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ORIGINAL ARTICLE

A participatory, qualitative analysis of the use of MagicSchool AI for course design

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This participatory study recounts conversational practices occurring between three teachers, a head of school, and a researcher during a month-long curriculum design workshop mediated by the MagicSchool AI technology to create social studies, language arts, science, and mathematics lessons for a virtual special education program. A social paradigm of AI-mediated educational practices is presented, wherein teachers interact with AI tools by embodying co-agency and a spirit of inquiry. Collective practices are interpreted using Gordon Pask's conversation theory framework, showcasing how to design systems of human-AI feedback loops devoted towards curriculum design. Meeting transcriptions, AI-prompt data, AI-mediated lesson plans, teacher feedback, and final products are shared using narrative inquiry to illustrate how collaborative co-agency culminated in lesson plans that co-observers felt confident in deploying.

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1. Introduction

Artificial intelligence has been around since James McCarthy coined the term at the 1956 Dartmouth Conference (Tilak et al., 2022). Since then, technologies have progressed from expert systems solving narrow problems to the deployment of versatile voice assistants like Siri, and more recently, generative artificial intelligence (GenAI) (Mishra et al., 2024). The high speed of entry GenAI has had into society makes it hard to separate truth from hype without evidence-based research. While initial verticals affected by AI included business and health, education has also seen pervasive AI use owing to its content creation and text summarization capacities. Since GenAI utilizes algorithms relying on relationships between words and components of visual media, human agency is necessary to avoid issues with cultural stereotypes, and with falsehoods present in AI-generated information.

 creative commons

Responses to GenAI have been mixed. Concerns raised include student academic integrity and accurately representing student skill (Alier et al., 2024). The opposite perspective calls to create educational scenarios teaching ethical, transformative uses of AI to teachers and students (Glassman et al., 2023). Both sides of the coin warrant careful analysis of human-AI systems in educational settings.

Specific GenAI tools have been designed for teacher use in planning educational experiences. MagicSchool AI is a widely used tool and has been regarded as aiding curriculum design, making learning relevant, and helping to draft emails/arrange meetings (Walkington & Bernacki, 2024). It also enables re-prompting to adapt output iteratively. While MagicSchool can be an expedient assistant for teachers, human agents need to work on output to ensure practical applicability.

To give effect to productive human-computer interaction that incorporates diverse perspectives in operating upon AI mediated products, this study understands how collaborative groups of teachers and researchers can iterate upon AI output, engaging in human-human and human-machine interactions within a dynamic, pervasive computational medium (Sharples, 2023). A proposal to employ such efforts not only meets the need for training teachers to use AI, but also understanding challenges and victories faced in implementing such tools to augment student learning (Ng et al., 2023).

Sharples outlines six roles GenAI can play in collaborative student-centered activities:

1. **Possibility Engine:** helps generate different ways of expressing ideas.
2. **Socratic Opponent:** acts as a simulated argumentative supporter/adversary.
3. **Collaboration Coach:** helps research information for humans to refine/compile.
4. **Co-designer:** assists in designing prototypes/drafts.
5. **Exploratorium:** provides tools to help visualize/interpret data.
6. **Storyteller:** creates stories incorporating specific events/perspectives.

Sharples' (2023) framework can be applied to learning processes teachers' undergo during collaborative curriculum design. Such a process turns GenAI into a possibility engine to explore alternate modes of delivering a lesson, and a co-designer, to draft lesson plan templates that teachers can adapt. Cybernetic principles from Gordon Pask's conversation theory can be used to design such activities. Cybernetics is a transdiscipline involving investigations of how living and artificial systems interact and change in their environments (Tilak, 2023).

Pask, an engineer and educational psychologist, created cybernetic approaches to design and analyze machine-dependent and independent collective action wherein the boundaries between the designer and the observed system were blurred. His work, which mirrors the

paired experiments in cultural-historical approaches to psychology (Tilak & Glassman, 2022) can expose cognitive and behavioral mechanisms of interacting with computers, and parameters to effectively design such systems (Wilson & Scott, 2017).

To Pask, concepts, software, and perceptions (intra- and interpersonal) housed within living minds constitute rule systems to be manipulated through collective action. A chatbot-human interaction can be delineated based on quality and conversational turns using Paskian analytic distinctions. In the context of the Internet, interactions with computers are often enmeshed within a larger social medium, where truth emerges and reifies itself through linguistic practices (Sharples, 2023; Glassman et al., 2023). A compass for collective teacher agency with AI is intuitive in a digitized world.

Pask suggests that sharp changes/consistent patterns in machine dependent and independent collective action can be measured using sharp and fuzzy methods (Westermann, 2018). Scientists can act as participants in observation (i.e., "*On digital platforms, I am variously a user or contributor or persona or, as they say, the product",* Silverman, 2023), relying on self-reflective partnerships avoiding clear boundaries between researchers and research participants.

This study operationalizes the ethos of second-order cybernetics, outlining processes followed by three special educators, a researcher, and a head of school to co-create basic templates for remote learning lesson plans in social studies, math, science, and language arts for 6th grade students, mediated by MagicSchool AI's lesson planner.

2. MagicSchool AI: An Overview of Affordances and Extant literature

MagicSchool AI's founder, Adeel Khan, an educator, invited colleagues with programming skills to provide feedback on a language model he created, which he felt could make teachers' jobs more efficient (Replit, 2023). The tool was launched publicly in May 2023, and today, has over 1 million teacher users. MagicSchool offers several tools to teachers and curriculum designers to develop content, interact with parents, and differentiate instruction (Carr, 2023). A chatbot, Raina, assists in performing operations.

The tool offers basic and premium subscriptions, with paid features including ability to prompt multiple times and refine output iteratively, unlimited generations, output history logs, and content exports to learning management systems (LMS) like Google Classroom (Sundet, 2024).

Figure 1, 2, and 3 display features provided by MagicSchool Plus, of which we use the Lesson Plan tool in Figure 1.

Figure 1

MagicSchool's features (Part I).

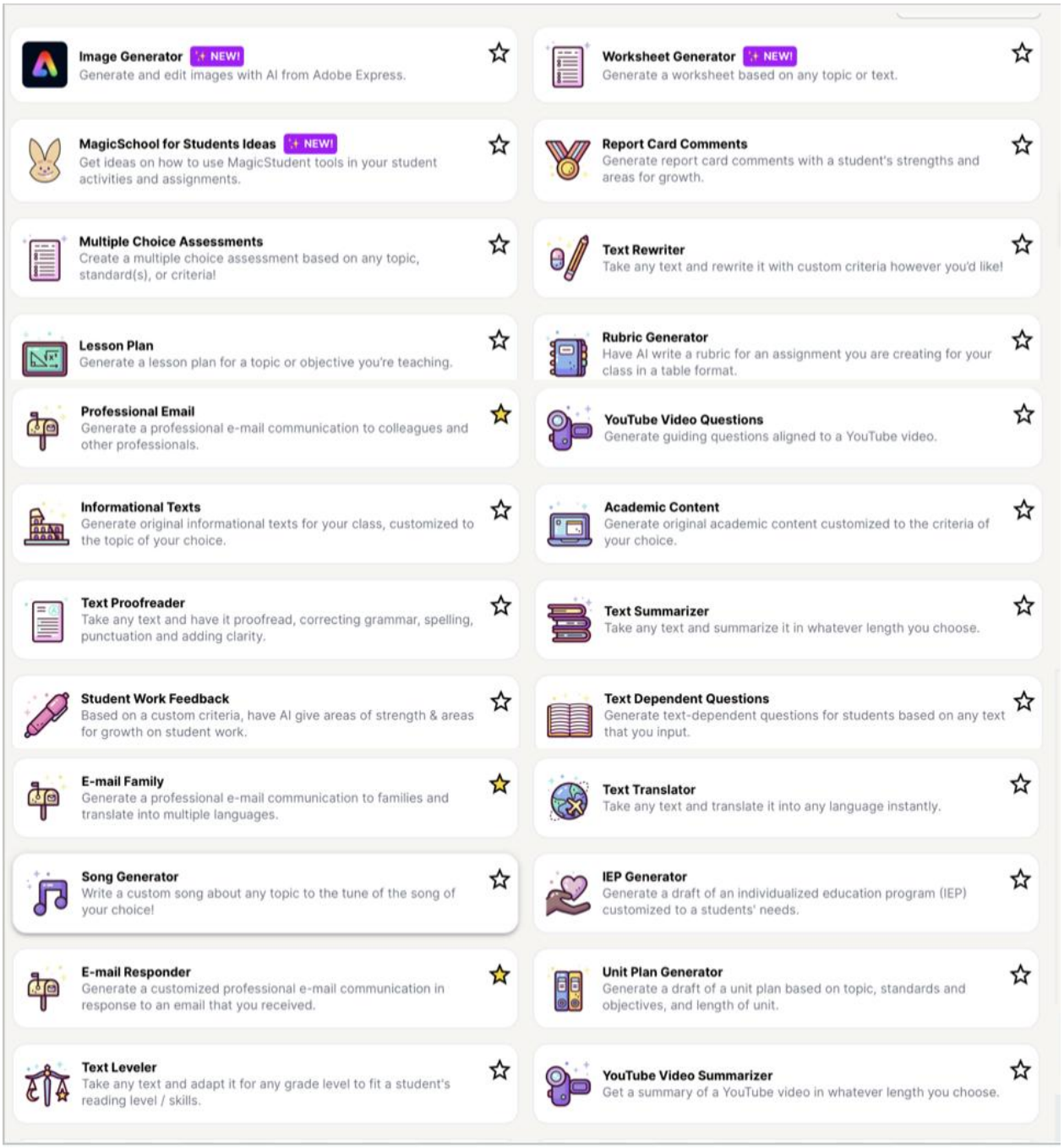


Figure 2

MagicSchool's features (Part II).

