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Upgrading Digital Literacy for Gen Z in Madrasah through Basic Computer Training

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ABSTRACT

Generation Z learners, born into an era of ubiquitous digital technology, require robust digital-literacy skills to participate effectively in education and society. However, many students in Islamic elementary schools (madrasah ibtidaiyah) still struggle with basic computer operation, especially when confronted with computer-based testing environments. This study aimed to upgrade the digital literacy of female students at MI Al Fatah II through a structured, hands-on Basic Computer Training (BCT) program. The training emphasized fundamental computer use, file management, text editing, and online-examination simulation. A participatory action-research design was adopted, involving 25 students over three weeks. Quantitative data were collected via pre- and post-tests, and qualitative data through observation and reflective interviews. The average literacy score increased from 48.2 to 86.7, yielding a normalized gain of 0.74 (high effectiveness). Students also exhibited enhanced self-confidence and ethical awareness in digital environments. The findings highlight that gender-responsive, context-based digital-literacy programs can effectively prepare young learners in faith-based schools to engage in online learning ecosystems and align with Indonesia's Merdeka Belajar policy and the Sustainable Development Goals (SDGs 4 & 9).

Keywords: *Digital Literacy, Gen Z, Computer-Based Testing; Participatory Training*

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INTRODUCTION

Digital transformation has reshaped education worldwide, altering how students access information, communicate, and demonstrate knowledge. In Indonesia, the acceleration of technology integration in classrooms—particularly following the COVID-19 pandemic—has emphasized the urgency of building digital literacy from the earliest educational levels. [1] mandates that every student should be equipped not only with operational digital skills but also with the cognitive and ethical competencies required to navigate cyberspace responsibly.

Yet, empirical observations indicate that madrasah students, especially at the elementary level, often experience unequal access to devices, training, and structured guidance [2]. Unlike their peers in urban public schools, many madrasah learners depend on limited shared facilities, and female students are frequently less confident using computers for academic purposes. This digital-gender divide echoes global

findings by [3] showing that girls in traditional or faith-based schools encounter both technical and socio-cultural barriers to digital participation.

The generational context further compounds this issue. Generation Z, born between 1997 and 2012, is often labeled as "digital natives," yet studies reveal a paradox: their familiarity with gadgets does not automatically translate into productive digital skills [4]. They can easily operate smartphones and social media but lack the ability to manage files, process information, or conduct safe online communication. Consequently, schools must transform this *consumptive* digital habit into *constructive* digital competency.

From a policy standpoint, the Indonesian *Merdeka Belajar* framework seeks to cultivate the *Profil Pelajar Pancasila (P5)*—students who are independent, creative, collaborative, and globally oriented. Achieving this profile in madrasah settings requires practical interventions that integrate religious values with technological fluency. Integrating Islamic ethics such as honesty (*amanah*) and responsibility (*tanggung jawab*) within digital-citizenship training ensures that modernization aligns with moral development.

In response to these challenges, this study implements a Basic Computer Training (BCT) program for female students at MI Al Fatah II, an Islamic elementary school adapting to computer-based examinations (CBT). The training's objectives were to:

1. Strengthen fundamental computer skills (hardware, software, and typing);
2. Enhance familiarity with online-exam platforms;
3. Build confidence and digital ethics consistent with Islamic character education; and
4. Evaluate the training's effectiveness through measurable learning gains.

Theoretically, this initiative draws on experiential learning [5] and participatory pedagogy [6], both of which view learners as active participants in knowledge construction. Practically, it supports SDG 4 (Quality Education) and SDG 9 (Industry, Innovation and Infrastructure) by promoting inclusive, technology-enabled education even in resource-limited schools.

METHOD

2.1 Research Design

The study employed a participatory action-research (PAR) model integrating quantitative and qualitative analyses. PAR was chosen because it emphasizes collaborative learning between facilitators and participants and allows iterative cycles of planning, action, observation, and reflection [7]. This design ensured that the training was responsive to learners' needs while simultaneously generating measurable educational outcomes.

