**Use of New Technologies in Primary Education**

**ABSTRACT:** The integration of new technologies in primary education has revolutionized traditional learning methods, enhancing student engagement, comprehension, and skill development. This study explores the impact of digital tools, including augmented reality (AR), virtual reality (VR), coding platforms, collaborative digital applications, and STEM-based robotics, on young learners. By incorporating digital literacy and internet safety modules, students develop responsible online behaviors while gaining foundational technology skills. Interactive learning with AR and VR enables immersive experiences that bridge the gap between theoretical knowledge and practical understanding. Coding and computational thinking activities introduce students to programming concepts, fostering logical reasoning, problem-solving, and creativity. Collaborative learning and digital creativity encourage teamwork and communication skills through digital platforms that allow for shared content creation and interactive discussions. STEM and robotics-based learning provide hands-on experimentation, allowing students to engage with real-world problem-solving scenarios that reinforce scientific and engineering principles. The findings highlight the importance of integrating technology in primary education to equip students with essential 21st-century skills, preparing them for a rapidly evolving digital landscape. Ultimately, technology-enhanced learning promotes active participation, critical thinking, and innovation, fostering a more inclusive and dynamic educational environment.

**KEY WORDS:** Primary education, digital literacy, augmented reality, virtual reality, coding, computational thinking, collaborative learning, interactive learning, 21st-century skills.

**Introduction**

In the 21st century, digital literacy and internet safety have become essential skills for students as technology is increasingly integrated into education and everyday life. Ensuring that young learners develop a strong foundation in responsible internet use is crucial for their academic and personal development. This module aims to equip students with fundamental digital skills, promote awareness of online safety measures, and encourage responsible digital citizenship.

To achieve these goals, various digital tools such as tablets, interactive whiteboards, and child-friendly search engines are introduced into the learning process. Students begin by familiarizing themselves with basic computer functions, including touchscreen navigation, keyboard usage, and simple software applications. Through hands-on activities and guided practice, students gain confidence in using digital devices, setting the stage for more advanced technological learning.

Beyond basic computer skills, the module focuses on safe internet practices, educating students on identifying trustworthy sources, avoiding cyber threats, and protecting personal information. Real-life scenarios are presented to help students recognize dangers such as cyberbullying, online predators, and exposure to inappropriate content. Additionally, the importance of password security and privacy settings is emphasized to ensure data protection and safe browsing.

Interactive games and educational platforms, such as Google’s **Be Internet Awesome** and **Interland**, are integrated to reinforce learning in an engaging manner. These tools provide students with simulated real-world scenarios where they can apply their knowledge of online safety and ethical digital behavior.

By the end of this module, students will have developed a comprehensive understanding of digital literacy, internet safety, and responsible online behavior. These foundational skills will empower them to navigate the digital world securely, fostering responsible and informed digital citizens prepared for the demands of modern education and technology-driven environments.

**DIGITAL LITERACY & INTERNET SAFETY**

Digital literacy and internet safety are essential skills for students in the 21st century as technology becomes an integral part of education learning and daily life. The aim of this module is to equip students with foundational digital skills ensure responsible internet use and promote awareness of online safety measures. To achieve this goal various technologies such as tablets interactive whiteboards educational applications and child-friendly search engines will be employed in the learning process. The module begins with an introduction to basic computer functions and touch screen navigation which is critical for young learners who interact with digital devices on a daily basis Students will learn how to operate a tablet or computer understand different components such as the keyboard mouse and touch screen and navigate through simple applications and educational websites. By providing hands-on experience and guided practice children will develop confidence in using digital devices which is a foundational skill for their academic and personal development [1].

In addition to basic computer literacy students will explore safe and unsafe behavior on the internet which is crucial for their protection and well-being in the digital world Educators will introduce real-life scenarios and discuss topics such as cyberbullying inappropriate content and online strangers to help children recognize potential online risks. Students will learn to differentiate between trusted and untrusted sources understand the importance of not sharing personal information and identify safe online spaces Child-friendly search engines such as Kiddle and KidRex will be utilized to ensure that students practice responsible browsing while discovering age-appropriate educational content [2]. Moreover the module will focus on password security and privacy awareness which are fundamental aspects of digital safety. Students will be taught the importance of creating strong passwords and using password managers when appropriate. The concept of multi-factor authentication will be introduced in an age-appropriate manner to help students understand additional security layers. To reinforce learning students will engage in activities where they create strong passwords test their memorization skills and practice secure login procedures. Privacy settings on applications and devices will also be explored to ensure students understand how to protect their personal information and minimize their digital footprint [3].