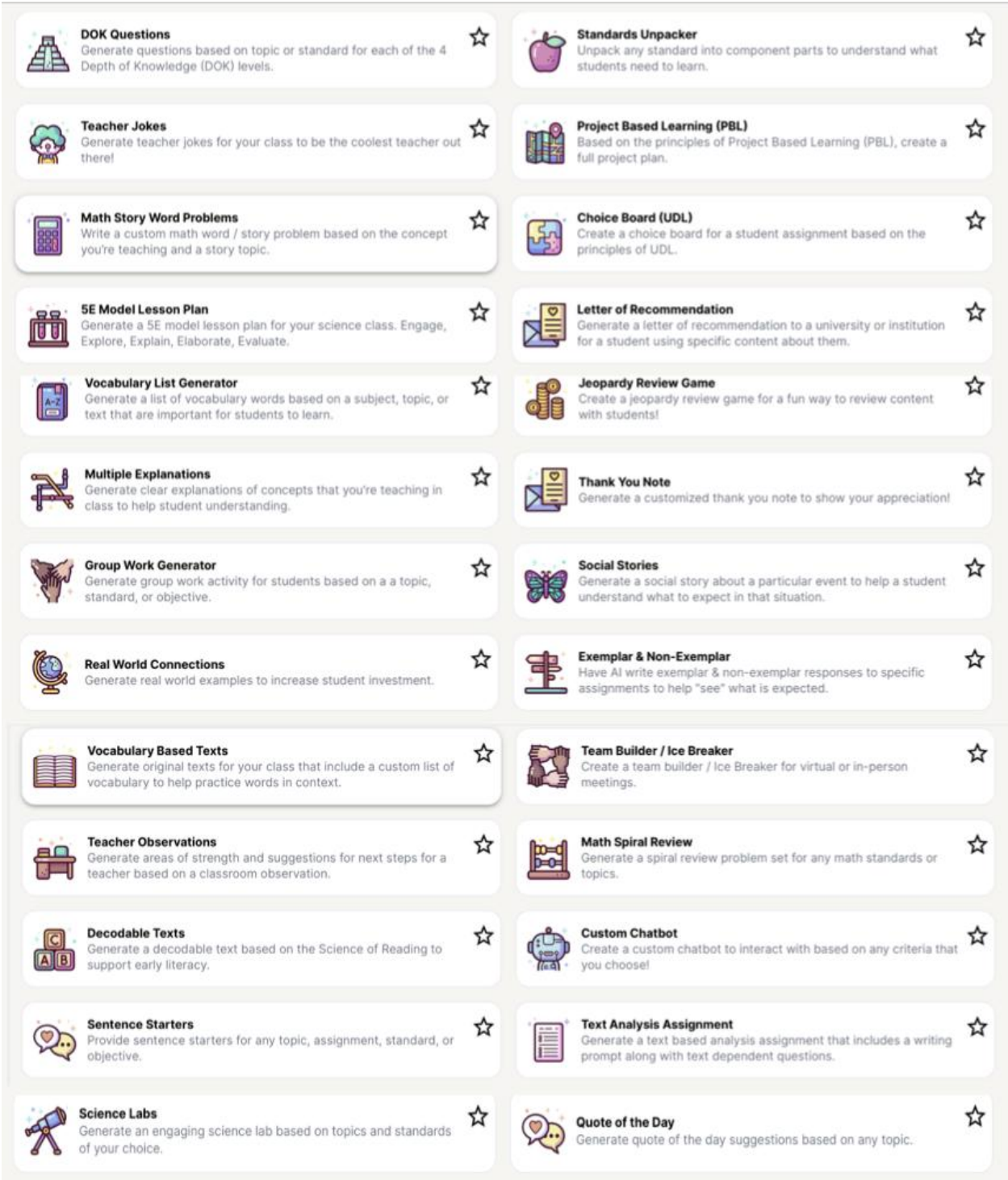
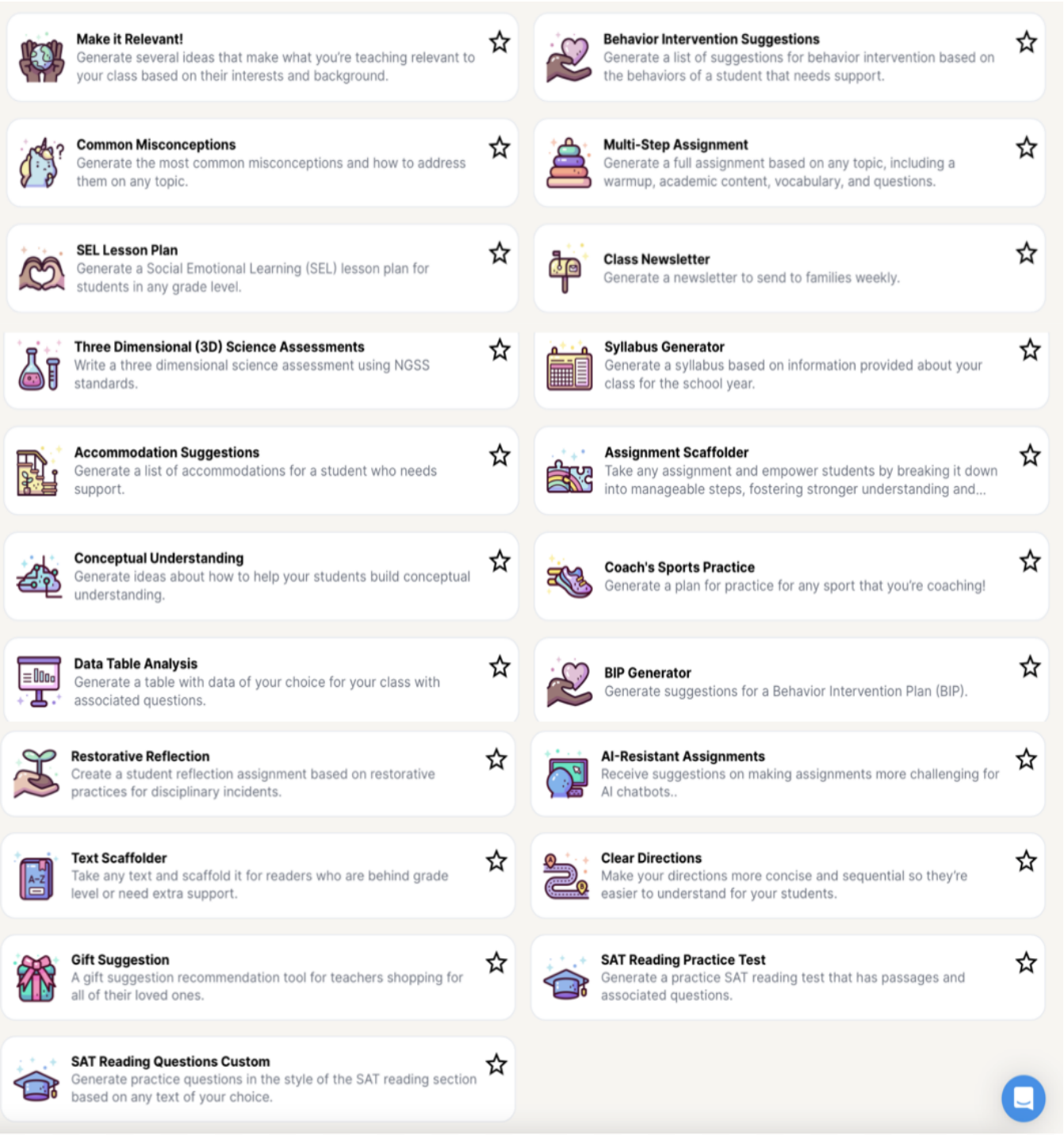


Figure 3

MagicSchool's features (Part III).



MagicSchool's creators have written case studies outlining benefits the tool has for teachers and students. However, these examples are not supported by rigorous qualitative and/or quantitative results. A case study conducted with a graduate student at Columbia University Teacher's College (Grado, 2023) only shares testimonials about its use to differentiate learning for a child part of the New School Design project. The researcher worked with a teacher to better understand how they utilized MagicSchool's Assignment Scaffolder, Math Story Word Problem and Restorative Reflection Generators to adapt instruction to serve a student with a learning difference. This example does not vet possibilities for MagicSchool's use through evidence-based research. Moreover, it assumes one-to-one teacher-AI interactions are sufficient to alter AI output, and implement instruction.

There is little extant scientific literature investigating the efficacy of using MagicSchool to create curriculum plans, and adapt them for specific students. Scholars have outlined its features, and stated it can help save teachers time with curriculum design (Foster et al., 2024), help create relevant content to match students' skill-level, and encourage content acquisition (Yalcinalp et al., 2024). Marino et al. (2024), commenting on possible uses of MagicSchool, call for special educators to understand how technology can help create educational scenarios with specific goals, by working backward from aims/ends-in-view to content.

In Walkington & Bernacki's (2024) study, 10 in-service and 3 preservice mathematics teachers interacted with MagicSchool's Math Story Word Problem Generator and Make It Relevant Tool to adapt lesson plans to involve students' informal interests. While teachers appreciated the expediency offered by MagicSchool in generating templates/lesson plans, they did mention types of adaptations made were vague, with little direction to implement activities in real-time (a hypothetical example would be Magic School output saying "this activity will be implemented in virtual reality" without direction or specifics). They also reported that only general details about technologies like Roblox were produced, since it sometimes did not "detect" affordances of tools. These scholars also described issues seen when trying to adapt lesson plans to be suitable in difficulty for L2 English learners. They provide an example where MagicSchool was asked to adapt activities to match language competencies of a Bolivian L2 learner; with the only change being altering the setting for a word problem to a Bolivian amusement park.

The common thread in the handful of papers written about MagicSchool's use is the call for comprehensive investigation of parameters that could help design human-AI systems encouraging reflexive problem-solving towards effective, practically deployable curricula. We apply Pask's conversation theory (Pask, 1975; Tilak et al., 2024) to design a

configuration of machine-mediated conversational feedback loops to operationalize this vision.

3. AI-mediated curriculum design workshops as a cybernetic system

We use conversation theory to structure out collaborative interactions during AI-mediated curriculum design, and lay out a methodology to analyze conversational practices engaged. We extend Pask's research into the 21st century by exposing sociocognitive mechanisms of collaboratively using GenAI as a conduit to generate curriculum plans.

Conversation theory allows understanding how to design machine-dependent and independent conversations. Systems with material presence (flesh in brain-body systems, hunks of metal in computers) or hardware are M-individuals, and can process concepts or P-individuals (rules, self-perceptions, perceptions of others, conceptual knowledge, software, and even the whole conversation itself; Scott, 2001). One M-individual can process or embody one/more P-individuals, and several M-individuals can together, embody one P-individual. P-individuals can be represented as webs of concepts; what Pask called entailment meshes, allowing the use of conversation theory to understand the byproducts of human-computer interaction at the collaborative and individual level. However, conversation theory is also a theory of theories; it allows the use of the M- and P-individual nomenclature to design the structure of goal-oriented collective action (Pangaro, 2008). This study focuses on effectively designing collaborative AI-mediated curriculum creation using self-reflections that blur the boundary between researchers and practitioners, in the true spirit of second-order cybernetics (Silverman, 2023). This is a step that precedes understanding the conceptual byproducts of collective action using entailment meshes. In line with Pask's assertion that both sharp and fuzzy methods can be used to recount processes involved in design (Westermann, 2018), this study uses narrative inquiry to recount collaborative practices in MagicSchool AI-mediated curriculum design.