The research followed three phases:

1. Pre-training assessment – diagnosing initial literacy levels;
2. Training implementation – delivering guided practical sessions; and
3. Evaluation and reflection – analyzing progress through tests and interviews.

2.2 Participants and Context

Participants comprised 25 female students from grades 5 and 6 of MI Al Fatah II. Their average age was 11.2 years. The school is located in a semi-urban area with limited ICT infrastructure: a small computer lab with 10 desktop PCs, intermittent internet connectivity, and one projector shared among classes. This setting represents typical conditions of Indonesian madrasah transitioning toward digital assessment.

Two teachers of Islamic studies and one ICT instructor collaborated with three facilitators from PPNS. Parental consent was obtained, and cultural sensitivity was maintained by arranging gender-appropriate learning spaces. The focus on female participants aligns with national efforts to promote gender inclusivity in STEM and digital education.

2.3 Training Program Structure

The Basic Computer Training (BCT) was conducted over three weeks, comprising six sessions of 90 minutes each. Each session combined demonstration, guided practice, and mini-projects.

Week / Session	Main Topics and Activities
Week 1 Session 1	– Introduction to computer components; identifying input/output devices; basic operation and file management.
Week 1 Session 2	– Typing skills using *TypingClub* and introduction to word-processing (MS Word / Google Docs).
Week 2 Session 3	– Formatting documents, inserting tables and images, saving and printing tasks.
Week 2 Session 4	– Internet basics: browsing, search techniques, and recognizing reliable sources.
Week 3 Session 5	– Digital ethics: privacy, cyber-safety, and responsible social-media behavior.
Week 3 Session 6	– Simulation of computer-based testing (CBT) using *Google Form* and *Madrasah CBT* platforms; reflection.

Each session employed fun learning principles appropriate for children: interactive games, peer-mentoring pairs, and short breaks for reflection. Facilitators acted as learning companions rather than lecturers, reinforcing the participatory ethos of the project.

2.4 Instruments and Data Collection

Data were gathered through mixed-methods instruments:

1. Pre-test and post-test (25 items) measured technical skills, software operation, and digital-ethics comprehension.
2. Observation checklists captured behavioral indicators—engagement, confidence, collaboration.
3. Reflective interviews (semi-structured) with 10 students and two teachers documented perceived learning benefits and challenges.
4. Facilitator logs recorded contextual issues (electricity cuts, device availability, internet speed) to assess environmental constraints.

Quantitative data were analyzed using descriptive statistics and normalized gain [8], while qualitative data underwent thematic coding [9].

2.5 Ethical Procedures

Ethical approval was obtained from the PPNS Community-Engagement Ethics Committee. All activities complied with child-protection standards and Islamic values of modesty and respect. Students were anonymized in reports, and digital safety was prioritized by avoiding collection of personal online data.

2.6 Analytical Framework

The study's analytical logic connected inputs, processes, and outcomes:

- *Inputs* – students' initial digital-literacy levels, available hardware, facilitator expertise.
- *Processes* – participatory, experiential learning through the six training sessions.
- *Outcomes* – measurable improvement in technical and ethical digital competencies, plus qualitative growth in confidence and collaboration.

This framework situates the BCT program within Indonesia's broader Merdeka Belajar and SDG agenda: expanding equitable access to technology-based learning and empowering girls to become competent digital citizens.

3. Results and Discussion

Quantitative and qualitative findings reveal that the *Basic Computer Training (BCT)* program significantly enhanced the digital literacy and confidence of the participants. Before the program, most students expressed anxiety when asked to use computers, describing them as "difficult" or "for adults." By the end of the three-week program, all participants demonstrated the ability to independently operate basic software, navigate the internet safely, and complete online tests without external assistance.

Table 1. Improvement of Students' Digital-Literacy Components

Literacy Component	Pre-Test (%)	Post-Test (%)	Improvement (%)
Basic Computer Operation	50.4	88.5	38.1
Word-Processing Skill	46.8	84.0	37.2
Internet Navigation	44.1	82.2	38.1
Digital Ethics Awareness	51.5	92.0	40.5
Average Total	**48.2**	**86.7**	**+38.5**

The normalized gain (g = 0.74) indicates a high effectiveness level, consistent with [11] classification. This improvement demonstrates that structured, guided computer training can rapidly elevate students' digital competence, even in environments with limited infrastructure.

