

# ClawAI: A Software Tool Teaching Text Classification and AI Systems to Middle School Students

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**Abstract** - Machine learning (ML) is a transformative technology shaping the modern world, yet its concepts remain inaccessible to many, especially to middle school students. To address this gap, we created an educational game, ClawAI, that introduces AI text classification through interactive play. ClawAI was built using python and connecting our game to the Machine Learning for Kids platform using a Watson API Key. The game engages children in describing objects for an AI claw machine to identify. Students learn key concepts like confidence levels and text classification across three rounds of gameplay. Tested with 43 students aged 7–14, the game demonstrated its effectiveness in teaching AI concepts, with 34 participants showing understanding of text classification through gameplay. This suggests our game successfully bridges the gap between AI education and engagement, offering a scalable model for teaching machine learning in K–12 settings. We had two groups of students, one group that were visuals, and the other group were conceptual students. These two strategies emerged from successful and unsuccessful students. In our findings we found two distinctive groups being formed based on the way they played and the words they used to classify these items. Overall half of the students played the game well and proved how they understood how text classification works with AI, while the other half did not. Out of the half that did well, two-thirds of them showcased a learning experience. Our results demonstrate that our game and games alike can be utilized as a learning tool when students are taught about AI in K-12 education.

*Index Terms* - AI literacy, Artificial Intelligence, Big Ideas in AI, Machine Learning

## 1 INTRODUCTION

AI is becoming increasingly integrated in user-facing technology more than ever in our modern technological society [1]. While AI is becoming more prevalent in our everyday society from medical use, business and entrepreneurial services, and even in our education systems, it has often been seen as a bad actor by those who do not understand how it works. Educators and scientists alike want to bridge the knowledge gap between AI and machine learning for K-12 students. AI in the future will transform

the way many students communicate, work, and live with each other and with machines [1]. Especially for students who are going to have the most interactions with via K-12 curriculum. Researchers want to teach students interactive and creative ways to learn AI concepts. Students should learn AI because it will teach them about machine learning and reinforcement learning, text classification and other aspects of AI that will impact their everyday lives. Education systems now need to train students at the K-12 level to live in a society where they must interact with AI. Therefore, AI literacy is a pedagogical and cognitive challenge at the K-12 level [2].

Here, we developed an approach to bridge the gap by designing a software tool that teaches children AI. Specifically, how AI recognizes text through a game called ClawAI. ClawAI is an interactive tool where users try to score items from a virtual claw machine by describing the item to the AI via a textbox. Students see how the text that typed directly impacts whether the AI recognizes the text or does not recognize the text.

## 2 BACKGROUND

Children need digital literacy skills to navigate the digital world, critically view, and reflect on the social and ethical implications of the design and architecture of AI Systems [3]. AI literacy is a set of competencies that enables individuals to critically evaluate AI technologies and leverage them for effective communication and collaboration [1].

There are a number of tools that laid the foundation between AI and K-12 education. For instance, ML- Quest is a 3d Role Player Game (RPF) that aims to introduce three ML concepts: Supervised learning, Gradient Descent and KNN classification to K-12 students without prior knowledge [4]. Further bridging the gap between AI literacy and competency ChemAIstry is an interactive software tool for children which demonstrates training and classification in machine learning [5]. Carney et al. created a web-based GUI tool for creating custom machine-learning classification models without specialized technical expertise [4]. Park, Youngki, and Youhyun Shin proposed a novel Scratch extension named Tooe that allows Scratch to communicate

with text-based programming languages [7]. These tools are effective in teaching K-12 machine learning.

These AI tools that assisted students learning inspired the development of ClawAI, a game-based approach for learning about AI text classification. Here the goal was to contribute to the exploration of AI literacy for K-12; middle schoolers education, by creating an interactive, engaging, fun, and competitive game that teaches children about AI and text classification. ClawAI tool helps students learn while also engaging them so that they have fun learning about AI and machine learning. As researchers we wanted to create a game that not only teaches kids AI literacy but also helps them to learn in a game-like environment.

