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WIP: Enhancing Broadband Access and Equity Through Co-Designed Navigator Strategies for Promotional Code Redemption

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Enhancing Broadband Adoption Through Co-Designed Digital Navigator Interventions: A Work-in-Progress Engagement in Practice Study at an HBCU

Abstract

This Work-in-Progress Engagement in Practice study investigates low redemption of broadband promotional codes bundled with laptops in underserved Baltimore communities. Guided by Diffusion of Innovations, the Technology Acceptance Model, and Equity Theory, the study examines barriers to adoption and the impact of co-designed digital navigator interventions.

A sequential mixed-methods approach included community co-design workshops, interviews, and focus groups (24 residents; 14 HBCU students), and a stratified A/B test with 180 households (control n=90 email-only; intervention n=90 navigator support and on-site activation). Results show redemption, rising from 16.67% to 68.89%, a 43% reduction in time-to-redeem, and reduced form attrition. Logistic regression identified navigator interaction as the strongest predictor of adoption ($\beta=0.42$, $p<0.01$).

The study provides preliminary evidence that student-led digital navigator models can improve broadband adoption while offering scalable, equity-centered learning experience for engineering education.

Keywords: digital equity, broadband adoption, digital navigators, community co-design, HBCU, engagement in practice.

1. Introduction

Broadband access is essential for education, employment, and civic participation, yet adoption remains uneven in low-income and minority communities despite major federal investment. Subsidy uptake frequently remains below 40–43%, and bundled device-plus-service redemption rates are often under 20%.

At Morgan State University, laptops distributed through a pilot program included broadband promotional codes, yet early evaluation showed only 1.8% redemption. Community feedback revealed unawareness, distrust, and usability challenges.

This paper is submitted to the ASEE Engagement in Practice track. The contribution is a replicable, student-implemented digital navigator model that engineering programs can adopt through service-learning partnerships with community organizations.

This Work-in-Progress study reframes redemption failures as engineering design challenges solvable through human-centered interventions and campus–community partnerships.

The work aligns with ABET Criterion 3 through engineering design that considers societal, cultural, and economic factors.

Research Questions

RQ1: What structural, behavioral, and perceptual barriers impede broadband promotional code redemption?
RQ2: How does navigator-assisted activation affect adoption outcomes?
RQ3: What scalable design principles emerge for engineering education and digital equity practice?

2. Theoretical Framework

The intervention integrates three complementary theoretical perspectives that explain adoption barriers in underserved communities. Diffusion of Innovations (DOI) highlights the importance of awareness, trialability, and observability in technology adoption. Limited exposure to broadband activation processes reduces perceived accessibility and slows diffusion. The Technology Acceptance Model (TAM) emphasizes perceived usefulness and ease of use as primary determinants of adoption. Complex activation procedures and unfamiliar online forms reduce perceived ease of use. Equity Theory explains distrust of "free" offers when individuals perceive hidden costs or unfair exchanges. Community feedback revealed widespread skepticism toward promotional broadband offers. These frameworks guided the co-design of the digital navigator intervention.

Table 1. Mapping theoretical constructs to intervention design and outcomes

Theory	Barrier	Co-Design Output	Intervention	Outcome
DOI	Awareness deficits	Multilingual reminders + QR codes	On-site activation	Redemption rate
TAM	Usability challenges	Streamlined 3-step process	Navigator walkthroughs	Time-to-redeem, attrition
Equity Theory	Trust barriers	Culturally sensitive scripts	Navigator conversations	Redemption, perceived fairness

This mapping ensures qualitative findings directly inform the intervention and quantitative phase.

2.1 Community Co-Design Process

A six-member advisory board consisting of laptop recipients, community leaders, and nonprofit partners collaborated with university researchers to co-design the intervention. Three inclusive workshops held in October 2024 included childcare, meals, and language interpretation services.

Participants identified key barriers including unclear instructions, spam filtering of email notifications, and anxiety surrounding online forms. Co-design sessions produced multilingual QR codes, simplified activation workflows, and culturally responsive communication scripts. These outputs directly informed the intervention components shown in Table 1.