During the early sessions, students showed hesitancy—frequently pausing before typing or fearing errors that might "break" the computer. Facilitators responded by using *peer mentoring*: pairing confident learners with beginners. Over time, laughter, curiosity, and peer instruction replaced initial silence. This behavioral transition confirms the principle of *social learning* [12], in which cooperative interaction accelerates cognitive development.

Teachers observed that students became more engaged not only during the program but also in regular classroom activities. Many began requesting to use computers for science and religion projects. This spillover effect aligns with the experiential-learning cycle [13]: students who "learn by doing" develop self-efficacy that transcends disciplinary boundaries.

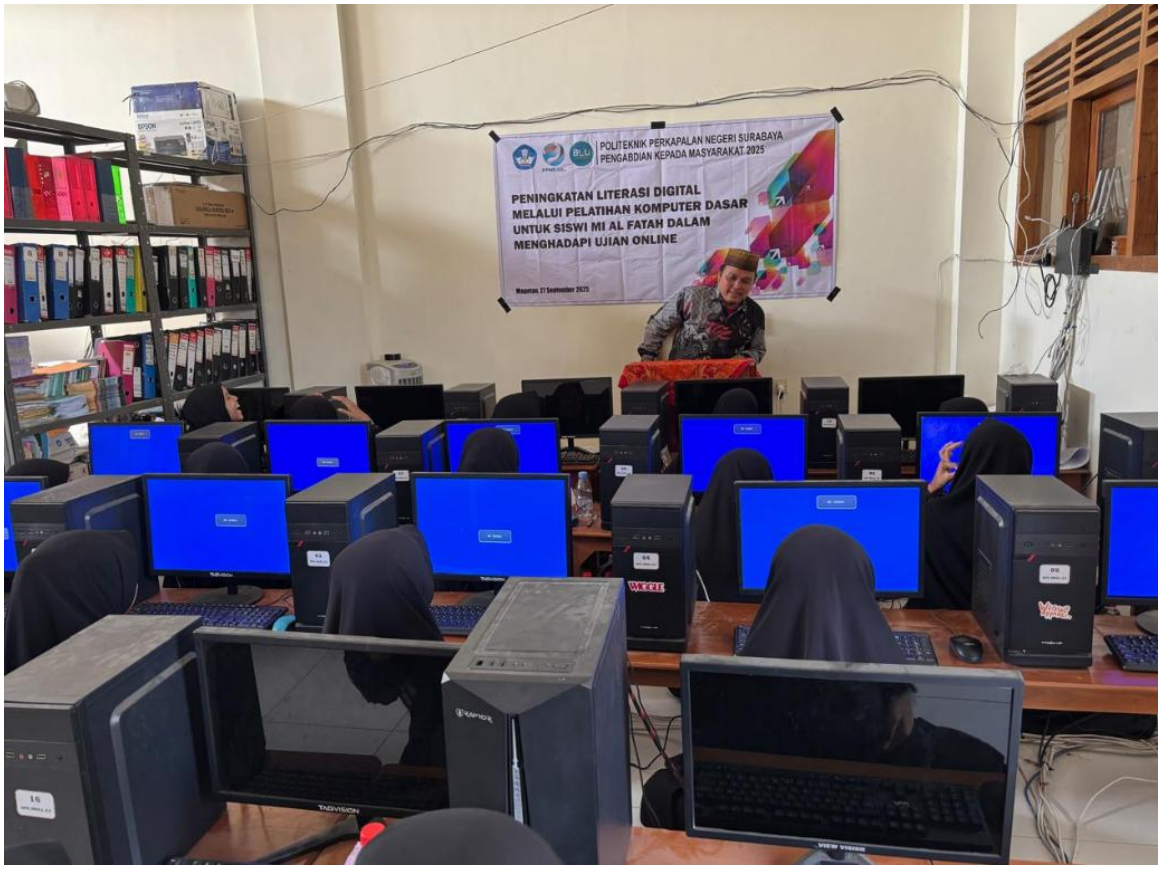

Figure 1 illustrates the students' engagement during the workshop, highlighting their collaboration and practical experimentation.