The objective for ClawAI was to contribute to the exploration of AI literacy for K-12; middle schoolers education, by creating an interactive, engaging, fun, and competitive game that teaches children about AI and text classification. ClawAI tool helps students learn about one of the Big Ideas in AI, namely natural interaction. ClawAI engaged students in a game-based learning environment so that they can have fun learning about AI and machine learning. As researchers we wanted to create a game that not only teaches children AI literacy but also helps them to learn in a competitive environment.

### 3 TOOL DESIGN

ClawAI is a software game made to engage students with an AI system and specifically to have them consider how AI recognizes text. ClawAI was developed in the context of a semester-long course, “Developing AI Tools for K-12” at the University of Texas at San Antonio. To use ClawAI, students have to type descriptions of objects represented in an image of a claw crane machine. They must achieve 80% or better match quality for their description to be accepted. ClawAI also includes timed rounds, making it a fun, competitive game to play.

#### 3.1 USER EXPERIENCE

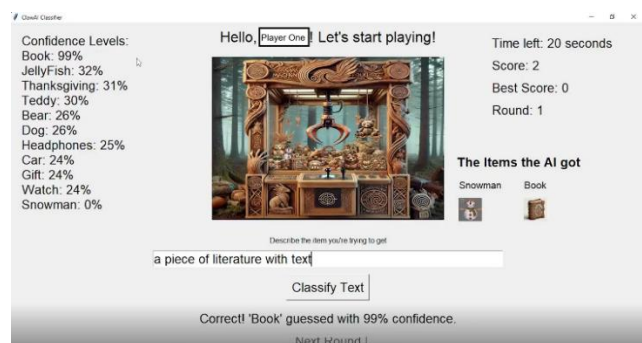
The first screen of our page is the username page where the user will type in their personal information before they start. This information is collected for research purposes as is described later. The second screen allows the user to choose their claw machine. There are four different themes/claw machines: Arcade, Folklore, Fairytale, and Goth. We created four designs to increase student engagement and to give them different choices and increase play value. Once the user chooses their claw machine, they are taken to the instructions page and then finally to the game itself.

The goal of the game is guessing the items in the claw machine. The user must describe the item so that ClawAI can get the item for them. The AI will only be able to get the item if the confidence level is at least 80%. Each time the AI guesses the item they are trying to describe, the user gets a point. Each game has three rounds, and the user can play the game as many times as they would like.

On the game page itself, at the very middle of the game, there is a picture of the selected claw machine with all the items inside, a textbox to classify the text, in game text of whether the AI’s confidence level is above 80% for any of the items, and whether or not the round or game is over. On the top right side of the screen is the round number, the timer, the user’s current score and their best score. On the bottom right half shows the objects the user guessed; it displays the picture of the object and the name. On the left-hand side, the screen shows the confidence levels for each item whenever a word is classified. See Figure 1 for an image of ClawAI’s main screen.

Below the textbox and the classify text button, there is in-game text that appears. During the game, the in-game text usually will tell the user about the text they tried to classify. It can tell them that the confidence levels for the items are less than 80% so they need to try again. It can tell them the AI got an item with a confidence level higher than 80%. It can also say things like if certain words are restricted, if time is up and that they need to go to the next round or if the game is over and their final score.

FIGURE 1  
MAIN GAME SCREEN



#### 3.2 IMPLEMENTATION/GAME DEVELOPMENT

We opted to use an existing online API to perform the text classification. We used Machine Learning 4 Kids (ML4Kids), an online platform where we can train machine learning models using text, images, and sounds, and then write a Scratch program with custom blocks based on embedded classification API. For ClawAI, we used the API only. Our project is focused on text classification, so we used their ML model to train our data set.

Our dataset was to train the following 11 items: Bear, Teddy, Snowman, Gift, Car, Thanksgiving, Dog, Headphones, Watch, Jellyfish, Book. We created this dataset to describe each word consisting of about 11-16 words and our dataset had over 170 words in total. Instead of using words to describe the object of how it looked like in the pictures provided, we decided to use words that were general descriptions words, characteristics words, or words that have a well-known relationship to that item. Table 1 shows the dataset in its entirety. Then we trained the ML model and tested it out. Whenever we typed in a word, it displayed the

closest item and its confidence score. After creating our ML model, we needed to be able to use it in our game. So, we created a Watson API key and used that to connect the ML model to our game. For our images, we used ChatGPT to generate them and then used Canva to assemble the images together [8]. We used Python to write our game, and we used libraries such as tkinter, PIL and ImageTK to build it. Our code is available at our GitHub repository [9]. In our code, we decided to use CSV files to collect the student's data when they were using our tools. We will explore more about this in the next section, Research Design.

