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Systematic Review

Investigating the Support Provided by Chatbots to Educational Institutions and Their Students: A Systematic Literature Review

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Abstract: A chatbot, or else a conversational agent (CA), is a technology that is used in order to imitate the process of a conversation between a human being and a software application for supporting specific services. The utilization of this technology has been increasing considerably over the past five years, particularly in education where CAs are mostly utilized as teaching assistants that provide educational content. This paper aims to contribute to the existing body of knowledge by systematically reviewing the support provided by chatbots both to educational institutions and their students, investigating their capabilities in further detail, and highlighting the various ways that this technology could and should be used in order to maximize its benefits. Emphasis is given to analyzing and synthesizing the emerging roles of CAs, usage recommendations and suggestions, student's desires, and challenges recorded in the literature. For this reason, a systematic literature review (SLR) was carried out using the PRISMA framework in order to minimize the common biases and limitations of SLRs. However, we must note that the SLR presented has specific limitations, namely using only Scopus as a search engine, utilizing a general search query, and selecting only journal articles published in English in the last five years.

Keywords: chatbots; education; educational institution; emerging roles of a chatbot; educational services support; learning process support; students; student support; systematic literature review; PRISMA framework

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1. Introduction

A chatbot is a technology capable of simulating human communication using oral, written or combined communication techniques. In the last five years, the usage of CAs has been increasing rapidly, especially in the educational sector. The most known usage of an educational chatbot is that of a teaching assistant. This way, a chatbot is utilized as an educational content provider where it provides specific exercises and information about certain educational topics and resolves students' questions [1–6]. Even though this is their usual usage, the contemporary literature indicates that this technology could be utilized in different ways in order to support the services of educational institutions and therefore increase their operating efficiency, while also providing better educational services to the students.

More specifically, much research has been conducted in the ways that a chatbot can support the services of educational institutions, like universities, in order to provide a better learning process and better services for the students. Initially, a chatbot can be used to assist the academic administrative staff of a university when it comes to students' registrations and final exams or the scheduling of teaching plans [1]. In addition, the recent technological developments in artificial intelligence (AI) in combination with the increased demand of digital academic services due to the COVID-19 pandemic quarantine has led universities and schools to search for ways to utilize CAs in order to offer better services to students, such as easier remote access to their library [7–10]. Furthermore, CAs could be used in order

to increase the quality of the evaluation of the services of an educational institution [11] and also support educators by helping them organize and control their courses better [12,13]. Last but not least, CAs can become a self-monitoring tool for students which informs them on topics relevant to their academic progress and alerts them about important on-going events and deadlines [12–15]. While this topic has been researched, chatbots' usage in the previous context is usually epigrammatically mentioned. This study aims to provide detailed information in the way that a chatbot can be utilized by an educational institution, in order to improve its services and therefore the learning process and experience provided. For this purpose, the latest developments in this sector are being examined.

As already mentioned, CAs can be utilized as teaching assistants and therefore support the educational process. While their usage could be advantageous, their application is not always effective and can be hindered by certain limitations and obstacles relevant to the students' acceptance of this technology. These obstacles are presented and relevant suggestions and students' desires about the suitable traits an educational chatbot should have are examined in order to limit them. The main purpose is to indicate how a CA can be applied in the learning process effectively.

Another important aspect of using chatbots in the learning process is that they can be beneficial not only as teaching tools but also as academic assistants for students. More specifically, CAs can play a variety of roles when it comes to students' interactions with them. For example, they can assume a pedagogical or a mentoring role [5] and even act as a fellow researcher for the student, which will sufficiently guide them to conduct qualitative research [3]. In accordance with their aforementioned uses, they could provide vocational guidance and counseling, thus helping students to cope with decision-making problems they might anticipate during their studies and expanding the CAs' current way of helping. These emerging roles are not previously examined and are being investigated in this review, with a hope to attract the interest of researchers who are developing educational conversational agents (ECAs).

For the purpose of addressing the previously mentioned subjects and developments, related articles from the last five years (2018–2023) will be analyzed, so as to synthesize a comprehensive review of the research in the field. More precisely, this analysis aims to investigate the following research questions:

RQ1: How can an educational chatbot support the educational services of an educational institution?

RQ2: How can an educational chatbot be effectively used in order to support the learning process?

RQ3: How can a conversational agent support students in their academic lives?

The rest of the article is structured as follows. In Section 2, relevant information about previous work conducted is summarized. In Section 3, the methodology used for carrying out the systematic literature review (SLR) is analyzed. The results are analyzed and discussed correspondingly in the next two sections. Finally, the limitations of this study are discussed in Section 6, and in Section 7, the main conclusions and possible plans for future work are presented.

2. Related Work

The utilization of chatbots in the educational process is a wide subject with many aspects to explore and has been reviewed by many researchers. More specifically, five relevant systematic literature reviews (SLRs) were traced which examined topics related to the main subject of this work. The related subjects of the aforementioned SLRs that were traced in this study are analyzed in Table 1.

Table 1. Summary of the systematic literature reviews found.

Authors	Year	Reference	Number of Primary Studies/Number of Data Sources	Method	Related Research Subjects
Pérez, J.Q.; Daradoumis, T.; Puig, J.M.M	2020	[2]	80/8	PRISMA framework	The ways an ECA affects student learning and whether it can contribute to the improvement of a service. The circumstances when an ECA can support student learning similar to a human educator.
Okonkwo, C.W.; Ade-Ibijola, A.	2021	[3]	53/6	Methods based on Kitchenham et al. [16], Wohlin et al. [17] and Aznoli & Navimipour [18]	The current ways that ECAs are utilized in the education domain. The benefits derived from the utilization of ECAs in education. The educational sectors that ECAs have not been applied to and could benefit from their usage.
Hwang, G.-J.; Chang, C.-Y.	2023	[4]	29/1	Coding scheme based on Chang & Hwang [19] and Hsu et al. [20]	The educational sectors where ECAs are used. The learning strategies that ECAs utilize.
Wollny, S.; Schneider, J.; Di Mitri, D.; Weidlich, J.; Rittberger, M.; Drachsler, H.	2021	[5]	74/4	PRISMA framework	The pedagogical roles an ECA can assume. Experimental cases where ECAs were used as students' mentors. Educational domains in which ECAs have been utilized.
Kuhail, M.A.; Alturki, N.; Alramlawi, S.; Alhejori, K.	2023	[6]	36/3	Guidelines based on Kitchenham et al. [16]	Educational fields in which ECAs have been used. The roles they can assume during student interaction. The interaction styles between students and ECAs.

In further detail, Pérez et al. [2] analyzed the ways that an ECA can influence the students' learning approach and investigated the circumstances under which an ECA can support them similarly to a human teacher. Also, they examined the contribution of ECAs to the improvement of a service by mentioning many case studies and explaining the problems that such an application could face. In another study, Okonkwo and Ade-Ibijola [3] shifted their focus to examining the existent ways that ECAs are utilized in education and their benefits, while also suggesting possible educational sectors where this technology could be utilized. In a similar approach, Hwang and Chang [4] explored the educational sectors where ECAs are used and also presented teaching techniques that are utilized by the chatbots in order to educate students. Wollny et al. [5] also examined the educational sectors where CAs have been used, but shifted their attention to the pedagogical roles this technology can assume. More specifically, case studies when the chatbot can function as a student's mentor are analyzed. Last but not least, Kuhail et al. [6] were interested in the interaction between a student and an ECA. In particular, they examined the interaction styles and the roles a chatbot could take on during this interaction and also presented educational fields where chatbots have been used.

Even though the usage and the roles of ECAs in educational settings have been examined in the literature, the support that an ECA can provide to educational institutions and their students has not been adequately investigated. In addition, no study focuses on the ways that an ECA can be applied in order to support the learning process effectively. This work is trying to address these topics with the higher purpose of providing reasons for ECAs to become widely accepted by educational institutions and provide information about an effective application of ECAs, while also extending the roles of current ECAs in order to become scaffolding tools for students' academic lives.

