African American Males Constructing Computing Identity

Betsy DiSalvo[1], Sarita Yardi[1], Mark Guzdial[1], Tom McKlin[2], Charles Meadows[3], Kenneth Perry[4], Amy Bruckman[1]

[1]GVU Center, Georgia Institute of Technology

[2]The Findings Group, Decatur, GA

[3]Department of Modern Foreign Languages, Morehouse College

[4]Department of Computer Science, Morehouse College

{bdisalvo, yardi, guzdial, asb}@cc.gatech.edu; tom.mcklin@gmail.com; {kperry,cmeadows}@morehouse.edu

ABSTRACT

Many young African American males have a passion for video games, but they don't often translate that passion into learning about computing. Part of the problem is that they do not identify with computing as a social norm within their peer group. This *disidentification* with computing can negatively impact academic performance and limit opportunities for upward mobility. We developed a job training program called Glitch Game Testers in which young African American men are trained to "break open the black box" of their game consoles to learn about computing. Perceptions of peers' technical competency were measured before and after the summer 2010 program. Results showed that participants were more likely to view their peers as technical resources and their overall access to technical resources increased. Broader implications for motivating technology adoption in HCI are discussed.

Author Keywords

African American culture, masculinity, group identity, video games, broadening participation in computing.

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

Design, Human Factors.

INTRODUCTION

One of the challenges in motivating young African American males to engage with computing is that they do not traditionally identify with computing culture [4,8]. Research suggests that people will be more likely to identify with something if they perceive it to be the norm in their social group [13]. However, the corollary is that people will *disidentify* with something they don't believe to be within their domain of self-identity. Domain disidentification among young adults can create situations of academic underperformance, economic downward mobility, and social stratification [4,12,13]. "Once disidentification occurs in a school, it can spread like the common cold… Peer pressure can become fierce" [12]. Disidentification with computing contributes to under-representation among African Americans, women, and other minority groups [8]. These groups make up 70% of the U.S. population but are the least represented throughout the computing pipeline. Increasing diversity is important for overcoming social stratification, increasing opportunities for economic advancement, and improving the quality of computational work in the U.S. [1]. However, solving this problem requires that we distinguish "not-learning"—when students decide they won't learn—from failure among marginalized communities [9]. Towards this goal, we developed a game tester job training program called Glitch Game Testers (Glitch) where young African American men learn computer science through video game testing. Glitch encourages participants to "break open the black box" to explore the computation underneath. The goal is for them to begin to see themselves as the kinds of people who "do" computing. Three hypotheses are examined:

H1: Participants will be more likely to view their peers as technical resources after Glitch.

H2: Participants' overall access to technical resources will increase after Glitch.

H3: Participants' own attitudes will correlate with their views towards their peers.

To address these hypotheses, we describe results of a pre and post-test survey with 21 Glitch participants. The survey measured the technical resources in participants' social groups before and after participating in Glitch. Results suggest that computing identity among young African American males can be positively impacted and the transformation takes place on a group level. The paper concludes with a discussion of applications in HCI.

CHI 2011, May 7–12, 2011, Vancouver, BC, Canada.

RELATED WORK

African American underperformance is typically attributed to access and socioeconomic status rather than racial identity and culture [8]. Yet, African American females have higher rates of online participation than other groups and young African American males play more hours of video games than other youth [11]. While computing has been stereotypically masculine, masculinity varies by culture [7]. Less is understood about the racialized culture of computing [3]. Some differences exist. Computer scientists typically describe an early "magnetic attraction" to tinkering with computers; the stereotypical hacker identity is portrayed as rejecting the body and appearance [15]. In contrast, African American identity is often heavily associated with the body, athletics, and sexuality [7]. Thus, while African American men have a passion for video games, unlike some other demographics—white men in particular—they do not tend to transfer that engagement into a curiosity or agency with the underlying technology [4,8]. Other social groups attribute their passion for technology to their early interest in game playing, but the same progression doesn't exist among African American men [3]. A study of play practices suggests young African American men play in specific ways that differ from the groups who do tend to leverage gaming interests in to computing interests [3]. African American men tend to:

- Use fewer cheats and mods; value good sportsmanship
- Play on console systems
- Place a high value on competition
- Play in multigenerational family settings

Using games for learning computer science has been explored in other research and video games have been shown to be motivating for students. Game2Learn is an introductory computer science course designed to increase student motivation in CS [2]. Szentgyorgyi et al. describe participants' feelings that consoles were more social than other kinds of games [14].

