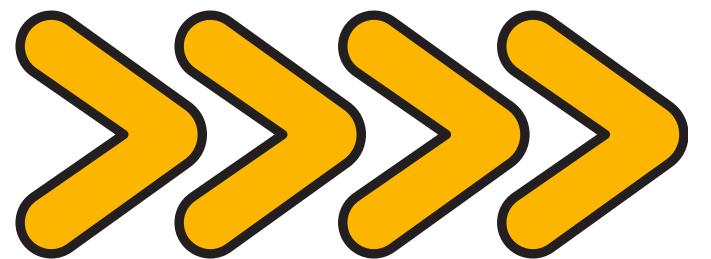


EDST Senior Capstone Presentation

STEM

**Exploring Race, Citizenship,
and Academic Pathways for
Social Mobility: Perspectives of
Undergraduate STEM Majors in
a U.S. Liberal Arts College**



by Amanda Tran '24

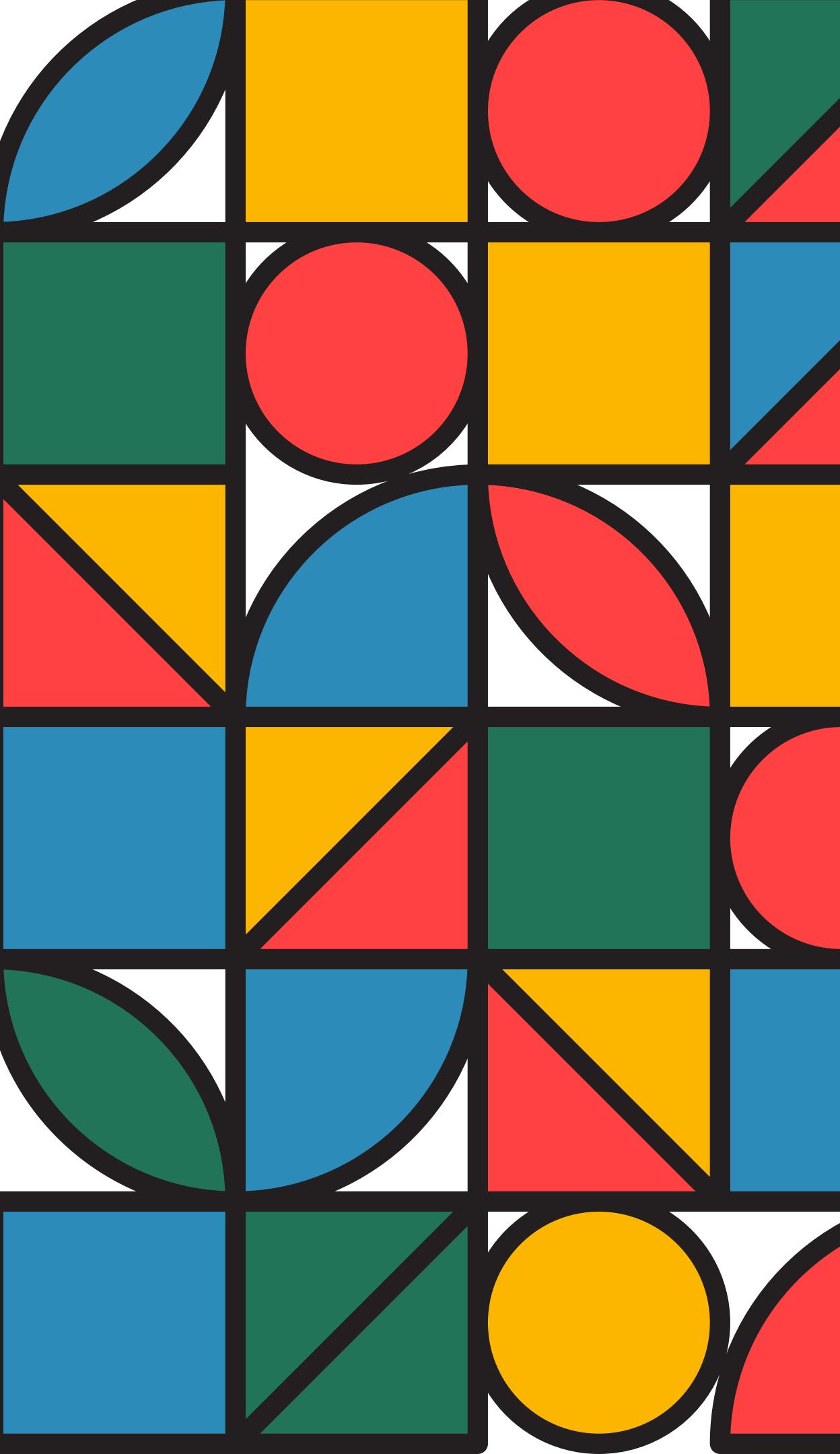


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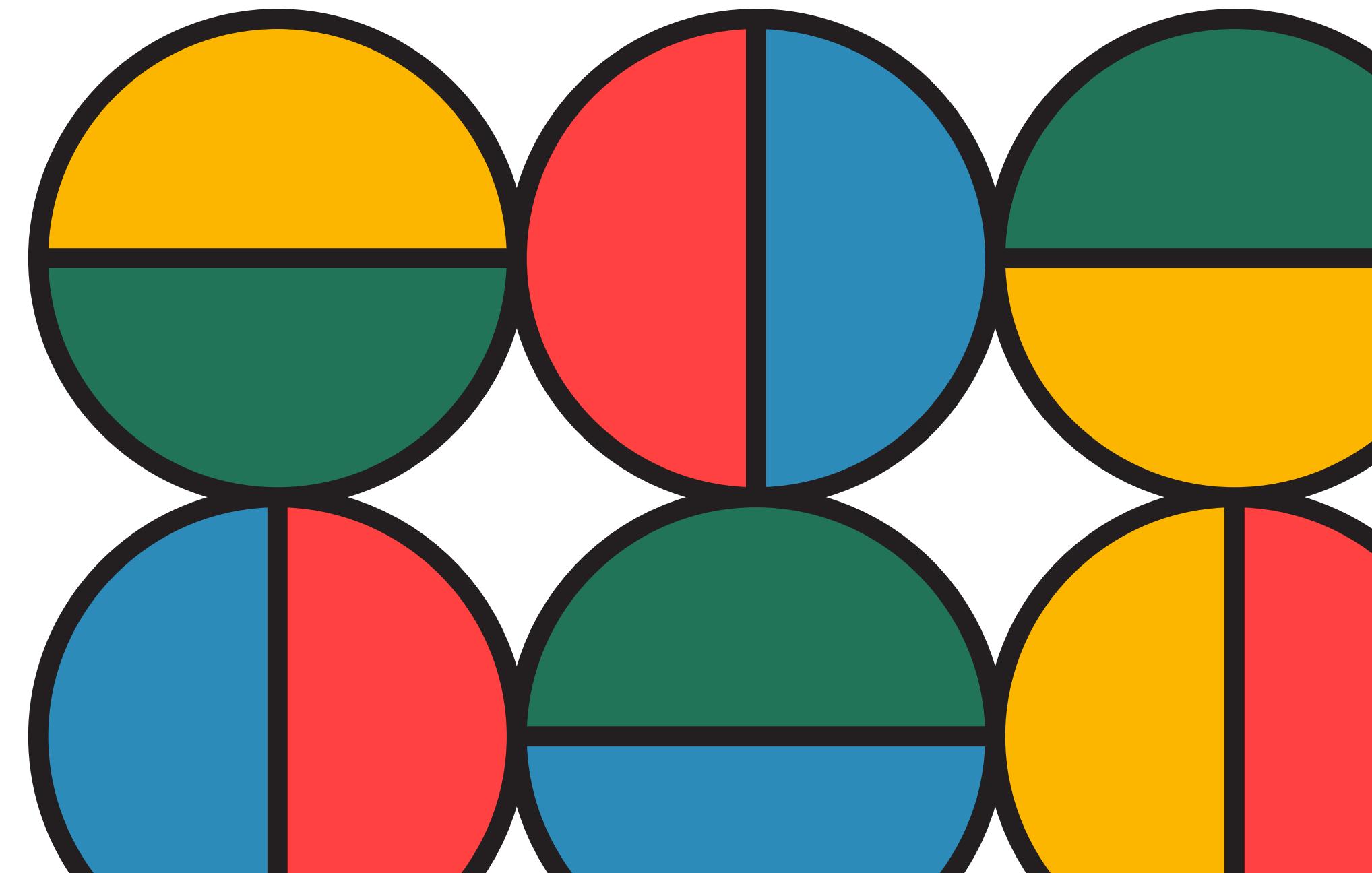
INTRODUCTIONS

