

Navigating the impact of AI on human creativity in language learning and teaching within Moroccan schools

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Abstract. In this paper, we are explaining how artificial intelligence (AI) is influencing creative aspects of language learning in Moroccan schools. The research aims to clarify how technologies that have lately been very common in learning environments, such as ChatGPT, DeepSeek, Grammarly, and other AI-driven platforms, affect the creative thinking of instructors and students. Using a qualitative research paradigm, we conducted in-depth interviews with 10 urban and 10 rural schools' teachers and students. The findings based on thematic analysis have shown that while learning and engagement are boosted, there are still concerns about discouraging independent thinking and creativity. The study also finds that there is a digital divide since there is limited connectivity and insufficient infrastructure for use in rural schools for accessing AI tools. as well as the paucity of Arabic content on sites dealing in AI is another constraint. Participants emphasize using AI as a tool and not as a substitute for human creativity. The research outlines some recommendations for tackling these issues, including enhancing technology infrastructure, expanding AI's linguistic capacities, and embracing balanced strategies for learning and implementing AI. It also suggests policies for equal access to AI-based tools while cultivating creativity. The research concludes by suggesting future research to study longer-term implications for learning and cultural aspects, imagination, and critical thinking.

1 Introduction

Artificial intelligence (AI) has had far-reaching implications in different spheres. In education as well, its potential to alter instructional processes is widely acknowledged. While the contribution of AI is typical in opening up opportunities for transformation, it is complex in nature when human creativity is involved. As application in learning practices is becoming universal in nature, there is a major query about how tools based on AI can be utilized in

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learning languages without losing learning practices in terms of being creative and innovative.

Learning is human in nature, involving not information alone but also creative thinking, awareness about culture, and adaptability as well. As we are witnessing increased use of artificial intelligence in learning languages, we are compelled to consider if human qualities can be nurtured or perhaps extended, or if tools can in some manner undermine them through automated learning processes. Researchers like Sternberg (2018) [1] underline the need for novel thinking in class. According to him, academic progress and problem-solving are rooted in it. Robert critiques schools as much for allotting precedence to memorization and multiple-choice testing as for discouraging uniqueness. On the other hand, he supports inculcating multiple modes of thinking in which multiple solutions are tried out rather than looking for one right alternative. According to his findings, creative thinking supports better critical thinking, motivation, and engagement and thereby academic performance. Some, like Bereiter and Scardamalia (2018) [2,3], alert us about constraints imposed upon innovative learning techniques by artificial intelligence. As much as artificial intelligence can be supportive in certain aspects of learning, they hold that technology supports structured, formula-based problem-solving, and this can be restrictive for students in exercising novel thought. Relying typically upon pattern recognition and predicting procedures, teacher-learner systems based upon AI can encourage efficiency at the cost of distinctiveness and discourage risk-taking.

The unique Moroccan learning context is a fertile background in which to explore these questions. The multilingualism of the nature of the Moroccan context with speakers of Moroccan Arabic, Amazigh, Tshalhit, and other dialects, as well as current issues in learning languages, provides a fertile field in which to consider how human creativity in learning languages is impacted by AI. As Moroccan schools continue to incorporate technology, learning about how AI is impacting student and teacher creativity is increasingly urgent for supporting effective strategies in learning a language.

This research is dedicated to studying the double impact of AI in Moroccan schools in English, French, and Arabic language learning, namely, if AI is a source for increased creativity or a hindrance to innovative thinking for learners and teachers. By consolidating findings in the literature and empirical findings in Moroccan classrooms, this research hopes to develop a balanced vision for best practices in learning languages using AI. The goal is to uncover strategies for achieving a harmonious fusion of the personalization and adaptability provided by AI and the need for preserving creative, human qualities required for rich learning experiences.

In a comprehensive review of recent research, complemented with empirical analysis and field research, this research endeavors to contribute towards the general discussion about learning and teaching and the use of AI. It endeavors to provide practical guidelines for policymakers and teachers about best practices in making use of the potential offered by AI while ensuring the intrinsic creative nature of good learning and good teaching. Ultimately, this research is targeted at offering insights for Moroccan schools—and for the broader learning and teaching society globally—to go beyond complexity in making use of AI in a way conducive to supporting technological advancement as well as key aspects of human creativity.