In *Proceedings of the National Academy of Sciences* editorial, Blau et al. (2024) outline five practices defining meaningful AI-mediated scientific research and practice. Here, these principles are applied to add structure to highly collaborative AI-mediated course creation workshops:

1. **Transparent disclosure and attribution:** Those interacting with AI to create content should be transparent about processes followed.
2. **Verification of AI-generated content and analysis:** Falsehoods emerging from AI-generated output calls for careful assurance of veracity by humans.

3. **Documentation of AI-generated data:** AI-generated data should be labeled as such, and archived to ensure correct representation of knowledge.
4. **Focus on ethics and equity:** Privacy, copyright, and intellectual property should be respected when using AI to generate content. Cultural stereotypes may be represented in AI-produced data, and human users/agents must prompt to filter out discrepancies.
5. **Continuous monitoring, oversight and public engagement:** Practitioners, academicians and technologists must work together to understand implications AI has, co-designing scenarios for its effective use in education.

This study uses these recently published guidelines. Three teachers, one researcher, and the head of a special education school met weekly to engage in curriculum development for a virtual curriculum to be piloted in Summer 2024. One computer was initially used, and later, a license was purchased for each teacher-researcher. The plan for the curriculum design workshop was articulated using basic principles following a conversation theory framework. The complexity of interactions between five agents leads to avoidance of a process diagram, which would be hard to read for the lay-person.

The five individuals and the computer(s) loaded with MagicSchool AI are M-individuals embodying prior knowledge, curricular plans, and collaborative feedback. Expert knowledge brought by each instructor about their lessons, advisory expertise of the head of the school, and data used to train MagicSchool are P-individuals that initiate conversations. The group provides input to AI (interaction between expertise and software), and subsequent feedback on initial prompts and lesson plans to produce four AI lesson plans to be modified, embodied by the group and the computer. After this group process where all agents reflected on initial output, each teacher embodies P-individuals in interaction with their computer, over a week's period to provide feedback on the AI-generated lesson, and creates a final lesson plan.

Steps involved in our AI-mediated course design were:

1. Teacher team prompts AI in workshop
2. AI produces output
3. Team discusses output
4. Each teacher makes comments and gives feedback on their lesson plan
5. A final lesson plan is drafted by integrating feedback

These steps implement Blau et al.'s (2024) guidelines. In designing a participatory research project explicitly outlining an AI-mediated course design workshop, we maintain transparency about processes used to develop lesson plans, and facilitate non-hierarchical collaboration between practitioners and researchers (rather than separating the observer

and observed). Through group/individual feedback, we vet the veracity and applicability of AI-output. By saving documenting input/output data, we store logs of interactions with AI, and attribute its influence in our course design. By prompting AI to differentiate lesson plans for students with learning differences, we lay focus on educational equity.

4. Analyzing collaborative teacher-AI use: A three-part teaching compass

In this study, teacher-researchers engaged in complex human-machine conversational processes at the many-to-one, many-to-many, and one-to-one level. These interactions forgo the paradigm of decoding individual interactions with GenAI in favor of adopting a social understanding of the use of such tools (Sharples, 2023). The process operationalizes a three-part teacher compass proposed by Misha & Oster (2023) that outlines parameters helpful in setting expectations for emergent productive interactions with GenAI:

1. **Co-agency:** Ensuring teachers, students, families, and technologies are not engaged in hierarchical interactions; but distributed ones involving constant feedback.
2. **Teacher Competence:** Equipping teachers with skills needed to navigate technology, prompting generative tools, academic standards, and course delivery.
3. **Communication:** Healthy atmosphere of critique through collective ideation.

Group inquiry involved in conversations between each teacher, head of the school, and computer(s) loaded with MagicSchool are described in this study. Analyses also elaborate whether teacher co-observers who previously used MagicSchool bring their technological skills to the table.

5. The Current Study

This participatory study outlines processes three teachers, a researcher, and the head of school (all participant observers) at an independent special education school followed to craft four core subject lesson plans part of an AI-mediated curriculum design workshop implementing MagicSchool AI's Lesson Plan Generator. We answer one exploratory research question:

RQ1: *How do special educators collaborate non-hierarchically in AI-mediated curriculum design workshops to create deployable lesson plans?*

6. Method

Participant Observers

All five co-authors were participant observers. Three white females (English teacher, math teacher, and head of school), one white male (the science teacher), and one South Asian male (the research director, and social studies curriculum designer) participated. All agents worked at an independent school for students with learning differences.

The team was developing 6th grade instruction as part of an online curriculum, called CadetNet. This study was approved by the Institutional Review Board at the local university, and by an internal review committee at the school as a participatory action study describing minimal risk educational activities.

Curriculum Design Workshop

This study recounts curriculum design processes followed during creation of nascent lessons for the CadetNet online special education program for middle schoolers with learning differences across the U.S., to be piloted in 2024-25 with a handful of student cases.

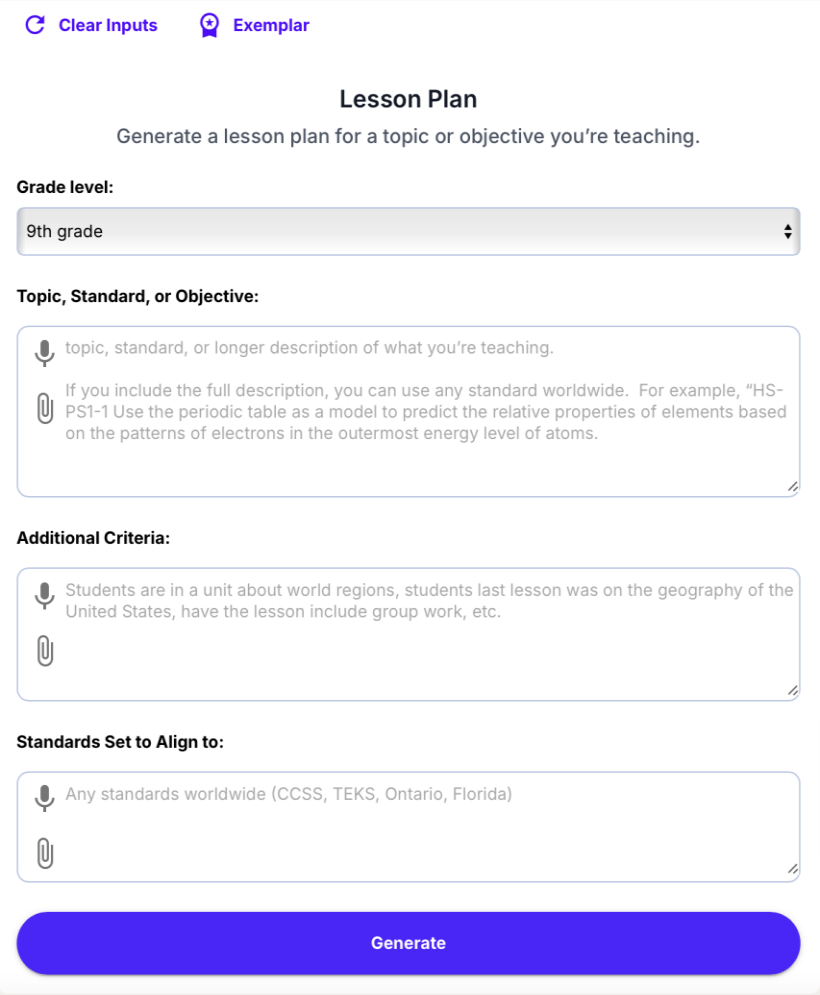
Virtual reality, gamification and traditional hypermedia were to be applied to create immersive experiences in the four core subject curricula; this framework of tool-mediated learning was developed based on an inference that such technologies could facilitate both content acquisition and knowledge creation for this population (Sorensen & Andersen, 2017).

Participant observers came to each meeting with first units in progress, designing lesson-by-lesson. During meetings, the team developed a lesson in each core subject using MagicSchool AI; this continued for four sessions, to prepare teachers to use AI to develop the rest of their curriculum efficiently.

When the group prompted MagicSchool, they collectively came up with topics, objectives, and additional criteria to structure synchronous sessions, and provided standards for instruction (Common Core for Math and Language Arts, the Next Generation Science Standards and the National Council of Social Studies Standards). The interface that was used by the team to add criteria for initial lesson prompts is shown in Figure 5.

Figure 5

Lesson plan generator interface.



The group brainstormed feedback to re-prompt MagicSchool and modify output. Final output was copy-pasted into word documents, where each teacher commented, and was given the option to produce a final lesson plan.

Data

Data were drawn from the four sessions of the AI-mediated curriculum design workshop. The first source were transcripts from weekly workshop meetings, and self-reflections about these meetings gathered using a five question rubric. The meetings each contained 15-20 minute MagicSchool assisted curriculum creation tasks for social studies, math,

science, or language arts. Meetings were recorded using Microsoft Teams, and transcripts were generated automatically. The second source was text stored from prompt input, pasted into Google Docs. The third source was AI lesson plan output stored in the same manner. The fourth were teacher comments made in Google Docs on AI output. The last source were final lesson plans; which teachers developed by commenting on and altering group output if they felt the lessons were somewhat usable. AI prompts, draft output, comments, and final plans are provided in this manuscript's supplementary materials.

Measures

Reflection Rubric: We asked each co-observer that developed the four lesson plans to reflect on processes followed in providing group input to iterate upon AI output, and edits they made individually to create final products. A five question rubric was developed:

1. How did you prompt MagicSchool with the group?
2. What differences did you see in output produced based on nature of prompting?
3. What feedback did the group have about the draft lesson plan produced by MagicSchool?
4. What were your comments on this draft that you made individually when working on it?
5. What changes did you make to the draft to create your final lesson plan?

These questions help in recounting steps followed in our workshops.

Teacher Compass: Collective activities narrated through transcript data and rubric reflections are linked back to variables in our three-part teacher compass in the Discussion section:

1. **Co-agency:** Aspects of data showcasing group feedback to AI. These include collective brainstorming on lesson standards, objectives, criteria, and perspectives shared to the group about how to modify AI output.
2. **Teacher Competence:** Aspects of data highlighting teacher comfort/savviness with AI tools.
3. **Communication:** Aspects of data highlighting a spirit of inquiry among our participant observers.

