BREAKING BARRIERS: THE ROLE OF TECHNOLOGICAL EDUCATION IN ADVANCING ARAB WOMEN IN ISRAEL

ROMPIENDO BARRERAS: EL PAPEL DE LA EDUCACIÓN TECNOLÓGICA EN EL AVANCE DE LAS MUJERES ÁRABES EN ISRAEL

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Resumen: El uso de las nuevas tecnologías en la práctica educativa es objeto de investigación para muchos investigadores, provocando una intensa movilización y reflexión. La globalización y el movimiento de las poblaciones hacen imperativa la necesidad de desarrollar una política educativa para explorarla a nivel internacional y destacar la diversidad y la interculturalidad en beneficio de la sociedad. Las nuevas tecnologías son uno de los recursos más importantes en el proceso educativo, como medio para la transmisión de conocimientos, el desarrollo del pensamiento crítico y la resolución de problemas. El objetivo de este estudio es destacar la utilidad de las TIC y las nuevas tecnologías en la educación intercultural. Los resultados de la investigación mostraron que la mayoría de los profesores cree en gran medida que el uso de las nuevas tecnologías contribuye a un mayor progreso de la sociedad. Asimismo, se encontraron diferencias significativas en el uso del ordenador para la preparación de su docencia a favor de las mujeres. Además, se destaca que los estudiantes, a través del uso de las TIC, participan más activamente en el proceso educativo en comparación con la forma tradicional de enseñar sin el uso de las TIC. Así, presentamos una línea de estudio que enfatiza la importancia de la utilización de las TIC durante todo el proceso educativo en un entorno intercultural educativo.

Abstract: This study investigates the role of technology integration in educational frameworks on empowering Arab women in Israeli society, focusing on their participation in the high-tech sector. It tests two hypotheses: that technology integration boosts Arab Israeli women’s interest in STEM and high-tech careers, and that it enhances their societal and economic empowerment. Despite the success of Israel’s high-tech industry and advancements in education, Arab women remain underrepresented in this sector. The research utilizes a structured questionnaire to assess digital literacy’s impact on Arab Israeli women’s career aspirations in high-tech. The findings suggest that integrating technology into education can significantly increase Arab women’s interest in STEM fields, supporting their greater involvement in the high-tech industry. The study underscores the importance of continued technological integration in education to promote diversity and inclusion in the high-tech sector. However, limitations include a regional focus and a quantitative approach, indicating the need for further research to fully understand the empowerment of Arab women in the Israeli high-tech industry.

Résumé: Cette étude examine le rôle de l'intégration de la technologie dans les cadres éducatifs sur l'autonomisation des femmes arabes dans la société israélienne, en se concentrant sur leur
participation au secteur de haute technologie. Il teste deux hypothèses : que l'intégration technologique stimule l'intérêt des femmes arabes israéliennes pour les carrières STEM et de haute technologie, et qu'elle renforce leur autonomisation sociétale et économique. Malgré le succès de l'industrie de haute technologie israélienne et les progrès de l'éducation, les femmes arabes restent sous-représentées dans ce secteur. La recherche utilise un questionnaire structuré pour évaluer l'impact de la culture numérique sur les aspirations professionnelles des femmes arabes israéliennes dans le secteur de la haute technologie. Les résultats suggèrent que l'intégration de la technologie dans l'éducation peut accroître considérablement l'intérêt des femmes arabes pour les domaines STEM, favorisant ainsi leur plus grande implication dans l'industrie de haute technologie. L'étude souligne l'importance de l'intégration technologique continue dans l'éducation pour promouvoir la diversité et l'inclusion dans le secteur de haute technologie. Cependant, les limites incluent une approche régionale et une approche quantitative, ce qui indique la nécessité de recherches plus approfondies pour comprendre pleinement l'autonomisation des femmes arabes dans l'industrie israélienne de haute technologie.

Palabras clave: Integración tecnológica, Mujeres árabes israelíes, Sector de alta tecnología, Educación STEM.

Keywords: Technology Integration; Arab Israeli Women; High-Tech Sector; STEM Education.

Mots clés: Intégration technologique; les femmes arabes israéliennes; Secteur de haute technologie; Éducation STEM.

INTRODUCCIÓN

Nowadays, the incorporation of technology into educational frameworks plays a pivotal role in driving societal development and enhancing personal empowerment. The use of technology in education has the capacity to transform traditional educational models, contribute to societal progress, and advance digital literacy, along with its cultural impact (Marín-Díaz et al., 2023). It further aids in improving personal autonomy and the ability to make informed decisions, while also challenging conventional gender roles and shaping perceptions of future technological landscapes. Moreover, this integration highlights the responsibility of educational institutions to prepare individuals, with a particular focus on Arab women, by providing them with the essential skills and knowledge necessary for success in technology-oriented sectors.