2 Literature Review

2.1 Human ingenuity and artificial intelligence in education

Use of artificial intelligence in educational environments raised important concerns about its influence on human creativity. Learning and studying a language mostly requires creativity and the capacity to think differently, come up with fresh ideas, and solve issues by means of novel techniques. Writers such as Sternberg (2018) have argued that developing capacity in this regard is much shaped by supporting creativity in the classroom. The influence of AI on language learning creative processes is still a complex issue.

Luckin et al. (2016) [4] discovered that experiences can enhance learning, accommodating diverse learning profiles by using AI. The technology of adaptive learning that is led by AI offers language learning that provides customized feedback and interactive learning experiences to each learner that can result in more creative uses of language. Bereiter and Scardamalia (2018) have concerns that using AI can result in a formulaic way of learning in which creative thinking can be stifled in favor of providing predictable results.

2.2 The Role of artificial intelligence in language learning and teaching: advantages and disadvantages

All individuals notice that artificial intelligence can revolutionize learning language-related operations. The work of Li and Wang (2020) [5,6] offers information on artificial intelligence-based systems utilized to learn a language like Duolingo that can be helpful in providing context-dependent and interactive lessons to learn a language. The software can offer instant feedback and allow personal performance in developing a simulated learning platform to learn a language and hence make it possible.

Dependence on artificial intelligence-based language learning systems does have some drawbacks nonetheless. Although they can provide effective, customized language instruction, they can make educators rely on automated content production at the expense of prioritizing creative preparation of lesson plans. Warschauer (2020) [7] notes that this deprives educators of opportunities to create innovative lesson plans and expose their learners to more richly culturally situated learning experiences.

2.3 Challenges and moral considerations in Ai-powered language learning

The application of AI technology in learning a foreign language also has issues and challenges. The concern is that of a digital divide, as cited by Selwyn (2019) [8], in terms of unequal access to technology by varying socio-economic classes of learners. The divide in technology access can be in terms of unequal acquisition of foreign language skills in some instances, like in Morocco, where potentially little technology is available.

Data privacy is a top concern. The application of big databases is due to AI systems delivering differentiated learning experiences, and security and application issues in appropriate ways of information of students do exist. Williamson (2017) [9] posits that misuse can offer unequal learning opportunities and sustain pre-existing learning differentials. It is important to resolve such ethical questions in making sure that AI technologies empower and do not strangle innovative learning in foreign languages.

2.4 AI's use in teaching languages in the Moroccan context

In Moroccan learning culture, foreign language learning is being highlighted as a possibility for improvement using AI, though research is still relatively limited. Bouhlila (2011) [10] and Boudarbat (2008) [11] identify recurring issues in Moroccan schools, for instance, lack of appropriate language training and resource constraints, and AI technology can potentially resolve them. El Amrani and Bensaid (2021) [12] suggest that AI can offer customized learning experiences meeting Moroccan learners' different linguistic needs, potentially resulting in innovative use of language.

But if AI-based learning is to succeed in Morocco, it should be implemented and integrated alongside traditional learning practices. A balanced approach based on blending human-guided learning and tools based on AI is necessary in a way to maintain cultural and contextual richness in learning while simultaneously enhancing creative capacities in students.

This study points to a dual reality about employing artificial intelligence to foster creativity in language acquisition. Artificial intelligence offers intriguing possibilities on the one hand—personalized and innovative tools to augment learning process representation. Artificial intelligence offers a legitimate point on the other hand that too great a dependence on it can suppress teacher creativity and make them more dependent on automated materials than on dynamic pedagogy by themselves. Contemplation on how to combine human creativity with artificial intelligence-based tools can make it possible to create a balance in which technology supports and not replaces the creative function of educators in classrooms.

In the case of Morocco, there is a requirement to study to determine how to make the best use of AI to complement and augment instead of replacing human learning in a manner that creative potential for teacher and learner can be maximized. A study of these practices will make it possible for us to leverage AI learning tools while still having the means to realize and maintain the human presence required for creative learning.

