Decolonizing Digital Education:

Analyzing the Intersection of Blackness and Educational Technology

An essay submitted in partial fulfillment

to the

NATIONAL COUNCIL OF BLACK STUDIES

By

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I. Abstract:

In this paper and project, I explore how blackness intersects with the analysis of educational technology and evaluate how culturally competent existing technologies actually are. I research IXL, an educational technology used to instruct students nationwide. This research is conducted with the intention to assess the existing literature on the intersection of educational technology and blackness. The potential implications of the findings for educational practice and policy include: (1) addressing the potential bias and existing inequalities in educational technology, (2) improving the cultural competence of education technologies like IXL, (3) providing grounds to tailor educational technologies further to the needs of different subgroups of students, (4) promote the diversification of the people and perspectives used when developing educational technology amd (5) encourage standardized procedures for data collections and reporting - in my research, I found that the reporting style for IXL was not consistent across state lines which is important to note and rectify.

II. Introduction:

A. Main Purpose

There are two main purposes of this research. The first is to evaluate the current attitude of educational technology designers toward improving the performance rate of black students in Florida. Secondly, I aim to identify common gaps in cultural awareness in the current technology of IXL. With his research I want to bridge the gaps found by designing the wireframes for new features on Figma - a web application used for interface design. Wireframes are a visual tool used to outline how a future technology - typically a web application - will look. Upon the completion of this Figma, I will conduct a focus group of college students to both reflect on their experiences with educational technology, test how culturally competent current technologies feel and compare them with the modifications I designed on Figma.

I address the following two research questions:

(1) What is the current attitude of educational technology platforms - specifically IXL - toward improving the performance rate of black students?

(2) What cultural gaps are technology makers not willing to explore, based on the collection of research on the impact of their platform?

B. Significance of Exploring the Intersection of Blackness and Educational Technology

When examining the intersection of race in education, it is often viewed through a historical lens, recalling pivotal moments like Brown v. Board, Ruby Bridges, and other significant historical cases and figures in African American educational history. However, to truly understand the current landscape, the intersection of black identity and educational technology must be considered. This exploration is

particularly valuable as both the culture surrounding education and the tools of oppression continue to evolve. A striking example of this dynamic is evident in the usage effects of IXL, where, as pictured below, black students are anticipated to demonstrate less improvement per week with the usage of IXL, and are the only subgroup to do so in a New York state middle school (Donnelly, 90). It raises questions about the disparities faced by black students in the realm of educational technology and underscores the need for a contemporary examination of these challenges.

Line Graph demonstrating Mean Scores relative to Ethnicity and Cohort Type

Furthermore, according to The National Center for Education Statistics, 89% of American households have computers, and around 82% have Internet access (NCES, 2016). This statistic emphasizes the pervasive role of technology in contemporary households, further highlighting the relevance and urgency of addressing racial disparities in educational technology. Is there something about the language, design or overall experience that impacts the scoring of black students? This topic is one example of why exploring the data, questions and perspectives at the intersection of blackness and educational technology is important.

C. Significance of further researching IXL

IXL learning is the largest education technology company in North America. Since 1998, it has been creating websites for teachers and learners to share study materials. This has ranged from customized flashcards and quizzes to its current day IXL platform. This platform holds K-12 math education as well as language arts, science, spanish and social studies. Through these subjects, IXL provides thousands of

instructional and curriculum tools that are currently used by 14 million students and over a million teachers. (https://www.ixl.com/company/story)

IXL utilizes a competency-based learning model, which enables students to work at their own pace and tackle questions matching their proficiency level. After answering 10 consecutive questions correctly, students advance to a higher difficulty level. Attaining a 90% SmartScore unlocks the "Challenge Zone," where mastery is achieved by correctly answering 10 additional questions. IXL provides written explanations for incorrect answers, fostering comprehension and progression. If questions prove too challenging or explanations are not understood, the system adjusts by providing easier questions (Donnelly, 8).

Another element that is Integral to IXL's approach is the adaptive learning model - this is driven by the SmartScore. This numeric score assesses proficiency based on students' responses, incorporating factors like item difficulty, answer accuracy, response patterns, and relative progress on a skill. Ranging from 0 to 100, the SmartScore allows the continual possibility of reaching mastery. It accelerates progress initially to build students' self-efficacy and gradually challenges them to demonstrate true mastery, promoting a mastery goal orientation (Bashkov, Mattison, & Hochstein, 2021, p. 45, 12).