TABLE I  
ML4KIDS DATASET

Items	Type of Text
Car	Metal, Brakes, Dashboard, Sports, Steering, Wheels, Headlights, Seats, Tires, Engine, Trunk, Luxury, Wipers, Windshield, Vehicle
Bear	Growls, Fear, Tails, Fluffy, Claws, Woods, Alive, Brown, Black, Huge, Big
Teddy	Cuddly, Comfort, Security, Love, Toy, Tail, Fluffy, Comfortable, Unreal, soft, big, small, black, brown, Inanimate, object
Snowman	Scarf, Snow, Coal, Winter, Buttons, Button-eyed, Cold, Frosty, Carrot, Hat, Sticks
Gift	Paper, Cards, Celebrations, Holidays, Ribbons, Presents, Bows, Kindness, appreciation, thankful, wrapping
Thanksgiving	Grateful, Empathy, Joy, Turkey, Sweet Potato Pie, Pumpkin Pie, Gratitude, Autumn, Family, Cranberries, Stuffing, Candles, Fruit, cornucopia, love
Dog	Warm, Teeth, fuzzy, whiskers, fluffy, soft, friend, furry, tail, playful, paws, happy
Headphones	Foldable, Wearable, sound, volume, buttons, oval padded, earphones, adjustable, wireless, wired, noise-cancelling
Watch	Ticker, Round, Digital, Stainless, buttons, gadget, mechanical, lightweight, analog, clock, time, monitor, memories
Jellyfish	Tentacles, ocean, sting, bioluminescent, glow, invertebrate, soft, translucent, slimy, wobbly, see-through
Book	Pages, title, words, author, coloring, audio, fiction, non-fiction, memoir, hardcover, paperback, illustrator, printed, story

#### 4 RESEARCH DESIGN

After creating our software tool, we next focused on figuring out how to collect our data, what type of data we are collecting, and made sure that we met IRB requirements, received parental consent and student consent before playing our game / participating in this research. We tested the tool over two days in an afterschool program set up at a STEM-oriented middle and high school in San Antonio, Texas. Middle school students (grades 6 to 8) were invited. As part of the class, a total of eight AI projects were presented to the students for two 2-hour sessions. A total of 102 students participated in the afterschool program and 43 students worked with our tool. We had five workstations set up for student use.

##### 4.1 DATA COLLECTION

For research purposes, we designed ClawAI to record specific interaction data during student use. While making our game, we kept a mental note that we would want to collect the following data from their interactions with our tool: student identification, timestamp, number of rounds played, words they classified, what time they classified that word, the confidence level for each item based on that word, whether or not the user received a point for that word, and their best score. In our code we made sure to create a new csv file and to record this information while the user played.

Along with our csv file, we worked on creating our pre survey and post survey questions to ask the students before and after they played our game. Our post survey questionnaire had five questions, and we used the last question in our data analysis (see section 5.4 for post survey analysis). While the students were playing, we recorded their screens and audio. Later, we looked back at these recordings for our data analysis.

The post survey question's data we used was the last question: "In your opinion, what factors or patterns do you think an AI uses to identify and interpret words from a dataset? Consider elements such as context, word associations, or the frequency of specific terms. Select all that apply." The correct answer was "Word Associations and Relationships."

##### 4.2 INTERACTIONS WITH THE STUDENTS

Most of the students enjoyed playing the game. They played the game with their friends and helped each other when they were stuck. There were some middle school students who were not as excited at first but by the end of the game were glad that they came to our station and enjoyed playing the game. Students were engaged and wanted to win. There were a handful of students that did not enjoy the game and seemed disinterested from start to finish for unknown reasons. There were students who would ask us what AI was doing and how AI and the game interacted. Some students worked individually and did not ask for help or collaborated with the other students.