Data Analysis

We use narrative inquiry (Connelly & Clandinin, 1990) rather than formal qualitative coding of string data to describe mechanisms of AI-mediated curriculum design; a fuzzy method to recount machine mediated collaboration, permissible within conversation theory's scope to design and analyze collective action, whether machine mediated or not (Westermann, 2018). Transcribed meeting recordings and rubric answers are shared. The reflection rubric facilitated collection of retrospective thoughts, and followed Blau et al.'s (2024) guidelines. These sources are tied back to Mishra & Oster's (2023) three-part teaching compass. Document logs provided in the supplementary indicate teacher feedback on AI output, and also reveal final lesson plans, showing evolution from AI-mediated drafts to final products.

7. Results

Study results are divided into four parts, outlining processes followed by each teacher-researcher to create a lesson each in social studies, science, language arts, and mathematics.

Social Studies Lesson Plan

The social studies teacher (SS), a South Asian male, served as the school's research director. SS came up with the idea of engaging in AI-mediated curriculum design. He explained to the team that MagicSchool output could be used as a consistent template to construct lesson plans:

"So, this (MagicSchool AI) will just generate templates for us that we can then go and input. You know what I mean? So I don't want us to use this verbatim, but I want this to help us generate just a general structure that we can input into those tables that you know everybody has been sharing with, like the rough curriculum plans."

The initial prompting engaged in by SS was carried out in a one-to-one manner, but then the saved output was brought to the group, to allow for further re-prompting:

"The first few times I prompted AI, I did so individually before bringing the idea to the group and continuing the process. I wanted to create a very structured template I could use and went in with minutes per activity, types of activities I wanted, and topics too. I focused on relative and absolute location since this is a good introductory session in middle school geography. I went in with very specific directions related to activities and how they were to be ordered, but then further increased my specificity of prompting by asking for time markers for each activity as well."

The initial lesson plan output is provided in the supplementary materials of this manuscript. Initially, SS prompted MagicSchool to create a set of activities to be implemented in the lesson that focused on location, coordinate mapping, and environmental changes, with the tool suggesting a lesson flowing from testing prior knowledge, introducing new knowledge, practice, and extension activities. This was followed by a request to make the activity on environmental change explicit using visuals of "before" and "after" snapshots of Hurricane Katrina and one to include time markers for each activity adding up to 60 minutes. The prompt was as follows:

"Can you make the independent activity on Hurricane Katrina have an in-class module as well showcasing the changes through visuals? Secondly can you suggest and mark out times for each activity, and ensure it all adds up to 60 minutes?"

MagicSchool processed these tasks successfully, and generated a 60-minute lesson, with explicit time markers, involving introductory content, a virtual reality landmark tour, a module on Katrina, and homework to research landmarks of their choice in terms of location. Since prompted activities already matched multisensory needs of learners who could require varied accommodations, the tool was not prompted about designing for students with learning differences. SS had erred in aligning the standards to the Common Core, rather than the National Council for Social Studies and asked the tool to realign content to social studies standards.

SS brought the lesson plan output to the first meeting dealing with AI-mediated course design to solicit feedback about edits to make. The team suggested adding more specificity in terms of the directions to be followed to implement activities, and also to add resources, readings and other artifacts that could be pulled from the internet to supplement instruction. Taking these collective insights, SS took this lesson, and edited it to include technologies/tools specific to the online school, guidelines that applied to the context, and a tighter selection of topics. In reflecting upon edits, he shared:

"When I operated upon the output produced by MagicSchool AI, after the team gave me feedback, I knew that I had to structure the instruction a little better and begin with basic concepts in physical and human geography like location, place, region, and movement, before transitioning into studying basic concepts related to absolute and relative location; I even later edited the parts about Hurricane Katrina out because it was getting all over the place because of the prompt I used. I also restructured the order of content provision suggested by MagicSchool and added games related to absolute location (e.g., a continent map game, and Where's Waldo) and relative location (Google Maps landmark hunt) that helped reinforce concepts; I added clear instructions for these. The virtual reality simulation, too, was adapted to specifically focus on latitudes and longitudes, and their role in interpreting coordinate points, time zones and seasonal changes."

This process highlights that while MagicSchool can provide brief descriptions of tools/resources and their functionalities, it may not always provide concrete directions about how to use them and implement them in practice. It may also not detect some forms of proprietary technology like the virtual reality simulator being used by the team. Accordingly, SS emphasized that lessons became possible to practically implement only with comprehensive human feedback:

"While the AI tool was able to give me a basic structure for my lesson, my edits upon the output, that were based on our team's brainstorm, made this lesson deployable in practice for our school because it was unable to recognize some of the more unique tools and techniques we were using to deploy immersive learning."

The final lesson plan is provided in this paper's supplementary materials, and includes slide content, games on relative and absolute location, a VR simulation related to latitudes and longitudes, and optional homework related to the prime meridian and time zones.

Science Lesson Plan

In the second session, the science teacher (SC) volunteered to prompt MagicSchool with the group to develop a 6th grade lesson about phases of the moon. Accidentally, the team chose the Common Core standards, but later prompted MagicSchool to realign the content to Next Generation Science Standards. Telling SS about the standards to be covered, SC cited MS-ESS1-1, which covered the shape and phases of the moon, and the sequence of phases as the moon revolves around the Earth. All remaining teachers (EL= language arts, M= mathematics) helped SC conceptualize a prompt as input:

***"SS**: So then what are maybe… how many activities would you have in like one session? For example, well, how would you structure like briefly? Like just say, I want this many minutes in X using this technology, that students will be learning remotely… like… these are the activities that I want… and this is like… the time for each, to ensure that it goes for this much time."*

***SC:** OK, so it should be let's say 60 minutes total.*

***SS**: Ummm…*

***SC**: The 1st 15 minutes will cover notes and instruction for Nearpod.*

***SS:** Ok cool thank you.*

***SC:** The next 15 minutes will include graphic organizer activity.*
And then, the final 15 minutes would be a gamification review.

SS: *Okay, so, and what about the last 15 minutes?*

M: *I think we're missing 15 minutes.*

SS: *Yeah, one more.*

SC: *And this is why I don't teach math! That would be my time. That's where I do attendance and I ask questions.*

M*: Ah…*

SC: *15-minutes would be to reflect on your learning, and the processes through which Mr.SC instructed you.*

EL: *I love that reflection piece. That's awesome."*

When asked to retrospectively reflect on the process through which the AI was initially prompted, SC said:

"We met weekly to discuss implementation of VR and additional technologies into our burgeoning virtual middle school. As a group we used MagicSchool to cooperatively lesson plan a 6th class in Science, Language Arts and Mathematics. As the science expert on the team, I chose Phases of the Moon because I had taught this lesson multiple times over 6 years at the school, and I knew what main factors needed to be included in the AI-drafted lesson plan. After we settled on a lesson and grade level, we asked the AI to align the lesson to standards and examined the output."

SC's reflection highlights how the group worked together to align the lesson to relevant standards, lay out criteria for activities, and ensure it spanned an hour. The produced output comprised content provision, a visual aid, diagramming, a graphic organizer, an optional research task on eclipses, and homework to observe the moon phases and note down the insights by date. The guided practice diagramming task involved a paper and pencil activity to label moon phases. While the team was satisfied with the jumping off points to eclipses and other solar/lunar phenomena that would be covered in the next units, they re-prompted MagicSchool AI, asking to adapt the guided practice to include an embodied VR component that would gradually progress into understanding eclipses in following classes, by using 3D models of the Earth, Moon and Sun:

"SC: *When they do the extension activity… so the next part of this unit would be eclipses and lunar, like what you call it.*

SS: *Oh!*

SC: *So that's cool, that goes right to it.*

M: *Mm-hmm.*

SS: *OK, so right at the end.*

SC: *Yeah, like right here at this extension activity like after we would do moon phases, we would go into eclipses.*

SS*: Mm-hmm.*

SC*: So that's cool. That already kind of links it right in there.*

SS*: Yeah, it does. Oh wow, yeah they finish with it.*

M: *Yeah! And I think this is one too, that'll be really cool to do in VR, where like hey! You could create the phases of the moon… like somebody holds up a Sun, somebody holds up the moon and somebody holds up the Earth.*

SC*: Yeah, I was thinking of this too!*

M*: And then they, like, move around to, like, demonstrate how the shadows change like that would be so cool."*

The tool was able to alter activities to incorporate virtual reality upon being prompted. SC reflected upon the process the group followed to provide feedback to the output through prompting, saying:

"First, the team noticed that the standards had been set to Common Core instead of Next Generation Science Standards (NGSS), as such we prompted the AI to realign the lesson to the appropriate set of standards. Second, the team wanted to test the capability of MagicSchool to

create a diagramming activity in VR, instead of a more traditional paper-and-pencil graphic organizer."

SC gauged quality of the AI output and commented upon it to start editing the draft to create a final lesson plan. Apart from the feedback related to standards and the possibility to include virtual reality simulations into the lesson plan, the teacher further altered the output:

"First in the Assessments portion of the lesson plan, I suggested that the AI lesson be changed from a visual timeline project and to permit an auditory timeline submission as well as a visual which will allow students to have more autonomy over their work. Next, in Key Points, the AI focused on objectives that were on the lower end of Bloom's taxonomy with the emphasis on recall and knowledge. My suggestion was to include more focus on modeling, analysis and creation in the classroom. In the Opening, I would alter the question from "why do moon phases occur" to "has anyone learned about the moon before?" Starting with a general question, instead of technical "why" question allows for more students to share their prior knowledge about the moon. "

The teacher edited the lesson plan, and expressed that eclipses would have to be explicitly studied in a separate class rather than through a flipped activity part of the class on the phases of the moon. In the final draft, the teacher chunked the activities in the draft to span three days, gradually providing concepts related to moon phases to build students' confidence. He also added the MS-ESS-3 standard to his lesson plan, since an exploration of the scale of objects in the Earth, Sun, and Moon system were related to the lesson. The mini unit was designed to progress from basic information acquisition/content review to building and comparing models, and testing newly acquired information. Gamified review and pretest content, a research project allowing drawn, written or recorded responses, graphic organizers, specific video resources, and instructions to use VR were incorporated.

