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Exploring the Role of Mobile Learning Technologies in Enhancing Educational Access and Equity in Rural Nigeria

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ABSTRACT

This study explores the revolutionary potential of mobile learning technologies to improve educational access and equity in rural Nigeria. Despite national commitments to inclusive education, rural communities continue to struggle with systemic issues like socioeconomic inequities, teacher shortages, and insufficient infrastructure. Utilizing devices such smartphones and tablets to provide curriculum-aligned material, mobile learning provides a scalable and flexible way to address these disparities. This study examines how mobile learning tackles challenges related to language diversity, gender, disability, distance, and expense, drawing on empirical data from 2022 to 2025 and current research. The research highlights significant obstacles such restricted internet connectivity, expensive data prices, inadequate power supply, and poor digital literacy among rural consumers. It also emphasizes policy and implementation deficiencies that impede widespread acceptance. The paper concludes by providing realistic policy proposals for enhancing mobile learning integration via device subsidies, local content creation, digital pedagogy training, and community involvement. In conclusion, the study demonstrates that mobile learning may be a driving force behind fair educational change in rural Nigeria if combined with targeted investment and inclusive legislation.

Keywords: Mobile learning, educational equity, rural education, Nigeria, ICT in education, inclusive learning, digital divide

1. Introduction

Quality education in Nigeria still reflects significant geographical and socioeconomic inequalities. Rural regions continue to be underserved, even though urban centers have comparatively superior schools and learning resources. Many rural communities have a lack of competent teachers, classrooms are overcrowded, and schools are few and far between. These circumstances make it challenging for students to get a regular education, which puts them at a disadvantage when compared to their urban counterparts.

These inequities may be addressed with the use of mobile learning technology. The widespread use of mobile phones throughout Nigeria, even in rural areas, makes using these devices for educational purposes a viable and scalable option. According to a study by Adewole and Igwe (2023), Nigeria's mobile penetration is expanding gradually, and mobile-based platforms are increasingly used for instruction.

The integration of mobile learning in rural communities is consistent with Nigeria's national objectives for inclusive education and digital literacy. The Federal Ministry of Education highlights the necessity of incorporating digital technologies in order to reach students in rural areas as part of its Strategic Plan for the Education Sector for the years 2021–2025. This vision places a strong emphasis on mobile learning.

In addition to access issues, rural communities encounter problems with low retention and high dropout rates. Due to a lack of opportunities or financial circumstances, children in isolated locations are frequently withdrawn from school. This issue can be resolved by mobile learning, which offers ongoing interaction through games, films, and quizzes.

The flexibility of mobile devices also allows instructors and students to work beyond typical school hours. A significant benefit in farming towns, where children's schedules are dictated by agricultural cycles, is that learning is no longer restricted to school buildings or schedules. Apps like uLesson and EduTab provide flexible scheduling that fits the needs of rural living.

In addition, educational information is made more accessible via mobile learning. It encourages independent learning, particularly for students who have little access to instructors or textbooks. Students may now learn at their own speed thanks to the growing availability of audio instructions, digital textbooks, and interactive classes on mobile devices.

Community-level educational initiatives have yielded encouraging outcomes. For instance, mobile learning pilot projects in Oyo and Taraba states have reported higher student attendance and engagement as a result of the novelty and accessibility of digital learning platforms (Nwankwo & Adebayo, 2024). Additionally, these resources have helped parents and caregivers become more engaged in their children's education.

The main focus of mobile learning is inclusion. It can help break through linguistic, gender, and disability barriers if used wisely. Apps can include features like subtitles and text-to-speech and provide material in a variety of Nigerian languages. These are essential for students in various rural towns.

Despite the upbeat outlook, acceptance continues to be uneven. The widespread use of mobile learning is still hampered by financial restrictions, skepticism, and a lack of digital infrastructure. In this way, this study attempts to critically but optimistically examine how mobile learning may promote educational fairness in rural Nigeria.

The paper is organized to start by defining mobile learning technologies, then analyze their functions in promoting access and equity, pinpoint obstacles, and propose strategic strategies for increasing their efficacy in delivering rural education.

