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Chatbot in Education as Assistant tutor.

A SYSTEMATIC REVIEW AND PILOT STUDY

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Contents

Chapter 1: Background and context to this study

"Can machines think? In 1950, Alan Turing asked this question, and since then there have been many attempts to answer it from the field of artificial intelligence, and more specifically through Chatbots."
(Lokman & Zain,2010).

This research study refers to the effects of human-computer interactions in education investigating, effectiveness, efficiency, satisfaction, and limitations using Chatbots in education as assistant tutor.

Chatbot systems are in trend and are being used on many websites and social media as a means of Artificial intelligence (AI) communication tool. According to A. Vaish, stated in ***(Khan, et al., 2019)*** *"Globally, the Chatbot market has seen explosive growth with a growth rate of 35% CAGR".*

The aim of this research is to identify various Chatbots in use within the educational environment, investigating effectiveness, efficiency, satisfaction, and limitations through evidence-based practice (EBP).

1.1 Research Method and Design

This study will carry out mixed-method research utilizing both, quantitative and qualitative data collection. The rationale for a mixed method approach is that quantitative data will provide a general picture of the students' response and impressions of the Chatbot as an assistant tutor, whilst qualitative data will analyse and explain the implications of Artificial Intelligence (AI) in education through Chatbots.

The research study analysis process is divided into two phases. Phase one qualitative method using the Evidenced-Based Practice (EBP) approach and Phase two a quantitative method analysing data gathered from Chatbot – Students' interaction.

1.2 EBP Approach

EBP Approach will adapt a clinical decision-making model to human-computer education by Pamela K. Ginex. This model is used by clinical practitioners to analyse individual situations to improve patients' outcomes.
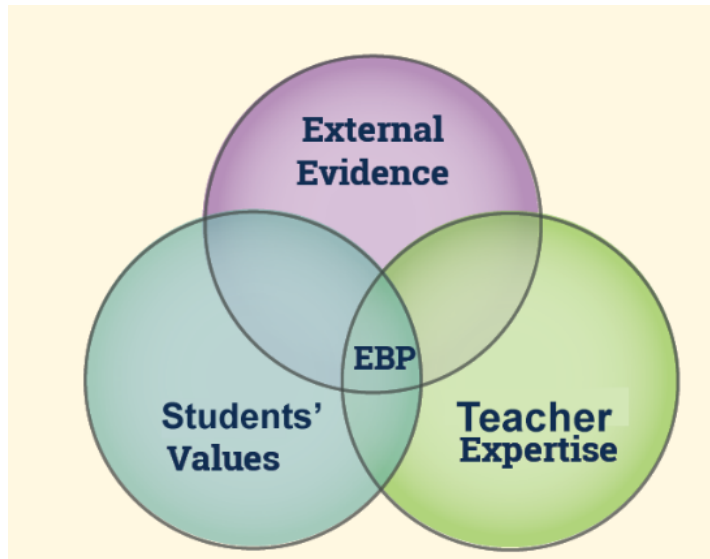
Figure 1March 22, 2018, by Pamela K. Ginex, EdD, RN, OCN® Senior Manager, Evidence Based Practice, and Inquiry

1.3 Students' values

Responses and perceptions data will be collected through a Chatbot piloting communication exercise, examining, and describing the most common perceptions and expectations highlighted by the students. Data gathered will be analysed to comprehend students' behaviour and responses when using a Chatbot in an Education environment as an assistant tutoring tool.

1.4 External information - Approaching EBP method using reliable databases.

A systematic review approach will examine **Teachers' Expertise** and use of Chatbots in education about effectiveness, efficiency, satisfaction, and limitations as well as human-computer interaction. Articles associated with the keywords, Chatbot/s, Education, Artificial Intelligence (AI), online learning, effectiveness, efficiency, satisfaction, and limitations will be screened for eligibility. Articles and records will be researched for relevancy following the

criteria required. A review between two researchers will be completed to identify any consistency and inconsistency for the final inclusion criteria of selected literature. The study selection strategy approaches the PRISMA (Liberati, et al., 2009) statement guidelines as follows:
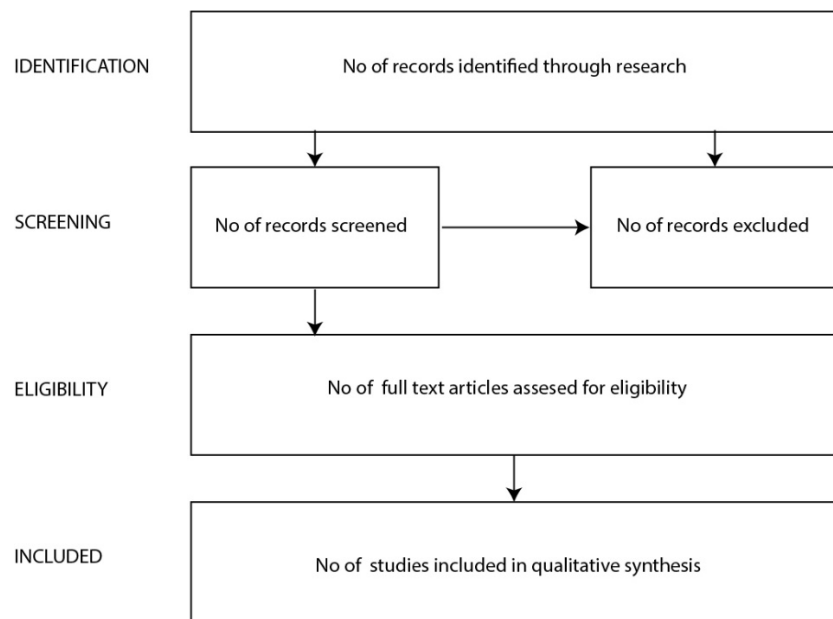
Figure 2: PRISMA (Liberati, et al., 2009)

1.5 Identification Sources

To examine Chatbot efficiency and limitation in education a cumulative collection of thirty articles and reports will be reviewed. To minimize bias publications different databases will be used referring to the following list; EBSCO, ProQuest, SAGE, Elsevier and Academia.edu. The keywords investigated for Chatbot efficiency and limitation in education are; Chatbot/s, Education, Artificial Intelligence (AI), online learning, effectiveness, efficiency, satisfaction, and limitations. The inclusion and exclusion of reviews are based on

specific criteria that relate to the effectiveness, efficiency, and limitation of Chatbots in education from teachers'/lectures' mindsets and the students' mindset. The research study will examine a minimum of ten to fourteen full text articles/reports. Outcomes will be rated independently by two-person experts in the use of technology in education and pedagogy. To establish relevant criteria and limit the chances of missing useful investigated material, a manual assigned procedure will be used to include/exclude categories of studies. Extraction will consist of two types: direct quotation from paper /reports that will be gathered through line-by-line coding and categorical data that will be gathered by noting the presence or absence of relevant criteria.

