

Exploring Cognitive Engagement Modes of AI Use in Language Classroom

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Abstract:

The study investigates the potential risks of deteriorating learning processes due to the systematic and excessive use of AI assistants as a medium for problem-solving in foreign language classes. In the context of a writing workshop inviting 15 second year Master's students of English and 10 students of the same level enrolled in French didactics to engage in writing activities, through non-participant observation combined with structured interviews, indicators of work situations unfavourable to active learning. The combined theoretical frameworks of active learning and the ICAP model of cognitive engagement denote that the use of AI tools creates a pedagogical environment undesirable to the development of students' knowledge and skills. The obtained results instruct foreign language educators towards the necessity of training students using digital didactic culture.

Keywords: Artificial Intelligence, Cognitive Engagement Mode, Written Production, Active Learning.

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Résumé :

Cette étude examine les risques potentiels de la détérioration des processus d'apprentissage en raison de l'utilisation systématique et excessive des assistants IA comme moyen de résolution de problèmes dans les cours de langue étrangère. Dans le cadre d'un atelier d'écriture invitant 15 étudiants en deuxième année de Master en Anglais et 10 étudiants du même niveau inscrits en didactique du français à participer à des activités d'écriture, des indicateurs de situations de travail défavorables à un apprentissage actif ont été identifiés grâce à une observation non participante combinée à des entretiens structurés. Les cadres théoriques combinés de l'apprentissage actif et du modèle ICAP de l'engagement cognitif montrent que l'utilisation des outils IA crée un environnement pédagogique peu propice au développement des connaissances et des compétences des étudiants. Les résultats obtenus orientent les éducateurs en langues étrangères vers la nécessité de former les étudiants à une culture didactique numérique.

Mots-clés: Intelligence Artificielle, Mode d'Engagement Cognitif, Production Écrite, Apprentissage Actif.

استكشاف أنماط التفاعل المعرفي لاستخدام الذكاء الاصطناعي في تعليم اللغة

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الملخص:

تتناول هذه الدراسة المخاطر المحتملة لتدهور عمليات التعلم نتيجة الاستخدام المنهجي والمفرط للذكاء الاصطناعي كوسيلة لحل المشكلات في تعلم اللغات الأجنبية. في سياق ورشة كتابة دُعي إليها 15 طالبًا من طلاب السنة الثانية ما ستر في اللغة الإنجليزية و10 طلاب من نفس المستوى مسجلين في تعلم اللغة الفرنسية للمشاركة في أنشطة كتابية تم رصد مؤشرات لظروف عمل غير مواتية للتعلم، وذلك من خلال النظرية للتعلم والتفاعل المعرفي إلى أن استخدام أدوات الذكاء الاصطناعي يخلق بيئة تعليمية غير مرغوب فيها لتطوير معارف الطلاب وصقل مهاراتهم. أكدت النتائج التي تم التوصل إليها أن معظم المدرسين يرون ضرورة تدريب الطلاب على مهارات التعلم الرقمي باعتبارها جزءًا أساسيًا من تعلم اللغات في العصر الحديث.

الكلمات المفتاحية: الذكاء الاصطناعي؛ نمط التفاعل المعرفي؛ الإنتاج الكتابي؛ التعلم النشط.

1. Introduction: As the industrial revolution metamorphosed human labour, the digital revolution brings undeniable transformations for everyone: educational policies, training institutions, teachers, and learners alike. In the era of digital pedagogy, and especially with the exponential rise of artificial intelligence (AI) in educational contexts, it is no longer acceptable to conceive of a didactic situation outside of a dynamic vision of the learner, one who is considered a piloting and responsible agent, not only for their exit profile but also for the learning processes they acquire, develop, and transfer throughout their training journey.

