

ОБЩЕСТВЕНИ КОМУНИКАЦИИ И ИНФОРМАЦИОННИ НАУКИ PUBLIC COMMUNICATIONS AND INFORMATION SCIENCES

COMMUNICATION MODELS, GENERATIVE LANGUAGE MODELS AND THEIR APPLICATION IN TEACHING

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Abstract: *Generative language models pose new challenges for teaching and learning processes. This article looks at the opportunities and risks of AI applications in teaching and learning settings against the background of communication models and identifies initial recommendations for action. On the one hand, the focus is on the new possibilities arising from the mass distribution of generative AI language models and their impact on the communication process. In order to be able to assess this, communication is understood as a process in which the sender and receiver are mediated with each other through a medium. With regard to generative AI language models, the large number of parameters to be determined is striking. These range from the nature of the algorithm to the question of the training data on the basis of which the AI application produces results. However, it is precisely at this point that the communication process between humans and AI proves to be susceptible to errors, as the selection of training data is not transparent for either laypersons or specialists. For the application of generative AI language models in teaching, it can therefore be concluded that repetitive tasks such as summarizing literature may be particularly suitable for AI use. However, the actual drawing of conclusions and the general use of AI outputs must be critically scrutinized by a human. At this point, it becomes clear that AI expertise will also be essential for teaching-learning settings in the future.*

Keywords: *AI, generative language models, communication models, teaching-learning context, AI in teaching, ChatGPT in teaching*

INTRODUCTION

Communication is everywhere and is currently in a state of revolution due to the mass distribution of generative AI language models. The use of this technology is being discussed not only in the business world, but increasingly in school and university contexts.

It is all the more important to be familiar with the basic functions of communication in order to be able to classify the rapid developments in a well-founded manner and to accompany them from a scientific perspective.

This article aims to present the basic elements of a communication model for teaching purposes. In particular, we should ask where the opportunities, but also the risks, of using AI technologies in these contexts lie. Impulses should also be given as to how the associated problems can be addressed.

This article primarily uses the relevant literature on communication models, communication psychology and the currently available information on generative language models, which is also accessible to laypeople via the Internet browser. In particular, this article refers to the ChatGPT

generative language model from the company OpenAI, which has become a symbol of the AI revolution.

COMMUNICATION IN TEACHING

Presenting a comprehensive definition of communication here would certainly go beyond the scope of this article. Therefore, a working hypothesis of the term will be designed below with which the questions regarding the use of generative language models in teaching and learning contexts at school and university can be examined.

Within the framework of the most basic conceptual approach possible, communication can be understood as a process in which the elements of language, self and sociality interact with one another (Anselm & Werani 2017, 17). Language in particular is considered a fundamental means of communication, which in turn should be understood as a tool that is interwoven with other psychological and social processes (Anselm & Werani 2017, 22).

A wide variety of theories have attempted to capture the concept of communication, whereby communication basically means the process in which two or more participants act as sender or communicator and/or as receiver or recipient of signs and symbols (Vogel 2018, 11). This process can take place via various modalities, but also indirectly via media (Vogel 2018, 11).

Central to the communication process is the process of signal transmission of information, which, according to the communication model of Shannon & Weaver (1949), is a message sent via the sender to the receiver via a specific channel and finally reaches its message destination (Vogel 2018, 11). In this multi-step process, which is modeled on the basis of signal transmission during telephone calls, sources of interference that can affect the channel also play a role (Vogel 2018, 11). However, it is also essential for the success of communication that decoding on the receiver side can take place smoothly and as intended by the sender (Vogel 2018, 11).

In his consideration of the similarities and differences between various communication models, Merten (1977) found that the smallest intersection of elements of communication models consists of the communicator as a sender, the recipient as a receiver and the stimulus, the stimulus or statement, which is also the establishes a connection between the sender and the receiver (Merten 1977, 27).

With regard to teaching activities, language is the fundamental element for the design of learning contexts in both the communicative sense, but at the same time language is also essentially responsible for structuring the individual thinking processes on the part of the learners and the teachers (Anselm & Werani 2017, 22). What is also fundamental to communication is that it always takes place socially and therefore requires at least a two-person system (Anselm & Werani 2018, 22).