1.6 Screening, Eligibility Data Extraction

The screening process will be objectively and accurately summarized in common formats to facilitate synthesis analysis of the articles/reports. A summary table of the study will be generated to produce inclusion and exclusion results. The first level of screening will examine the title and abstract of each article/report to decide inclusion or exclusion of the study review, a deeper assessment will proceed in the second stage of the screening (eligibility).

The use of AND, OR, and NOT will be applied to various keywords that reflect requirements of specific databases; such as Artificial intelligence OR Machine Learning OR Neural networks AND Intelligent retrieval.

A deeper assessment review will take place to minimize bias. At least two reviewers will go through the second stage of the screening. Results will be discussed to resolve any discrepancies, retrieve, and read the full text to determine if the studies are to be included or excluded. A documentation process will be produced to keep track of the systematic review components.

Included Articles/Reports will include the development of the research question, forming criteria, keywords search, searching databases, title, abstract, full-text screening, manual searching, extracting data, quality assessment, and data checking.
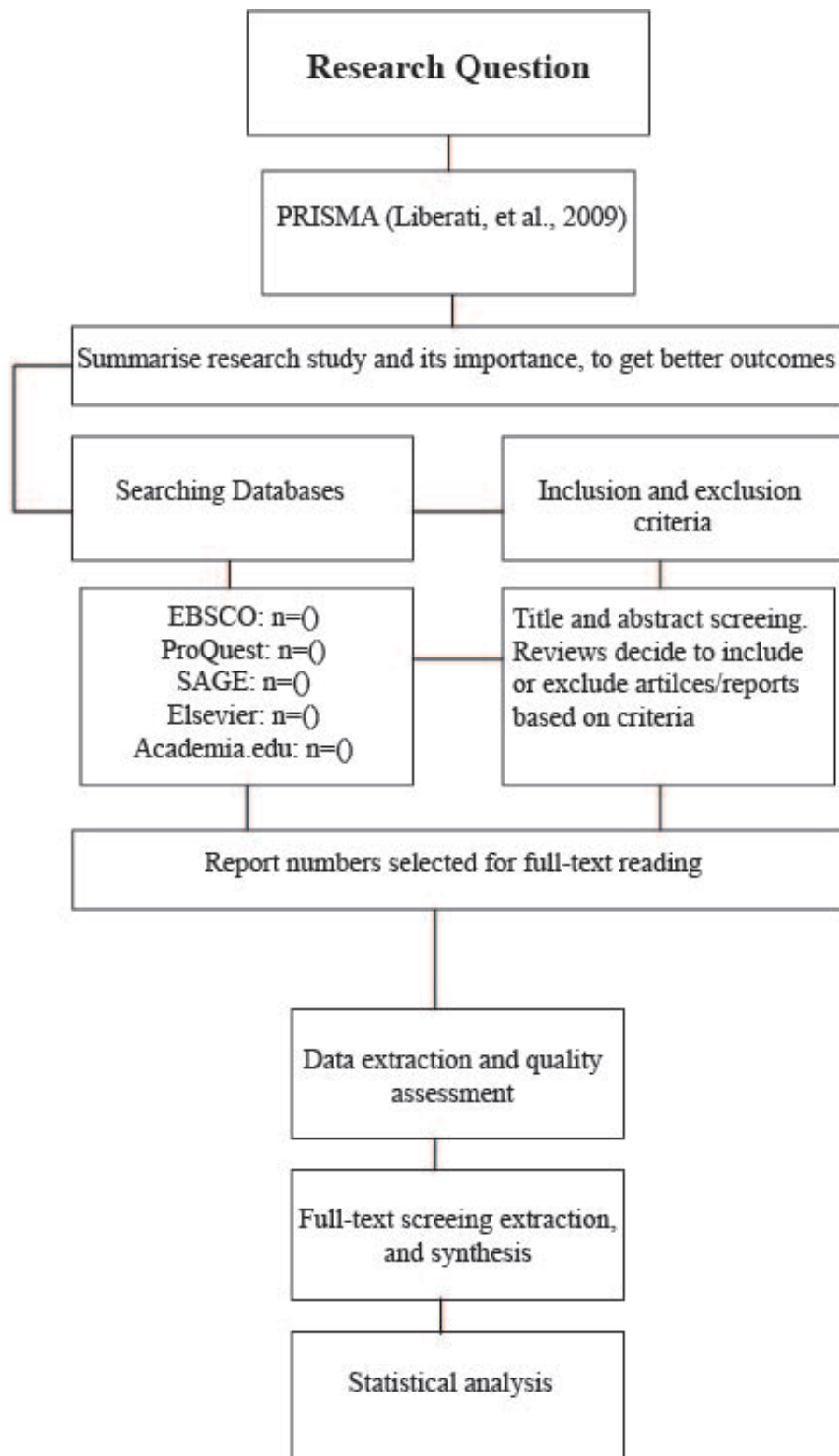
1.7 Conceptual Framework

Figure 3 Adapted on (Tawfik, et al., 2019)

Chapter 2: Screening

2.2 Title and abstract Screening

Decisions to select retrieved articles/reports were based on eligibility criteria, to minimize the chance of including non-relevant articles/reports. According to the CASP checklist guidance, two reviewers were involved in the procedure of title and abstract screening. Any duplications found were removed manually. Electronic searching of databases was applied to include all the possible relevant articles that must undergo further scrutiny against the inclusion criteria. After the first stage screening, fifteen out of forty articles/reports were selected. Second stage screening nine articles/reports out of fifteen were extracted for full-text data collection to be used in the synthesis analysis.

2.2 Synthesis of Analysis

After analysing the opportunities, strengths, and potential of a Chatbot in education, research demonstrates that Chatbots,' particularly in teaching and learning, supports students learning. Often Chatbot research studies aim to investigate students' main barriers, advice, and coaching unit instructor. A study conducted by (Gupta, et al., 2019) stated that participants *"frequently needed to check the basic information, such as course materials, textbook information, due dates, study tips, and office hour information."*

Literature shows that Chatbot testing is more efficient when applied to subjects such as classified Language, Economics, Math, Multiple subject matter, Literature, History, Nature, Programming, Psychology, and Design.

