

# ChatGPT in education: Does it improve learning or affect educational quality?

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**Abstract**— *Education in Costa Rica must think forward and take advantage of new digital tools, like chatbots while considering the associated challenges and concerns, as well as their impact. The advancement of the educational sector in Costa Rica and its limitations can reflect a model of the constraints, limitations, and opportunities for the Latin American countries in this topic. There are few studies on ChatGPT and its use in Latin America, this is a seminal study that can lead to many future researches on Generative Artificial Intelligence (Gen AI). The focus on universities offers opportunities to analyze the practical impact of ChatGPT in the educational sector. The research had a qualitative-exploratory approach, being the method of data collection was the bibliometric review of academic databases in the field of education and generative artificial intelligence, resulting in the identification of three case studies representative of the study phenomenon, where, through data triangulation, the main factors that explain the object of study were identified. Results support ChatGPT, which has a positive influence on Costa Rican education by improving the learning process, providing quick and personalized answers, and encouraging student participation. Additionally, we propose a strong alignment between all institutions for the collaboration and enforcement of the educational system: Minister of Education, Central Government, Local Government, Universities, Centers of Innovation, Non-Governmental Organizations (NGOs), Think Tanks, and International Organizations.*

**Keywords**— *ChatGPT, large learning models, generative artificial intelligence, chatbots, e-learning.*

## I. INTRODUCTION

In a world where Artificial Intelligence (AI) has flourished in fields as diverse as medicine, customer service, and government decision-making, it has empowered an even more promising arena: Generative Artificial Intelligence (Gen AI). This article dives into this exciting terrain, aiming to explore the dizzying growth and its ever-evolving positive implications.

In recent years, technology has transformed education worldwide, offering new opportunities for learning and teaching. The word chatbot is composed of 'chat', which refers to a conversation, and 'bot', which refers to a robot. In the context of AI, a chatbot seeks to provide appropriate and logical responses in human-machine interactions [1]. Thus, a chatbot simulates human being behavior in a conversational

environment. It processes natural language text and interacts to generate intelligent and relevant responses. This type of tool is especially useful in adaptive learning, as it enhances learner engagement and interaction [2].

However, we have the research question of whether it improves learning or affects educational quality; although the use of ChatGPT can be beneficial in many aspects, there are also important concerns that should be carefully considered. Among them are the reliability of the results obtained through the technology, as well as the possible loss of important skills in students, such as the ability to research, analyze information, and develop critical thinking [3]. The best evidence to justify the research is per case studies, we have prepared three case studies to clarify the practical way of the study, and the practical implications for Costa Rican Government.

The ChatGPT was created based on the AI technique known as Human Feedback Reinforcement Learning (HFRL). According to OpenAI, the tool's training process consists of feeding the chatbot a large set of text data and then using that information to learn patterns within the language [2]. This technology is attractive because it permits reflection and information in real-time about student questions. Their implementation in educational institutions has shown a remarkable improvement in student engagement. Therefore, their use in education has become essential for modern institutions seeking to optimize the experience of both students and professionals [4].

The study was based in Costa Rica, with technology has become a fundamental tool to improve the quality of education, and various digital tools have been implemented such as online learning platforms (Google Classroom, Moodle, and Edmodo), videoconferencing tools (Zoom, Google Meet and Microsoft Teams), mobile applications (Duolingo, Kahoot and Quizlet), among others [5]. In this context, ChatGPT could become a high-impact digital tool in the country, by providing students and teachers with the ability to answer questions and provide real-time feedback on any subject of study. Another tool derived from OpenAI since 2022 is POE AI, which gives access to ChatGPT 3.5 and ChatGPT 4.0 and offers both paid and free versions.

To answer this question, this study was based on a comprehensive bibliometric review of three study cases related to the impacts of Gen AI. The findings reveal the presence of benefits in the use of these technological platforms, highlighting the need to address issues throughout the life cycle of mathematical algorithms, for today's world.

Also, the research has a contribution to the art state to analyze the impact of ChatGPT in Costa Rican education today, and how through proper implementation and taking the necessary precautions, Gen AI can become a valuable resource that contributes to the improvement of learning and educational quality in Costa Rica.

