L'INTELLIGENCE ARTIFICIELLE DANS L'ENSEIGNEMENT SUPERIEUR : ENTRE PROMESSES ET MENACES

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Harnessing AI for Online Interaction Analysis in Higher Education: Enhancing Collaborative Knowledge Building

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RESUME

À l'ère numérique, les interactions en ligne occupent une place centrale dans l'enseignement supérieur. Les forums de discussion constituent un terrain privilégié pour observer les dynamiques de collaboration et les processus de co-construction des savoirs. Cette étude s'appuie sur l'analyse de fils de discussion issus de la plateforme Moodle. À travers les principes de l'analyse conversationnelle, nous avons mis en évidence des schémas de communication et des stratégies favorisant l'engagement des étudiants. L'utilisation du logiciel Tropes a permis de dégager des tendances lexicales et sémantiques, ainsi que de représenter graphiquement les thèmes récurrents liés à l'apprentissage collaboratif. Un questionnaire a également été élaboré afin de recueillir la perception des étudiants concernant l'apport des outils d'IA dans leur compréhension des contenus. Les premiers résultats révèlent que ces outils sont perçus comme motivants et facilitant la participation. L'objectif de cette recherche est de montrer comment l'IA peut enrichir l'apprentissage collaboratif en ligne.

ABSTRACT

In today's digital context, online interactions have become a key element of higher education. Discussion forums offer a fertile space for observing how students collaborate and build knowledge together. This study explores these dynamics by analyzing discussion threads from the Moodle platform. Using the principles of conversation analysis, we examined communication patterns and strategies that foster engagement and collaboration. The Tropes software allowed us to identify lexical and semantic tendencies and to visualize recurrent themes through graphs that reveal the sequences most conducive to collaborative learning. To complement this, a questionnaire was designed to capture student perceptions of AI tools and their influence on understanding course content. Early results show that students generally see these tools as motivating and supportive of their participation in online exchanges. This work seeks to highlight how AI can be mobilized to enrich collaborative learning within digital platforms.

1 Introduction:

The observation of student exchanges on digital platforms reveals the complexity of communication dynamics in higher education. This raises a central question: to what extent do online interactions foster the co-construction of knowledge? The literature has long emphasized the role of digital learning environments in supporting collaboration. Henri and Lundgren-Cayrol (2001) underlined that online forums can create authentic conditions for knowledge building. Nissen (2007) demonstrated that these interactions often generate forms of negotiation and mutual adjustment that are essential to learning. Similarly, Degache (2006) and Mangenot (2008) highlighted the importance of scaffolding and tutor mediation in structuring meaningful exchanges. More recently, Peraya (2014) insisted on the need to reconsider pedagogical practices in light of the digital transformation of higher education. At the same time, several authors have questioned the persistence of myths surrounding educational technologies, such as the supposed impact of screen time, reminding us of the importance of grounding practices in empirical evidence (Amadieu & Tricot, 2014; Fluckiger, 2021). According to Damasio (1995), "in many circumstances of our lives, as social beings […], emotion is only triggered in us after a phase of mental evaluation of the event has taken place" (p. 173). This observation draws attention to the affective dimension of learning, which plays a significant role in motivating students to engage in online discussions. Our research applies the principles of conversation analysis, supported by Tropes software, to identify lexical and semantic patterns in discussion threads on Moodle. We hypothesize that certain interactional strategies promote student engagement, and that the integration of AI-based tools can further enhance motivation and comprehension. By situating this work within Mohammed Premier University, Faculty of Letters and Human Sciences in Oujda, this article contributes a locally grounded perspective to ongoing international debates. It seeks to show how digital transformation reshapes collaborative learning processes, while offering empirical insights into the methodological and pedagogical implications of using AI in higher education.