LITERATURE REVIEW

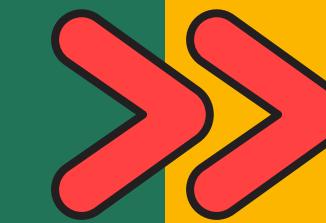
FRAMEWORK &
METHODS

FINDINGS

DISCUSSION



INTRO DUCTIONS



**STEM Education on
the rise**



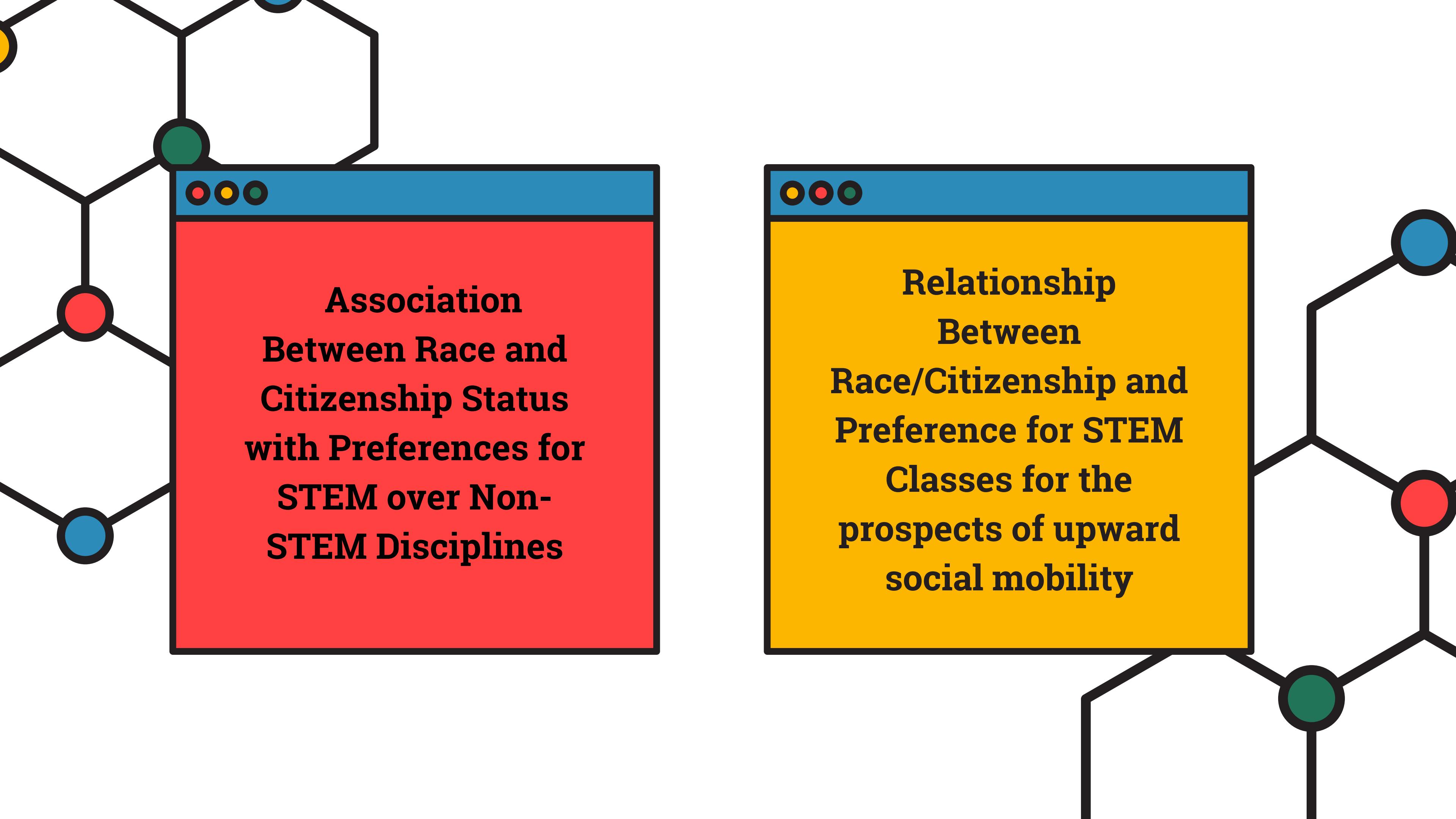
**The Myth (and
Marketing) of STEM &
Social Mobility**