2. Concept of Mobile Learning Technologies

Any portable digital device that supports learning outside the classroom is referred to as a mobile learning technology. This list includes tablets, ereaders, smartphones, feature phones, and even rudimentary SMS-based services. The portability and asynchronous delivery of content, which enables students to learn at their own pace, are the main characteristics of these technologies (Okonkwo & Musa, 2022).

The notion of universal access to education forms the basis of mobile learning (mlearning). By delivering on-demand information, it overcomes the spatial and temporal restrictions of conventional education. With a mobile device, students in rural regions who may have long commutes to school or experience school closures due to weather or insecurity can continue learning from home. Both formal and informal learning environments benefit from this versatility.

In Nigeria, there are a number of platforms that facilitate mobile learning. Curriculum-aligned classes in video and audio formats are available through apps like Roducate and uLesson. Some also offer peer discussions, quizzes, and live comments. These platforms have customized their content to suit regional curricula and local languages, which helps students better relate to the subject matter. Education becomes more engaging and meaningful through interactive learning.

Mobile learning technologies aid teachers in addition to students. They can interact with parents and students, provide instruction, and share resources using platforms like WhatsApp and TeachMint. With only a few resources and little supervision, instructors may use these technologies to be more productive. Additionally, they promote ongoing professional growth.

SMS and IVR (interactive voice response) technologies are used to contact students who do not have internet-capable devices, in addition to smartphone applications. These low-tech remedies are essential in low-income or very isolated places where data access and smartphones are uncommon. In prior rural outreach initiatives, UNICEF and GIZ employed these technologies to provide basic literacy and numeracy instruction.

The capacity of mobile learning to customize content is one of its most useful features. Students may choose courses that match their grade level, speed of comprehension, and linguistic choice. In multicultural, multilingual environments like rural Nigeria, where classrooms frequently include pupils of different ages or those with specific needs, this level of personalization is essential.

Technologies for mobile learning are available both online and offline. Several learning platforms provide preloaded SD cards or downloadable courses, allowing students to keep learning even when they are not online. In places like rural Nigeria where network service is bad or inconsistent, offline availability is crucial.

Furthermore, mobile learning accommodates a variety of formats video, audio, text, and interactive games that appeal to a range of learning styles. It benefits visual, auditory, and kinesthetic learners alike. Students with low literacy can learn from voice-based instructions, while others might prefer reading or viewing movies.

From a pedagogical perspective, mobile learning fosters active participation. Students engage with material by clicking, answering questions, and using feedback loops, rather than just passively listening. This interaction promotes greater comprehension and retention. Additionally, instructors benefit from real-time data that reveals student performance.

3. Educational Access and Equity in Rural Nigeria

Several socioeconomic and structural variables impede rural Nigeria's access to education. Frequently, schools in distant areas do not have essential facilities like classrooms, power, water, and restrooms. A lot of them operate in run-down buildings or under trees, which makes the learning environment hazardous and unpleasant. These circumstances make attendance less appealing, especially for girls and youngsters with disabilities.

The distribution of teachers is also quite unbalanced. The availability of housing, amenities, and professional networks in cities makes urban schools more likely to draw teachers who are both skilled and well-trained. In contrast, rural schools frequently depend on volunteer teachers who are not qualified or have a persistent lack of staff. Students in rural regions are academically behind due to a lack of high-quality education, which makes inequity worse.

Additionally, children in rural areas are less likely to attend school regularly due to increased poverty rates. Particularly during harvest times, many people are predicted to help with domestic tasks or farm work. Particularly for older youngsters and girls who may also be under pressure to marry early, the opportunity cost of attending school becomes a hurdle (UNESCO, 2023).

In rural Nigeria, there are significant gender inequalities. The educational needs of boys are frequently given priority over those of girls due to cultural standards, religious views, and financial limitations. In many northern towns, girls are either withdrawn from school early or never enrolled at all. By providing girls with a private, at-home learning environment, mobile learning can help bridge this gender divide.

Children with disabilities are further marginalized. The majority of rural schools do not have inclusive amenities like ramps, special education teachers, or adaptive learning resources. Alternative ways for these students to engage with education on their own terms are provided by mobile learning apps that include accessibility tools like text-to-speech, configurable fonts, and audio instructions.

There are also obstacles to access education in terms of curriculum and language. School lessons are frequently given in English, but many youngsters exclusively use native tongues. This gap can be bridged and more inclusive learning can be fostered by mobile learning platforms that support local languages and culturally relevant content.

