of defining underrepresented populations and "diversity" in study design and interpretation of results. When considering "leaky pipelines" and factors affecting particular populations, harmful stereotypes and generalizations can equate certain populations with negative perceptions of being "underprepared" or disadvantaged [7]. A more positive view focuses on interventions and approaches to provide support for students - noting systematic barriers and trends; while not making assumptions based on individual identity.

RQ2: Which populations outside the North American region are college choice decisions influenced by socioeconomic status or family influence?

Perna's model has proven useful not only for the North American context but also for studying college choice decisions from other regions, such as the Asian continent. Gao & Ng [18] addressed the lack of research on the interplay among various types of capital and the multiplicative capital effects on enrollment. The participants of this study consisted of China-born college students of Korean ethnicity, of the age range 18-23, studying the first year of a bachelor's program in a Chinese university. Their goal was to analyze how models of involvement were adopted by Korean parents aiming to increase the labor mobility of their adult population. It has been demonstrated by earlier research that utilizes Perna's model that capital factors offer critical predictive power in a model of college enrollment.

Based on Perna's model, these authors propose a conceptual framework for this context, including the interaction between cultural and economic capital with social capital to determine educational

aspirations. This research used a quantitative approach that included bivariate correlation, simple slope, and multiple regression analysis. According to their findings, there is a statistically significant interaction between the different capital variables to assure further research in promoting parental involvement in college preparation and planning. Work in this type of context can be complemented with assessing how social capital can vary with the involvement predictions when economic and cultural capital experience change, including the participation of other racial/ethnic groups.

Following other contexts, Ngan & Khoi [24] focused on an academic program to test factors that affect college choice in a technology university in Vietnam using statistical analysis based on partial least square/structural equation modeling. Their work complemented Perna's model with other frameworks to test hypotheses of how factors related to college reputation, student capability, and career opportunities positively influence college choice decisions. One benefit of this work is that, in contrast to what typically occurs in Western cultures, where women are typically not representative for this research, the female sample representation they acquired for their statistical analysis (above 65%) was one of its advantages. However, concerns arise in particular when seeking opportunities after the attainment of college education.

RQ3: How do researchers apply Perna's model to focus on populations more broadly (i.e. those that may not traditionally be defined as minorities)?

In order to address this research question, we focused on US regions with a predominately white student population, adhering to the North American setting in which individuals who are not categorized as minorities comprise the core of the studies.

Studies utilizing Perna's model highlight systematic barriers, the influence of communities, and differences based on geographic variation affecting college choice decisions. Vaziri and authors[25] highlight the influence of communities in particular for rural students to enroll in college for engineering. For engineering to become a reality for some students, key organizations in a community play a critical role in supporting engineering as a college choice. The future of engineering also lies in improving opportunities for students to learn about engineering careers coupled with community partnerships. Likewise, studies highlight inequities in engineering enrollment based on various factors. Knight el al. [21] and authors depict geographic variation in the relationships between high school attendance and engineering enrollment by demographics such as gender, race, and socioeconomic status. This quantitative approach is powerful in highlighting trends which only allude to the deeper inequities which need further exploration and attention to address these issues at a systematic level.

Moore & Williams [23] addressed the dual enrollment initiative at an Appalachian community college. The particularity of this study is that it was carried out during the COVID-19 pandemic lockdown and used semi-structured interview protocols through video conferences and field annotations. Their questions mapped the four layers of Perna's model to describe the college expectations of the participants, courses registered during high school, hobbies, and recreations, as well as how they learned about dual enrollment. The results of the qualitative research design showed how students valued the supportive faculty and why the environment of the host institution was a major consideration in the participants' decision to choose it. The findings

showed that the participants acknowledge this program as a way to save money and take advantage of the broad alternatives it offers, particularly with regard to transfers and location.

Similarly, Gannon [17] also approaches qualitative research design intending to explore the understanding of higher institution choice decisions in rural students in southeastern and south-central Kansas, which analyzed their intentions, location choice, and academic program interest. In three to four rounds of interviews, three participants who presented individual stories about their rural habits and cultural capital were the subjects of this study. They obtained 170 codes for later comparison to fit into Perna's model's layers, but they stated that they could only offer results for the first two categories—habitus and school/community context—because the bulk of responses detailed their experiences with thick descriptions. Of note is the advantage in using a qualitative approach to understand nuanced experirences and justification of college choice decisions. Grant & Roberts [19] used a similar methodology in a comparable degree, but they included components that addressed every layer in the context of an R1 university in the Southeastern US. According to the participants, high school students were encouraged by their parents, teachers, and community members to pursue pragmatic degrees to leverage a career that would meet their parents' expectations. This highlights the influence of family expectations in the college choice decision.