Supported by literature reviews Analytic Hierarchy Process (AHP) is recommended for solving multi-criteria decision-making problems.

Radziwill and Benton "summarized the quality attributes from previous studies as a checklist *for Chatbot analysis. The quality attributes include the effectiveness (functionality,*

humanity), efficiency (performance), and satisfaction (accessibility, affect, behaviour and ethics)."

AHP decomposes the problem into sub-problems to easily comprehend the elements of the decision problem putting a set of alternatives in order from most to least desirable.
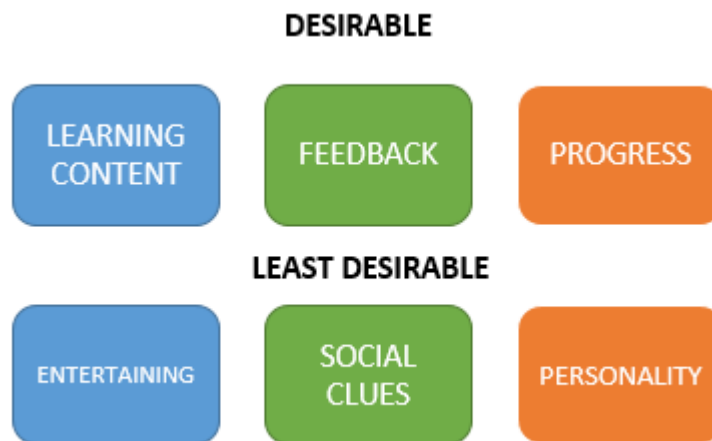
Figure 4: Desirable to Least Desirable Diagram

APH can be applied to identify questions and answers to be assigned to a Chabot system according to the subject matter. Teaching could be subcategorized into three desirable criteria as Learning Content, Feedback, and Progress while the least desirable can be Entertaining, Social clues, and personality. This depends on a case-to-case basis according to a specific research study. The incorporation of a Chatbot in education needs to be preceded by prior planning and thoughts. Observing and analysing a course is an extremely important phase before deciding to develop a Chatbot for tutoring assistance. During the course observation, it is important to keep records of students' behaviour and constant Frequent Asked Questions (FAQs) related to the unit course.

Prochaska and Clemente (1992) cited in (Abbasi & kazi, 2014) introduce the model which describes how people can develop behaviour and attitudes. The six phases of the model are described below:

1. Acknowledgment of the new behaviour or attitude,

2. Recognition of one's similarity with the observation,

3. Identification of the outcomes,

4. Remembrance of the behaviour or an attitude,

5. Reproduction of the behaviour or an attitude,

6. Reinforcement of the model.

Acknowledgment of the new behaviour or attitude. In this case, this is a face-to-face resolution since it is related to behavioural changes depending on emotional factors such as the learning environment and other changes that affect the individual attributes. This is an unpredictable event.

Recognition of one's similarity with the observation and Identification of the outcomes. This phase can be integrated into the Chatbot intelligent tutoring system, thus, determining the efficacy of the learning Chatbots on the student's behaviours learning outcomes considering memory retention through the Chatbots system.

Remembrance of the behaviour or an attitude. Analysing behaviour and attitude enhances the communication abilities between students and the Chatbot also stimulates the students to engage with the Chatbot.

Reproduction of the behaviour or an attitude and Reinforcement of the model.
Reiners et *al.* (2014) cited in (Abbasi & kazi, 2014) *"suggested that developing the*

Chatbot with the specialist resource with strong educational scenario have significant impact on the learning of students."

This demonstrates that enhancing **the Reproduction of the behaviour or an attitude** based on a structural model can help to provide effective learning outcomes developing a positive impact on the students' learning.

It is important to keep in mind that Chatbots will not replace lecturers but will complement and help lecturers to provide their service efficiently, especially with students that have learning difficulties. An example could e the lecturer takes personal teaching tasks while a Chatbot provides support by answering FAQs and acting as a virtual tutor. symbiosis would allow the lecturer to stop taking on more repetitive tasks which would be undertaken by the Chatbot.

(Brustenga, et al., 2018, p. 15) distinguishes two types of Chatbot in education; with educational intentionality and those without.

"Without educational intentionality: these are Chatbots that are incorporated into teaching tasks of an administrative nature (student guidance and personal assistance) and of a support nature (to answer FAQs)."

"With educational intentionality: these are designed to foster teaching and learning directly. They are basically of two types:

Tutors that provide scaffolding for the learning process: they can adapt, select, and sequence contents according to the student's needs and pace, aid reflection and metacognition processes and provide learning motivation.

Exercise and practice programs for skills acquisition: these present a stimulus in the form of a question or problem, and the student gives an answer. This is automatically assessed by the Chatbot, which gives immediate feedback to the student."

2.3 Design Considerations

For the purpose of this research study, the design should focus on a system that replies to queries of a specific unit course between the Chatbot and the student. Also, all the data should be in text form for a query as well as responses. Jill Watson Technology can be a point of reference as an educational technology Chatbot design for supporting learning at scale by automatically answering routine questions and automatically replying to students.

To maintain engagement and connectivity literature suggests giving a name to the Chatbot as well as an active Internet connection must be available. An FAQ (Frequent Asked Questions) page should be maintained along with feedbacks to keep track of the Chatbot performance. A basic Algorithm could be:

Take input from the user in Text

Send Text input for further processing

Match the input for intents and entities

Search the data repository for an appropriate answer to generate a response

"IF the conversation has ended

Then STOP

ELSE repeat step 1"

The following poses a list of considerations that should be considered supported by literature review:

1. There will be just one assistant for everyone or a specific assistant for each student, or a common one for each subject?

2. It is important to limit the dependence on the help that the Chatbot provides to prevent the student from relying completely on the Chatbot.

3. What subject areas will it know about? Just the official courses or a specific course? Will it be open to external resources? (Such as internet sources)

4. Will the Chatbot be efficient for students with learning difficulties or students with different learning styles?

The above considerations are extremely important and need to be part of the Chatbot efficiency to avoid the risk of discrimination, confusion, and de-motivation.