Overall students liked the features, asked questions about when they were stuck or needed further clarification.

#### 5 DATA ANALYSIS AND RESULTS

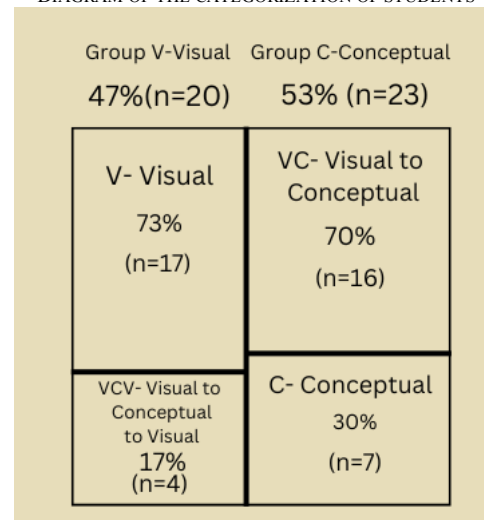
In total, we have studied the data from 43 students. We used these 43 students to understand how they interacted with the game. Some of the data we used included csv files, screenshare/audio recordings, and our post survey. Our csv files included data such as the time spent, the inputs students classified, and the number of points they scored. We used OBS studio to record the screens and the audio of the students when they were playing our game. Through this we were able to see and listen to how they interacted with our game. Finally, we utilized the post survey to determine if they learned what text classification is and to ask them follow up questions about their answers overall. With this

data we analyzed what inputs the students were classifying, was there a change in types of words/inputs they were providing. We analyzed how they interacted with the game system itself. Did the students get competitive as they were playing, did they interact with other peers or were they incurious? The students who were determined and competitive, did they score better or answered the post survey question correctly? What about the others? These are some of the questions we asked ourselves when analyzing our data. The section will look at the different results we found.

### 5.1 CATEGORIZATION OF STUDENTS

As we began to investigate the data of the students, we realized that two groups started to emerge: a Conceptual group ("Group C") and a Visual group ("Group V"). The Conceptual group consisted of students that used general (conceptual) descriptions or understandings of the object they were trying to get versus what they looked like in the picture. Students who used descriptions with adjectives, verbs, nouns, and / or characteristics were more likely to be in this group. Examples of this would "used to tell time" (describing a watch) or "ocean animal" (describing a jellyfish). The Visual group consisted of students who were prone to directly describe what they saw in the ClawAI image. Examples of this would be "White teddy with green bow" or "bear in the back right corner" (referring to the location of the item in the picture). Some students were conceptual from the very beginning, but some students started off visual, but as they were playing the game, they changed their strategy and ended up in the conceptual group. We created a table to see how many students fell into each subgroup and how their strategies moved them from one subgroup to another. "V" stands for Visual. These students used visual strategies throughout the entire game. "C" (Conceptual) are the students who used conceptual strategies throughout the entire game. The "VC" students first started off as visual and switched to Conceptual. The "VCV" students started with visual strategies, switched to conceptual, and then went right back to visual. (See Figure 2). About 53% of the students were in the conceptual group while 47% were in the visual group. Of those 53% of the students, 70% of them were VC learners while the remaining 30% were just in the subgroup "C". Of the 47% of the students in the visual group, 73% remained in the "V" subgroup, while 17% are in the "VCV" group, having started with the visual approach, trying the conceptual, but then returning to the visual.

FIGURE II  
DIAGRAM OF THE CATEGORIZATION OF STUDENTS



### 5.2 VISUAL TO CONCEPTUAL STUDENT GAME INTERACTION

The following is a transcript of how a VC student interacted with the game. This is a transcript of a student who started off visual but slowly ends up in the conceptual group:

Student Types: the pumpkin

ClawAI says: Confidence is 75%. Try again.

Student Types: the pumpkin with a face

ClawAI says: Confidence is 62%. Try again

Student says: "uhhhh I don't get this"

ClawAI says: End of Round 1. Click Next Round...