Dialogic communication models are particularly suitable for describing communication in teaching and learning contexts, as they emphasize the binding reference system for understanding language in dialogue (Anselm & Werani, 2017, 34). However, the focus is not primarily on conveying information, but also on constructing intersubjectivity, since shared dialogue can be seen as constituting a shared reality primarily through real conversation (Anselm & Werani 2017, 35). For dialogic communication models, it is also assumed that the relationship aspect in the communication process plays an essential role in the success (Anselm & Werani 2017, 38). The best-known dialogic communication models include the models of Watzlawick, Beavin and Jackson (Anselm & Werani 2017, 35). With regard to teaching activities, communication can be seen as an essential component (Anselm & Werani 2017, 13). Successful teaching-learning contexts are particularly dependent on knowledge about the laws of classroom communication, but also on the opportunities for reflection that make it possible to reflect on the language used (Anselm & Werani 2017, 13). For teachers in both school and university contexts, the basic assumption is that developed

communicative skills reflect equally developed didactic competence and inner attitude (Anselm & Werani 2017, 13). Communicative competence in teaching situations not only includes conveying information, but also a certain way of speaking and listening, which is considered an “indicator of professional competence” (Anselm & Werani 2017, 13). Linguistic activity is a central didactic feature of teaching and takes on the dual function of medium of instruction and subject of instruction (Anselm & Werani 2017, 13). Last but not least, lessons also promote the learners' language, for example in the form of acquiring a specific specialist language.

Communication in teaching is also a social phenomenon in which teachers and learners interact closely with each other (Anselm & Werani 2017, 14). In this context, it can be assumed that there is an interactive process that takes place under complex conditions and in which teachers simultaneously serve as role models for communicative competence (Anselm & Werani 2017, 15).

For example, successful communication does not depend on the skills of the teachers, but also on the professionalization of the communicative skills of the learners, as they also have to make a contribution to the success of communication (Anselm & Werani 2017, 15). Not only speaking itself, but also listening becomes an indicator of communicative competence, especially on the part of teachers (Anselm & Werani 2017, 15).

For both teachers and learners, communicative competence in the educational context is seen as an essential key competence for successful communication (Anselm & Werani 2017, 16). However, both teachers and learners do not possess this communicative competence a priori; rather, both sides have to consciously work on it. This communicative competence can be further developed and professionalized through targeted analysis, but also reflection and training of personal self-regulatory processes (Anselm & Werani 2017, 17).

ELEMENTS OF COMMUNICATION MODELS IN TEACHING

Teaching processes must always be understood as communication processes in both school and university contexts. The aim of this communication process is successful learning (Schumacher 2022, 22). In both school and university contexts, learning is largely geared towards the acquisition of knowledge. A wide variety of learning theories also examine in an interdisciplinary manner what learning is and how it works. Traditional learning theories, such as those that emerged in the first half of the 20th century, deal with the elements of acquisition, storage and reproduction of learning content as characteristics of the learning process (Anselm & Werani 2017, 99). However, more current learning theories go well beyond these theories. The activity-theoretical perspective on the learning process established that learning should be seen as a meaningful, communicatively mediated process in which the learning activity is geared towards the learning object to be acquired, but essential elements of the learning process must be negotiated with the learners in order to achieve meaning (Anselm & Werani 2017, 102). However, this depends crucially on whether the learners have already learned how to learn themselves. Only then are they able to develop learning needs and motives based on their interests and to generate their learning goals themselves (Anselm & Werani 2017, 102).

In comparison, neurodidactics, which emerged in the 1990s, assumes that learning must be viewed as a physiological process in which body and mind form a unit, since both physical and psychological factors are involved in learning (Anselm & Werani 2017, 108). In addition, neurodidactics emphasizes the central importance of linguistic activity as a means of learning (Anselm & Werani 2017, 110).

It is obvious that speaking and thinking are particularly closely related to one another in the learning process, which is why various hypotheses have been developed to explain this connection. These include the determinism hypothesis, the independence hypothesis and the interaction hypothesis (Anselm & Werani 2017, 110). Not only the linguistically conveyed content, but also the

quality of speaking itself has an influence on thinking and problem solving, especially through the choice of words used (Anselm & Werani 2017, 111). It must be noted that the use of language is a habitualization that was shaped by appropriate language role models (Anselm & Werani 2017, 111). For teaching-learning contexts, this means that, on the one hand, the teacher must be seen as a linguistic role model, and on the other hand, he or she is also responsible for corrective feedback, for example in the context of language-sensitive specialist lessons, in which the learners' speech is corrected and has a positive effect on communicative skills also affects internal cognitive processes (Anselm & Werani 2017, 111). The learners' inner speaking has a hinge function between external and internal psychological processes and ultimately leads to the further development of higher psychological functions of thinking and consciousness (Anselm & Werani 2017, 112). Especially in the learning process, communication is also subject to numerous disruptive factors, for example when content cannot be understood, believed or implemented (Schumacher 2022, 24). But verbal disturbances, for example in the form of heckling, restless behavior, refusal to participate and others, can also disrupt the communication and learning process in school or university teaching (Schumacher 2022, 31).