GLITCH GAME TESTERS

We developed Glitch to leverage games and the social process of game playing as a motivating context. Glitch is a job training program where participants work full-time during the summer and part-time during the school year performing quality assurance for pre-release games. Since early 2009, we have partnered with game companies such as Yahoo!, Electronic Arts, and Cartoon Network to debug pre-releases of real games. In the process, participants learn to identify and document bugs in the code and code and participate in the software development process.

Materials were disseminated through word of mouth and email flyers to local high school teachers and community organizers in Atlanta, GA. We have received over 300 inquiries since the program started. Gender and race were not explicitly included in the selection criteria; however, early applicants that met other criteria (namely, in high school, low income as measured by Free and Reduced Lunch eligibility, and interested in games) were all African American males. Glitch was launched in June 2009 with 12 high school juniors and seniors and was run full-time for 8 weeks from 9-5, Monday-Friday. Ten participants continued and three new participants joined for Saturday full-day workshops through the 2009-2010 school year. A new class of 10 participants was added in summer 2010. In the first year of the program, participants spend one hour of each day in a computational media workshop [5] using Alice, a drag and drop programming language, and Python, a textual programming language, to teach introductory computer science concepts. In the second year participants attend Advanced Placement Computer Science classes.

Incentive-based "Glitch Points" are awarded for producing bug reports, completing computer science projects, and performing the daily operations required of a quality assurance provider job. At the end of each semester and summer, a prize is awarded to the top point earner. In most cases the prize is a computer built by the Glitch team. In addition, periodic awards of donated games are given out. Prior work contains qualitative and quantitative results that suggest Glitch is having a positive impact [3]. For example, six of the seven Glitch participants who graduated from high school in 2010 are attending college. Five of the seven have selected computer related majors. Only one had planned to go into computing before Glitch. Among the 23 participants, intent to persist in computing increased for 22.

METHODS

There has not yet been a good way to test peer group beliefs about technology. Measuring social norms in the wild is difficult. With few exceptions, most studies of domain disidentification have been in controlled laboratory or educational settings [12]. Drawing from social capital theory and social construction of technology theory, we developed a measure of "technical capital"—the technical resources in a person's social groups. The technical capital measure draws on an approach from the social sciences called ego-network analysis, using an instrument called the resource generator [16] .

"Ego" refers to the person being studied, "alter" refers to the people she knows, and "tie" refers to the relationship between them. Like social capital measures, the technical capital measure invites participants to list the names of family and friends, how they know them (e.g. friend, brother), how close they are on a Likert scale from 1 to 10, and how good this person is with computers and technology on a scale of 1 to 10. From this we build a map of the social and technical groups in their lives.

Participants who joined Glitch for the first time in June 2010 were categorized as "newcomers." Participants who joined in June 2009 were "oldtimers." Both classes had similar aptitude and interest towards technology before they entered the program. The technical capital pre-test was administered in the first week of the summer 2010 program. The post-test was administered in the last week of the summer (8 weeks—about 280 working hours—after the pre-test). Of the 23 participants, 11 oldtimers and 10 newcomers completed the pre-survey and 10 oldtimers and 10 newcomers completed the post-survey. Participants were divided into a modified 2×2 within-subjects design with 10 participants in each group.

The Likert scale data are ordinal and not normally distributed, and thus the Wilcoxon rank-sum test was used for the pre-post test comparisons (indicated by Z). The

Wilcoxon rank-sum test is a non-parametric alternative to the paired (dependent) t-test and also better handles small datasets because it does not make distributional assumptions. The Mann-Whitney test (or Wilcoxon signed rank test) was used for oldtimer-newcomer comparisons (indicated by *z*). The Mann-Whitney test is also a non-parametric alternative but for unpaired (independent) datasets. Finally, pre and post-interviews and focus groups were conducted with participants. We transcribed and analyzed interviews and included some of that data here to add depth and nuance. Researchers have spent over 800 hours recruiting, observing, and engaging with participants. The work and insights here builds off those experiences.

RESULTS

H1: Participants will be more likely to view their peers as technical resources after Glitch.

Participants listed the names of eight close friends and six close family members. Thus, up to 14 ties for each of the 21 participants were captured in the pre-test and again in the post-test (224 for the pre-test and 203 for the post-test, duplicates were removed in analysis). Relationships for each name were aggregated and grouped into *peers* (e.g. classmates, teammates, Glitchmates) and *others* (e.g. parents, siblings, teachers, coaches, pastors, uncles, grandparents). Participants ranked each name based on perceived technical expertise.