Language Arts Lesson Plan

The group created a language arts lesson in the third workshop session by prompting components that would make up a class about studying genre through the example of science fiction and fantasy narratives. They decoded what Common Core Standards to touch on, zeroing in on Standard 6.3, which related to evaluating themes, characters and events in a piece of literature, but desired designing introductory sessions that restricted the focus to comparing fantasy and science fiction after an initial exploration of the concept of genre itself. The team then discussed how long the lessons should be, agreeing that an hour would be ideal with 10 minutes of spare time baked in. When asked about the process the language arts teacher (EL) followed with the group to prompt MagicSchool, she responded:

"I wanted to begin the process very broadly at first to give everyone an opportunity to contribute and evaluate the AI results at the start. I had worried that getting too into the details and content specifics on the first prompt would make the results too narrow and exclude collaboration. Additionally, by beginning broadly, we're able to see what the AI can do and then adjust based on what we're looking for. It's kind of like, you don't know what you're looking for at the outset but you know what you don't want. "

The team had already prompted MagicSchool to develop a lesson for students with learning differences in a virtual learning environment. However, initial guidelines and activities developed by MagicSchool did not meet these criteria, with activities being conducted largely in a lecture style format, supplemented by independent reading and a creative writing prompt. The team re-prompted to ask for accommodations and an explicit virtual component. EL commented that a shortcoming of MagicSchool was the need to be very specific with parameters for a lesson, saying it would provide a generic outline unless otherwise specified:

"it will give you this layout essentially for whatever lesson you choose to do so you know, graphic organizer, notes, etc."

Further commenting on the notion of using MagicSchool's output as a basic template, or providing it with very detailed instructions to generate a lesson specific to one's context, the teacher added:

"So from my experience this was like a very great starting point for saying like, okay, this is kind of like what I should be doing or what I can do."

To build in the additional criteria related to learning differences into the lesson that MagicSchool AI had earlier missed, EL suggested prompting the tool again to make these modifications based on her previous experiences:

"*So one time when I was trying to simplify a lesson, I literally put in: simplify this for students who struggle with reading."*

The tool could create general accommodations for reading and writing related learning differences such as dyslexia (e.g., suggesting hands-on activities), but EL felt that the guided and independent practice activities were still too general. She was skeptical as to whether prompting for a wider gamut of multisensory learning activities would work:

"Honestly, I think it's one of those things that maybe AI isn't as capable at this point. You know, we know our kids, we know what their learning differences are like. We are going to be the ones who have to like, add those modifications and accommodations to the lessons."

SS commented that in addition to each child having their own preferences to which instruction needed to be individualized and diversified, different practitioners approach the process of differentiation differently too. Speaking to the broad nature of MagicSchool output in response to a general prompt, EL commented that while MagicSchool provided opportunities to develop pieces of a lesson and even whole units, navigating varied parts of the tool to complete the whole picture, and also constant re-prompting to create an environment sensitive to each student's needs was perceived as tedious:

"On MagicSchool there are other tools that assist with developing different pieces of a lesson, however, it seems tedious to jump from place to place to create these things and generate new prompts in a different location."

A third round of prompting was also conducted to incorporate elements of virtual learning. The output vaguely suggested virtual and multimedia tools, but without concrete examples. In comments on the output, the teacher suggested that tools should be programmed to provide examples of possible ways to conduct activities, and resources to use, sharing her own suggestions about using technologies like Nearpod.
EL felt that the output was slightly more advanced in difficulty level compared to the scope of the intended lesson, owing to the use of a Language Arts standard that focused on relationships between plot, characters, and setting; the initial goal was to design an introductory lesson to gradually scaffold student knowhow about literary style, and then foster understanding through examples related to science fiction and fantasy. According to her, the output would not be suitable for deployment as part of an introductory lesson, and would be harder to follow for the population for which it was being designed. Lessons would need to start by modeling basic knowledge about plot and character development before exploring specific genres.

Mathematics Lesson Plan

The math teacher (M) had built a prompt related to a lesson about ratios and proportions. The prompt contained a breakdown of activities, and standards. The team worked together to ensure that the prompt was structured well, and asked MagicSchool AI to align it with Common Core Standards. The prompt asked to design an activity about measuring the magnitude of individuals who were "cat people" and "dog people" in class, and then

computing a ratio to understand how the two numbers compared. The team discussed the AI output as follows:

*"**M**: I don't know, let's see. It did include a lot of what I was saying.*

***SS**: Visual representations and stuff, right?*

***M:** Because I had it make a survey of…*

***SS**: Oh, of the information.*

***M**: Yeah, I've asked for comparing dogs and cats and then showing the kids who likes cats and who likes dogs. And then, we make a ratio of dog and cat lover."*

M explained that since she was specific about the activities she wanted to implement, the AI output did not build much on her initial prompt, saying:

"I was pretty specific in what I wanted the lesson to include, and I feel that the output matches it pretty well. In fact, I don't really see that the output adds much to my lesson, other than maybe the structure of it and making it look 'pretty'.

The one piece of additional input M wanted to add to the prompt was asking MagicSchool to build the lesson for a virtual format. However, she was unsatisfied with adaptations made, because the only incorporation made was to incorporate polling software in conducting the survey activity, and the use of virtual tiles to display results:

"I also realized that I didn't have it geared towards a virtual classroom, so I asked it to do that. I feel like it added the word 'virtual' to the lesson. I would have loved for it to, maybe, pull in videos or other content I wouldn't have to go find myself."

Through these comments, M highlighted the notion that MagicSchool often created adaptations to lesson plans to incorporate teacher feedback in a cursory manner rather than pulling well-defined resources to implement the same class in another format.

After the output was produced, the team discussed the potential to use it to create a deployable lesson. There were concerns about the survey activity, since MagicSchool did not provide instructions to have the children compare the number of dog and cat lovers

using ratios (instead, it asked about number of dog lovers pet cat lover), even though the "Introduction to New Material" section did speak of different techniques to notate ratios:

***"M**: Umm... but this output discusses a survey tool to determine the more preferred animal.*

***SS**: Umm…*

***M**: That's not the point of it. The point is just to come up with the ratio of dog lovers to cat lovers, right?*

***SS**: The ratio of it right? Yes. Umm…*

***M:** Yeah, so…*

***SS**: Right and this… it's not really how many dog lovers per cat lover."*

M had a clear idea about how to effectively connect the final lesson to the Common Core math standard dealing with understanding how to represent and calculate ratios. This plan is provided in our supplementary materials, along with initial prompts, and draft output, and incorporates technologies like Nearpod for class review, and survey/polling activities, the results of which could be displayed using digital tiles, followed by similar activities using other objects like digital graphics of chicken nuggets as manipulatives. However, the difference between the teacher's lesson and the MagicSchool generated output was the presence of clear instructions, online content, steps related to technology use, and the addition of the Delta Math technology for structured practice. M shared insights about her edits to the AI output, saying:

"I kept a lot of the structure of the lesson the same, but I added a few more resources in (videos, etc.) to beef it up a little bit. I also added an activity that was more relevant to the students being at home and signing in virtually."

The edited lesson also involved homework that instructed students to ask their family about preferences of their own (related to food, animals, clothes, etc.), and compute a ratio of different preferences for their family members. While M was able to create a lesson plan that expanded on her initial prompt output, she expressed that she used MagicSchool AI mainly as a formatting tool that helped her maintain a neat, easily readable structure for lessons.

8. Discussion

This study focuses on one exploratory research question, *RQ1: How do special educators collaborate non-hierarchically in an AI-mediated curriculum design workshop to create deployable lesson plans?* Narrative inquiry is used to recount experiences of five participant observers engaged in curriculum design for online special education offerings in interaction with MagicSchoolAI. Analyses showcase how conversational practices can turn GenAI into a possibility engine and co-designer part of a pervasive social medium (Sharples, 2023). Steps followed in the AI design workshops, in maintaining transparency about AI-mediated course design, logging data, ensuring its veracity, working collectively to ensure practical applicability of lessons, and adapting output to meet the needs of underrepresented neurodivergent populations follow guidelines outlined as part of cogent AI-mediated scientific practices (Blau et al., 2024). By collaborating to prompt AI, and discuss possible feedback/edits to give effect to in AI lesson plan output, the team exercised co-agency, giving each other input about possible ways to prompt MagicSchool, and edit AI-generated lesson plans. Technology-related competencies and experiences were brought to the table, with teammates sharing past struggles and victories in using MagicSchool AI. Teacher content knowledge also played an important role in the sessions, in aligning content with standards, and prompting the AI to create classes about developmentally appropriate topics in a virtual format. The team's curious spirit facilitated deep, speculative feedback in the group meetings, and in individual editing sessions that culminated in final lesson plans. These processes involved healthy communication to support human-computer interaction, effectively embodying Mishra & Oster's (2023) teaching compass for the 21st century.

Apart from embodying guidelines outlined in conceptual literature on the use of GenAI, efforts in this study present a blazing path for empirical inquiry into the use of tools like MagicSchool for course design. While MagicSchool's use has been studied by its developers using scant case studies, these efforts have not involved the use of rich qualitative data or self-reported perceptions (Grado, 2023). Scholars and practitioners have outlined its potential in combating teacher burnout and heightening expediency in curriculum design (Foster et al., 2024; Waterfield et al., 2024). Those writing about MagicSchool's possible uses have suggested that teacher experience in the use of AI is crucial in effectively using it, calling for a study of mechanisms in human-AI systems. Only one study, has so far, responded to this call, assessing victories and challenges faced by teachers in MagicSchool, but uses sparing testimonial data to support arguments (Walkington & Bernacki, 2024). The current study advances educational research on human-AI systems through the use of a comprehensive qualitative methodology that shares and evaluates live experiences in AI-mediated curriculum planning workshops.

9. Limitations

This study's implementation of participant observation may introduce bias in the context of scientific practices assuming extramundane sources of observership. However, we argue self-reflective practices adopting principles of second-order cybernetics, blurring the boundaries between observer and observed (Reinertsen, 2012), and adopting intramundane sources of observership embody the potential to transparently share processes involved in collective action (broadly) for both practitioners and researchers to reflect upon. In the context of designing AI-mediated educational efforts, such transparency is a necessity (Blau et al., 2024).

We forego utterance-based coding for a narrative inquiry, but rich qualitative data shared from our meeting transcripts, reflective rubrics, and lesson plan documents enable a "fuzzy" (Westermann, 2018) process-oriented rather than causal understanding of the spirit of inquiry needed for cogent AI-mediated curriculum design. This study shares insights from participant observers in developing four lessons, one in each core subject, calling forth doubt as to whether more long-term offerings that progress from lesson to lesson would be feasible. One of the co-observers, the language arts teacher, felt that the lesson produced by MagicSchool did not facilitate gradual progression of difficulty level despite the tool being prompted to create middle school content on narrative and genre. However, the use of AI-generated lesson plans as basic templates for further development reduced the effort the team put in to develop full units of instruction, providing a basic structure to follow for subsequent lesson plans. Only a handful of developed lessons were deployed as part of a pilot in the 2024-25 academic year, including those on the phases of the moon, and relative/absolute location. The language arts teacher, too, relied on a handful of components from the generated lessons on science fiction and fantasy, to enable students to sort out symbols related to these genres in VR, after introductory lessons were delivered. While only a few of the developed, edited lessons were deployed, the team worked on lesson plan output to ensure that it was in line with what they envisioned implementing, and felt confident about. Further research would involve assessing live feasibility and fidelity of lessons developed in an AI-mediated setting.