3 Methodology

3.1 Study Design

The study utilizes a qualitative research design to study the effect of using AI technologies in education on learner and teacher innovativeness. In working with human experience especially, a qualitative design is more fitting as it is more suitable for capturing nuanced personal impressions and handling difficult incidents (Creswell & Poth, 2018) [13, 14]. Given that thematic analysis is effective in extracting and examining patterns in qualitative data, using it in this study in data analysis is fitting (Braun & Clarke, 2006) [15, 16]. The design is hence a powerful tool to illustrate how artificial intelligence enhances or diminishes creativity, as it is best suited to thoroughly investigate participants' experience.

3.2 Participants and sampling strategies

Urban and rural school teachers, and students participated in the study, including 10 teachers and 10 diverse students with diverse backgrounds and experience in education and in applying and using AI. Purposive sampling, as introduced in Palinkas et al. (2015) [17], was

employed with a focus on achieving rich diversity of insights and representativeness of urban and rural regions and diverse levels of experience in using and applying AI. The strategy was employed because it is capable of yielding information-rich cases with meaningful insights aligned with study goals (Patton, 2014) [18]. Purposive selection is based on selecting participants in line with relevance to study goals, in this study with respect to experience in using and applying AI and caring to maintain creativity while studying.

3.3 Data collection

The researchers employed the semi-structured in-depth interviews to conduct this research to obtain rich and detailed information on participants' experience with AI tools in learning. The qualitative nature of this type of interview provides room to leave space for participants to freely answer while still addressing key areas (Kvale & Brinkmann, 2009) [19.20]. The interviews were structured to address some of the key areas, such as how schools adopt AI and how it is applied in learning and teaching, how it impacts creativity, and what some of the challenges with using AI-based tools—namely, managing human language and responsiveness to technology. Participants explained their ideas on what policymakers can do to improve them to support creative learning. The interviews were audio-recorded and each researcher transcribed those in the language he is teaching to make sure that each and every detail of what was said was preserved. They were then transcribed using best practice standards for collecting and analyzing qualitative data and therefore enabled close reading of participant ideas. This ensured that richness of their experience, views, and recommendations were preserved and hence created a rich platform to inform knowledge of artificial intelligence technologies and how they affect learning and creativity. (Silverman, 2020) [21].

3.4 Data analysis

Using thematic analysis—a tried and trusted qualitative research tool that enables the identification, interpretation, and description of patterns in the data—interview data were examined (Braun & Clarke, 2006). Under Braun and Clarke's instruction, familiarization started with repeated readings of transcripts until material felt natural to read. Systematic coding was then used to mark key elements prominently and sequentially (Boyatzis, 1998) [22]. The codes were then consolidated into more general themes that represented key findings based on the data. Themes were investigated and refined through the refining stage to make sure that they represented participants' perspectives and aligned with study inquiries. As it allows for a detailed study of artificial intelligence tool use and perception in learning spaces, thematic analysis is both deep and flexible and is a sensible option for this study (Braun & Clarke, 2019).

3.5 Ethical considerations

3.5.1 Informed Consent

In accordance with ethical principles, participants were informed of the purpose of the research and had consented to participate prior to being involved (Orb, Eisenhauer, & Wynaden, 2001) [23, 24, 25]. They had also been informed of their right to volunteer and withdraw at any time.

3.5.2 Anonymity

The anonymity of participants was assured by withholding identifying information in interview transcriptions, as Babbie (2013) [26] recommends.

3.5.3 Free Participation

Participation was voluntary, and participants had the option to opt out if they felt uneasy answering some questions.

3.6 Validity and reliability

3.6.1 Validity

The use of thematic analysis, supported by good quality research procedures, makes findings credible (Lincoln & Guba, 1985) [27,28]. Triangulation in comparing information across participants in ascertaining consistency in themes (Patton, 1999) [29] was achieved.

3.6.2 Reliability

The use of a semi-structured interview schedule and systematic and exact procedures for data analysis ensures reliability in research. The methodology is flexible enough to accommodate consistency while still providing richness and detail in responses. The practices ensure reproducibility in future research since they provide a structured but flexible system for gathering and analyzing information (Yin, 2018) [30].