3. Methods

This work tries to construct a comprehensive review of the literature in order to present the latest developments around the support provided by ECAs in the services of educational organizations, the learning process and the academic lives of students during the last five years. More specifically, in order to achieve this the PRISMA framework is utilized, which provides a specific methodology in order to produce a valid SLR, with increased legitimacy [21]. This SLR is a fragment of a larger study, part of which was published earlier this year [22] and thus is following the same methodological approach in order to accomplish its purpose. The whole process began by searching for suitable literature using the search engine of Scopus. After a 2-phase formation phase, a comprehensive search query was formed in order to retrieve the relevant documents. The final results were shaped based on specific criteria which were used in order to conclude which documents should be included and which should be omitted.

3.1. Eligibility Criteria

As it was previously mentioned, the method utilized to create this review was the PRISMA framework. In this methodology, the retrieved documents are being evaluated based on specific criteria in order to evaluate their relevance to the examined topic. Following the same strategy as Ramandanis and Xinogalos [22], the screening process began by examining the relevance of the title and the abstract of the retrieved documents in order to examine the capability of the text to respond to the research questions. After the completion of this first screening step, predefined inclusion and exclusion criteria were used to evaluate the full text. Using the inclusion criteria, the retrieved documents should focus on the support an ECA can provide to the educational process or the academic lives of students or the educational services of an educational institution that affect the aforementioned sectors. On the contrary, an article would be excluded if its focus was on the application results or the technical details of an ECA and not on its support capabilities for the earlier mentioned areas.

The research interest in ECAs has been increasing noticeably and particularly over the last five years [2,6]. Because of this fact, the collected documents were limited to those published between the years 2018 and 2023. Furthermore, the retrieved papers were solely articles from scientific journals, because articles usually target specific topics and provide more solid results than a book or a conference paper. Last but not least, it was decided to include only papers written in the English language. The criteria used for this process are presented in Table 2. It should be clarified that some papers were excluded because their full text was not available.

Table 2. Inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
IC1: The included article should focus on the support provided by the ECA to the educational process, the academic lives of students or the educational services of an educational institution that affect students or the educational process.	EC1: Articles focused on the application results of an ECA without indicating its contribution in support of the learning process or students.
IC2: The year that the article was published should be between 2018 and 2023.	
IC3: The type of the retrieved document should be a journal article.	EC2: Articles focused on technical details and on the creation process of an ECA without showing the support provided by the ECA to students or the learning process.
IC4: The included documents should be written in English language.	

3.2. Information Sources

In order to construct an exhaustive review of the existent literature, this work consisted exclusively of articles from academic journals. The selected database was Scopus since it constitutes a remarkable and reliable tool in order to conduct research, such as an SLR. In addition, Scopus provides access to articles of many remarkable publishers, which is, however, not exhaustive. The first document search was conducted on 7 March 2023 in order to track relevant literature reviews and acquire the suitable terms for the final search query. The final search query was formed and used in the search engine of Scopus on 9 March 2023, which resulted in the final set of papers.

3.3. Search Strategy

As it was implied in the previous subsection, the search strategy of this paper consisted of two steps. The first step was the definition of the terms that would be utilized to form the final search query. In order to achieve this, "Chatbots in education" was utilized, which consisted of more general terms and resulted initially in four reviews. From these reviews, utilizing the technique of backward searching, another review [23] as well as a paper with general material [1] were selected. The keywords from the retrieved reviews were utilized to form the final search query. More specifically, the duplicate terms were removed, and the remaining were divided into those which were related to education and those which were relevant to the term "chatbot". Terms relevant to education were "education", "educational", "learning", "learner", "student", "teaching", "school", "university" and "pedagogical". Furthermore, chatbot-related terms were "chatbot", "conversational agents", "conversational tutors", "bots", "agents", and "dialogue-systems". Some of the aforementioned terms were excluded since their content could be phrased more accurately in order to accumulate more precise searching results. For example, the term "agents" is better connected to the examined topic as "conversational agents". Combining these terms with the previously mentioned limitations relevant to the publication year, the document type and the language used in the text, the final search query used in Scopus was as follows:

"TITLE-ABS-KEY (("education*" OR "learning" OR "student" OR "teaching" OR "school" OR "university" OR "pedagogical") AND ("chatbot" OR "conversational agents" OR "bots" OR "dialogue-systems" OR "conversational tutor")) AND PUBYEAR > 2017 AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English")).

The second step was the utilization of this query to retrieve the final set of documents. This search query resulted in a set of 1597 articles, which were later screened based on a specific selection process.

3.4. Selection Process and Data Collection Process

With the purpose of synthesizing this SLR, the articles which were acquired by the utilization of the previously mentioned search query were sorted out following a specific process. In further detail, the 1597 articles were initially retrieved from Scopus as an excel .csv file. In this document, the necessary information for their evaluation was recorded. In other words, the authors, title, abstract, digital object identifier (DOI), date of publication and keywords of each paper were stored. Then the documents were screened following a 2-step process. Initially, the papers were evaluated by examining their title and abstract. If the title was relevant to the examined topic, then the abstract would be examined. If the abstract was suitable, then the analysis of the full text would begin, which was the second step of the selection process. Through this process it would be concluded whether a document should be included in the final list. Documents which were retrieved using backward searching were also screened in the same way and those whose text was not fully available were recorded. The overview of this process is illustrated in detail in Figure 1.

