

DESIGN OF INFORMATION, COMMUNICATION, AND TECHNOLOGY (ICT)-BASED APPSHEET FOR COLLECTING DATA IN DECISION MAKING: A CASE STUDY OF FATHER'S PARENTING IN CHILDREN'S CHARACTER EDUCATION IN FEMALE MIGRANT WORKER FAMILIES

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Abstract

This study aims to explore the use of information and communication technology (ICT)-based AppSheets for data collection in the decision-making process related to parenting patterns in female migrant worker families. This research method uses a design-based research (DBR) approach, which uses four main steps: analysis, design, development, and evaluation. The results showed that the AppSheet application facilitates digital data collection and is accessible and simple to use by respondents on various devices, including smartphones and tablets. The impact of using AppSheet is to increase respondent participation and real-time information collection. This study highlights that the parenting patterns of fathers in female migrant worker families tend to be authoritative. The ability of ICT applications such as AppSheet to automatically and systematically store data, minimize human error, and simplify data analysis was the driving force behind its selection. Focusing on female migrant worker families is crucial, as they typically share childcare responsibilities between the father and mother. However, in these women's migrant worker families, the role of childcare shifts to the father during the mother's absence. The research underscores that fathers' parenting style significantly influences children's character development. In this context, the use of digital tools not only aided data collection, but also provided valuable insights into the unique dynamics of fathers' authoritative parenting in fostering children's character in female migrant worker families.

Keywords: AppSheet, Character education, ICT, Parenting.

1. Introduction

Information and communication technology (ICT) design is the process of planning, creating, and implementing effective and efficient ICT systems to achieve specific goals. This study delves into the innovative use of ICT by developing an AppSheet-based tool that gathers data on parenting patterns, specifically focusing on the role of fathers in female migrant worker families.

Given the unique dynamics of such families, where fathers often double as breadwinners and primary caregivers in the absence of mothers, this study aims to provide a comprehensive analysis of paternal parenting patterns, which have a significant impact on children's character development in such families.

This introduction serves as the foundation for an in-depth investigation into the design, implementation, and utilization of the AppSheet tool, which ultimately enhances the research process and aids in informed decision-making and policy development.

Table 1 shows previous studies have shown that the application of information and communication technology (ICT) has made significant contributions in various fields, ranging from cultural heritage preservation to early childhood language development. For example, 3D and virtual reality (VR) technologies can give new life to cultural heritage, highlighting the use of ICT-based learning media to enhance the language development of 4-6-year-old children. Demonstrates the effective use of AppSheet for online attendance systems and Micro, Small, and Medium Enterprise (MSME) marketing, highlighting the significant potential of ICT-based applications to enhance data efficiency and affordability.

This AppSheet application can increase income for MSMEs, help MSMEs market their products to the wider community, and facilitate urban village data collection. The parenting patterns used by single-father parents in Seweru Hamlet, Kare, and Madiun to instil disciplinary character in elementary school-age children are primarily democratic, permissive, and situational. The importance of appropriate parenting, particularly in the context of single parents and the Strawberry generation, with the main recommendation being democratic parenting that involves agreement between parents and children. Table 1 presents some of the detailed findings from these studies.

The purpose of the research was to design an information communication and technology (ICT)-based AppSheet to collect data for decision-making. We used a case study of fathers' parenting in children's character education in female migrant worker families. We provided an efficient and accurate tool for researchers to collect data on fathers' parenting in a real-time and structured manner. This study's novelty lies in the use of ICT-based AppSheet technology to overcome the challenges of collecting data from hard-to-reach populations, such as female migrant worker families.

The app allows respondents to easily access and fill in data via mobile devices, increasing participation and data accuracy. This application provides a glimpse into a father's parenting style within the family setting of female migrant workers, serving as a foundation for children's character education, particularly during the mother's departure.

Table 1. Previous research.

No.	Title	Findings	Ref.
1.	System architecture design of a multimedia platform to increase awareness of cultural heritage: a case study of sustainable cultural heritage	The use of information and communication technology (ICT) with 3D models and virtual reality (VR) brings new life to cultural heritage. UML-based web engineering (UWE) is applied to present the web application architecture, database structure, and platform interface.. This proposed platform provides a new idea about the system architecture design of multimedia platforms and can strengthen public knowledge about cultural heritage.	[1]
2.	Implementation of information communication technology in enhancing early childhood language development	This research focuses on ICT-based learning media that can improve the language development of children aged 4-6 years.	[2]
3.	Designing a mobile-based online attendance system for teachers and staff using Appsheet	Designing a mobile-based online attendance system that can facilitate teachers and employees in taking and recording attendance.	[3]
4.	Application of APPSHEET-based MSME E-Catalog Simple Application in MSME Development in Gedog Village	This AppSheet application can increase income for MSMEs, help MSMEs market their products to the wider community, and facilitate urban village data collection. This application has the potential to significantly benefit the residents of Gedog Village, particularly the MSME players. This application aims to promote MSMEs more effectively, fostering community recognition and broadening their marketing reach.	[4]
5.	Single Father Parenting in Instilling Disciplinary Character in Elementary School-Age Children	The study's results reveal that the parenting patterns used by single father parents in Seweru Hamlet, Kare, and Madiun to instil disciplinary character in elementary school-age children are primarily democratic, permissive, and situational. The study also highlights the efforts made by single parents in Seweru Hamlet, Kare, and Madiun to instil disciplinary character in elementary school-age children. These efforts include setting an example, demonstrating parental unity in enforcing moral rules and values, living in the children's environment, enforcing rules and logical consequences, regulating children's behaviour, and instilling religious values as the foundation for instilling disciplinary character.	[5]
6.	Pengaruh Pola Asuh Orangtua Terhadap Pembentukan Karakter Anak di Zaman Generasi Strawberry	The parenting styles inherited from previous parents are no longer appropriate for the Strawberry generation. Inappropriate parenting can lead to a person lacking character. Given the importance of the relationship between proper parenting and the formation of children's character and personality, the most recommended parenting is democratic parenting, where there is an agreement between parents and children.	[6]