## II. LITERATURE REVIEW

By exploring the historical evolution of AI, it is possible to understand how the concerns have influenced the development and perception of AI over time, marking significant milestones in their intersection [6]. In its origins, between 1950 and 1960, discussions were limited, as the focus was on the technical aspects and potential of such technology. However, as systems became more sophisticated (1970s - 1980s), it enabled autonomous decision-making, and concerns about accountability and transparency emerged, the main focus being how machines handled ethical issues [7].

Thus, in 1990, the first codes for AI research were created. This marked a more significant moral awareness in the design of algorithms and systems, with privacy being a central concern. With the rise of the Internet and massive data collection, discussions focused mainly on the protection of personal information and its respective use [8]. Since 2010, algorithmic discrimination stood out as a significant ethical concern, as cases arose in systems that perpetuated segregation in areas such as criminal justice and access to financial credit. This led to using technology with a renewed focus, based on equity and algorithmic justice. This, in turn, has triggered a debate in different sectors, concerning the ethical responsibility of Gen AI in society [9].

As a result of this evolution, accountability frameworks and transparency mechanisms are being developed to address emerging challenges. History shows how concerns have evolved in the ever-changing field of technology [10].

Chatbots and virtual assistants, such as ChatGPT, have been recognized for their ability to provide quick and personalized responses, as well as to encourage participation and interactive learning [11]

Research in ChatGPT and AI in the Costa Rican context doesn't exist in previous studies, and ChatGPT 4.0 is a topic very new to literature, and advantages or disadvantages in academic ambience have not been described in the literature review nor in a practical way. So, this seminal work is an amazing opportunity to get an introduction to the sector of universities in the whole country and the whole educational ambience.

Along the same lines, the Large Language Model (LLM) allows training models by using prediction models based on deep learning (neural networks). These are models of autolearning and for the future training models can have the possibility to create solutions [12].

In other words, ChatGPT is a game changer, for the educational system, naturally, with all the options created

every day, this software with different versions offers innovation opportunities for students [13].

Nowadays, students have a wide knowledge and familiarity with new digital tools. It is crucial to take this affinity into account and take advantage of it in the definition of realistic and achievable educational objectives. This implies the need to develop new teaching-learning structures and modalities, supported by the latest technologies based on AI. Ignoring this need to adapt to a new reality would lead us to fall behind in technological terms, becoming "techno fossils" [14].

Other studies have analyzed its ability to provide clear and understandable explanations on various topics of study. The results have shown that students value the ability of this tool to provide real-time answers, clear explanations, and personalized and constant support in their learning process. In addition, it has been observed that it can stimulate creativity and idea generation, as students can interact with it in a judgment-free environment [15]. Importantly, it has great potential for teachers, not only in content but also as a support tool to develop their teaching proposals [16].

However, implementation in education also brings challenges and concerns. Concerns have been raised that chatbots may exhibit biases and provide incorrect information if their training and the data sources used are not properly monitored. One of the main challenges is to ensure that they are properly trained in different contexts and scenarios to get the answers in any situation [17].

The use of ChatGPT also poses the risk of facilitating academic fraud, as this language model can generate satisfactory results in a variety of subjects of interest to the student, such as essays, written assignments, or summaries. Effortlessness could hurt critical thinking and the ability to have autonomy in decision-making. An advantage of the system is conducting investigations for pupils and arriving at their conclusions or perhaps partial solutions [6]. However, the problem goes beyond the tool itself and is related to the possible obsolescence of certain educational tasks [18].

Academic writing involves fundamental skills such as critical thinking, the ability to synthesize and analyze information, and competencies that are not yet available to machines. For example, AI-based tools could be developed to provide organizing and structuring ideas, correcting grammatical and spelling errors, and in some points, the tools can suggest the best choice for the correct homework or study [19].

It is important to have the ability to compare sources, and the ability to formulate appropriate questions in the chat. In situations where a specific skill needs to be developed at a given educational level, it is necessary to exercise control over their use, similar to how access to calculators is limited when working on skills related to basic calculation operations [20]. We clarify this author is the most prolific in academic ambience and conferences including the Costa Rican context in the digital era.

Educators must constantly adapt and improve their pedagogical skills. In the long run, the task of writing essays could become less challenging for students, even for those with no previous experience in a specific subject. Against this backdrop, teachers have a responsibility to reflect on new teaching philosophies that will enable them to effectively assess their students in this changing context [21].