3.7 Limitations

3.7.1 Generalizability

As research is being undertaken on a specified population of participants, findings may not be completely generalizable across varied learning settings. The information derived does, however, offer valuable insights as to how AI can be applied in supporting creative thinking in studied settings (Creswell, 2014) [31].

3.7.2 Access to Technology

Technology variations, in urban and rural areas in particular, may have affected participants' experience of using AI tools and thereby had implications for responses.

4 Findings

The interviews provide rich insights into how learning is being applied using AI tools, how it is influencing creativity, and some of the challenges faced by students and teachers. Despite contextual and profession-based variations, there are certain prominent themes running across all interviewees.

4.1 Experience and motivation in AI for education

They are all proficient in using AI tools but for varied reasons and in varied capacities. Teachers like Allal, Jamal, and Lotfi use AI for content generation, answering questions, and providing alternative descriptions for complex topics. By contrast, student Zineb uses AI for individual feedback and writing and for practicing for exams. Some of the widely used AI tools mentioned in the interviews include ChatGPT, Grammarly, and Google's AI-based programs.

They agree on the application of AI for improved engagement, complex subject comprehension, and content generation. As an illustration, teacher Jamal from Moussa Ibno Nocier School said, "AI tools are used for content generation, answering questions, and providing alternative descriptions." Also, as a student, Zineb said, "I have utilized tools like Grammarly and ChatGPT for close to six months. They have enhanced writing and complex subject comprehension."

The prime reason for using AI tools is to enhance the learning experience. From the teacher's perspective, AI is a method for enhancing learning for students by offering them alternative perspectives and interactive learning. As mentioned in Allal from the same school, "I wanted to enhance the learning experience for my students and offer them alternative perspectives." From the student's perspective, like Zineb, a student from Elyasmine School, it is about receiving personal feedback and advice, especially in preparation for exams. She stressed, "I started using AI since I wanted to receive better personal feedback and advice."

In general, participants are encouraged by AI's potential for improved learning outcomes and improved learning and instructional engagement.

4.2 AI's impact on creativity

AI is universally agreed upon as a creative trigger since it makes it possible for teacher and student alike to focus on complex, creative tasks while making routine tasks simpler. Teachers like Fadwa, a French teacher, elucidated, "AI sparks creativity by freeing thinking space away from routine tasks," while Mohammed elaborated, "I think AI helps in a creative way in designing school assignments and tasks." They perceive AI as a tool for generating innovative ideas and enriching instructional practices. Similarly, student Radia said, "AI helped me in generating innovative ideas, especially when writing assignments or making essays." The foregoing is indicative of AI's ability as a creative trigger, freeing time for advanced thinking and innovation.

But while there are some good things about using AI in creative thinking, there is a general consensus across participants about how excessive use of responses produced by AI can stifle independent thought and creative thinking. The danger of excessive dependency on AI is emphasized equally by both Jamal and Lotfi, losing the capability for in-depth independent thinking. The same is expressed by Allal Boulakroune, who clarified, "If too much use is given to AI-generated responses, it may prevent them from thinking deeply. Zineb, also noted, "AI provides easy solutions and doesn't encourage deep thinking, and hence I need to force myself to avoid using it too much." There is a consensus overview of how, if applied too broadly or without caution, artificial intelligence may restrict profound thinking even if it might inspire new ideas.

Finding a balance between autonomous cognition and what artificial intelligence can do is very important to all the respondents. Although artificial intelligence's support is much appreciated, most respondents agree that technology is designed to be used as a tool rather than a replacement for human creative ideas. Saying, "I made sure to add my own thoughts too," Zineb, for example, shows proactive action taken to guarantee autonomous thinking by ensuring she added her own ideas in material produced by artificial intelligence. Jamal, was also keen about striking a balance and stated, "It's important to strike a balance between using it as a tool and fostering independent creative thinking among students." Overall, what is observed is that while artificial intelligence may be helpful in supporting personal creative thinking, it is necessary to make sure it does not supersede it.

