

Getting on the Computing Faculty Pathway*

A Perspective on Equity for Latinos

Faye R. Jones[†]

College of Communication & Information
Florida State University
Tallahassee, FL, USA
fjones@fsu.edu

Marcia A. Mardis

School of Information
Florida State University
Tallahassee, FL, USA
mmardis@fsu.edu

Ebe Randeree

College of Communication & Information
Florida State University
Tallahassee, FL, USA
eranderee@fsu.edu

ABSTRACT

Latinos are the largest minority group in the nation and major contributors to the middle-skilled STEM workforce. Although many of these positions require technical computing competencies, they typically do not require advanced degrees. This limited pathway means that most Latino students will never experience a Latino or Hispanic professor, much less stay in college long enough to become faculty members themselves. This degree stagnation presents equity imperatives for higher education leaders to embrace servingness and strategies to build authentic STEM identity and meaningful experiences for Latinos that lead to advanced degrees.

CCS CONCEPTS

•Social and professional topics •User characteristics •Race and ethnicity

KEYWORDS

Latinos, Computing, Servingness, Graduate degrees, Faculty

ACM Reference format:

Faye Jones, Marcia Mardis, and Ebe Randeree. 2024. Getting on the Computing Faculty Pathway: A Perspective on Equity for Latinos. In *Proceedings of ACM RESPECT Conference (RESPECT'24)*. ACM, Atlanta, GA, USA, 5 pages. <https://doi.org/10.1145/3653666.3656088>

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than the author(s) must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from Permissions@acm.org.
RESPECT 2024, May 16-17, 2024, Atlanta, GA.
© 2024 Copyright is held by the owner/author(s). Publication rights licensed to ACM.
ACM ISBN 979-8-4007-0626-4/24/05.
<https://doi.org/10.1145/3653666.3656088>

1 INTRODUCTION

STEM Workforce Participation is not Advanced STEM Representation. Strengthening the STEM workforce has been a priority in the U.S. to achieve and sustain economic promise and innovation, as evidenced by presidential initiatives [1, 2] as well as efforts to expand access to people of color, rural communities,

women, and those underserved, underrepresented or marginalized in STEM [3, 4]. Hispanics, the largest minority in the U.S., comprise 19% of the population [5]. Based on 2021 U.S. data, 24% of the U.S. workforce was employed in STEM occupations, whereas 15% of those workers were Hispanics [6].

Relatively small shares of young Hispanics have persisted to advanced degrees [7]. Compounding the issue, most data sets do not distinguish among Hispanic subgroups, disregarding important cultural and economic differences among them [8]. Figure 1 indicates Hispanics earn more STEM Associate degrees than other U.S. citizens and permanent residents (32%) [6].

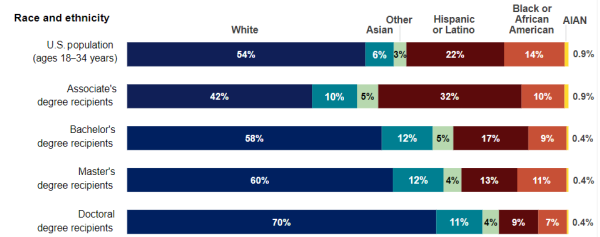


Figure 1: U.S. Degree Recipients by Degree Level 2020 [6]

Figure 1 also indicates that STEM completion gaps widen for Hispanics at the Bachelor's (17%), Master's (14%), and Doctoral degree (9%) levels. Hispanics comprise only 6% of all faculty [9]. Given that higher education is key to economic mobility and political participation, this attrition has immediate and long-term consequences in and beyond their communities [10]. Hispanic students may not see a pathway or see themselves at IHEs in faculty or leadership roles. As a result, “the number of Hispanic STEM faculty is so small that it cannot be reported without compromising their privacy” [11, p.1]. This perspective on equity focuses on how we can transform decades of ineffective practices and policies to realize Latino success in advanced computing degrees. Since Latinos’ success in two-year programs is well evidenced, we will primarily focus on improving experiences at the graduate level in this paper.