The Research question

This study seeks to explore the impact of technology integration within educational contexts on the empowerment of Arab women in Israeli society, specifically examining its influence on their educational and career decisions. Two specific hypotheses are formulated: Hypothesis 1 suggests that greater integration of technology in education correlates with more Arab women pursuing STEM fields and careers in high-tech. Hypothesis 2 contends that enhanced technological literacy through education positively influences the societal and economic empowerment of Arab women, leading to increased roles and leadership positions in high-tech.
METHODOLOGY

This quantitative research employed a structured questionnaire to assess digital literacy's impact among adolescents, reflecting methods supported by Covello and Lei (2010) and Shopova (2014) for considering adolescents' cognitive and emotional stages. The use of digital platforms was informed by the technology's influence on adolescents (Hargittai, 2005; Wardhani et al., 2019; Vazquez-Cano et al., 2020), aiming to improve engagement with digital natives. The questionnaire emphasized inclusivity and cultural relevance (Gutiérrez-Ángel et al., 2022), ensuring it suited a diverse adolescent audience. Ethical considerations, particularly for minors, followed Nelson et al. (2011) guidelines, focusing on informed consent and confidentiality. This approach provided a comprehensive framework to study technology's role in educational empowerment for Arab women in Israeli society.

Participants

This study is derived from a larger research project examining the impact of digital literacy on the academic and professional ambitions of young Arab Israelis within the context of the digital revolution in the 21st century. The original study involved 253 participants, with a gender distribution of 130 males (51.4%) and 123 females (48.6%), ranging in age from 17 to 25 years. Educational levels varied, encompassing high school students, university students, and working professionals, with a diverse array of specializations and institutional affiliations. For the purposes of the current analysis, we focused exclusively on the female participants (n=123), extracting data relevant to their demographic details and responses to selected sections of the comprehensive questionnaire.

This study used a quantitative approach with a convenience sample, selecting five Arab students from Northern Israel for interviews. Chosen for their diversity and to illustrate digital literacy's effects on educational and career goals, this method capitalized on the author's experience and connections to explore digital technology's impact on Arab youth. A total of 123 individuals participated, providing a diverse range of ages, educational backgrounds, specializations, and institutional affiliations. The participants' ages ranged from 17 to 25 years, with the majority falling within the 17-18 age group, representing 55.3% (n=68) of the sample. Those aged 19-20 years constituted 13.8% (n=17), followed by 9.8% (n=12) in the 21-22 age range, and 21.1% (n=26) were between 23-25 years.

Regarding their educational status, 27.6% (n=34) of the participants were 11th-grade students, and 26.0% (n=32) were 12th-grade students. Academic students, defined as those enrolled in higher education, made up 31.7% (n=39) of the sample. The remaining 14.6% (n=18) had completed their education and were currently employed.
The study encompassed participants from a range of academic specializations. Computer Science was the most represented field, with 32.5% (n=40) of participants. This was followed by Biomedical Engineering at 20.3% (n=25), Physics and Mathematics at 17.1% (n=21), and Electronics Engineering at 13.8% (n=17). Other areas of study included Medicine (9.8%, n=12) and Law and Advocacy (6.5%, n=8). Civil Engineering and Hebrew University Jerusalem were not represented in the participant pool.

Participants were also categorized based on their institutional affiliation. A majority were from private schools, accounting for 59.3% (n=73) of the sample. This was significantly higher than those from state schools, which comprised only 3.3% (n=4) of participants. Among higher education institutions, Tel Aviv University had the highest representation at 22.8% (n=28), followed by the Technion Applied Institute at 8.1% (n=10) and the University of Haifa at 5.7% (n=7). Private colleges of engineering and technology accounted for 0.8% (n=1) of the sample, indicating a wide but specific distribution of educational institutions among the participants.

**Research Tools**

The methodology for this study involved a structured questionnaire, initially developed for an extensive research project on the impact of digital literacy on the academic and professional aspirations of young Arab Israelis. The questionnaire, administered from June to early October, included sections on demographic information, creativity levels, academic orientations, and digital literacy. This specific research focused on a subset of the 'Academic Orientation' section, selecting 9 of the 16 statements designed to evaluate participants' perspectives on STEM fields and their academic goals within the framework of technological progress. Concentrating on these questions and the demographic details of female participants allowed for a detailed analysis of the variables affecting their engagement in the high-tech industry.