III. Methodology:

A. Overview

This paper is a meta-analysis of five case studies and performance reviews relevant to K-12 Education in Florida, IXL and reading plus. It draws on data from three research papers presented on the IXL website to understand the types of research they are conducting in regards to the effectiveness of their platforms. The final two references are studies conducted on IXL but independent of it; they are used to see how the research coming from IXL juxtaposes the research conducted by outside parties.
A qualitative analysis of the keywords and associations made with black students were noted as indicators of the current attitude toward improving the performance rate of black K-12 students. Furthermore, the paper employs a thorough analysis to examine the numerical data informing the design of IXL and Reading Plus platforms, contrasting it with the values collected but not incorporated during the platform design process.

B. Research Questions and Hypotheses:

The first of the two central questions that guided the targeted case studies - What is the current attitude toward improving the performance rate of black students on the online platforms of IXL and Reading Plus? - aims to investigate whether or not there are existing stereotypes and biases against black students embedded in the way in which the performance of these educational technologies is analyzed. The strongest hypothesis related to this question is:

Hypothesis #1:

Black students are consistently underestimated in regards to their expected performance in IXL and similar educational technologies. This is evident in how the data is collected and the lack of research into why these existing score disparities exist.

The second of the two central questions that guided the targeted case studies - What cultural gaps are technology makers not willing to fill, based on their curriculum and website design? - aims to investigate whether even if existing stereotypes and biases against black students are embedded in the way in which the performance of these educational technologies is analyzed, what efforts would be made to fix them, and who would lead these efforts? The strongest hypothesis related to this question is:

Hypothesis #2:

If the current data indicates that Black students are consistently underestimated in regards to their expected performance in IXL and similar educational technologies, what aspects of the data are ignored and not incorporated into the design of the IXL and educational technologies like it? I argue that culturally relevant and dialect appropriate action phrases could be adjusted to aid students, but are currently not utilized.

C. Inclusion and Exclusion Criteria:

Outline the criteria used to select studies for your meta-analysis:

The criteria used to select studies for your meta-analysis includes papers that had at least one of the following attributes: 1) an acknowledgement of varying experiences within educational technology for black and other marginalized students 2) numerical analysis of student performance grouped by different demographic. This is because the variables of interest include attitudes and cultural gaps, and these attributes include them. All of the studies included were published between 2021 and 2024 and were required to come directly from IXL or from a K-12 public school using IXL. This was done to get both a nationwide and florida-specific perspective on the recent use of IXL.

IV. Literature Review and Discussion:

When evaluating the effectiveness of IXL Math Online Software at an urban middle school in New York, as detailed in a study by Donnelly (2021), some troubling trends emerged. As pictured in the introduction, a significant decline in performance among Black students using IXL, contrary to anticipated overall positive outcomes (Donnelly, 2021, 114). This unexpected result aligns with prior research by Longenecker (2013) and Clark (2014) - as referenced in the article, which identified significant differences in achievement scores between Black and Hispanic students compared to White students. As Donnelly (2021) pointed out, "While Hispanic students increased their mean scale scores using IXL, the result was not significant; the increase was only marginal. What was most surprising is

Black students experienced a decline when using IXL, and this finding was statistically significant" (p. 114). The key themes and findings from this existing literature challenge the optimistic expectations surrounding IXL's ability to address the needs of low-achieving Black students.

While the key themes and findings from *A Study of the Effectiveness of IXL Math Online Software on Student Achievement in an Urban Middle School* challenges the optimistic expectations surrounding IXL's ability to address the needs of low-achieving black students was explored in the literature review, an evaluation of IXL's impact on female students provided a better insight into their attitude toward other subgroups. While the mean scale score of female students in the IXL cohort was higher than their Non-IXL counterparts, a closer examination reveals discrepancies in the score distribution. According to Donnelly (2021), "The mean scale score of female students in the IXL cohort was greater than the mean scale score of female students in the Non-IXL cohort by 1.83 points. Yet the female scale score upper boundary was 0.97 points less, and lower boundary was 4.63 points greater than Non-IXL" (p. 104). This juxtaposition raises questions about IXL's comprehensive analysis of its impact, suggesting a potential bias in favor of highlighting positive outcomes while overlooking nuanced challenges and disparities faced by certain student groups.

Lastly, a quote on the experience of black students specifically reflects a negative assessment of the impact of IXL on Black students' academic performance.