This journey is a curriculum during which five main language activities are taught with the aim of developing five complementary competencies: reading and listening comprehension, written and oral production, and finally, interactive competence. This set of language activities develops progressively to form a learner capable of communicating, transferring their learning, and adopting good behaviour. In the more specific context of language and culture didactics, learner agency is even more important insofar as this field confronts with emotional and cultural data that are absent from the scientific and technical domain. The didactic situation is not spared, and misuses can lead to increased difficulties in identifying and determining learning objectives, mobilizing reasoning and reflective resources, as well as the decline of cognitive skills and ethical values related to this domain, as attested by the work of Megahed, Chen, Ferris, Knoth & Jones-Farmer (2023) and also Bills (2025). It is therefore legitimate and even desirable to conduct studies on the potential of generative AI tools to propel the approaches and profiles of users, just as it is highly recommended to measure these benefits by comparing them to the pitfalls that can result from automatic and unthinking use. Following this dynamic and active perspective that places the learner at the heart of the formative and experiential process (Kolb, 1984), the study attempts to describe and analyze the benefits and pitfalls of using generative AI artifacts by students in a foreign language writing problem-solving situation. We have deliberately limited our reflection to the domain of written production, due to the considerable number of linguistic mastery difficulties the activity poses, particularly lexical and grammatical, as well as feedback difficulties leading to a clear demotivation towards writing (Abdel Latif, Alghizzi & Alshahrani, 2025).

2. Theoretical Foundations of Active Learning in the Era of Digital Pedagogy: Since the earliest methodologies of language teaching-learning, the status and role granted to the learner has always been a subject of various controversies. Indeed, from the 19th century until the early 20th century, traditional approaches considered the student as a receiver, like a sponge memorizing lists of thematic vocabulary and grammatical rules for training focused on reading, translation, and grammar exercises. Subsequently, still in a guided context, the advent of the direct method assigned them a more active role in listening situations and inferring linguistic rules through inductive reasoning. However, they remained passive regarding verbal production.

Finally, the audio-oral methodology, as well as the global audio-visual structural method, both dominated by the behaviourist current, offered a more significant active value to the learner, who mobilized it to increase their memory resources as an imitator of the content to which they were exposed, in a logic of intensive repetition, imitation, and reinforcement for the purpose of habit formation. Faced with this stimulus-response activity, the era was dominated by mechanical learning, marking a linguistic automatism, leading to a passivity of conception of their training according to their needs, without deep cognitive involvement or creativity. It was necessary to wait for the humanist movements of the 1970s and authors like Carl Rogers (1969), Abraham Maslow (1968), or Gordon Allport (1968) to note a more significant recognition of the individual in general and the learner in an educational context in particular. Indeed, the advent of communicative and action-oriented approaches marked a turning point characterized by taking into account emotional, social, and cultural aspects and multiple intelligences that distinguish learners. By considering the cognitive, metacognitive, and socio-cognitive activity of learners, these two approaches energized their status by considering them as meaning negotiators, knowledge constructors, communicative partners, and social actors involved in academic and civic training.

Tasks (Task-Based language teaching) in authentic contexts and problem situations replaced structural exercises. Errors are no longer viewed negatively but are instead considered indicators of learning. Needs were analyzed for better training. Formative assessment accompanied the learner throughout their learning journey. Training no longer depended solely on the teacher but also on

the learner to lead them to progressive autonomy. They would become active, strategic, and manipulated artifacts to progress, including collaborative platforms, digital tools, and currently generative artificial intelligence tools (Rezai, Namaziandost & Hwang, 2024). Ultimately, the role and status of the learner have undergone a profound transformation in language and culture didactics, granting the latter significant evolution and notable intensification in knowledge construction (Kumaravadivelu, 2006; Richards & Rodgers, 2014, Puren 1998). This discipline has experienced a gradual shift in its approach, initially focused on the object of study (language) and the teacher, towards a contextualized, authentic, and action-oriented approach, considering the learner as responsible for managing their learning, through their agency, reflectivity, and cognitive dynamic. Nowadays, any training path is based on the representation of a dynamic learner.

Indeed, active learning focuses on managing the learner's cognitive activity and the devices they mobilize to achieve their goal. This approach thus opposes a passive practice centered on content, to the detriment of reflection that allows the learner to aggregate complex practices such as reasoning, collaboration, cognitive conflict, and problem-solving (Prince, 2004). Thus, we can deduce that active learning is intrinsically linked to doing, acting, involvement, and therefore to active and meaningful engagement through the results it generates, whether these results are related to knowledge or know-how (Serrat, 2017; Pay, 2004, Ellen Macarthur Foundation, 2019).

