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# Children's Education in the Metaverse Era: Between the Rapid Growth of Information Technology and Self-learning of Generation Z

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**Abstract**

The phenomenon of distance learning patterns during the pandemic has become an extraordinary leap and has significantly impacted the massive use of the internet in society. The digital era is an era where many human life activities are carried out online by minimizing social interaction, such as school with online learning, working in the office to working from home, organizational meetings via online meeting platforms such as Zoom and Google Meet, health consultations answered directly by doctors, as well as other activities that were rarely carried out before Covid-19. This research aims to determine children's learning patterns and behavior in the metaverse era. Meanwhile, the research method used is quantitative, with several approaches such as correlation between variables and the close relationship between one variable and another. The three groups of respondents in the study were early adults (>20 years), early adolescents (15-20) years and children (10-15 years). The research results show that at the age of children, smartphone use and online activities are only limited to playing games and social media. Meanwhile, in their early teens, some are even starting to learn game-making through online platforms such as Roblox Studio. In early adulthood, which is the age of college education, smartphone use is not just about social media or online shopping; some even have digital wallets and crypto wallets, invest in cryptocurrency, and even actively use the creator's platform games and NFTs with payments via cryptocurrencies such as Ethereum, polygon, etc.

**Keywords:** Metaverse, Distance learning, Cryptocurrency, Metaverse era, Online activities

**Abstract**

Fenomena pola pembelajaran jarak jauh di masa pandemi menjadi sebuah lompatan yang luar biasa dan berdampak secara signifikan terhadap masifnya penggunaan internet di masyarakat. Era digital merupakan era dimana aktivitas kehidupan manusia banyak dilakukan secara online dengan meminimalisir interaksi sosial, seperti sekolah dengan pembelajaran online, bekerja di kantor menjadi bekerja dari rumah, rapat organisasi melalui platform meeting online seperti Zoom dan Google Meet, konsultasi kesehatan yang dijawab langsung oleh dokter, serta aktivitas lainnya yang jarang dilakukan sebelum Covid-19. Penelitian ini bertujuan untuk mengetahui pola dan perilaku belajar anak di era metaverse. Sementara itu, metode penelitian yang digunakan adalah kuantitatif, dengan beberapa pendekatan seperti korelasi antar variabel dan keeratan hubungan antara satu variabel dengan variabel lainnya. Tiga kelompok

responden dalam penelitian ini adalah dewasa awal (>20 tahun), remaja awal (15-20) tahun dan anak-anak (10-15 tahun). Hasil penelitian menunjukkan bahwa pada usia anak-anak, penggunaan smartphone dan aktivitas online hanya sebatas bermain game dan media sosial. Sementara itu, pada usia remaja awal, beberapa bahkan mulai belajar membuat game melalui platform online seperti Roblox Studio. Pada usia dewasa awal, yang merupakan usia pendidikan perguruan tinggi, penggunaan smartphone tidak hanya sebatas media sosial atau belanja online, bahkan ada yang sudah memiliki dompet digital dan dompet kripto, berinvestasi di mata uang kripto, bahkan aktif menggunakan platform kreator.

**Kata Kunci:** Metaverse, Pembelajaran jarak jauh, Mata uang kripto, Era Metaverse, Aktivitas online

## INTRODUCTION

The digital era began when internet use became a common habit in society. The most significant leap in internet use is mobile phones, which can match the function of computers for simple office needs.[1] Not only those in school or office environments but even mobile vegetable sellers are now using smartphone devices to receive orders and purchase goods.[2] After the digital era with non-cash payments, we are in a multiverse era where payments are not just about digital money in dollars or certain countries' currencies but digital cash for communities with almost no rules. Metaverse is a kind of imaginary world with an immersive digital space, offering a more interactive environment for the world of educational environments. Metaverse is an extension of synchronous communication that includes an adequate number of users who share different experiences.[3]

In 2022, on September 15, Ethereum cannot officially be mined, and this will automatically have a direct impact on all digital ecosystems that use Ethereum as official payment, such as open sea, decentral, and many more. Children in the digital era have grown up with information technology. Those born in the early 2000s, 2010s, and 2020s have grown up with metaverse-style games such as Roblox, Sandbox, and Minecraft, which are very popular among them. The research examines the social benefits of using two popular metaverse platforms, Roblox and Zepeto. Research focuses on the younger generation, millennials, and Generation Z, stating that their social presence in the metaverse facilitates supportive interactions among users and reduces feelings of loneliness through increased self-efficacy and social interactions on metaverse platforms.[4]

This research aims to determine the learning patterns of children and adolescents in the multiverse era and how the younger generation interacts with the metaverse world in the digital era. Meanwhile, the scope of material used as a list of questions relates to respondents' internet

[1] Erna Budiarti and Sitti Yasmin Adar, "Impact of Digital Media on Social-Emotional Development in Early Childhood: A Case Study at TK Kartika XX-46 Kendari," *Golden Age: Jurnal Ilmiah Tumbuh Kembang Anak Usia Dini* 8, no. 2 (June 30, 2023): 89–98, https://doi.org/10.14421/jga.2023.82-04; Kardi Kardi et al., "Challenges of Online Boarding Schools In The Digital Era," *At-Tadzkir: Islamic Education Journal* 2, no. 1 (March 8, 2023): 37–51.

[2] Muhammad Nawawi Fathullah et al., "Management of Digital Literacy-Based Work Practice Training in The Boarding School Environment," *Munaddhomah: Jurnal Manajemen Pendidikan Islam* 4, no. 1 (January 23, 2023): 1–11, https://doi.org/10.31538/munaddhomah.v4i1.230; Rizqi Anfanni Fahmi, Ris'an Rusli, and Amilda Sani, "Digital Nomad Influence on Malay Work Ethics: Exploring Cultural Dynamics," *Jurnal Ilmiah Peuradeun* 12, no. 2 (May 30, 2024): 741–62, https://doi.org/10.26811/peuradeun.v12i2.974.

[3] Iman A. Akour et al., "A Conceptual Framework for Determining Metaverse Adoption in Higher Institutions of Gulf Area: An Empirical Study Using Hybrid SEM-ANN Approach," *Computers and Education: Artificial Intelligence* 3 (2022): 100052, https://doi.org/10.1016/j.caeai.2022.100052.

[4] Hyun Jung Oh et al., "Social Benefits of Living in the Metaverse: The Relationships among Social Presence, Supportive Interaction, Social Self-Efficacy, and Feelings of Loneliness," *Computers in Human Behavior* 139 (February 2023): 107498, https://doi.org/10.1016/j.chb.2022.107498.

habits, accessing digital content, and being directly involved with business in the digital era. The discussion material that is most asked about relates to habits in accessing the metaverse world in games, NFTs, or favorite meta worlds such as Decentraland, Roblox, Minecraft, Sandbox, and other metaverse world platforms. With the popularity of metaverse games, researchers explored respondents' opinions about developing the metaverse world for the growth of more enjoyable, affordable, and responsible education.