2. Literature Review

2.1. Design of Information Communication and Technology (ICT)

ICT is the technology used to communicate, create, manage, and distribute information [7]. Generally, ICT includes computers, the internet, telephones, television, radio, and other audiovisual equipment. There are many reports relating to ICT that can evolve our socioeconomic condition (see Table 2), based on literature [8-12].

ICT includes two aspects, namely information technology and communication technology. ICT is everything related to the process, use of tools, manipulation, and management of information [13]. Information, communication, and technology (ICT) design generally refers to the process of designing and developing systems or tools that use information and communication technology to improve efficiency, accuracy, and accessibility in various activities and processes [14]. ICT design involves the use of software, applications, and digital platforms designed to simplify data collection, processing, and analysis, as well as support more effective communication and collaboration.

Table 2. Previous studies on ICT research in socioeconomic conditions.

No.	Title	Ref
1.	Teaching and learning with technology: Effectiveness of ICT integration in schools.	[8]
2.	Motivation and ICT in secondary school mathematics using unified theory of acceptance and use of technology model.	[9]
3.	Accessibility, usability, and readiness towards ICT tools for monitoring educational practice in secondary schools.	[10]
4.	Lecturers' efficacy and readiness towards utilization of ICT for academic research in college of education.	[11]
5.	Motivation and ICT in secondary school mathematics using unified theory of acceptance and use of technology model.	[12]

Figure 1 illustrates the functions and benefits of ICT, which include data storage, data processing, communication, information access, and efficiency improvement [15]. Software and hardware enable efficient data collection and storage through ICT, an important information system. With specialized algorithms and hardware, ICT can identify trends, patterns, and insights contained in data [16]. ICT's basic concept enables individuals to communicate and collaborate efficiently through various platforms such as instant messaging, email, video conferencing, social media, telephony, and others, regardless of geographical distance. Easy access to information from various sources, especially through the internet, allows users to search for information, explore news, and access knowledge quickly [17]. The existence of ICT also contributes to increasing productivity and efficiency in various sectors, such as business, where integrated information management systems can automate business processes, increase employee productivity, and optimize inventory management.

The way information and communication technology (ICT) works generally involves the use of information and communication technology to facilitate various processes and activities [18]. ICT utilizes computer software, hardware, and networks to collect, store, process, and transmit data efficiently [19]. This includes the use of digital applications and platforms designed to facilitate the interaction and exchange of information between individuals, organizations, and systems.

With the adoption of these technologies, various activities such as communication, collaboration, decision-making, and management can be performed more quickly and precisely, enabling higher operational efficiency and increased productivity across different sectors and work environments.

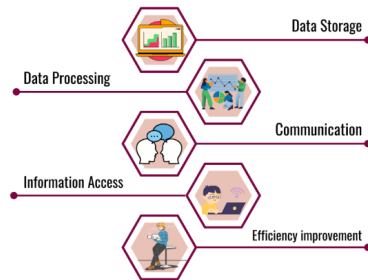


Fig. 1. Functions and benefits of ICT.

2.2. AppSheet

AppSheet is an open-source, no-code software development tool used by application developers to create customized applications for mobile devices, tablets, and personal desktop computers (PCs) [20]. This application is a cloud-based application development platform that makes it easy for users to create, manage, and deploy form-based research questions to make it easier and simpler in the programming system [21]. The AppSheet application is integrated into various other applications, such as Google Sheets, Excel, and other databases needed in research, making it easier to collect and organize data more effectively and in real-time through mobile devices.

Figure 2 illustrates an AppSheet and Application Script, which are designed to mimic the architecture of a mobile application. Researchers use AppSheet to manage research data, which includes real-time editing, deleting, and viewing [22]. Despite its limitations in complex data analysis, AppSheet allows for the export of collected and managed data into other data analysis tools like SPSS. This application also allows for monitoring research progress, including the status of data collection, analysis, and reporting. In designing the forms needed for field data collection through research questions given to research subjects, the forms are in the form of text input questions and audio recordings,. Thus, the data obtained in the research is richer and more diverse. The use of AppSheet in field data collection streamlines surveys, aids in data collection, and simplifies access to necessary data analysis. Users of the application synchronize their activities with connected data sources [23]. This dynamic nature of the AppSheet application stems from its easy integration with existing mobile devices and its role as a communication platform [24].