The problem of transportation is another. Children in many towns must walk many kilometers to get to the closest school, which may put them in danger physically and in terms of their safety. By minimizing the requirement for regular commute, mobile learning helps to lessen this. Lessons are available at home or at community centers that have shared gadgets.

The perception that education does not result in economic progress is one of the reasons for the high dropout rates in rural Nigeria. This narrative can be altered by mobile learning platforms that integrate digital literacy, vocational skills, and entrepreneurship education, since they demonstrate real results and foster motivation.

Access is also influenced by parental literacy levels and attitudes. There might be less encouragement for education in homes where the parents are not well educated. By offering straightforward interfaces and parent-friendly capabilities, mobile learning may nonetheless foster family participation. On several platforms, parents may monitor their children's development.

In general, mobile learning technologies provide a strategic chance to interrupt the cycle of exclusion and underachievement in rural education. These technologies can advance a more inclusive and equitable education system in Nigeria by tackling the many obstacles to access and equity.

4. Role of Mobile Learning in Enhancing Educational Access

By delivering education regardless of location or time limits, mobile learning technologies play a crucial role in increasing educational access in rural Nigeria. Due to inadequate infrastructure, teacher shortages, or local emergencies, formal education is disrupted in many rural locations. In such circumstances, mobile platforms offer continuity, enabling pupils to keep studying at home or in group environments even when schools are closed (Yusuf & Ibrahim, 2024).

Reaching learners who have never been reached before is one of the major advantages of mobile learning. For instance, audio-based mobile apps can deliver fundamental literacy and numeracy classes to out-of-school children in isolated populations. In an effort to entice youngsters back into the learning environment, some programs, like the uLesson platform, have developed content specifically designed for these situations. These sites frequently provide visual, auditory, and interactive choices, which enhance accessibility even for students with impairments.

In addition, mobile learning solves the problem of a lack of physical learning resources in rural schools. Many rural learners do not have access to textbooks, workbooks, or even basic writing supplies. Students may download or stream textbooks, movies, prior exam papers, and interactive activities via their mobile devices. The playing field with their urban counterparts is leveled by this democratization of content.

Furthermore, mobile learning facilitates asynchronous and adaptable learning. In rural areas, in particular, it's advantageous for students to be able to learn whenever it works with their daily schedules rather than being constrained by school schedules. For example, if content is accessible offline, a youngster who is assisting on the farm throughout the day may nevertheless use a mobile device to continue their education in the evening.

Regarding scalability, mobile learning technologies can accommodate a large number of students without requiring corresponding increases in physical facilities. Thousands of students all over the nation may receive a single application.

Pilot project data back the effectiveness of mobile learning in increasing access. After three months of receiving audio-visual instruction, students in mobile learning programs in Niger and Gombe states showed improved retention and test scores. Even in places where school attendance has historically been poor, the accessibility and interactive character of digital material has helped maintain student interest.

Additionally, mobile technologies support peer-to-peer and student-teacher engagement via capabilities such as chat, forums, and online classrooms. By mimicking classroom experiences and alleviating the sense of loneliness that is typical in rural distance learning environments, these interactions help. Additionally, they enable instructors to track students' progress and offer feedback from a distance.

Many mobile learning initiatives also include parental involvement tools that let parents monitor their children's development and help them with their learning. This is especially crucial in areas where parents may not be literate themselves yet want to encourage their children's schooling. By providing translated instructions, learning reminders, and short message alerts, parents are able to participate in their children's education.

The effectiveness of mobile learning has been acknowledged by NGOs and government organizations, who are now incorporating it into larger educational programs. Mobile learning is listed as a crucial component of inclusive education in the National Digital Literacy Framework, which was

established in 2023. In a similar vein, programs like LearnAnywhere Nigeria that are funded by donors are experimenting with solar-powered mobile hubs in far-off locations.

5. Promoting Educational Equity through Mobile Technologies

Equity in education is not just about access; it's about making sure that every student, regardless of their background, gets what they need to succeed. By catering to the diverse needs of marginalized groups, mobile learning technologies may be instrumental in advancing educational equality in rural Nigeria. Many mobile applications, for instance, currently offer adaptive learning pathways that enable students to learn at their own speed, which is essential for pupils who might be lagging behind in reading or arithmetic skills (Chukwuemeka & Bello, 2023).