Despite significant research conducted about ChatGPT, we need to overcome such issues as ethical and student data privacy challenges, because interaction with these tools involves the collection and storage of personal information [22].

While it has been noted that it can improve access to data and facilitate interactive learning, some concerns about overreliance, bias, and data privacy have also been identified. Finally, nowadays ChatGPT is evolving, and the previous version presented bias and the need to maintain and update the databases and the protocol by applying machine learning for the success of the software. The contribution of this research is to clarify the level of advancement in ChatGPT technology in the Costa Rican context and propose in this first study what to improve education in the university system.

### III. METHODOLOGY

This research was conducted as a qualitative approach and with an emphasis on exploratory research, because the purpose was to explain the object of study, through the relationships between its components and the regularities of the same [23], the purpose of the identification of the benefits derived from the use of Gen AI through ChatGPT in Costa Rican education. Also, it is qualitative-descriptive, since they describe the phenomenon of the study, and based on Reference [24], case studies are a good representation to explain the advances and challenges of ChatGPT in the educational Costa Rican model.

The objective was a detailed analysis of the positive aspects of Gen AI, focusing on the guidelines to be followed during its use in education. Also, it was to understand how the use of this technology contributes to the educational system, providing new perspectives and opportunities for improvement. The data collection was performed through a bibliometric review, to develop a solid conceptual framework based on previous research [25-27], allowing to establish a deductive line of reasoning to structure the study logic.

The documentary review was carried out through searches in electronic databases of recognized authors in the field. It is important to clarify when we have a new study in emerging economies, the studies have scarcity, and then we discovered and proposed three case studies focused on three areas: AI in Higher Education, Generative AI in teaching practice, and Redefining teachers' relationship with AI. During research these articles were carried out in Spanish and English, using specific search criteria, incorporating keywords such as "ChatGPT", "education" and "benefits" and

specific combinations to narrow down the search criteria of the subject with greater precision.

A working hypothesis was chosen [28], to conduct the exploration of the data, for its analysis and explanation, based on Grounded Theory's bottom-up approach.

In addition, the working hypothesis proposed is based on understanding the phenomenon studied, which introduces a rule that operates in the form of a hypothesis to consider within such a rule the possible outcome from the particular to the universal and implies a measurement methodology without theory [29], in other words, it is based on inductive reasoning to explain the object of study from the documented experiences of the participating companies, considering the experience of the participating companies as an explanatory hypothesis. In this way, induction is the logical operation by which the hypothesis of this study arises.

For his part, Reference [30] stated that qualitative research does not seek to verify a hypothesis but to unveil what is hidden, to discover that which shapes the various subjectivities, the discourses of the persons investigated, which are situated in historical-social contexts. In this sense, it is valid to construct it later but it can also be proposed as a preliminary guide or aid.

Based on the arguments, the study presents based on the literature a priori hypothesis, as a guide or aid during the research process and not as a process of verification of any theory, this hypothesis was adjusted and evolved throughout the study based on the findings obtained from the experiences of the participating companies until the constitution of the model.

The working hypothesis of this study was: ChatGPT has a positive impact on Costa Rican education by improving learning and providing quick and personalized answers for students, and this is a consequence of the research question: Is there a positive impact on Costa Rican education for ChatGPT use in undergraduate level?

For the analysis of case studies, we defined a triangulation of results in the discussion of the paper and comparing with the working hypothesis of research and how to enforce the same hypothesis. In the analysis, we incorporate the scientific criteria of benefits for the educational system of ChatGPT use, and the contribution of the research question for the Costa Rican context case.

This methodology allowed for highlighting the controversies, main conversations, and threats associated with Gen AI in business management and economics, using ChatGPT as a representative case study. The above is supported by essential researchers such as [31, 32].

Finally, with all the information gathered, we proceeded to identify and infer the characteristics and factors that should characterize positive impacts of Gen AI and, highlight its growing importance in contemporary society, but the focus of the study is the Costa Rican country, an amazing case in Latin America with a very high education level of his population and economic stability as a promise after COVID-19 for Latin America region, this example of region like others: Panama

and El Salvador are adopting technology as a tool in the government and particularly for the research interest in educational sector.