**Racial identities in
STEM**



**International students
in STEM**



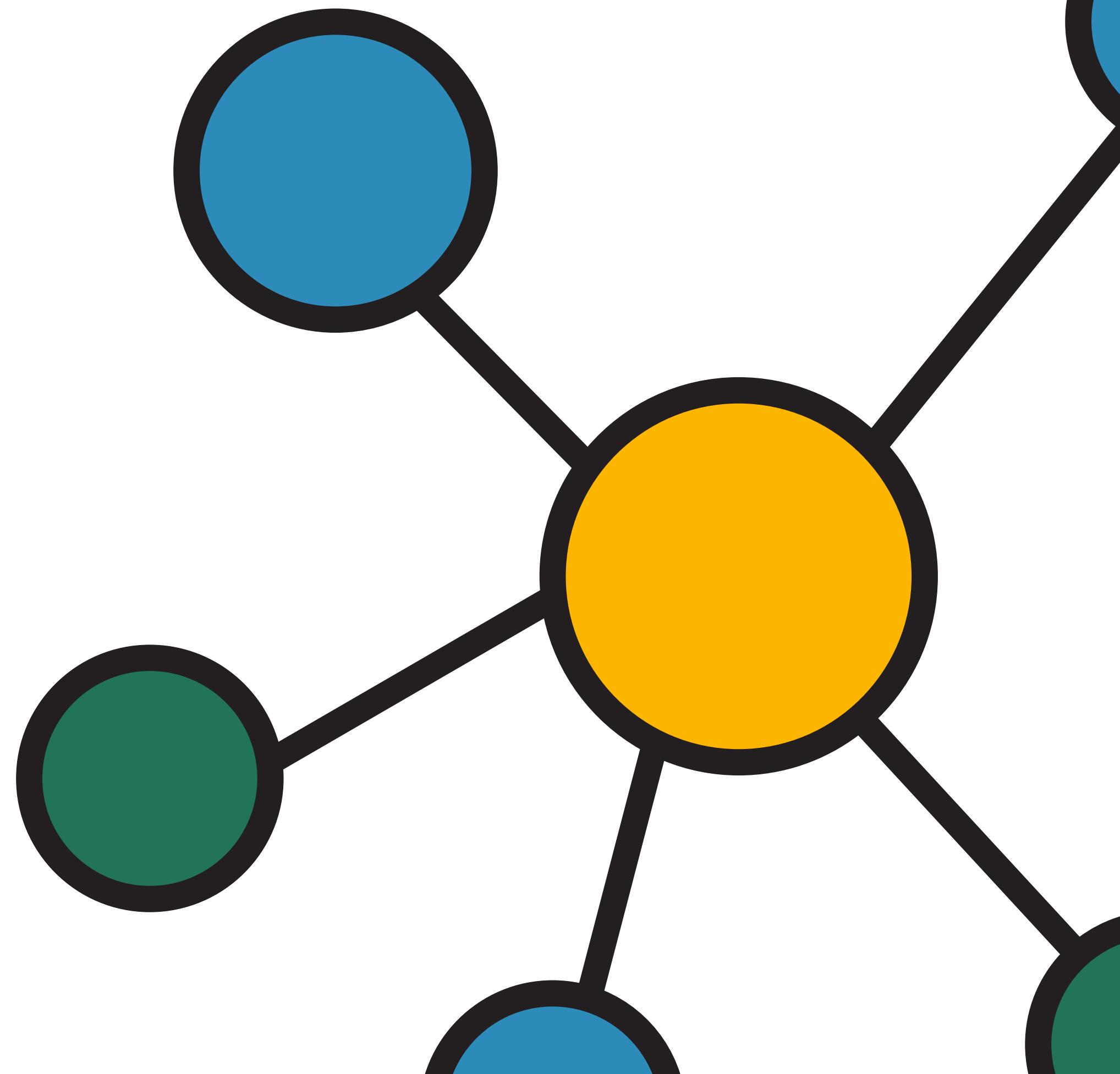
**Association
Between Race and
Citizenship Status
with Preferences for
STEM over Non-
STEM Disciplines**



**Relationship
Between
Race/Citizenship and
Preference for STEM
Classes for the
prospects of upward
social mobility**

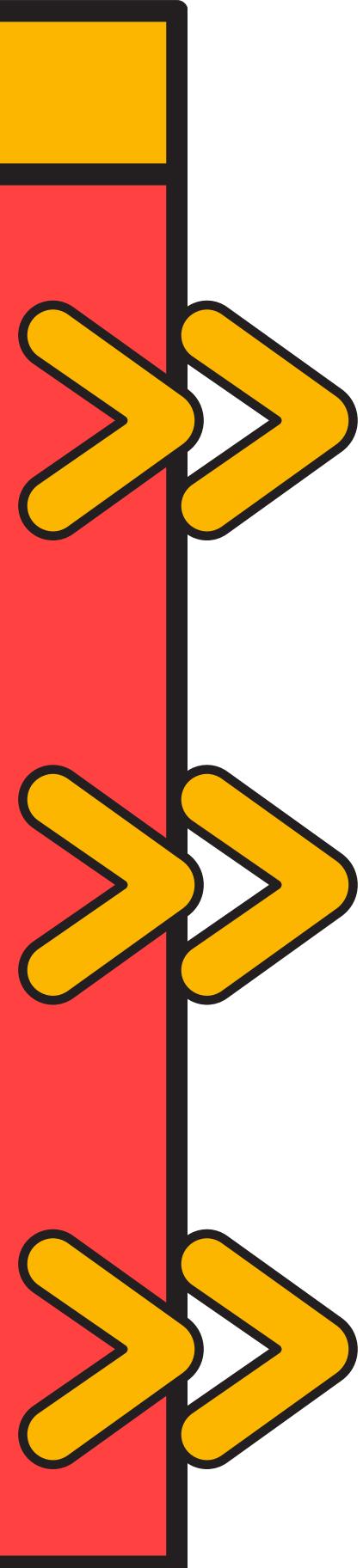
LITERATURE REVIEW

Key themes in existing
literature



LITERATURE REVIEW

STEM, RACE, CITIZENSHIP, & SOCIAL MOBILITY



PERCEIVED BENEFITS OF STEM CAREERS

STEM fields offer higher salaries, particularly in the U.S., creating a perception of better earning potentials and drive STEM degrees (Rothwell, 2013; USCIS, 2022).

STEM AS PATH TO SOCIAL MOBILITY

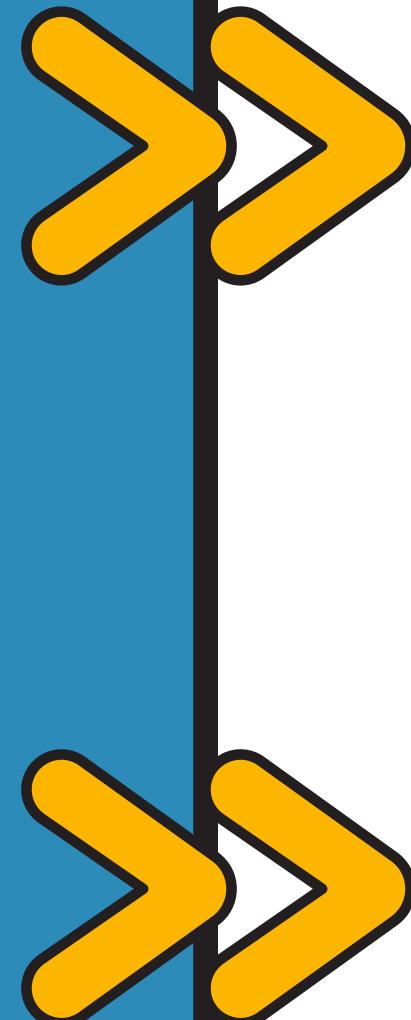
STEM education is seen as a path to social mobility, but racial and social factors lead to disparities in access and opportunities (Boliver & Wakeling, 2023; Zhou & Lee, 2007).

FAMILY DYNAMICS AND STEM PURSUIT

Racially marginalized communities view social mobility as a family-wide effect and often encourage STEM careers to fulfill familial expectations (Wainwright & Watts, 2021; Mein et al., 2020).

LITERATURE REVIEW

PERSONAL GOALS IN THE PURSUIT OF STEM



AGENTIC VS. COMMUNAL GOALS

Research suggests that personal goals in tertiary STEM education can be categorized into agentic goals focused on individual achievement and communal goals oriented towards benefiting others (Medina et al., 2021; Wolter et al., 2019).