From these references, two words challenge us: "involvement" and "engagement." We link them to the "Interactive, Constructive, Active, Passive" (ICAP) model implemented by Michelene Chi (2009). It represents a framework for understanding and analyzing four types of cognitive engagement of the individual in a learning situation. The model's name indicates that there is a hierarchy of four modes of cognitive engagement: passive, active, constructive, and finally interactive (Chi & Wylie, 2014). First, the passive mode refers to the lowest level of cognitive engagement adopted by the learner, as they are a receiver of data generated by the material without adopting a deep cognitive processing approach to the information received. Their cognitive resources are limited to encoding information, which leads to short-term memorization.

Subsequently, the active mode refers to the idea that the learner engages in limited action on the data generated by pedagogical tools, such as selecting a set of information or highlighting or even fully reproducing an excerpt without being able to produce new ideas. Cognitive engagement is thus described as superficial because, in addition to the encoding of the previous mode, the learner performs an action of perceiving information considered useful or important, hence their selection from all the data generated by the pedagogical tool. In the third step, the constructive mode describes the profile of a learner who energizes their knowledge and skills to connect them with the information generated by pedagogical tools and ultimately produce new information, formed by a combination of the learner's data and those offered by the scaffolding of the learning aid tool. Examples of concrete and active acts are given within this model, such as reformulation, summarization, or the creation of mind maps in the form of an iconic message that resembles the functioning of the human brain. Unlike the previous two levels, the learner infers data and associates it with the output generated by the tool to create a different output not only compared to the material's data but also to their initial knowledge. The user's knowledge and skills are therefore modified, transformed, and better than the initial state of the learning situation. Finally, beyond this mental reorganization resulting from constructive cognitive engagement, the fourth and last mode reflects a higher quality of knowledge and skill construction, which can only exist in a situation of interaction between the individual and the scaffolding means, whether human or artificial. In this situation, there is an attitude of negotiation, exchange, reflection, and integration of information following the activation of reasoning, i.e., a high-level cognitive mental operation (Alghamdi, 2024; Franiatte, Boissin, Delmas, De Neys, 2024). This is a more elaborate, more developed output based on a combination of activating high-level mental operations recursively and permanently.

At this level, we are in a situation of reasoned co-construction of the output, based on the continuous evaluation of the information generated by the tool to confront it with reasoning that allows it to be refined and enriched. This situation is therefore collaboration between the learner and the learning aid tool. Ultimately, this model defends the idea that the quality of learning is closely dependent on the mode of cognitive engagement developed by the learner. In short, the

closer the latter approaches the interactive mode, the better and more transferable the learning, as the learner becomes self-aware and capable of improving their approaches.

As this cognitive psychologist and her collaborators (Chi & Wylie, 2014) argue that the interaction with pedagogical artifacts significantly influences learners' cognitive engagement, the present study proposes a methodological framework for investigating the didactic field, with a particular focus on understanding the strategies students adopt when engaging with (AI) tools.

3. Research Methodology: To draw a profile of users of (AI) tools in a scriptural problem-solving situation, two methodological tools seem complementary to achieve our research objectives. The non-participant observation and directive interviews. In a qualitative approach, non-participant observation is a methodological artifact that allows us to observe real behaviours and obtain in-situ data on the use of artificial intelligence assistance tools, without teacher intervention. This mode of investigation favours the collection of authentic information (Martinez, Roys, Maestre & Araujo, 2024). The contribution of this approach is our physical presence in the didactic field, while maintaining a distance from the learners, in order to reduce the effects of this presence on the natural behaviours of the subjects. Non-participant observation is based on an absence of didactic mediation on the part of the teacher, i.e., direct involvement in the action performed by the learner, in order to promote objectivity and neutrality in the possible interpretation of the complexity of the observed behaviours, and the formulation of objective meanings regarding the actions undertaken by the actors in the field (Marietto, 2018).

To reduce the biases of our presence and preserve the authenticity of the observed socio-didactic uses, we structured this non-participant observation by equipping ourselves with a criterion-based grid that is considered a checklist (Busetto, Wick & Gumbinger, 2020). This grid reinforces the qualitative approach that aims to study the nature of the manifestation of the phenomenon of generative AI tool use by students. This grid is developed based on the parameters of active learning and the four modes of cognitive engagement of the ICAP model (passive, creative, constructive, and interactive).