Mobile learning is quite beneficial for girls, who are frequently at a disadvantage in education in rural Nigeria due to societal expectations and family duties. Even if girls cannot attend school on a regular basis, mobile-based platforms provide a flexible and secure method for them to continue their education. Several platforms also offer gender-specific material, such as lessons on reproductive health and rights, which can help girls stand up for their education.

Additionally, mobile learning advances equity for students with impairments. More and more educational programs include audio tutorials, voice-guided instructions, and big print or sign language translations. Due to a lack of inclusive facilities, these characteristics assist learners who might otherwise be excluded from regular classrooms. Such tools promote greater involvement, performance, and educational aspirations among these pupils.

Additionally, language diversity contributes to fairness in education. Although indigenous languages are used in many rural communities, English is frequently the language of instruction in the classroom. This gap can be bridged by mobile learning apps that offer multilingual choices, enabling students to learn in their native languages while progressively moving toward English. This linguistic adaptability enhances understanding and memory.

In addition, mobile learning can aid in bridging the digital divide by introducing rural students to technology at a young age. In contrast to urban students, who are typically tech-savvy, rural pupils are behind since they have less resources. Rural students gain digital skills that are necessary for academic and professional success in the twenty-first century through the integration of mobile learning.

Differences in socioeconomic status also restrict access to private tutors and enrichment programs. By providing free or inexpensive educational resources to students who cannot afford additional classes, mobile learning platforms can help level the playing field. Additionally, interactive quizzes and gamified learning can help captivate pupils who have trouble with conventional teaching methods.

By enhancing the quality of instruction in under resourced locations, teacher support systems integrated into mobile learning platforms promote equity. Apps that include automated grading tools, instructional videos, and lesson plans lessen the strain on educators and aid in standardizing instruction across schools.

Community learning hubs with internet connection and mobile devices have become inclusive environments where all children may learn together, irrespective of their gender, background, or aptitude. These centers, which are frequently backed by philanthropists or NGOs, encourage social integration and equitable education by providing shared learning opportunities.

Additionally, equity is supported by datadriven insights from mobile learning platforms. Administrators may use data to pinpoint students who are having difficulties and provide the necessary resources or support services. By helping to identify trends of underachievement and dropout risks, analytics enable prompt interventions.

At its core, mobile learning is not merely a means of increasing access; rather, it is a mechanism for restructuring education delivery in a way that emphasizes equity and inclusion. By implementing the correct policies and engaging the community, mobile learning technologies have the potential to revolutionize Nigeria's educational system so that it serves all students fairly and effectively.

6. Challenges of Mobile Learning in Rural Nigeria

In spite of the great promise that mobile learning technologies have for enhancing educational results in rural Nigeria, their adoption is hindered by a number of major obstacles. A lack of internet access is one of the most enduring challenges. Many rural communities have poor mobile network coverage or no broadband infrastructure. Learners find it difficult to download materials, stream lessons, or engage in live sessions without a reliable internet connection (Iheanacho & Adebanjo, 2022).

Additionally, the usage of mobile learning platforms is restricted by the high cost of data. The price of internet subscriptions can be too high for households below the poverty line, even with network access. Sometimes, parents have to make the decision between buying mobile data and providing for their family's fundamental requirements, such as food and shelter. Students' interaction with digital content is less frequent and less intense due to this financial obstacle.

Another significant barrier is the absence of access to mobile phones. In rural Nigeria, not every student owns a smartphone or tablet, and in many households, devices are shared by several family members. Furthermore, in some cases, parents who work long hours own the devices, which means that children have little or no access to them throughout the day. The digital divide continues to be a structural impediment to fair mlearning adoption.

One of the most pressing infrastructural issues is the provision of power. Even those who are connected to the national electricity grid experience regular outages, and many rural areas lack a dependable power grid. Because it is now harder to charge devices every day, students are frequently forced to rely on pricey generators or travel great distances to get to charging stations. As a result, the regularity of mobile learning is impacted, and prolonged use is discouraged.

The efficiency of mobile learning is further hampered by low digital literacy among teachers and students. Students are less likely to take advantage of mobile learning tools if they are unfamiliar with using apps, downloading content, or fixing technical problems. Similarly, teachers who lack fundamental ICT skills may struggle to teach classes or offer technical help, which lowers the overall quality of instruction.