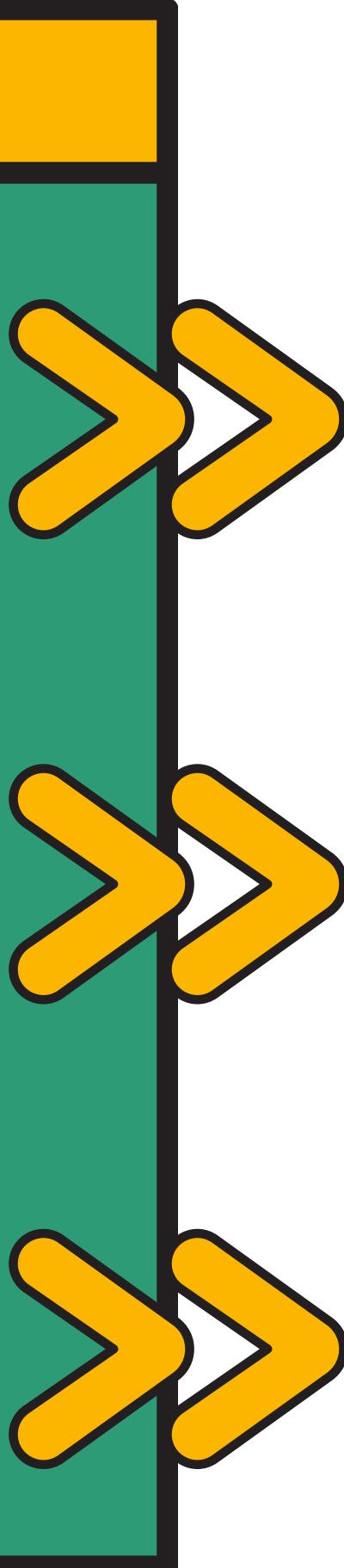
RACIAL BACKGROUND & GOALS

While some students prioritize economic goals and personal well-being in STEM pursuits, others are motivated by altruistic intentions to benefit society, particularly those in need (Davis & Wilson-Kennedy, 2023; Marsh, 2023).

LITERATURE

REVIEW

STEM STUDENTS' SELF-EFFICACY



RACE, NATIONALITY, CAREER SELF-EFFICACY

Factors like race and nationality intricately shape STEM students' perceptions and experiences of self-efficacy (Lent et al., 1994; Abe et al., 2021).

UNDERREPRESENTED GROUPS AND EXPERTISE SELF-EFFICACY

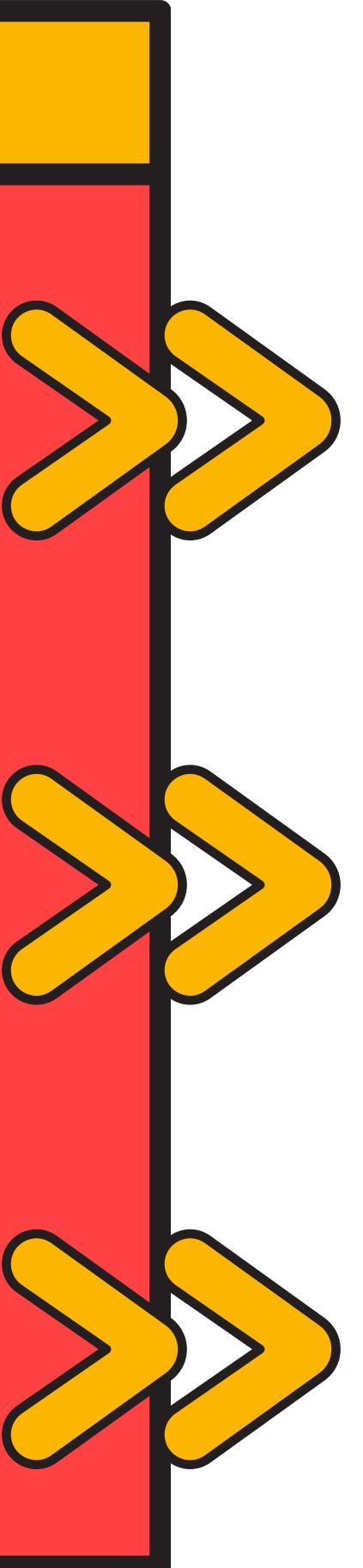
Underrepresented racial/ethnic groups may exhibit higher levels of career self-efficacy, yet face systemic barriers that impact their confidence (Chatterjee et al., 2023; Mau, 2004; Davis and Wilson-Kennedy, 2023).

INTL. STUDENTS AND SELF-EFFICACY

Immigrant students show heightened engagement in STEM but face unique challenges such as job security concerns and discrimination based on citizenship status (Porche et al., 2016; Rahming, 2022).

LITERATURE REVIEW

CAREER OUTCOME EXPECTATIONS (COE) AMONG STEM STUDENTS



ECONOMIC CONSIDERATIONS

STEM students often base their educational decisions on expected earnings, influenced by factors such as economic considerations and self-perception of decision-making skills (Xu, 2013).

RACE & CAREER DECISION-MAKING

Race plays a significant role in shaping self-efficacy and career outcome expectations, particularly among racially marginalized groups in STEM fields (Abe et al., 2021).

INTERNATIONAL STEM STUDENTS' CHALLENGES & COE

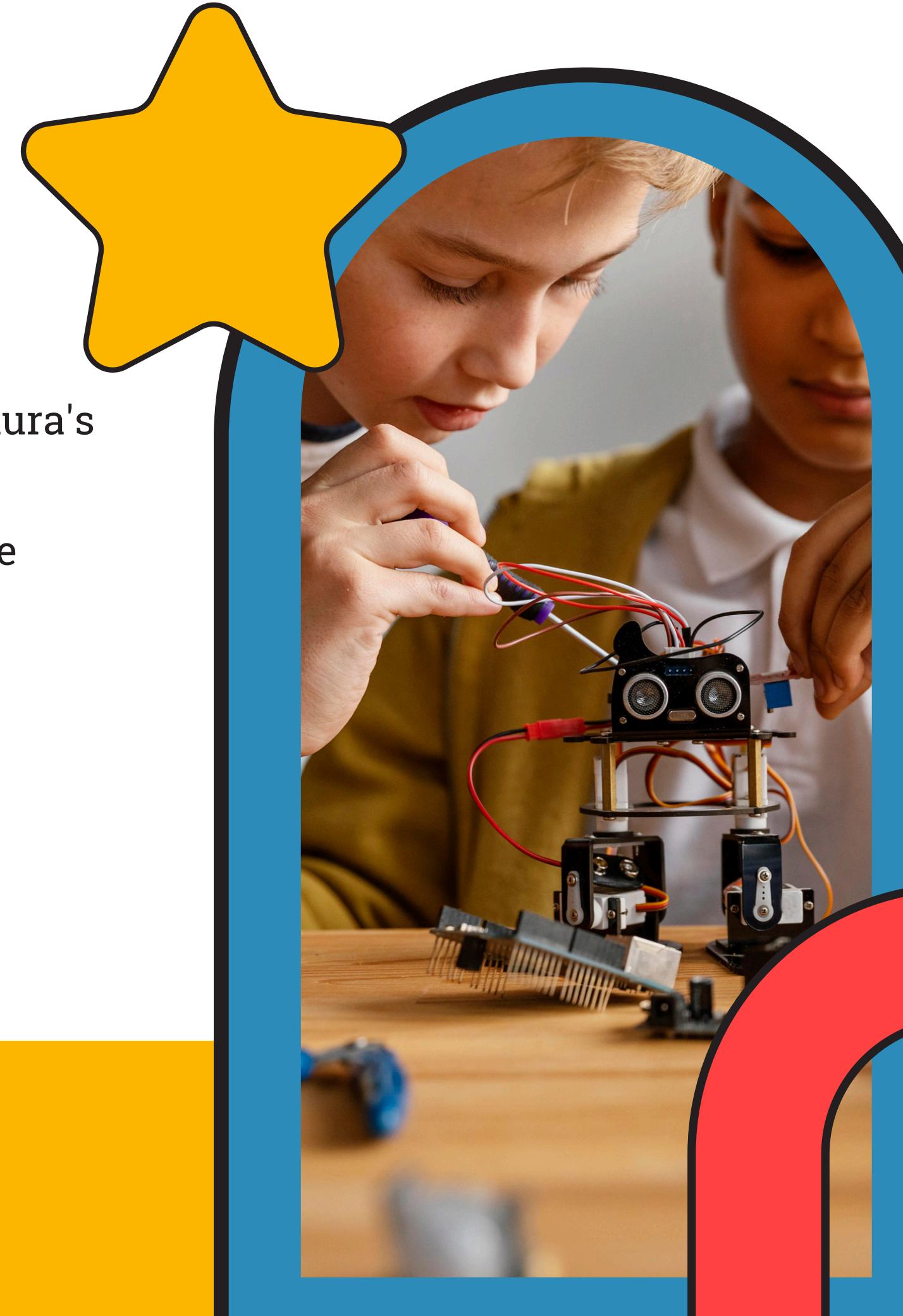
International STEM students encounter unique challenges related to their non-citizenship status, including barriers in accessing job opportunities (Rahming, 2022).

