



A Tale of Two Universities: An Intersectional Approach to Examining Microaggressions Amongst Undergraduate Engineering Students at an HBCU and a PWI

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Abstract

The current study utilized the intersectionality theory to analyze microaggressions towards engineering undergraduate underrepresented gender and racial minority students. In this study, participants were sampled from intersecting identity groups (Asian female, Asian male, Black female, Black male, Hispanic female, Hispanic male, White female) at two institutional settings: 1) a Historically Black College/University (HBCU) and 2) a Predominantly White Institution (PWI). The study's analysis examined microaggressions in the context of undergraduate engineering programs at both sites, an HBCU and a PWI. The results suggested that a higher frequency of microaggressions took place at the PWI than the HBCU. The most frequently identified microaggressions included disjointed race and gender dialogue, hidden language, projected stereotypes, an ascription of intelligence, silence, and marginalization. The paper aims to increase awareness of the prevalence and varying types of microaggressions experienced between the sites. These results may influence policies and educational practices to meet the needs of underrepresented minority students in engineering. This material is based upon work supported by the National Science Foundation under Grant No. (1828172 and 1828559). "Collaborative Research: An Intersectional Perspective to Studying Microaggressions in Engineering Programs".

Introduction

Gender and racial minority groups remain disproportionately represented within engineering programs (NSF, 2019). Previous literature that discussed minority disparities within engineering education investigates racial disparities and gender disparities separately. Studying race or gender as separate entities, rather than at their intersection, overlooks how people are treated differently in engineering programs based upon overlapping identities.

Microaggressions are the subtle offense individuals encounter based on their social group membership, such as race, gender, and sexual orientation (Nadal et al. 2011; Sue et al., 2007). Microaggressions exist within engineering (Fouad, Chang, Wan, and Singh, 2017). Therefore, microaggressions may be a factor that impairs minority retention, a factor that potentially drives underrepresented minority students away from the engineering field. Furthermore, the subtle negative interactions that underrepresented minority students experience need attention in engineering education. This need urges scholars to investigate whether microaggressions experienced by underrepresented engineering students factor into the retention of these populations in engineering.

Intersectionality theory proposes that layered characteristics such as race and gender impacts a person's experiences, perception, and identity (Crenshaw, 1989). This current paper applies intersectionality theory to distinguish the various microaggressions towards each gender and racial identity group. The current study addresses diverse engineering students' experiences with microaggressions at a historically Black college/university (HBCU) and a predominantly White institution (PWI). The findings contribute to the knowledge-base for educators and

administrators to better understand how to address the negative interactions and possible microaggressions towards underrepresented engineering students.

Literature Review

Microaggressions

Scholars have defined microaggressions as the common day-to-day verbal or nonverbal interactions towards an individual, which can communicate subtle negative and degrading messages about race, sex, sexuality, and class (Nadal, Griffin, Wong, Hamit, & Rasmus, 2014; Sue, Capodilupo, et al., 2007). Within microaggression experiences, individuals have projected quick, sly remarks towards a marginalized individual (Torino et al., 2018). Sue and colleagues (2007) have categorized microaggressions three different groups based on the impact and intent of the interaction. The three forms of microaggressions include 1) microassaults, 2) microinvalidations, and 3) microinsults (Sue, Capodilupo et al., 2007). Although any individual may experience microaggressions, the current paper focused on certain underrepresented minority groups (Asian female, Asian male, Black female, Black male, Hispanic female, Hispanic male, White female).

Microassaults described overt demeaning actions, such as avoidant behavior. An example of microassaults have included comments that condemn a person's hairstyle or natural. Microinvalidations involved the instances when the negative experiences and feelings of underrepresented minority persons are refuted and denied. Finally, microinsults labeled the offensive behavior that belittles an underrepresented minority person's culture or identity (Sue et al., 2007). Microinsults included comments related to "how well" a person of color speaks or dresses for their identity group (Sue et al., 2007). As these interactions are subtle, targeted individuals have questioned themselves, ignored the attack, or debated whether to address the perpetrator (Sue et al., 2007).