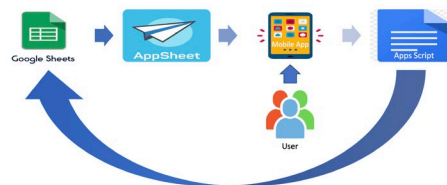


Fig. 2. Mobile app architecture based on AppSheet and app script.

2.3. Parenting

Parenting is the way parents treat, educate, guide, and discipline children to achieve maturity. It includes how parents interact with children, provide affection, set rules and boundaries, and instil values and morals. Effective parenting is essential for children's physical, emotional, social, and intellectual development [25]. Proper parenting can help children become independent, responsible, and happy individuals.

The parenting style used in raising children greatly impacts their future success [26]. Baumrind, a clinical and developmental psychologist, created three types of parenting styles: authoritative, authoritarian, and permissive [27]. Baumrind states that "Parenting attitudes also play an important role in parent-child relationships and parenting competence [28]. Parenting alone does not determine the parent-child relationship; the child's environment and demographic factors also play a significant role. Baumrind conceptualized parenting styles known as authoritarian, authoritarian, and permissive [29].

Figure 3 explains that authoritarian parenting is characterized in that the relationship between parents and children is not warm and often punitive [30]. Authoritarian parenting is a parenting pattern characterized by a way of parenting children with strict rules, often forcing children to behave like themselves (parents); freedom to act on behalf of themselves is limited; children are rarely invited to communicate and invited to chat, tell stories, and exchange ideas with parents [31]. Parents assume that every attitude taken is correct, so there is no need to ask for children's consideration for all decisions that raise their children's problems.

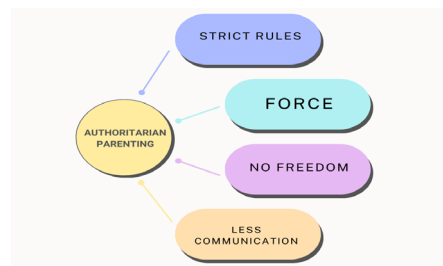


Fig. 3. Authoritarian parenting.

First, authoritarian parenting tends to emphasize strict control and discipline. Parents with this parenting style often set strict rules without providing space for children to participate in decision-making [32]. This can result in children who are obedient but less able to develop social skills and self-initiative. Second, democratic parenting involves more collaboration between parents and children in the decision-making process [33]. Parents provide guidance and encouragement but still respect children's opinions and feelings. This helps children learn about responsibility, develop communication skills, and increase their self-confidence. Third, permissive parenting tends to give children great freedom without much restriction or structure [34]. While this can result in creative and independent children, it can also cause children to lack discipline and good self-regulation. The diversity of parenting patterns shows that each family has a different approach to educating their children, and its success depends on consistency, compassion, and suitability to the child's individual needs.

Figure 4 illustrates the form. Authoritative parenting combines reasonable control with affection and support [35]. Authoritative parents set clear rules and expectations

but also listen to their children and explain the reasons behind the rules [36]. They encourage discussion and provide space for children to participate in decision-making. Communication in authoritative parenting is two-way [37]. Authoritative parents are open to hearing their children's opinions and communicate in a supportive and respectful way [38]. Children with authoritative parenting are given freedom that is appropriate to their age and abilities [39]. With parental guidance and support, they learn to be independent and make their own decisions.

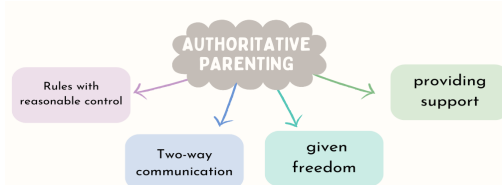


Fig. 4. Authoritative parenting.

The authoritative parenting style employs rational and reasoned rules to guide the behaviour of both boys and girls, fostering a dynamic exchange of verbal communication. Parents with an authoritative approach apply firm control but do not impose their views on children through restrictions [40]. Each child's interests are recognized, along with the recognition of parental rights and responsibilities. Baumrind explains that an authoritarian parenting style, which links high control and positive encouragement, correlates with competent, responsible, and independent behaviour in girls and, to a lesser extent, in boys [41]. Only high-achieving girls showed a correlation between this parenting style and social responsibility.

Good parenting includes a combination of consistent affection, clear boundary setting, and positive behavioural modelling from parents [42]. It entails open communication that allows the child to feel heard and accepted, as well as encouraging independence by providing opportunities to make decisions and learn from experiences. Good parenting also recognizes the individual needs of each child and tailors educational approaches according to their development. Sincere praise for children's achievements, thoughtful supervision to keep them safe, and consultation with experts when needed are important additions to creating an environment that supports children's holistic growth and well-being.