The process of selecting data for this analysis leveraged the author's expertise in academic counseling and familiarity with Arab students in Northern Israel to explore the effect of digital literacy on educational and career goals. The creation of the questionnaire was enhanced by contributions from Dr. Raed Zidan, a senior lecturer at the Arab College of Haifa, and Dr. Anit Lipil from Ruppin Academic Center in Netanya, ensuring its accuracy and relevance. Responses were collected on a 5-point Likert scale, reflecting high reliability as indicated by a Cronbach's alpha of 0.880. Additionally, an 'orientation' score was computed for each participant, reflecting their academic direction and facilitating a detailed assessment of digital literacy's impact.
Process and Ethical Considerations
The survey, conducted from May to October 2023, involved 253 participants through online and in-person methods, overseen by the researcher. Informed consent was obtained via WhatsApp for minors and directly from university students, ensuring comprehensive engagement. The researcher directly addressed any participant questions or concerns, especially among high school students, to ensure accurate and sincere responses.

Data Analysis
Analysis utilized descriptive and inferential statistics to examine digital literacy's effects among young Arabs in Israel. Descriptive statistics summarized participant responses, while inferential statistics, like t-tests and ANOVAs, explored relationships within the data. The 5-level Likert scale responses were categorized into three levels for analysis, simplifying the presentation of findings and enhancing clarity (Mezmir, 2020; Beiderbeck et al., 2021). This methodological approach confirmed the survey's validity and reliability.

RESULTS
In this section, the key findings related to the integration of technology in educational settings and its impact on the empowerment of Arab women within Israeli society are presented, particularly in their participation in the high-tech industry. Observing how participants' attitudes and perceptions toward technology and its role in education correlate with their willingness to pursue STEM fields and high-tech careers sheds light on the potential pathways to empowerment through technological literacy and inclusion. The analysis revealed mean scores between 3.46 and 4.32, with standard deviations reflecting response variability, indicating a range of attitudes towards technology integration in education among participants.

Choice of Science in Future Studies
Among the participants, 17 (13.9%) disagreed, 25 (20.3%) were neutral, and 81 (65.8%) agreed or strongly agreed with the statement "I think I will choose a science topic in the future." The mean score for this item was 3.89 (SD = 1.15), indicating a general inclination towards selecting science subjects in future academic pursuits, which suggests that greater integration of technology in education may lead to increased interest in STEM fields among Arab women.

Perception of Technology in Societal Progress
Concerning the belief that "In my opinion, the possibility of progress within my society lies through the inclusion of technology in our educational life in schools, academic institutions,
and public life”, 16 respondents (13%) disagreed, 27 (22%) were neutral, and 80 (65%) agreed or strongly agreed. The mean score was 3.88 (SD = 1.11), reflecting a strong consensus on the importance of technology in educational settings. This indicates that the importance of technology in education is recognized as a means to empower Arab women in high-tech fields.

**Technology in High-Tech Education**

In response to "The fast technological change in the 21st century in the educational system is the way to create graduates in the industry of high-tech", 30 (24.4%) disagreed, and 93 (75.6%) agreed. The mean response was 3.79 (SD = 1.17), highlighting the perceived importance of adapting to technological changes in education, emphasizing the significance of adapting to technological changes in high-tech education for Arab women's empowerment.

**Integrating Technology for Arab Workforce in High-Tech**

Regarding the statement "Integration with the rapid technological change in the twenty-first century in the educational system is the only way to create graduates specialized in increasing the number of male and female workers from the Arab community in the field and industry of high-tech,", 5 (4.1%) disagreed, 31 (25.2%) were neutral, and 85 (69.1%) agreed. The mean score of 3.98 (SD = 0.87) underscores the perceived necessity of technological integration in education for this purpose. This finding emphasizes the importance of technology in addressing diversity in high-tech industries.

**Technology and Academic Achievement**

In response to "In my opinion, integrating computers in the process of learning promotes high achievements in their academic studies", 7 (5.7%) disagreed, 34 (27.6%) were neutral, and 82 (66.7%) agreed. The mean score was 3.97 (SD = 0.98), suggesting a strong belief in the positive impact of computer integration on academic performance, suggesting that technology’s role in education may contribute to the academic empowerment of Arab women, potentially preparing them for high-tech careers.

**Openness to Technology**

Regarding the statement "I Believe I would be more open to the technological world in the future", only 4 respondents (3.3%) disagreed, while 28 (22.8%) were neutral, and a significant 91 (74%) agreed or strongly agreed. This resulted in a mean score of 4.15 (SD = 0.88), suggesting a high likelihood of embracing future technological advancements among participants, which implies that enhanced technological literacy through education may
foster an openness to embrace new technology, potentially empowering Arab women in high-tech.

**Digital Literacy and Western Culture**

In response to "I think that the digital literacy and the use of technology in and out of schools is the reason to being open to the western culture" 12 (9.8%) disagreed, 20 (16.3%) were neutral, and 91 (74%) agreed. The mean of 4.07 (SD = 0.99) points to a significant correlation between digital literacy and cultural openness, suggesting that technological literacy through education may foster cultural openness, potentially impacting Arab women's roles in high-tech and society.