Positionality Statement. This paper’s authors are a multi-disciplinary group of scholars in the fields of higher education, computing, and information sciences. This paper was inspired by Dr. Faye R. Jones, a Latina senior faculty researcher who studies STEM Pathways, and is Afro-Latina with a Cuban mother and father from La República Dominicana. She was born in New York

but raised in Florida by her immigrant Cuban grandparents. Most importantly, she witnessed what it was like to never experience a Latino faculty member during her undergraduate and graduate college experiences. While she is grateful for the countless professors who supported her and for the education that she received, she is acutely aware of the opportunities more Latino faculty representation can bring to students and the computing field. Dr. Marcia A. Mardis is a professor of information science and an associate dean for research with a demonstrated commitment to furthering equity-related educational research and program development relating to the rural technical workforce, particularly emphasizing the interplay between locale, community, and opportunity. Ebe Randeree is faculty in information technology and associate dean for student outreach and engagement, with interests in development of experiential learning and discipline-based activities for computing and technology students.

In this paper, we use the words Hispanics and Latinos interchangeably. We prefer to use Latiné instead of Latinx and La República Dominicana instead of the Dominican Republic to promote authenticity in publishing the work of Spanish speakers and writers and show the interchangeability of words and code-switching second nature to bilingual people. We also consider the word “Latinos” to be gender-inclusive.

2 LITERATURE & THEORETICAL FOUNDATIONS

Latino/Hispanic Identity. In the U.S., Latinos are considered an ethnicity, or a group of people who share a common cultural background or descent. However, the U.S. Census reports 44% of Latinos identify as “Some Other Race” or do not respond to the race question, due to an onset of confusion that may ensue. For many Hispanics, “Hispanic or Latino” are both a race and ethnicity, which is why the Biden administration is considering allowing “Hispanic or Latino” to be chosen as both a race and ethnicity in the next Census [12].

Furthermore, the diversity within the Latino community is unlike any other minority group. There are 21 Spanish-speaking countries worldwide, and three additional Latin countries that do not have Spanish as their first language. In many of these countries, Spanish colonialism and the African slave trade have created complex and beautiful intersectionalities between Hispanics and Latinos that are often muted in a larger society. What is positioned as emblematic of Hispanic or Latino multiculturalism (e.g., food, clothing, music, dance); language (Spanish has over 20 dialects, including fluent Spanish speakers, Spanglish speakers, and non-Spanish speakers); and citizenship (i.e., foreign-born or immigrant) is actually a blend of races (i.e., Black, White, Asian, Indigenous) and cultures. With so little recognition of their unique identities, Hispanics/Latinos often conclude it is easier to identify as “Latino or Hispanic” than to select or choose between “Black Hispanic,” “White Hispanic,” or even “All the above Hispanic” [12, 13].

Servingness in Higher Education Institutions. Servingness is a multidimensional theory [14] focused on how institutions serve

Latiné students with four reinforcing themes 1) student outcomes, 2) student experiences, 3) internal organization, and 4) external influences. Internal structures for serving include leaders’ decisions to change hiring practices to increase faculty diversity; obtaining funding to provide more targeted student support and success programs; and using culturally relevant curricula and pedagogy [14]. External influences include the presence of legislation, governing boards, advocacy groups, or other stakeholders, although discriminatory practices can also impact servingness. Servingness applies to minority-serving institutions, like Hispanic Serving Institutions (HSI) that enroll Hispanics in U.S. higher education and to all institutions that seek to transform their institution or improve Latiné or inclusive experiences [14]. To achieve equity, we must serve all students. In our view, servingness brings intentionality to equipping Latinos for success at institutions that currently enroll or are poised to enroll at least 25% of Latinos in their student populations, such as Primarily White Institutions (PWI) that are emerging Hispanic Serving Institutions (eHSI).

Belongingness, Authenticity, & STEM Identity. Servingness reflects what an institution gives to a student. Feelings of belonging to both an institution and a STEM field depend on whether students feel they are free to be their authentic selves. Using Museus’ culturally engaging campus environments model, Gonzalez et al. [15] found that students’ sense of belonging can be impacted through campus organizations, the presence of Latiné faculty, and institutional diversity. Similarly, authentic learning experiences based on ideas of diversity and inclusion can foster the formation of a positive STEM identity [16]. Only students and, in this case, Latiné students, can tell you whether institutional servingness is effective based on whether they feel free to be their authentic selves, receive opportunities at parity with others, and if they realize equitable STEM academic and professional outcomes.