(Goel & Polepeddi, 2016) stated, *"that in order to improve coverage, the design of Jill Watson gradually moved from using an episodic memory of previous question-answer pairs to using semantic processing based on conceptual representations."*
Sustaining that freedom of choice will engage students to make use of the Chatbot. For example, making the students aware that there is a Chatbot available 24/7 online for FAQs related to the unit course and are free to use it rather than giving them instructions of how and when to use the Chabot. This status will also safeguard students with learning difficulties giving them an alternative option that they can rely on. This supports the second consideration in the list *(It is important to limit the dependence on the help that the Chatbot provides to prevent the student from relying completely on the Chatbot.)*

2.4 Ethical Considerations

An educational Chatbot could be varied and even contradictory. It is of the utmost importance to avoid the risk of setting the Chatbot to particularly challenging activities which may induce students' frustration leading students to fail. On the other hand, avoid developing Chatbot tests extremely easy which makes the passing course too easy preventing the students from learning. Bias due to Chatbot training can also be an ethical issue. A Chatbot trained with data that may be incorrect such as previous answers given by other students in other events such as discussion or debate sessions, information from the internet that has not been validated. In this case, the human expertise element must be present to validate data and training.

The human presence is of extreme importance as cited in (Brustenga, et al., 2018, p. 25)

"human in the loop" (Bridgwater, 2016) to ensure that there is no bias and

that what happened with Tay (Vincent, 2016), the Microsoft Chatbot that

turned racist, does not happen again."

2.5 Recommendations

Chatbots, as assistant tutors, will contribute to the personalization of learning and more inclusive education. It is also to be considered the introduction of Chatbots that may help to make assessments with personalized and immediate feedback supporting students' metacognitive control of their learning.

The person-Chatbot relationship occurs in the user interface (UI), which is

based on (written and or oral) language and the user experience (UX), which

allows the user to interact and engage with the Chatbot. Further research and collaborative activities need to take place to establish a UX/UI design framework that enhances how

conversations flow between the Chatbot, Student, and Lecturer. It is important to refrain from overestimating a Chabot capability and be aware of its limitations such as:

- learning curve,

- lacking social-emotional interaction,

- the ability for Chatbots to be more "intelligent" in understanding dialog flows.

However, a clear and functional route by giving the students options in a Chatbot enhances the flow of interaction between the Chatbot and the student exploiting the strengths of a Chatbot such as:

Accessibility - students could be able to learn and understand the material outside of the class time at any place considering they have access to an internet connection.

Interactivity - key concepts through conversations compared with learning from learning by themselves outside of the classroom.

Confidentiality - By using Chatbots to help students with course information and routine questions a one-way shift of information from the Chatbot to students.

Literature suggests that Chatbots should not be designed to pretend to be human but extra help for students and lecturers.

The study also focused on the evaluation of selected Chatbots to describe their specific events in specific circumstances referring to FAQs for a unit course following an educational intentional strategy. Improving the learning and the interaction between the teacher and the students can enhance the effectiveness of a Chatbot and an assistant tutor. Even though the research study focuses on FAQs tutoring assistance, the research study can be expanded by adding several features to the Chatbot, like multilingual capability and adding college

information for a particular course and the admission process for that college. A rating and comment section can be provided to analyse the feedback provided.

Chapter 3: Phase 2 - Analysing Students Data

A prototype was developed building multiple statistical neural network models to match content depending on FAQs designed by educators in the context of specific assignments. The Chatbot is currently running in a node-red docker container deployed on a raspberry pi 4 which is set up to serve a Chatbot server internally on the MCAST network.

The Chatbot does not have direct access to the internet and different models can be trained inside different docker containers and run-on different ports according to requirements.

Students frequently seek clarification from lecturers or ask typical questions. For example, they could be about assessment, deadlines, or resources. The goal of this type of FAQ Chatbot is to anticipate and respond to some of these frequently asked questions. If a student asks a question to the Chatbot, the query can be matched with the most comparable question in the database, and then the most relevant response is picked and presented to the student. Compared to a traditional FAQ list, this has various advantages. The FAQ Chatbot would allow knowledge to be transmitted between different educators teaching the same courses, in addition to allowing an educator to add to their expertise throughout numerous semesters.

3.1 Discussion of Analysis: Introduction

During the covid-19 pandemic education migrated to online learning platforms. However, face to face activity is still important to reach out to students for reasons such as encouraging them to enrol or checking on their well-being, especially now. The use of Chatbot and virtual assistants, are increasing which can simulate human conversation via text exchanges.

During the academic year 2021/2022, a Chatbot developed by Mr Gerard Said in collaboration with Mr Bryan Ogden, founder of Ninjamoba LTD, was made available to 134 students at the Institute of Information and Communication Technology (IICT). Each student had the opportunity to text the Chatbot with frequently asked questions (FAQs) about their project assignments.

A prototype was developed building multiple statistical neural network models to match content depending on FAQs designed by educators in the context of specific assignments.

The Chatbot focused on proactive assistance, to assist students with answers even before they ask assistance, a brief explanation of an assignment's specific criteria, common troubleshooting issues during the assignment project development, or the extension of a deadline can all be proactive and beneficial to the student experience.

3.2 Observation

This analysis looks at Chatbot in education as a potential future direction, as well as to discuss the benefits and research trends in this area. During the observation stage of this study, it is noted that students are more concerned with the effectiveness of the Chatbot application methods and information validation. Once the students have validated the Chatbot answer, they are more likely to rely on the Chatbot's assistance.

The following lessons for assignment support using the Chatbot were learned:

- Create brief, straightforward questions that include both polarities, such as positive and negative effects/benefits and disadvantages.

- A Chatbot should replicate real-life conversations as closely as possible.

- Allow students to freely express their thoughts on a single subject through multiple questions.

The most successful action taken was direct questions in the form of the Chatbot telling the student what to do and or providing a brief explanation leading to understand not only the solution but also the concept behind the solution. This finding is consistent with prior research, which found that assignment process support was the most demanded assistance from students, particularly during class project assignments. In classroom settings, the Chatbot activity's content has added value when for evaluation support settings.

During the observation it was noted that a combination of question types for educational Chatbot systems is recommended, according to the present set of Chatbot activity. Simple memory questions do not frustrate the student, nor do open-ended questions, however, instructional questions overwhelm students. Closed-ended button-response questions can be followed with open-ended questions requiring recall of specific knowledge and requiring

one-word or single-phrase responses such as asking the students to type in the criteria of a specific section or the title of a specific part of the assignment. Total bot solutions, bot-to-user inquiries, and directive response were used to calculate the engagement rate. Direct questions were tagged first, followed by open-ended questions with responses for information about the assignment and troubleshooting solutions. Some students found it difficult to interact with the Chatbot, which is understandable. All students, regardless of demographics, had a different pace of learning and comprehending, which was a struggle. However, once the students understood the effectiveness of the Chatbot, they were more than willing to use it in their tasks. Students had to be reminded on a regular basis that a Chatbot is available and that they can query the Chatbot before approaching the lecturer.