Results showed that participants were significantly more likely to view their *peers* as technical resources after participation in Glitch than before *(Z=-3.23, p<.005)*. In contrast, there were no significant changes in views of *others* (*Z=.09, n.s.*). When peers were separated by newcomers and oldtimers, newcomers' view of their peers increased from pre-post more than oldtimers' view of their peers (*Z=-5.51, p<.001; Z=-2.14, p<.01*). This is in part because oldtimers start with higher perceptions of their peers' technical expertise than newcomers do (*z=.77, p<.005, n1=11, n2=10*). Oldtimers still end higher, though the difference is less significant after Glitch (*z=.49, p<.01, n1=10, n2=10*).

H2: Participants' overall access to technical resources will increase after Glitch.

Participants listed the names of four people that they would go to for help if they had a question about computers and technology. Again, they also reported the relationship, closeness, and technical expertise of those ties. Access to technical expertise was averaged for each participant and compared from pre to post. Results showed that participants' overall access to technical expertise increased significantly (*Z=-1.41, p<.001*). Newcomers increased more than oldtimers (*Z=-3.38. p<.001; Z=-2.41, p<.01*) and oldtimers again started higher and ended higher (*z=2.21, p<.01, n1=11, n2=10; z=1.8, p<.01, n1=10, n2=10*). The values for H2 shown in Table 1 are expected to be higher than for H1 because participants specifically listed sources of technical expertise rather than social ties.

		Pre-test avg(std)	Post-test avg(std)	*Z*
H1	Peer technical expertise	6.98(3.06)	7.93(2.28)	-3.23*
	Newcomers	6.06(3.12)	7.38(2.51)	-5.51***
	Oldtimers	8.00(2.99)	8.60(2.14)	-2.14**
H2	Access to technical help	9.19(1.15)	9.36(0.84)	-1.41***
	Newcomers	8.99(1.04)	9.30(0.98)	-3.38***
	Oldtimers	9.38(0.91)	9.41(0.70)	-2.41**
H3	Own technical expertise	8.35(1.36)	8.53(0.97)	r=.21*
	Newcomers	8.50(1.57)	8.70(1.07)	-1.91**
	Oldtimers	8.10(1.19)	8.56(0.88)	-2.21**

***p<.05 **p<.01 ***p<.001**

Table 1: Wilcoxon test pre-post differences for peers. (Mann-Whitney newcomer-oldtimer comparisons omitted for space).

H3: Participants' own attitudes will correlate with their views of their peers.

H1 and H2 demonstrate that Glitch increases participants' perceptions about their peer groups, but they do not account for participants' perceptions of themselves. H3 considers an additional variable: participants' perceptions of their own technical expertise. The difference in participants' own technical expertise was compared to the average difference in peers' technical expertise from pre to post-test. A Pearson's test showed a small significant correlation between individual and peer group ratings (r(20)=.31, p<.05, N=20). However, caution should be taken when interpreting significance with 20 cases. The results suggest important relationships but larger tests are needed. A stronger difference was exhibited in oldtimers' pre-test and post-test ratings for their own technical expertise which were much higher than newcomers's pre-test to post-test self-ratings, respectively (*Z=-2.21, p<.01; Z=-1.91, p<.01*). Interestingly, oldtimers' expertise increased but newcomers decreased slightly (*Z=01.1, n.s.; Z=.16, n.s.*).

Limitations

Measuring social norms is hard and a number of variables cannot be captured. Beliefs are constructed since early childhood, but we are only able to capture current self-articulated social relations. We are currently examining face-saving [6] among Glitch participants to understand *how* technology becomes a social norm among peers. Glitch is not designed to assimilate all young African American men into computing culture. Its design is shaped by their culture and to meet their values. We hope Glitch opens a door for them that was previously closed too quickly.

INTERPRETATION AND DISCUSSION

H1 and H2 were supported and H3 was weakly supported. However, differences in newcomers and oldtimers were exhibited in each of the sets of tests. These can be partially explained by interaction effects during Glitch. The pre- and post-interview data supports these findings. In general, participants talked about not promoting their technical skills among friends at school or in their community before Glitch. For example, when asked if people at school knew him as someone who's good with computers, Tom (pseudonyms used) replied: "*I don't put that out there like that. If we have the same class, and they see that I get it, then they might ask.*" Keenan similarly replied that people don't come to him for help with computers: *"Not many people know I'm good with computers… I'm not very outgoing with showing people. So the only people who know I know how to use the computers is my family, my computer teachers, that's it. Maybe a couple friends. 'He's a geek.' That's my friends talking."*