Education in the digital era and the metaverse world may still be a topic of discussion that has yet to be widely studied so that this research will focus on the perspective of pupils and students facing the digital world and the metaverse. Policymakers, especially in the education sector, should recognize the rapid development of the metaverse world so that standard guidelines and rules can be formulated and learning and teaching activities can adopt developments in the metaverse world without losing the essence of learning and seeking knowledge.

## Literature Review

Metaverse can expand the physical world using augmented and virtual reality technologies that allow users to interact in actual and simulated environments using avatars or holograms. Virtual environments and immersive games such as Decentraland, Sandbox, Fortnite, Roblox, and VRChat have been described as precursors to the metaverse world and offer some insight into the potential and socio-economic impact of cross-platform metaverses.[5]

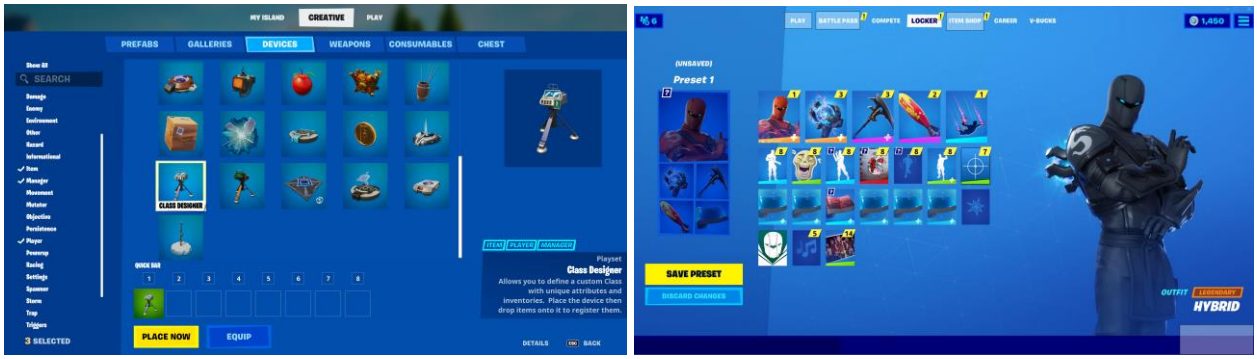


**Figure 1**. Fortnite user interface (T. Johnson, 2020)

The development of metaverse has even entered a new phase in education, namely with metaverse-based social skills training programs for children with autism spectrum disorders to improve social interaction abilities.[6] However, caution is needed as war simulation games such as Fortnite have been found to have a significant emotional impact and influence on heart performance. Interestingly, heart rate responses due to video game activity are equivalent to playing soccer on the field.[7] Figure 1 above is a screenshot of the Fortnite game. Fortnite is a game that was trending on the day of its release until now. Now Fortnite reportedly has a total of 8 million players from all over the world. Even though it was released after the PUBG game,

[5] Yogesh K. Dwivedi et al., "Metaverse beyond the Hype: Multidisciplinary Perspectives on Emerging Challenges, Opportunities, and Agenda for Research, Practice and Policy," *International Journal of Information Management* 66 (October 1, 2022): 102542, https://doi.org/10.1016/j.ijinfomgt.2022.102542.

[6] Joo Hyun Lee et al., "Metaverse-Based Social Skills Training Programme for Children with Autism Spectrum Disorder to Improve Social Interaction Ability: An Open-Label, Single-Centre, Randomised Controlled Pilot Trial," *eClinicalMedicine* 61 (July 2023): 102072, https://doi.org/10.1016/j.eclinm.2023.102072.

[7] Dustin Nash et al., "Video Game Ventricular Tachycardia: The 'Fortnite' Phenomenon," *HeartRhythm Case Reports* 6, no. 6 (June 2020): 313–17, https://doi.org/10.1016/j.hrcr.2020.02.007.

this game was able to exceed the number of players.[8] Now PUBG is reportedly experiencing a decline in the number of players and now only has 400 thousand players. Based on the Fortnitetracker website, Fortnite game users even reached 154,314,569 players from all over the world until April 2024.[9]

Figure 2 below is the interface of one of the Metaverse sandbox platforms collaborating with the game company Atari. Sandbox is a virtual world where players can build, own, and monetize their voxel gaming experiences on the Ethereum blockchain. The team's vision is to offer a genuinely immersive metaverse where virtual worlds and games will be created collaboratively without a central authority. The Sandbox has three main components: a VoxEdit NFT (non-fungible token) creator for creating voxel game ASSET, a Marketplace for buying and selling ASSET, and a Game Maker tool where complete interactive games can be made and shared. It is reported that more than 350 million users of the Fortnite Battle Royale game globally have spent 3.2 billion hours playing. Meanwhile, Roblox players have reached 140 million, which is larger than the populations of Canada, Spain, Australia, and Colombia.