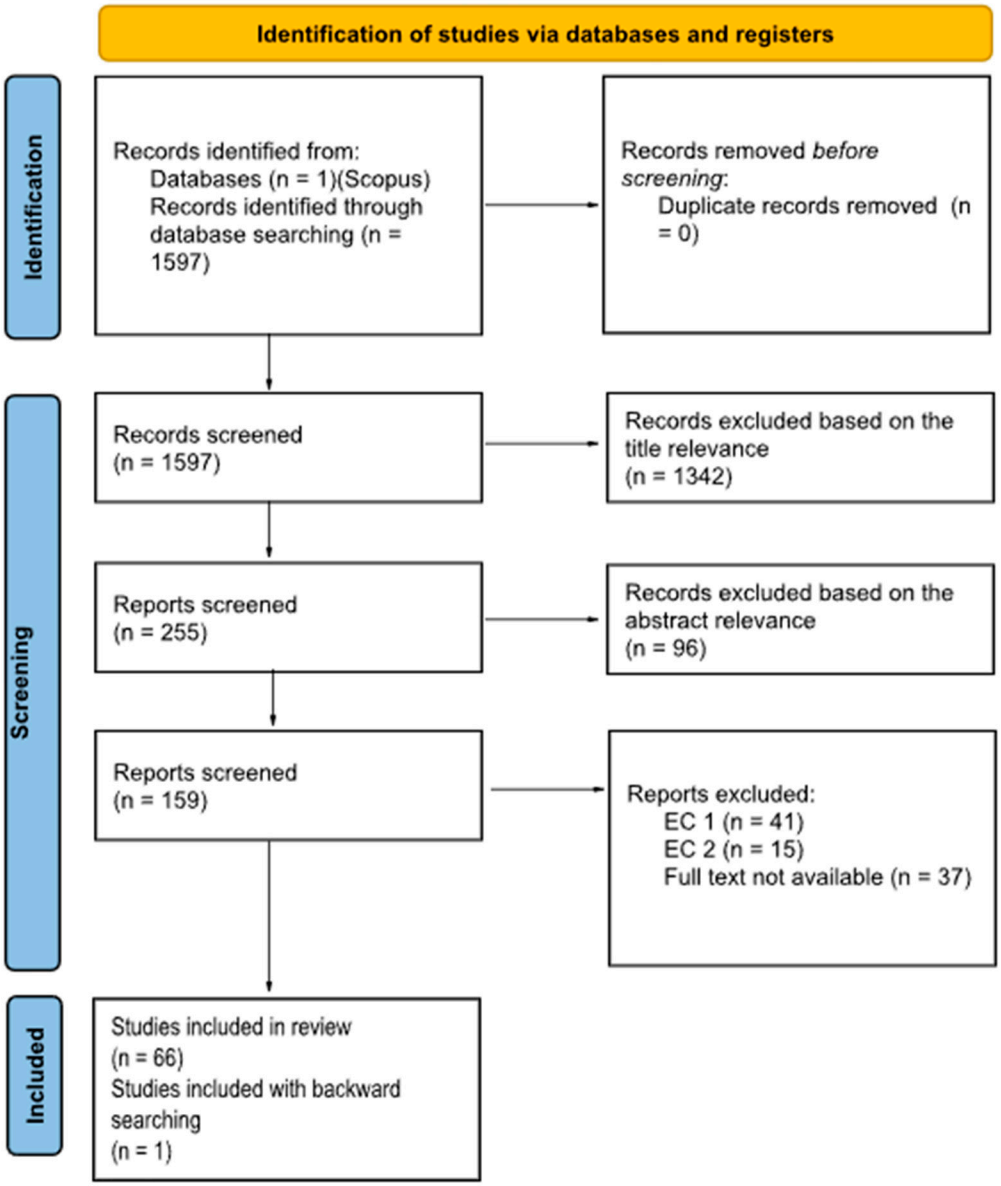

Figure 1. PRISMA framework flowchart.

3.5. Data Items

In order to make this review as inclusive as possible, the collected papers were selected without examining their subject area. This way, the final set of documents originated from various subject fields like Computer Science, Chemistry, Mathematics and many more, as can be seen in Figure 2. Articles were only limited based on the publication year since this review focuses on the latest advancements around this specific topic. The final list consisted of 67 total papers, with 66 documents included from the search results and 1 [24] retrieved using backward searching; the latter was relevant to ChatGPT, which was considered an important CA relevant to the latest developments. The distribution of the collected papers is displayed in Figure 3 where an increasing interest in the subject can be noticed. Though, 2023 is not very high in comparison to 2022, and that is possibly because the search was performed in the first third of 2023.

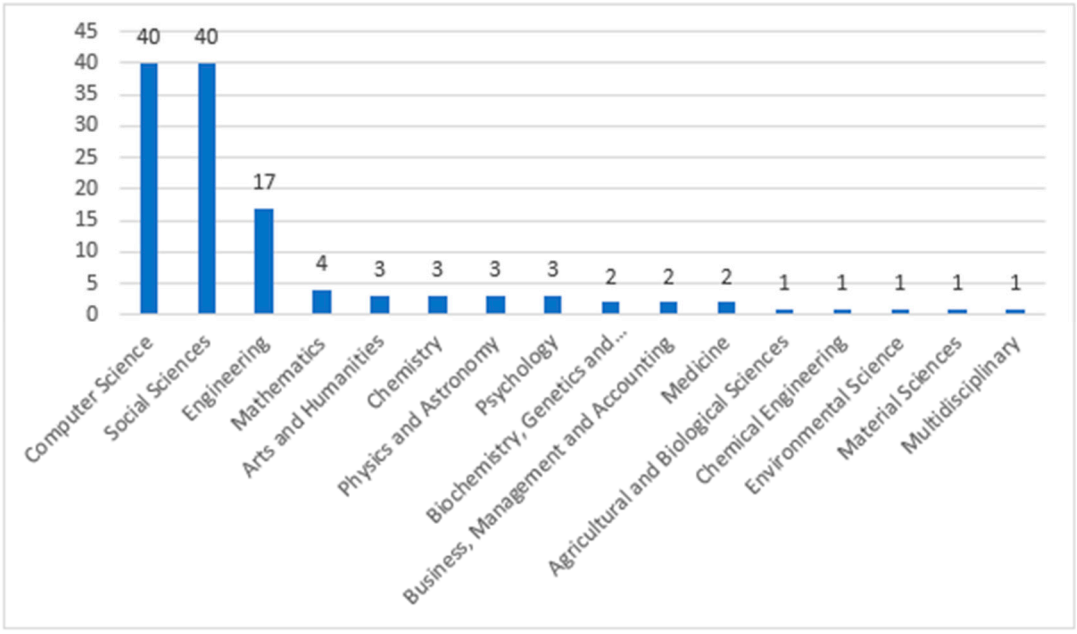

Figure 2. Subject fields of the collected documents.

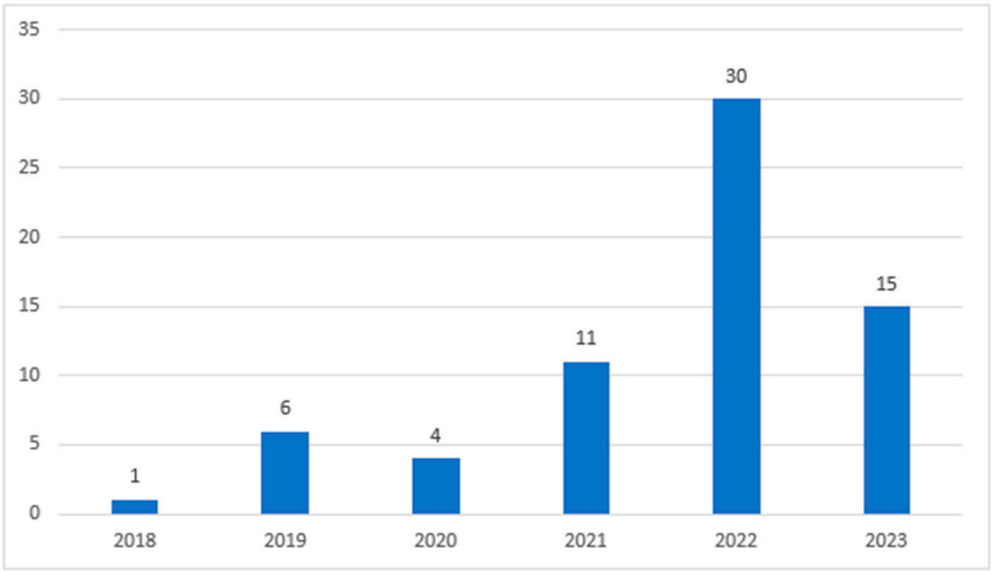

Figure 3. Time distribution of the collected documents.

4. Results

Before analyzing the results, a brief classification of the documents is conducted based on their content. More precisely, 17 documents were analyzed to synthesize data for RQ1, 47 papers were used to answer RQ2 and 12 papers were used in order to answer RQ3. This classification can be seen in further detail in Table 3.

Table 3. Classification of the collected documents based on the research question they address.

Research Question	References
RQ1. Support of chatbots in the services of an educational institution	[7–15,25–32]
RQ2. Support of chatbots in the learning process	[32–78]
RQ3. Support of chatbots in the academic lives of the students	[14,15,24,32,35,45,66,79–83]

4.1. Support Provided by Chatbots in the Services of an Educational Institution (RQ1)

Chatbots can support the educational services of an educational institution in a variety of ways. More specifically, the examined applications of CAs could be divided in 5 main categories, namely: student assistance, teacher assistance, administrative staff assistance, library staff assistance and assistance in the evaluation of the services of an educational institution.