4.3 Challenges faced with AI tools

Although artificial intelligence technologies have great possibilities, some obstacles prevent efficient use of them. Participants listed two main obstacles: technological limits and linguistic restrictions. These difficulties affect professors as well as students in great measure.

4.3.1 Language and content challenges

Among the main difficulties Arabic instructors like Allal and Fouzia face is the dearth of Arabic-language information available on artificial intelligence platforms. Using artificial intelligence in their teaching is much hampered by that absence. "The main problem is the language and the content that is available, which is much less than what is available for English or even for French," Allal said. "It's difficult to make AI tools adaptable to the particular educational requirements of Arabic," Fouzia said as well. Both points of view agree that creating AI tools meant for English-speaking students and using them for Arabic-speaking learners is challenging.

Although the language gap affects mostly Arabic-language teachers, the general challenge of customizing AI technologies to particular educational requirements is a shared issue for everyone involved. AI systems, according to teachers, give English-language content top priority, followed by French materials; Arabic items are least often represented. This hierarchical distribution of resources significantly affects AI's effectiveness in diverse linguistic contexts. Even educators who teach in English or French acknowledged that AI-generated content does not always align with curriculum requirements, making its integration into classrooms more complex.

4.3.2 Technical problems

Both students and teachers have mentioned technical problems as being a major obstacle in making use of AI tools efficiently. They have mentioned instances of breakdowns, when tools fail to act as expected or produce irrelevant output, and this discourages the creative process and is irksome. As can be seen in the quote said by Lotfi below, for example, "One is the technical glitches when tools don't perform as expected." He explained some of the general problems in the infrastructure as well, saying, "We really have technical problems constantly because of the quality and speed of internet connectivity as well as the lack of technical infrastructure." The problems mainly affect teachers, who are not able to use AI in creative manners when there is unpredictable technology and slow connectivity.

Whereas for students, there are different types of problems when it comes to dealing with AI. Frustration for them is typically caused when the AI does not comprehend or provide suitable responses to queries raised. As one student, Imrane, explained, "Sometimes responses are not exactly as I need them, or the tool does not understand my query." Teachers are affected more in terms of system limitations in technology, while for students, it is about relevance and functionality in content created by AI. The difference is in line with different problems for different user groups, as teachers are affected in terms of connectivity and infrastructure and as students have to cope with relevance and correctness in responses provided by AI.

4.3.3 Rural and urban contextual variables

A key context for all participants is urban-rural disparity in accessing the internet and AI tools. Urban-based participants like Zineb, Imrane, Ali, and Lamyae have good connectivity to the internet and are consequently able to maximize use of AI tools for learning and creative endeavors. Imrane, who is studying in Khemisset but ethnically based in Ait Ikkou, explained, "In urban locations, being able to have internet and advanced technology at hand makes it easier to use AI." Similarly, Zineb, based in Ait Yadine but studying in Khemisset, explained, "I don't feel like my cousins have as much advantage as mine in accessing this technology." The two students are in a place of gratitude for being able to have this resource at hand in comparison to lesser opportunities available for family members in rural districts.

Conversely, Othmane, who is the solitary participant in a rural setup, had felt frustrated at constraints imposed upon rural students. His perception is that "students in schools in rural areas may lack equal opportunities, and this could affect learning and imagination." His experience is indicative of frustration at being unable to use tools based on AI optimally in spite of slow connectivity and insufficient technology setup, severely discouraging creative problem-solving and learning.

They are in consensus about unequal tool access for AI in urban and rural areas, depriving opportunities for rural students to use AI and stymieing their creative capacities. Urban students such as Zineb and Imrane are privileged in having opportunities to use cutting-edge technology, but for Othmane, his experience is characteristic of today's digital divide for much of the population in rural areas.

5 Discussion

The findings of this study provide a rich understanding of AI utilization in Moroccan schools, its impact on creativity, and what it entails to use it. Although AI tools offer tremendous benefits in engagement, customization, and creative support, effective use remains constrained by linguistic, technical, and infrastructure barriers. These findings provide important considerations for educators, policymakers, and AI designers about addressing inequalities and fulfilling AI's potential in Moroccan educational context.