Assignment Project How did the Chatbot helped?	Not only did the Chatbot facilitate students' learning by making it more engaging, concise, and entertaining, but they also aided lecturers by streamlining their teaching processes throughout class assignment projects.
Assignment brief Providing information of the assignment concept answering questions related to assignment's aims and objectives.	As a result of this observation stage, students find using the Chatbot for assignment assistance to be exciting and engaging. Instant messaging, programs, laptops, and social media have all become ingrained in their lives, and as a result, they felt more connected during the assignment's development. This condition heightened their interest and involvement

	throughout the project's development process, Students, on the other hand, informed me that some of the responses provided by the Chatbot were not detailed, and others provided no replies at all, causing them to lose trust with regards to the Chatbot support and reliability.
Criteria Explanation Providing a brief explanation of a specific criteria.	Some students expressed concern about depending on their procedure by accepting the Chatbot's response online and sought confirmation from the lecturer. Another critical factor to consider is the gap that exists during this transition, particularly for students who are introverted and others who often rely solely on the lecturers' face-to-face help.
FAQs about syntax, libraries, and Digital graphics Providing explanation about libraries and the use of the main libraries how and where to use them.	It was revealed during this observation that inquiring about syntax suggestions and the use of certain libraries redirects students' conversations with the Chatbot to a more personal level. As a result of these approaches, this study can consider ways to improve Chatbot responses by including suggestions that would benefit the chatter's status.

FAQs trouble support. Common trouble shooting issues during the development and online publishing process.	The findings from this phase of the observation indicate that students find troubleshooting assistance appealing and beneficial. The primary reason is that this method of acquiring information saves them time, enabling them to locate solutions without browsing the web, and simplifies the process of obtaining common and specific solutions.

3.3 Observation overview

This observation demonstrates that there are two ways to consider Chatbots' role in education. The first is that students enter the classroom with a range of abilities, interests, and prior experiences, necessitating tutors who can tailor lectures and explanations to their specific abilities, interests, and prior experiences. Another approach is to think about the use of Chatbots to personalise education since learning occurs outside of the classroom.

During the observation, it was noted that students allow the lecturer to discover students' shortcomings and the lecturer can provide feedback informing students about areas in which they should exert further effort. Teachers can quickly communicate comments with students in conjunction with assignments questions and troubleshooting solutions.

Chatbots can be used to assist learners in achieving goals such as passing an external standardized exam or improving their abilities in their field of study. Along with personalizing content to learners' requirements, Chatbots can employ Artificial Intelligence (AI) to assess student data and deliver feedback to teachers.

The Chatbot was able to have a general conversation with the user. This means that depending on the field of study, the Chatbot can react to general and specialised issues. Students showed willingness to communicate with the Chatbot and make them feel at ease, but a lack of knowledge caused them to recognise the Chatbot's limitations and lose trust, diminishing their motivation to use the Chatbot as a support.

During this observation it was noticed that the employment of Chatbot systems in education was disclosed by the students' attitude. While the idea of the student as a rational and cognitive being can be viewed as incomplete, research highlights how signs expressed through Chatbots should better align with the mental orientation of high task, who possess the competences to easily meet functional goals and who place value on the social value of the interaction. The lecturers' attitude in designing the responses to be included in the Chatbot is crucial in providing a social presence, a concept that relates to the extent to which a medium is viewed as sociable, warm, sensitive, and personal when it is used to connect with others. The more humanised the responses are, the more social the Chatbot appears.

3.4 Survey Data Analysis

The aim of this pilot study survey is to identify the efficiency of Chatbots in a classroom. The questionnaire included 19 questions about students' attitudes to Chatbots structured as follows:

- Six Likert questions
- Nine direct questions
- Four semi-structured questions.

In addition, the questionnaire included three metrics questions on the respondents' efficiency, which are:

- Usability and Stimulation to Research
- Reliability and Trust
- General Opinion.

The questionnaire was distributed electronically to Multimedia Software Development project students at level four. All the students polled use the internet. The research sample consisted of 25 participants. Most respondents were male (95 percent). Female were in the clear minority (5 percent). The responders were mostly between the ages of 18 and 19 years old. (96 percent).

3.5 Usability and Stimulation to Research

1. Form 1 to 5, being 1 the lowest value and 5 the highest: (0 point)
   How easy was to make use of the chatbot during the project assignment?

   More Details

   25
   Responses

   3.12
   Average Number

The Chatbot was straightforward to use and accessible for most of the students, but a considerable number of students had difficulty accessing it. The cause could be related to access limitations, since the Chatbot could only be accessible within the college with limited permissions.

2. Form 1 to 5, being 1 the lowest value and 5 the highest   (0 point)
   What was the level of difficulty in asking the chatbot clear questions?

   More Details

   25
   Responses

   2.80
   Average Number

This proves conclusively that students had trouble posing inquiries to the Chatbot and receiving precise solutions to their problems. During the observation, it was revealed that students had difficulty using search engines to formulate queries for general research. It is essential that the lecturer formulate questions that are related to the assignment or the functionality of the Chatbot.

3. Did the chatbot's answer solve your issue/s? (0 point)
More Details

● Yes	7
● No	6
● Maybe	12

This question's response reflects the outcome of question two. Students showed a mix of dissatisfaction and satisfaction with the Chatbot's response, but 50% responded "maybe," indicating that they were not completely satisfied. This may be the result of a combination of two factors: an incorrect question and an inappropriate answer entered by the lecturer.

4. From 1 to 5 being 1 the lowest value and 5 the highest: How would you rate the chatbot's level of response satisfaction? (0 point)
More Details

25	2.84
Responses	Average Number

Students expressed a level of contentment with the Chatbot's response. This is not a desirable outcome, but it is not terrible. This can be caused by a lack of replies that effectively guide students towards problem-solving, and it can be remedied by observing and recording concerns and problem-solving situations that occur throughout the session, which can then be included into the Chatbot system.

6. After the chatbot had responded to my query, I.....? (0 point)

More Details

- Continued to carry out a researc... 3
- I continued my research in orde... 10
- I continued my research becaus... 7
- Regardless of the response, I co... 5

This question seeks to determine if a Chatbot conversation encourages students to conduct independent investigation and solve problems on their own. Most students indicated that they continued their research to gain further knowledge and comprehension, suggesting that interacting with a Chatbot fosters independent learning.