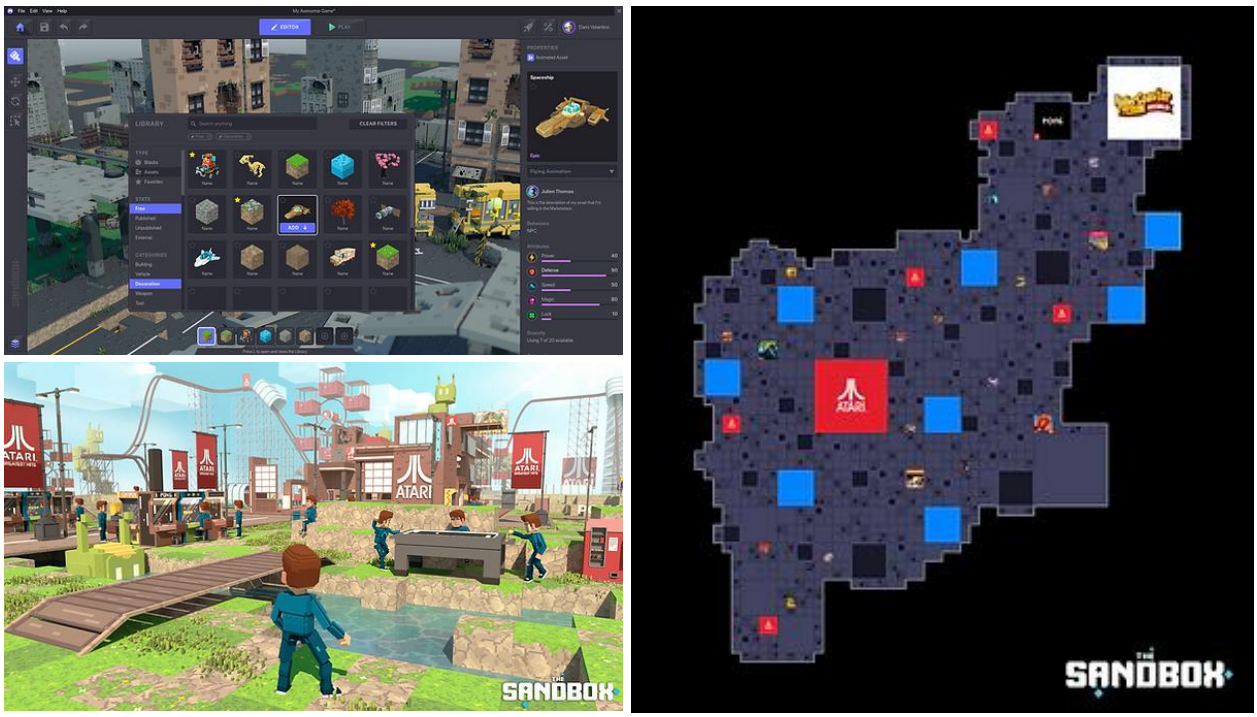


**Figure 2**. Sandbox and Atari collaborate to build a metaverse world (Sawyer, 2020)

Metaverse integrates various digital technologies, which can significantly reduce production costs, improve product quality, and differentiate consumer experience. It has become an essential direction of the manufacturing industry's digital transformation. From a supply chain perspective, the proposed gaming system shows that the metaverse world is an evolutionary step in which manufacturers, retailers, and governments can actively participate in developing

[8] Timothy Thomas, "Fortnite Kini Mencapai 8 Juta Pemain di Seluruh Dunia," *Dafunda.com* (blog), November 9, 2018, https://dafunda.com/game/fortnite-kini-mencapai-8-juta-pemain-di-seluruh-dunia/.

[9] Asaf Livne, "Tracker Network Changelog March 2024," Fortnite Tracker, April 2, 2024, http://fortnitetracker.com/article/2285/tracker-network-changelog-march-2024.

the metaverse.[10] However, what about the patterns and models of education in the metaverse era; can they be equated with manufacturing industry activities? In the pre-digital era, parents played a significant role in determining their children's educational patterns, even influencing where their children would continue their schooling.[11] But how about education in the current digital and metaverse era?

Implementing the metaverse concept in higher education has attracted the attention of many educators and researchers. It allows students to engage in deep experiential learning and experience multiple modes of real human interaction. Some studies indicate that although introducing new technologies may bring new learning experiences, it may only sustain students' learning for a short period, even when using digital platforms in the metaverse world. In reality, learners' academic achievements still depend on their learning motivation.[12]

The term YouTube University is quite popular among students, where a student or even someone without an educational background can learn by watching videos on YouTube and then imitating them. Watching YouTube videos can develop students' English learning skills at school.[13] YouTube acts as a patient's source of information about the disease they are suffering from.[14] YouTube has been widely used for blended learning, online education, and research popularization for several years during COVID-19. YouTube in tourism is still used through the Travel Professors YouTube channel, which provides short videos recorded at tourist locations on various tourism-related topics. Of course, both aim to popularize tourism research and can be helpful references for classroom and online learning.[15] In recent years, applying the metaverse in higher education has attracted the attention of many educators and researchers. The results show that most students believe that with the metaverse, they can learn knowledge about subjects that are not specified in any location, thus bringing the idea of learning to a more practical application.[16] The development of the metaverse world is also supported by advances in 5G networks and other communication technologies coupled with the implementation of strict health regulations due to the COVID-19 pandemic, which has attracted attention and development of the metaverse (Yu, 2024).[17]

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[10] Xiaole Wan et al., "How to Drive the Participation Willingness of Supply Chain Members in Metaverse Technology Adoption?," *Applied Soft Computing* 145 (September 2023): 110611, https://doi.org/10.1016/j.asoc.2023.110611.

[11] Mauhibur Rokhman et al., "Consideration of Parents in Choosing Islamic Schools in the Digital Era," *Nazhruna: Jurnal Pendidikan Islam* 6, no. 3 (December 1, 2023): 403–19, https://doi.org/10.31538/nzh.v6i3.4026; Andy Fefta et al., "Public Policy Management in Determining the Feasibility of the Smart City Project in Malang, Indonesia," *International Journal of Sustainable Development and Planning* 18, no. 3 (March 31, 2023): 677–82, https://doi.org/10.18280/ijsdp.180303.

[12] Gwo-Jen Hwang, Yun-Fang Tu, and Hui-Chun Chu, "Conceptions of the Metaverse in Higher Education: A Draw-a-Picture Analysis and Surveys to Investigate the Perceptions of Students with Different Motivation Levels," *Computers & Education* 203 (October 2023): 104868, https://doi.org/10.1016/j.compedu.2023.104868.

[13] Hadeel A. Saed et al., "The Use of YouTube in Developing the Speaking Skills of Jordanian EFL University Students," *Heliyon* 7, no. 7 (July 2021): e07543, https://doi.org/10.1016/j.heliyon.2021.e07543.

[14] Erin P. Johnson et al., "Informal Prenatal Genetic Screening Education: What Can You Learn from Google and YouTube?," *Genetics in Medicine Open* 2 (2024): 101821, https://doi.org/10.1016/j.gimo.2024.101821.

[15] Denis Tolkach and Stephen Pratt, "Travel Professors: A YouTube Channel about Tourism Education & Research," *Journal of Hospitality, Leisure, Sport & Tourism Education* 28 (June 2021): 100307, https://doi.org/10.1016/j.jhlste.2021.100307.

[16] Hwang, Tu, and Chu, "Conceptions of the Metaverse in Higher Education"; Mursal Aziz et al., "Tahfidzul Qur'an Curriculum Media Innovation in Islamic Boarding Schools," *Tafkir: Interdisciplinary Journal of Islamic Education* 5, no. 2 (April 2, 2024): 235–49, https://doi.org/10.31538/tijie.v5i2.970; Hafid Hafid et al., "Manajemen Pembelajaran Kelas Digital Berbasis Google Workspace for Education," *Kharisma: Jurnal Administrasi Dan Manajemen Pendidikan* 1, no. 1 (October 26, 2022): 48–58, https://doi.org/10.59373/kharisma.v1i1.5.

[17] Heeseung Yu, "Why Do People Use Metaverse? A Uses and Gratification Theory Perspective," *Telematics and Informatics* 89 (May 2024): 102110, https://doi.org/10.1016/j.tele.2024.102110.