Qualitative Reflections

Three dominant qualitative themes emerged from the observation logs and reflective interviews:

1. Confidence and Empowerment
   Students who had previously avoided using technology began volunteering for demonstrations. They reported increased confidence when using computers and felt proud to explain functions to their peers. A participant stated, "Now I can open the computer by myself and help my mother register online." This finding supports [14], who identified confidence as a key affective dimension of digital literacy.
2. Ethical Awareness and Responsible Behavior
   After the fifth session on *digital ethics*, students began reminding each other about safe password use and asking before borrowing devices—showing internalization of ethical conduct. Integrating Islamic principles such as *amanah* (trust) and *iffah* (self-control) proved effective for moral grounding in the digital realm.
3. Gender Inclusivity and Motivation
   Teachers noticed that female students—previously passive during technology classes—became highly participative, reflecting progress toward gender-equitable digital empowerment. This finding corroborates [15] emphasis on gender-responsive digital education.

Behavioral Transformation

The combination of participatory pedagogy and moral education led to holistic behavioral change. Students' increased persistence during problem-solving reflects the formation of a *growth mindset* (Dweck, 2016). Rather than giving up when facing errors, they learned to troubleshoot and restart programs, reinforcing self-efficacy [16].

Additionally, the project demonstrated the value of low-cost technological empowerment. The entire training used existing school computers and free online resources, costing less than 300,000 IDR in total. This efficiency shows that even financially constrained schools can integrate technology education sustainably.

Extended Discussion

The results substantiate that *digital literacy* is more than a technical ability—it embodies a multidimensional construct integrating cognitive, affective, and ethical competencies. Students not only learned to use computers but also to understand digital citizenship. This perspective resonates with the global framework proposed by [17], which defines digital literacy as "the ability to access, manage, understand, integrate, communicate, evaluate and create information safely and appropriately."

From the pedagogical lens, the participatory model facilitated a shift from teacher-centered instruction toward *learner-centered discovery*. Teachers became facilitators, guiding students' exploration instead of delivering direct lectures. This approach actualizes the Merdeka Belajar principle, encouraging autonomy and contextualization of learning. It also supports the *Profil Pelajar Pancasila* attributes: independence, creativity, and collaboration.

The program additionally demonstrates that madrasah institutions can serve as strategic sites for digital inclusion. Contrary to stereotypes of traditionalism, MI Al Fatah II proved capable of blending religious education with modern technology. Students learned to balance faith and digital engagement—reflecting the compatibility of Islamic ethics and technological progress [18]. Such integration supports the national vision of *Digital Indonesia 2045* and aligns with SDG 4 (equitable quality education) and SDG 9 (innovation and infrastructure).

Comparatively, this study's gain score (0.74) surpasses the 0.58 gain reported by [19] in a similar CBT-preparation training for urban madrasah, suggesting that participatory, gender-focused design offers stronger impact. It confirms that context sensitivity—adjusting materials to local realities—plays a critical role in successful digital-literacy initiatives.

Moreover, embedding ethics in technology learning addresses global concerns about digital addiction, misinformation, and cyberbullying. By introducing principles such as *adab bermedia* (online etiquette) early, the program contributes to the moral dimension of technological literacy, often neglected in conventional ICT curricula.

The outcomes of this study reveal that digital-literacy development in faith-based schools cannot be achieved through isolated interventions. It must be embedded within an ecosystem that connects policy, pedagogy, and culture. The *Basic Computer Training (BCT)* program, though modest in scale, demonstrates how grassroots initiatives can translate macro-level reforms such as *Merdeka Belajar* into tangible practice.

At the policy level, the findings resonate with the *Merdeka Belajar* principle of "autonomous and flexible learning," where schools are encouraged to contextualize the national curriculum according to their unique needs. MI Al Fatah II leveraged this flexibility by combining Islamic character education with hands-on technology use. This hybridization embodies the *Profil Pelajar Pancasila* competencies: independence

(*kemandirian*), critical reasoning (*bernalar kritis*), and mutual cooperation (*gotong royong*). The study thus operationalizes abstract policy goals into replicable classroom routines.