2 Theoretical Foundations: Mediated Communication and Digital Learning Environments.

The rise of digital technologies has reshaped the modes of interaction in educational contexts, notably through what is referred to as *computer-mediated communication* (CMC). It is important to distinguish between *communication médiatisée* and *communication médiée*, two concepts frequently used in French-language scholarship. *Communication médiatisée* refers to interactions that are entirely shaped by a technological device, such as online forums or video conferencing platforms, where the

medium plays a central role in structuring the exchange (Perraya, 2005). In contrast, *communication médiée* implies that the communication is facilitated or assisted by a technological tool, but not entirely dependent on it; the interaction can occur outside the digital medium but uses it as a support. In the context of online learning, interactions within platforms such as Moodle fall under the category of *communication médiatisée*, as the structure, timing, and content of the interactions are conditioned by the digital interface. As Perraya (2005) explains, "the mediation of the machine imposes its logic on the communication process, shaping the forms of expression and interaction" (p. 78). This aligns with more recent perspectives in educational technology studies, which stress that computer-mediated pedagogical communication is not a simple replication of in-person interaction but a reconfiguration of pedagogical intentions through technological affordances (Baron & Boulc'h, 2018; Gros & Dufresne, 2021). Pedagogical communication mediated by computers involves not only the transmission of knowledge but also the creation of a digital environment conducive to interaction, feedback, and co-construction of meaning (Garrison, Anderson, & Archer, 2000). In this framework, the role of learners and instructors shifts from mere participants to co-constructors of the learning process, mediated through digital platforms. As such, online interactions should be understood not as secondary or lesser forms of communication but as environments with their own semiotic, temporal, and relational dynamics, which deserve specific analytical frameworks (Perraya, 2005; Baron & Boulc'h, 2018).

2.1 Interaction in Education: Dialogic Processes and Digital Implications

The expansion of digital technologies has transformed the ways in which interactions occur in educational settings, particularly through computer-mediated communication (CMC). It is essential to differentiate between *communication médiatisée* and *communication médiée*, two terms commonly used in French-language research. *Communication médiatisée* describes interactions that are entirely shaped by technology, such as online forums or video conferencing, where the platform itself structures the exchange (Perraya, 2005). In contrast, *communication médiée* refers to interactions that are supported or facilitated by technology but are not entirely dependent on it; the communication can take place outside the digital medium while still benefiting from its support. In online learning environments, interactions on platforms like Moodle exemplify *communication médiatisée*, as the digital interface conditions the timing, structure, and content of exchanges. As Perraya (2005) notes, "the mediation of the machine imposes its logic on the communication process, shaping the forms of expression and interaction" (p. 78). Recent studies in educational technology emphasize that computer-mediated pedagogical communication does not merely

replicate face-to-face interaction but reconfigures teaching and learning through the affordances of the medium (Baron & Boulc'h, 2018; Gros & Dufresne, 2021). Such communication involves not only the transmission of knowledge but also the creation of a digital environment that fosters interaction, feedback, and the co-construction of meaning (Garrison, Anderson, & Archer, 2000). Within this framework, learners and instructors assume the role of co-constructors of the learning process, mediated through digital platforms. Online interactions should therefore be regarded as distinct environments with their own semiotic, temporal, and relational dynamics, warranting dedicated analytical approaches (Perraya, 2005; Baron & Boulc'h, 2018).

2.2 Artificial Intelligence and Conversational Analysis in Educational Contexts

Building on the growing role of AI in personalizing learning and supporting student engagement, it becomes crucial to examine how these technologies operate within specific educational platforms. The integration of artificial intelligence (AI) into educational practices has significantly transformed the learning landscape, promoting approaches that better respond to individual student needs. Holmes and Tuomi (2022) note that AI-driven systems enhance the personalization of learning by identifying each student's strengths and areas for improvement, allowing the provision of resources tailored to their pace. These adaptive features are especially visible in online settings, where intelligent tutoring systems and conversational agents, such as chatbots, support learners in real time and encourage active engagement (Luckin et al., 2016). In higher education, learning management systems like Moodle are increasingly incorporating AI to support both administrative and pedagogical functions. These platforms can automate formative assessments, monitor learner progress, and analyze interactions among peers. Additionally, natural language processing (NLP) technologies, including semantic analysis software such as Tropes, enable researchers to examine large volumes of discussion forum data. This approach uncovers emerging themes and hidden lexical relationships, providing insight into how students collaboratively construct knowledge through dialogue.