 Finally participation in an interactive game that teaches internet safety will provide an engaging and effective way for students to apply their knowledge. Various educational games such as Google’s Be Internet Awesome and Interland will be used to simulate real-life internet situations where students can practice making safe choices. These games promote an understanding of internet etiquette responsible social media use and critical thinking skills needed to assess online content . Through a combination of discussions practical exercises and interactive gameplay students will develop the knowledge skills and confidence needed to navigate the digital world safely and responsibly. By the end of this module they will have a solid foundation in digital literacy understand the importance of internet safety and be empowered to use technology in a secure and ethical manner fostering responsible digital citizenship in their academic and personal lives [4].

**INTERACTIVE LEARNING WITH AUGMENTED REALITY (AR) & VIRTUAL REALITY (VR)**

Interactive learning with augmented reality (AR) and virtual reality (VR) represents a transformative approach to education, allowing students to engage with subjects in a way that is immersive, dynamic, and experiential [5]. The objective of this unit is to enhance subject comprehension through the use of AR and VR technologies, creating an enriched learning environment that bridges the gap between theoretical knowledge and practical understanding. The technologies used in this unit include AR-enabled applications, VR headsets, Google Expeditions, and Merge Cube, which provide students with interactive opportunities to visualize and interact with content in three-dimensional spaces. By incorporating AR and VR into lessons, students can experience deeper engagement, increased motivation, and improved retention of information as they explore new concepts in a multisensory manner [6].

The first key activity in this unit involves using AR to explore 3D models of animals, planets, or historical sites. This allows students to observe and analyze objects that may otherwise be inaccessible within a traditional classroom setting. AR applications such as Quiver and AR Makr enable students to bring digital models into their physical space, allowing them to rotate, zoom in, and interact with these objects in real-time. For example, when studying the solar system, students can use AR apps to project 3D models of planets into the classroom, where they can examine the relative sizes, distances, and surface features of each celestial body. Similarly, when learning about biology, students can explore the anatomy of animals by interacting with 3D models that illustrate different physiological systems, such as the skeletal, muscular, and circulatory systems. This hands-on approach fosters curiosity and deepens comprehension by making abstract concepts tangible and visually engaging [7].

The second key activity in this unit consists of virtual field trips, which transport students to different locations without ever leaving the classroom. By using VR headsets and platforms like Google Expeditions or National Geographic VR, students can embark on journeys to places such as the depths of the ocean, the vastness of space, or historical sites such as the Pyramids of Egypt [8]. These virtual experiences provide students with an opportunity to witness real-world environments, explore geographical and historical landmarks, and gain a sense of scale and perspective that textbooks and static images cannot convey. For instance, a student learning about marine ecosystems can put on a VR headset and dive into the Great Barrier Reef, where they can observe marine life, coral formations, and underwater habitats in an immersive and engaging way. This experience not only enhances understanding but also fosters an appreciation for the natural world and global heritage, which can inspire further inquiry and exploration [9].

The third key activity focuses on interactive storytelling through AR-enhanced books, which revolutionize the way children engage with literature and storytelling. Traditional books come to life with AR applications such as Wonderscope or Bookful, which use augmented reality to animate characters and settings, enabling students to experience stories in a more interactive and engaging manner [10]. This approach to storytelling helps improve reading comprehension by providing visual and auditory cues that support textual understanding. For example, a story about space exploration can be enhanced by an AR app that projects astronauts, space stations, and planets into the physical environment, allowing students to witness the narrative unfold in an immersive and dynamic way. By actively participating in storytelling, children develop literacy skills, improve their ability to visualize narratives, and enhance their overall engagement with reading materials [11].