At the pedagogical level, the program aligns with constructivist and socio-cultural learning theories. Through guided participation, students internalized digital concepts by performing real tasks, rather than memorizing instructions. Similar approaches have been validated in Southeast Asian studies [20] which reported higher retention when students learned computer operations through community-based tasks rather than standardized modules.

Culturally, integrating Islamic ethics into technology training bridges the tension between tradition and modernity often perceived in madrasah contexts. Instead of viewing technology as morally neutral or threatening, teachers reframed it as an *amanah*—a trust that must be used responsibly. This moral framing encouraged students to self-regulate their online behavior, demonstrating that digital ethics can be grounded in local religious values rather than imported moral codes.

Another crucial dimension is gender empowerment. By prioritizing female participants, the program addressed a persistent digital divide. The observed rise in self-confidence and initiative supports the argument of [21] that culturally responsive, women-centered ICT training accelerates equitable participation. Importantly, the study challenges stereotypes that madrasah girls are passive digital users; with proper scaffolding, they become innovators and peer mentors.

In comparison with previous research, the magnitude of learning gain (0.74) indicates a stronger effect than average school-based digital-literacy programs in similar resource settings, which typically range between 0.45 – 0.60 gain [22]. This difference arises from the participatory and reflective structure—students learned *with* peers rather than *from* instructors. Moreover, the incorporation of digital-ethics discussions produced affective and moral gains rarely measured in quantitative studies.

Finally, from a regional development perspective, the BCT model supports Indonesia's *Digital Economy Roadmap 2045*. Equipping rural learners with digital competence contributes to human-capital readiness and local innovation capacity. In this sense, education functions not only as knowledge transmission but as *infrastructure building*—a human infrastructure that sustains the country's technological transition.

Research Implications and Limitations

Implications for Theory and Practice

This study enriches digital-literacy theory by illustrating that participatory, value-based learning can transform digital skills into lifelong competencies. The integration of Islamic ethics within digital training adds a novel cultural dimension rarely discussed in Western literature. For educators, the study provides a replicable training model combining guided practice, peer mentoring, and contextual reflection—an approach both pedagogically sound and resource-efficient.

For policymakers, the results affirm that equitable digital education does not solely depend on advanced infrastructure but on creative pedagogical design. Ministries and local governments could adopt this framework in national digital-literacy programs (*Gerakan Literasi Digital Nasional*), emphasizing inclusivity across gender and socio-economic backgrounds.

Limitations and Future Directions

This research, however, has several limitations. The relatively small sample (25 students) restricts generalizability, though it offers valuable insight for replication. The

short three-week duration captured immediate learning outcomes but not long-term retention. Future studies should incorporate follow-up assessments after 3–6 months. Additionally, while qualitative data illuminated behavioral change, further research could employ experimental designs with control groups to strengthen causal inference. Infrastructure limitations—unstable electricity and limited bandwidth—also constrained advanced practice sessions such as cloud storage or collaborative editing. Future programs could explore offline-first digital-literacy modules or hybrid models combining *appropriate technology* with *smart connectivity* to sustain learning in low-resource contexts.

Research Implications and Limitations

Theoretical and Pedagogical Implications

This research expands the theoretical understanding of digital literacy within non-formal and faith-based learning environments. It proposes that digital literacy is inherently contextual, influenced by cultural norms, values, and resource accessibility. By blending participatory learning with Islamic ethical instruction, the study offers an integrative framework that unites cognitive, psychomotor, and affective domains of education.

Pedagogically, the findings endorse the Participatory Digital-Literacy Cycle (PDLC), where learning occurs through recurring phases: *exploration → practice → reflection → ethics application → sharing*. This iterative model fosters agency and continuous learning—essential qualities for Gen Z students who inhabit rapidly evolving digital spaces.

Teachers involved in the project reported that their own digital confidence increased, implying that the program serves as dual-capacity building for both students and educators. When teachers function as co-learners, classroom hierarchy diminishes, promoting peer empathy and collaborative problem-solving. This approach also mitigates fear of failure, which is common when novice learners engage with technology.