Online learning has become a trend in recent years due to the impact of the pandemic. Educational patterns are finally evolving, mainly focusing on integrating immersive technology into academic curricula to make learning more exciting and easier to understand for students.[18] Therefore, Metaverse is one of the focal points for educators to create 3D virtual classrooms.[19] The metaverse world is built on blockchain technology and artificial intelligence, involves virtual reality, and expands with time. *Metaverse* is a disruptive new technology that is still in the early stages of development. More empirical research is needed on the Metaverse, making it difficult to understand its potential and guide future investigations thoroughly.[20]

If the metaverse is a developing world, what about society's readiness to face the development of the digital world and metaverse? What about the readiness of network infrastructure in urban areas? Can it support the development of learning patterns in the metaverse world? In educational cities like Malang, Indonesia, it is known that basic needs such as food, clothing, and school are still a priority for the community compared to internet needs.[21]

This research discusses the relationship between the behavior of the generation born in the early 2000s and technological developments in the digital era, especially in study and learning patterns at schools, campuses, or outside educational institutions. One of the analyses used is correlation analysis, which aims to determine the relationship between one variable and other variables. A multidimensional perspective on research makes assessing the analyzed phenomena more realistic since it generally considers more data.[22] Without eliminating the complexity of an organism, this method simplifies the multidimensional view, ultimately providing better results and allowing researchers to draw practical conclusions. Multi-factor correlation analysis on spatial and temporal scales can provide diverse insights, especially for making policy decisions.[23] In Industry 4.0, data production from the Internet of Things has reached fantastic big data sizes with the emergence of sophisticated information and communication technology. The enormous density of low-value significant data challenges traditional clustering and correlation analysis. To overcome this problem, extensive data-based correlation analysis can be carried out based on the proposed grouping to increase the efficiency of data processing so that it has better results and meaning.[24]

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[18] Kardi Kardi et al., "Challenges of Online Boarding Schools In The Digital Era," *At-Tadzkir: Islamic Education Journal* 2, no. 1 (March 8, 2023): 37–51, https://doi.org/10.59373/attadzkir.v2i1.11; Muhamad Arif, Kusnul Munfa'ati, and Mei Kalimatusyaroh, "Homeroom Teacher Strategy in Improving Learning Media Literacy during Covid-19 Pandemic," *Madrasah: Jurnal Pendidikan dan Pembelajaran Dasar* 13, no. 2 (May 1, 2021): 126–41, https://doi.org/10.18860/mad.v13i2.11804; Masrur Masrur, "The Challenges of Implementing Online-Based Leadership in The Application of Education Innovations," *Nidhomul Haq : Jurnal Manajemen Pendidikan Islam* 8, no. 2 (August 31, 2023): 227–41, https://doi.org/10.31538/ndh.v8i2.3916.

[19] Dimitris Mourtzis, John Angelopoulos, and Nikos Panopoulos, "Metaverse and Blockchain in Education for Collaborative Product-Service System (PSS) Design towards University 5.0," *Procedia CIRP* 119 (2023): 456–61, https://doi.org/10.1016/j.procir.2023.01.008.

[20] Ava Hajian et al., "From Theory to Practice: Empirical Perspectives on the Metaverse's Potential," *Technological Forecasting and Social Change* 201 (April 2024): 123224, https://doi.org/10.1016/j.techfore.2024.123224.

[21] Fefta et al., "Public Policy Management in Determining the Feasibility of the Smart City Project in Malang, Indonesia."

[22] Sonia Wróbel et al., "Data Integration through Canonical Correlation Analysis and Its Application to OMICs Research," *Journal of Biomedical Informatics* 151 (March 2024): 104575, https://doi.org/10.1016/j.jbi.2023.104575.

[23] Yue Xiang et al., "A Multi-Factor Spatio-Temporal Correlation Analysis Method for PV Development Potential Estimation," *Renewable Energy* 223 (March 2024): 119962, https://doi.org/10.1016/j.renene.2024.119962.

[24] Shuaiyin Ma et al., "Big Data-Driven Correlation Analysis Based on Clustering for Energy-Intensive Manufacturing Industries," *Applied Energy* 349 (November 2023): 121608, https://doi.org/10.1016/j.apenergy.2023.121608; Kyungjae Lee and Hyunwoo Lim, "Correlation Analysis of Building Parameters According to ASHRAE Standard 90.1," *Journal of Building Engineering* 82 (April 2024): 108130, https://doi.org/10.1016/j.jobe.2023.108130.

Meanwhile, GAP analysis determines the gap between one variable and another variable so that improvements can be made to variables whose values are shallow. GAP Analysis can be used in many studies, especially to see the gap between variables that are considered essential and other variables that you want to develop. A close relationship between several research objects and increasing the capacity of objects with the beginner category in the world of education can be a middle way by looking at the weaknesses obtained through data analysis. Large amounts of data can be analyzed quickly because manual data grouping will be assisted by using analysis via computer tools.[25]

**Analysis Methods**

The research method is quantitative research. Meanwhile, respondents in the study were divided into three age groups, namely: (1) adults born before 2000, (2) teenagers and early adults or college-age born after 2000, and (3) children and early teens born after 2010. For each age group, there were 90-110 respondents, with a total of 305 respondents. The research was conducted in 3 big cities in Indonesia: Jakarta, Surabaya, and Malang. The list of questions is divided into three large groups of questions, namely (1) general knowledge about the internet in the digital era, (2) involvement in the digital world, while the third group of questions is related to (3) metaverse and crypto ecosystem. The research used a Google form to collect opinions from all respondents on questions related to the metaverse in the digital era.

The first group of questions pertains to general knowledge about the internet in the digital era, including personal data, age, occupation, and other personal data-related questions, followed by inquiries regarding the age of initial internet access, purposes for accessing the internet, daily hours spent online, availability of adequate internet connection at home, device used for internet access (personal computer/laptop, smartphone/tablet), monthly budget for internet access, possession of digital wallets, and types of digital wallets owned. On the other hand, the second group of questions pertains to digital engagement, including social media usage, content creation such as blogging and video creation uploaded on platforms like Instagram, TikTok, WhatsApp, etc., being a content creator on YouTube, online shopping from platforms like Shopee, Lazada, Tokopedia, etc., operating a digital store, selling ready-to-eat meals online, online shopping budget, purchasing tickets for travel purposes, using online transportation services like Grab, Gojek, etc. The third group of questions pertains to the metaverse and crypto ecosystem, including familiarity with the metaverse, involvement in the metaverse, possession of metaverse accounts, frequency and duration of exploring the metaverse, types of metaverse worlds explored (game-based like Roblox and Minecraft, exploration-based like Decentraland and Sandbox), possession of digital wallets for crypto assets, number of crypto wallets owned, awareness of local Indonesian crypto wallets, involvement in crypto asset purchase, purposes of crypto asset purchase, participation in crypto asset trading as a trader or investor, and creation of content for the metaverse such as NFTs, games, and similar activities.