Observation Criteria	Yes	No	Remark
Positive reaction to the authorization to use generative AI (acceptability)			
Negative reaction to the authorization to use generative AI (Refusal or fear)			
Reflection on the problem situation prior to AI use			
Reflective attitude on AI-generated content: -Cognitive conflict between the learner and AI-generated data through the expression of facial expressions or a surprised behavior. - Verification of the generated response (consultation of other digital resources such as Google for example or other intelligent resources) -Questioning other students -Reformulating or rewriting the AI-generated response, either through AI or personally by the student themselves.			
Personal reflectivity (note-taking, mind map, addition of prior knowledge, etc.)			
Socio-didactic reflectivity (Exchange with peers about the generated response)			
Frequency of questioning the AI tool for interactive effect (multiplication of prompts)			

Table n°. 1: Non-participant observation criteria (the authors)

These criteria thus contribute to the reliability and validity of the results of this study by allowing us to identify elaborate uses in an extracurricular and extra-university social context, in the absence of academic training. These uses can be considered as norms or routines or implicitly internalized practices by students.

Despite the advantages of non-participant observation, it has limitations that we tried to reduce by associating the observed acts with a directive interview following the use of AI. This interview is conducted with students based on a set of ordered questions formulated prior to the interview. The directive interview that follows non-participant observation allows us to compare the observed acts with the verbatim expressed by the students (Elhami & Khoshnevisan, 2022). The choice of the directive form of the interview is justified by our research objective, which does not aim to explore

other perspectives outside of the student's engagement and action with generative AI in a problem-solving scaffolding situation. Ultimately, this approach is suitable for a transversal vision reducing biases related to the interviewer, thanks to the framing of exchanges by precise questions without possible improvisation (Dursun, 2023).

The interview guide we implemented aims to better understand the inner thoughts that explain the observed acts. It mainly involves questioning students on three parameters that we considered important regarding the observed uses: their representations of AI tools in relation to learning, their uses of AI, and finally their feelings after solving a problem in an AI scaffolding situation. Our interview guide is presented in the form of these four questions:

- what do you think of generative (AI) tools in learning situation?
- How do you use generative (AI) objectives outside the university?
- Regarding the requested written production topic, did you have arguments or ideas before consulting (AI)?
- After using generative (AI) to write the text the teacher asked you for, what feelings do you experience?

In accordance with the research protocol, this interview guide was pre-tested with three English language students and three French language students to validate the wording of the questions and check their conformity with the research objective. No changes were made.

Regarding the target audience of this study, we conducted this classroom practice with 25 Master 2 level students, enrolled in two different fields: English language and French language. The objective of this choice is to determine if the uses of AI tools differ according to foreign languages, knowing that for these students, French is the first foreign language learned in the Algerian school context. Thus, it is interesting to compare the uses of AI in the context of foreign language didactics.

The writing task assigned to the students was an argumentative text. This choice was deliberate because it requires the student's point of view and will reflect their opinion and the arguments chosen to defend that opinion. The task instruction was formulated considering the female gender of the students and is as follows:

"To encourage women's employment, some advocate for the obligation to create childcare facilities, from the end of maternity leave until school age, in all state and private companies. Write a short argumentative text of about twenty lines in which you express your point of view on this idea." You have the possibility to communicate with other students as well as the possibility to use artificial intelligence tools or assistants. The task duration is one hour.

Following this instruction, the students responded to the task, and we developed a grid for each student. We present the results in the following lines.

4. Research Results and Data Interpretations: Our study aims to describe and analyze the uses implemented by the twenty-five students in a foreign language argumentative writing problem-solving situation. To do this, we analyze the actions performed by these students when manipulating generative AI assistants, in light of the criteria of the analysis grid constructed based on the theoretical foundations of active learning and cognitive engagement in a learning situation that we detailed in the theoretical part of our study.