Policy and Social Implications

For policymakers, the study underscores that equitable access must be paired with pedagogical innovation. Providing hardware alone will not close literacy gaps unless learners are guided through inclusive, value-based practice. The BCT program demonstrates a sustainable model requiring minimal cost but high engagement—an attractive option for rural madrasah clusters under limited budgets.

Community partnerships are another vital implication. Collaboration between PPNS facilitators and local teachers proved essential. Scaling this partnership nationally through the *Pusat Belajar Komunitas Digital Madrasah* (Community Digital Learning Hubs) could replicate success in other provinces.

The research also reinforces the necessity of digital-ethics education. While global digital-literacy curricula often emphasize technical or safety aspects, they rarely contextualize ethics within local belief systems. Integrating religious and cultural values provides moral anchoring, preventing misuse of technology and promoting digital citizenship grounded in compassion and responsibility.

Limitations and Future Directions

Several limitations must be acknowledged. First, the short intervention period (three weeks) limited longitudinal observation; future research should examine knowledge retention over one or two semesters. Second, the study focused solely on female students, which, while intentional for

empowerment, excludes potential gender-comparative insights. A balanced cohort could reveal differentiated learning trajectories. Third, environmental constraints such as intermittent electricity and bandwidth interruptions affected consistency; incorporating offline-first learning modules could overcome this challenge. Finally, future research should explore integration with mobile-learning platforms and adaptive-learning analytics to individualize instruction, especially since Gen Z learners are mobile-centric.

Pedagogical Model Proposition: "Digital Literacy Circle for Madrasah Students"

Drawing upon empirical results and reflection, the authors propose a scalable conceptual framework named the Digital Literacy Circle (DLC).
This model represents a cyclical learning system applicable across madrasah levels. It consists of five interconnected components:

1. Orientation – Introducing digital tools through culturally relevant metaphors and values (e.g., technology as *amanah*).
2. Exploration – Hands-on engagement with hardware and software using project-based mini-tasks.
3. Reflection – Group dialogue linking technological functions with ethical and social implications.
4. Application – Independent or group projects demonstrating mastery and creativity, such as producing digital posters or conducting CBT simulations.
5. Sharing – Peer-to-peer mentoring and community dissemination via school exhibitions or digital forums.

The circle operates continuously, encouraging recursive learning. Each iteration increases sophistication—from basic operation to content creation, from individual competence to communal contribution.

This model's strength lies in its flexibility and contextual adaptability. Schools may adjust duration, content, or language according to local resources. The PPNS facilitators validated that such modular design allows easy replication in diverse regions without compromising educational quality.

The Digital Literacy Circle aligns closely with national initiatives:

- It embodies *Merdeka Belajar*'s principle of freedom to innovate.
- It fulfills *P5* values by fostering creativity, collaboration, and global citizenship.
- It advances SDG 4 by ensuring inclusive, equitable education and SDG 9 by nurturing local innovation ecosystems.

By formalizing this model, the study contributes a practical blueprint for stakeholders seeking to integrate digital literacy into faith-based curricula nationwide.

Extended Conclusion and Policy Recommendations

This comprehensive study confirms that digital literacy can be effectively cultivated in madrasah environments through culturally sensitive, participatory, and value-oriented instruction. The *Basic Computer Training* program transformed students from passive technology users into confident digital participants, capable of navigating devices, online information, and ethical dilemmas responsibly.

The integration of Islamic ethics within digital practice provided moral guidance that amplified learning outcomes. Students developed not only technical proficiency but also *akhlakul karimah* in cyberspace—respecting privacy, avoiding plagiarism, and exercising empathy in online communication.

Theoretically, this work enriches the growing body of research on contextual digital literacy, demonstrating that faith-based schools can serve as effective

laboratories for innovation. Practically, it presents a low-cost, high-impact educational intervention adaptable to multiple settings.