[25] Cigdem Kentmen-Cin, Yasemin Akbaba, and Burcu Saracoglu, "Turkey's Gender Gap in Higher Education: An Analysis of IR Doctoral Students," *Women's Studies International Forum* 102 (January 2024): 102863, https://doi.org/10.1016/j.wsif.2024.102863; Sharon Kibwana et al., "Education, Practice, and Competency Gaps of Anesthetists in Ethiopia: Task Analysis," *Journal of PeriAnesthesia Nursing* 33, no. 4 (August 2018): 426–35, https://doi.org/10.1016/j.jopan.2017.02.001; Anne B. Lane and Kim A. Johnston, "Bridging the Writing Gap between Student and Professional: Analyzing Writing Education in Public Relations and Journalism," *Public Relations Review* 43, no. 2 (June 2017): 314–25, https://doi.org/10.1016/j.pubrev.2017.02.008; Elizabeth A. Taylor and Robin Hardin, "A Gap in the Sport Management Curriculum: An Analysis of Sexual Harassment and Sexual Assault Education in the United States," *Journal of Hospitality, Leisure, Sport & Tourism Education* 20 (June 2017): 65–75, https://doi.org/10.1016/j.jhlste.2017.04.004.

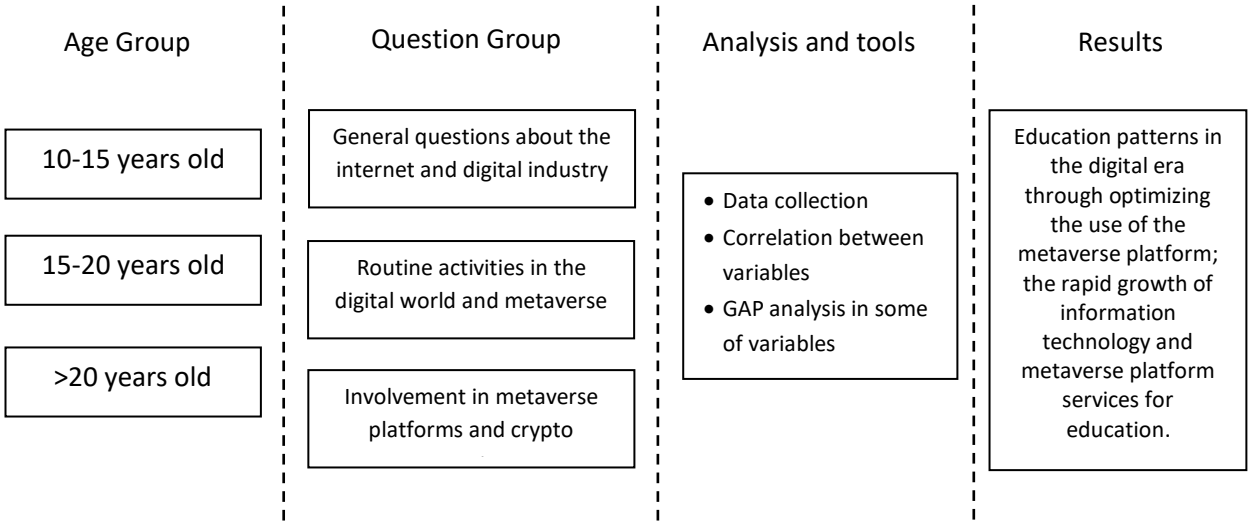


**Figure 3**. Research Flow and Process

Figure 3 above shows the research flow and process. The research divided age into three groups: children, adolescents, and early adulthood. Starting with general questions about the digital world, continuing with routine activities in the digital world and on specific metaverse platforms, and actively participating in metaverse platforms and the crypto ecosystem. The data collection results are then studied using several analytical tools such as correlation analysis, factor analysis, importance, and performance analysis.

The expected results from the research include knowing the patterns of tendencies of children and adolescents in learning through optimizing the use of available metaverse platforms. Of course, in the development of the metaverse platform itself, it is hoped that it will not only be a seasonal industry but is expected to be of significant benefit, especially in the learning process in the digital era like now. Data was collected digitally using a Google form and distributed using social media: Facebook, WhatsApp, and Instagram. More than 450 data were obtained, but only 305 could be used because 95 data could not be used due to defects or double data entry. The data distribution was chosen evenly, namely 102 data for the children's age group, 101 for the adolescent age group, and 102 for the adult age group. Analysis using correlation and GAP analysis data is expected to provide a different perspective in looking at the behavior of children and adolescents in the independent learning activities they carry out. Correlation and gap analysis still uses data previously collected through questionnaires on 305 respondents, with data grouped into several categories.

## Result and Discussions

The research involved more than 305 respondents with three groups of questions. The first group of questions is the respondent's general knowledge about the internet and the digital world that is currently developing, the second group of questions is about the respondent's interaction and intensity with the digital world, and the third group of questions is about the metaverse world and the crypto ecosystem.

Table 1 below presents the respondents' data collection results by filling out a Google Form questionnaire via digital platforms such as email, WhatsApp, Facebook, and Instagram direct messages. The information successfully recorded indicates interesting phenomena in general internet usage. For instance, the age at which individuals first accessed the internet varies

significantly, with some starting as early as three years old. In contrast, ages 10-15 are commonly considered appropriate for internet access. As the survey was conducted among school-age children and university students, internet usage is quite diverse, such as for gaming (26.23%), video streaming (21.31%), listening to music (21.97%), accessing social media (20.33%), and participating in video conferences like Zoom or Google Meet (10.16%).

Another notable observation from Table 1 is the widespread availability of internet networks at home, with 77.05% having access, typically with speeds ranging from 10 to 50 Mbps, as speeds of 100 Mbps or higher are less commonly used for household purposes. Another exciting aspect is the ownership of digital wallets, with 68.85% of respondents having digital wallets, as opposed to relying on their parents, which is more common among children. Table 2 is a recapitulation of respondents' data regarding the intensity of internet use, and the results show a massive phenomenon in internet use in everyday life. The use of social media is not limited to viewing activities on social media, but 70.49% use it actively and even optimize its use for learning activities, shopping, and business activities such as selling, team coordination, and so on. 87.97% of school-age internet users are also actively creating digital content, with 73.11% in video content such as YouTube, TikTok, and Instagram. Blogging has started to decline, with only 13.11% of respondents still actively maintaining a blog. In contrast, respondents have turned to YouTube channels, albeit only 10.16% actively create video content for YouTube regularly.