Figure 5 illustrates a form of permissive parenting, where parents tend to grant their children significant freedom with minimal clear rules or boundaries. Permissive parents are very responsive to children's needs and wants, often being very understanding and supportive but lacking in setting limits and control. In this parenting pattern, parents typically avoid confrontation and tend to fulfil children's requests more frequently to avoid conflict [43]. Permissive parenting fosters open communication and encourages children to express themselves [44].

Parents choose parenting because they believe that what they give their children is best for them. Various factors, including the parents' age, the child's gender, their education, life experiences, and the husband-wife relationship, often influence this. Other factors, such as the family's socioeconomic status and the surrounding culture, also influence parents' parenting choices [45]. Parents' ages can influence their parenting views because longer life experiences can shape different beliefs and preferences in educating children [46].

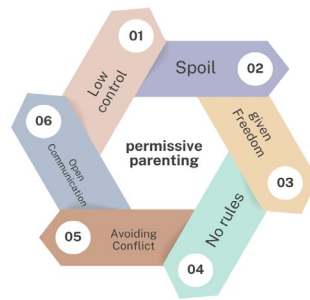


Fig. 5. Permissive parenting.

Parents may treat boys and girls differently depending on their child's gender [47]. Parents' education often plays an important role in their knowledge of child development and effective educational techniques. Life experiences, including those gained from raising previous children, can also shape a parent's parenting style [48]. Harmonious husband-wife relationships or household conflicts can also impact the parenting style of children. Parents who have a stable or high socioeconomic status may have more resources to provide better education to their children [49]. In addition, the dominant culture and values in the neighbourhood can also influence the way parents educate their children.

2.4. Gender and parenting patterns

Gender in parenting encompasses how gender roles and perceptions influence the way parents educate and raise children [50]. Traditionally, fathers are often perceived as the primary providers of the family's financial needs and authority figures. They are more likely to engage in activities that emphasize independence, toughness, and courage. Fathers may play more physically with children and encourage them to take risks [51]. Mothers are often regarded as the primary carers responsible for children's emotional well-being and daily needs. They tend to be more involved in the emotional and social development aspects of children, such as teaching empathy, communication, and interpersonal relationships. Parenting is a trait regulation technique practiced by mothers and fathers as a manifestation of responsibility in the formation of children's character. There are various parenting styles exhibited by mothers and fathers that can influence their children's character development.

Figure 6 shows fathers' parenting has distinctive characteristics, fathers are usually more likely to encourage independence and courage in their children through physical activities and challenging games [52]. They often use a firm and direct approach to communication, setting clear and consistent rules. In many cases, fathers adopt permissive parenting, giving children greater freedom to explore and learn from their own experiences, while still providing necessary guidance and support [53]. Fathers also play an important role in providing financial support and ensuring the family's material needs are met. In addition, fathers are often involved in teaching practical skills and providing real-life examples of how to deal with life challenges [54]. Although fathers' parenting styles may be more lax in terms of supervision and control, their presence and involvement have a significant positive impact on children's character development, independence, and confidence.

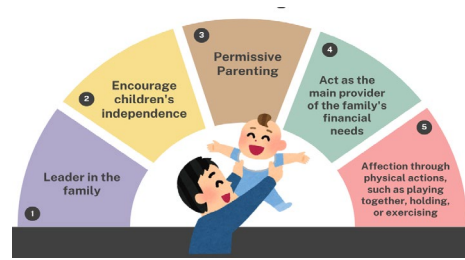


Fig. 6. Characteristics of father's parenting.

Father's parenting in the family is more towards meeting the needs of affection, nurturing, and financial support, and permissive parenting which is characterized by dominance or arguably comprehensive towards children, is loose and gives the freedom that is usually given by both parents [55]. This parenting style lacks guidance and direction from both parents, control, and special attention. Father's parenting is an important element in child development, as well as the role of the mother [56]. Active involvement of fathers in parenting provides many benefits for children, both physically, emotionally, socially, and intellectually. Fathers who are physically involved with their children, such as playing, exercising, and helping them with chores, can help children feel closer to their fathers and build trust. Fathers can help enforce rules and boundaries at home, and teach children how to take responsibility for their actions. Fathers can encourage their children to be independent and take responsibility for themselves.

Figure 7 describes the parenting of mothers who have characteristics that focus on compassion, empathy, and detailed attention to children's needs, tend to use a more empathic and in-depth approach to communication, listening carefully to children and providing supportive responses [57]. Mothers are responsible for daily care, such as providing meals, ensuring hygiene, and caring for children when they are sick. Mothers also usually set rules with clear explanations, help children understand the reasons behind the rules, and encourage them to follow with awareness. In terms of nutrition and health, mothers often play an important role in providing breast milk and appropriate complementary foods, as well as ensuring children get a healthy and nutritious diet. In addition, mothers provide psychosocial stimulation that is important for children's social and emotional development, helping them develop empathy, social skills, and healthy relationships. By providing strong emotional support, mothers help children feel loved, safe, and valued, all of which are important for their character development and psychological well-being.