After Glitch, participants told us they had more peers to talk about computing with. Michael said he would ask other Glitch participants for help: *"Mark, he's really smart and he knows a lot about computers. I can communicate pretty good with Carl, so I ask him for help. Romeo, he's pretty cool too and he knows a lot about computers and stuff."* Ramon was a newcomer who said in his pre-interview: *"[Glitch] is just a job and I don't need to make friends here."* Later, after they produced the two most popular computer animations for an introductory programming project, Ramon began sitting with Dewan and two others who had more friends in the program. By the time of his post-interview, Ramon said: *"The guys that are senior, it is just like in high school. It is no big thing. They have seniority, we will have it next year – you got to respect that they know what they are doing."*

These quotes offer just a few examples but highlight the influential social structures in participants' lives. Oldtimer influence on newcomers suggests the importance of learning in a community of practice, overcoming bravado, and fostering social support for newcomers [10]. In many cases, being a "computer person" just isn't a social attribute that is promoted in participants' culture. However, contextualizing computing in an authentic job and game testing setting—both of which wield social status—builds participants' interest in promoting this identity.

Applications in HCI

African American men's identification with technology can be influenced by their peers and oldtimers can influence newcomers in technology adoption. This peer influence should be explored when designing for other non-dominate groups in a few ways: (1) pairing newcomers with oldtimers can help motivate adoption and desire to learn among newcomers; (2) changing how technology is interpreted among peer groups can also change the way a social group such as African American men thinks about technology. Designing technology as socially desirable should be explored in introducing new technologies, particularly for technologies that involve learning or require acceptance for reluctant users. Finally, (3) the technical capital survey offers an approach for HCI researchers to evaluate individual and group attitudes or to measure social stigmas among users in a variety of domains. The creativity required to look beyond the assumed functions of the technology and see new possibilities is a powerful force for social change [4]. Many new directions in HCI are focused on designing for non-dominant groups such as homeless, elders, or the disabled. Future research should consider social norms and group identification in the design process.

ACKNOWLEDGEMENTS

This work was supported by NSF #0837733 and #0940394. We thank participants for their commitment.

REFERENCES

1. Preparing Women & Minorities for the IT Workforce: The Role of Nontraditional Educational Pathways. *AAAS Report*, 2005.
2. Barnes, T., Powell, E., Chaffin, A., Lipford, H. Game2Learn: improving the motivation of CS1 students. *GDCSE '08.*
3. DiSalvo, B., Guzdial, M., Mcklin, T., Meadows, C., Perry, K., Steward, C., et al. (2009). *Glitch Game Testers: African American Men Breaking Open the Console*. DiGRA 2009 Breaking New Ground: Innovation in Games, Play, Practice and Theory.
4. Eglash, R. *Appropriating Technology: Vernacular Science and Social Power*. Univ. of Minnesota Press, 2004.
5. Forte, A. and Guzdial, M. Computers for Communication, Not Calculation: Media as a Motivation and Context for Learning. *IEEE Computer Society* (2004).
6. Goffman, E. On Face-work: An Analysis of Ritual Elements of Social Interaction. *J. Study of Inter Proc. 18*, 3 (1955), 213-231.
7. Harper, S.R. The Measure of a Man: Conceptualizations of Masculinity Among High-achieving African American Male College Students. *Ber. J. of Soc. 48*, 1 (2004), 89-107.
8. Katz, S., Aronis, J., Allbriton, D., Wilson, C., and Soffa, M.L. Gender and Race in Predicting Achievement in Computer Science. *IEEE Tech & Soc, 22*, 3 (2003), 20-27.
9. Kohl, H. *I Won't Learn From You*. New Press, 1995.
10. Lave, J. and Wenger, E. *Situated Learning: Legitimate Peripheral Participation*. Cambridge Univ. Press, 1991.
11. Lenhart, A., et al. Teens, Video Games and Civics. Pew *Internet Report*, 2008.
12. Steele, C.M. Race and the Schooling of Black Americans. *The Atlantic Monthly 269*, 4 (1992), 67-78.
13. Steele, C. A threat in the air: How stereotypes shape intellectual identity and performance. *Amer. Psych. 52*, 6 (1997).
14. Szentgyorgyi, C., Terry, M., and Lank, E. Renegade gaming: practices surrounding social use of the Nintendo DS handheld gaming system. In *Proc. CHI '08*, (2008).
15. Turkle, S. *The second self: Computers and the human spirit*. Simon & Schuster, New York, 1984.
16. Van Der Gaag, M. The Resource Generator: Social capital quantification with concrete items. *Soc Net*, (2004).