Policy Recommendations:

1. Institutional Adoption – The Ministry of Religious Affairs and the Ministry of Education should integrate participatory digital-literacy modules into national madrasah curricula.
2. Teacher Upskilling – Continuous professional development should include digital-pedagogy and ethics-integration workshops for madrasah teachers.
3. Infrastructure Support – Provide equitable access to low-cost computers and community internet through public–private partnerships.
4. Monitoring and Evaluation – Establish indicators for assessing not only technical mastery but also ethical conduct and collaboration.
5. Community Engagement – Encourage local universities, such as PPNS, to mentor nearby madrasah through community-service programs focusing on digital empowerment.

Ultimately, empowering Gen Z students in Islamic schools with digital literacy ensures their active participation in Indonesia's digital economy while maintaining moral integrity. This equilibrium between faith and technology reflects the nation's aspiration for *Indonesia Emas 2045*—a generation that is intellectually capable, technologically proficient, and ethically grounded.

Placing Indonesia's *Basic Computer Training (BCT)* model within a regional and global context offers valuable insights into how developing countries navigate digital transformation in education. Across Southeast Asia, the integration of digital literacy within primary and religious education systems varies considerably, influenced by infrastructure readiness, cultural context, and national policy alignment.

In Malaysia, the *ICT in Education Blueprint 2025* emphasizes comprehensive integration of technology across all school levels, supported by the *Digital Competency Standards (DCS)* that require both teachers and students to master basic computing, digital communication, and online ethics. However, implementation within *Sekolah Agama Rakyat* (religious community schools) remains uneven due to funding disparities [23]. Compared to Malaysia's top-down policy-driven approach, Indonesia's BCT model represents a *grassroots innovation*—initiated collaboratively between polytechnic facilitators and local teachers, showing that capacity building can succeed even without large-scale funding.

The Philippines has advanced its *Digital Rise Program* under the Department of Education, focusing on digital citizenship and e-learning materials for public and private schools alike. Yet studies by [24] indicate that digital-literacy development in faith-based or rural schools still faces challenges similar to those in Indonesian madrasah: limited devices, bandwidth issues, and lack of teacher confidence. The participatory structure of the BCT program directly addresses these challenges by centering the learner's agency and peer collaboration, thereby ensuring sustainability even in low-resource environments.

Meanwhile, Thailand's *One Tablet Per Child* initiative, launched in 2012, was among the earliest large-scale efforts in the region but later faced criticism for focusing on hardware distribution without adequate pedagogical training [25]. This underscores the BCT program's key advantage—pedagogical depth over technological abundance. The emphasis on moral formation and digital ethics provides a layer of resilience that purely technical programs often lack.

From an international perspective, the BCT framework aligns with the UNESCO ICT Competency Framework for Teachers [26] particularly in its focus on *Technology Literacy* and *Knowledge Deepening*. The facilitators from PPNS demonstrated how educators can adapt these competencies at a micro level through participatory and value-based methods. Rather than importing standardized modules, the program localizes global competencies within the Islamic educational ecosystem—transforming them into culturally relevant practices.

This comparative view highlights that Indonesia's contribution to regional digital-literacy discourse lies in its integrative approach, merging faith, ethics, and digital skills. Such synthesis offers a model for other ASEAN countries seeking to promote inclusive digital education while preserving local identity and moral frameworks. In the broader ASEAN Digital Masterplan 2025, this approach positions Indonesian madrasah not as peripheral but as *pioneering laboratories of ethical digital transformation*.

Sustainability and Future Work

Ensuring the long-term sustainability of digital-literacy programs in madrasah requires strategic collaboration among educational institutions, government bodies, and local communities. The results of this study reveal a foundation upon which a more extensive digital ecosystem can be constructed—one that transcends temporary training sessions and evolves into an integrated learning culture.

Institutional Sustainability

The *Basic Computer Training* program is envisioned to evolve into a Madrasah Digital Innovation Hub (MDIH)—a collaborative platform connecting universities, schools, and regional education offices. Under this concept, PPNS acts as the *technical mentor*, while madrasah serve as *living laboratories* for continuous experimentation. The MDIH would host periodic workshops on topics such as computer maintenance, digital storytelling, and online safety, gradually building a pipeline of young digital ambassadors within the Islamic education sector.