> Lastly, for Black students, the upper boundary was 6.35 points less and the lower boundary was 0.73 points less, indicating that IXL not only did not help both struggling and accomplished students, but also has a greater deleterious effect on the accomplished students – those on the higher side of the scale score spectrum decreased more. For these students, clearly the IXL software did not work, and the conversion calculation from scale score to performance level and proficiency rating could drop substantially – perhaps decreasing an entire level or more moving these students down from approaching proficiency to below proficiency (p. 105)

The mention of the upper boundary being 6.35 points less and the lower boundary being 0.73 points less for Black students indicates a consistent pattern of lower achievement compared to their counterparts who did not use IXL. The phrase "IXL not only did not help both struggling and accomplished students" emphasizes a lack of positive influence across the performance spectrum. Furthermore, the assertion that the software has a "greater deleterious effect on the accomplished students" suggests that even high-performing Black students experience a more pronounced decline in their academic performance when using IXL. The analysis concludes by stating that, for these accomplished students, the IXL software did not work effectively, potentially leading to a substantial drop in their proficiency level, moving them from approaching proficiency to below proficiency. Overall, the tone of this quote conveys a critical attitude towards IXL's impact on the academic performance of Black students, particularly those who are already achieving at higher levels.

The key themes and findings from *The Impact of IXL on High School Math Learning in Texas* include a more optimistic attitude toward the impact of IXL and generalizes its impact across all students. “In this statewide study of IXL’s impact in New York, we found that IXL Math and IXL ELA had positive and statistically significant effects on state assessment proficiency rates, taking into account prior test performance and many demographic characteristics (An, 7).” In the quote we can see that IXL claims to do intentional research across different demographic characteristics, assumably race, gender, ability, and school location, all features that were addressed in reports about the Florida school. However, these characteristics were broken down in a way that makes it nearly impossible to decipher a unique experience in the experience of black students and the related data, which was presented on in the Appendix and not the body of the paper.

The Impact of IXL on High School Math Learning in Texas

Appendix A: Demographics

Table A1. Demographic characteristics of treatment (IXL) and comparison (non-IXL) groups

	IXL Cohorts	Non-IXL Cohorts
Pretest and posttest	*n* = 50	*n* = 798
2019 % proficient	49.72 (22.74)	50.11 (20.90)
2021 % proficient	32.94 (21.98)	29.22 (20.21)
School demographics		
Title 1 schools (*n* schools)	47	745
Grade size (*n* students)	349.36 (286.89)	311.33 (275.06)
Gender: % male	51.04 (3.96)	51.37 (4.97)
Race: % White	25.88 (23.70)	27.98 (24.14)
% Special education	11.19 (3.16)	10.71 (3.81)
% Economically disadvantaged	67.39 (17.68)	63.30 (19.96)
% English learners	15.94 (12.76)	14.63 (12.82)

Note. Baseline performance and demographic characteristics are presented as *M (SD)*.

Appendix B: Full Results of Usage Analyses

Table B1. Full IXL Math efficacy model

Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	30.85	2.21	26.53 – 35.16	0.07	13.945	<.001
Gender: % male[1]	-0.02	0.08	-0.19 – 0.14	-0.01	-0.290	.772
Race: % White[1]	0.34	0.03	0.27 – 0.40	0.40	9.753	<.001
% Special education[1]	-0.24	0.15	-0.54 – 0.06	-0.04	-1.586	.113
% English learners[1]	0.06	0.05	-0.04 – 0.15	0.04	1.154	.249
% Economically disadvantaged[1]	-0.04	0.04	-0.12 – 0.04	-0.04	-0.954	.340
Title I school[2]	-0.48	2.23	-4.83 – 3.88	-0.02	-0.213	.831
Grade size (N students)[1]	-0.01	0.00	-0.01 – 0.00	-0.10	-3.600	<.001
2019 STAAR Algebra I % proficient[1]	0.40	0.03	0.35 – 0.45	0.42	15.929	<.001
Used IXL Math	**4.26**	**1.83**	**0.69 – 7.83**	**0.21**	**2.329**	**.020**

Note. Dependent variable: Percent of ninth-graders reaching proficiency on 2021 STAAR Algebra I. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient. [1] Grand-mean centered. [2] Dummy coded; non-Title I schools as reference group.