GENERATIVE LANGUAGE MODELS – FIELDS OF APPLICATION IN TEACHING AND ACCESS

Since the second half of 2023 at the latest, generative language models have been present as a topic in public and outside of LLM development specialist circles. These AI systems are operated via text input, also known as prompt, which contains the writing or answering task for the AI (Busse&Kleiber 2023, 1). However, recent developments also allow media to be used other than prompt, such as images, diagrams or even voice input (OpenAi.com 2024). Based on these work orders, it is possible for generative language models to create completely new texts, image and video content and even program code (Busse&Kleiber 2023, 1).

One of the opportunities that arise from working with AI applications is that tasks can be simplified, for example by delegating literature summarization to the AI application (Mrass 2023, 108). In this way, standard activities can be taken over more by AI tools, while human capacities are freed up for more complex research tasks (Mrass 2023, 108). The resulting efficiency gains can then be used, especially in teaching-learning contexts, for didactic tasks, for example (Mrass 2023, 114).

Given the potential of generative language models, in addition to the aspects presented in the context of teaching and learning contexts, one of the opportunities offered by these applications is certainly to gain initial access to new subject areas in a short time. In dialogic communication with ChatGPT and other similar applications, one's own creativity can also develop by receiving new food for thought during the phases of information search and its assessment (Cieźka 2024, 384).

PROBLEMS OF GENERATIVE LANGUAGE MODELS

One of the problems that arise when using generative language models in a teaching-learning context is the question of the authorship of the result. It is sometimes difficult to determine to what extent humans themselves can be considered the author of the text generated with AI support (Busse&Kleiber 2023, 1).

From an ethical perspective, numerous questions arise from the use of AI language models in teaching and learning contexts. However, especially with regard to the authorship of such applications, it must be noted that they cannot under any circumstances be given responsibility for their work and that a human reviewer must always check the outputs (Mrass 2023, 109).

Aside from copyright issues, the use of AI in writing in teaching-learning contexts involves further technical, social, ethical and legal questions that have not yet been fully clarified (Busse&Kleiber 2023, 1).

In this context, Busse & Kleiber (2023) point out that the use of AI in teaching focuses primarily on learning objectives of higher taxonomy levels, as typical time-consuming tasks, such as summarizing texts, can be significantly simplified through the use of AI (Busse&Kleiber 2023, 2). Analyzing and evaluating the results output by the AI application, on the other hand, is more perceived as the main task of humans.

PROBLEM AREAS AND SOLUTIONS

As diverse as the opportunities and potential for the use of AI in teaching and learning contexts are, the problem areas and risks must also be considered urgently.

These include, first of all, the question of where the content generated by generative language models actually comes from. The processes are algorithm-controlled and cannot be easily understood by laypeople. The database on which an LLM such as ChatGPT is trained is also difficult for laypeople to understand.

It must also be noted that it is difficult to verify from which sources AI applications obtain their information. This has far-reaching consequences not only for science, but also for professional areas such as journalism, which has to face source criticism (Busse&Kleiner 2023, 2). Sources used by the AI are not specified and therefore cannot be checked (Busse&Kleiber 2023, 4).

However, the question of training data entails further considerations. For example, it is unclear which database was actually used for training and whether it represents a balanced, realistic picture of topics. The question is whether the language model is not subject to bias, as the training data suggests this (Busse & Kleiber 2023, 4). With regard to the further development of these systems, the problem arises that in the future AI-generated texts will no longer be able to be reliably recognized by appropriate detectors (Busse&Kleiber 2023, 4). This means in general, but especially for use in the context of teaching-learning models, that the content generated by a generative language model cannot be adopted without question, but must always be assessed and checked by a human.

Last but not least, this context also raises the question of developing AI skills that should enable people to work confidently and productively with this rapidly developing technology (Busse&Kleiber 2023, 2). The enormous speed of development of this technology and the high complexity of the topic represents the greatest challenges.

Particularly for use in the teaching and learning context, complex debates about norms and values are necessary, which still have to determine what a profitable and responsible use of AI applications can look like (Busse & Kleiber 2023, 2).

In the teaching-learning context, it is therefore necessary to develop the competence to use AI tools responsibly and at the same time to use them meaningfully and successfully (Buck et al. 2023, 8). In particular, users in teaching and learning contexts must be aware of the limits and risks of AI applications, which makes the development of critical thinking essential (Buck et al. 2023, 8). The aim should be to evaluate the quality but also the relevance of the AI output and to take your own position on it (Buck et al. 2023, 8).