#### IV. RESULTS

We present three case studies after reviewing literature in the context of Costa Rican education, based on a few studies in the Latin American context, the conferences and papers about ChatGPT and its impact in Costa Rican education are very thinking forward for the future Latin-American context. The roadmap of ChatGPT in Costa Rican education is focused on three areas: AI in Higher Education, Generative AI in teaching practice, and Redefining teachers' relationship with AI.

##### *Case Study 1. AI in Higher Education.*

Based on work by Reference [20], AI presents technophobic and technophobic positions as follows: Gen AI can conflict with moral aspects of society [33]. Many Universities in the first steps of ChatGPT have presented concerns, about how useful or harmful the new software is on real-time answers for students. However, analyzing a balance between the positions are more positive factors than negative factors of AI in Higher Education.

In another position: Rather than reject these machines, we can rethink what they can teach us about ourselves; after all, they are images of humanity but on the Internet; for instance, when the birth of the calculator occurred, was the same, but this has not stopped people from learning to perform mathematical operations [34]. This reflection is important because history has shown that prohibitions are often not as effective as intended.

Some reflections on the Costa Rican context of this first case:

Gen AI may be disturbing and, in some cases, frightening. Likewise, the presence of such technologies cannot be dismissed, resisted, denied, or banned. Of course, the presence of this tech can be regulated and this is a great opportunity to work as the paper explains in the following steps.

Faced with the temptation to prohibit these sources of selection and formulation of appropriate questions to ask in the chat. Likewise, a challenge, because in Costa Rica there could be 100,000 to 500,000 teachers trained, but in the United States of America there would be millions of teachers who would have to be trained in these technologies. The problem in the educational sector is the same as in the health sector, many times they are cutting budgets, but never they are thinking in the long term in prevention with skills for professors and students to have the tools for getting an amazing performance.

##### *Case study 2. Generative AI in teaching practice.*

Based on Reference [22], there are three directions of AI in education:

##### 1. Learning from AI.

ChatGPT is based on an LLM which is GPT (see Figure 1), this is a system with  $m$  tokens  $P(w_1, \dots, w_m)$  using a probability distribution, i.e., predicting the next token from the previous ones (autoregressive models), it permits the prediction of future sentences and ideas. This language can permit machine translation, speech tagging, speaking, handwriting recognition, information retrieval, etc. So, the possibilities while the science advances are amazing. For entrepreneurial activities and the development of virtual assistants, we have POE, this application offers the ability to ask, answer, and chat instantly.

##### 2. Learning about AI.

The two best-known models that have been used in Latin America are:

##### a. GPT 3.5

- Size: its architecture involves learning a total of 175 billion parameters.
- It was trained with the "Common Crawl" dataset, which is a corpus containing about one trillion words of text extracted from the web and occupies a space of 45 TB of compressed text, which was reduced to 570 GB once filtered and preprocessed.
- With this training, GPT 3.5 can handle a context window (how much information the model can process to make its next prediction) of 4,096 tokens (about 2,500 words).

##### b. GPT 4.0

- Size: The context window is double that of GPT 3.5, i.e., 8,192 tokens, but this is not the final version and GPT-4 is expected to reach a context window of 32,768 tokens (about 25,000 words, 50 pages of a document).
- It is multimodal.
- New user interfaces to enhance the user experience.
- Ability to manage tools.
- Includes Metacognition.

##### 3. Learning with AI.

Fig. 1 shows the most relevant roadmap from GPT-3 until GPT-4, in the timeline from 2019 to 2024, we can observe many different languages for example: GPT-3, BLOOM, CPM-2, TO, CodeGen, OPT, Tk-Instruct, UL2, Flan-T5, ChatGPT, GPT-4. In this chronology of the LLM models, we can observe the development of ChatGPT up to 2023-2024.



productivity, Gen AI can facilitate personalized learning and assist in the critical thinking of process and new knowledge.

Reference [37] proposes the efforts made in collaboration with Ministers of Education to address the opportunities, challenges, and risks arising from AI applications in education systems. It is revealed that governments are working on developing policies and regulatory frameworks to adapt to this accelerated evolution (see Table 1).

TABLE I  
COMPARISON OF THREE CASES IN THE COSTA RICAN CONTEXT.