One of the main areas that an educational institution can utilize a CA is its *administration services*. First of all, a chatbot can provide information and answer questions about the responsibilities, tasks and the schedule of an administrative employee and also automatically notify them regarding any news or on-going events at the school or university [12]. Secondly, it can help them create announcements and address them to their receivers faster [13,14]. Furthermore, they can help them manage the enrollment procedure for a university studying program by answering FAQs or even support students to complete the process by themselves [25,26]. In addition, CAs can provide informative material about the general function of the educational institution and its procedures [11,27,28] and thus reduce the necessity of the administration staff to deal with these issues. Moreover, a conversational bot can answer FAQs about the provided courses and guide students through the enrollment procedure to a course, so they do not have to communicate with the administrative staff of the institution [14,15,25,29,30]. Last but not least, it is known that educational institutions usually lack a student counseling service, or it is very limited due to budgetary reasons. CAs can assist the implementation of such a service and this way increase the availability to the students, without time limitations [15].

Secondly, chatbots can support the function of an *academic library*. This is mainly because such a library provides access to a variety of scientific resources, which are not easily browsed, especially when the student or researcher is inexperienced or there are emergency conditions where the library cannot be physically attended, like the COVID-19 quarantine. More precisely, CAs are capable of providing information and answering questions related to the functions and on-going events of the library [8,10]. Moreover, during the COVID-19 pandemic, chatbots assisted some academic libraries to extend their services so as to respond to the increasing demand for support by their users, without demanding extra manpower [8,9,31]. In addition, the variety of the academic resources of a library could be difficult to search. For this reason, CAs are utilized with the purpose of making this procedure easier for the users of the library, by offering relevant searching results through an interactive dialogue with the user [7,9,10,31,32]. Finally, the usage of this technology in a library could assist librarians to provide supportive material which is more targeted to the users' needs, since CAs can provide them with analytics about which topics are most searched, in addition to the document retrieval [31,32]. Besides the contribution to the services of an academic library, it is important to mention that chatbots are being used in order to support the staff working and not to replace them [32], and that this way their purpose is to assist a library in providing better services to their users with its current resources, not to reduce them.

One interesting view in the adoption of chatbots by an educational organization is the *evaluation of its educational services*. More specifically, Belhaj et al. [11] have suggested a new interactive way of engaging students to fill in surveys. In addition to its utility for increasing the participation in surveys for research purposes, the article also indicates this usage in order to convince students to evaluate the services of their university. The results of this research showed that students prefer a chatbot notification rather than other communication channels and that this way a questionnaire can be completed faster than the usual way. For that reason, CAs could prove to be a valuable asset for a university in order to collect feedback for its services and use it to improve them, according to the students' demand.

Teacher assistance refers to a CA that is used to support educators in their work in order to reduce the workload of a teacher and thus help them focus on the most time-consuming tasks they have to deal with. More specifically, Mendoza et al. [13] propose a model for

the improvement of the educational process in middle school. In this research, a chatbot helps the educator with handling supportive education material they have specified to their students and creating reminders for the lesson related subjects, such as an examination event. Furthermore, the CA is capable of receiving students' homework and therefore helping the educator manage it. Last but not least, a CA can take initiatives and alert a teacher to communicate with a student, when it evaluates that the student deals with problems that need the educator's intervention [13]. In higher education, Arun et al. [12] suggested a CA that was mainly focused on providing information to the educators about the news of the university, the schedule and placement information, while also informing them of their working duties and answering possible questions they might have about the institution.

Finally, *student assistance* refers to the ways that a school or university can utilize CAs in order to offer more qualitative services to its students. More explicitly, CAs are used to inform students about school announcements, on-going events and procedural details about their studies [12–15], provide access to extra educational material specified by the teacher [13], alert them with reminders about important events like examinations or lectures [14], and help them organize their study plan [13–15] and which course they might choose for a semester [14,15]. In addition, CAs can provide personal information about their GPA (Grade Point Average), their absences or academic credentials, as well as maps for the campus location [14]. This way, a conversational bot can reduce the workload of the academic staff in these tasks and help them focus on other tasks that might need more time to deal with, while also improving the educational experience of a student. This information is summarized in Table 4.

Table 4. Support provided by CAs to the educational services of an educational institution.

Contribution Sector	Benefits of Using a Chatbot	References
Administrative Staff Assistance	Extension of the provided services for students and employees of a school without time limitations.	[15]
	Reduction of the workload of the administration staff.	[14,15,25,29,30]
Library Staff Assistance	Extension of the library services, without demanding extra manpower or time limitations.	[8,9,31]
	Provision of better experience to library users.	[7,9,10,31,32]
Service Evaluation Assistance	Collection of feedback, useful to improve the services of the school.	[11]
Student Assistance	Improvement of the educational experience for a student.	[12–15]
Teacher Assistance	Reducing the workload of the academic staff and helping them focus on other tasks that might need more time to deal with.	[12,13]
	Supporting educators in their daily tasks.	[12,13]

4.2. Support Provided by Chatbots in the Learning Process (RQ2)

4.2.1. Suggestions for Applying an ECA and Motivating Students

In this section, suggestions and considerations of ways that an ECA should guide and support students in the learning process are presented. Chuang et al. [33] built an educational chatbot used in junior high school and suggested the implementation of a function of the system that would help students manage the time they spend with the ECA. In addition, Lippert et al. [34] indicated the possibility of the integration of chatbots in visual learning environments (VLEs) as a learning guide. Mendez et al. [35] shifted their attention to constructing a conceptual framework for an ECA and implied that higher user satisfaction indicates a better quality of the system as well as higher user trust and willingness to use it. Also, Chaiprasurt et al. [37] pointed out the importance of motivating students to use the ECA through motives like a grade bonus, while Rooein et al. [38] indicated the importance of promoting the application of the agent by motivating and encouraging students to use it since students are not always keen on this technology. Finally,

Fryer et al. [39] indicated that students have to perceive the agent as a tool that will help them comprehend the learning material better than their usual way of studying in order to utilize it fully. These suggestions are presented in Table 5.

Table 5. Suggestions for motivating students to use an ECA.

Suggestion	References
An ECA should help students with their time management.	[33]
In virtual learning environments, the ECA should act as a learning guide.	[34]
Students have to see a benefit in the usage of the ECA in order to use it.	[39]
Students should be motivated to utilize the ECA.	[37,38]

Suggestions and concerns about the teaching process were also presented. Fryer et al. [39] implied that teachers should not use the ECA as the main tool of the teaching process, but rather as a supportive tool. In addition, the educational chatbot should be suitable for every student and adapted to their learning needs, and it should be guaranteed that every student can access it. Kohnke [40] implied that educators should try to ensure that the ECA does not shift the students' focus from the teaching goals, while Chiu et al. [36] indicated the necessity for supporting teachers during the application of the ECA in the learning process. Finally, Han et al. [41] indicated the importance of the ability of an ECA to clarify to users that its capabilities are limited, so they can reduce the frustration of the students when they do not receive a suitable response. In addition, educators should also update students about the limited conversational abilities of an ECA before they let students interact with it, while also informing them about its purpose and function as an educational tool. Finally, they suggested that the chatbot should be trained with as much data as possible and that the students should be informed on how to use keywords and specific phrases in order to obtain better results. The suggestions that are presented here are general advice based on the perspective of the researchers and they are summarized in Table 6.

Table 6. Suggestions for the application of an ECA in the teaching process.

Suggestion	References
An ECA should be a supportive tool in the teaching process.	[39]
An ECA should be suitable for and accessible to every student.	[39,40]
Explanation should be provided to the students of the limited capabilities of the chatbot.	[41]
Provision of searching advice should be provided to the students so they can utilize the ECA better.	[41]
The chatbot should not distract students from their learning goals.	[40]
Teacher support should be strong and available during the use of the ECA's application.	[36]

4.2.2. Recommended Capabilities and Conversational Traits of an ECA

Students, domain experts and educators have contributed to the evaluation of the examined applications. In this part, recommendations and suggestions based on these evaluations are presented. In particular, the recommendations and observations from the evaluation results of an ECA application tend to be categorized into general advice for educators when utilizing a chatbot in their teaching, observations about the desired functions, capabilities and traits of a conversational tutor, and the needs, behaviors and preferences of the students when they use a conversational assistant.