10. Conclusion

In an age where responsive tools are gaining traction for their capacity to generate content despite potentials for falsehood; transparency and a collaborative spirit of inquiry (Blau et al., 2024) are imperative in shepherding their use in educational settings. This study reflects on feedback loops emergent in AI-mediated curriculum design using conversation theory.

It shows how collaborative practices in concert with language models embody the type of human agency needed to create educational experiences that teachers feel they can deploy practically, and their students can benefit from. This study prompts further investigations of mechanisms guiding effective human-AI systems in educational contexts.

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Supplementary Materials

Social Studies Lesson Plan
MagicSchool Prompt #1

Grade level: 7th grade (per suggestions for Geography curricula, but meant for 6th grade).

Topic/Standard/Objective: Design a geography lesson plan for me that focuses on relative and absolute location, time zones, seasons (latitudes and longitudes), and changes in the environment over time.

Additional Criteria: Students are taking class remotely. The first activity should be a VR activity in Google Earth to understand absolute and relative locations using historical landmarks as examples. The second activity should involve understanding time zone differences using a diagram of the Earth. The third activity should use the example of Hurricane Katrina to showcase how natural disasters can change the environment in an acute way.

Standards Set to Align to:
CCSS

MagicSchool Output #1
Exploring Earth: Understanding Geography Concepts

Objective: Students will be able to identify and explain relative and absolute location, time zones, seasons (latitudes and longitudes), and understand how the environment changes over time.

Assessment: Students will create a presentation showcasing their understanding of relative and absolute location, time zones, and the impact of natural disasters on the environment.

Key Points:

- Understanding relative and absolute location on Earth
- Exploring time zones and their significance
- Connecting latitudes and longitudes to seasons
- Analyzing how natural disasters like Hurricane Katrina can affect the environment

Opening:

- Engage students with a virtual reality tour of historical landmarks on Google Earth
- Ask students to identify the locations of different landmarks and discuss the concept of relative and absolute location

Introduction to New Material:

- Discuss the difference between relative and absolute location
- Introduce time zones and explain their purpose
- Address the relationship between latitudes, longitudes, and seasons
- Anticipate misconception: students may confuse time zones with latitudes

Guided Practice:

- Provide examples of various locations and ask students to determine their relative and absolute positions
- Show a diagram of the Earth with time zones marked and discuss how they work
- Guide students through an activity linking latitudes and longitudes to seasonal changes
- Monitor student performance through questioning and observation

Independent Practice:

- Ask students to research and create a presentation on the impact of natural disasters like Hurricane Katrina on the environment
- Encourage students to include information on location, time zones, and environmental changes

Closing:

- Have students share key findings from their presentations
- Summarize the concepts of relative and absolute location, time zones, and environmental changes over time

Extension Activity:

Students who finish early can research another natural disaster and compare its impact on the environment to Hurricane Katrina.

Homework:

Students are assigned to identify at least three historical landmarks around the world and research their relative and absolute locations.

Standards Addressed:

- CCSS.ELA-Literacy.RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
- CCSS.ELA-Literacy.RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

MagicSchool Prompt #2

Can you make the independent activity on Hurricane Katrina have an in-class module as well showcasing the changes through visuals? Secondly can you suggest and mark out times for each activity, and ensure it all adds up to 60 minutes?

MagicSchool Output #2

Exploring Earth: Understanding Geography Concepts

Objective: Students will be able to identify and explain relative and absolute location, time zones, seasons (latitudes and longitudes), and understand how the environment changes over time.

Assessment: Students will create a presentation showcasing their understanding of relative and absolute location, time zones, and the impact of natural disasters on the environment.

Key Points:

- Understanding relative and absolute location on Earth
- Exploring time zones and their significance
- Connecting latitudes and longitudes to seasons
- Analyzing how natural disasters like Hurricane Katrina can affect the environment

Opening (5 minutes):

- Engage students with a virtual reality tour of historical landmarks on Google Earth

Introduction to New Material (15 minutes):

- Discuss the difference between relative and absolute location
- Introduce time zones and explain their purpose
- Address the relationship between latitudes, longitudes, and seasons
- Anticipate misconception: students may confuse time zones with latitudes

Guided Practice (15 minutes):

- Provide examples of various locations and ask students to determine their relative and absolute positions
- Show a diagram of the Earth with time zones marked and discuss how they work
- Guide students through an activity linking latitudes and longitudes to seasonal changes

In-Class Module on Hurricane Katrina (15 minutes):

- Show visuals (pictures, maps, graphs) depicting the changes in the environment post-Hurricane Katrina
- Discuss the impact on the location, time zones, and environmental changes
- Facilitate a class discussion on the long-term effects of natural disasters

Independent Practice (5 minutes):

- Assign students to research and prepare for their presentation on the impact of natural disasters on the environment

Closing (5 minutes):

- Have students share their thoughts on the in-class module on Hurricane Katrina
- Summarize the key concepts learned in the lesson

Extension Activity:

Students who finish early can research another natural disaster and compare its impact on the environment to Hurricane Katrina.

Homework:

Students are assigned to identify at least three historical landmarks around the world and research their relative and absolute locations.

Standards Addressed:

- CCSS.ELA-Literacy.RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
- CCSS.ELA-Literacy.RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

MagicSchool Prompt #3

Can you align these to NCSS please?

MagicSchool Output #3

Exploring Earth: Understanding Geography Concepts

Objective:

Students will be able to identify and explain relative and absolute location, time zones, seasons (latitudes and longitudes), and understand how the environment changes over time.

Assessment:

Students will create a presentation showcasing their understanding of relative and absolute location, time zones, and the impact of natural disasters on the environment.

Key Points:

- Understanding relative and absolute location on Earth
- Exploring time zones and their significance
- Connecting latitudes and longitudes to seasons
- Analyzing how natural disasters like Hurricane Katrina can affect the environment

Opening (5 minutes):

- Engage students with a virtual reality tour of historical landmarks on Google Earth

(**Comment**: *First slides need to talk about the Earth, its position in the solar system, and then geographer's tools. This would be the introduction to the unit. This should be followed by games to guess continents, and to find Waldo.*)

Introduction to New Material (15 minutes):

- Discuss the difference between relative and absolute location
- Introduce time zones and explain their purpose
- Address the relationship between latitudes, longitudes, and seasons
- Anticipate misconception: students may confuse time zones with latitudes

(Comment: *Share definitions for relative and absolute location, then resources related to maps. Ask students to think about a place they find special to them in the city that they enjoy visiting.*)

Guided Practice (15 minutes):

- Provide examples of various locations and ask students to determine their relative and absolute positions
- Show a diagram of the Earth with time zones marked and discuss how they work
- Guide students through an activity linking latitudes and longitudes to seasonal changes

(**Comment**: *Share game about location, using Google Maps, ask students to locate a place they go to often in their city, share location of school and ask to find distance between the landmark they chose and the school.*)

In-Class Module on Hurricane Katrina (15 minutes):

- Show visuals (pictures, maps, graphs) depicting the changes in the environment post-Hurricane Katrina
- Discuss the impact on the location, time zones, and environmental changes
- Facilitate a class discussion on the long-term effects of natural disasters

(**Comment**: *This meanders in topic, and thus must be replaced with modules on latitudes and longitudes, a VR activity.*)

Independent Practice (5 minutes):

- Assign students to research and prepare for their presentation on the impact of natural disasters on the environment

Closing (5 minutes):

- Have students share their thoughts on the in-class module on Hurricane Katrina
- Summarize the key concepts learned in the lesson

(**Comment**: *Asynchronous work to be assigned in Nearpod for the week.*)

Extension Activity:

Students who finish early can research another natural disaster and compare its impact on the environment to Hurricane Katrina.

Homework:

Students are assigned to identify at least three historical landmarks around the world and research their relative and absolute locations.

Standards Addressed:

- National Council for the Social Studies (NCSS) Standard 3: People, Places, and Environments
- National Council for the Social Studies (NCSS) Standard 10: Civic Ideals and Practices

Final Lesson Plan for Implementation

Lesson 1: Place, Space, and Time (60 minutes)

- National Council for the Social Studies (NCSS) Standard 3: People, Places, and Environments

Key Points:

- Absolute location refers to the exact position of a place on Earth's surface using coordinates.
- Relative location describes where a place is in relation to other places or landmarks.
- Regions are areas that share common characteristics that differentiate them from surrounding areas.
- Places are locations that hold meaning for people due to personal experiences, cultural significance, or historical events.
- The concept of how places change over time includes human and environmental factors.

Introduction (5 minutes)

Resources
Slide Deck contains intro content.

Introduction Slides

- Share slides introducing the Geography Units to students.
- Explain to them that this is an introductory set of games specifically designed for novice geographers that will prepare them to study the world.
- Ask them what geographers do and if they know what tools they use.
- Tell them that geographers study place, location, human interaction, climate, agriculture, land and water bodies.
- Ask students to think about a place they consider special in the town they live in and why it holds significance to them. Tell them to keep it in their mind for later!

Absolute Location (15 minutes)

Resources

- Vibe Board Maps for Absolute Location
- 3D Model: https://sketchfab.com/3d-models/earth-41fc80d85dfd480281f21b74b2de2faa
- Where's Waldo Image in Slides

Absolute Location Games

- First open up the Earth Vibe board maps, and ask students to label using post-its in their group where we are with "Here", and then label the continents they know.
- Then, have them play a Where's Waldo game.

- Then ask them what the common factor was, that they were finding absolute locations.
- Share definitions of relative and absolute location.

Relative Location (15 minutes)

Resources:

- Google Earth: https://earth.google.com/web/@36.86350092,-76.18150424,3.12168956a,849.99840563d,35y,0.00000001h,45.00015863t,-0r/data=OgMKATA
- Google Maps: https://www.google.com/maps

Relative Location Games

- Tell students to recall their special places from their neighborhoods.
- Then tell them to find the distance and direction from CBA using the Compass and metrics on Google Maps and Google Earth.
- Scaffold questioning by starting with easy examples and gradually increasing the complexity to ensure understanding, go back to the map of the Earth of share Google Earth itself to show students how you walk from one place to another. Also have a compass graphic handy to show students when needed.