Workshop findings directly informed three intervention components: (1) simplified activation steps and multilingual QR codes addressing awareness deficits; (2) navigator-led trust-building conversations addressing skepticism toward promotional offers; and (3) on-site activation walkthroughs addressing usability challenges. These components formed the operational basis of the A/B test intervention.

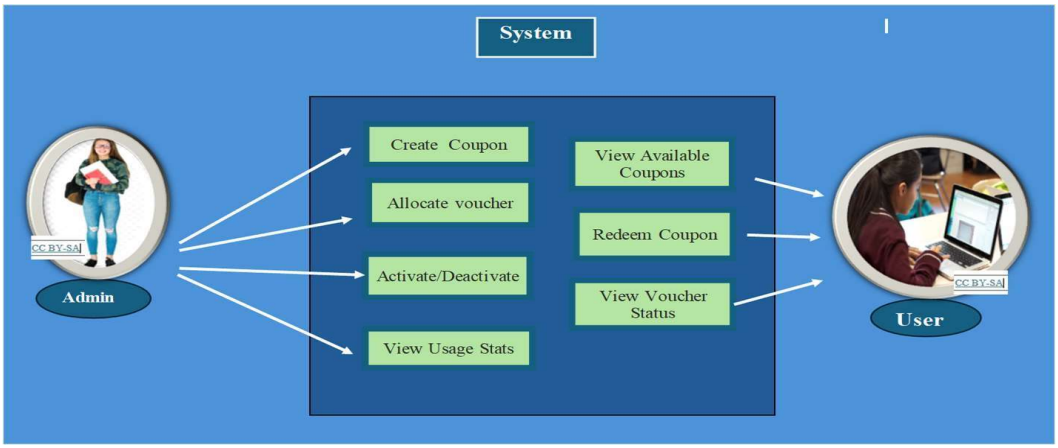

Fig. 1. Iterative co-design workflow used to develop the navigator intervention.

3. Methodology

A sequential mixed-methods design was employed, consisting of three phases: community co-design, qualitative inquiry, and a controlled A/B experiment.

The qualitative phase included 24 Baltimore residents who had received laptops but lacked home broadband access. This group consisted of 15 semi-structured interviews and 9 focus group participants across two sessions. In addition, 14 HBCU engineering students participated in two focus groups. The total qualitative sample was therefore 38 participants. Qualitative data were analyzed using thematic analysis to identify barriers and inform the intervention design.

The quantitative phase included 180 households randomly assigned to either a control group receiving standard email notification only (n = 90) or an intervention group receiving trained student navigator support and on-site activation assistance (n = 90). Twelve engineering students served as digital navigators through a service-learning capstone course.

Quantitative outcomes included redemption rate, time-to-redeem, and form attrition rate, defined as the percentage of participants who initiated but did not complete the activation form. A binary logistic regression model was specified with redemption as the dependent variable and navigator interaction, age, income bracket, prior internet experience, and self-reported digital literacy as independent variables. IRB approval and informed consent were obtained.

4. Preliminary Results

4.1 Qualitative Findings

Nearly all participants reported unawareness of the bundled codes ("I never saw the email—it went straight to spam"). Three primary themes emerged: awareness deficits, trust barriers ("Free internet? Sounds too good; probably a trick"), and usability challenges ("The form was confusing; I gave up after 10 minutes"). These themes directly informed the intervention components in Table 1.

4.2 Quantitative Findings

The intervention produced substantial improvements, as shown in Figure 2. Redemption rates increased from 16.67% in the control group to 68.89% in the intervention group. Average time-to-redeem decreased from 14.56 to 8.21 days, representing a 43% reduction, and form attrition fell from 58.89% to 35.56%.