The final key activity in this unit is hands-on science experiments using AR apps, which allow students to conduct virtual experiments and simulations that would otherwise require specialized laboratory equipment or pose safety risks. AR applications such as JigSpace and Curiscope Virtuali-Tee provide students with interactive science lessons where they can visualize complex processes such as chemical reactions, physics experiments, and human anatomy in an engaging and safe manner [12]. For example, when learning about the human body, students can use an AR-enabled t-shirt like Virtuali-Tee, which allows them to see a real-time augmented reality view of internal organs, circulatory systems, and respiratory functions. This interactive approach makes abstract scientific concepts more accessible and engaging by allowing students to manipulate digital models, conduct virtual dissections, and observe cause-and-effect relationships in a controlled environment [13].

The integration of AR and VR in primary education not only enhances subject comprehension but also promotes active learning, creativity, and critical thinking skills. By providing immersive learning experiences, students can explore and interact with content in ways that traditional methods cannot achieve. AR and VR technologies cater to different learning styles by incorporating visual, auditory, and kinesthetic elements into lessons, ensuring that students with diverse learning needs can benefit from these innovative tools [14]. Furthermore, these technologies encourage collaborative learning, as students work together to explore virtual environments, solve problems, and share insights with their peers. Ultimately, the use of AR and VR in the classroom represents a shift toward more interactive and experiential learning methodologies that empower students to become active participants in their education. By embracing these cutting-edge technologies, educators can create more engaging, dynamic, and effective learning environments that prepare students for the digital age, equipping them with the skills and knowledge necessary to navigate an increasingly technology-driven world [15].

**CODING & COMPUTATIONAL THINKING**

Coding and computational thinking are essential skills in the digital age, equipping students with the ability to solve problems, think logically, and create technology-driven solutions [16]. This unit aims to develop problem-solving skills through basic coding concepts, introducing young learners to programming in a fun and engaging way. By integrating hands-on activities and interactive tools such as Scratch Jr., Blockly, Bee-Bots, and Micro:bit, students will gain a foundational understanding of coding principles, logical sequencing, and algorithmic thinking. The goal is to foster creativity, enhance critical thinking, and provide students with the skills needed to navigate an increasingly technology-driven world [17].

The first key activity in this unit is an introduction to block-based coding using Scratch Jr., a beginner-friendly programming environment designed specifically for young learners. Scratch Jr. enables students to create their own interactive stories and animations by assembling visual coding blocks [18]. Instead of writing complex code, students use a drag-and-drop interface where they piece together blocks that control movement, sounds, and interactions. This approach eliminates the intimidation factor of text-based coding and allows children to focus on problem-solving, sequencing, and creativity. Through guided lessons, students will learn how to make a character move across the screen, animate objects, and respond to different commands [19]. For instance, they may create a simple story where a cat follows a path or a character jumps when tapped. This activity introduces fundamental coding concepts such as loops, conditionals, and events while encouraging experimentation and exploration in a low-risk environment [20].

The second key activity involves programming Bee-Bots to navigate a maze, reinforcing students' understanding of sequencing and directional commands. Bee-Bots are small, programmable robots designed to help young children grasp basic coding principles through hands-on play. Students will work in teams to plan a route for their Bee-Bot, using arrow buttons to program a sequence of movements that guide the robot through a maze or toward a specific target. This activity promotes computational thinking by requiring students to break problems into smaller steps, debug errors in their commands, and refine their sequences to achieve the desired outcome [21]. It also strengthens spatial awareness, as students must consider direction, angles, and distances when programming their Bee-Bots. By engaging in trial and error, students develop perseverance and problem-solving skills, which are crucial for computational thinking and real-world problem-solving [22].

Another key activity in this unit is storytelling through animated coding projects. Using Scratch Jr. or Blockly, students will create their own digital stories by programming characters to move, speak, and interact. This activity combines literacy with coding, allowing students to design narratives while practicing logical sequencing and creative expression. For example, they might create a short story about an astronaut exploring space, a jungle adventure with animated animals, or a day in the life of a robot. As students construct their stories, they will learn how to use event-driven programming, where characters respond to different triggers such as taps, messages, or interactions [23]. This process strengthens their ability to structure a coherent sequence of events, much like writing a traditional story but with the added element of coding. Through debugging and refining their animations, students enhance their ability to think critically and improve their logical reasoning skills [24].