These results are in line with existing studies on AI's dual impact on creativity and learning. Luckin et al. (2016), for instance, argue that AI can enhance creativity through adaptive and personalized learning. However, this study is in line with Bereiter and Scardamalia's (2018) argument that AI can encourage formulaic learning rather than creative thinking. Similarly, results are in line with larger debates in education studies on how to reconcile AI support with human creativity and support the argument that AI is intended to be used as a tool and not a substitute for cognitive activity.

5.1 Artificial intelligence for education: advantages and inspiration

Use prevalence among participants reflects rising acceptance of AI in learning environments since both tutors and students are seeing the learning and engagement potential in AI. Participants' justifications for the use of AI tools, for example, to enrich content presentation and provide individualized feedback, are in line with research findings citing AI as a tool for enriching learning experiences (Luckin et al., 2016). Teachers, as in instances like those of Allal and Jamal, are seeing AI as a method for providing unique insights and interactive learning, while students like Zineb are embracing AI for providing individualized writing and exam preparation assistance.

Although widely known for supporting learning, research is still mainly confined to utilization in some functions, such as generating content and offering feedback. It is indicative of a need for research on how specifically AI can be utilized in a larger context for learning practices aside from repetitive processes. The potential for AI to empower richer and more creative learning is yet untapped and is indicative of room for research and development in the future.

5.2 The double-edged impact of Ai on creativity.

AI's impact on creativity is possibly one of the lesser-known findings in this research. Respondents across the board perceive AI as a creative booster in as much as it reduces cognitive load and does away with repetitive tasks, thus making time for complex creative tasks. The research is congruent with prior research suggesting that AI can be used as a "creativity booster," as it can facilitate ideation and problem-solving (Sawyer, 2011). Educators Fadwa and Mohammed view AI as idea generation and instructional strategy tools, while students like Radia use AI as a tool for ideation and preparation for projects.

Despite these benefits, there is general consensus across participants regarding fear of dampening down thinking and creativity in general. Excessive application of content produced by AI, as discussed in Jamal and Zineb's discourse, is a source of serious concerns regarding loss of independent thought. It is symptomatic of broader discourse in research regarding compromises between convenience and creativity when learning is supported by AI (Schwab, 2016) [32]. Participants' fears are indicative of a need for balanced use—AI must complement and not replace human imagination. It is a reminder for learning strategies to encourage students to use AI as a supporting tool while preserving agency and cultivating independent creative capacities.

5.3 Challenges in using AI tools: technical and linguistic.

Among the identified major problems in findings is Arabic content deficiency in AI platforms, a major problem for Arabic-speaking educators such as Allal and Fouzia. The language gap severely limits use in non-English or French-speaking contexts and reduces potential for learning improvement for Arabic-speaking students. English content predominance, and secondly French content, is symptomatic of a lingering deficiency in research and development in AI, in which inclusiveness in various languages is still a major deficit (Bender et al., 2021) [33]. It is a major need for developers in AI to open up the

linguistic features in their platforms for use in multiple language groups and thereby achieve equity and inclusiveness in learning tools in AI for all.

In addition, research reveals connectivity and infrastructure as major technical hindrances to effective utilization of AI. The issues disproportionately affect teachers who require uninterrupted connectivity in generating creative content and preparation for class (Kozma, 2011) [34]. The mentioned technical issues and insufficient good infrastructure are symptomatic of broader systemic issues slowing down universal inclusion of AI in schools, and particularly in schools in disadvantaged districts (Kozma, 2011). The solutions require investments in technology infrastructure and teacher training in order to allow utilization of AI tools to their full capacities, particularly in disadvantaged districts.

5.4 The urban-rural gap in access to Ai

Finally, a major theme that emerges is that of the urban-rural digital divide. City residents such as Zineb and Imrane value having good internet and advanced technology readily accessible and are hence capable of using AI tools to optimal levels. The only participant based in a rural community is Othmane, and he discusses the enormous gap in having access to technology and resources for AI and hence getting frustrated and having limited means for creative problem-solving.