**Table 1**. General Knowledge about The Internet

| No | Questions | Answer | | | | |
|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** |
| 1 | At what age did you start accessing the internet? | 3 yo | 4 yo | 7 yo | 10 yo | 15 yo |
| | | 8.85% | 11.48% | 18.03% | 24.59% | 37.05% |
| 2 | What are your reasons for accessing the internet? | Game | video | music | Soc med | Vid conf |
| | | 26.23% | 21.31% | 21.97% | 20.33% | 10.16% |
| 3 | How many hours do you spend on the internet? | 2 hrs | 4 hrs | 6 hrs | 8 hrs | > 8 hrs |
| | | 6.56% | 11.48% | 44.26% | 24.92% | 12.79% |
| 4 | Is there an internet network available at your home? | no | Yes | | | |
| | | 22.95% | 77.05% | | | |
| 5 | What is the speed and capacity of the internet at your home? | 10 mbps | 30 mbps | 50 mbps | 100 mbps | > 100 |
| | | 28.52% | 24.59% | 27.87% | 14.75% | 4.26% |
| 6 | Do you access the internet using a computer? | no | Yes | | | |
| | | 34.43% | 65.57% | | | |
| 7 | Do you access the internet using a mobile phone or tablet? | no | Yes | | | |
| | | 4.92% | 95.08% | | | |
| 8 | Do you have a digital wallet account? | no | Yes | | | |
| | | 31.15% | 68.85% | | | |

The phenomenon of online shopping has become a common habit, with a percentage as high as 88.52% of respondents primarily making purchases through Shopee (40.98%), followed by Tokopedia (30.16%) and Lazada (21.31%), respectively. Surprisingly, purchasing items, food, or tickets through online platforms has also become a habit among Generation Z, comprising school and college students. The percentage of respondents who frequently buy food online is 86.56%, and those who often use online transportation services are around 52.46%. The monthly budget for online shopping is approximately USD 25 for 55.41% of respondents, with 3.93% spending over USD 1000 per month. Considering Indonesia's per capita income of around USD 300 (+ IDR 4,500,000) (Ratnasari et al., 2023), spending over USD 1000 monthly online shopping is different for most Indonesians. There is a need for wiser financial management, especially among low- to middle-income individuals, to avoid falling into non-productive shopping activities and non-primary needs expenditures.[26]

The phenomenon of online shopping with expenditures equal to or exceeding income requires greater attention from the government as policymakers and the ability to develop appropriate regulations to protect the population from debt-related crises. This phenomenon is even starting to spread to areas outside the developing category. However, they need help developing and forcing themselves to follow global trends in the digital era, such as online shopping.[27] The lack of an internet infrastructure network should also receive attention from the government, and on the other hand, optimizing the internet for daily life should not only be for social media purposes and watching YouTube or TikTok videos but more for learning activities for students, or efforts to increase community capacity. in terms of business and local economic development.[28]

The rapid growth of cryptocurrencies such as Bitcoin has quickly attracted billions of dollars in investments. Eventually, several countries have begun introducing crypto trading regulations.[29] Ideally, government-initiated regulations should aim to protect the public from irresponsible crypto purchases, but so far, the Indonesian government has categorized crypto as a taxable digital asset. [30]

**Table 2**. Engagement and Intensity of Using Digital Platforms

| No | Questions | Answer | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Optimization of social media usage? | no | Yes | | | |
| | | 29.51% | 70.49% | | | |

[26] António Afonso and M. Carmen Blanco-Arana, "Does Financial Inclusion Enhance per Capita Income in the Least Developed Countries?," *International Economics* 177 (March 2024): 100479, https://doi.org/10.1016/j.inteco.2024.100479.

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[30] Marwa Alnasaa et al., "Crypto-Assets, Corruption, and Capital Controls: Cross-Country Correlations," *Economics Letters* 215 (June 2022): 110492, https://doi.org/10.1016/j.econlet.2022.110492; Paresh Kumar Narayan et al., "Bitcoin Price Growth and Indonesia's Monetary System," *Emerging Markets Review* 38 (March 2019): 364–76, https://doi.org/10.1016/j.ememar.2018.11.005; Elissar Toufaily, "An Integrative Model of Trust toward Crypto-Tokens Applications: A Customer Perspective Approach," *Digital Business* 2, no. 2 (2022): 100041, https://doi.org/10.1016/j.digbus.2022.100041.

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | Actively creating digital content? | no | Yes | | | |
| | | 18.03% | 81.97% | | | |
| 3 | In what form do you create digital content? | text | music | video | | |
| | | 18.69% | 8.20% | 73.11% | | |
| 4 | Do you have an active blog account? | no | Yes | | | |
| | | 86.69% | 13.11% | | | |
| 5 | Do you have a YouTube channel? | no | Yes | | | |
| | | 23.93% | 76.07% | | | |
| 6 | Do you create YouTube content regularly? | no | Yes | | | |
| | | 89.84% | 10.16% | | | |
| 7 | Do you frequently shop online? | no | Yes | | | |
| | | 11.48% | 88.52% | | | |
| 8 | Online stores frequently visited? | Bulalapak | Blibli | Lazada | Tokopedia | Shopee |
| | | 2.62% | 4.92% | 21.31% | 30.16% | 40.98% |
| 9 | Do you have an active online store? | no | Yes | | | |
| | | 82.95% | 17.05% | | | |
| 10 | Do you purchase tickets online? | no | Yes | | | |
| | | 22.30% | 77.70% | | | |
| 11 | Do you purchase food online? | no | Yes | | | |
| | | 13.44% | 86.56% | | | |
| 12 | Do you often use online transportation services? | no | Yes | | | |
| | | 47.54% | 52.46% | | | |
| 13 | Monthly budget for online shopping? | ± USD 25 | ± USD 50 | ± USD 100 | ± USD 500 | > USD 500 |
| | | 55.41% | 23.28% | 10.82% | 6.56% | 3.93% |

Table 3 presents the results of the data collection of respondents regarding the metaverse and crypto ecosystem. Respondents' understanding of the crypto world still needs to be improved, with 34.43% not familiar with the metaverse. This could be due to misunderstandings or differing perceptions, leading to respondents unfamiliar with the metaverse but playing games on platforms like Roblox and Minecraft, accounting for 78.69% of respondents. 55.41% explore the metaverse in game form, but there are also 15.74% who are interested in and purchase digital content such as NFTs. Additionally, 70.16% of respondents admit to buying digital content like skins, weapons, and others, with 78.36% claiming to explore the metaverse even though they do not engage in transactions.

As for respondents' opinions about the crypto ecosystem and cryptocurrency, 34.75% have a crypto wallet account, and 29.18% of respondents even have three crypto wallet accounts on different platforms, such as Indodax, Tokocypto, and Akunku. 49.18% purchased crypto assets, but only 29.51% of respondents traded crypto assets either for investment or short-term trading.