Table B2. Full IXL Math usage model

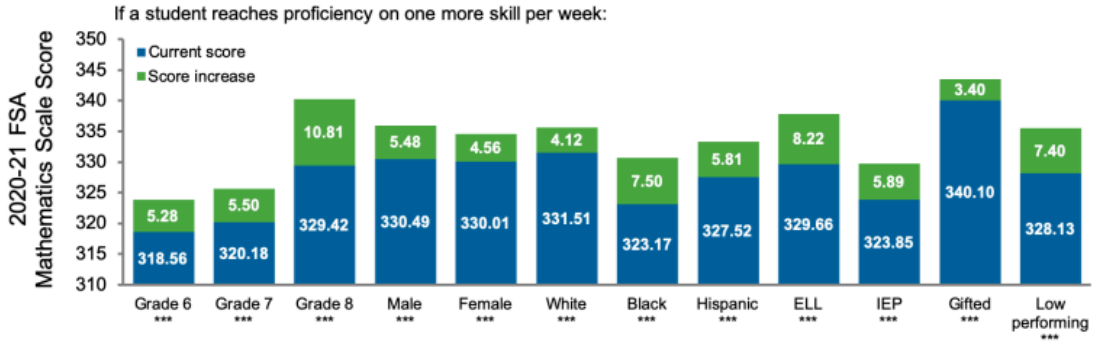
Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	29.98	6.14	18.33 – 41.62	0.19	4.881	<.001
Gender: % male[1]	-0.32	0.46	-1.20 – 0.56	-0.05	-0.694	.489
Race: % White[1]	0.30	0.09	0.13 – 0.46	0.38	3.358	.001
% Special education[1]	0.93	0.52	-0.05 – 1.92	0.14	1.805	.074
% English learners[1]	0.23	0.13	-0.03 – 0.48	0.15	1.724	.089
% Economically disadvantaged[1]	0.03	0.12	-0.19 – 0.26	0.03	0.291	.772
Title I school[2]	-3.56	6.18	-15.28 – 8.16	-0.19	-0.576	.566
Grade size (N students)[1]	-0.01	0.01	-0.02 – 0.00	-0.11	-1.261	.210
2019 STAAR Algebra I % proficient[1]	0.46	0.08	0.32 – 0.61	0.48	6.120	<.001
IXL Math Skills Proficient[3]	**11.73**	**5.39**	**1.52 – 21.98**	**0.16**	**2.177**	**.032**

Note. Dependent variable: Percent of ninth-graders reaching proficiency on 2021 STAAR Algebra I. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient. [1] Grand-mean centered. [2] Dummy coded; non-Title I schools as reference group. [3] Weekly average amount per student.

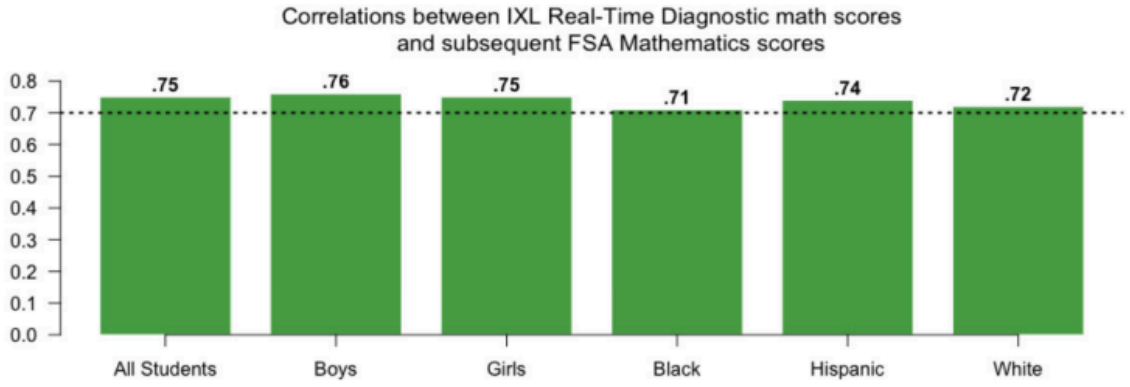
THE USAGE EFFECT OF IXL MATH AMONG STUDENT SUBGROUPS

We evaluated the usage effect of IXL Math for a variety of student subgroups, using the number of skills proficient as the main predictor of interest. The target subgroups that we tested included groups by grade, gender, and race/ethnicity, as well as English language learners, special education students, gifted students, and low-performing students.

In sum, we found similar or even larger usage effects for all the student subgroups that we tested (all *p* values < .001). The results indicated that the more a student practiced on IXL, the better they performed on the 2021 FSA Mathematics compared to his or her peers. See Table C in Appendix C for more detail. Figure 2 shows the expected improvement in FSA Mathematics scale scores with reaching proficiency in each additional skill.



Examining the Predictive Validity of the IXL Real-Time Diagnostic Using the Florida Standards Assessments as Criterion



(An, 1).