Unfortunately, microaggressions have occurred in academic environment settings. Yang and Carroll (2018) measured female faculty members' (N=102) experiences with microaggressions quantitatively. Tenured and non-tenured female STEM faculty reported gendered microaggressions experiences, sexual objectification, silence and marginalization experiences, and the strong woman archetype. Within a sample of about 400 students, a study confirmed that Black, Asian, and Latino students in higher education reported higher scores on a microaggression scale than their White peers (Forrest-Bank & Jenson, 2015). As these slight insults may be intentional or unintentional, microaggressions likely have contributed to the racial/ethnic and gender disparities in the engineering field. Within the last decade, engineering educators have expressed interest microaggressions and how these interactions impact the learning environment, later workplace.

Table 1 *Microaggression Taxonomy, Sue et al. (2007) and Lewis and Neville (2015)*

Microinsult	Microinvalidation	Microassault
Ascription of Intelligence	Alien in own land	Assumptions about style & beauty
Second Class Citizen	Colorblindness	Projected stereotypes

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Pathologizing Cultural values Assumption of criminality Dehumanization Silence & Marginalization Pathologizing Characteristics of Speech	Myth of meritocracy Denial of individual racism Assumed universality Assumed shared nationality	Sexual objectification Sexist humor & jokes Emasculation Exoticism
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Microaggression in Engineering Education. The engineering community has collaborated with social science researchers to understand how student experiences impact engineering education outcomes. Specifically, engineering education literature has used various terms to label what Sue et al. (2007) have identified as microaggressions (Casad, Petzel, & Ingalls, 2019; McLoughlin, 2005; Yang & Carroll, 2018). Engineering scholars used terms like "spotlighting" to describe microaggressions within engineering education indirectly. For example, McLoughlin (2005) described spotlighting within engineering undergraduate settings, as "the singling out of women based on gender in ways that make them feel uncomfortable" (p. 375). The negative experience interpreted as a minor attack on the woman's ability ultimately represents a microaggression. Engineering education researchers have not consistently recognized the experience of microaggressions as a cohesive phenomenon due to the number of different terms used to describe them.

Intersectionality

Intersectionality was introduced by a law professor, Kimberle Crenshaw (1989), to explain the marginalizing interactions based on social identity (i.e., race/ethnicity, gender, sexual orientation). The discussion began as a spotlight on how Black women have been treated differently in America. Crenshaw (1989) argued the current analyses of race and gender discrimination ignore multi-layered identities, and the anti-discrimination policies ineffectively met (Crenshaw, 1989; Cross, Clancy, Mendenhall, Imoukhuede, & Amos, 2017). When disparity is addressed from only one perspective, such as race, gender, or class, underrepresented groups with an intersection of these identities are likely to be excluded (Cho, Crenshaw, McCall, 2013; Cooper, 2016). With the intersectional framework, the current study critically probes diverse engineering students' experiences based on both their race and gender.

STEM and Intersectionality. Scholars applied intersectional frameworks to construct a distinct narrative for underrepresented student groups in STEM disciplines (Camacho & Lord, 2011; Ireland et al., 2018). For example, Ireland et al. (2018) conducted a content analysis of the existing STEM literature that explored the experiences of Black women and girls based on their racial/ethnic and gender identities. The analysis included studies that investigated negative experiences amongst both race and gender groups. The emergent themes in the study that sampled Black women and girls in STEM discussed personal identity or self-image development, interests and confidence in STEM achievement, and social support for STEM identity development (Ireland et al., 2018). Camacho and Lord (2011) introduced the microaggressions concept to the engineering profession with a study that explored the

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intersectional experiences of Asian, Hispanic, and White women. They discovered that Asian and Hispanic female students had a greater occurrence of interpersonal microaggressions than White female students. Cross, Clancy, Mendenhall, Imoukhuede, and Amos (2017) found that African American, Hispanic, and Native American students were underserved and had different experiences from both their male counterparts and the White female population. Litzer, Samuelson, and Lorah (2013) found that African American and Hispanic students had lower confidence in their STEM performance when compared to other race/gender groups.