Reliability and Trust

7. From 1 to 5, being 1 the lowest value and 5 the highest how helpful the chatbot was for your assignment?   (0 point)

More Details

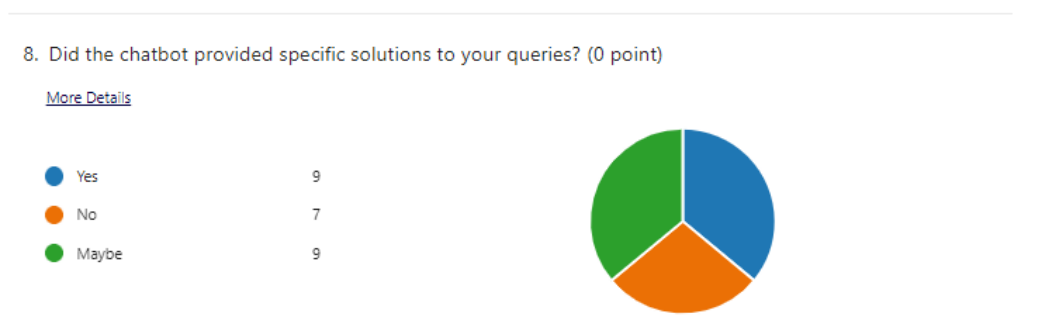**25**
Responses

2.76
Average Number
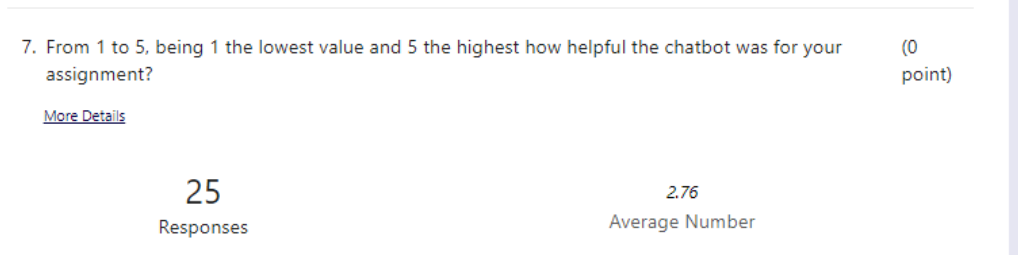
The students' responses were well-balanced, but their reliability for assignment support was unsatisfactory. The problem might be a lack of information and accessibility, as the Chatbot was only accessible on an internal network and could not be accessed from an external network, limiting its use.

8. Did the chatbot provided specific solutions to your queries? (0 point)

More Details

- Yes — 9
- No — 7
- Maybe — 9

Students are satisfied with the Chatbot's responses. This reinforces the result of question 7 that the Chabot's lack of helpfulness is not due to a lack of solutions, but to another factor, which could primarily be accessibility restrictions.

9. Would you think you'd use a chatbot for assignment help if you were offered it from the comfort of (0 your own home? point)

More Details

● Yes	12
● No	4
● Maybe	8

This outcome once again demonstrates the significance of accessibility. Accessibility has a crucial function in terms of reliability and trust. Students rely on and accept Chatbot's responses, but with caution.

10. Would you rely on a chatbot to assist you during the assignment? (0 point)

More Details

● Yes	5
● No	6
● Maybe	8
● Depends	6

The results of question 10 indicate that students lack confidence in depending on a Chatbot for assistance. This topic was about assignment assistance; responses followed an open-ended question stating, *"If you selected the answer depends, give a brief explanation of what it depends on"*. In which students offered reasons for relying on a Chatbot. Output of keywords as displayed in the figure

help or assistance

well/ specific

d responses   responses and the ability

type of assignment **question**   **specific**   chat bot level of help

specific are the responses   responses are specific

solutions are good   complexity of the issues

12. From 1 to 5, being 1 the lowest value and 5 the highest value how much concered are you about Chatbot and privacy?   (0 point)

More Details   Insights

25   *2.60*

Responses   Average Number

Surprisingly, the output of question 12 reveals that students are not deeply knowledgeable about privacy regulations and even less so about social media privacy in general, not just when speaking with a Chatbot. This lack of awareness might also affect students' trust in Chatbot, if not aware of the provider's privacy requirements regarding the data during the chat.

General Opinion

13. Do you think that a chatbot can be a lecturer's assistant? (0 point)

More Details

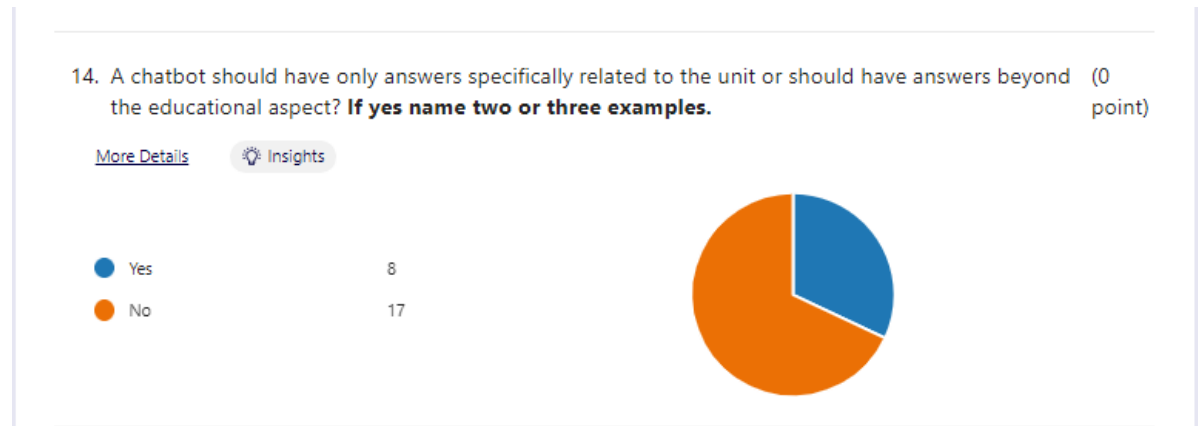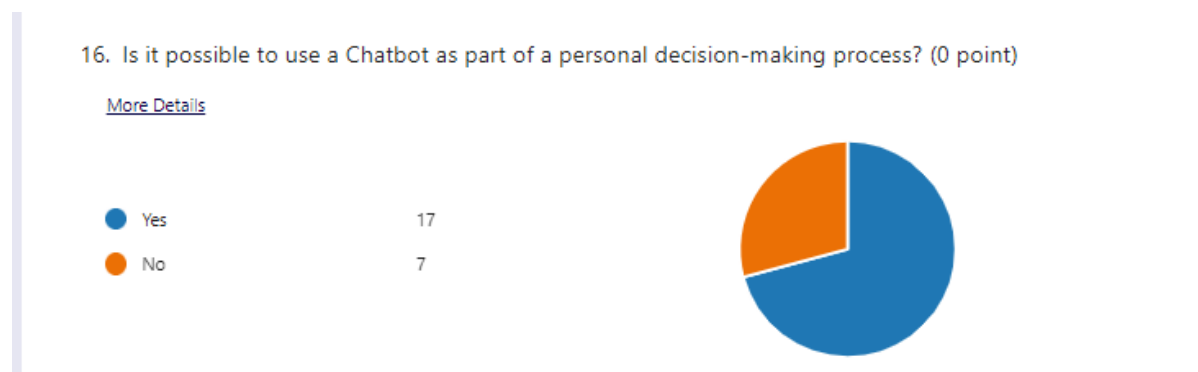|	
Yes	9
No	8
Maybe	8