Interestingly, 52.79% of respondents purchased crypto assets with a budget of around USD 25 per month, and there were also 2.62% of respondents who purchased crypto assets with a budget of USD 500 per month. Only 5.25% of respondents created crypto-based digital content, such as creating NFTs in images and videos on the OpenSea platform or for browsing platforms in the metaverse sandbox world.

**Table 3**. Metaverse and Crypto Ecosystem

| No | Questions | Answer | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Do you know the metaverse world? | no | Yes | | | |
| | | 34.43% | 65.57% | | | |
| 2 | Do you have an account in the metaverse world? | no | Yes | | | |
| | | 47.54% | 52.46% | | | |
| 3 | Are you active in the metaverse world? | no | Yes | | | |
| | | 46.56% | 53.44% | | | |
| 4 | How often do you explore the metaverse world? | never | once | seldom | often | very often |
| | | 45.57% | 29.84% | 14.10% | 8.85% | 1.64% |
| 5 | What type of meta-world do you explore? | game | explore | NFT | | |
| | | 55.41% | 28.85% | 15.74% | | |
| 6 | Do you play games like Roblox and Minecraft? | no | Yes | | | |
| | | 21.31% | 78.69% | | | |
| 7 | Do you purchase digital content? | no | Yes | | | |
| | | 29.84% | 70.16% | | | |
| 8 | Do you visit exploration worlds in the metaverse? | no | Yes | | | |
| | | 21.64% | 78.36% | | | |
| 9 | Do you have a crypto wallet account? | no | Yes | | | |
| | | 65.25% | 34.75% | | | |
| 10 | Have you ever bought crypto currency? | no | Yes | | | |
| | | 22.30% | 77.70% | | | |
| 11 | How many crypto wallets do you own? | ± 1 | ± 3 | ± 5 | ± 8 | > 10 |
| | | 34.43% | 29.18% | 23.93% | 7.54% | 4.92% |
| 12 | Do you engage in crypto currency trading? | no | Yes | | | |
| | | 70.49% | 29.51% | | | |
| 13 | What is your monthly budget for crypto shopping? | ± USD 25 | ± USD 50 | ± USD 100 | ± USD 500 | > USD 500 |
| | | 52.79% | 27.87% | 16.72% | 2.62% | 0.00% |
| 14 | Do you create crypto-based digital content? | no | Yes | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 94.75% | 5.25% | | | |

The following analysis in this research uses correlation analysis, which is an analysis to determine the relationship between several questions and the answers given by respondents. There are six key questions (see table 4) which are then analyzed using correlation data analysis, namely: how many hours do you spend on the internet, what is the internet speed and capacity at home, the budget for online shopping per month, how often do you explore the metaverse world, how many crypto wallets do you have, and the budget for crypto shopping per month.

**Table 4**. Six Lists of Key Questions

| No | Questions | Answer | | | | |
|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** |
| 1 | How many hours are spent on internet consumption? | 6.56% | 11.48% | 44.26% | 24.92% | 12.79% |
| 2 | What is the speed and capacity of the internet at home? | 28.52% | 24.59% | 27.87% | 14.75% | 4.26% |
| 3 | What is the monthly budget for online shopping? | 55.41% | 23.28% | 10.82% | 6.56% | 3.93% |
| 4 | How often do you explore the metaverse world? | 45.57% | 29.84% | 14.10% | 8.85% | 1.64% |
| 5 | How many crypto wallets do you own? | 34.43% | 29.18% | 23.93% | 7.54% | 4.92% |
| 6 | What is your monthly budget for crypto shopping? | 52.79% | 27.87% | 16.72% | 2.62% | 0.00% |

**Table 5.** Correlation between key questions

| | Row 1 | Row 2 | Row 3 | Row 4 | Row 5 | Row 6 |
|---|---|---|---|---|---|---|
| Row 1 | 1 | | | | | |
| Row 2 | 0.19859 | 1 | | | | |
| Row 3 | -0.52833 | 0.64722 | 1 | | | |
| Row 4 | -0.46090 | 0.76966 | 0.96233 | 1 | | |
| Row 5 | -0.16226 | 0.91443 | 0.82314 | 0.91793 | 1 | |
| Row 6 | -0.40558 | 0.77935 | 0.97436 | 0.98516 | 0.92948 | 1 |

In some literature, the level of a solid relationship in correlation analysis is 0.80 – 1.00, but in other literature, the figure is 0.90 – 1.00, and in this study, the assessment for robust correlation is the interval 0.90 – 1.00 (Annoye et al., 2024; Ma et al., 2023; S. Xiang et al., 2023; Y. Xiang et al., 2024). With this interval, it can be seen in Table 5 that several questions have a solid relationship with other questions, such as the budget for online shopping and crypto shopping, internet capacity, and several crypto wallet ownerships, as well as the intention to explore the crypto-based metaverse world and monthly crypto shopping budget.

This phenomenon should be viewed as either a progress in the advancement of the times or merely a form of uncertainty because the volume of online shopping and crypto asset purchases shows a linear trend, even though only about 77.7% have ever bought crypto assets or currency. The point is that education is infrequently found in formal education curricula, yet its development is massive among young people. There is a significant need for regulations to bridge the gap between education, curricula, and a student's time consumption in exploring the metaverse, especially for those requiring expenses to actively engage in it, such as online games

with skill upgrades and user capacity facilities. Tables 6, 7, 8, and the following figure represent the gap analysis results based on the opinions of 305 respondents.

Table 6. Key questions in group #1

| No | Questions | Score | Information |
|---|---|---|---|
| 1 | At what age do you access the internet? | 61.64% | Above 10 years old |
| 2 | Duration of daily internet access? | 81.97% | More than 6 hours per day |
| 3 | Is there an internet network at home? | 77.05% | Private Internet network available |
| 4 | Internet speed | 46.89% | More than 30 Mbps |
| 5 | Use of smartphones for Internet access | 95.08% | Very significant |
| 6 | Ownership of digital wallets | 68.85% | More than 50% of respondents |

Table 7. Key questions in group #2

| No | Questions | Score | Information |
|---|---|---|---|
| 1 | Actively creating digital content | 81.97% | Video content creation |
| 2 | Do you have a YouTube channel? | 76.07% | Owns a channel |
| 3 | Regular content creator on YouTube | 10.16% | But does not create content |
| 4 | Do you frequently shop online? | 70.16% | Active in online shopping |
| 5 | Do you often buy food online? | 86.56% | Active in buying food online |
| 6 | What is your monthly budget for online shopping? | 55.41% | USD 25 per month |