2.3 Using Conversation Analysis to Explore Online Educational Interactions

Building on the insights gained from AI-supported interactions in Moodle, this study examines the detailed mechanisms of learner communication through conversation analysis (CA), a framework developed by Sacks, Schegloff, and Jefferson (1974). CA focuses on the sequential organization of talk and the ways participants create mutual understanding. Its

strength lies in revealing the structure of conversational exchanges—such as turn-taking, repair sequences, and alignment strategies—that are crucial for collaborative learning (Sidnell & Stivers, 2013). In the context of online education, CA provides a nuanced lens to assess how digital dialogue facilitates or constrains collective meaning-making. When combined with AI tools such as Tropes, CA is enhanced through automated lexical and semantic mapping, without compromising the rigor of qualitative analysis. Previous studies have highlighted CA's value for exploring educational interactions and understanding how discourse shapes student engagement. By integrating AI-driven analysis with conversation analysis, this study aims to uncover the interactional processes that support knowledge co-construction in digital learning environments.

3   Methodology:

To explore the dynamics of online interactions within a university context and assess the influence of AI tools on knowledge co-construction, we adopted a mixed-methods approach. This combination of qualitative and quantitative methods not only enriches the analytical process but also allows for a triangulation of data, thereby enhancing the reliability and depth of our findings (Creswell & Plano Clark, 2018).

3.1   Research Methods and Data Collection

To further examine the interplay between AI tools and student interactions, the qualitative component of this study focused on discussion forums hosted on the Moodle platform, a widely used online learning environment in higher education. These forums were chosen for their ability to facilitate peer collaboration and support collective knowledge-building processes (Paquette, 2015). Student exchanges were analyzed using conversation analysis, the framework developed by Sacks, Schegloff, and Jefferson (1974), which allows researchers to uncover communication patterns and discursive strategies that enhance engagement, coordination, and mutual understanding. The analysis aimed to identify how participants manage cooperation, share knowledge, and regulate the flow of conversation within these digital spaces. Complementing this, the quantitative component relied on a structured questionnaire to gather students' perceptions of AI tools in their learning experience. This instrument investigated aspects such as personalized learning, improvements in content comprehension, and engagement in online discussions. Collecting these perceptions provided insight into how AI-supported tools, including intelligent tutoring systems and automated feedback mechanisms, can influence learner motivation and participation.

3.2 Data Analysis Tool

Following the methodological approach outlined earlier, the data collected—especially the textual interactions from Moodle forums—were analyzed using Tropes, a linguistic and semantic analysis software designed to handle large textual corpora. This tool proved particularly suited to our study, as it enables a detailed examination of lexical patterns, semantic fields, and discursive structures within educational interactions. Tropes allows for the identification of recurring conversational patterns and sheds light on how participants construct meaning collaboratively. Aligned with our research objectives, the software facilitated the observation of how student discourse develops through online exchanges, offering insights into the mechanisms underlying knowledge co-construction. In addition, Tropes produces graphical visualizations, which provide an alternative perspective that enhances interpretation through semantic mapping and thematic clustering. By integrating these digital tools, the study combined the qualitative depth of conversation analysis with the computational power of linguistic software, resulting in a robust analytical framework capable of exploring online pedagogical interactions both thoroughly and systematically.

3.3 Qualitative Analysis of Online Interactions on Moodle

In continuity with the methodological approach described earlier, this section presents the qualitative analysis of online exchanges, focusing on their potential to support the co-construction of knowledge in higher education contexts. As previously stated, this analysis is grounded in the theoretical framework of Conversation Analysis (CA), which provides a systematic lens for examining the underlying mechanisms of language use in educational interactions (Sacks, Schegloff, & Jefferson, 1974).