A binary logistic regression model including navigator interaction, age, income bracket, prior internet experience, and digital literacy confirmed navigator interaction as the strongest predictor ($\beta = 0.42$, $SE = 0.11$, $p < 0.01$), corresponding to a 52% increase in the odds of redemption. Student reflections indicated growth in human-centered engineering practice and community engagement.

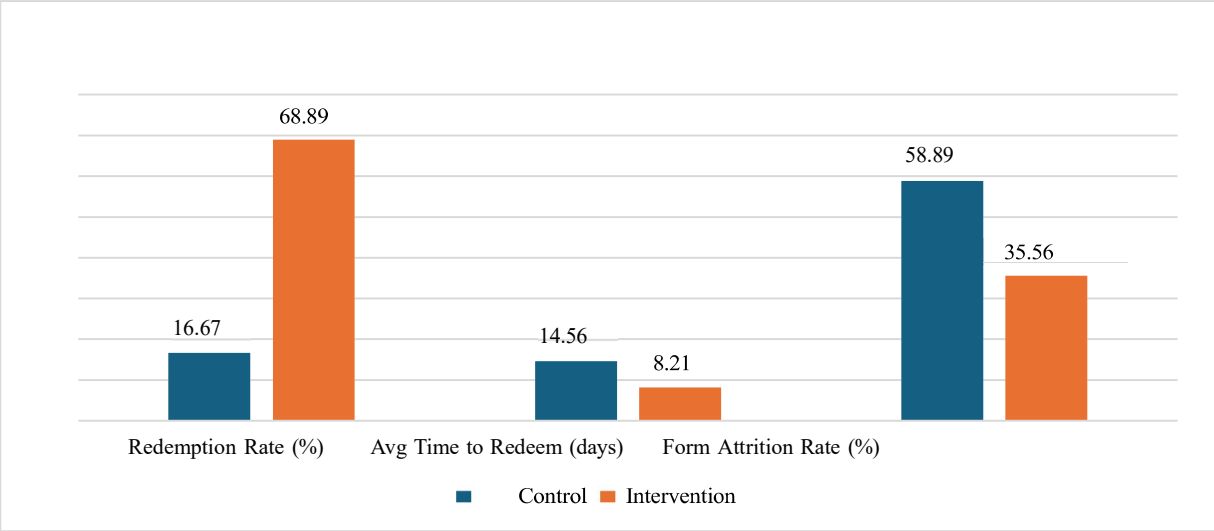

Fig. 2. Comparison of redemption rate, time-to-redeem, and form attrition between control and intervention groups.

5. Discussion, Lessons Learned, and Future Work

As a Work-in-Progress study, results should be interpreted as preliminary evidence of effectiveness. Co-designed digital navigator interventions addressed awareness, trust, and usability barriers while operationalizing the theoretical frameworks guiding the study. Twelve engineering students participated as navigators through a service-learning capstone course, completing structured training and reflective assignments. Reflections indicated growth in stakeholder communication, systems thinking, and ethical design aligned with ABET Criterion 3 outcomes.

Navigator support cost approximately $50 to $75 per household, based on stipends, training, and materials divided across households served. This cost is feasible for grant-funded programs and supports transferability to rural areas, other providers, and non-HBCU settings. An open-source toolkit is planned for public release in 2026.

Several limitations temper interpretation. The geographic focus, modest sample size, short-term metrics, and self-reported data limit generalizability. In addition, because many recipients did not see standard email notifications, the control group likely functioned as a minimal-contact condition. The observed improvement therefore, reflects the combined effect of human contact and navigator-assisted activation rather than isolating navigator expertise alone. Future work should include larger multi-site trials, longer-term retention tracking, and three-arm experimental designs to separate contact effects from trained navigation support.

6. Conclusion

This Work-in-Progress study demonstrates that **human infrastructure**, implemented through student digital navigators, can transform broadband adoption into an actionable engineering opportunity. The intervention significantly improved redemption outcomes while providing scalable, equity-centered learning experiences for engineering students. The model offers a replicable approach for Minority-Serving Institutions and broadband programs seeking to expand adoption and advance socially responsible engineering practice.

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