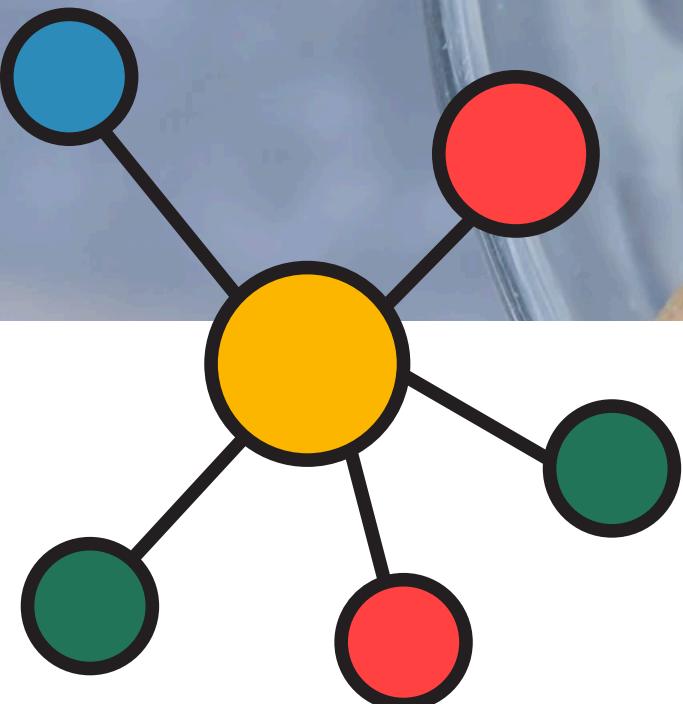
THEORETICAL FRAMEWORK

- Developed by Lent, Brown, and Hackett in 1994, SCCT builds upon Bandura's social cognitive theory, extending it to career development.
- Core constructs: Career Self-Efficacy (CSE) and Career-Related Outcome Expectations (COEs), dynamic beliefs influencing career goals and behaviors.
- Benefits: Offers a systematic explanation of how race and nationality influence CSE, COEs, and overall career trajectories, particularly for underrepresented students; sheds light on systemic barriers, societal expectations, and personal experiences shaping career perceptions (Chatterjee et al., 2023; Wang et al., 2022).).

Framework: Social Cognitive Career Theory

Methods: Quantitative





METHODS

Data Source

Students who intend to, or have declared a major, or minor, in a STEM-degree awarding program

Methods for Q1

COE: Fisher's Exact Test

Others: Kruskal-Wallis Test & Post-hoc Wilcoxon

Survey Design

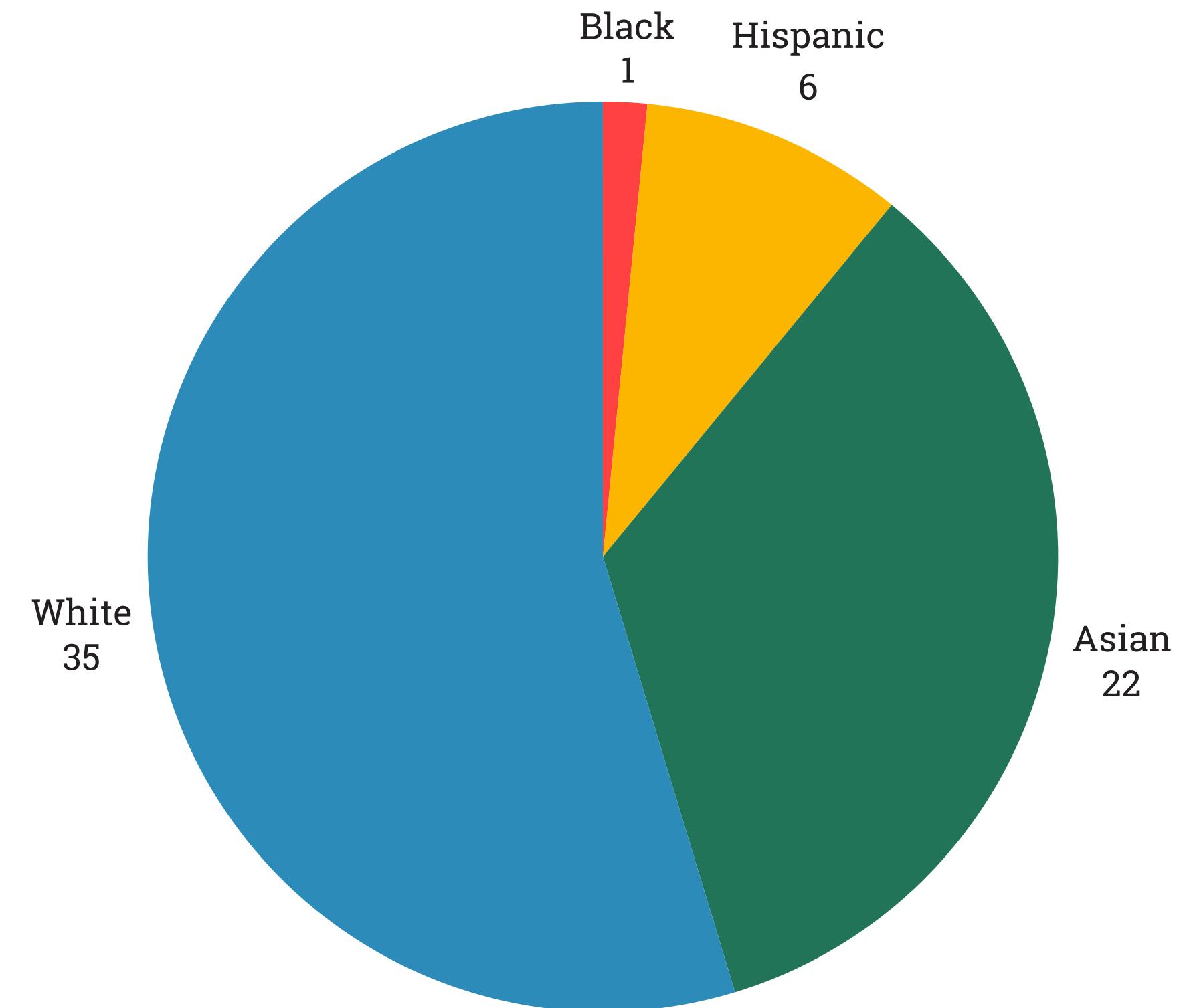
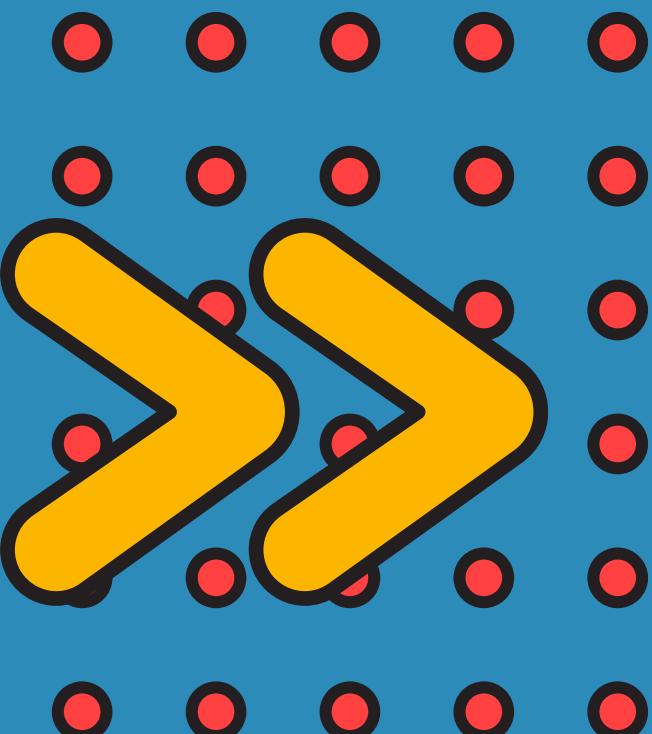
SASS (McDonough et al., 2021)-adjusted survey design