On the other hand, Bennett [16] uses a quantitative research design to investigate a wide range of nearly a hundred private colleges that have adopted test-optional policies for undergraduate admissions. The author uses time series regressions and descriptive analysis to link the policies and student behavior to college enrollment decisions. The results demonstrate both the benefits and drawbacks of implementing test-optional rules to improve fairness in matriculation and admissions processes. This work has the potential to lead to action strategies examining how policies impact the registration of women and other populations considered minorities.

Recommendations

Based on our review, understanding college choice has strengths and weaknesses based on the qualitative or quantitative approach and intended research focus. Quantitative approaches can highlight trends and patterns which can then be uncovered and understood more deeply at the individual level using qualitative approaches. It is clear that culture and context play a key role in college choice - such as the impact of family or support from a community in certain populations. Although we have presented a review of studies of the population influenced by different variables concerning college choice decisions for STEM education in a broad context, it would be beneficial for researchers to expand these insights with other aspects or populations not considered by current literature. For instance, research could involve Indigenous underrepresented populations from the American continent to explore nuanced factors that impact college choice. Socioeconomic factors, representativeness, public policies, geographic location, access to pre-college education resources, or even segregation or racism from others with access to educational resources influence in different or similar ways to marginalized populations from the Andes or Mesoamerica. Studying college choice among aboriginal populations may not only be within this continent but also expand its exploration to other locations from Africa or Oceania. The reason is that non-representative populations may be affected by similar variables, where

internal conflicts make it complex to collect data to explore this phenomenon.

On the other hand, urban populations not considered minorities may be influenced by different variables associated with Perna's model when deciding their choices for post-secondary education. People from urban households strongly use Internet access for many educational activities related to pre-college and college education (e.g., homework submissions, sharing documents, or programming), which makes them heavily dependent on online tools allocated in the cloud and virtual platforms. Even though quantitative studies provide valuable insights into factors that impact college choice decisions in different actors worldwide, particularities across cultures can be challenging to interpret using only statistical variables. For this reason, future research should orient towards qualitative studies that allow us to obtain deep descriptions of factors that involve college choice decisions in different populations.

Conclusions

Models and suggestions developed in well-known and particular contexts can be useful guides for conducting research by modifying their definitions and constructs to fit other contexts that may differ in terms of geography, politics, or economics. Through this overview, we present Perna's model's effectiveness for college choice evaluations at different levels, from K-12 to undergraduate education. Through our review of eleven studies, we compared and assessed variables involved in Perna's model's layers of habitus, school/community, higher education, and socioeconomic status to analyze them according to a targeted population.

The applicability of Perna's work in different contexts allows researchers to employ its constructs for assessing them with qualitative or quantitative design techniques, emphasizing its usefulness for college choice criteria, either in industrialized or emerging countries. Our purpose in presenting the appraisal of these works is to encourage the readers to evaluate and consider elements from case studies to seek potential transferability or generalizations that this model can offer. Therefore, we recommend continuing to explore several lenses and facts using this model and complementing it, if required, with other frameworks or theories to obtain a better perspective of the processes and situations that affect and impact college choice decisions.

References

[1] E. Abad-Segura and M.-D. González-Zamar, "Sustainable economic development in higher education institutions: A global analysis within the SDGs framework," *Journal of Cleaner Production*, vol. 294, p. 126133, 2021.

[2] M. Menon, A. Katz, and M. Paretti, "A thematic and trend analysis of engineering education for sustainable development," in *2022 ASEE Annual Conference & Exposition*. ASEE Conferences, June 2022. [Online]. Available: https://peer.asee.org/40876

[3] E. A. Cech and T. J. Waidzunas, "Navigating the heteronormativity of engineering: The experiences of lesbian, gay, and bisexual students," *Engineering Studies*, vol. 3, no. 1, pp. 1–24, 2011.

[4] C. Zongrone, C. McCall, M. C. Paretti, A. Shew, D. R. Simmons, and L. D. McNair, ""I'm looking at you, you're a perfectly good person...": Describing non-apparent disability in engineering," *Collaborative Network for Engineering and Computing Diversity*, 2021.

[5] M. Song, "Rethinking minority status and 'visibility'," *Comparative Migration Studies*, vol. 8, pp. 1–17, 2020.

[6] M. Syed, M. Azmitia, and C. R. Cooper, "Identity and academic success among underrepresented ethnic minorities: An interdisciplinary review and integration," *Journal of Social Issues*, vol. 67, no. 3, pp. 442–468, 2011.