Campus Climate

Studies that describe the perceptions of campus climate have provided insight into the experiences of underrepresented student groups. In 1994, Henry and Nixon explained the metaphor “chilly climate” as the slow nature of the institutional change to address minority retention. In a large quantitative study (N=7,347), Rankin and Reason (2005) found that students of color generally perceived campus climates to be more racist and hostile, while White students perceived the same campus climates as friendly and non-racist. More specifically, Hispanic and African American students were impacted by racialized college campuses (Solorzano, Allen, & Carroll, 2002).

Given the ambiguous nature of microaggressions and its likely impact on minority retention, it becomes evident to critically understand how the campus environment may impact the experiences of underrepresented minority students. The current study probes both a Historically Black College/University (HBCU) and a Predominantly White Institution (PWI) engineering undergraduate populations for a deeper understanding of how the intersection of both gender and race influenced microaggressions experienced by underrepresented minority students in engineering programs.

Research Questions

The research study sought to answer two questions:

1. What are the microaggressions experienced by engineering undergraduate students attending an HBCU and PWI?
2. Does the campus climate, HBCU vs PWI, influence the occurrence of microaggressions experienced by engineering undergraduate students?

Methodology

The research design for this study was the phenomenological method (Creswell & Poth, 2016). Researchers conducted interviews with students of varying racial and gender intersecting identities to identify and describe the instances when they confronted microaggressions within engineering programs at an HBCU or PWI. Phenomenological methods use a rich inquiry to describe the lived experiences of individuals impacted by a specific occurrence (Creswell & Poth, 2016). Researchers have applied phenomenological methods to collect qualitative data from multiple people that describe a common experience and identify any prevalent patterns or trends. Within this study, microaggressions represented a subtle and often undetectable experience identified from personal narratives. Therefore, the phenomenological method allowed the researcher to identify and code the macroaggression experience from stories shared by

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engineering students, even when these targeted students were not conscious of the microaggressions.

Sampling and Recruitment

The sample population included undergraduate engineering students from two land-grant, public universities, one HBCU, and one PWI. The HBCU is in the mid-Atlantic region and the PWI in the Midwestern region of the U.S. The study was IRB approved at both universities, and Recruitment methods included advertisement and the snowballing technique during the spring and fall semesters. Researchers distributed flyers in the engineering buildings and computer labs. Additionally, researchers asked student support staff and student organizations to recommend students to participate in the study.

The estimated sample size PWI setting was approximately 8,700 students, whereas, at the HBCU setting, the estimated sample size was 1,900 students. As these groups had the representation in each of the settings, eligible participants included four underrepresented intersecting identity groups: 1) Asian female and male, 2) Black female and male, 3) Hispanic female and Hispanic male, and 4) White female. One study found that White participants scored much lower on the microaggression scale and validated that ethnic/racial microaggressions mostly impact people of color (Forrest-Bank & Jenson, 2015). The current study excluded White males as part of the coding for this study due to their third-party perspective related to microaggressions. Similar studies have found that White males recalled their observation of microaggressions amongst peers, not negative interactions directed towards themselves. Additionally, the Asian population consisted of exchange students from a partner school in Korea for juniors and seniors (< 2%) at the HBCU. Of the total interviews, there were no Asian male student interviews collected at the HBCU or the PWI; as such, the study does not include Asian males within the current dataset. Due to difficulty with recruitment efforts, the current analysis does not include the Hispanic male student perspective at the HBCU setting.

The researchers collected (N=22) interviews between the two universities. All interviews conducted between the HBCU (n= 10) and PWI (n=12) sites took between fifteen minutes and sixty minutes. The interview protocol listed a series of twenty-eight questions related to their experiences as a person of color and woman or man. For example, questions included “Can you recall an instance inside or outside of class when you suspected you were treated negatively because of your gender, but you were not sure?” and “Can you recall an instance inside or outside of class when you suspected you were treated negatively because of your race/ethnicity, but you were not sure?”