As it was implied earlier, the first group of the examined propositions concerns general advice for teachers that want to use a conversational agent. More specifically, it was indicated that teacher support and motivation are crucial factors for the usage of an ECA by the students [36,42]. In addition, it was implied that educators should utilize the

learning analytics that are provided by an educational ECA to monitor the progress of their classroom and improve its function [42]. These propositions are presented in Table 7.

Table 7. Recommendations for utilizing ECAs in the teaching process.

Recommendation	References
Educators should motivate the students to use the ECA.	[36,42]
Learning analytics should be utilized to improve the ECA.	[42]

Another observation aspect concerns the functional capabilities and traits of a conversational tutor. More precisely, the teacher supervisors in the study of Katchapakirin et al. [43] indicated that a learning bot can offer a personalized learning experience and help students monitor their learning progress. Additionally, it was observed that the capability of an ECA to successfully respond to students' questions diminishes as the aggregate of these questions increases [44].

Tlili et al. [45] examined the possibility of the utilization of ChatGPT (a well-known chatbot constructed by OpenAI) in the learning process, by conducting interviews with different kinds of possible end users and three educators. More precisely, ChatGPT as a conversational educational tool was considered a helpful tool for information seeking. Its capabilities could help students search about almost any subject, while also saving time they would spend by searching for answers at various sources on their own. In another study, Massive Open Online Courses (MOOC) instructors that examined the application of González-Castro et al. [46] indicated the importance of the capability of an ECA to respond to a large volume of questions with detailed answers and the need for a thorough segmentation and presentation of the learning matter by an ECA.

In the same subject, the research of Ericsson et al. [47] showed that students did not want excessive tutorial info rather than basic advice on how to use an ECA. In addition, it was implied that an ECA should generate follow-up questions to the discussed topic when it cannot respond to the user, so as to collect more information and not interrupt the conversation flow. Also, the teachers involved in this application implied that they would like an ECA that is adapted to the local educational curriculum. Another study showed that the pace of the conversational tutor to provide learning content should match the students' learning pace [38]. Domain experts that evaluated the usage of a conversational tutor in a gamified learning environment indicated that the function of the chatbot should be adapted to the personal traits, the learning competence and the linguistic traits of the students [48]. Furthermore, they implied the customization of important learning factors to modify the function of the agent so it can motivate students in the learning process. Relevant to motivation, students using an educational chatbot in the study of Neo et al. [49] were able to utilize the ECA more if they considered the learning interaction pleasant and the ECA motivated them. The students evaluating the application of Wambsganss et al. [50] expressed the need for variations of the UI of the system, so they can choose the one they like more, and the need for a faster response generation. In another application, the students expressed the desire to receive general information and specific details about the organization and the summary of a course [37]. The evaluation results in the study of Wan Hamzah et al. [42] indicated that an ECA should be able to respond to the most asked educational topics by the students. Finally, Chien et al. [51] utilized the element of competition to design the learning activities and observed that the students that completed the competitive tasks were more motivated than those who were completing noncompetitive learning tasks.

In functional aspects, the expression style of the agent should also include specific traits. More clearly, the students in the study of Belda-Medina and Calvo-Ferrer [52] valued the rich use of words and the semantic cohesion of the used ECAs indicating the need for linguistic variations in the expression style of the ECA. In the study of Yang et al. [53], students expressed that the ECA could not understand them sometimes and that it used a difficult-to-understand language, which means that an ECA should use simple language

that students can easily understand. The studies of Briel [54] and Hew et al. [55] showed the benefits of an architecture for an ECA that functions in multiple perspectives and provides a flexible interaction style. The desired capabilities and conversational traits of an ECA can be seen collectively in Tables 8 and 9.

Table 8. Recommended capabilities of an ECA for supporting the learning process.

Capability	References
Ability to motivate the students to learn	[48,49]
Ability to respond to the most searched educational topics of the students	[42]
Help students monitor their learning progress	[43]
Presentation of the educational material in small detailed segments	[46]
Provision of basic usage tutorial information	[47]
Provision of educational material from authorized legitimate scientific sources with proper citation of them	[45]
Provision of general information and specific details about the organization and the summary of a course	[37]
Provision of interesting learning activities and tasks by the ECA that utilize motivating techniques like competition	[51]
Provision of quizzes with unpredictable answers	[45]
Support students in information seeking while not affecting the development of the students' critical thinking skills	[45]
The ECA should not allow students to utilize the provided material to cheat or complete their course assignments using it, without doing any work	[45]
The provision rate of educational material by the ECA should match the student's learning pace	[38]

Table 9. Recommended conversational traits of an ECA for supporting the learning process.

Conversational Trait	References
Ability to handle a lot of questions and provide detailed responses	[46]
Flexible interaction style of the ECA able to adapt to each user	[48,54,55]
Provision of follow-up questions in order to understand the student and to not interrupt the conversation flow	[47]
Use of linguistic variations	[52]
Use of simple language	[53]

4.2.3. Students' Behaviors and Interactions with an ECA

The final aspect of the recommendations based on the evaluation results is relevant to the needs and preferences of the students. In further detail, it concerns the behavior of the chatbot and also some usual behavior that students tend to show when interacting with an ECA. These suggestions aim at improving the conversational ability of an ECA and increasing its acceptance by the students. Initially, the students in the study of Mendez et al. [35] expressed the need for more personalized content provided by the agent and the importance of satisfying user needs was indicated. In the same year, in Bailey's et al. [56] study it was found that higher learning performance students were more willing to use the chatbot than those who had low performance in the specific subject. In addition, students' unresolved queries often originated from the vocabulary that students used to interact with the ECA, which contained words out of the educational context and which the ECA was not trained to understand. In another application [36], it was noticed that students with high learning performance are more willing to use the conversational assistant. Furthermore,

students want to feel more liberated when they use an ECA to learn and not be limited in a specific teaching way. Yildiz Durak [57] observed that students' perceived course satisfaction is connected with the satisfaction of using the ECA and that the satisfaction of using the ECA is connected with students' engagement in the course. Additionally, the results in the study of Durall Gazulla et al. [58] showed that when the students are included in the development process, they feel the need to express their opinion in order to modify the educational matter and adapt it to their needs. Moreover, Belda-Medina and Calvo-Ferrer [52] observed that students were concerned about the privacy of their data.

González-Castro et al. [46] observed that the provision of visual material and personalized responses adapted to the students' needs and the provision of single personalized questions that a learner might need the answer for, instead of an aggregate of them, are two desires of students when using a conversational tutor. A similar desire was expressed by students in the study of Han et al. [41] where the need for the provision of personalized information and human-like generated responses by the ECA was noticed. The students that utilized the ECAs that were developed by Hew et al. [55] also declared that they would like a chatbot that utilizes human-like conversational characteristics, can handle small talk and provide personalized, accurate and fast responses. In addition, they wanted the conversational tutor to offer learning content in various forms, utilize different conversational flows so that it cannot be predictable how it will respond, and finally provide personalized feedback. Students in the study of Jasin et al. [59] felt more competent and confident when using the ECA but also anxious when the chatbot was not able to respond properly. They valued the ability of the ECA to handle small talk and provide quick responses, but disliked the fact that it could not remember past conversations. Relevant to learning confidence, another group of students using a conversational tutor expressed that they would feel more confident to make mistakes in the artificial educational application, rather than in the classroom with a human educator [60]. Additionally, in the study of Yang et al. [53] it was observed that students would be more outgoing with the ECA than they are usually in the classroom, indicating that they were more confident in the learning process using the agent.