In this instance, students accepted that a Chatbot could aid a professor during classes. This was noted throughout the delivery of the lesson when students requested support and the lecturer was unable to provide equal support to each student. During this time of assistance,

some students relaxed while others became frustrated. Some of the questions asked were repetitious and could have been easily addressed by a Chatbot, allowing the lecturer to dedicate more resources to more complex topics; the students noted this; yet there are still students who will exclusively rely on Face-to-Face support regardless of the situation.

14. A chatbot should have only answers specifically related to the unit or should have answers beyond the educational aspect? **If yes name two or three examples.** (0 point)

More Details   ☼ Insights

● Yes   8
● No   17

Most students felt that the Chabot should assist them with their assignments for a particular unit or with specific queries and answers that help them with their problems related to the project assignment. Students may believe that their privacy, particularly when they ask private inquiries is not protected. This might be due to a lack of information about privacy. This was demonstrated by question 12's output result. Eight respondents indicated that they would accept a Chatbot that provides support and general information in addition to answering inquiries regarding the unit.

16. Is it possible to use a Chatbot as part of a personal decision-making process? (0 point)

More Details

● Yes   17
● No   7

Question 16's response contradicts all other responses about privacy and the use of a Chatbot outside the scope of an assignment. The outcome demonstrates conclusively that students will embrace a decision-making Chatbot. The students were then instructed to provide a brief explanation as to why they would not accept the use of a Chatbot to assist them with decision making. The data demonstrate that the issue is still associated with privacy concerns. As student quoted *"Because these are personal things"*

18. Did you ever used a chatbot apart from the current one? **If yes when did you used a chatbot?** (0 point)

More Details

● Yes	7
● No	18

72 % of students responded that they had never used a Chatbot, while only 28% used Chatbots for help or assistance. This finding demonstrates that the use of a Chatbot must be specific, personalised, supporting, and assisting; otherwise, users will turn to other types of online support, like blogs, YouTube, online short courses, and social media.

Chapter 5: Conclusion and Recommendations

Educational Chatbots are a great method to change how tutors, teachers, and lecturers communicate with students today. Indeed, it is now even easier for students to learn more about their options and what they can do. The increased use of technology in daily life is altering how students learn and absorb information. Services for mobile application development and Artificial intelligence enables lecturers to provide students with a tailored learning environment.

The study revealed that students are proficient with social media and instant messaging services. They utilise these platforms to communicate with others, conduct research, and obtain the greatest assistance with their tasks. With a Chatbot, it would be simple for students to locate information regarding assignments, due dates, and other remarkable events.

Teachers can simplify their repetitive activities using Chatbots. The bots can respond to queries designed by the instructor based on specific demands and objectives, such as online courses, assignments, and deadlines.

Additionally, Chatbots customise student experiences and adapt to the curriculum. The Chatbot may also be used to provide personalised feedback and conduct general monitoring.

Students have instantaneous access to everything because to technology. The world is at their fingertips, and their requirements are continually evolving. Therefore, educational institutions must maintain and accelerate their student communication processes to attract the attention of this generation.

Each year, many potential students visit the college website or administrative offices to enquire about the admissions process, course offerings, and course fees. Due to the repetitive nature of most queries, Chatbots can automate this time-consuming activity.

This study also highlighted the significance of general support. In today's education sector, it is not sufficient to provide students with a strong faculty, improved courses, and well-equipped labs. Education Chatbots can be extremely valuable in such situations. Chatbots that assist with the admissions process can also present students with all the key information about their courses, modules, and faculties.

The bots can also serve as campus guides and help students upon their arrival. They can inform library memberships, scholarship opportunities, and much more.

Regarding upcoming classes and assignments, Chatbots can play a significant role. The technology that can convey information can be a bot. Chatbots mostly function by seeking inputs from the lecturer and or the user to generate some form of output. Lessons and assignments frequently include dates, solutions, research guidelines, and a schedule.

Configuration and development may be performed on Chatbots. This would allow them to discuss dates, schedules, and other relevant information like lectures, assignments, and general college information.

Chatbots are now used in a variety of online applications, including shopping and as "personal assistants." Personalization and 24-hour instantaneous availability are two of the potential benefits of these Chatbots. Chatbots' advantages make them suitable for use in the educational sector.

The first phase of this research study conducted a systematic review on Chatbots. It presented two scenarios in which Chatbots could be used in educational settings, each with a preliminary application. A list of frequently asked questions Chatbots allowed educators to implement an interactive mechanism and respond to frequently asked student questions. This Chatbot should lighten an educator's load while also providing students with immediate and

personalized responses to questions. This Frequently Asked Questions Even if a Chatbot is not used, it has the potential to help with knowledge retention.

The second phase of this research study examined the Chatbot and analysed students' feedback. Revealing that the proposed Chatbot would facilitate the delivery of a lesson by prompting students' textual justifications of their responses. This form of this Chatbot enables the quick, personalised identification of misunderstandings and the redirection of users to the most pertinent resources. Opening a dialogue with a student gives for the possibility of error correction and student clarification requests leading students to research.

Chatbots are becoming increasingly popular across a variety of industries, including education. In the field of education, Chatbots present an opportunity to enhance students' access to relevant information. One advantage of utilizing Chatbots is that they can:

Allows for simultaneous access by many users,

Provide ease of use and optimal performance,

Can be connected with the existing databases and legacy systems at the educational institutions.