Table 8. Key questions in group #3

| No | Questions | Score | Information |
|---|---|---|---|
| 1 | Do you have an account in the metaverse world? | 52.46% | Metaverse account |
| 2 | Do you purchase digital objects? | 70.16% | NFT and other digital objects |
| 3 | Do you visit exploration worlds in the metaverse? | 78.36% | Exploring the metaverse |
| 4 | Have you ever bought cryptocurrency? | 49.18% | Buying crypto assets |
| 5 | Do you engage in cryptocurrency trading? | 29.51% | Non-investment purchases |
| 6 | What is your monthly budget for crypto shopping? | 52.79% | USD 25 per month |

There is a significant gap in several variables in Tables 6, 7, and 8 regarding critical questions in each group. For example, in group 1, there are questions about the age of internet access dominated by children aged ten and above, with a percentage of 61.64%. The use of smartphones for internet access has a rate of 95.08%, indicating that children aged 10 are already very accustomed to using and accessing the internet through smartphones. An interesting finding is that although respondents have a habit of creating video content (81.97%) and have a YouTube channel (76.07%), they are not video content creators for YouTube, with only 10.16% being accustomed to creating video content for YouTube.

As for the questions related to the metaverse and crypto ecosystem, although respondents are pretty active in activities within the metaverse and crypto ecosystem, only 29.51% invest and engage in crypto asset trading. On the other hand, respondents are pretty active in purchasing digital objects, with up to 70.16% spending USD 25 per month on digital crypto assets, 52.79%.

Figure 4 below depicts the significance diagram of each variable in the question group within the study.

| Group 1 | Group 2 | Group 3 |
|---|---|---|
| 61.64% | 81.97% | 52.46% |
| 81.97% | 76.07% | 70.16% |
| 77.05% | 10.16% | 78.36% |
| 46.89% | 70.16% | 49.18% |
| 95.08% | 86.56% | 29.51% |
| 68.85% | 55.41% | 52.79% |

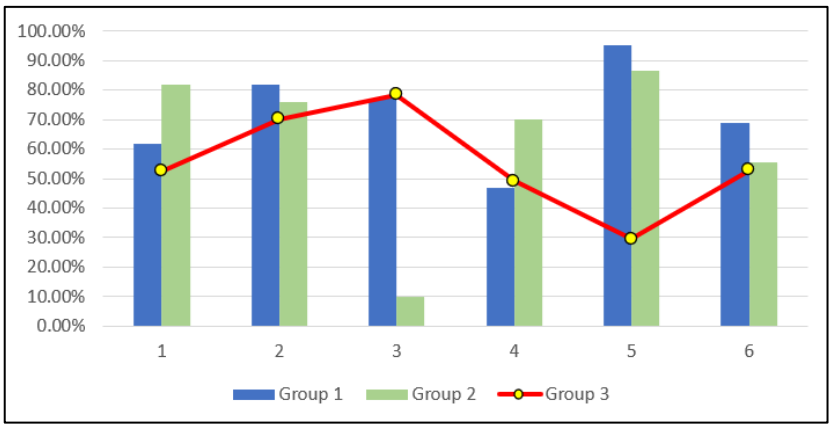


**Figure 4**. Gap Diagram Between Questions and Groups

This research was conducted in Indonesia with individuals having diverse socio-cultural backgrounds and varying financial capabilities compared to children in other countries such as the United States, Japan, Germany, Australia, Canada, and others. Therefore, the findings presented in this research report may only apply to Indonesia and not necessarily to other countries. Several recommendations can be made based on the results of this research, including: (1) Face-to-face learning should not only focus on delivering material and academic content. However, it should also include socio-cultural activities that cannot be obtained through online learning. If there is a desire to develop digital platforms for educational activities, learning, and teaching, offline or face-to-face learning should be supported. (2) Hybrid learning can be an option with a certain proportion for face-to-face and online activities. This is because the metaverse in the digital era represents a new experience that will grow massively and globally. Therefore, students should prepare for a more diverse digital world with various activities. (3) Proportional supervision regarding internet usage and children's activities in the metaverse is needed. Children's purchase of digital items may fall into the category of wastefulness or even futility. Parents should not only carry out regulations and supervision, but developers can also implement unique verifications before children make payments. Governments must create appropriate regulations to prevent misuse by game developers in influencing children to buy digital items or even view content unsuitable for children. One limitation of this research is mixing data between adolescent and adult age groups, resulting in less satisfactory and less rigid research outcomes. There needs to be more clarity in understanding the age groups that play games, purchase digital content, crypto assets, etc. The diversity of questions related to self-learning is also limited, with indicators focusing mainly on internet usage duration, of which only a small portion may be used for learning while the rest is for entertainment. Further studies are needed to obtain more accurate information regarding activities conducted for more than 6 hours while accessing the internet, primarily related to self-learning purposes.

## CONCLUSION

Internet use in the digital era, like now, has become part of society's culture, even from the age of children. The internet usage behaviour of school-aged children needs to be balanced with formal education that can guide active internet users to be more selective in their use. Children at school sometimes need to be more responsible for using their time and money. So, supervision from related parties such as parents, teachers, and even digital platform developers needs to be the focus of attention.

Research on education development in the digital era through the metaverse platform shows that conventional shopping patterns have begun to shift to digital shopping patterns. This is shown in the respondents' opinions when filling out the questionnaire regarding their tendency to shop, order food, order vehicles, and even order tickets online. The budget for online activities is also fantastic. 55.41% use a budget of USD 25 per month for online shopping. It is essential to supervise children strictly in how they use the money they have because they are still children who do not have their income. However, it is interesting that school-age children get much information through the internet, so it is necessary to prepare educational content that is still within the realm of children's enjoyment and preferences in the digital era to eliminate boredom in learning.

The relationship between the use of digital platforms, the budget spent on digital content, and even the time to access the metaverse world is directly proportional to the duration of internet use. Optimizing internet use for more productive purposes is needed so children get many benefits, significantly increasing their capacity and expertise in the field they like as students. Some gaps in the research results can be used as morning lessons for educators. They use the internet briefly but are still just playing around and having fun. Only 10.16% of respondents actively create YouTube content, even though 76.07% have a YouTube channel. Indeed, this is not an essential or dominant indicator, but channeling creativity through helpful videos on YouTube requires much effort and more expertise. Because today's children still create digital content in the form of text 18.69%, music 8.20%, videos 73.11%, perhaps on platforms other than YouTube.

### Authors' contributions

Conceptualization: M.R., F.U., Z., and S. C.; methodology, M.R. and F.U.; validation, M.R. and F.U.; analysis, F.U. and S.C.; investigation, Z.; resources, F.U., S.C.; data curation, M.R. and S.C.; writing—original draft preparation, M.R. and F.U.; writing—review and editing; supervision, F.U., Z., and S.C.

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