The contrast between the detail and recognition of subgroups in the Florida report and the New York reports shows that in the instances in which IXL could highlight disparities via informative subgroup

categories, they have not done so. The word black is only mentioned twice in *IXLs CORRELATIONS AMONG STUDENT SUBGROUPS* and Study Design and Methodology sections, and they were in purely statistical references. However, the data - indicating that black students are likely to actually do worse with the intervention of IXL - would warrant a deeper look into why this is occurring. However, the IXL report *"The Impact of IXL on Math and ELA Learning in New York State,"* published in 2023 made no note of this disparity. In fact, the report did not even break the data down into subgroups based on any of the same demographic features which were used in Florida despite the fact that there are clearly examples of schools in New York state where black students are put at a greater disadvantage due to the usage IXL. This leads to the belief that the current attitude toward is one that minimizes or overlooks the experience of black students.

This can be seen in this quote:

> "To date, is the only study independently analyzing the effectiveness of a widely-used online learning application, IXL Math, in a Title 1 urban Middle School consisting of 6th, 7th and 8th grade students and measuring the impact of the online program on students most at-risk, and whose attributes comprise the lowest third percentile of achievers (*Donnelly, 2021,* 0)."

From the comparison between the Florida 2023 iXL reports and graphics, the New York 2023 you can see how the New York charts does not acknowledge any blips or gaps in the system while Florida did. The following graphic is from *A Study of the Effectiveness of IXL Math Online Software on Student Achievement in an Urban Middle School* and here, the data is displayed in a way that acknowledges intersectionality.

Table 22.
Average Utilization of IXL by Ethnicity, Gender and Disability Status.

Ethnicity	Gender	Disability	Time Spent (min)	Problems Attempted	Skills Mastered
Asian	Male	Without	1400	2730	32
		With	242	505	1
	Female	Without	1150	2152	36
		With	732	1280	10
Black	Male	Without	1126	2037	22
		With	1055	1897	15
	Female	Without	1387	2092	23
		With	1282	1866	11
Hispanic	Male	Without	1190	2011	21
		With	1628	2319	22
	Female	Without	1182	2038	25
		With	1497	2071	15
White	Male	Without	1342	2541	35
		With	1364	2070	16
	Female	Without	1783	2766	43
		With	1968	3682	26

(Donnelly, 2021, 97)

VI. Conclusion:

What is the current attitude of educational technology platforms - specifically IXL - toward improving the performance rate of black students? There is research on the experience of black students, but most is not concerned with the intersection of identities. The attitude of educational platforms - specifically IXL - toward improving the performance rate of black students is a disregarding attitude. For example the research provided by IXL cannot offer many concrete suggestions on how to improve the experiences that black students have specifically. The underperformance of black students seems to be accepted as a norm, and this is a dangerous and self-fulfilling framework of thinking. What cultural gaps are technology makers not willing to fill, based on the curriculum and website design of these products? It is hard to tell from the existing research because so little attention is put toward the existing disparity within the experiences of students across subgroups. The sources closest to this acknowledge but do not suggest changes.

VII. Recommendations for Future Research:

In my future research, I will use Figma for wireframe design with the overarching goal of enhancing the interaction between black students and educational technologies. **S**ince Figma is recognized as a web application for interface design, it serves as a pivotal tool in visualizing the changes that could be made to IXL. Through this research, I aim to show that these future changes are tangible and possible; I want to shape the trajectory of future educational technologies, highlighting their role in fostering intuitive and student-friendly interfaces.

In my future research, I will use Figma as the key tool for wireframe design with the overarching goal of enhancing the interaction between black students and educational technologies. Figma will be a crucial tool in visualizing the changes that could be made to platforms like IXL. Through this research, I aim to demonstrate that these proposed changes are tangible and necessary. By utilizing Figma, I will create modified wireframes that integrate cultural competence into the design process, addressing the identified gaps in existing technologies. These wireframes will be informed by an understanding of the purpose of wireframes in designing future technologies and will incorporate strategies for bridging the gap in design.

Furthermore, I will conduct a focus group with college students, specifically targeting black students, to gather insights and feedback on their experiences with educational technology. This focus group will serve as an avenue for reflection, allowing participants to share their perspectives on the usability and cultural relevance of current technologies. Additionally, I will test the cultural competence of these technologies through the focus group discussions and by evaluating the effectiveness of the modified wireframes. By integrating cultural awareness into wireframe design and testing, I aim to contribute to the creation of more inclusive and equitable educational technologies that better serve the needs of black students. Through these methods, I will work towards shaping the trajectory of future educational technologies, emphasizing their role in fostering intuitive and student-friendly interfaces that promote learning and engagement among diverse student populations.

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