The researcher says: "For the confidence levels, these are just the items (inaudible)... and try to describe the items here in as little words as possible"

Student says: "Oh Okay"

Student types: pet

ClawAI says: Confidence is 72%. Try again.

Student says: "Oh so it's that" (points to the left column with all the confidence levels for each item)

Student types: thursday

ClawAI says: Confidence is 36%. Try Again. End of Round 2. Click Next Round..

Note: student starts to switch from Visual to Conceptual

Student types: Time



ClawAI says: Correct! Watch guessed with 100% confidence.

Student types: Time

ClawAI says: 'Watch' has already been guessed with high confidence. Try another

The researcher says: "Oh you got one that's good"

Student says: "Oh yeah, time! I could do automobile, would that count as that?" (points to car)

The researcher says: "you can describe.. or whatever comes to mind"

ClawAI says: Game over you completed 3 rounds. Final score: 1. Restart game button

Student types: reading

ClawAI says: Correct! Guessed Book with 81% confidence

Student says: "How many words can I type in"

The researcher says: "You do as many... I would suggest 3 to 4 words... but you can do a sentence..."

Student types: Reading from authors

ClawAI says: 'Book' has already been guessed with high confidence. Try another

Note: student gets a better confidence level of 98% for book!!

ClawAI says: End of Round 1. Click Next Round...

Student says: "Thursday Feast" (says as typing it in)

Student types: Thursday Feast

ClawAI says: Confidence is 69%. Try again.

Student types: Thursday family feast

ClawAI says: Correct! Guessed Thanksgiving with 96% confidence. End of Round 2. Click Next Round...

Student types: Ocean Animal

ClawAI says: Correct! Guessed Jellyfish with 89% confidence

The researcher says: "Okay you got it! you got one!"

Student says: "Yea I got it"

### 5.3 CONCEPTUAL STUDENT GAME INTERACTION

Here, we present a student in the conceptual subgroup. This student decided to list out all possible descriptions of each item on a sheet of paper and test them out. He looked at what type of words or sentences triggered the AI and helped

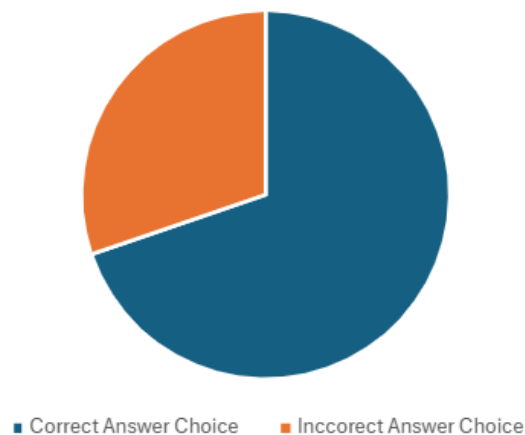
him score. Here are some of the phrases he had written down and tested out.

The student typed "A figure made of snow" and got the item Snowman. Then the student typed "a piece of literature with text," and got the item book. Then the student typed "a sea creature with numerous legs" and got jellyfish. The student kept typing in descriptions of item such as, "A toy version of a bear." For the final round the student tried to guess the item watch by stating, "a wrist accessory that displays time," and only got 70% confidence levels. On this student's first attempt for game 1, he got 3 points. Then this learner did something surprising. The student asked to play again and said, "Do you have a piece of paper and a pen?" We gave the student a sheet of paper with a pen. The student wanted to "optimize the time" in the second attempt and got 5 points and 5 items. These sentences worked:

A figure made of snow, a piece of literature with text, a four-legged creature that is large, a sea creature with numerous legs, a toy version of a bear.

FIGURE II  
POST SURVEY QUESTION RESULTS

### Post Survey Question Results



### 5.4 POST-SURVEY QUESTION

The post survey question's data we used was the last question: "In your opinion, what factors or patterns do you think an AI uses to identify and interpret words from a dataset? Consider elements such as context, word associations, or the frequency of specific terms. Select all that apply."

- Word Associations and Relationships
- Length of Words
- Syntax and Grammar

The correct answer would be to choose "Word Associations and Relationships. By choosing this answer the students showed understanding not only if they beat the game but

also how AI text classification works. Based on the pie chart (See Figure 3), about two thirds of students selected the correct answer and in our data, we saw about half of them were in the conceptual group.