The final key activity in this unit involves creating simple interactive games using beginner-friendly coding apps. Students will be introduced to game design principles, including character movement, scoring systems, and collision detection, through platforms like Scratch Jr. or Micro:bit. They will learn how to program basic game mechanics such as making a character jump when a button is pressed, collecting objects for points, or moving a character through obstacles. For example, a student may design a game where a fish collects coins in the ocean or a spaceship avoids asteroids [25]. By developing their own games, students gain a deeper understanding of problem-solving, logic, and user interaction. This hands-on approach also encourages perseverance, as students must test their games, identify errors, and iteratively refine their designs to create a functional and enjoyable experience. Through this process, they gain confidence in their ability to code and innovate, which can inspire further interest in STEM fields [26].

Integrating coding and computational thinking into primary education is essential for preparing students for the future. These activities not only introduce the fundamentals of programming but also promote logical thinking, creativity, collaboration, and resilience. By working with coding tools such as Scratch Jr., Blockly, Bee-Bots, and Micro:bit, students engage in interactive and meaningful learning experiences that make coding accessible and enjoyable. Furthermore, coding enhances problem-solving abilities across subjects, helping students approach challenges with a structured and analytical mindset. By the end of this unit, students will have developed a foundational understanding of coding concepts, gained hands-on experience with programming tools, and built confidence in their ability to create and innovate with technology [27].

**COLLABORATIVE LEARNING & DIGITAL CREATIVITY**

Collaborative learning and digital creativity play a crucial role in modern education, helping students develop essential teamwork, communication, and problem-solving skills. This unit aims to foster collaboration and creativity using digital tools that allow students to work together, share ideas, and co-create content in an interactive and engaging manner. By integrating technology into learning experiences, students can participate in meaningful group activities that encourage cooperation, critical thinking, and innovative expression [28]. The key technologies used in this unit include Google Workspace for Education, Canva for Kids, Microsoft OneNote, and Padlet. These platforms provide a range of functionalities that support digital collaboration, visual creativity, and interactive learning. Through hands-on activities, students will enhance their ability to work with peers, develop digital literacy, and express their creativity using modern technological tools [29].

The first key activity in this unit focuses on group storytelling and presentations using digital whiteboards. Digital whiteboards, such as Jamboard and Microsoft Whiteboard, allow multiple students to collaborate on a shared canvas in real-time, contributing ideas, adding images, and organizing content visually [30]. This activity begins with students working in groups to create a collaborative story, where each student contributes a section of the narrative using text, drawings, or multimedia elements. By structuring their story collaboratively, students learn to build upon each other’s ideas, practice sequencing, and refine their storytelling skills. Once the story is complete, students present their work to the class using a digital slideshow or interactive whiteboard, practicing their public speaking and communication skills. This activity not only enhances literacy and storytelling abilities but also reinforces teamwork and the ability to integrate digital tools into creative expression [31].

The second key activity involves creating collaborative mind maps for brainstorming ideas. Using digital platforms such as Padlet or OneNote, students will work together to organize their thoughts visually and explore topics in a structured manner. Mind maps are an effective way to break down complex subjects, helping students connect different concepts and build a deeper understanding of the material [32]. For example, in a history lesson, students may create a mind map that outlines key events leading to a historical milestone, linking important figures, causes, and effects. In a science class, students may use a collaborative mind map to explore ecosystems, illustrating relationships between plants, animals, and environmental factors. By working in groups, students practice communication and idea-sharing while refining their critical thinking skills. This activity encourages active participation, allowing each student to contribute unique insights while developing a sense of ownership over their learning process.

The third key activity centers around creating digital posters and e-books using design apps such as Canva for Kids and Book Creator . These applications provide easy-to-use tools that allow students to design visually appealing materials, incorporating text, images, colors, and graphics. In this activity, students will work in pairs or small groups to design digital posters that illustrate concepts from their curriculum. For instance, students learning about environmental conservation may create a poster advocating for recycling and sustainability, combining persuasive writing with engaging visuals. Similarly, students studying literature may collaborate on an e-book that summarizes a novel, includes character analyses, and features illustrations created by the group. Through this creative process, students develop digital design skills while reinforcing their understanding of the subject matter. Additionally, by working together on a shared project, they strengthen collaboration, problem-solving, and decision-making abilities, learning to divide tasks effectively and contribute collectively to a polished final product [33].

