**Senior Research CSC 450**

**Intelligent Tutoring Systems:**

**The Perception of ChatGPT in Learning Basic Python Coding**

Git Hub Link:

**<https://mikelarbi4u1.github.io/Michaels-ITSs-Project.com/>**

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**The Perception of Student on ChatGPT in learning basic Python Coding**

**Abstract:**

This study examines the effectiveness of ChatGPT in computer science education by exploring the perception of students in helping them learn basic python coding. To examine its characteristics, a comparison was made with w3schools. A survey was conducted on the prior knowledge of python, experience and preference between ChatGPT and w3schools with ten (10) students in spring 2023 computer science senior research class at Eastern Connecticut State University. We collected and analyzed using SurveyMonkey.

We found that there was equal preference between ChatGPT (40%) and w3schools (40%). Ten percent (10%) more of the participants indicated that they learnt more with w3schools (20%) than ChatGPT (10%). Thirty percent (30%) of the participants declared that they were very experienced, and seventy percent (70%) said they were intermediate with ChatGPT as with Thirty percent (30%) and sixty percent (60%) for very and intermediate experienced with w3schools. Although there was equal preference between the two (ChatGPT and w3schools), We concluded that ChatGPT was more informative, and most participants were more experienced with it than w3schools. Overall ChatGPT is a great tool to enhance computer science education with further advancement in its model.

**Keywords:** ChatGPT, w3shools, Python, Education, Students, Intelligent Tutoring System (ITS)

**Introduction**

*Intelligent Tutoring Systems (ITS)* is an aspect of *Artificial Intelligence (AI)* in education. It is a computerized tutoring system or program that provides student-specific instructions based on their personal learning needs and progress. It is a field of computerscience and engineering that aims to create intelligent machines that mimic the role of a human tutor, providing feedback, guidance, and support to help improve students’ success. The radix of ITSs can be trailed back from the 1960s through the ‘70s with some of its earliest inventions being “Seymour Papert’s Logo”, with further development of the “ACT” systems and Intelligent Computer-Assisted Leaning (ICAI) in the 1970s and ’80s, now known as ITSs, helped diagnose student errors, provide progress feedback as well as teaching math.

ITSs have substantially evolved from primitive computer-assisted instruction to modern-day ITSs characterized by significant advances in their user interfaces, e-learning systems, and learner adaptive systems[1]. Some research studies claim that the integration of ITSs has the potential to revolutionize education (teaching and learning) by providing students with customized, engaging, and effective experiences [2]. Coupled with its cost-effectiveness and flexibility. “Most schools are beginning to shift from conventional methods of teaching to smart education to enhance students’ learning experiences” [3].

However, ITS systems continue to attract interest for their growth, research, benefits, and applications”[4], as AI is gradually becoming an important tool for solving difficult problems with the development of computers[5] [6].

ChatGPT for instance has become ITS “The star of the show” in this modern era, when it comes to Artificial Intelligence in education (AIED), especially the aspect of Intelligent Tutoring Systems in computer science education where it can be used in multi-engineered ways.

ChatGPT is a large language model or a chatbot system developed by Open AI and was released in November 2022, based on GPT -3.5 and GPT -4 architecture model, trained to understand and generate human-like text, as well as to perform a wide range of natural language processing tasks, like answers to user questions and provide responses that are relevant and coherent to a specific topic. In computer science ChatGPT is a very useful toolkit for developers in areas like debugging [7], and performs diverse programming-related task such as code completion, text-to-code and image generation, code optimization and snippet prediction, refactoring, document generation and solutions to technical queries etc. which make learning programming languages facile and less challenging to newbies and even some experienced developers[8].

Similarly, W3schools.com (an educational website launched in 1998), provides the “teach yourself tutorials”, references on topics and “when as needed” platform for learning programming in its simplicity. This website has embedded technology to help you run sample code to better help you understand each syntax, programming subject topic and sub-topics and delivers real-time feedback.

Over the past few years, Intelligent Tutoring Systems (ITSs) have gained a great deal of attention in the field of education. It has been shown in numerous studies that intelligent tutoring systems can greatly enhance students' learning outcomes, especially in difficult and time-consuming subjects[9]. In retrospect, ITSs have been used as a teaching assistant and platforms for providing individualized and adaptive learning to students since its inception.

The significance of this intelligent tutoring system lies in its capacity to improve students’ learning outcomes and quality of education. Technologies such as auto test generation, learners assessment, auto grading among others, helps minimize instructors workload to a great extent. [10] They have the potential to transform teaching and learning practices by providing real-time feedback and facilitating decision-making using artificial intelligence and machine learning algorithms [11]. Despite its phenomenal rate of significance, Literature reviews from other studies reveal doubts, questions, and concerns surrounding the possibilities of ITSs, which proposes the need for further research into the perception, experiences and potential of ITSs in education. However, to further demonstrate the diverse application of ITSs, this paper aims to compare the learning experience of senior computer science students in using w3schools and ChatGPT to learn python programming at Eastern Connecticut State University. The data from this research will help examine and analyze the potential of w3schools.com and ChatGPT in computer science education. And will allow user to evaluate and better understand their effectiveness to help them make a choice of preference among the two. Also, it will be the beginning of a research program to establish research in broader perspectives of exploring the challenges, potentials and deeper dive into other areas of ITS.