This is in line with recent studies on learning and the digital divide, whereby rural learners are disadvantaged with regards to access to digital infrastructure and tools (Selwyn, 2016). It is evident that urban learners can make optimal creative uses of AI, while rural learners are disadvantaged and expand learning inequalities. It is time to tackle urban-rural learning inequalities through intervention and offer equal access to AI tools to all regardless of place.

6 Recommendations and conclusion

6.1 Recommendations

There are several implications for AI use in learning that are found in this study. It is a certain requirement to overcome technical and language barriers to AI tool utilization, particularly for Arabic and disadvantaged communities. Policymakers and developers should place on top of their agenda making it accessible in different languages and investing in improved technology in disadvantaged regions in a way to offer even opportunities for utilization.

Secondly, there is a need for schools to focus on formulating plans for balanced utilization of AI—to promote utilization for creative thinking while also ensuring independent thinking and problem-solving abilities in students. School training programs should focus on AI as a supporting tool and not a substitute for human genuineness to ensure wiser and better utilization of technology in schools.

Finally, the state should close the urban-rural digital divide in schools and do it through strategic investment in schools in general and especially in rural district schools. By giving all students equal access to AI-based tools, we can close this gap and empower all students to be able to use AI in productive and positive means regardless of where they are.

6.2 Conclusion

The study has offered a detailed look at how AI is shaping language learning in Moroccan schools—most significantly with respect to creativity. Emerging through the findings is a complicated picture: AI is indeed altering how learners and teachers engage with learning, offering useful tools to simplify routine tasks and facilitate personalized learning. With these advantages come challenges. An ongoing theme in responses by participants was the risk of too heavy a dependence on AI-produced materials that are easy to use but gradually stifle independent thought, individual voice and expression, and creativity language learning aims to promote.

At the center of the paper is a message that resonates: balance is important. AI is not meant to replace human creativity—instead, it is meant to enhance it. Teachers and students need to learn to use AI as a helper and not a replacement. This requires careful education policies and properly designed training programs that focus on critical thinking and creativity and not merely digital literacy.

The study also uncovers disproportionate barriers to specific groups of learners. Teachers and learners who are Arabic-speaking are restricted by a lack of Arabic-language content on AI platforms. Not only does this language gap undermine inclusivity, it also reinforces systemic inequalities in access to education. To this is added the urban-rural divide in digital access. While urban learners are increasingly empowered to use and create with AI, rural learners are left to cope with basic connectivity or are without infrastructure to meaningfully interact with these tools. AI remains out of reach to these learners.

In bridging these gaps, it is important that creators of AI expand linguistic access—especially for Arabic—and that policymakers invest in infrastructure in under-resourced regions. If AI is to be a bridge to educational equality, then all learners across geography and background must be able to cross it.

Looking ahead to the future, future studies must delve deeper into how AI can support higher-order thinking, creativity, and problem-solving—beyond content creation. We need to learn more about the long-term cognitive and cultural impacts of AI-enabled learning across multiple educational contexts. By doing this, we can ensure that as technology evolves, it is doing so in a manner that honors and protects human imagination.

Of course, there are limitations to this study. With a modest number of participants and a focus on specific regions, generalizations are best made with caution. However, the themes outlined herein form a good platform for continued study of the interplay between AI, creativity, and inclusive education in Morocco—and quite possibly much more broadly.

References

1. R. J. Sternberg, *The Nature of Human Creativity*, Cambridge University Press, (2018).
2. C. Bereiter, M. Scardamalia, *The Psychology of Written Composition*, Routledge, (2018).
3. C. Bereiter, M. Scardamalia, *Surpassing Ourselves: An Inquiry into the Nature and Implications of Expertise*, Open Court Publishing, (2018).
4. R. Luckin, W. Holmes, M. Griffiths, L. B. Forcier, *Intelligence Unleashed: An Argument for AI in Education*, Pearson Education, (2016).
5. J. Li, Y. Wang, *Artificial Intelligence in Language Learning: Opportunities and Challenges*, Springer, (2020).
6. J. Li, Y. Wang, *Exploring AI-Powered Language Learning: A Review of Current Applications*, Taylor & Francis, (2020).