Latitudes and Longitudes 4 (20 minutes)

Resources

- 3D Models:
  - https://sketchfab.com/3d-models/latitude-and-longitude-low-poly-005e6a893d984538a7caee0cd403e0c6
  - https://sketchfab.com/3d-models/earth-sun-5115f4e8ff0647feac27a05c0cee26a3

- IFX Snapshot with images, guides and 360 biomes loaded into EngageXR.
- Video Resource: https://www.youtube.com/watch?v=dsP9GiwPWJw

Latitudes & Longitudes Simulation

- Play video
- Take the kids into EngageXR

- Load 3D Model of Latitudes and Longitudes
- Explain using 3D Models loaded in VR how the time zones change by longitudes and the temperature and seasons based on latitudes, explain using the Sun as a reference.
- Highlight how the Earth revolves around the Sun and rotates on its axis and this is how we measure the duration of a year, and explain seasonal changes.

Closing and Optional Reading (5 minutes)

Resources:

- Optional Reading: https://manoa.hawaii.edu/exploringourfluidearth/physical/world-ocean/locating-points-globe/weird-science-prime-meridian-and-time-zones

- Assign optional reading about the prime meridian and the different timezones.

Summarize the key concepts covered in the lesson by having students share one new thing they learned about relative and absolute location.

Science Lesson Plan

MagicSchool Prompt 1

Grade level: 6th grade
Topic, Standard, or Objective:
ESS 1-B is the standard to be covered. Students will understand the shape and the phases of the moon and the timeline along which the phases change.
Additional Criteria:
The lesson should be 60 minutes in total. The first 15 minutes will cover notes, and instructions for Nearpod. The next 15 minutes will include a graphic organizer activity and the final 15 minutes will be a gamification review. 15 minutes would be to reflect on your learning and the processes through which the teacher instructed you.
Standards Set to Align to:
CCSS

MagicSchool Output #1

Exploring the Phases of the Moon
Objective:
Students will be able to understand the shape and phases of the moon and the timeline along which the phases change.
Assessment:
Students will create a visual timeline showing the different phases of the moon at various points in time.
Key Points:

- Identify the different phases of the moon
- Explain the sequence in which the moon phases change
- Understand the relationship between the moon's position and its appearance

Opening:

- Show a picture of the moon and ask students to describe what they see.
- Pose the question: "Why does the moon look different on different nights?"

Introduction to New Material:

- Present information on the phases of the moon through a visual aid.
- Engage students in a discussion about common misconceptions, such as the moon producing its own light.

Guided Practice:

- Have students work in pairs to label the different phases of the moon on a diagram.
- Ask scaffolded questions to guide students from recognizing basic moon phases to understanding their sequence.
- Monitor student performance by circulating the room and providing support as needed.

Independent Practice:

- Distribute graphic organizers for students to complete individually, showing the phases of the moon in proper sequence.
- Assign a task where students have to draw the moon in each phase and label them correctly.

Closing:

- Have students share their completed graphic organizers with a partner and discuss any discrepancies or questions.

Extension Activity:

- For early finishers, provide them with the opportunity to research and present on lunar eclipses or other celestial phenomena related to the moon.

Homework:

- Ask students to observe and record the moon's phase each night for a week, drawing what they see and noting the date.

Standards Addressed:

- CCSS.ELA-LITERACY.RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
- CCSS.ELA-LITERACY.WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic.

MagicSchool Prompt #2

I am sorry, can you link this to the NGSS standards, I made an error.

MagicSchool Output #2

Of course! Here is the revised lesson plan aligned with the NGSS standards:

Exploring the Phases of the Moon

Objective:

Students will be able to understand the shape and phases of the moon and the timeline along which the phases change.

Assessment:

Students will create a visual timeline showing the different phases of the moon at various points in time.

Key Points:

- Identify the different phases of the moon
- Explain the sequence in which the moon phases change
- Understand the relationship between the moon's position and its appearance

Opening:

- Show a picture of the moon and ask students to describe what they see.
- Pose the question: "Why does the moon look different on different nights?"

Introduction to New Material:

- Present information on the phases of the moon through a visual aid.
- Engage students in a discussion about common misconceptions, such as the moon producing its own light.

Guided Practice:

- Have students work in pairs to label the different phases of the moon on a diagram.
- Ask scaffolded questions to guide students from recognizing basic moon phases to understanding their sequence.
- Monitor student performance by circulating the room and providing support as needed.

Independent Practice:

- Distribute graphic organizers for students to complete individually, showing the phases of the moon in proper sequence.
- Assign a task where students have to draw the moon in each phase and label them correctly.

Closing:

- Have students share their completed graphic organizers with a partner and discuss any discrepancies or questions.

Extension Activity:

- For early finishers, provide them with the opportunity to research and present on lunar eclipses or other celestial phenomena related to the moon.

Homework:

- Ask students to observe and record the moon's phase each night for a week, drawing what they see and noting the date.

Standards Addressed:

- NGSS MS-ESS1-1: Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
- NGSS MS-ESS1-3: Analyze and interpret data to determine the scale properties of objects in the solar system.

MagicSchool Prompt #3

Can you make the diagram labeling activity in virtual reality? I want them to explore 3D models of each phase?

MagicSchool Output #3

Certainly! Here is an updated version of the lesson plan with a virtual reality diagram labeling activity included:

Exploring the Phases of the Moon

Objective:

Students will be able to understand the shape and phases of the moon and the timeline along which the phases change.

Assessment:

Students will create a visual timeline showing the different phases of the moon at various points in time.

(**Comment**: *Could this also be auditory, explanations of the experiencing the moon phases from a journal or something? I like more avenues to show mastery when possible.*)

Key Points:

- Identify the different phases of the moon
- Explain the sequence in which the moon phases change
- Understand the relationship between the moon's position and its appearance

[**Comment**: *Lower levels of blooms tax, no real creation or analysis, would add Create a model of the phases of the moon, (big emphasis in NGSS)*]

Opening:

- Show a picture of the moon and ask students to describe what they see.
- Pose the question: "Why does the moon look different on different nights?"

(**Comment**: *I would add in "Have you ever studied the moon and what do you know about it?" before the "Why" question. Kind of mini formative assessment to see if your students have had a Space Sci class or any personal interest in the subject.*)

Introduction to New Material:

- Present information on the phases of the moon through a visual aid.
- Engage students in a discussion about common misconceptions, such as the moon producing its own light.

(**Comment**: *Notes, PowerPoint, videos, etc. would those need to be listed or will visual aid work?*)

Guided Practice:

- Introduce the virtual reality activity where students will explore 3D models of each phase of the moon.
- In pairs, students will navigate through the virtual reality space to label the different phases of the moon on a 3D model.
- Ask scaffolded questions to guide students from recognizing basic moon phases to understanding their sequence.

- Monitor student performance in the virtual reality environment and provide support as needed.

Independent Practice:

- After the virtual reality activity, distribute graphic organizers for students to complete individually, showing the phases of the moon in proper sequence.
- Assign a task where students have to draw the moon in each phase and label them correctly.

Closing:

- Have students share their completed graphic organizers with a partner in the virtual reality space and discuss any discrepancies or questions.

Extension Activity:

- For early finishers, provide them with the opportunity to research and present on lunar eclipses or other celestial phenomena related to the moon.

(**Comment**: I am not sure about the validity of this extension for our students, too open ended may cause paralysis by analysis.)

Homework:

- Ask students to observe and record the moon's phase each night for a week, drawing what they see and noting the date.

(**Comment**: *Connects really well to our end product assessment. Could extend to be photographs, clay models, Oreos, etc. lots of options to show the moon phases in a homework observation.*)

Standards Addressed:

- NGSS MS-ESS1-1: Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
- NGSS MS-ESS1-3: Analyze and interpret data to determine the scale properties of objects in the solar system.

(**Comment**: *My standard is different than this listed one, will be reexamining those in my document. Do we want the ES (big cross cutting main idea) standard or the more specific MS (just middle school) one? Or both, I have that in some of the sections but need to evaluate where everything fits.*)

Final Lesson Plan for Implementation

Time Frame	Lesson Overview- Moon Phases, Tides and Lunar/Solar Eclipses	Objectives/Standards and Resources
Week 1 - Monday (Asynch Intro or Review)	**Time: 60 minute class** **<u>Activity 1: Gamified Pretest 15-20 minutes</u>** Have students take a pretest on the upcoming information on Phases of the Moon. Be sure to emphasize in the instructions that the students have not learned this material yet this is just to see what they know and all they need to do is try their best to answer the following questions. The teacher can review the generated report to better understand the areas of general strength and challenge the class will have during this topic **<u>Activity 2: Research 20-25 minutes</u>** Research a Model of the Phases of the Moon, recreate the Model you see in the VR setting or using real world materials and submitting a picture or recording. **<u>Activity 3: Video Recap and Extension 5 Minutes</u>** Watch these following videos to learn more about the upcoming topic Video 1: Moon 101 from National Geographic and Video 2: Space Race video from NPR	**Standards:** ● ESS1-B ● MS-ESS1-1 ● MS-ESS1-3 **Goals:** ● Distinguish between the different phases of the moon ● Model the Phases of the Moon ● Explain why phases of the moon occur and why they are cyclical ● Construct an explanation of how the orientation of the Earth-Moon-Sun affects our tides **Resources:** ● Gamified Pretest ● VR Headset ● Recording/Picture taking devices ● Model Crafting supplies ● Moon 101 Video https://www.youtube.com/watch?v=6AviDjR9mmo ● Space Race Video https://www.youtube.com/watch?v=xvaEvCNZymo
Week 1 -	**Time: 60 minute class**	**Resources:**

Tuesday (Synch)	**<u>Activity 1: Notes and Discussion 30-35 Minutes</u>** Begin with the Slide on Phases of the Moon detailing who we get our phases and what causes the shape to change, also include the orbital pattern of the Moon around the Sun. Next move to the slide on the Phases of the Moon beginning with the New Moon and moving through the Waxing Crescent, First Quarter, and Waxing Gibbous. The next slide details the remaining phases of the Moon starting with Full Moon, then Waning Gibbous, Last Quarter and Waning Crescent. Have students watch the video "Phases of the Moon" from the History Channel. Finally define the terms waxing and waning in the notes (teacher could ask if anyone heard the definition in the video) **<u>Activity 2: Graphic Organizer Modeling 25-35 Minutes</u>** With the teacher the students will create a graphic organizer for their notes. With the remaining time students may attempt to recreate the phases of the moon using the IFX graphics in the VR environment.	● Guided Notes ● Powerpoint or Slides ● Phases of the Moon graphic organizer ● VR Headsets
Week 1 - Wednesday (Asynch Review or Application or Research)	**Time: 60 minute class** **<u>Activity 1: Comparing Models 15 Minutes</u>** On Google Classroom the students reflect on how their initial Model of the Phases of the Moon differed from the Phases of the Moon graphic organizer made in class yesterday. How do the models differ, do they explain the same thing, strengths and weaknesses of each. **<u>Activity 2: Gamified Review 20 Minutes</u>** Using Kahoot, Blooket, or Gimkit, review the Phases of the Moon and Waxing vs Waning **<u>Activity 3: Current Events in Science 35 Minutes</u>** Using the Google form Current Events in Science and https://www.snexplores.org/ students will work on the second current event of the year. Students will read 2 of the peers summaries and respond with their thoughts.	**Resources:** ● Google Classroom ● VR Headsets ● Graphic Organizers ● Gamified Review of Topics

Language Arts Lesson Plan

Initial Teacher Notes about Lesson Topic

1. Characteristics of a variety of genres including but not limited to science fiction, mystery, comedy, fantasy, historical fiction, realistic fiction, horror, adventure, mythology, legends, drama
    a. Refined to comparing and contrasting science fiction and fantasy.
    b. Refined to comparing and contrasting historical fiction and realistic fiction.