[7] S. Appelhans, T. De Pree, J. Thompson, J. Aviles, A. Cheville, D. Riley, J. Karlin, S. Fatehiboroujeni, and A. Akera, "From "leaky pipelines" to "diversity of thought": What does "diversity" mean in engineering education?" in *2019 ASEE Annual Conference & Exposition*. ASEE Conferences, June 2019. [Online]. Available: https://peer.asee.org/32861

[8] M. Mitchell, M. Leachman, and M. Saenz, "State higher education funding cuts have pushed costs to students, worsened inequality," *Center on Budget and Policy Priorities*, vol. 24, pp. 9–15, 2019.

[9] K. Babineau, "Closing the gap: An overview of the literature on college persistence and underrepresented populations." *Cowen Institute*, 2018.

[10] T. Mitropoulos and D. Bairaktarova, "Why engineering?–Exploring the link between students' self-concepts and their person or thing orientation," in *2022 IEEE Frontiers in Education Conference (FIE)*. IEEE, 2022, pp. 1–6.

[11] J. B. Main, T. Dang, B. Johnson, Q. Shi, C. Guariniello, and D. Delaurentis, "Why students choose STEM: A study of high school factors that influence college STEM major choice," in *2023 ASEE Annual Conference & Exposition*, 2023.

[12] L. W. Perna, "Studying college access and choice: A proposed conceptual model," in *Higher education: Handbook of theory and research*. Springer, 2006, pp. 99–157.

[13] M. J. Grant and A. Booth, "A typology of reviews: an analysis of 14 review types and associated methodologies," *Health information & libraries journal*, vol. 26, no. 2, pp. 91–108, 2009.

[14] R. W. Lent, S. D. Brown, G. Hackett *et al.*, "Social cognitive career theory," *Career choice and development*, vol. 4, no. 1, pp. 255–311, 2002.

[15] N. Acevedo-Gil, "College-*conocimiento*: Toward an interdisciplinary college choice framework for Latinx students," *Race Ethnicity and Education*, vol. 20, no. 6, pp. 829–850, 2017.

[16] C. T. Bennett, "Untested admissions: Examining changes in application behaviors and student demographics under test-optional policies," *American Educational Research Journal*, vol. 59, no. 1, pp. 180–216, 2022.

[17] J. L. Gannon, "Exploring college choice experiences of rural students through creative nonfiction," *Educational Considerations*, vol. 48, no. 2, pp. 1–26, 2022.

[18] F. Gao and J. C. K. Ng, "Studying parental involvement and university access and choice: An 'interacting multiple capitals' model," *British Educational Research Journal*, vol. 43, no. 6, pp. 1206–1224, 2017.

[19] P. D. Grant and J. K. Roberts, ""You're poor, so you're not going to do anything:" Socioeconomic status and capital accumulation as a means to access higher education for rural youth," *Rural Sociology*, vol. 87, no. 4, pp. 1340–1369, 2022.

[20] J. P. Gross, E. Stolzenberg, and A. Williams, "College choice and enrollment among youth formerly in foster care," *Journal of College Access*, vol. 5, no. 2, pp. 8–31, 2020.

[21] D. B. Knight, J. R. Grohs, I. S. Bradburn, T. J. Kinoshita, S. Vaziri, H. M. Matusovich, and C. Carrico, "Illuminating inequality in access: Variation in enrollment in undergraduate engineering programs across Virginia's high schools," *Journal of Engineering Education*, vol. 109, no. 4, pp. 665–684, 2020.

[22] M. K. Lauderdale and S. J. Heckman, "Family background and higher education attainment among children of immigrants," *Journal of Family and Economic Issues*, vol. 38, pp. 327–337, 2017.

[23] K. P. Moore and M. R. Williams, "Factors encouraging student enrollment following dual enrollment participation." *Community College Enterprise*, vol. 28, no. 1, pp. 9–27, 2022.

[24] N. T. Ngan and B. H. Khoi, "Using PLS-SEM algorithm for choice of university in Vietnam," in *Journal of Physics: Conference Series*, vol. 1933, no. 1. IOP Publishing, 2021, p. 012066.

[25] S. L. Vaziri, M. C. Paretti, J. R. Grohs, L. M. Baum, M. M. Lester, and P. L. Newbill, "Community cultures: Broadening participation by understanding how rural communities support engineering as a college major choice," in *2020 ASEE Virtual Annual Conference Content Access*. Virtual On line: ASEE Conferences, June 2020, https://peer.asee.org/34307. [Online]. Available: https://sftp.asee.org/34307

[26] J. S. London, W. C. Lee, and C. D. Hawkins Ash, "Potential engineers: A systematic literature review exploring Black children's access to and experiences with STEM," *Journal of Engineering Education*, vol. 110, no. 4, pp. 1003–1026, 2021.