3 ACCESSING THE COMPUTING FACULTY PATHWAY

Graduate computing programs can be transformed into places that provide a sense of belongingness and promote authentic computing identity for Latinos if we 1) move beyond academic preparation, emphasizing only the importance of academic rigor from K-12 in math, science, and computing concepts [17, 18]; 2) teach coding and computational thinking processes early [19]; 3) engage students in advanced computing and AP courses [20]; and 4) provide informal computing experiences, especially with peers and mentors [21, 22]. These experiences are not impactful if they do not also impart sound communication, leadership, and other soft-skills employers expect to accompany subject-matter proficiency [23].

In addition to areas of servingness identified by Gina et al. [14], computing education can be made more equitable for Latino students by exploring the role of faculty in teaching, research, and service, and how Latinos (and other underserved populations) might be further developed on what faculty do [24].

Teaching Assistantships. Teaching assistantships are “consistently related to Latino doctoral students’ odds of planning to work as a faculty member” [25, iv]. Computing programs should monitor the number of teaching experiences provided to Latinos to ensure that meritorious students receive these opportunities as part of their doctoral studies to understand faculty work [26, 27], build effective strategies for teaching synchronous and asynchronous courses, and learn key tasks such as syllabus development [28]. Moreover, the national computing teacher shortage [29] creates an imperative to prepare more computing graduate students to fill gaps across all educational levels, or at least maintain the number of trained computing educators in postsecondary education.

Research Assistantships. Program leaders and policymakers have many opportunities to provide Latinos with introductory research experiences throughout their undergraduate collegiate journeys. At the graduate level, these experiences can be tailored to develop skills in empirical research conduct and reporting [30]. Students benefit from experience in ethical and rigorous research experiences [31] and being exposed to guidelines for research development [32]. Moreover, when Latino graduate students experience collegiality and participate in collaborative ideation [33], they can learn effective work habits that lead to successful research outcomes and experience the effort required for knowledge generation. Participation in sponsored projects is an effective way to learn some of these competencies [34].

Grant Writing Experience. Doctoral curricula often expose students to the important task of grant-writing. This process allows students to learn to identify funding sources and understand the process components. Because many students do not have the opportunity to participate in developing an idea through grant submission, they are undoubtedly unfamiliar with the importance of collaboration, budgeting, data management, and project evaluation.

Experiences in Publishing for Co-Authorship. Developing strong research reporting skills is often overlooked in doctoral education but is essential for developing a publication track record [35] and establishes competitiveness in the academic marketplace [36]. Latino students may also have few experiences in academic written English [37]. When Latino students do not have the opportunity to work on other types of academic publishing, such as conference proceedings and journal submissions, they are denied foundational skills to function as independent researchers and members of effective collaborative research teams, two areas critical to early career faculty success [38]. Additionally, there is a significant association between the number of articles published and time-to-degree [39].

Senior Faculty Mentorship. Doctoral advisors and major professors prepare and guide students to success in academic careers. They give students the tools to be successful and prepare them for life in the academy or preferred profession. Guidance may include learning about success on the tenure track, guidance

on how to negotiate academic positions and professor positions, and advice on how to climb the academic ranks. Latino students entering a doctoral program may need assistance to ensure a good fit with their major professors and talk to other doctoral students about the level of training that they should expect.

Conference and Presentation Participation. Graduate students benefit from opportunities to network with the large community of computing scholars and share their work at conferences. They should also be able to obtain funding for at least one or two conference presentations per year to learn discourse skills, answer audience questions, and build relationships around their work. Knowledge of the common formats for conference presentations might also be helpful, along with information about types of presentations (e.g., seminar versus symposium).

Multiple Language Use. Latiné students should not be limited to publishing in English once other program requirements have been met and encouraged to disseminate research or project findings in non-traditional ways. Moreover, there are several computing journals that accept papers in Spanish for an academic audience to provide a better (or additional) dissemination outlet for faculty to reach Latiné communities both nationally and internationally.

The use of the Spanish language is also important for many students who grew up speaking Spanish but often have no one at postsecondary institutions to share their culture and language with. Faculty who speak and write in Spanish should be encouraged to make safe havens for intellectual discourse at postsecondary institutions, providing a place for Spanish orators and writers to belong without judgement.