Results

Interviewers asked the students a series of questions about any negative experiences or instances where they felt as though they were treated differently due to their racial and gender identity. Table 2 includes the participant information at each site. The students described incidents that occurred in classrooms, faculty-student interactions, teaching assistant-undergraduate student interactions, and peer interactions that were later identified as microaggressions. In the last interview question, interviewers asked the students whether they would categorize or label any of their responses as microaggressions. The current dataset

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included 241 incidents labeled as microaggressions within the interviews. Coders identified microaggression occurrences narrated at the PWI than the HBCU. In all, the students at the HBCU site described a total of 27 incidents later coded as microaggressions. The students at the PWI site described a total of 214 incidents later coded as microaggressions.

Table 2 *Participants and number of microaggressions within each group*

Identity Group	Microaggressions referenced within interviews
HBCU N=10	
Hispanic Female n=2	8
Black Female n=3	15
Black Male n=3	3
Asian Female n=1	1
White Female n=1	0
Total	27
PWI N=12	
Hispanic Female n=2	52
Hispanic Male n=4	69
Black Female n=2	25
Black Male n=2	16
Asian Female n=1	34
White Female n=1	15
Total	214

Types of microaggressions

The five most prevalent types of microaggressions identified amongst the institutions classified as the following: *disjointed race and gender dialogue*, *hidden language*, *projected stereotypes*, *an ascription of intelligence*, *silence*, and *marginalization*. The interviews from each of the institutions described at least one instance where these specific microaggressions occurred.

Disjointed race and gender dialogue described moments when an underrepresented minority person was engaged in a conversation when individuals have taken extreme precautions or misinterpreted race and diversity conversations. These interactions suggested that the topic is not appropriate or uncomfortable to discuss. This theme also included when the interview audio had long pauses, or the participant began to stutter, suggestive of an uncomfortable memory. Hispanic female students at the PWI site described the highest prevalence of *disjointed race and gender dialogue* experiences. A White female student attending the PWI also experienced *disjointed race and gender dialogue* during the interview when asked whether it was difficult to discuss race and gender in college.

The hidden language described the encounters when privileged individuals made subtle comments that were superficially kind but suggested derogatory meanings. Within the interview, underrepresented minority engineering students found themselves reading between the lines for a secret meaning or ill-mannered message. Interviews with *hidden language* microaggressions

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occurred most frequently in the Hispanic male interviews, next in the Hispanic female interviews, both at the PWI site.

Another type of microaggression identified within the interviews was *projected cultural stereotypes*, the encounters when an individual treated an underrepresented minority person poorly based on negative stereotypes, rather than being acknowledged as a human. *Projected cultural stereotype* microaggressions were misinformed attitudes produced by media outlets, pop culture, or outdated socio-cultural references. Underrepresented minority individuals are reduced to one-dimensional caricatures defined by their group membership. Interviews with *projected cultural stereotypes* occurred most frequently in the Hispanic male interviews, followed by the Hispanic female interviews, then the Asian female student interviews, all from the PWI site.

Several of the interviews included microaggressions, an *ascription of intelligence and silence and marginalization*, previously defined in the literature. (Capodilupo et al., 2014; Sue et al., 2007). For example, the microaggression, *ascription of intelligence*, was defined as "assigning intelligence to a person of color based on their race" (Sue et al., 2007, p. 276). Microaggressions identified as an *ascription of intelligence* were rooted in negative assumptions about participants' knowledge and intelligence. All the students of color attending the PWI reported instances in which their intelligence was questioned or challenged. Only the Black students at the HBCU discussed an ascription of intelligence. Also, Sue and colleagues (2007) identified *silence and marginalization*, moments during social interactions when participants felt invisible or as the outcast from the group. The interviews of Hispanic students attending the PWI primarily mentioned this type of microaggression. There was little discussion of being silenced and invisibility amongst the other student groups.

Comparison of Sites. The results indicated that microaggressions occurred more frequently at the PWI than the HBCU. Table 3 includes excerpts from the interviews that identify the microaggressions described above. The examples were selected to illustrate how underrepresented minority students experience these microaggressions at the HBCU and PWI. The interview narratives did not describe disjointed race and gender dialogue on campus. However, the White female student attending the HBCU often asked for the question to be repeated, took long pauses, and hesitated during moments of the interview. Similar to the Hispanic female students at the PWI, an interview from a Hispanic female student from the HBCU indicated one situation that contained hidden language. Students at both the HBCU and PWI experienced projected stereotypes; however, the students at the PWI recalled more encounters perceived as microaggressions. Ascription of intelligence was also prevalent amongst both sites, and one Black female student at the HBCU explicitly recalled when ascription of intelligence is most prominent. Students at the HBCU did not discuss examples of silence and marginalization experiences.