In another research [61], students declared that they used the conversational tutor to improve their learning effectiveness and they valued the instant responses of the bot. In addition, they liked that they could use it as a revision tool, and they viewed it as a supplementary tool for their teacher. Finally, they did not like that they would obtain the same answer for different questions. Ong et al. [62] also noticed that students using their ECA valued its usage as a revision tool that helped them prepare for their final exams. In the research of Schmulian and Coetzee [63], students expressed their satisfaction for the conversational tutor as they perceived it as an online, ubiquitous and also supplementary to the teacher tool that helped them comprehend the educational material in their personal learning pace.

In a different aspect of this subject, Wambsganss et al. [50] implemented an educational chatbot that contributed to course evaluation. Based on these results, the students felt that their opinions matter, considered the application as a pleasant way to evaluate the course and provided more detailed feedback about it. Finally, they valued the follow-up questions and the usage of humor by the ECA, while it was also noticed that students using the ECA could complete their evaluation a little faster than those who did not.

Huang et al. [64] observed that students value an ECA when it can effectively help them study and make it easier for them to process the educational material. In another study [43], students felt less stressed using the conversational tutor and considered that they saved time they would otherwise spend searching for answers on their own. In addition, they felt that they could learn more efficiently using the ECA and asked for a retry possibility on the provided learning tasks in order to improve their scores in the ranking leaderboard of the classroom.

Students using the application of Vazquez-Cano et al. [65] expressed their satisfaction for the provision of feedback and the presentation of educational material in various forms.

In addition, they perceived the ECA as a helpful and ubiquitous tool that supported them in their learning process. In another research, students have expressed that they do not like the repetitiveness of some learning items, and they have expressed the desire to be able to backtrack to previous learning items [38]. The application, based on a learning framework by Neo et al. [49], showed that students value an educational tutor when it helps them study by saving time they would spend searching information and providing good explanations. Moreover, Wan Hamzah et al. [42] implemented an ECA that was evaluated by 47 students. Based on these results, they recommended the provision of the educational material in various forms, the encouragement to use the ECA along with guidelines on how to use it, and the utilization of learning analytics to redesign and improve the function of the chatbot. Additionally, an ECA application that was used by 195 students [66] showed that students are willing to explore further educational material when the relevant educational content is connected with a quiz question or a learning task. Also, these students liked the provision of both open-ended and close-ended quiz questions by the ECA and expressed the need for a more social ECA that can handle small talk and understand the possible linguistic variations of a student's input. In further detail, the study of Schmitt et al. [67] showed that students may perceive the information received by the ECA more trustworthy than the information they could find on their own. Lastly, the interviewees in the study of Tlili et al. [45] indicated that when it comes to user interaction, ChatGPT clarifies that it is an AI and not a human being. This way it can be concluded that it lacks human conversational traits, which are usually wanted by the students.

Students in the study of Černý [68] indicated that they would prefer an educational chatbot with humane conversational traits. Also, Essel et al. [69] observed that students tend to interact with the educational chatbot during the first lectures when the learning matter is new to them and during the last lectures, which indicates that they possibly used it to revise the educational content and prepare for the final exam. In addition, the students that used it, expressed their desire for a more human-like conversational assistant that could provide an "in depth learning experience". Students evaluating the application by Lee et al. [70] valued the ubiquity of the ECA and its provision of feedback. They also expressed the dislike for some interactions where the agent would not respond in a humane way. Furthermore, students tend to interact more with an ECA that is low self-sufficient, by advising and encouraging it, and additionally, low self-efficient students tend to interact more with this kind of chatbot [71]. Lastly, Janati et al. [72] indicated that an ECA should have the capability of discussing casual topics and make small talk out of the educational context.

In another study [73], students expressed a dislike for the use of long text messages, thus indicating the need for alternative representations of the ECA's responses. Additionally, they declared that they would like a more interactive ECA and guidelines on how to use it. Finally, they stated a need for practice exercises and feedback provision from the chatbot. Relevant to this, the results of the Kharis et al. [74] study also showed that students would like instructions on how to use the ECA and would like a mobile application form of the ECA as well. Finally, Sáiz-Manzanares et al. [75] noticed that students need guidance and instructions on how to utilize the ECA as well.

In the study of Al-Sharafi et al. [76], the satisfaction of students' learning needs and the capability of the ECA to improve students' learning efficiency and to provide knowledge in concepts that are new to them are considered important aspects of an educational ECA in order to increase the students' engagement. Furthermore, Suárez et al. [77] implied that adapting the function of the chatbot to the students' learning needs and enriching the educational material with visual aids and other media are two important factors for the students; Neo [78] observed that students liked the quizzes that were offered by the ECA. Lastly, in the survey conducted by Kohnke [40], students expressed the need for the provision of extra supportive learning material, while teachers evaluating the application stated the need for training in order to use this technology.

The results and the recommendations based on these observations are collectively presented in Tables 10 and 11.

Table 10. Students' behaviors when they interact with ECAs in the learning process.

Observed Student Behavior	References
High performance students tend to utilize an ECA more.	[36,56]
Students are willing to express their opinions in order to shape the provided educational material when they are included in the development process.	[58]
Students feel anxious when the ECA cannot understand them.	[59]
Students feel more confident and are not afraid to make mistakes when using an ECA and thus, they examine the educational material more.	[53,59,60]
Students perceive the evaluation process of a course using an ECA as pleasant.	[50]
Students feel their opinion is appreciated and provide more detailed feedback when evaluating a course using an ECA.	[50]
Students make quicker course evaluations using an ECA.	[50]
Students' perceived course satisfaction is connected with the satisfaction of using the ECA of the course.	[57]
Students' perceived satisfaction of the ECA is connected with students' engagement in the lesson.	[57]
Students perceive the ECA as a supplementary educational tool to their teacher.	[61,63]
Students tend to be more willing to use the chatbot if it is perceived as a tool that helps them improve more than their usual way of studying.	[39,43,61,65]
Students tend to increase their engagement with the educational material when it is connected with quiz questions or exercises.	[66]
Students tend to interact more with an ECA that functions as a low self-efficient student, especially the students that are also low self-sufficient.	[71]
Students tend to perceive the information provided by the ECA as more trustworthy.	[67]
Students tend to use an ECA at the beginning of the lectures when the teaching material is novel to them and during the end to revise it.	[69]
Students tend to utilize an ECA more if they perceive the knowledge offered by it as new.	[76]

Table 11. Students' desires for effectively interacting with ECAs in the learning process.

Students' Desire	References
Students demand personalized interaction with an ECA.	[35,41,46,55]
Students do not like obtaining the same answer for different questions.	[61]
Students do not like the repetitiveness of the learning items.	[38]
Students like to backtrack to past conversations to review previously examined teaching matter or exercises.	[38]
Students like to use an ECA as a revision tool.	[61,62]
Students value human-like conversational traits of an ECA.	[41,45,50,55,68–70]
Students value the chatbot because it helps them learn at their own pace.	[63]
Students value the chatbot because it is available continuously and they can use it whenever they want.	[65,70]
Students value the chatbot when it helps them learn easier.	[63,64]
Students value an ECA when it provides a pleasant learning interaction.	[49]
Students value an ECA when they believe it can save time spent on searching for information.	[43,49]
Students valued the usage of follow-up questions when evaluating a course using an ECA.	[50]
Students want the ability to repeat learning tasks they failed to accomplish.	[43,56]
Students want their data to be protected.	[52]
Students would like a mobile application form of an ECA.	[74]
Students would like an ECA that provides quick responses.	[50,55,59,61]
Students would like extra supportive material from external educational sources provided by an ECA.	[40]
Students would like guidance and instructions relevant to the usage of an ECA.	[42,73–75]
Students would like the ECA to be capable of handling small talk.	[55,59,66,72,73]
Students would like the ECA to provide exercises for practice.	[73,78]
Students would like the ECA to provide feedback on their learning performance.	[55,65,70,73]
Students would like the ECA to provide various forms of educational material except text messages.	[42,46,55,65,73,77]
Students would like the ECA to remember past conversations.	[59]
Students would like to feel liberated while learning with an ECA.	[36]

4.2.4. Obstacles and Limitations When Applying an ECA to Support the Learning Process

Using an ECA to support the learning process could be beneficial for all the stakeholders of the educational process. However, despite the potential benefits, it seems that the application of ECAs could face some obstacles or even affect the learning process in a negative way.