The final key activity in this unit involves real-time class discussions through interactive digital forums. Online discussion platforms such as Google Classroom, Padlet, or Microsoft Teams enable students to engage in meaningful conversations, share perspectives, and participate in collaborative learning beyond the physical classroom. This activity begins with the teacher posing an open-ended question related to the lesson, prompting students to respond in the discussion forum. For example, in a social studies lesson, students might discuss different cultural traditions around the world, sharing images, videos, and personal experiences in an interactive thread. In a science class, students may debate the impact of climate change, supporting their arguments with research and multimedia resources. Through these discussions, students develop critical thinking and communication skills while engaging in respectful and constructive dialogue with their peers. The asynchronous nature of digital discussions also allows students to reflect on their responses, consider multiple viewpoints, and contribute thoughtful insights at their own pace [34].

Integrating collaborative learning and digital creativity into education empowers students to become active participants in their learning journey. By using tools such as Google Workspace for Education, Canva for Kids, Microsoft OneNote, and Padlet, students gain valuable experience in working together, thinking creatively, and utilizing digital platforms for academic and creative purposes. These activities not only enhance subject comprehension but also prepare students for future academic and professional settings, where collaboration and digital literacy are essential skills. Furthermore, fostering creativity in a digital space allows students to express themselves in unique ways, developing confidence in their ideas and contributions. By the end of this unit, students will have gained experience in group collaboration, storytelling, brainstorming, digital design, and interactive discussions, equipping them with the skills needed to thrive in an increasingly digital and interconnected world [35].

**STEM & ROBOTICS IN HANDS-ON LEARNING**

STEM education, which encompasses science, technology, engineering, and mathematics, plays a crucial role in preparing students for the rapidly evolving digital world. The integration of robotics and hands-on experimentation allows students to develop problem-solving skills, critical thinking abilities, and creativity in a highly engaging and interactive environment. This unit aims to provide students with foundational knowledge of STEM concepts through hands-on activities using robotics and digital design tools such as LEGO WeDo, Sphero robots, 3D printing, and Tinkercad. By engaging in these activities, students will not only enhance their understanding of scientific and mathematical principles but also develop computational thinking and engineering design skills that are essential for future learning and careers [36].

The first key activity in this unit involves building and programming LEGO WeDo robots, which introduces students to basic robotics and engineering concepts. LEGO WeDo is a beginner-friendly robotics kit that allows students to construct simple machines and program them using a visual coding interface. In this activity, students will work collaboratively in teams to build a robot that performs specific tasks, such as lifting objects, navigating a course, or responding to sensory inputs [40]. They will explore key engineering principles such as stability, balance, and mechanical movement while programming their robot to execute commands using block-based coding. By engaging in this hands-on experience, students develop computational thinking skills as they break down problems, debug errors in their code, and iteratively refine their designs to improve their robot's functionality. This activity not only enhances problem-solving abilities but also fosters teamwork, creativity, and perseverance as students experiment with different design solutions [37].

The second key activity focuses on learning basic physics through motion experiments with Sphero robots. Sphero is a programmable robotic ball that enables students to explore concepts such as speed, acceleration, force, and friction in an interactive and engaging manner. In this activity, students will conduct physics experiments by programming their Sphero robots to move at different speeds, travel specific distances, or navigate obstacle courses. By adjusting variables such as speed and angle, students will observe real-world applications of Newton's laws of motion and gain a deeper understanding of cause-and-effect relationships [38]. For instance, they may investigate how increasing force affects acceleration or how different surfaces impact friction and movement. Through these hands-on experiments, students will not only grasp fundamental physics concepts but also develop their ability to hypothesize, test, and analyze data in a scientific manner. Additionally, they will enhance their coding skills as they use programming commands to control their Sphero robots and modify their movement patterns based on experimental observations [39].

Another key activity in this unit involves creating simple 3D models for printing using Tinkercad. Tinkercad is a user-friendly online design tool that allows students to create digital 3D models that can be printed using a 3D printer. In this activity, students will be introduced to basic principles of 3D modeling, including shape manipulation, scaling, and spatial reasoning [40]. They will be given a design challenge, such as creating a miniature bridge, designing a keychain, or modeling a simple house. By engaging in this process, students develop an understanding of geometric principles, symmetry, and proportion while enhancing their digital design skills. Once their models are complete, they will have the opportunity to print their creations using a 3D printer, allowing them to see their digital designs come to life in physical form [41]. This hands-on approach not only reinforces STEM concepts but also fosters creativity and innovation as students explore the possibilities of digital fabrication and prototyping.