CONCLUSION

As has already been shown when considering communication models in teaching, learning and communication processes are closely related and are subject to a variety of interactions. Learning can be understood as a communicatively mediated process in which speaking and thinking are closely intertwined.

With reference to the topic of generative language models considered here, it can initially be assumed that applications such as ChatGPT, which enable dialogue via text, image or voice input, imitate the communication process of human teaching and learning situations. In the course of this

dialogue between humans and chatbots, internal speaking situations can also arise when dealing with the generated content, which can lead to the further development of the teaching-learning process.

It must be critically noted, especially in the context of teaching-learning settings, that due to the ethical and legal problems of the training data already described, it should not be expected from a generative language model that AI applications can actually help in the development of communicative competence. As has been shown, both learners and teachers must consciously work on their communicative competence. However, unlike human teachers, generative language models cannot correct this process for the learner. Rather, they simply provide output to prompts created by the learner based on their respective level of knowledge. For example, if the learner is required to use a certain technical language, he or she must already master it before using generative AI in order to achieve the desired result.

In the context of the classic communication model by Shannon & Weaver (1949), it can be assumed that the person who formulates the prompt and enters it into the generative AI is to be understood as the sender, while the generative language model represents the receiver.

However, when it comes to the disruptive factors in this communication process, it can be stated that they are massive. Although there cannot be any disruptive interjections or refusal to work behavior in the dialogue between humans and generative AI, as is the case in purely human teaching and learning settings, the numerous intransparencies that are, at least currently, still associated with training and training data selection can be identified as significant disruptive factors become. Holistic media education must begin here in order to raise awareness of these disruptive factors and to create a critical approach to these applications, but especially their results.

A variety of factors related to the use of AI in teaching and learning contexts are currently still unclear, such as ethical questions about data protection and sustainability; Since technical progress in this area is occurring at an accelerated pace, further developments must remain critically monitored (Buck et al. 2023, 9). In view of the extensive disruptive factors, it is therefore advisable to declare AI-generated results in order to create more transparency in teaching and learning contexts. In this respect, AI competence should also be viewed as a potential field of action in media didactics, which should no longer be neglected given the rapid development. Embedded in a comprehensive concept for media education, AI competence could lead to an awareness of the communicative disruptive factors of AI outputs and thus lead to a critical and conscious approach to these applications. At the same time, the manufacturers of such generative language models should also be required to make the scope and selection of the training data they use more transparent in order to minimize the number of disruptive factors and thus enable users to better assess the AI outputs.

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КОМУНИКАЦИОННИ МОДЕЛИ, ГЕНЕРАТИВНИ ЕЗИКОВИ МОДЕЛИ И ТЯХНОТО ПРИЛОЖЕНИЕ В ПРЕПОДАВАНЕТО

Резюме: Генеративните езикови модели поставят нови предизвикателства пред процеса на преподаване и учене. В тази статия се разглеждат възможностите и рисковете, свързани с приложенията на изкуствения интелект в условията на преподаване и учене на фона на комуникационните модели, и се набелязват първоначални препоръки за действие. От една страна, фокусът е върху новите възможности, произтичащи от масовото разпространение на генеративни езикови модели с ИИ, и тяхното въздействие върху комуникационния процес. За да може да се направи оценка на това, комуникацията се разбира като процес, при който изпращачът и получателят са опосредствани един от друг чрез медия. По отношение на генеративните езикови модели на изкуствения интелект поразителен е големият брой параметри, които трябва да бъдат определени. Те варират от естеството на алгоритъма до въпроса за данните за обучение, въз основа на които приложението на ИИ дава резултати. Точно в този момент обаче процесът на комуникация между човека и ИИ се оказва податлив на грешки, тъй като изборът на данни за обучение не е прозрачен нито за неспециалисти, нито за специалисти. Следователно за прилагането на генеративни езикови модели на ИИ в обучението може да се заключи, че повтарящи се задачи като обобщаване на литература могат да бъдат особено подходящи за използване на ИИ. Въпреки това действителното изготвяне на заключения и общото използване на резултатите от ИИ трябва да бъдат критично проверени от човек. В този момент става ясно, че експертните познания в областта на ИИ ще бъдат от съществено значение и в бъдеще за условията на преподаване и учене.

Ключови думи: ИИ, генеративни езикови модели, комуникационни модели, контекст на преподаване и учене, ИИ в преподаването, ChatGPT в преподаването

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