Fig. 7. Mother's parenting characteristics.

A mother's parenting is influenced by two main factors, namely internal factors and external factors. Internal factors within the mother include the mother's age, the mother's level of education and insight ability, the mother's scientific intelligence, and the mother's attitude and concept of role in the family. External factors include the social environment, economy, and the character of the child. For example, parenting is strongly influenced by the socio-economic conditions of the family and the individual characteristics of the child.

Table 3 explains the comparison of parenting patterns of mothers and fathers, Parenting patterns of fathers and mothers show that in educating children. Fathers and mothers need to unite in the education of their children because the role of both has a significant impact on the formation of children's character in the future. The permissive parenting style of fathers, who tend to care less about children, has little effect on children's emotional development. On the other hand, mothers' authoritarian parenting style, which tends to provide many rules and strict controls, has a greater influence on children's emotional development [58]. Further explanation of the different aspects is shown in Table 3.

Table 3. Comparison of father and mother parenting patterns. The table was adopted from reference [58].

Parenting Aspects	Father	Mother
Emotional Approach	More likely to encourage independence and courage	More likely to teach empathy and emotional support
Engagement in Activities	Focus on physical activity and active play	Focus on daily activities and family routines
Communication Style	Direct, assertive, and shorter communication	Empathetic, detailed, and in-depth communication
Establishment of Rules	Set rules firmly, emphasize discipline	Establish rules with explanations and discussion
Teaching Value	Teaches the value of independence, resilience, and courage	Teaches the value of caring, empathy, and cooperation
Providing Support	Provide support by encouraging children to try new things.	Provide support by listening and giving affection
Giving Responsibility	Encourage children to take responsibility and face the consequences	Guiding children in managing responsibilities with guidance
Academic Engagement	Engage in academic aspects by example and inspiration	Involved in helping with tasks and guiding the learning process
Monitoring	More flexible in supervision, giving room for exploration	Stricter supervision, ensuring safety and comfort
Approach to Conflict	Resolve conflicts with a logical approach and practical solutions	Resolve conflicts with emotional and negotiation approaches

2.5. Female and male brain anatomy in decision-making

There are scientific trends in the way fathers care for their children. Genetic factors strongly influence early childhood development. This includes the physical and psychological potential that individuals have since the time of formation, which is determined at the time of manufacture and inherited by the genes received from

their parents. Fathers in parenting patterns have an important role in child development, especially in providing emotional and social support. Children who get father support in their parenting have a more open social environment than children with no support from their fathers. Father's involvement in childcare provides great benefits for children's development. Fathers maximizing parenting roles through playing, teaching, and providing emotional support will positively correlate with children's cognitive, social, and psychological well-being. The warmth of affection that fathers provide to their children has a profound effect on children's psychological health and well-being.

In Fig. 8, the yellow part is the prefrontal cortex. Women have a larger prefrontal cortex compared to men, hence women have faster planning, attention, and reasoning, as well as decision-making, and are more sensitive to emotional cues. Whereas men, although they have a larger brain size overall, their prefrontal cortex is smaller. Men tend to think longer before making decisions and focus more on one task. The decision-making process involves cerebral reasoning and is based on experience or information that has been received previously. The decision-making process and the risk in making this choice are related to the consideration of the profit and loss situation predicted by a person. Decision-making by parents is complex, and anatomically dependent on the integrity of the frontal lobes and prefrontal cortex which play a role in thinking, planning, and decision-making.

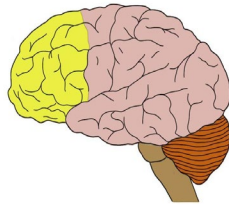


Fig. 8. Prefrontal cortex. The figure was adopted from

<https://neuroscientificallychallenged.com/posts/know-your-brain-prefrontal-cortex> taken on July 2024.

Men think more by utilizing grey matter in their brains, while women with white matter or prefrontal cortex [59]. Gray matter is described as the main component of the central nervous system consisting of nerve cell bodies, neuropil (dendrites as well as un-myelinated and myelinated axons), glial cells (astroglia and oligodendrocytes) and capillaries. The white matter consists mostly of myelin axons (white fatty substance).

Figure 9 is the white fatty matter in the brains of women and men. This brain structure then affects how women and men make decisions. This decision-making process is also closely related to the care of women and men for their children. The decision-making process occurs in the frontal lobe of the brain, specifically in the prefrontal cortex which consists of other core parts, the orbitofrontal cortex (OFC), anterior cingulate cortex (ACC), and dorsolateral prefrontal cortex (DLPFC), which interact with each other and influence the decision-making process. The logic organized in the limbic network is the cause of the differences in how men and women make decisions. The limbic part called the amygdala regulates human feelings and emotions. Therefore, it can be concluded that the limbic system of women is more active in the decision-making process than men.

How gender shapes brain function

Brain scans of men and women with equivalent IQs show that men rely more on gray matter in performing mental tasks and women rely more on white matter. Gray matter is associated with information processing, white matter with communication between parts of the brain.