4 CONSIDERATIONS FOR ACADEMIA

Performance Metrics. In graduate curricula, a checklist with performance metrics can help to ensure students are prepared to be computing faculty and help the program gauge success, complementing metrics for enrollment, retention, and graduation of students. Clear metrics can measure equity and quality of doctoral experiences and afford more Latinos the opportunity to obtain faculty positions and achieve success.

Institutional Responsibilities. Although two-thirds of Latinos attend Hispanic Serving Institutions or HSI, one-third do not [40]. Moreover, of the 572 HSI in the nation, only 11 are research intensive (R1) institutions [41], indicating that many HSI may have limited resources for graduate students. In contrast, PWIs may have resources and programs, but not serve Latinos or provide programs that result in inclusive excellence. Graduate computing programs are responsible for improving servingness to offer the appropriate supports that yield successful doctoral outcomes for Latinos, specifically those with advanced computing degrees.

Non-Academic Outcomes. Latinos should complete their doctoral program with a positive academic self-concept in computing gained by participating in activities as their authentic selves without judgment. This result benefits the graduates immediately but sets a precedent for students who follow. Authentic and positive dispositions are critical for furthering social justice and civic engagement, enriching future students' experiences, and strengthening communities.

5 IMPLICATIONS FOR THE RESPECT COMMUNITY

In this paper, we affirmed that computing graduate education must be re-evaluated if Latinos are to achieve equitable opportunities and outcomes, move beyond stagnation at 2-year degrees, and achieve advanced degrees. This equity perspective is a call to action for institutional leaders and computing faculty to explore current practices, policies, and processes that hinder or limit the development of Latino students. For the RESPECT community, the next steps may include targeting research on the responsibilities of institutional leaders to identify best practices, understand how to tailor them to local needs, and ongoingly assess how well the efforts help their institutions move from Latiné enrolling to Latiné serving.

ACKNOWLEDGEMENTS

We extend our thanks to Jamie Payton at Temple University and Tiffany Barnes at North Carolina State University for their support of this work and for continuing the fight for broadening participation in computing.

This material is based upon work supported by the National Science Foundation under Grants No. 2137393, 2137338, and 2000799.