The final key activity in this unit involves engaging in STEM challenges that require students to apply real-world problem-solving skills [42]. These challenges encourage students to think critically, collaborate with peers, and apply their knowledge of robotics, engineering, and coding to solve practical problems. For example, students may be tasked with designing a robotic arm to pick up and move objects, programming a Sphero robot to simulate a Mars rover navigating rough terrain, or building a bridge using limited materials that can support a certain weight. These challenges encourage students to experiment, iterate, and refine their designs based on testing and feedback [43]. Through this process, they develop essential engineering skills such as prototyping, troubleshooting, and optimizing solutions. Additionally, these activities cultivate resilience and perseverance, as students learn that failure is a valuable part of the learning process and that innovation often requires multiple iterations and adjustments [44].

By integrating STEM learning with robotics and hands-on experimentation, this unit provides students with a rich and immersive educational experience that builds foundational skills in technology, engineering, and mathematics. The use of LEGO WeDo, Sphero robots, 3D printing, and Tinkercad allows students to engage with STEM concepts in a tangible and meaningful way, fostering both creativity and analytical thinking. Moreover, these activities promote teamwork and collaboration, as students work together to solve problems, share ideas, and develop innovative solutions. By the end of this unit, students will have gained valuable experience in robotics, coding, digital design, and engineering challenges, equipping them with the skills and confidence to tackle future STEM learning opportunities. This unit not only reinforces core academic concepts but also inspires curiosity and enthusiasm for STEM fields, encouraging students to explore careers and opportunities in science, technology, engineering, and mathematics in the future [40].

**CONCLUSIONS**

The integration of new technologies in primary education significantly enhances student engagement, comprehension, and skill development. By incorporating digital literacy and internet safety, students acquire foundational skills that enable them to navigate the online world responsibly. These skills are crucial in protecting students from potential risks while fostering responsible digital citizenship. The use of interactive learning through augmented reality (AR) and virtual reality (VR) further enriches the educational experience, allowing students to visualize complex concepts in a dynamic and immersive manner. By engaging with 3D models, virtual field trips, and interactive storytelling, students develop a deeper understanding of subject matter that goes beyond traditional classroom instruction.

The introduction of coding and computational thinking equips students with problem-solving skills and logical reasoning, preparing them for future careers in technology-driven fields. Through hands-on activities using Scratch Jr., Blockly, Bee-Bots, and Micro:bit, students gain an early foundation in programming concepts, fostering creativity and computational thinking. The emphasis on collaborative learning and digital creativity enables students to develop teamwork, communication, and digital literacy skills. By utilizing tools such as Google Workspace for Education, Canva for Kids, Microsoft OneNote, and Padlet, students engage in meaningful group projects that promote cooperative problem-solving and innovative expression. These digital platforms provide students with opportunities to explore creativity, create digital content, and share their ideas in interactive ways.

STEM education and robotics further enhance learning by incorporating real-world problem-solving and hands-on experimentation. The use of LEGO WeDo, Sphero robots, 3D printing, and Tinkercad allows students to engage with engineering and scientific concepts in a practical and engaging manner. Through activities such as building robots, conducting physics experiments, and designing 3D models, students not only strengthen their understanding of STEM principles but also develop critical thinking, innovation, and adaptability. The problem-solving challenges within STEM-based learning encourage students to experiment, analyze data, and refine their designs, reinforcing the iterative nature of the engineering and scientific process.

Overall, the use of new technologies in primary education promotes active learning, digital literacy, and 21st-century skills essential for students' academic and personal growth. These technological advancements provide educators with innovative tools to create more inclusive, engaging, and effective learning environments. By integrating technology across various subjects, primary education can better prepare students for the future, equipping them with the skills necessary to thrive in an increasingly digital and interconnected world. As education continues to evolve, the effective implementation of technology will play a pivotal role in shaping student learning experiences, fostering creativity, and preparing young learners for the challenges and opportunities of the future.

**COMPETING INTERESTS DISCLAIMER:**

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

**Disclaimer (Artificial intelligence)**

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Details of the AI usage are given below:

1. language improvement

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