Method for Q2

Logistic regression

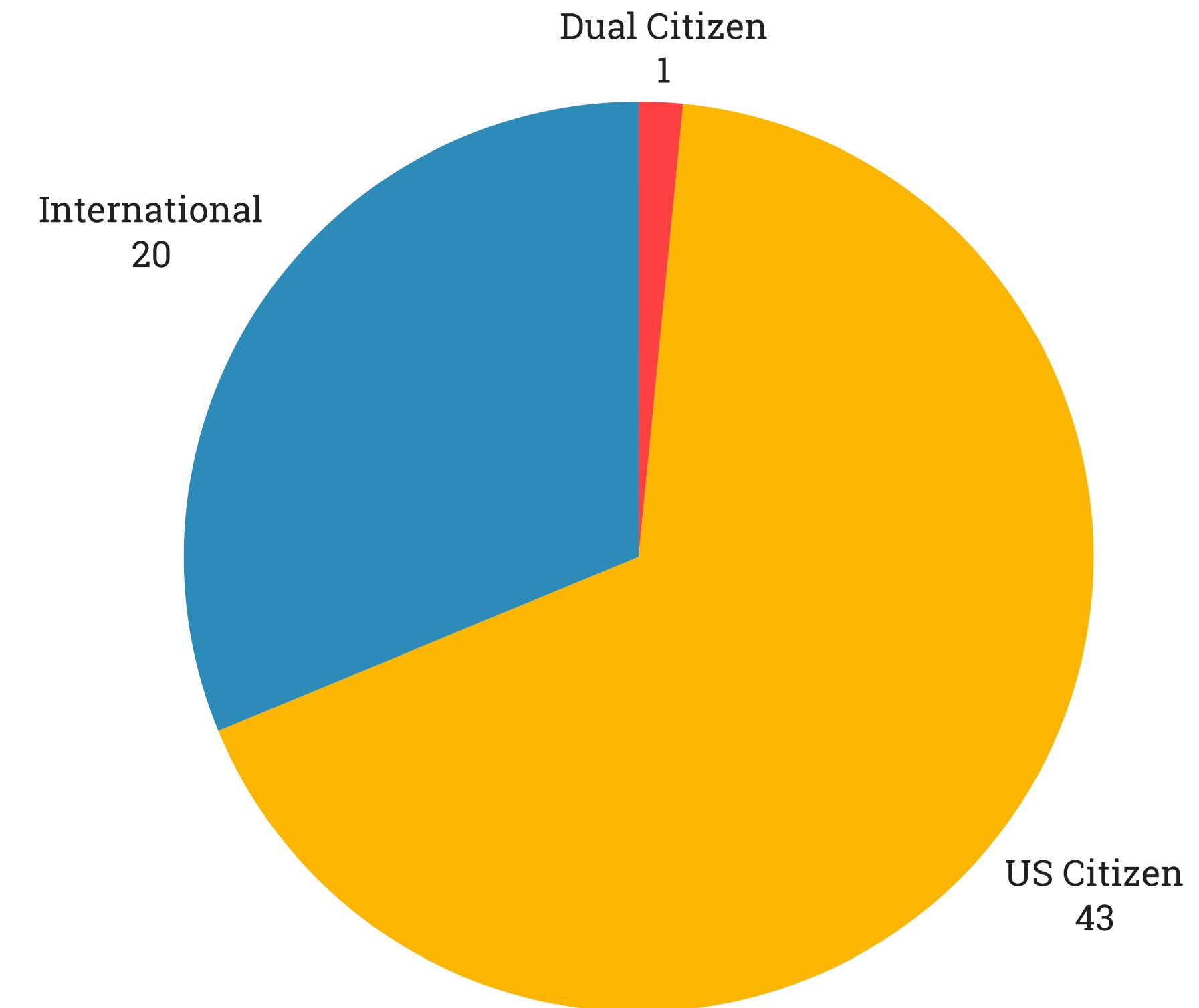
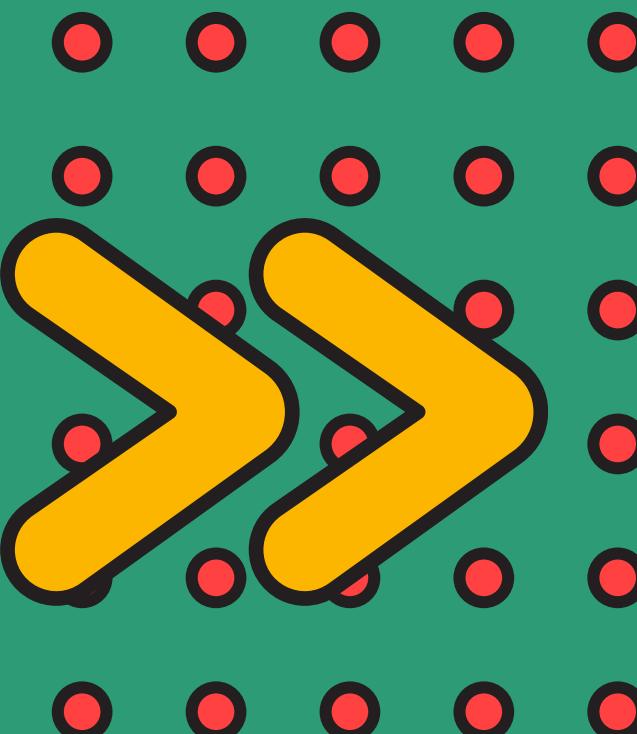
SAMPLE OVERVIEW