4.1 Students' Choices of Generative (AI) Tools: Following the reading of the task instruction, each student immediately grabbed their smartphone and clicked on a generative AI assistant already installed on the smartphone. This indicates a habitual social use prior to the classroom didactic situation. The generative AI tools installed on the students' smartphones are "ChatGPT" for 24 students from both fields (English language and French language) and "Perplexity" for only one English student. Thus, we can note a limited knowledge of generative AI tools that can be exploited in social and academic contexts, which can reduce students' literacy performance and the reliability of the results obtained, as attested by these studies (Aryal, Hayojoo, Gurung, Do, Chataut, Gadhamshetty & Gnimpieba, 2024). Furthermore, this approach reflects the students' lack of understanding of the very training of AI assistants, which are trained with specific data, limiting their scope of knowledge and richness of responses, particularly in the field of languages, cultures, and humanities and social sciences (Ju & Aral, 2025).

4.2 Active Learning and Cognitive Engagement Mode: Analyzing the mode of cognitive engagement adopted by the students in light of the criteria of our theoretical framework. Thus, due

to the absence of differences, the data related to the non- participant observation of the 15 English language students and the 10 French language students are gathered in the following table:

Observation Criteria	Yes	No	Remark
Positive reaction to the authorization to use generative AI (acceptability)	X		Same result for all students
Negative reaction to the authorization to use generative AI (Refusal or fear)		X	
Reflection on the problem situation prior to AI use		X	Reading the instruction and immediate use of AI via smartphones
Reflective attitude on AI-generated content: -Cognitive conflict between the learner and AI-generated data through the expression of facial expressions or a surprised behavior. - Verification of the generated response (consultation of other digital resources such as Google for example or other intelligent resources) -Questioning other students -Reformulating or rewriting the AI-generated response, either through AI or personally by the student themselves.		X X X X X	Reading and copying AI-generated content
Personal reflectivity (note-taking, mind map, addition of prior knowledge, etc.)		X	
Socio-didactic reflectivity (Exchange with peers about the generated response)	X		Simple phrases exchanged about the success of the argument search
Frequency of questioning the AI tool for interactive effect (multiplication of prompts)		X	Apart from the first prompt requesting arguments in favor of the student's opinion, there were no other prompts.

Referring to our theoretical framework, the observed data lead us to qualify the cognitive engagement mode of students in a learning situation as "passive." The absence of reflection prior to generative AI assistance to add prior or sociocultural knowledge related to the theme of written production, as well as the absence of multiplying investigations by questioning other classic digital

resources and other generative AI tools, leads us to note the absence of any active, constructive, or interactive engagement. Indeed, the simple exchange with peers about the success of the argument search thanks to AI cannot be considered an indicator of an active engagement mode. During the activity, the 25 students did not engage in reflection on the activity except for the point of view they adopted regarding this idea proposed by the task instruction. Once they considered the idea to be positive, we observe an immediate use of AI through their smartphone. There is therefore no personal analysis in search of arguments. The subsequent behaviours reinforce this attitude of passive consumers of AI-generated responses, which leads to an absence of cognitive conflict and thus an absence of Vygotsky's zone of proximal development, since AI assistants were not used to improve an insufficient skill or knowledge. This result will be confirmed by the directive interview we conducted following this non-participant observation. Furthermore, faced with this behaviour, we note an absence of critical attitude to verify the accuracy of the information produced by AI or to reinforce it with personal ideas. Globally, students limit themselves to copying and pasting the arguments generated by AI, following a single prompt in which they request arguments in favour of the obligation to create childcare facilities in all state and private companies to promote women's employment. This use also indicates a lack of understanding of digital culture in the era of AI, where it is necessary to interact repeatedly or iteratively with AI tools to refine responses. This use of AI can be described as simple, punctual, and superficial, without the construction of new knowledge and active and transferable skills, and without the activation of a higher-level cognitive mode.

Following this non-participant observation, we knowingly conducted a directive interview with the 25 students to understand their representations of AI in general and particularly their representations of AI use in a university context. The interview was conducted individually by asking the questions formulated in the interview guide. The thematic analysis (Paillé & Mucchielli, 2021; Braun & Clarke, 2021) of the collected responses led to the emergence of thematic categorizations (Bardin, 2013) that indicate insufficient digital competencies for relevant AI use. Here are some examples:

- In a university learning situation, what do you think of generative AI tools?