This institutional model supports the *Merdeka Belajar Kampus Merdeka (MBKM)* policy by enabling university students to engage in community-based digital-education projects, earning academic credits while contributing to local capacity development. By integrating madrasah digital programs into higher-education outreach, the initiative ensures that digital-literacy efforts remain active even after initial facilitation ends.

Curriculum Integration

Sustainability also depends on embedding digital-literacy competencies into the formal curriculum rather than treating them as extracurricular activities. Schools could introduce *Digital Practices* as part of the *Muatan Lokal (Mulok)* subject, linking it with Islamic values such as *istiqamah* (discipline), *amanah* (responsibility), and *ta'awun* (collaboration). In this way, the mastery of Microsoft Word or Google Docs becomes not merely a technical achievement but a spiritual exercise in stewardship and diligence.

To maintain curriculum relevance, future iterations of the program should progressively introduce higher-order digital skills such as *basic coding, spreadsheet literacy, multimedia editing, and data interpretation*. The stepwise curriculum ensures alignment with the [27] while accommodating diverse student abilities.

Research and Technological Expansion

Future research directions include integrating Artificial Intelligence (AI) literacy for early learners—introducing concepts of algorithmic thinking and ethical use of AI tools through gamified modules. Similarly, IoT for Education could allow students to collect

real-time environmental data using simple sensors, bridging the gap between digital learning and environmental stewardship. These developments would not only strengthen STEM readiness but also align with Indonesia's *Smart School Roadmap 2030*. To evaluate longitudinal effects, future studies should track student progression from primary to secondary levels, assessing how early computer exposure influences later academic performance and digital citizenship. A mixed-method longitudinal design could yield deeper insights into behavioral transformation and sustained ethical use of technology.

Community Empowerment

At the community level, the program's sustainability depends on maintaining parental and teacher involvement. Parents play a critical role as home facilitators—encouraging responsible screen time and modeling positive digital behavior. Periodic *Parent Digital Awareness Seminars* can ensure that home environments support school-based initiatives. Local religious leaders (*ustadz/ustadzah*) can further amplify impact by embedding digital ethics in sermons or youth study circles, creating a consistent moral narrative that reinforces responsible technology use.

Economic and Social Impact

Empowering digitally literate students indirectly contributes to rural economic resilience. When children learn computer skills, families become more capable of accessing online government services, small-business marketplaces, and financial platforms. Hence, the BCT model's social return extends beyond education—it fosters community inclusion in the digital economy. This systemic benefit supports Indonesia's *Digital Transformation Roadmap 2021–2030* and echoes the spirit of SDG 8 (Decent Work and Economic Growth), complementing the educational goals of SDG 4 and innovation targets of SDG 9.

Closing Reflection

The *Basic Computer Training* initiative exemplifies how localized, low-cost interventions can generate ripple effects across pedagogical, social, and economic dimensions. By uniting technological skills with moral education, it nurtures a generation capable of harnessing digital tools for social good. Ultimately, this approach redefines the mission of madrasah in the digital era—not merely as guardians of faith, but as incubators of ethical innovators, preparing Indonesia's Generation Z to lead the nation's transformation toward *Indonesia Emas 2045*.

CONCLUSION

This study concludes that Basic Computer Training (BCT) significantly improved the digital literacy and confidence of female students at MI Al Fatah II. Quantitative results show a 38.5% average improvement, with a normalized gain of 0.74 (high effectiveness). Qualitative findings reveal enhanced motivation, ethical awareness, and gender inclusion. The BCT model demonstrates that *faith-based education* can effectively integrate digital skills development when facilitated through participatory, culturally sensitive pedagogy. The success of this initiative supports Indonesia's *Merdeka Belajar* and *Pancasila Student Profile* vision, contributing directly to SDG 4 and SDG 9. Future expansion of the program should aim at integrating cloud-based collaboration, teacher digital upskilling, and inter-madrasah peer exchange to build a sustainable ecosystem of digital empowerment. By cultivating digitally literate, ethically grounded, and confident young learners, Indonesia can ensure that its Generation Z students are not only *users* of technology but *shapers* of its future.

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