Students require information on a variety of topics, not only from their teachers but also from the college itself. Because the college host such a diverse range of extracurricular activities, the content of this material might or might not be related to academics. Although conventional approaches have been successful in the past that does not mean that, they are as efficient as they once were. Methods that are based on modern technology allow information to be accessed quickly and completely. This makes it easier to make better decisions and take better actions. Chatbots that are being designed and built with designs and architectures that

are based on datasets, protocols, and regulations, provide students with access to the information they require since Chatbots are lightning-fast, and many users can access and use them concurrently. Access to information in a timely manner is essential for students. When it comes to looking for information, Chatbots that are based on applications or on the web can be quite helpful. Students can obtain relevant academic as well as non-academic material through Chatbots that have been built by the institutions.

Today's students do not want to wait days or months to receive feedback. It is completely needless to delay their feedback on a project they are working on. By the time they receive suggestions for enhancements, they will have forgotten what they created. There are too many projects to work on and not enough time to dedicate to them.

Consequently, on-call or what we refer to as "active learning" must become an intrinsic component of student education. Assessments in a course must be friendly and conversational so that no student must stress or worry about the outcome.

The Chatbot presented in this study is not intended to be a stand-alone resource.

Rather, it should be used as a support mechanism to deal with large student populations and individualisation. Chatbot operations will still necessitate supervision, support, and upkeep.

By the year 2026, it is anticipated that the market for e-learning will have expanded at a compound annual growth rate of 9.1%.

(Research.com, 2020)

People are increasingly interested in taking corporate training and courses that can be completed at a distance so that they do not have to take time away from their jobs or families to advance their careers.

This expansion necessitates the need for educational institutions to develop robust student support strategies. The questions that students have before they enrol, while they are taking the course, and after they have completed the course need to be prioritized and answered immediately.

The use of educational Chatbots can be of considerable assistance in the provision of first-rate student support and the prompt delivery of answers to questions raised by students.

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Appendices

Chatbot sample questions

What are SVG primitive Shapes	These are the shapes that you can create in Aframe such as Sphere, Cube and Cylinder
Which Attributes can we list	Attributes such as animation, color and other elements that you can make changes and effects related to your project
Do we have to list three or add more details	You have to list three attributes and explain how they will be used in your project
What are different lights	Lights such as spot light or omni light
What are texture properties	Texture properties example how to set the pattern size the texture map and how to create texture maps
Is there an amount of words to write	No but make sure that your explanation makes sense and related to you project
What do you mean by JavaScript Libraries	Aframe is a JavaScript Library and Aframe registry these are also a list of libraries
What do you mean by events	Interactive events like mouseenter and similar Aframe JS syntax
What interactive elements can we mention	Such as cursor and other interactive elements that are related to interaction. If you are using specific controls descibe them
How much time do we have to finish this assignment	You have 2hrs to complete this assignment
How many marks does this assignment have	This assignment has 5 marks divided as follows: question 1 -1Mark - Question 2 - 1Mark - Question 3- 3Marks
If I mention that I will be using cursor is that correct	No you need to mention how you will apply the cursor and where the interaction will happen
What should I explain about the library	You can explain what elements you will be using or any Aframe registries you will be adding
Do we need to answer the top four questions	No those are only for the introduction of your assignment
Can we use internet for this assignment	No you can only use your own notes
Where shall I write my assignment	Open a new word Doc once you have completed your assignment save it and name it with you name and surname
Once I have completed my assignment where do I submitted	Once your assignment is completed you can find a link with you classroom and upload your assignment on vle.mcast.edu.mt

Reviewed Articles

Include / Exclude	Ttile/Reference	Reason
Excluded	Bot-teachers in hybrid massive open online courses (MOOCs): A post-humanist experience. Aras Bozkurt Anadolu University, Turkey Whitney Kilgore University of North Texas, USA Matt Crosslin University of Texas, Arlington, USA	The article doesn't discuss the relevancy of this reseach. This research discusses Chbots and the importance of integration with MOOCS to achieve a hybarid method.
Excluded	A Review on Chatbot Design and Implementation Techniques Ramakrishna Kumar1, Maha Mahmoud Ali2	This research study discuss the use of Chatbots business wise. Education is just mentioned as an example for business. Results have no relevancy for this research study.
Included	Artificially Intelligently (AI) Tutors in the Classroom. Sambhav Gupta San Jose State University sambhav.gupta@sjsu.edu Krithika Jagannath UC Irvine kjaganna@uci.edu Nitin Aggarwal San Jose State University nitin.aggarwal@sjsu.edu Ramamurti Sridar San Jose State University ramamurti.sridar@sjsu.edu Shawn Wilde San Jose State University shawn.wilde@sjsu.edu Yu Chen San Jose State University yu.chen@sjsu.edu	This study is related to AI in education and presents a report of the students' feedback with regards to the use of chatbots in education.
Included	Chatbots in Education Guillem Garcia Brustenga @txerdiakov Marc Fuertes-Alpiste @marc_fa Núria Molas-Castells @Nuria_M_C	This research study relates to chatbots in education and provides information and data with regards the implmentation of chatbots in education including considerations which directly involves students taking into consideration a proper design inclusing ethics.
Excluded	Bringing Chatbots into Education: Towards Natural Language Negotiation of Open Learner Models. Alice Kerly1, Phil Hall2 and Susan Bull1	The research study is more technical oriented and focuses on the negotiation aspect for open learning rather on the pedagogical effect specified on students teachers design.
Included	Chatbots for learning: A review of educational chatbots for the Facebook Messenger. Pavel Smutny, Petra Schreiberova	The research study focuses on the effectivness of Chatbots in education via FB messenger. The results of this reseach can help to identifiy a Chatbot model for refrence chabot development for education.
Excluded	CHATBOT APPLICATIONS INTEGRATED WITH SOCIAL MEDIA FOR CUSTOMER SERVICES: ALDY WIDJAYA	This article even though has few related information with regards Chatnbots and education lacks of details in this area.
Excluded	How effective are chatbots as language learning tools for use by younger students?	This research study is not relevant due to the fact that it doesn't contain specific information such as effectivness, design and perceptions.
Excluded	Freudbot: An Investigation of Chatbot Technology in Distance Education	This paper focuses on distance Psychology exercises using chatbots which make the relevnacy of this study low.
Included	Evaluation of Developing Educational Chatbots Based on the Seven Principles for Good Teaching	This report provides pedagogical foundations to design an effective chatbot which relates to the current research in the design reseach of an effective chatbot.
Included	In the Shades of the Uncanny Valley: An Experimental Study of Human–Chatbot Interaction	This study provides evidence for a good chatbot design based on effectivness and students' perceptions taking into consideration the uncanny element