- "it's magical!" (student of French)
- "it is very helpful" (student of English)
- "it is quick to have a solution" (student of English)
- "AI easily finds arguments for me" (student of English)
- "Finally/ ah/ no more grammar and spelling problems! It's great!" (student of French)
- "Oh/ it's the speedy way to finish the work correctly" (student of English)
- "No more stress, no more pressure! It's wonderful!" (student of English)
- "it's like a game where you always win" (student of English)
- "She does the work for me, who would say no?" (student of French)

We may note that the students' laudatory remarks reflect a positive representation of AI where themes of rapid satisfaction, fascination, and ease of data reception prevail over support for reflection, curiosity, and creativity. No distrust is expressed about potential AI errors or the risks of culturally and ideologically biased information due to training data (Zowghi & Bano, 2024; Hanna, Pantanowitz, Jackson, Palmer, Visweswaran, Pantanowitz, Deebajah & Rashidi, 2025). These data show that it is necessary to accompany students' training in the use of AI to be able to evaluate the effects by developing negative emotions leading to caution and positive ones where AI serves as a cognitive booster (Song & Tan, 2025; Wang, Obrenovic, Gu & Godinic, 2025). In conclusion, our results allow us to mention the existence of extreme motivation to use AI accompanied by excessive confidence (overreliance).

Regarding the second question, we obtained the following answers:

2/ How do you use generative AI? All the answers obtained can be summarized in the idea of asking questions and getting quick answers. Examples: "I ask a question and immediately get an answer." "It is very easy, I ask IA and I obtain a response with just one click"

- The third question aims to verify the students' prior knowledge about the topic of the written production text, to better understand the speed with which they immediately questioned AI without first writing the text and then using the AI to improve it.

3/ Regarding the requested written production topic, did you have arguments or ideas before consulting AI? All answers are affirmative, and therefore all students had personal information that they could integrate into their written production either before consulting the AI or after using the AI to rewrite the text and add this knowledge. But this did not happen. They limited themselves to the information suggested by the AI.

4/ Finally, the last question aims to understand the degree of satisfaction of the students regarding their learning approach.

5/ After using generative AI to write the text the teacher asked you for, what feelings do you experience? The answers obtained show that the students are satisfied with their learning approaches since they were able to use AI to solve the problem of written production. No answer shows that AI can help develop the learning process and not just the text as a product of this process. There are therefore no awareness and interest in transferable know-how to other work situations and for active learning promoting the formation and memorization of long-term knowledge and skills (Latimier, 2019; Cussens & Dzeroski, 2003).

6/ Finally, no answer addresses the ethics regarding AI, and the students appropriated the results of the AI without copyright. Thus, the analysis of the verbatim of the directive interviews reinforces the passive cognitive engagement mode of non-participant observation. This result is not different depending on the language of study since English-speaking students, like French-speaking students, adopt exactly the same behaviour.

5. Conclusion: The theoretical framework of our research reports that active learning, based on constructivism associated with the mediation of learning developed by socio-constructivism, linked to the cognitive engagement model (ICAP), with the aim of describing and analyzing students' uses of artificial intelligence assistants to solve a written production problem in foreign languages.

The methodological component of this study is based on the combination of two complementary methodological tools, non-participant observation supplemented by directive interviews to describe and understand the interaction that the learner implements with the cultural tool represented by the generative artificial intelligence assistant.

The results obtained clearly set forth facts that some of our students ignore the ethical use of digital technologies ICTE, they just copy paste information. Educators and professionals should raise awareness by providing structured training on the use of modern technologies.

One way to improve the approaches to using (AI) tools for better learning may be the suggestion of Chi, Leew, Chiu & Lavancher (1994) is a classic in educational psychology. They demonstrated that students who are explicitly prompted to explain the material to themselves while reading—effectively bridging new information with what they already know—develop a much deeper understanding than those who simply read the text multiple times, through self-explanatory didactic interventions to better integrate effective learning approaches. Given the potential of these generative AI tools, we can be optimistic about their advantages in developing learning approaches, since recent work has noted that through guided training, it is possible for learners to improve their training processes, particularly in writing (Siddiqui, Feliciano, Pea & Subramonyam, 2025). Another perspective can be considered through another study allowing us to analyze the uses of generative AI tools in relation to oral competence, particularly due to this generation of learners' inclination towards oral communication in its various sound and visual forms encouraged by social networks.

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