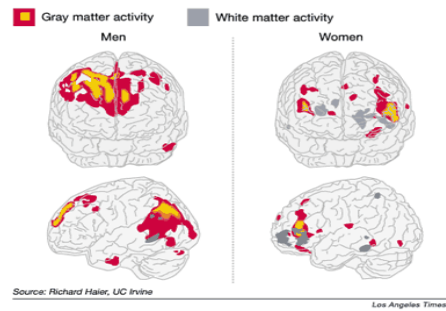


Fig. 9. Differences in white fatty matter in female and male brains.

The figure was adopted from

<https://englishbloggin.wordpress.com/2010/12/02/brain-differences-between-women-and-men/06brain1/> taken on July 2024.

2.6. Character education

Character education in the family is the main foundation for shaping children's personalities and morals [60]. Family is the first and main environment where children learn about values, norms, and ethics that will guide them throughout life [61]. Through daily interactions, parents and other family members have the opportunity to instil positive values such as honesty, responsibility, empathy, and discipline [62]. By providing positive and consistent examples, families can shape children's character with strength and integrity.

Character education coaching through parenting is an important aspect of shaping children's personalities from an early age [63]. Parents act as the first role models that their children follow. Therefore, the attitudes, behaviours, and values shown by parents will greatly affect the development of children's character. Affectionate parenting, consistency in applying discipline, and providing positive examples are the main keys to fostering character [64]. For example, by teaching the values of honesty, responsibility, and empathy through real-life actions, children will more easily absorb and apply these values in their lives.

In this digital era, character education in the family is becoming increasingly important because children are more exposed to fast and diverse technology and information [65]. Families play a central role in guiding children to understand moral and ethical values that are relevant to the use of technology [66]. Parents need to provide positive role models for technology use, such as wise and responsible use of the content consumed and limiting screen time to ensure sufficient time for social interaction and physical activity [67]. Families can help children develop a critical attitude towards information obtained from the internet and social media, as well as understand the consequences of unethical or unsafe online actions, with the right approach.

In addition, families also have a role in building strong emotional relationships with children, which is the foundation for healthy character development [68]. Open communication about children's online experiences can help parents understand the challenges and concerns their children face in the digital world [69]. By creating a supportive and loving family environment, parents can teach values such as empathy,

respect for privacy and safety, and interpersonal skills needed in online interactions. Thus, family character education in the digital age not only helps children become smart users of technology but also individuals who have moral integrity and can contribute positively in an increasingly complex digital society.

Figure 10 explains that in the master design of character education, the Ministry of National Education has also explained the configuration of character in the context of psychosocial and socio-cultural processes in four major groups, namely: 1. spiritual and emotional development; 2. intellectual development; 3. physical and kinaesthetic development; and 4. affective and creativity development [70].

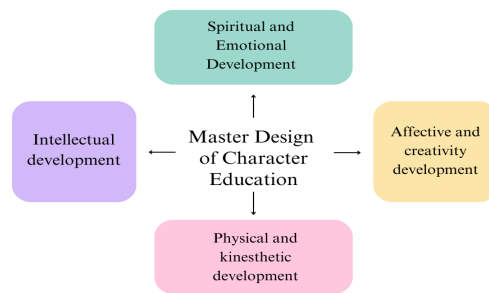


Fig. 10. Character education master design.

3. Method

This research uses design-based research (DBR), which consists of four stages, namely: analysis, design, development, and evaluation. Figure 11 explains the steps in the DBR research, first is analysis, which emphasizes the importance of innovative delivery to gather relevant information to achieve sustainable development goals, especially in the context of using technology that is already prevalent; second is design, which is realized in the form of the AppSheet application for Android devices, which focuses on parenting in Female Migrant Worker Families; third is development, this application is tested for validity by media experts; fourth is evaluation, which is the result of using the AppSheet application as a data collection tool in decision making related to the case study of parenting patterns of fathers in children's character education in the Family of Female Migrant Workers located in Kertamukti Village, Tanjungmedar District, Sumedang Regency, West Java Province, Indonesia.

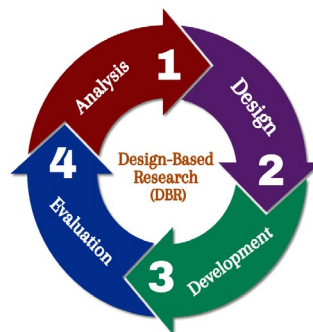


Fig. 11. Design-based research (DBR) process.

4. Result and Discussion

4.1. AppSheet analysis

In this digital era, the use of AppSheet-based research instruments is essential for researchers. AppSheet assists researchers in developing digital research instruments that respondents can easily access and use on a variety of devices, such as smartphones and tablets, facilitating real-time participation and information access. This increases participation and flexibility in data collection. In addition, the use of this technology is in line with the trend of digitalization and enables researchers to achieve sustainable development goals more effectively. AppSheet also supports instrument validation and pilot testing in a more practical and structured manner, providing more accurate and reliable data. AppSheet allows for the automatic and structured storage of digitally collected data, thereby reducing human error and simplifying data analysis. This is particularly important in the context of research on paternal parenting in female migrant worker families, where easy access and interaction through digital technology can increase participation and the accuracy of the data obtained.