Overview of the racial
demographics of participants



SAMPLE OVERVIEW

Overview of the **citizenship** demographics of participants



FINDINGS: QUESTION 1

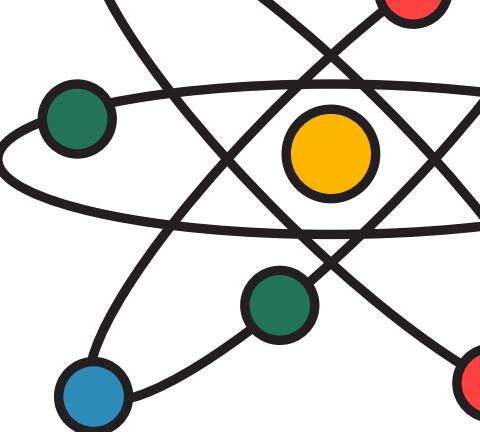
Results of Fisher's exact tests, Kruskal-Wallis tests and Wilcoxon rank-sum tests



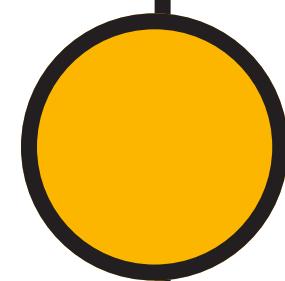
CAREER OUTCOME EXP

Career Outcome Expectations	Sig. for WH vs. AFHS	Sig. for AS vs. AFHS	Sig. for WH vs. AS
Earn a good salary	0.17674698	0.431034483	0.638916474
Have a career that my family values	0.258621587	0.642394188	0.001294587
Get a job that is in high demand	0.177306318	0.018007663	0.219680781
Be supported by my family members	0.052825809	0.170591627	5.55E-05

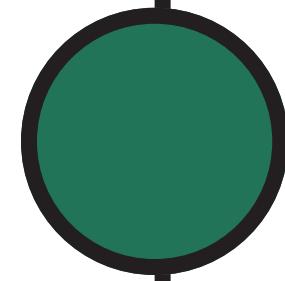
- Race groups differed in their perceptions of STEM fulfilling COEs like salary, career value, demand, and family support.
- Asian students differed from Black & Hispanic students in perceiving STEM's potential for high-demand jobs ($p\text{-value} = 0.018$), and significant differences were also seen between Asian and White students regarding career value and family support ($p\text{-value} = 0.001$; $p\text{-value} < 0.01$).
- Marginally significant differences were noted between White vs. Black & Hispanic students regarding family support ($p\text{-value} = 0.052$), while no significant differences were found regarding salary perceptions among any pair of races.
- Citizenship status (resident vs. non-resident) showed differences in perceptions of STEM as a valued career and family support, with non-residents differing significantly from residents on these factors ($p\text{-value} < 0.01$).



Significant differences were found in confidence levels among race groups regarding statements related to Self-Efficacy for Academic Tasks (SEA) and Goals.



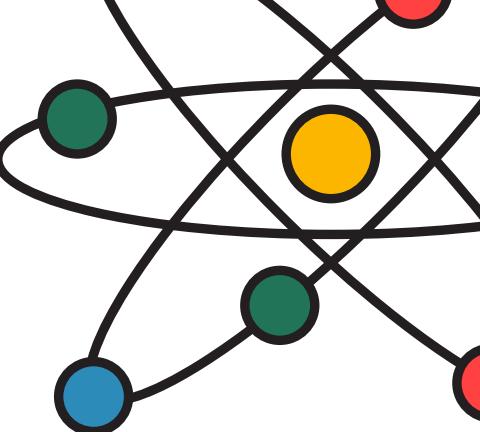
Asian students showed statistically higher confidence in STEM classes compared to White students, while interests in "making a positive impact on society" were lower among Asian students compared to White and Black & Hispanic students



Asian students ranked "having a high earning potential" higher than White and Black & Hispanic students, while ranking "representation of my identity in the field" lower than White and higher than Black & Hispanic students .

SCCT FACTORS & RACE

Variable	Race	Median
SEA: STEM classes in your major	AFHS	2
	AS	4
	WH	2
Goal: Make a positive impact on society	AFHS	1
	AS	2.5
	WH	1
Goal: Have a high earning potential	AFHS	2
	AS	1
	WH	3
Goal: Add to the representation of my identity in the field	AFHS	3
	AS	4
	WH	3



SCCT FACTORS & CITIZENSHIP

Differences in perceptions between citizenship statuses were observed for 2 Goals and 2 Interests (IN) items.

Non-resident students showed lower interest in promoting social sciences, arts, and humanities, and in consuming content about these topics, compared to residents.

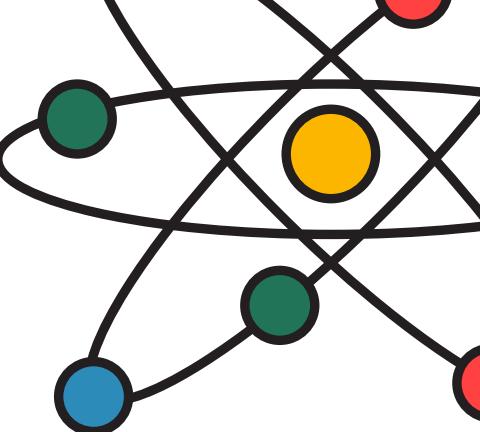
Non-residents also placed lower importance on "making a positive impact on society" but higher importance on "having a high earning potential", compared to residents.

Variable	Citizenship	Median
Helping people understand the importance of social sciences and/or arts and/or humanities in their daily lives	NR	3
	R	4
Watching videos or listening to podcasts about social sciences, arts, humanities, or other non-STEM topics	NR	3
	R	4
Make a positive impact on society	NR	2
	R	1
Have a high earning potential	NR	1.5
	R	3

FINDINGS: QUESTION 2

Results of Logistic
Regression Models





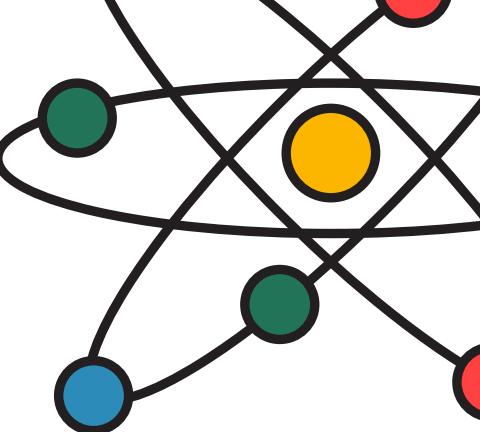
IDENTITY & HIGH EARNING

The intercept coefficient (β_0) was significant ($p < 0.001$), indicating the log-odds of perceiving STEM fields as having higher earning potentials for the reference group (WH_NR) is 2.014903.

AFHS_R, AS_R, and WH_NR coefficients had high estimates (16.55), but with large standard errors, resulting in non-significant p-values ($p > 0.05$).