7. M. Warschauer, *Technology and Social Inclusion: Rethinking the Digital Divide*, MIT Press, (2020).
8. N. Selwyn, *Education and Technology: Key Issues and Debates*, Bloomsbury Academic, (2019).
9. B. Williamson, *Big Data in Education: The Digital Future of Learning, Policy and Practice*, SAGE Publications, (2017).
10. D. S. Bouhlila, "The Quality of Secondary Education in the Middle East and North Africa: What Can We Learn from TIMSS' Results?", *J. Educ.*, (2011).
11. B. Boudarbat, "Earnings and Education in Morocco: Evidence from the 1999–2001 Moroccan Living Standards Measurement Study Panel", *Middle East Dev. J.*, (2008).
12. R. El Amrani, B. Bensaid, *Artificial Intelligence in Moroccan Education: Pedagogical Implications and Challenges*, Springer, (2021).
13. J. W. Creswell, C. N. Poth, *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*, SAGE Publications, (2018).
14. J. W. Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, SAGE Publications, (2018).
15. V. Braun, V. Clarke, "Using Thematic Analysis in Psychology", *Qual. Res. Psychol.*, **3**, 77-101, (2006).
16. V. Braun, V. Clarke, "Reflecting on Reflexive Thematic Analysis", *Qual. Res. Sport Exerc. Health*, **11**, 589-597, (2019).
17. L. A. Palinkas, S. M. Horwitz, C. A. Green, J. P. Wisdom, N. Duan, K. Hoagwood, "Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research", *Adm. Policy Ment. Health*, **42**, 533-544, (2015).
18. M. Q. Patton, *Qualitative Research & Evaluation Methods: Integrating Theory and Practice*, SAGE Publications, (2014).
19. S. Kvale, S. Brinkmann, *InterViews: Learning the Craft of Qualitative Research Interviewing*, SAGE Publications, (2009).
20. S. Kvale, *Doing Interviews*, SAGE Publications, (2007).
21. D. Silverman, *Interpreting Qualitative Data*, SAGE Publications, (2020).
22. R. E. Boyatzis, *Transforming Qualitative Information: Thematic Analysis and Code Development*, SAGE Publications, (1998).
23. A. Orb, L. Eisenhauer, D. Wynaden, "Ethics in Qualitative Research", *J. Nurs. Scholarsh.*, **33**, 93-96, (2001).
24. L. Eisenhauer, A. Orb, D. Wynaden, "Qualitative Research and Ethical Considerations", *Nurs. Inq.*, (2001).
25. D. Wynaden, A. Orb, L. Eisenhauer, "Research Ethics and Participant Consent in Qualitative Research", *J. Adv. Nurs.*, (2001).
26. E. Babbie, *The Practice of Social Research*, Cengage Learning, (2013).
27. Y. S. Lincoln, E. G. Guba, *Naturalistic Inquiry*, SAGE Publications, (1985).
28. E. G. Guba, Y. S. Lincoln, "Competing Paradigms in Qualitative Research", in *Handbook of Qualitative Research*, N. K. Denzin, Y. S. Lincoln (Eds.), SAGE Publications, 105-117, (1994).
29. M. Q. Patton, "Enhancing the Quality and Credibility of Qualitative Analysis", *Health Serv. Res.*, **34**, 1189, (1999).
30. R. K. Yin, *Case Study Research and Applications: Design and Methods*, SAGE Publications, (2018).
31. J. W. Creswell, *A Concise Introduction to Mixed Methods Research*, SAGE Publications, (2014).
32. K. Schwab, *The Fourth Industrial Revolution*, Crown Business, (2016).
33. E. M. Bender, T. Gebru, A. McMillan-Major, S. Shmitchell, "On the Dangers of Stochastic Parrots: Can Language Models Be Too Big?", *FACCT '21: Proc. 2021 ACM Conf. Fairness Account. Transpar.*, 610-623, (2021). DOI: 10.1145/3442188.3445922
34. R. B. Kozma, "The Technological Revolution in Education: Current Trends and Future Perspectives", *Int. J. Educ. Technol.*, (2011).