Case study number	Level of influence
1	Positive
2	Positive
3	Positive

The proposal for a strong relationship with all institutions for collaboration in the economy: Minister of Education, Central Government, Local Government, Universities, Centers of Innovation, NGOs, Think Tanks, and International Organizations to work together define the new role in the educational sector for AI and ChatGPT. First of all, there are going to be many handicaps at the starting point, because many actors don't know the system and their benefits. In the second round after the institutions for collaboration know the system, the possibilities are amazing because all institutions automatize processes, working together on the cloud or they are using digital solutions based on AI, this is the first stage of advancement for the business intelligence of the company and working together in the education of their administrative personnel, professors and students, all of them in the typical example of a university (in the ideal situation covering 100% of employees in the use of AI and ChatGPT).

Therefore, ChatGPT demonstrates a more significant commitment to the needs of students of course exist many concerns and challenges and they are based on regulations, but countries need to work together to define some issues of intellectual property, copyright, bias in the information, fake information and a very bad consequence of this is disinformation.

## VI. CONCLUSIONS

The study reflects the growing technological awareness that is profoundly impacting society, and the need to address its implications for the common good. In addition, the discussion addressed the principles of using ChatGPT in education, and how these can trigger a positive benefit. These principles are the essential guidelines while providing a starting point for evaluating its application in various situations.

In conclusion, the present study analyzed the impact of ChatGPT in Costa Rican education, evaluating its benefits. The results obtained promote, stimulating students' active participation, and fostering peer-to-peer collaboration. In addition, its ability to adapt to individual needs was found to promote the personalization of learning and contribute to

educational inclusion. Another advantage in Costa Rica is that ChatGPT is useful from the cell phone this creates three economies: economy of scale, the economy of reach, and the economy of the network because all the people in the network can consume and use all the services of ChatGPT, and of course, in any point of the future, the network is sustainable because one author needs the consultants and peer-to-peer collaboration of others.

For the orange economy, in some countries with the technological base as Costa Rica, it could be possible to develop more languages with AI with specialization in software for education or music, images, and so on, perhaps this economy could develop some electronic components as microchips and semiconductor industry can develop more AI, in comparison with others countries without the experience working with technology.

However, significant challenges and concerns were also identified in this research. The need for responsible use was highlighted, avoiding over-reliance on technology and promoting students' critical thinking and tools to solve problems, some of the benefits are:

- Provide adequate training to teachers: without training for educators, the possibilities to advance are reduced.
- Establish continuous monitoring mechanisms, perhaps the most important thing here is feedback and functionality of the system.
- To implement a model of advanced education oriented to the search for human development integrally, through novel ways of thinking that erase the artificial divisions between arts, culture, science, and technology. A model focused on autonomy acquired through creative acts, instead of seeking minimal capabilities whose purpose is only a job. Part of the secret lies in the design of classroom lessons, forms of assessment, and the appropriation of technologies that amplify our capabilities. The more powerful the technology, the more sophisticated the educational model must be [38]. The most sophisticated model is one using the audiovisual tools in the metaverse, AI, ChatGPT, and all the holograms in an immersive room in an engineering class for example, but we finish as a remarkable point the role of educator because the hybrid model of the future to get impact with all these technologies and information, need the help of the Professor or Facilitator or Educator in the context of a country. The same model is in a Medicine School, an Architecture School, a Psychology School, or a Business and Law School, why? Because all the students need fast answers and to have a first approach or some topics, of course, it depends on the education of the people, because the first premise is: all the people want to study.

In summary, ChatGPT shows promising potential to improve Costa Rican education by providing quick and personalized responses, stimulating student participation, and fostering educational inclusion. With proper implementation and the necessary precautions, it can become a valuable resource that enriches the learning experience and contributes to the improvement of educational quality in Costa Rica.

The practical implications of the study led to a change of approach from the perspective of using emerging technologies in the digital era. Therefore, it will become a guide to ensure the success of individuals, companies, or society. Thus, the results will provide a roadmap for stakeholders, to promote a strategy based on information-based decision-making, and to understand technology's role in safeguarding infrastructure, data, and people. Of course, the main topic and issue of this paper is not regulation, but in order, to get advanced results for Latin America and Costa Rican context the most important thing is the regulation in the educational sector, why? Because all the people notice the advantages and disadvantages of the technology and they focus on the best practices, of course with regulation the society knows very well what they are not going to do and part of the strategy is to know what not to do, and what you need to in the academic sector for the future, maybe invest more in orange economy and interactive platforms with AI for students.