This research focuses on female migrant worker families, with a special emphasis on the father's parenting. In the context of female migrant worker families, the father automatically assumes the parenting role alone when the mother departs to work abroad. The father, in addition to his role as breadwinner, is also the main person responsible for childcare during the mother's absence. This study examines the parenting patterns applied by fathers in these situations. This is considered important because the father's role in parenting has a significant impact on fostering good character in children. Therefore, the differences in parenting characteristics between fathers and mothers need to be understood in the unique context of female migrant worker families. This research on fathers' parenting patterns aims to provide a deeper insight into the dynamics of parenting in female migrant worker families, especially the optimization of the father's parenting role in fostering children's character during the mother's departure.

4.2. AppSheet design

The results obtained from AppSheet using the DBR process on the typology of parenting on BMP include analysis, design, development, and evaluation. The analysis step in DBR-based research with the object of research on the typology of parenting patterns of female migrant workers (BMP) involves several important stages. Researchers collected preliminary data on BMP family conditions, focusing on the father's role in childcare while the mother worked abroad. This data collection was done through direct observation to understand the social, cultural, and economic context of BMP families to find out how the typology of father's parenting patterns. The results of the analysis after making initial observations include; (1) to find out how the typology of father's parenting needs to be carried out further research using research instruments in the form of a collection of questions that describe how the form of father's parenting typology applied to BMP families; (2) from the results of the form of parenting typology applied will certainly have an impact on the formation of children's character; (3) one of the developments made to get accurate, fast and structured data.

The AppSheet app helps collect data efficiently, can be used anywhere and anytime, and can collect complete metadata even if respondents are in different locations. AppSheet is an effective alternative for rapid data collection by integrating research questions into a digital format that respondents can easily access and answer. The design of AppSheet is tailored to the researcher's need to create an interview instrument in digital form that is efficient and easy to use. The information displayed in this application is designed to guide respondents, especially fathers and children from Female Migrant Worker (BMP) families, through the flow of using the application. The following is a visualization of the AppSheet design used in the study.

Figure 12 explains the AppSheet design carried out with respondents starting from opening the AppSheet application and logging in using their Google account. After logging in, respondents will be presented with an interface page regarding Parenting that makes it easy for respondents to answer questions that have been compiled by researchers. AppSheet on Parenting consists of Primary Navigation and Menu Navigation. There are 3 submenus in Primary Navigation, namely Permissive Parenting (*Pola Asuh Permisif*) and Authoritarian Parenting (*Pola Asuh Autoritarian*) with 9 questions each, and Authoritative Parenting (*Pola Asuh Autoritatif*) with 6 questions. Next is the Navigation Menu which consists of the Religious and Honest (*Olah Hati*) submenu with 17 questions, *Olah Pikir* with 10 questions, Sports (*Olah Raga*) with 25 questions, *Olah Rasa and Karsa* with 15 questions, and there is Intensity of Interaction between Fathers and Children (*Intensitas interaksi antara ayah dengan anak*) and Intensity of Interaction between Children and Children (*Intensitas interaksi ayah dengan anak*) with 11 questions each. Respondents answered the questions by filling in the blank columns provided in the AppSheet.

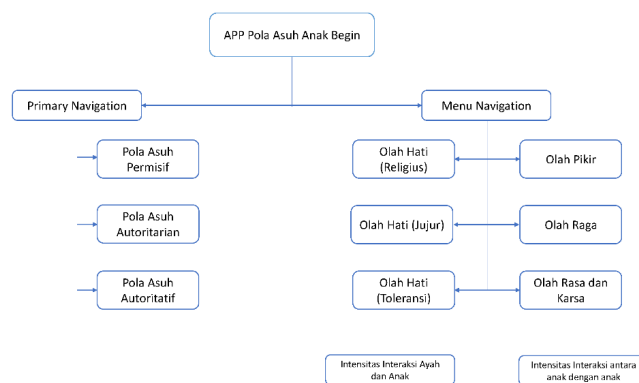


Fig. 12. AppSheet design.

4.3. Development AppSheet

Figure 13 explains the flow of using the AppSheet app, ensuring that each step of the data collection process is clear and easy for respondents to follow. With this approach, researchers can ensure that the data collected is accurate, structured, and easily accessible, supporting the overall research objectives. The first step was for respondents to open the AppSheet app and login using their Google account. This login process provides security and easy access for respondents to start filling in

the data. The second step is for the respondent to select an indicator that contains many questions that must be answered by the informant. After answering all the questions in the AppSheet application, all informants' answers will be recorded and stored systematically in the system. This approach ensures that data is collected efficiently and can be analysed more easily by researchers. Thus, research can be conducted more deeply and accurately on father's parenting in children's character education in the families of female migrant workers.