3.4 Data Corpus

The dataset analyzed in this study was drawn from discussion forums on the Moodle learning platform, collected over a single academic semester across two university modules. The first module yielded 503 interactions distributed across five active forums, while the second module provided 83 interactions from four active forums. These forums were selected for their relevance to the research, particularly considering the richness, diversity, and frequency of student participation. The qualitative analysis focused on identifying discursive strategies, patterns of collaboration, and indicators of student engagement, aiming to understand how these interactions support shared meaning-making and peer-to-peer learning. This phase of the study allowed us to observe how learners employ a range of communicative resources—such as turn-taking, acknowledgment cues, and expressions of agreement or disagreement—to

collaboratively construct and refine their understanding of academic content.

Week	Theme	Number of Contributions
1	The Role of Didactics in Educational Sciences	39
2	Didactics of French as a Foreign Language (FFL)	89
3	Key Concepts in FFL Didactics	89
4	Current Trends in French Didactics	70
5	Didactic Approaches	216
Total	**503**	

Table 1: Weekly Distribution of Student Contributions by Theme in French Didactics Modules

Week	Total Contributions	Topic
1	56	Reading of resources
2	5	Time management and obstacles
3	3	Use of documentary resources
4	19	Writing exercises
5	6	Active listening and mnemonic techniques
Total	**89**	

Table 2: Weekly Distribution of Student Contributions by Topic in Academic Skills Modules

Capture 1: Expressions of Gratitude
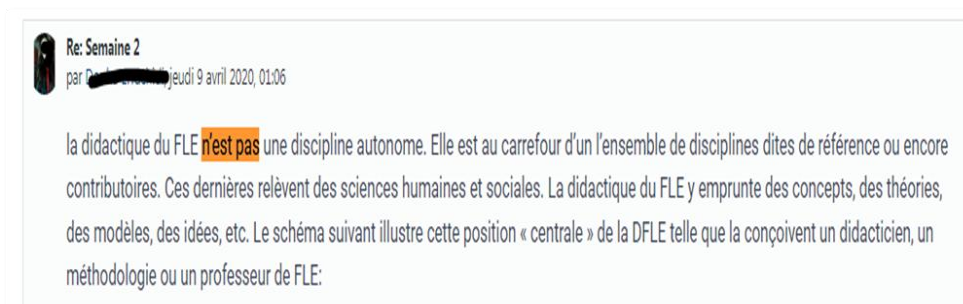
Capture 2: Presence of Disagreement Forms
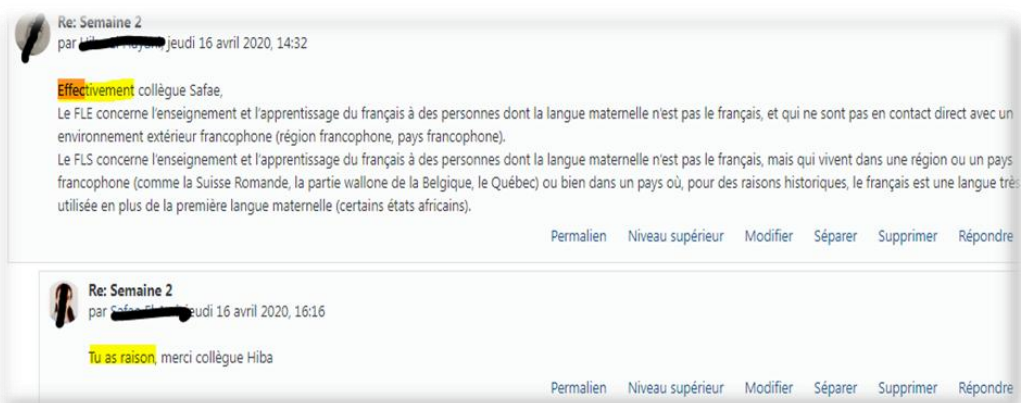

Capture 3: Instances of Agreement

3.5 Use of the Tropes Tool:

To gain a deeper understanding of the interactions, we used Tropes, a tool specialized in semantic and lexical analysis. This application allowed us to identify recurring ideas and trace how key terms were interconnected across different

contributions. Through this process, we were able to highlight frequently used expressions, dominant lexical clusters, and the central concepts that shaped participants' exchanges.