## 6 DISCUSSION

By looking at the average times for each group, we saw that the more time students spent on our game, the more they switched from the Visual Group to the Conceptual. The students that spent less time were less likely to switch from visual to abstract. The more time students spent playing games they were more likely to figure out that our dataset is abstract and not based on the images in the game.

When analyzing the two separate groups, we saw two different strategies emerge; the way these students approached the game set them apart and determined whether they succeeded in the game and if they understood how AI understands things based on the type of datasets we give.

The conceptual group were problem solvers, specifically the VC subgroup. In the Visual to Conceptual subgroup (VC) about 70% of students explored different methods through trial and error and found a method that works. (See specified figure). They started writing visual input such as 'white bear with green bowtie' or even just the word 'bear'. When these students realized that this approach was not working, they tried a new way. Some used movie references or brand names to describe things and when that did not work, they started to use more generalized definitions, characteristics, or purpose of the items. Examples of this would be "lives in the sea" (to identify jellyfish) or "thursday family feast" (to identify Thanksgiving). Students in this group were engaged; the timer seemed to make them competitive and determined to get an item, to get a certain number of points or to beat their friend's score. The mindset of these students was to win and in this process of trying to win, they began to understand how the AI works, how to trigger it, and directly or indirectly understood what kind of information was fed to this AI system. About 80% the students in this section answered the last post-survey question correctly, showcasing they understood text classification works with AI. (See Section 5.4 for post survey question).

Group 1 Conceptual had another subgroup: subgroup C which was for students who were just conceptual the entire time. These students' first input was generalized definitions, characteristics, or purpose of the items. When they got their first point, the students realized this method worked and didn't deviate from this path. Even though this was the case, the students still answered the post survey question correctly, exhibiting understanding of our games AI system. Out of 53% of students in group 1, about 30% of those students were in this subgroup.

About 47% of students were in the Visual group (Group 2) and of those students 73% were in the 'V' subgroup. (subgroup meaning that they used a visual approach during their entire interaction). Students were using the visual strategy where they would type in words such as "brown

cube" (to identify book), or "orange small". These students did not understand how to describe the object in general but instead focused on the physical characteristics of the avatars for each item. Group two slowly became disengaged as they were unable to approach the problem differently. They continued to type in similar or the same words repeatedly instead of trying something new. They slowly got discouraged and became disengaged from the game and no longer wanted to play. These students also were unable to explain how the AI system worked in our game and failed to correctly answer the last post survey question correctly. (See Section 5.4 for post survey question).

Out of 47%, the remaining 16% were in the subgroup 'VCV'. The students started off as visual and for the majority of the time but attempted different ways to identify the items. They would've ended up being in group 1 category 'VC' if they had persisted and continued to try new ways but these students also got discouraged and ended up going back to visual descriptions. Soon these students gave up too.

The students in the conceptual group were competitive and used their problem-solving skills to look for solutions to beat the game. They were thinking of different categories, different words, and looked for patterns in the answers they got right and the answers they got wrong to determine how to approach this game. The visual group were stuck in one mindset and were unable to deviate from their approach or try different strategies, and very quickly became discouraged and gave up.

## 7 LIMITATIONS

In our prior implementation, we observed several limitations and areas that required refinement. Pre- and post-survey questions were not as concise as they could have been, potentially leading to less accurate assessments of student understanding. During the game, we provided students with specific instructions on how to engage with the tasks, which may have restricted their independent exploration and problem-solving skills. Time constraints per round impacted student performance and engagement differently. While some students found the timed nature of the game engaging and competitive, others were discouraged, suggesting that a more flexible time allocation could have been beneficial. Additionally, the input text box lacked restrictions, allowing students to enter text of any length. This might have affected the uniformity of data collection and the ease of analysis. Limiting the input box to 50 characters could have streamlined the process and reduced potential issues. These challenges highlight the importance of iterative design and reflective practice in improving educational tools for middle school learners.