To be more specific, the first important challenge an ECA could face in educational settings is its acceptance from its possible end users. In other words, the working staff of an educational institution may view this technology as a possible replacement of themselves rather than an assisting tool [32]. In addition, some educators felt the need for extra training in order to be able to utilize the ECA [40], something that might discourage them to adopt it in their teaching since it will mean extra work. On the other hand, students need to be motivated in order to use a chatbot, since they are not familiar with this technology [38] and might view it as extra study work. Also, they are sometimes concerned with the protection of their privacy and data when interacting with an ECA [52]. Last but not least, the access to this educational tool should be secured for every student [40], otherwise it could lead to educational inequalities and some students may feel excluded or unappreciated.

As aforementioned, the usage of ECAs might impact the educational process in a negative way. More precisely, the end users using ChatGPT in the study by Tlili et al. [45] raised some concerns about the decrease in students' critical thinking and the possibility of making them less active and less engaged with the learning subject, if it becomes a tool that provides solved exercises and answers to questions. In addition, the generated responses should be accurate, otherwise they increase the possibility of plagiarism occurrences in the content that will be produced by the students who use it. Finally, the end users also raised a concern relevant to the privacy of the users' data. Apart from the end users' views, Tlili et al. [45] also interviewed educators to evaluate the educational application of ChatGPT. In further detail, they indicated that this chatbot can help students produce written texts and answer multiple choice exam questions and thus help students cheat, without getting caught. Additionally, although it can provide useful information, its responses might not always be accurate, and it sometimes provides different answers to the same question when there should be a specific unique answer. Although it can provide quizzes, it appears to be confronted with some problems with the structure of the quiz such as providing questions that are too easy or placing the incorrect choice always in the end and thus making the structure predictable for the student to use. Also, sometimes it does not provide full information on a topic for functional or ethical reasons, which might discourage students from using it. Finally, there is also a concern about the storage of the user's interaction and their privacy, along with a concern about the bias of the algorithms it uses to provide responses, since sometimes it could offer information about material which was produced later than the data it was trained on, such as articles produced after 2021 (which is the last year of data it was trained on) from which it can display their reference but not context details.

4.3. Support Provided by Chatbots in the Academic Lives of Students (RQ3)

Apart from helping students gain specific knowledge, conversational agents can assist them in a variety of roles by supporting and helping them make decisions relevant to their academic future and responsibilities. In this section, 12 papers are being analyzed in order to examine these roles in further detail.

The first important supportive role an educational chatbot can assume is that of an *academic advisor*. In this context, Wei et al. [79] implemented a CA that could support students in selecting the necessary optional academic subjects that would best fit their learning capabilities and liking, functioning as a course suggestion tool. Additionally, according to Bilquise and Shaalan [15], a chatbot could be used to support and provide academic advising services. In further detail, a CA could utilize students' data relevant to their academic progress and construct a suggestion for which courses a student should take. This suggestion could be handed to the academic advisor who supervises the specific student and who helps students organize their choices of academic courses. Moreover, a

conversational bot can analyze a student's learning progress and conclude whether they are likely to fail some of their courses. Based on this function, the agent could update an academic advisor to reach the student or if that is not possible, inform the student directly, so the possibility of a student failing a course could be diminished, or even prevented from an early stage. Finally, the third capability of a conversational academic advisor, mentioned by the authors, is that it can respond to students' general questions relevant to the available studying programs and the provided curriculums. In a similar approach, Bilquise et al. [80] also implemented a conversational academic advisor. Specifically, their CA was able to express itself in English and in the local language and could answer students' questions relevant to the regulations and educational policies of the educational institution as well. Sweidan et al. [14] implemented a conversational system with many capabilities to support the students. The constructed CA was capable of tracking students' learning progress and helping them organize their course selection plan based on the courses they owed and their learning performance. Kuhail et al. [81] implemented a CA that could function also as an academic advisor. The proposed chatbot was capable of responding to students' questions relevant to the regulations and educational policies of the educational institution. Finally, the proposed CA was responsible for supporting students with general problems that might have hindered their academic progress.

The second way that a chatbot can support students in their academic lives is by providing *career counseling and vocational guidance*. In particular, Chen et al. [66] mentioned that a CA can aid students to learn more about their possible future career paths and choices. In addition, they can relieve students from the stress they might have when they confront such decisions, by answering their questions with personalized responses, providing them a safe space to express their thoughts and problems and supporting them emotionally.

Mentoring and personal supervising is the third possible role a CA can take on to support students. To be more specific, Mendez et al. [35] explain the application of a conversational agent as a mentor for the students. In other words, this CA utilizes responses from domain experts in order to respond to possible students' queries the way a mentor would do. This way they could obtain answers and guidance to different subjects that concern them, relevant to their academic and professional current and future situation. In addition, Neumann et al. [82] indicated the usage of conversational assistants as personal educators and mentors to the students. In particular, they indicated that a CA could supervise students' learning progress and provide them with personalized feedback, in order to be able to correct and accomplish their assignments faster and quicker. Additionally, a CA can provide specific exercises and educational material relevant to students' needs, like an educator who supervises the student would do, if they tracked a learning weakness. Lastly, the conversational assistant of Kuhail et al. [81] would resolve students' questions to help them improve their learning efficiency and would suggest to students relevant external learning material sources to help them study.

An equally important role a chatbot could assume to support students is that of a *personal academic guide*. In other words, an ECA functioning as an academic guide can provide information relevant to students' courses and educational institutions that they might sometimes not find easily. To be more precise, the chatbot implemented by Sweidan et al. [14] would inform students by notifying them about important news relevant to their courses like a lesson cancellation, a submission deadline or date reminders for events like an examination of a course. Furthermore, it could help students monitor their absence rate from specific courses and could give information about the teaching hours of a specific course. Last but not least, the CA was able to provide information about important locations in the vicinity of the educational institution like a library or a bookstore and could provide to them contact information of their educators and their office hours. The proposed CA functioned in a way an academic advisor would do and also as a ubiquitous personal guide for the students. In a similar approach, the application of Bilquise and Shaalan [15] would inform students about various learning subjects or even provide general information about the institution, while the CA of Kuhail et al. [81] would provide general details about the

organization of a course like its name, summary, the days of the week it was being taught and the classrooms. Finally, the conversational assistant of Bilquise et al. [80] could offer information about the organization and general information of the offered courses in the students' curriculum. Also, it could respond to student-related issues such as vacation breaks, semester finals and information relevant to the attendance of the courses.

Students, and especially undergraduate students or younger, do not have much experience in *searching for suitable academic sources* when they want to study something. Chatbots can take on a supportive role as helping tools in order to guide students through the process of browsing academic sources and help them track what they really need for their assignment or study. To clarify that, Peng et al. [83] implemented a conversational agent with the purpose of helping students process academic papers more efficiently. More precisely, students would read a document and then could refer to the chatbot that asked them specific questions, so they could evaluate the usability of the document they had previously read with regard to their research purpose. This way, it could be stated that a conversational agent could function as a research assistant for the students. In addition, Kaushal and Yadav [32] studied the ways a chatbot could help improve the services of an academic library. In their study, they indicated that chatbots could support students and help them browse academic resources faster and more efficiently, in order to obtain better search results. This way, a CA could function as a research helper to students. Relevant to this subject, Tlili et al. [45] investigated the capabilities of ChatGPT, an advanced conversational assistant, in the educational process. In their study, they mentioned the capabilities of ChatGPT to help students search information, thus indicating that a chatbot could function as a research helper to students that will help them search faster and obtain better results. Using the said CA, Zhai [24] created a paper with the aid of ChatGPT. In this study, the author is presenting how ChatGPT could possibly aid students conduct research, although concerns are clearly mentioned about the possibility of the CA to be exploited by the students so they can receive the solutions for their learning assignments without actually engaging with them.