Capture 4: Tropes interface
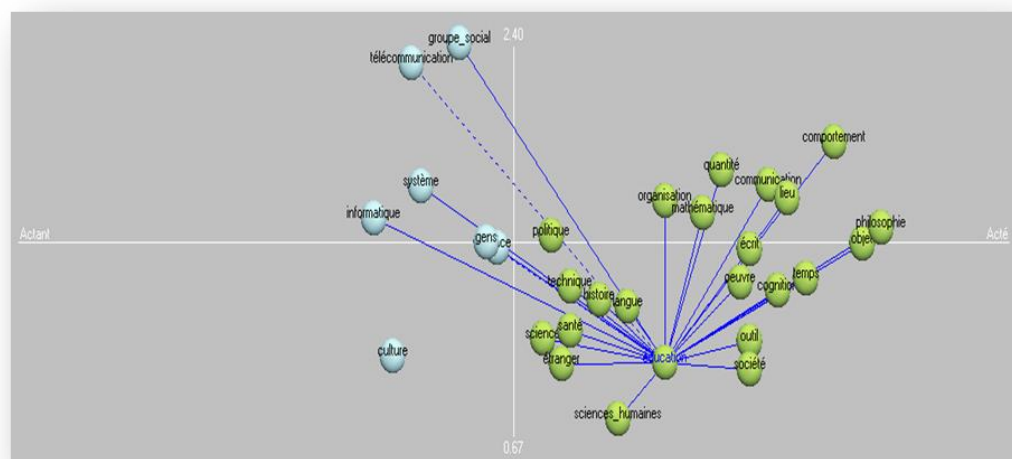
Capture 5 : Graph Showing Thematic Patterns in Student Interactions

4   Quantitative Insights : Students' Perceptions of AI in Online Learning

To complement the qualitative analysis of online interactions, a quantitative survey was conducted using a structured questionnaire designed to capture students' perceptions of the influence of artificial intelligence on their learning experience. This section presents the main statistical findings, highlighting learners' perspectives, preferences, and expectations regarding the integration of AI within digital learning environments. The questionnaire consisted of 18 items organized around three thematic areas to explore students' engagement with AI in educational contexts. First, it examined

the types of AI-powered technologies students are currently using in their academic activities. Second, it assessed the extent to which learners felt that AI tools enhanced their motivation and participation in learning tasks. Finally, it gathered insights into the features students consider essential for an effective and supportive AI-integrated learning environment.

4.1 Quantitative Insights: Students' Perceptions of AI and Online Learning

In addition to the qualitative exploration of online interaction dynamics, a quantitative survey was conducted to investigate students' perceptions of artificial intelligence in digital learning environments. The analysis highlights learners' attitudes, experiences, and expectations regarding AI-powered tools in their academic journeys. Many respondents indicated that AI-supported platforms enhanced their motivation to engage with course materials and participate in collaborative activities. This aligns with the findings of Zawacki-Richter et al. (2019), who emphasize that AI technologies, when integrated pedagogically, can foster learner autonomy and personalize instructional pathways. Students also noted that AI improves content accessibility and comprehension through tools such as automated feedback systems, intelligent tutoring, and adaptive content delivery, supporting Holmes et al.'s (2021) argument that AI contributes to differentiated instruction tailored to individual learning profiles. At the same time, the data reveal some caution: while AI is recognized as valuable, students expressed concerns about data privacy, over-automation, and the potential reduction of human interaction, reflecting observations from earlier studies (Luckin et al., 2016). These findings suggest that AI tools are most effective when aligned with clear pedagogical objectives and ethical considerations. Turning to student engagement in online forums, our data show that 40.7% of learners contributed only rarely. This statistic highlights deeper structural and pedagogical challenges in distance education. Limited participation raises questions about the effectiveness of digital platforms and AI in promoting inclusive engagement. While AI offers advantages such as personalized learning and real-time feedback, it cannot alone address motivational gaps or technological disparities. As Selwyn (2016) notes, digital tools must be embedded within coherent pedagogical frameworks to encourage genuine learner involvement. The qualitative analysis of forum exchanges, enriched by Tropes' semantic mapping, indicates that guided and structured interactions increase the likelihood of meaningful knowledge-building. However, such engagement is not automatic; factors such as discourse structure, tone, and tool accessibility shape participation. These observations echo Mangeneau's (1991) view that discursive spaces function as hybrid environments, intertwining social and cognitive dynamics. Consequently, it is crucial to rethink the design of online learning communities, emphasizing strategies

that promote sustained interaction. Implementing diversified feedback models, adaptive prompts, or peer facilitation could reduce barriers for less active contributors and foster a more participatory learning culture.