**Methodology:**

A survey was conducted on senior students in a computer science class at Eastern Connecticut State University. Survey Questionnaires were uploaded online through SurveyMonkey for senior computer science participating students in CSC450, spring 2023 semester, to complete survey questions online based on their experience with both ITSs in learning python programming language by answering multiple choice questions, inquiring about their experience, and choice of platform (between ChatGPT and w3schools). Data collected was analyzed using SurveyMonkey. To help provide detailed data analysis and insights on the data collected, a bar chart, pie chart, tables and figures.



Sample questions that students were asked includes the following:

1. How much experience do you have with Python? (Bar graph)
   1. Which one provided more information?
   2. Overall, preference for learning? (Bar graph for overall preference vs experience)

**Results**

The response of the experience and choice of preference between ChatGPT and w3schools.com from senior computer science student at Eastern Connecticut State University 2023 spring semester, class of 22 students was collected and analyzed on April 23rd, 2023. We found out that there were seventeen 17 students in the class at the time of the survey but only ten (10) students participated in the survey.

Graphical user interface, application

Description automatically generated

**Figure 1. The knowledge levels of student on Python, prior to the study.** The Graph shows the responses collected from computer science students based on their prior knowledge on Python before learning it with ChatGPT and w3schools.

Table

Description automatically generated

**Figure 2. Students experience level with w3schools prior to the survey.** The Graph shows the responses collected from computer science students based on their learning experiences with w3schools prior to the survey. (See **Discussion** for details).

Graphical user interface, application, table

Description automatically generated

**Figure 3. Students experience level with ChatGPT prior to the survey.** The Graph shows the responses collected from computer science students based on their learning experiences with ChatGPT prior to the survey. (See **Discussion** for details).

Chart, waterfall chart

Description automatically generated

**Figure 4. Summary of perceived information provided from using chatgpt and w3schools.com.** The Graph shows the responses collected from computer science students based on their learning experiences between ChatGPT and w3schools.

Chart, table

Description automatically generated with medium confidence

**Figure 5. Summary of student learning perception from using chatgpt and w3schools.com.** The Graph shows the responses collected from computer science students based on their learning experiences between ChatGPT and w3schools.

Chart

Description automatically generated with medium confidence

**Figure 6. Student preference between ChatGPT and w3schools.** Thestudent’s preference between ChatGPT and w3schools in learning basic Python coding.



**Discussion:**

In the survey we asked two similar questions with the same multiple-choice answers but there were discrepancies in the responses. we discovered that in **Fig. 4,** no one said w3schools was more informative as opposed to 30% who said ChatGPT was more informative.

However, when a similar question was asked about which one helped the student learn better in **Fig. 5**, w3schools had a 10% greater preference than ChatGPT which was very fascinating. From data between **Fig. 1** and **Fig. 2,** I hypothesized that participants who said they were less experienced with w3school might be the same with less prior knowledge in python, but that was not certainly true. Rather, analysis report from the SurveyMonkey[12] disclosed that those participants who chose less experience with w3schools in **Fig. 2** were intermediate with prior knowledge in python in **Fig. 1** and the vice-versa.

This poses the question as to why is that so? Could it be that participants were using w3schools to programming languages other than python? It even got more intriguing to discover that despite all the abnormalities between the responses, 40% of the participants in **Fig. 6 e**qually preferred ChatGPT to w3schools, which sums up to 80% for both, but 20% said they preferred none (neither w3schools nor ChatGPT), so again the question is, what else did the rest twenty percent (20%) of the participants prefer? what factors affected their choice of preference ? could it the wording questions, their understanding of questions and answer choices? Their mood (emotions at the time of the survey). These are questions that need further investigation that time constraints didn’t allow (limitation). Which creates an objective and possibilities for future work, including conducting other surveys on ChatGPT versus w3schools or ChatGPT with other platforms in learning other programming languages, including random participants from other majors (faculties) or various professional levels as results may vary.

Future work possibilities (objectives) and other factors that could have affected my results include:

* Sampling size (surveying large number of people could have changed the results)
* How we prepared, structured the survey and how we had made participants take survey.
* How would my data be different if I distributed the survey in a different format.
* The way I asked the question and participants understanding of the question could be a factor that could have skewed the results of my data.
* Using platforms other than w3schools or other ITSs to benchmark the participants perception of ChatGPT.
* Including participants from other cultural and academic backgrounds, ethnicity, age etc.

Other research works conducted on ChatGPT includes a study done by S. Biswas on “Role of ChatGPT in Computer Programming” and proposed that ChatGPT is a powerful and resourceful tool to developers and users in providing accuracy and efficiency in programming-related tasks. [8]

N. M. S. Surameery and M. Y. Shakor, also researched on the “Use Chat GPT to Solve Programming Bugs,” concluded that ChatGPT is a great comprehensive debugging toolkit and that its capabilities combined with other debugging tools could be extremely effective and useful in solving programming bugs. [7]

Similarly, A. Shaji George did “A Review of ChatGPT AI’s Impact on Several Business Sectors” and proves it to be efficiency and effective in all business sectors including healthcare and education[13]

Lastly a study on “How ChatGPT Can Transform Autodidactic Experiences and Open Education” conducted by Dr. Mehmet Firat concluded that ChatGPT can enhance engagement among autodidactic students.[14]

In conclusion, even though the majority of the students equally preferred ChatGPT and w3schools (**Fig. 6** and **Fig. 5)** taking into account the outliers, most of the participants were experienced with ChatGPT. Data from **Fig. 3**. The overall perception of participants who prefer ChatGPT is that it is informative in learning python coding and has a great potential to enhance code learning through intelligent tutoring by providing code detailed explanation, debugging assistance and as well as by providing students with customized, engaging and effective experiences in learning programming languages in computer science.

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