In all the above papers, it is implied that a CA can play these roles as a supplementary tool to support the students. Its purpose is not to replace the people that are working to provide such supportive services to students, but rather to assist them, so that they can accomplish their tasks easier and more effectively. Also, it is a good solution in many cases when such services are not available to students due to budgetary limitations in an educational institution. The results of the previous analysis are summarized in Table 12.

Table 12. Overview of the ways a CA can assist students in their academic lives.

Role of the CA	CA Contributions	References
Academic advisor	Discuss with students about problems that might hinder their academic progress	[81]
	Help students monitor and manage their absence rate from a course	[14]
	Help students monitor their learning progress so they do not fail courses	[15]
	Provide information about the available studying programs of a university	[15]
	Respond to students' questions relevant to the regulations and educational policies of the educational institution	[80,81]
	Support students in constructing a course selection plan adapted to their academic capabilities	[14,15,79]
Career counselor/Vocational guidance assistant	Aid students to learn more about their possible future career paths and choices	[66]
	Provide personalized answers to students' questions relevant to vocational guidance and encourage them to discuss their concerns	[66]
Mentor/Personal supervisor	Answer questions relevant to working experience or possible career paths	[35]
	Provide personalized feedback on students' assignments	[82]
	Suggest suitable extra educational material to the students	[81,82]

Table 12. *Cont.*

Role of the CA	CA Contributions	References
Personal academic guide	Notify students about important landmarks or news about their courses	[14]
	Provide general information like the content and teaching hours of a course	[14,15,80,81]
	Provide general information that might interest them like the calendar of the school year	[80]
	Provide information about the contact information and availability of the educational staff	[14]
	Provide map information	[14]
Research helper	Help students evaluate research papers by asking them questions that would trigger their critical thinking	[83]
	Help students search the resources of an academic library to obtain the results they want faster and easier	[24,32,45]

5. Discussion

This SLR analyzed and examined three questions, for the purpose of providing a comprehensive and state-of-the-art overview of the knowledge regarding the support that ECAs can provide to the educational process.

To begin with, the current review examines the ways that a CA could support the educational services of an educational institution and improve their quality for the students. In particular, CAs can be utilized to reduce the workload of the employees of an educational institution, so they can focus on the tasks that demand more time to be resolved [12–15,25,29,30]. In addition, they can extend the supportive services offered, reducing time limitations, without demanding extra resources [8,9,15,31]. Finally, they can be used for the evaluation of said services [11] and the improvement of their quality, and thus, of the educational experience of the students [7,9,10,12–15,31,32]. It should be clarified that the purpose of using chatbots is to support the staff in their work and deliver the aforementioned improvements, not to replace the staff.

Additionally, there are many recommendations relevant to the way that an ECA should be applied in the teaching and learning process. More specifically, the directions implied in some of the reviewed papers were that the educators should support students actively and resolve possible problems relevant to the usage of an ECA [36]. Furthermore, it should be clear to the students that the chatbot is a tool that will help them study and will not add more tasks to their current workload, since they tend to utilize a CA when they view it as a supportive tool that can help them study easier [64] and faster [43,49]. Finally, educators should ensure that the implemented ECA is accessible to all the students [39,40] and that the used students' data are protected [45,52]. Also, the used ECA should not provide students ways to cheat and should try to engage them actively in the learning process.

Last but not least, this review examined the emerging roles of educational chatbots in a student's academic life. To be more specific, six different roles were observed. The first role is that of an academic advisor [14,15,79,81]. In that role, a chatbot supports students to monitor their learning progress [15], construct a course selection plan [14,15,79] and discuss problems they might face relevant to their academic progress, in order to motivate them and help them not to give up [81]. Another role that was noticed was a CA functioning as a career counselor or vocational guidance assistant [66], where the CA would provide students with personalized responses relevant to possible career paths and resolve any possible questions they might have about this topic [66]. The third role a conversational assistant could take on is that of a mentor of a student [35], where the CA is sharing professional experiences from real life like a mentor. Furthermore, a dialogue assistant could be a personalized academic guide for students that will provide them specific information about their courses [14,15,80,81], but also general information about the university and the educators [14]. The fifth role a chatbot could take on is that of a personal learning supervisor that provides feedback to the students about their assignments [82] and suggests extra personalized educational material for a student [81,82]. Finally, a CA could

also assist students when they conduct research by helping them obtain better and faster searching results [24,32,45] and help them filter the retrieved sources of knowledge [83].

The aforementioned findings indicate that chatbots are technological tools with many supporting capabilities for the educational sector. However, their adoption by educational institutions is rather sporadic and not widespread, which is usually the case for their application in the teaching process as well. More specifically, among 1597 documents only 17 referred to the usage of chatbots for supporting the services of an educational organization, indicating the need for more research in this subject. Furthermore, many concerns were raised about the utilization of ECAs in the learning process, but the actions required for dealing with them have not been adequately researched. For this reason, a set of possible restrictions and application guidelines might be needed in order to deal with potential negative effects. Last but not least, alternative roles of ECAs are emerging and reveal support capabilities that are not usually connected with the application of ECAs, such as the role of a mentor and academic guide. However, only 12 studies during the last five years were found relevant to this subject, which shows the need for more research that will help us gain a deeper understanding of the supporting capabilities of ECAs in the learning process and the academic lives of students. It is hoped that this SLR will contribute in clarifying the various roles that an ECA can play and the potential benefits for an educational institution and its students, and recording the most important obstacles that are usually met for their acceptance and effective use. It is clear that further research is required for the consistent adoption of chatbots in the learning process, expanding their role to become something more than a simple teaching assistant.

6. Limitations

As it was mentioned earlier, this SLR was created using a specific method and criteria, which led to certain limitations that should be known, in order to analyze this work. First of all, the documents collected for this SLR were retrieved from a unique scientific database, namely Scopus, and this could result in omission of possible relevant papers that could have been included by browsing other scientific search engines. The same possible loss of data could occur because of the inclusion criteria and more specifically, the exclusion of papers that were not written in the English language or that were not journal articles. Additionally, articles published before 2018 were ignored, since the target of this study was to gather knowledge from the latest advancements regarding the examined topic. Another limitation of this work was that possibly pertinent results were omitted due to the unavailability of the full text of some documents. Last but not least, the usage of a search query with general terms around the topic could be replaced with a more specific query that could provide more accurate results. The usage of general terms was preferred as a better option since the general terms would lead to more results and therefore providing an exhaustive and thorough search that fits the selected methodology, rather than more limited results where information omission would be more possible.

7. Conclusions and Further Research

The purpose of this SLR was to examine the ways that CAs can support the learning process and improve the educational experience that students could have when they are used in this context. More specifically, it was found that CAs can actually support the educational services of an educational institution, by extending the availability of their services and thus providing constant and more qualitative educational services for the students. Furthermore, ECAs can support the learning process more effectively if the gain of their usage is acknowledged by the students, the students' data are protected, the access to the ECA is secured and educators provide support to students when the ECA cannot. Finally, the emerging roles that an ECA could take on in order to support students in topics relevant to their academic lives include helping students deal with simple problems relevant to their academic progress; providing career counseling; and helping them conduct research on their own. Even though the main target was an exhaustive

review of the literature, this study is restrained by certain limitations. Possible further research could utilize the current information in order to extend the role of existing ECAs and create chatbots that could support students by being more than a simple teaching tool, while also supporting the educational services provided by an educational institution.

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