Additionally, there isn't enough content that is specific to the area. Although some platforms like uLesson and Roducate have made significant progress in creating material that is specific to Nigeria, many mobile learning applications still employ a methodology that is either too generic or too foreign. This discrepancy between national curricula and linguistic preferences makes it harder for students to participate and understand. Furthermore, because there are no mother tongue instructions, students in linguistically varied communities frequently find it difficult to access material.

Some rural communities continue to have a cultural resistance to technology. Mobile devices may be perceived as distractions rather than educational tools by parents, community officials, and even instructors. Some carers are hesitant to let their kids utilize mobile devices for educational reasons due to worries about screen time, internet exposure, and perceived moral corruption.

Mobile learning adoption also exhibits gender-based inequities. Boys in many rural homes may be given greater independence and priority in using digital devices, while girls may be restricted or assigned household duties as a result of conservative values. This exacerbates existing gender disparities in education and leads to inequitable learning opportunities.

In some areas, mobile learning is further impacted by security issues. Due to insecurity, which includes banditry and insurgency in Northern Nigeria, mobility is limited, and there are conditions where students cannot safely congregate to use shared digital resources. Learners are further cut off from support networks because teachers and facilitators are frequently reluctant to work in such locations.

Lastly, there are still institutional and policy gaps. The government has attempted to support digital education, but there is still no all-encompassing national plan that only addresses mobile learning in rural regions. There is frequently a lack of coordination between ministries, NGOs, and private tech businesses, which results in duplication of efforts and restricted scalability. Pilot initiatives frequently fail to have a lasting effect if they are not supported by solid policies.

To sum up, these obstacles must be overcome via community sensitization, inclusive content development, infrastructure development, and coordinated policy action, even if mobile learning has the potential to be transformative. Only then will mobile learning in rural Nigeria be able to deliver on its promise of equitable education.

7. Policy Implications and Recommendations

The successful integration of mobile learning technologies into Nigeria's rural education system depends heavily on effective policy formulation, implementation, and monitoring. National and state-level governments must prioritize digital education policies that specifically address the needs of rural and underserved populations. Such policies should not only promote mobile learning but also address the structural barriers that inhibit its growth, including connectivity, affordability, and training.

One of the most immediate policy recommendations is the expansion of rural digital infrastructure, including broadband internet, mobile network towers, and community-based learning centers equipped with solar energy. Government collaboration with telecommunications companies can incentivize service providers to expand coverage in remote areas, potentially through tax breaks or infrastructure-sharing agreements. This infrastructure is foundational to any mobile learning initiative.

Device accessibility must also be addressed at the policy level. The government and development partners should introduce programs that provide low-cost or subsidized smartphones and tablets to students and teachers in rural communities. Partnerships with mobile device manufacturers can facilitate mass procurement and distribution of durable, education-focused devices tailored to low-bandwidth environments.

Data affordability is another critical concern. Policies that support zero-rated educational websites or discounted data bundles for students and teachers can significantly increase mobile learning adoption. Collaborations between the Nigerian Communications Commission (NCC) and mobile network operators can help structure such policies. This model has been successful in other African countries, and with strong political will, can be replicated in Nigeria.

A **national curriculum-aligned mobile learning framework** is essential. Many current apps and platforms either use foreign syllabi or offer fragmented content. The Nigerian Educational Research and Development Council (NERDC) should collaborate with local EdTech firms to develop and standardize mobile learning content across primary and secondary levels, ensuring alignment with national learning outcomes.

Teacher training and digital pedagogy must be institutionalized in pre-service and in-service teacher education. The National Teachers' Institute (NTI) and Colleges of Education should include compulsory ICT and mobile learning modules in their curricula. Continuous professional development through mobile platforms can further enhance teacher engagement and capacity.

Gender-responsive mobile learning policies should be enacted to ensure equitable access for girls. This includes culturally appropriate messaging to communities, the promotion of safe digital spaces for girls, and deliberate inclusion of girls in device distribution schemes. Monitoring frameworks should track gender equity indicators in mobile learning adoption and performance.