**Digital Tools for Future Academic Needs**

As for the statement "Technological tools in high schools allow full access to updated digital materials which provide information to my future needs in my academic learning", 19 respondents (15.4%) disagreed, while 104 (84.6%) agreed. The mean score of 4.32 (SD = 0.73) indicates widespread recognition of the value of technological tools in education, emphasizing the significance of technology in education.

**Influence of Digital Learning on High-Tech Career Consideration**

Regarding the statement "The uses of computers and digital learning make me think about studying the field of high-tech and high-tech in the academic future", 28 (22.8%) disagreed, 27 (22%) were neutral, and 68 (55.3%) agreed. The mean response was 3.46 (SD = 1.40), showing that over half of the participants are influenced by digital learning to pursue studies in the high-tech field, indicating that digital learning can positively influence Arab women's interest in high-tech careers and empowerment.

**DISCUSSION**

This study aimed to explore the impact of technology integration within educational frameworks on empowering Arab women in Israeli society, particularly their participation in the high-tech industry. Guided by two hypotheses, the investigation first proposed that greater integration of technology in education correlates with an increased interest among Arab Israeli women in STEM fields and high-tech careers. The findings revealed a strong preference among participants for scientific subjects, suggesting that enhanced technology integration could significantly elevate interest in STEM disciplines. This trend supports the advancement of Arab women into high-tech careers, aligning with observations by Tal (2020) of higher enrolment rates in optical science courses among Arab high school students than their Jewish counterparts.
Arab Israeli women's pronounced presence in STEM, particularly in engineering and computer science, underscores their growing representation. In 2016, 37.5% of Arab Israeli women high school graduates chose the STEM track, compared to 24.5% of Jewish women. In higher education, 40.7% of Arab Israeli women pursued STEM subjects in 2015, against 29.2% of Jewish women, with a notable 18.9% of Arab women selecting biology, compared to 9.8% of Jewish women, showcasing their strong representation in these fields (Fuchs & Friedman Wilson, 2018).

The second hypothesis examined the crucial role of rapid technological advancements in preparing graduates for the high-tech industry. Innovative educational strategies are essential for equipping students with the necessary digital skills and competencies for the dynamic job market, as emphasized by the Innovation Authority (2018) and supported by research from Andriamahery and Qamruzzaman (2022), Mackey and Petrucka (2021), and Neumeyer et al. (2020). These strategies extend beyond technical knowledge to fostering critical thinking, problem-solving, and creativity, skills deemed vital for the high-tech sector. The significance of technology integration in education for increasing Arab representation in the high-tech sector is also highlighted, aligning with the study's hypothesis. The OECD (2018) argues that digital technologies can significantly reduce the gender gap in education and skills development, promoting gender equality in the high-tech sector (Khil et al., 2022).

Educational and training initiatives supported by the Council for Higher Education have been instrumental in narrowing the digital gender gap and enhancing minority representation in the high-tech industry, as corroborated by Kwon et al. (2020), Petrucci (2020), and Sicat (2020).

Additionally, the positive influence of computer integration on academic performance is recognized, with evidence suggesting that computer use, particularly for occupational motivations, can enhance academic outcomes (Simões et al., 2022; Valverde-Berrocoso et al., 2022).

CONCLUSION

The integration of technology in education plays a crucial role in fostering Arab women's interest in STEM fields and their subsequent involvement in the high-tech industry. This finding is supported by various studies (Chan, 2022; He et al., 2020; Rogers et al., 2021), underscoring the empowerment potential of educational technological advancements for Arab women in Israeli society and their progression into high-tech careers. The study
advocates for ongoing efforts to integrate technology in educational settings, highlighting its significance in promoting diversity and inclusion within the high-tech sector.

However, this research encounters limitations, including a scarcity of studies on Arab women in the Israeli high-tech sector, hindering a thorough background establishment and limiting broader contextualization. The study's focus on northern Israel may also narrow the findings' applicability due to regional educational and socio-economic differences. The demographic scope, while covering various academic stages, could be broadened to include more diverse ages, socio-economic backgrounds, and education levels for a fuller understanding. Additionally, the quantitative approach may overlook personal experiences and perceptions that qualitative methods could capture.

Future research directions include expanding the geographical scope across Israel for a fuller perspective on Arab women's experiences in the high-tech industry and incorporating qualitative methods like interviews or focus groups for deeper insights. Longitudinal and comparative studies could provide long-term insights and cross-cultural comparisons, enhancing understanding of Arab women's unique and universal experiences in high-tech.

Focusing on specific STEM fields could identify unique challenges and opportunities, aiding in tailored educational and policy interventions. Investigating the impact of government policies and institutional support on Arab women's integration into high-tech could offer practical insights for policymakers and educators, contributing to a more nuanced understanding of technology's role in education for empowering Arab women in the Israeli high-tech industry.

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