Table 3 *Excerpts from the data*

Identified Microaggression	Quotes from interviews	Identity Group	Site
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Disjointed race and gender dialogue	“I think especially with Caucasians they get really awkward when it comes to different talks about race and like just talking a little bit about the past, they get super uncomfortable with that too.”	Hispanic Female	WI	P
Hidden language	“I feel like race has just become so intertwined with, like, politics, you know, that you can’t say that you’re black or Hispanic without someone else thinking, “Oh, you must be a liberal” or something like that”	Hispanic Male	WI	P
Projected stereotypes	“One of the things that my opponents were you doing against me as a Latino male was making this story of me being a rapist. And that sort of, like, goes in line too with, you know, the stereotype of Latino men being rapists and such. And so, it was completely false but it was just something that they were perpetuating throughout, even their social media as well as, like, on campus where they vandalized, like, some of my posters and signs that were promoting myself as a candidate for the student government and writing “rapist” on top of them and things of that nature.”	Hispanic Male	WI	P
Ascription of intelligence	“I had definitely I’ve had some of my definitely the older male professors kind of like not necessarily hear you when you’re trying to talk about more technical things.”	Black Female	BCU	
Ascription of intelligence	I feel like my math skills are very lacking and it’s very interesting for me... okay, maybe this is the negative of... When someone asked me for help in math, there’s always that perception in my mind, “Do they ask me because they think I’m smart? Do they ask me because I’m a girl? Or do they ask me because I’m an Asian?”	Asian Female	WI	P
Silence and marginalization	“I came up with some of my ideas and some of my aspects of it and I brought	Hispanic Male	WI	P

it to the team. I was always working. And they always seemed to shun me out.”

Discussion

The number of identified microaggressions varies between the students' race, gender, and school attendance. Undergraduate engineering students at both the HBCU and PWI had recounted occasions when probable microaggressions took place. The interviews from the PWI site contains almost eight times more microaggression descriptions than at the HBCU site. These findings support previous literature that indicated microaggressions are likely to target groups that are underrepresented minority populations within certain settings (Camacho & Lord, 2011; Cross et al., 2017; Yang & Carroll, 2018), further acknowledges that gender and racial minorities are more likely to be the targets of microaggressions at PWIs. Within each setting, the White female students report the fewest interactions that described perceived microaggressions amongst the identity groups. Students attending the PWI describe not only the most microaggression instances but, they also encounter a greater variety of microaggressions when compared to their peers attending the HBCU site. Studies have investigated the racialized campus climate at PWIs and found them to be more oppressive to students of color (Rankin & Reason, 2005). However, fewer instances of microaggressions occurred at the HBCU, as these universities have historically committed to scholastic opportunities for underrepresented students, and continue to promote collectivistic ideals (Albritton, 2012).

Microaggressions are likely to target racial and gender minorities (Torino et al., 2018). Through the intersectional lens, the microaggressions in the interviews also vary between the intersecting identity groups (Cooper, 2016; Crenshaw, 1989). One Asian female student interview from the PWI setting contains the highest number of microaggressions. The Asian female students recall examples that included mostly projected stereotypes, such as "model minority" schema and experienced only-ness, as the assumed, sole representative for an entire cultural group (Camacho & Lord, 2011). As listed in Table 2, an Asian female student at the PWI experiences microaggressions that may create intrinsic pressure to have the innate skill over her peers, especially in science and math.