Inclusive design should be a legal requirement for all educational technology solutions funded or approved by the government. This means that platforms must be accessible to learners with disabilities and should support multilingual content. Policies should mandate user testing in rural settings to ensure usability and relevance before wide-scale rollout.

Community engagement and sensitization campaigns are also vital. Local leaders, parents, and teachers must be informed about the benefits and safe use of mobile learning tools. Government agencies should partner with local radio stations, religious groups, and traditional councils to build trust and dispel misconceptions about mobile education.

Monitoring and evaluation (M&E) policies must accompany every mobile learning intervention. Standard indicators for access, usage, performance, and satisfaction should be developed and tracked across states. Independent reviews and feedback mechanisms will help refine strategies and ensure accountability. Data collected from M&E should feed into policy reviews and resource allocation decisions.

Lastly, there is a need to establish a Mobile Learning Taskforce at the federal level, composed of education stakeholders, ICT experts, researchers, and civil society organizations. This taskforce would guide national strategy, coordinate donor interventions, and ensure synergy among stakeholders. With a clearly defined roadmap, mobile learning can move beyond isolated pilot projects into a sustainable, nationwide initiative.

8. Conclusion

Mobile learning technologies have proven to be a potent instrument that has the potential to revolutionize the educational environment in rural Nigeria. Because of their capacity to overcome geographic, economic, and infrastructure constraints, they are a desirable option for increasing educational access and equity. Mobile learning provides a flexible, scalable, and inclusive option in circumstances where conventional classroom models fail, particularly in rural and underserved communities.

This study demonstrates that mobile learning is not just a short-term solution but a long-term educational approach that may be adapted to the circumstances of rural students. Mobile learning has already proven effective in enhancing learning outcomes, boosting student involvement, and promoting lifelong learning. Students may learn at their own speed, in their own language, and on their own time, thanks to its mobility and flexibility.

Equity entails making sure that every student gets the resources they need to succeed, regardless of their gender, talent, or geographic location, not just giving everyone the same resources. This is made possible by mobile learning technologies, which offer individualized and readily available information. In Nigeria's quest for education for all, special attention is paid to gender inequalities, disabilities, and linguistic diversity to make sure that marginalized populations are not overlooked.

Nonetheless, there are difficulties associated with incorporating mobile learning. This article has highlighted major challenges such as inadequate digital infrastructure, expensive data prices, a lack of devices, low digital literacy, and cultural opposition. The benefits of mobile learning will be restricted if these challenges are not overcome, and rural students will still be at an educational disadvantage. As a result, it's critical that all parties involved in the implementation of mobile learning adopt a comprehensive and collaborative strategy.

Generic appeals for digital inclusion are insufficient as policy solutions. A national plan that addresses the specific requirements of rural communities is what is needed. The government and its partners must commit to investing in the infrastructure and capacity of mobile learning over the long term, from providing subsidies for devices to creating curriculum-aligned content, and from training teachers to increasing network coverage.

The significance of public-private partnerships is also highlighted in this piece. Improving rural education is in the interest of community leaders, telecom carriers, NGOs, and EdTech enterprises. These performers may share knowledge, combine resources, and experiment with context-specific remedies by collaborating. By financing evidence-based, locally owned, scalable models, international groups and donor organizations may provide additional assistance.

The significance of community involvement is another crucial lesson. Without the backing of the people it intends to serve, no educational change can be successful. From the very beginning, parents, teachers, and students should be involved in planning, executing, and assessing. Training programs and culturally appropriate awareness campaigns can foster trust and promote the use of mobile learning technologies.

In the end, mobile learning should be viewed as a necessary component of Nigeria's overall plan for educational reform, not as a separate system. It enhances conventional education by providing novel avenues for learning skills, becoming digitally literate, and participating in society. Mobile learning in today's fast changing environment equips students for life, not just for tests.

It is impossible to overstate the necessity of prioritizing inclusive and creative solutions as Nigeria advances towards accomplishing the Sustainable Development Goals, notably Goal 4 on quality education. Mobile learning technologies, when properly managed and fairly implemented, provide one of the most promising ways to close the educational gap between rural and urban areas.

Ultimately, an investigation of the function of mobile learning in improving educational equity and access in rural Nigeria highlights both a great deal of promise and a great deal of responsibility. The challenge now is to translate concepts into action, promise into progress, and move from exploration to execution.

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