## 8 CONCLUSION

Overall, about 53% of students figured out how to win the game and proved that they understood how text classification works with our AI system and figured out the

opaque box. 70% of these students showcased critical thinking skills when approaching our game and had experienced a learning journey. By experimenting with different methods, they succeeded. These students proved that our game and similar games can be used as a learning tool when students are taught about AI in K-12 education.

There were still 47% of students who struggled during this game but out of this group, about 16% of students were almost able to solve the game and win. Unfortunately, they were easily discouraged, and they gave up hope too quickly.

## 9 FUTURE WORK

With the opportunity to continue to work on this again, we would first like to repeat this experiment again to confirm our results and confirm our findings.

Another possible future experiment would be to create the same game but add a subsystem that prompts or helps out the students. The goal of this experiment would be to see if this could help increase the number of students in the conceptual group than the visual group. We may even have a control group to test the improvement in learning by conducting a/b testing. Our control group would be the students playing our original game and the experimental group would be the students with the prompting system to guide them.

To enhance the effectiveness of our education tool, we can address the way we engage students by showing the inner workings of the dataset we used for the ClawAI. We would also show the students how to train their own datasets with ML4kids or create our own ML model. With these changes, students would have a more comprehensive understanding of AI text classification.

Additionally, we would adopt a more disciplined approach to guiding gameplay, limiting the amount of information shared to encourage independent exploration and problem-solving. This approach aligns with research, which emphasizes the importance of balancing learner autonomy with a structured framework [10]. When observing students' varied responses to the timed gameplay, adjustments could be made to extend the time per round, supporting students who require additional time while maintaining the competitive element for others. These changes aim to address diverse learning needs and foster greater engagement, reflecting principles of adaptive game design.

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## REFERENCES

- [1] Long, D., & Magerko, B. (2020, April). What is AI literacy? Competencies and design considerations. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (pp. 1-16).
- [2] Casal-Otero, L., Catala, A., & Fernández-Morante, C. et al. (2023). AI literacy in K-12: a systematic literature review. *International Journal of STEM Education*, 10(1), 29.
- [3] Iro Voulgari, Marvin Zammit, Elias Stouraitis, Antonios Liapis, and Georgios Yannakakis. 2021. Learn to Machine Learn: Designing a Game Based Approach for Teaching Machine Learning to Primary and Secondary Education Students. In *Proceedings of the 20th Annual ACM Interaction Design and Children Conference (IDC '21)*. Association for Computing Machinery, New York, NY, USA, 593–598.
- [4] Priya, S., Bhadra, S., Chimalakonda, S., & Venigalla, A. S. M. (2022). ML-Quest: a game for introducing machine learning concepts to K-12 students. *Interactive Learning Environments*, 32(1), 229–244.
- [5] Martin, F., Mahipal, V., & Jain, G. et al. (2024, March). ChemAIstry: A Novel Software Tool for Teaching Model Training in K-8 Education. In *Proceedings of the 55th ACM Technical Symposium on Computer Science Education V. 1* (pp. 792-798).
- [6] Carney, M., Webster, B., & Alvarado, I. et al. (2020, April). Teachable machine: Approachable Web-based tool for exploring machine learning classification. In *Extended abstracts of the 2020 CHI Conference on Human Factors in Computing Systems* (pp. 1-8).
- [7] Park, Y., & Shin, Y. (2021). Tooe: A novel scratch extension for K-12 big data and artificial intelligence education using text-based visual blocks. *IEEE Access*, 9, 149630-149646.
- [8] OpenAI. (2024). ChatGPT (December 2024 version). Retrieved December 12, 2024, from <https://chat.openai.com>
- [9] GitHub repository: <https://github.com/AishatK21/ClawAI>
- [10] Foster, A., & Shah, M. (2016). Towards balancing learner autonomy and pedagogical process in educational games. *ResearchGate*. Retrieved from [https://www.researchgate.net/publication/289857899\\_Towards\\_balancing\\_learner\\_autonomy\\_and\\_pedagogical\\_process\\_in\\_educational\\_games](https://www.researchgate.net/publication/289857899_Towards_balancing_learner_autonomy_and_pedagogical_process_in_educational_games)

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