5   Discussion:

This study aimed to explore how the integration of artificial intelligence (AI) in online learning environments, specifically within Moodle discussion forums, influences student engagement and the co-construction of knowledge. The findings indicate that AI-supported tools, such as intelligent tutoring systems and conversational agents, were perceived positively by students, particularly in terms of personalized learning and real-time feedback. However, a significant proportion of participants expressed concerns regarding data privacy, over-automation, and the potential reduction of human interaction in the learning process. These results align with previous research highlighting the importance of pedagogically aligned AI to enhance student engagement. For instance, Zawacki-Richter et al. (2019) found that AI, when thoughtfully integrated, can foster learner autonomy and tailor instructional pathways. Similarly, Holmes et al. (2021) emphasized that AI contributes to differentiated instruction by responding to individual learner profiles. However, concerns about privacy and reduced human interaction are consistent with findings reported by Luckin et al. (2016), suggesting that successful AI adoption requires not only technological innovation but also ethical and pedagogical vigilance. The implications of these findings are multifaceted. They suggest that AI can serve as a valuable ally in creating more personalized and interactive learning environments. However, effective integration requires careful pedagogical planning and transparent communication with users. Ethical considerations, including data privacy and maintaining human interaction within the learning process, remain essential. Despite these insights, the study presents several limitations. The sample was confined to students from a single higher education institution, which may limit the generalizability of results. Additionally, the analysis of online interactions was conducted at a single point in time, without capturing the evolution of engagement over the semester. While Tropes enabled detailed semantic and lexical mapping, direct observational data could have provided additional depth regarding interaction dynamics. For future research, longitudinal studies are recommended to monitor the evolution of student engagement over extended periods. Comparative analyses of different AI tools and their effects on learner participation would also be valuable. Finally, incorporating educators' perspectives would yield a more comprehensive understanding of how AI shapes both teaching practices and learner experiences.

6   Conclusion:

This study has highlighted the central role that online interactions—when complemented by AI tools—play in reshaping pedagogical dynamics within digital learning platforms. The qualitative analysis of Moodle discussion threads revealed subtle conversational structures, where speech acts such as acknowledgements, agreements, and turn-taking emerged as key mechanisms supporting collaborative knowledge construction. These interactions demonstrate that online engagement extends beyond mere participation, encompassing both cognitive and social dimensions, thereby confirming our hypothesis that AI-supported platforms can enhance meaningful student interaction. The integration of AI tools, particularly semantic analysis software like Tropes, allowed for the detection of recurring themes and engagement patterns. Such tools went beyond simple data processing; they provided new perspectives to observe how effective participation develops in digital learning spaces. As Buckingham Shum and Ferguson (2012) note, learning analytics serve as "a mirror to the learner," revealing interactional behaviors that are otherwise difficult to capture in traditional classrooms. Quantitative survey results reinforced these findings. Many students reported that AI tools improved their comprehension of course content, helped identify knowledge gaps, and increased their confidence in participating asynchronously. These perceptions align with Luckin et al. (2016), who argue that AI does not merely automate learning but amplifies learner agency and engagement. Ultimately, AI integration should not be viewed solely as a technological upgrade; it represents a substantive transformation in how learning is mediated, experienced, and co-constructed. By facilitating richer exchanges and supporting individualized understanding, AI contributes meaningfully to the evolution of distance education. Nonetheless, this transformation introduces complex ethical and methodological challenges, including transparency, bias, and equitable access, which future research must carefully address (Williamson & Eynon, 2020).

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