REFERENCES

- [1] The White House. "President Trump Signs Memorandum for STEM Education Funding." <https://trumpwhitehouse.archives.gov/articles/president-trump-signs-memorandum-stem-education-funding/>
- [2] The White House. "Fact Sheet: Biden Harris Administration Announces Bold Multi-Sector Actions to Eliminate Systemic Barriers in STEMM." <https://www.whitehouse.gov/ostp/news-updates/2022/12/12/fact-sheet-biden-harris-administration-announces-bold-multi-sector-actions-to-eliminate-systemic-barriers-in-stemm/>
- [3] The White House. "Fact Sheet: Biden-Harris Administration Actions to Attract STEM Talent and Strengthen our Economy and Competitiveness." <https://www.whitehouse.gov/briefing-room/statements-releases/2022/01/21/fact-sheet-biden-harris-administration-actions-to-attract-stem-talent-and-strengthen-our-economy-and-competitiveness/>
- [4] The White House. "STEM for All." The White House. <https://obamawhitehouse.archives.gov/blog/2016/02/11/stem-all>
- [5] U.S. Census Bureau, "Quick Facts: United States Population Estimates," ed: U.S. Census Bureau, 2022 [Online].
- [6] E. Grieco and S. Deitz, "Diversity and STEM: Women, Minorities, and Persons with Disabilities 2023," National Center for Science and Engineering Statistics, National Science Foundation, 2024. [Online]. <https://nces.nsf.gov/pubs/nsf23315/report>
- [7] L. Mora, "Hispanic enrollment reaches new high at four-year colleges in the U.S., but affordability remains an obstacle," 2022 [Online]. <https://www.pewresearch.org/short-reads/2022/10/07/hispanic-enrollment-reaches-new-high-at-four-year-colleges-in-the-u-s-but-affordability-remains-an-obstacle/>
- [8] C. L. Schneider, "Connected Mathematics and the Texas Assessment of Academic Skills," vol. 62, ed: Dissertation Abstracts International, 2000.
- [9] National Center for Education Statistics, "Annual Report: Characteristics of Postsecondary Faculty," 2023. [Online]. <https://nces.ed.gov/programs/coe/indicator/csc>
- [10] P. Gandara, "The Potential and Promise of Latino Students," *American Educator*, vol. 41, no. 1, 2023. <https://www.aft.org/ae/spring2017/gandara>
- [11] U.S. House of Representatives Committee on Science, Space, & Technology. "The Chips and Science Act." <https://democrats-science.house.gov/imo/media/doc/STEM%20Participation.pdf>
- [12] N. Acevedo, "A Large Share of Latinos Don't Identify with Current Race Categories," ed: NBC News, 2023. <https://www.nbcnews.com/news/latino/latinos-census-dont-identify-racial-categories-rcna77592>
- [13] Instituto Hispania, "20+ Types of Spanish Dialects Spoken Around the World," Instituto Hispania, 2024. <https://www.ihispania.com/spanish-dialects/>
- [14] G. A. García, A. M. Núñez, and V. A. Sansone, "Toward A Multidimensional Conceptual Framework for Understanding 'Servingness' In Hispanic-Serving Institutions: A Synthesis of the Research," *Review of Educational Research*, vol. 89, no. 5, pp. 745-784, 2019.
- [15] E. Gonzalez, G. Ortega, M. Molina, and G. Lizalde, "What does it mean to be a Hispanic-Serving Institution? Listening to the Latina/o/x voices of students," (in EN), *International Journal of Qualitative Studies in Education*, research-article 2020-9-13 2020, doi: TQSE-2019-0334.R1.
- [16] A. Singer, G. Montgomery, and S. Schmoll, "How to foster the formation of STEM identity: studying diversity in an authentic learning environment," *International Journal of STEM Education*, vol. 7, no. 57, pp. 1-12, 2020-11-06 2020, doi: doi:10.1186/s40594-020-00254-z.
- [17] CPALMS. "Computer Science Standards." https://www.cpalms.org/Standards/Computer_Science_Standards.aspx
- [18] K12CS. "K–12 Computer Science Framework." K12CS. <http://k12cs.org>
- [19] E. Macrides, Q. Miliou, and C. Angeli, "Programming in early childhood education: A systematic review," *International Journal of Child-Computer Interaction*, vol. 32, 2022. [Online]. <https://doi.org/10.1016/j.jccci.2021.100396>
- [20] J. Wyatt, J. Feng, and M. Ewing, "AP Computer Science Principles and the STEM and Computer Science Pipelines," [Online]. <https://apcentral.collegeboard.org/media/pdf/ap-csp-and-stem-cs-pipelines.pdf>
- [21] P. Garcia, Perez, M., Farrell, D., Bork, S., Ericson, B., Mondisa, J., "Supporting Mutually Beneficial Near-Peer Mentoring Relationships Within Computing Education Programs," in *Conference on Research in Equitable and Sustained Participation in Engineering, Computing, and Technology (RESPECT)*, Philadelphia, PA, 23-27 May 2021: IEEE Xplore. [Online]. <https://ieeexplore.ieee.org/abstract/document/9620669>
- [22] Trujillo et al., "Near-peer STEM Mentoring Offers Unexpected Benefits for Mentors from Traditionally Underrepresented Backgrounds," *Perfect Undergrad Res Mentor*, vol. 41, no. 1, 2015. <http://blogs.elon.edu/purm/files/2015/11/>
- [23] O. Hazzan, Ragonis, N., & Lapidot, T., "Computer Science Soft Concepts and Soft Skills," in *Guide to Teaching Computer Science*: SpringerLink, 2020.
- [24] American Association of University Professors [AAUP], "What Do Faculty Do?," ed: AAUP, 2006. <https://www.aaup.org/issues/faculty-work-workload/what-do-faculty-do>
- [25] F. Fernandez. (2017). Doctoral Education of Latinas and Latinos in the United States: Examinations of (Sub)Baccalaureate Origins, the Role of Hispanic Serving Institutions, and the Relationship between Sources of Financial Support and Post-Graduation Plans. https://etda.libraries.psu.edu/files/final_submissions/13898
- [26] Bender et al., "Towards a Competency Model for Teaching Computer Science," *Peabody Journal of Education*, research-article pp. 519-532, 2015-8-8 2015, doi: 10.1080/0161956X.2015.1068082.
- [27] S. Mandal, "The Competencies of the Modern Teacher," *International Journal of Research in Engineering, Science and Management*, vol. 1, no. 10, 2018. [Online]. https://www.ijresm.com/Vol_1_2018/Vol1_Iss10_October18/IJRESM_V1_I10_93.pdf
- [28] Jobs for the Future & the Council of Chief State School Officers, *Educator Competencies for Personalized, Learner-Centered Teaching*, Boston, MA: Jobs for the Future, 2015. [Online].