As a collective group, the interviews include a high frequency of derogatory remarks and microaggressions towards Hispanic female and male students attending the PWI site. Hispanic male students face projected cultural stereotypes from peers at the PWI site. The example in Table 2 includes an example as *the assumption of criminality* or the inference that the underrepresented minority person is guilty or potential to commit a crime (Sue et al., 2007). Additionally, these students encounter hidden language and likely expend extraneous time to decode conversations and interactions with peers, faculty, and advisors. Camacho and Lord (2011) defined interpersonal microaggressions to categorize the interactions that led women to question their belonging in engineering. The HBCU Hispanic female interviews mention hidden language and invisibility, yet, at a lesser rate than their PWI peers. Though the prevalence of microaggressions experienced by Hispanic male and female students at the PWI site is alarming, the malicious intent directed towards these students is concerning.

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Black female and Black male students respond with fewer examples of perceived microaggressions than their Hispanic and Asian peers. Similarly, a prior study with HBCU and PWI perspectives concluded African American students at both institutions were equally involved in institutional activities, yet, the African American students at the HBCUs reported greater satisfaction with their overall college experience than their PWI peers. (Outcalt & Skewes-Cox, 2002). Both Black female and Black male students attending the PWI describe microaggressions that attack their scholarly ability, ultimately doubt their intellectual worth and becoming an engineer. Interestingly, a previous study stated that Black males have “higher STEM confidence than White men” (Litzer, Samuelson, & Lorah, 2014, p. 826). Black male students at the HBCU site recall about four instances that were identified as the ascription of intelligence, compared to the only four instances recalled by the Black male students at the PWI site. The underlying message of HBCU missions to promote safe and quality education for Black students and other students of color was evident in the few identified microaggressions at the HBCU (Albritton, 2012). As each identity group discussed different types of microaggressions, underrepresented minority students face additional stressors that can impede their academic and career trajectory, if left unaddressed.

The current study identifies various negative interactions within engineering educational settings. Many, though not all, of the excerpts, involve well-meaning White people or unintentional microaggressions towards the underrepresented minority person (Trepagnier, 2017). Subtle, covert negative interactions perpetuate the difficulties in the career and academic pursuit of underrepresented minority women hindering minority retention within engineering education (Camacho & Lord, 2011). The goal of this paper is to illuminate multiple experiences amongst undergraduate engineering students and identify the microaggressions that impact underrepresented minority engineering students. While every engineering department may not have an issue with marginalizing underrepresented students, the findings from this study encourage administrators and educators to become aware and intentional about fostering a safe learning environment for diverse minority engineering students.

Limitations. It is important to acknowledge the limitations of the study. Despite much past study, the nature of microaggressions is ambiguous. Lilienfeld (2017) outlines several potential weaknesses that may diminish the validity of microaggression research initiatives. For example, many of the coded microaggressions are overtly racist or gendered comments, rather than subtle. The term microaggression may be viewed as an oxymoron, for some instances may be offensive while others lack clear intentions (Lilienfeld, 2017). The authors have taken precautions in this report to ensure the construct is studied from the perspective of the targeted individual. The current study’s design did not allow for analysis of the microaggression intention from the suspected individual. The study is designed to explore microaggressions as “subtle biases” to invite open discussion about any negative experiences that would be later identified as microaggressions. However, due to the abovementioned ambiguous nature of microaggressions, participants may not always confirm these experiences as microaggressions. The current findings suggest that these instances influence their targets, yet, these negative outcomes may not be apparent to the participants. Moreover, the identified microaggressions are based on the experience, judgment, and theoretical understanding of the researchers, not the participants.

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Additionally, though recruitment efforts were intensive, due to the small populations of certain underrepresented minority groups at each site, each group is not included from each campus. The data from the Asian male student group at the HBCU and the PWI is unavailable at the time of the current analysis. Similarly, data from the Hispanic male student group at the HBCU setting is not currently collected. Finally, the geographical location of each university may inhibit the diversity representation on campus; as such, these factors limit generalizability and emphasize the need for further investigation.

Future research. The current study gathers the diverse experiences in engineering education, thus increases the visibility of microaggressions within engineering. Further research must duplicate the design at other universities to increase the generalizability of the present findings, as due to the qualitative nature of this study, the findings are transferable, but not generalizable. Future studies will achieve greater reliability by including measures that allow the participant to confirm or provide their understanding of microaggressions, allowing for a more accurate depiction of the underrepresented minority student's experience. Additionally, studies may include data from likely perpetrators of microaggressions in engineering education settings.

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