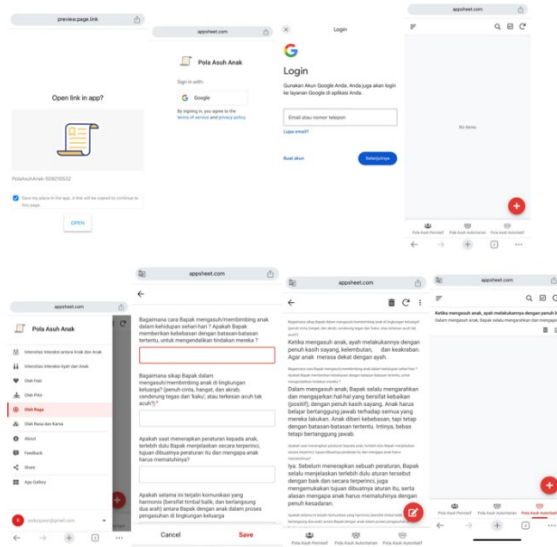


Fig. 13. Flow of AppSheet application usage.

4.4. Evaluation of AppSheet from users

Table 4 describes the parenting patterns of fathers in migrant women's families obtained based on data collected using AppSheet. From the data, it is known that there are four fathers from the Female Migrant Worker Families whose parenting tendencies are different; namely, two fathers use authoritarian parenting, and the remaining two fathers each use authoritarian and permissive parenting.

From the data collection results through AppSheet, it can be seen that the tendency of parenting patterns used by fathers in the family environment of female migrant workers is Authoritative. The use of authoritative parenting can provide the best alternative in the character education of their children. A democratic attitude is always visible when fathers take care of their children. Fathers always appreciate the existence of their children, understand their circumstances, accept all their strengths and weaknesses, and respect their decisions and opinions. Control, attention, guidance, and direction of children's personal lives are always carried out seriously, taking into account that their mothers are not at home. Thus, the responsibility of parenting to foster good character in children is in the hands of the father.

Fathers parenting firmly, but full of affection, warmth, tenderness, and familiarity. Giving freedom but still within certain limits, is a form of control exercised by the father to foster the character of his child. Thus, the child can take responsibility for everything he does. Many children's characteristics that emerge

from the father's authoritative parenting include independence, responsibility, tolerance, communication, adaptability, the ability to harmonize parents' expectations with their desires, and high self-confidence. Thus it can be stated that the tendency of using Father's Authoritative Parenting in the environment of Female Migrant Worker Families, can foster good character in children during the mother's departure.

Table 4. Father's parenting in female migrant worker families.

Parenting Style	Characteristics
Authoritative	(i) Giving freedom with certain limits; (ii) Parenting firmly, but with love, warmth, gentleness, and intimacy; (iii) Rules are made and explained in detail; (iv) All decisions related to the child's interests are communicated together; (v) Cultivating an independent attitude from an early age; (vi) Respect the child's decisions and opinions, and the child's personality.
Authoritarian	(i) The rules made by the father are not to be broken by the child; (ii) Father never communicates clearly about the rules he makes; (iii) The child must obey the rules set by the father; (iv) The child is never allowed to question the rules applied by the father; (v) If the child violates the rules made, the father will strictly warn them; (vi) When the child violates the rules in the family environment, the father will punish him (beaten); (vii) Father makes all decisions related to the child's needs by himself; (viii) All decisions related to the child's interests are always made by the father; (ix) The child must obey all the father's wishes. Children are not allowed to voice their wishes and opinions.
Permission	(i) Fathers always give freedom to their children in their behaviour; (ii) Fathers always involve themselves in their children's lives; (iii) Father never demands anything from the children; (iv) Fathers never exercise control, when parenting; (v) Father never punishes children when they make mistakes; (vi) Father rarely interferes in children's personal life; (vii) Father is always warm to the child, respects self-expression, and discusses all decisions made; (viii) Father always complies with the child's wishes and desires; (ix) When parenting children, fathers never control and pay attention to them.

This study states that parenting styles, both father and mother, significantly influence children's character development. In this context, the authoritative parenting style used by fathers in the family environment of female migrant workers provides the best alternative for children's character education. Children raised with this parenting style tend to have good social skills, high levels of self-confidence, and better emotional abilities. Therefore, this study emphasizes the importance of a balanced and consistent parenting approach to support children's optimal character development. Finally, this study adds new ideas and information relating to the use of applications in ICT, as reported elsewhere [71, 72]. This paper also adds new information in the education, as reported elsewhere [73, 74].

5. Conclusion

This study employs a DBR approach to investigate the use of an ICT-based AppSheet for data collection on paternal parenting in female migrant worker families. The results show that AppSheet facilitates efficient digital data collection, increases respondent participation, and enables real-time information collection.

These families perceive the authoritative parenting style of their fathers as highly effective in fostering children's character education. The use of AppSheet is useful for collecting data for decision-making related to the case study of a father's parenting in children's character education in a family of female migrant workers.

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