- https://ccsso.org/sites/default/files/2017-12/EducatorCompetencies_081015.pdf
- [29] E. Shein, "The CS Teacher Shortage," (in EN), *Communications of the ACM*, research-article vol. 62, no. 10, pp. 17-18, 2019-09-24 2019, doi: CACM-Society-2019-10-m-LF-0314.
- [30] S. Kern, "Library Guides: Computer Science and Engineering: Main Parts of a Scientific/Technical Paper." Penn State University. <https://guides.libraries.psu.edu/c.php?g=371360&p=8352512>
- [31] National Science Foundation. "Responsible and Ethical Conduct of Research (RECR)." <https://www.nsf.gov/od/recr.jsp>
- [32] Institute of Education Sciences [IES] and National Science Foundation [NSF], "Common Guidelines for Education Research and Development," 2013, August.[Online]. <https://ies.ed.gov/pdf/CommonGuidelines.pdf>
- [33] Y. H. Tan and S. C. Tan, "Understanding Knowledge Creation," in *Conceptions of Knowledge Creation, Knowledge and Knowing*: Springer, 2020.
- [34] M. Caston and D. Klein. "Student Perspectives of Sponsored Projects: Best Practices for Project Selection and Preparation." Venture Well. <https://venturewell.org/open2015/wp-content/uploads/2013/10/CASTON.pdf>
- [35] C. Guerin, "Connecting the Dots: Writing a Doctoral Thesis by Publication in: Research Literacies and Writing Pedagogies for Masters and Doctoral Writers," in *Research Literacies and Writing Pedagogies for Masters and Doctoral Writers*: Brill, 2016, pp. 31-50.
- [36] A. J. Fisher, Mendoza-Denton, R., Patt, C., Young, I., Eppig, A., Garrell, R.L., Rees, D.C., Nelson, T.W., Richards, M.A., "Structure and belonging: Pathways to success for underrepresented minority and women PhD students in STEM fields," *PLOS One*, 2019, doi: 10.1371/journal.pone.0209279.
- [37] B. Gauthier, "Motivation for Success: Generation 1.5 Hispanic Students and Academic Written English," Master of Arts in Teaching English, California State University, Northridge, ScholarWorks,2024.[Online]. <https://scholarworks.calstate.edu/downloads/9k41zj08c>
- [38] T McGill and M. Dixon. (2005) Information Technology Certification: A Student Perspective. [Periodical].19-30. <https://login.proxy.lib.fsu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=edsbl&AN=RN189958935&site=eds-live&scope=site>
- [39] M. P. Churchill, Lindsay, D., Mendez, D., Crowe, M., Emtage, N., Jones, R., "Does Publishing During the Doctorate Influence Completion Time? A Quantitative Study of Doctoral Candidates in Australia," *International Journal of Doctoral Studies*, vol. 16, 2021. [Online]. <http://ijds.org/Volume16/IJDSv16p689-713Churchill7432.pdf>
- [40] Hispanic Association of College & Universities [HACU]. "2023 Fact Sheet: Hispanic Higher Education and Hispanic-Serving Institutions." 2021-22 IPEDS data using Title IV eligible, 2 year & 4 year, public and private, nonprofit institutions. https://www.hacu.net/images/hacu/OPAI/2023_HSI_FactSheet.pdf
- [41] A. Martinez, Garcia, N.M., "R1 Hispanic Serving Institutions: Potential for Growth and Opportunity," 2023. [Online]. https://cmsi.gse.rutgers.edu/sites/default/files/HSI_Report_R2_0.pdf