Goodness-of-fit statistics showed a decrease in deviance from 39.82453 to 35.93074, indicating adequate model fit, with an AIC value of 47.93074, suggesting a reasonable balance between fit and complexity.

Coefficient	Estimate	Std_Error	Z_value	P_value
(Intercept)	2.014903	0.5322906	3.785343647	0.000153496
AFHS_NR	-1.3217558	1.335415	-	
AFHS_R	16.5511655	3261.319342	0.005074991	0.995950761
AS_NR	0.6931472	1.161895	0.596566108	0.550797105
AS_R	16.5511655	2662.856109	0.006215569	0.995040726
WH_NR	16.5511655	6522.638629	0.002537495	0.997975374



IDENTITY & HIGH-IN- DEMAND CAREER

AS_NR had a marginally significant coefficient ($p = 0.205$), indicating a potential increase in perceiving STEM fields as leading to high-demand jobs for Non-Resident Asians compared to the reference group.

Other predictor variables (AFHS_NR, AFHS_R, AS_R, WH_NR) did not exhibit statistically significant coefficients ($p > 0.05$), suggesting no substantial influence on perceptions of STEM fields compared to the reference group.

Goodness-of-fit statistics suggest adequate model fit, with a null deviance of 71.9789, and residual deviance of 62.61514. AIC value of 74.61514 indicating a reasonable balance between fit and complexity.

Coefficient	Estimate	Std_Error	Z_value	P_value
(Intercept)	0.8754687	0.3763863	2.325984437	0.02001938
AFHS_NR	-1.5686159	1.2812754	1.224261318	0.22085366
AFHS_R	-0.8754687	1.068488	0.819352874	0.41258511
AS_NR	1.0704414	0.8444497	1.26762015	0.20493363
AS_R	16.6905997	1615.1039	0.010334072	0.99175475
WH_NR	16.6905997	3956.180346	0.004218867	0.99663384

DISCUSSION

Interpretation of data vs.
existing literature,
limitations, and thinking
ahead!



Discussion: STEM preference & Race

1.

Black/Hispanic students placed more importance on adding to the existing representation of their identity in STEM, potentially reflecting a desire for increased diversity and role models in STEM (Rahming, 2022).



2.

Asian students reported higher confidence in succeeding in STEM classes within their major compared to White & Black/Hispanic students ~ among underrepresented groups (Black/Hispanic), stereotypes and systemic barriers affecting underrepresented minority students in STEM (Chatterjee et al., 2023).



3.

Asian students placed higher importance on high earning potential + gravitation to STEM for family approval & financial prospects ~ how Asian families often view STEM careers as pathways to upward social mobility (Wainwright & Watts, 2021).



Discussion: STEM preference & Citizenship

1.

Non-resident students demonstrated lower interest in advocating for non-STEM knowledge and consuming non-STEM content compared to residents ~ research suggests international students often prioritize STEM fields due to perceived job prospects and economic mobility (Rahming, 2022).



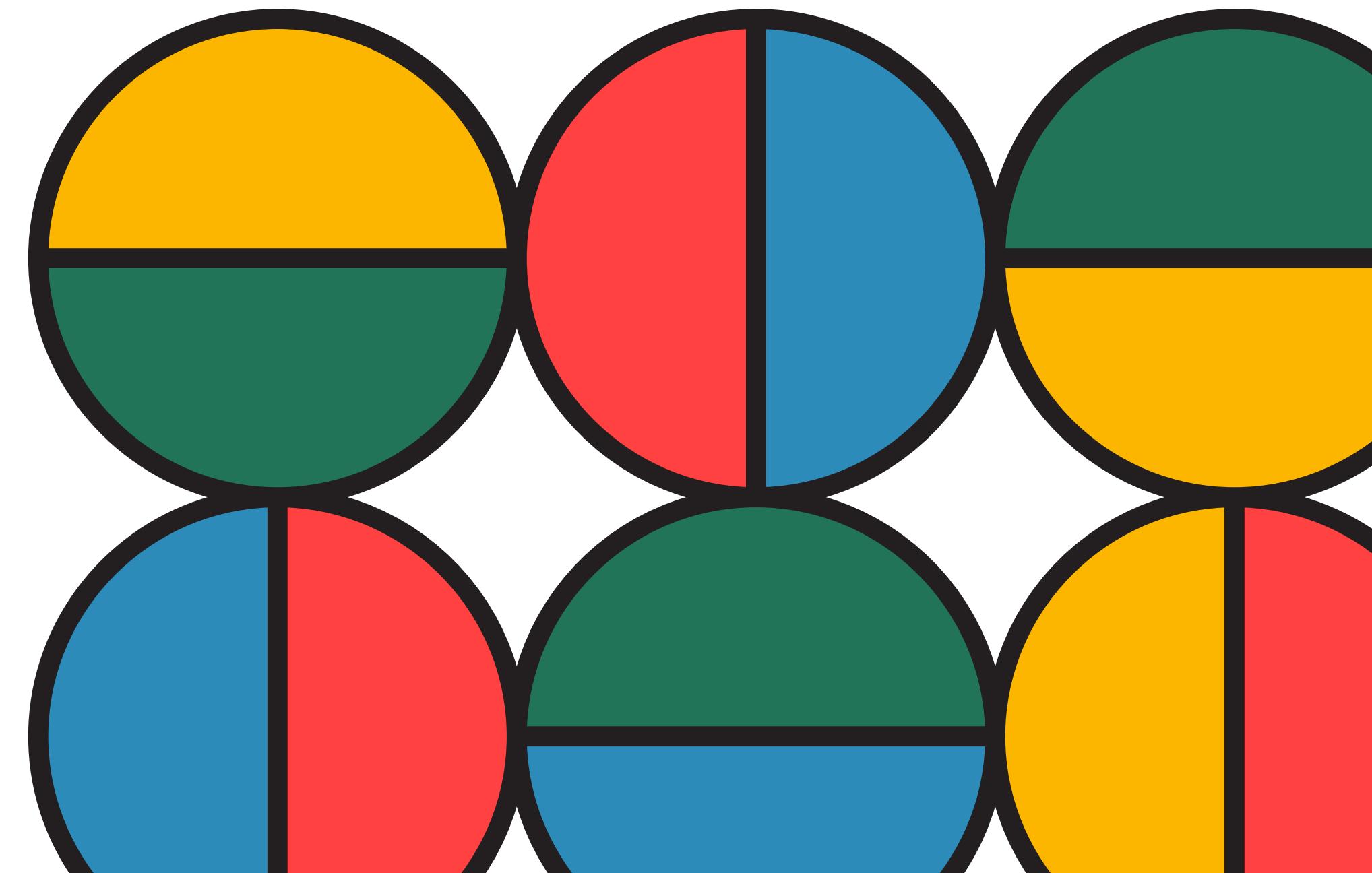
2.

Non-residents emphasized economic goals over societal impact, reflecting the belief in obtaining an education in the West for economic mobility. However, these beliefs wane among Non-resident Black & Hispanic students.



IMPLICATIONS & FUTURE WORK

- Imbalance in demographic representation in survey sample
- Restrictive nature of interpreting quantitative results
- New angle of SCCT-grounded analysis: tying self-efficacy to goals formation
- Potential for mixed methods/qualitative opportunities



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