The implications from the academic field can address the study of procedures, processes, and standards to generate de roadmap of Gen AI as part of the 5.0 revolution, giving room for a variety of studies yet to be explored. Maybe for policymakers the practical implications of AI, it is going to have many concerns and issues, and we finish the paper mentioning some of the disadvantages of the technology without regulation: Fake face ID, recognition of passwords based on AI, selling databases in the deep web, fake news, and what about political parties campaigns using fake information with the face of Tom Cruise as a candidate for the White House, everything is false but is possible to recreate and rethinking based on AI. The problem is the same topic of this paper what is the moral behind the purpose of the technology?

In other words, sometimes we need to ask why we need the technology. To have more intelligent answers for our students in medicine school, or for winning the elections based on the fake news created for our opponents in the AI, this is a moral issue of the tech, but maybe we can regulate it in the future. Finally, the future is going to be more sophisticated and complicated than the tools that we have now.

#### *Future lines of research and practical examples of generative artificial intelligence*

Now Gen AI offers multiple ways to increase marketing productivity, we are going to mention three examples with Google Ads, you can improve leads and conversions, increase online sales, increase in-store traffic, show your brand to more people, and promote the App that we have in the company for new users. The Copy Shark AI generator, which

uses already generative intelligence, contains more than fifty tools, that are available to generate article copies, executive summaries, files, website copies, product descriptions, sales copies, and much more. This generative thinking tank contains more than a hundred languages, including English, French, Spanish, and German, to name just a few examples. For businesses that want to multiply their copywriting efforts, such as results consultancies, they more easily achieve their Key Performance Metrics (KPIs) and easily scale their business model with Copy Shark. The tool: Ad Copy Generation, from Copy Shark, is the latest generation of ChatGPT-3, although we all know that ChatGPT-4 is more powerful, this software empowers copywriting pieces that can be generated on Facebook and Google ads. It is basically for a consulting or marketing company to have your team of writers working around the clock, to create unlimited copies for you.

The future here every day is more sophisticated and maybe we are not going to have problems with copywriting for the next few years, but some concerns for writers and researchers are related to the moral issue, because sometimes, something is permitted, but fifty years ago it was prohibited, maybe the discussion is: Are we advancing?

The third case is about free AI services on Amazon Web Services (AWS) because they allow you to automate workflows with Gen AI. No machine learning skills are required. Although there are already tools that automate machine learning from Microsoft Azure, they are the principles of Automation Machine Learning (AML), that is, you automate the process of AI and consumer learning in your company, every time the consumer clicks the software in the online supermarket: learns who consumes more lactose-free milk in the supermarket, the price they pay and who does not consume gluten, probably in the future we will be able to link some eating habits with the proper use of credit cards and the first wealth that is health, to prevent diabetes or that you are not walking enough each day from the office. It is important to have a final reflection of this information in the cloud computing of any company like Google Amazon, Airbnb, and so on, the real concern is not the positive history of benefits like not having gluten or lactose-free milk in your coffee, the real problem is why the cloud want the data, and who is the owner of the data, and who can sell the data, and finally, for this paper the last question to continue more research is: who is buying this database on the cloud with what specific purpose.

Only we need to imagine all the benefits in the COVID-19 times, for a company such as Pfizer, if they know all the databases of people with hypertension, a precondition to suffer complicated results in pandemic times, and what is happening in a medical school or pharmacy as CVS if all the information of frequency of controlled medicine is on the cloud, for example, many consulting in the future could be possible in ChatGPT 4 or next generation, and if all the answers go to the cloud, we don't know, but in the future is possible 100% of our consultancy and answers with geo

localization can be on the cloud, thank you to generative pre-trained transformers models, and if this future exists, maybe we are going to have people in the medicine school that they agree or disagree with the technology.

In this final case, the problem is the Medicare regulation, and the university's use of information, maybe the most important issue comes back, why we want the information, and what the benefits for society of this information and students and citizens in general. In the future, the most powerful concern will be related to governance and regulation, but first of all, we need to share the knowledge with the people, to understand the education in data privacy and the limits of bots and platforms with AI and persons using information, for buying and selling and more dangerous avenue is deciding the future of the society.

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