MagicSchool Prompt #1

Grade Level: 6th grade

Topic Standard Objective
This 6th grade lesson will cover the characteristics of science fiction, and fantasy. Students will be able to compare and contrast the two genres. The lesson will tackle the following standard:

CCSS.ELA-LITERACY.RL.6.3
Describe how a particular story's or drama's plot unfolds in a series of episodes as well as how the characters respond or change as the plot moves toward a resolution.

(**Comment**: *With the specification of this standard, the lesson becomes less of an introduction to the concept and more a detailed analysis of the genres once the basic concepts have been mastered. This lesson could be implemented as an extension activity for high achievers or as a supplemental lesson to cover genre in more depth.*)

Additional Criteria
The lesson should be 50 minutes long. It should include key vocabulary, and should have an interactive component to it. The lesson will be delivered virtually, and will be designed for students with learning disabilities.

Standards to Align to: CCSS

MagicSchool Output #1

Exploring Science Fiction and Fantasy Genres

Objective:

Students will be able to compare and contrast science fiction and fantasy genres by describing how the plot unfolds and characters respond or change in a story.

Assessment:

Students will be given a graphic organizer to fill out, where they will compare and contrast a science fiction and a fantasy story in terms of plot development and character evolution.

Key Points:

- Understanding the characteristics of science fiction and fantasy genres
- Analyzing how the plot unfolds in a story through a series of episodes
- Describing how characters respond or change as the plot progresses

Opening:

- Begin the lesson by asking students to brainstorm what comes to mind when they hear the terms "science fiction" and "fantasy."
- Show students a brief video clip from a popular science fiction and fantasy movie to capture their interest and engage them in the topic.

(**Comment**: *Investigation of prior knowledge needs to be extended. Ideally would be more engaging and include videos, art, discussion, etc.*)

Introduction to New Material:

- Discuss the key characteristics of science fiction and fantasy genres.
- Clarify a common misconception: "Science fiction always involves advanced technology, while fantasy always includes magic."
- Model how to compare and contrast the plot development and character changes in a science fiction and a fantasy story.

(**Comment:** *Implement notes, PowerPoint (Nearpod?) and graphic organizer here for the first point. For the last activity, practically speaking, I'm not sure how accessible this concept is for a sixth grade unit as they are just grasping the basics of genres. Additionally, there is a lot of overlap between the genres which may be confusing for many students. I would likely simplify this to tracking the genres through a basic plot diagram.*)

Guided Practice:

- Provide students with excerpts from science fiction and fantasy stories and guide them in analyzing the plot development and character evolution.
- Scaffold questioning from simple identification tasks to more complex comparisons.
- Monitor student performance by circulating the virtual classroom and providing feedback during group discussions.

Independent Practice:

- Assign students the task of choosing a science fiction and a fantasy book to read independently.
- Task students with completing the graphic organizer to compare and contrast the plot and character development in the two chosen books.

(**Comment**: *I would simplify this. Students should be able to identify two features of each genre from either a movie or text. There could be an additional worksheet created to help facilitate and scaffold this process.*)

Closing:

- Summarize the lesson by asking students to share one similarity and one difference they discovered between science fiction and fantasy genres.
- Encourage students to reflect on how understanding these genres can enhance their reading experience.

(**Comment**: *Some form of assessment or check for understanding may be necessary here. How do we facilitate that and where is the data stored? How do we use that data in the future to inform instruction?*)

Extension Activity:

- For early finishers, provide a creative writing prompt where students can create their own science fiction or fantasy story integrating the elements discussed in the lesson.

Homework:

- Homework suggestion: Write a short paragraph describing a science fiction or fantasy story of their own creation, focusing on plot development and character evolution.
- **Standards Addressed:** CCSS.ELA-LITERACY.RL.6.3, CCSS.ELA-LITERACY.RL.6.9
-

MagicSchool Prompt #2

Can you modify this lesson plan to accommodate students with dyslexia?

MagicSchool Output #2

"Certainly! To support students with dyslexia in this lesson, we can incorporate multisensory activities, provide visual aids, and offer alternative ways for students to demonstrate their understanding. Here are some modifications to the lesson plan:

Exploring Science Fiction and Fantasy Genres for Students with Dyslexia

Objective:

Students with dyslexia will be able to compare and contrast science fiction and fantasy genres by describing how the plot unfolds and characters respond or change in a story using multisensory techniques.

Assessment:

Students will be given a graphic organizer with visual prompts (such as images or diagrams) to fill out, where they will compare and contrast a science fiction and a fantasy story in terms of plot development and character evolution.

Key Points:

- Understanding the characteristics of science fiction and fantasy genres through visual aids
- Analyzing how the plot unfolds in a story through a series of episodes using interactive and hands-on activities
- Describing how characters respond or change as the plot progresses through visual representations

Opening:

- Begin the lesson by engaging students in a hands-on activity related to science fiction and fantasy, such as creating a visual collage of images representing the genres.
- Show students a brief video clip with closed captioning from a popular science fiction and fantasy movie to capture their interest and engage them in the topic.

(**Comment**: *This is an excellent option to differentiate the content and provide supports for students with learning differences. It's also a very engaging way to begin the lesson. How do we monitor and control the use of appropriate images within these activities?*)

Introduction to New Material:

- Discuss the key characteristics of science fiction and fantasy genres using visual aids and interactive discussions.
- Clarify a common misconception: "Science fiction always involves advanced technology, while fantasy always includes magic," using visual examples.
- Model how to compare and contrast the plot development and character changes in a science fiction and a fantasy story using visual organizers and manipulatives.

Guided Practice:

- Provide students with hands-on activities and manipulatives to analyze the plot development and character evolution in excerpts from science fiction and fantasy stories.
- Scaffold questioning from simple identification tasks to more complex comparisons using visual cues.
- Monitor student performance by providing individualized support and feedback during group discussions.

(**Comment**: *I'm finding that many of the guided practice and independent practice activities are extremely vague. While it does allow us more freedom to customize, it would be helpful if there were example activities included within the lesson. Can we prompt AI to specifically include these in future requests?*)

Independent Practice:

- Assign students the task of choosing a science fiction and a fantasy book to read independently, with the option of audiobooks for those who struggle with reading.
- Task students with completing the graphic organizer with visual supports to compare and contrast the plot and character development in the two chosen books.

Closing:

- Summarize the lesson using visual aids and ask students to share one similarity and one difference they discovered between science fiction and fantasy genres.
- Encourage students to reflect on how understanding these genres can enhance their reading experience using visual prompts.

Extension Activity:

- For early finishers, provide a creative visual art project where students can create a visual representation of their own science fiction or fantasy story integrating the elements discussed in the lesson.

(**Comment**: *This could be adapted as the assessment or check for understanding in the lesson rather than an extension activity. It incorporates skills learned from the opening*

activity but gives students the opportunity to independently practice those skills and choose a media format that appeals to them.)

Homework:

- Homework suggestion: Create a visual storyboard or comic strip illustrating a science fiction or fantasy story they create, focusing on plot development and character evolution.

Standards Addressed:

- CCSS.ELA-LITERACY.RL.6.3
- CCSS.ELA-LITERACY.RL.6.9

These modifications aim to provide additional support for students with dyslexia by incorporating visual aids, hands-on activities, and alternative assessment methods. Let me know if you would like me to provide specific materials or resources for these modifications.

(**Comment**: *We can also add speech to text and read aloud as additional supports.*)

MagicSchool Prompt #3

You have suggested several activities that are to be conducted in person, but this class is online. Can you modify it further?

MagicSchool Output #3

Absolutely! To adapt the lesson plan for online delivery while still accommodating students with dyslexia, we can leverage digital tools, interactive platforms, and accessible resources. Here are some adjustments:

Exploring Science Fiction and Fantasy Genres for Students with Dyslexia (Online Adaptation)

Objective:

Students with dyslexia will be able to compare and contrast science fiction and fantasy genres by describing how the plot unfolds and characters respond or change in a story using interactive and multisensory online tools.

(**Comment**: *Again, examples of online tools would be helpful here. I think we need to do some dedicated research on how to incorporate OG and "Science of Reading" based practices into our online curriculum.*)

Assessment:

Students will be provided with a digital graphic organizer with drag-and-drop features to fill out, where they will compare and contrast a science fiction and a fantasy story in terms of plot development and character evolution.

(**Comment**: *This is an excellent suggestion and can be facilitated by Nearpod.*)

Key Points:

- Understanding the characteristics of science fiction and fantasy genres through interactive presentations and multimedia resources
- Analyzing how the plot unfolds in a story through online simulations and virtual activities
- Describing how characters respond or change as the plot progresses using audio descriptions and visual aids

Opening:

- Begin the lesson with a multimedia presentation introducing science fiction and fantasy genres, incorporating audio descriptions and visual cues.
- Engage students by sharing an online interactive quiz or game related to the genres to capture their interest.

Introduction to New Material:

- Present the key characteristics of science fiction and fantasy genres using interactive slides and multimedia resources.
- Clarify misconceptions with interactive polls or digital whiteboards where students can share their thoughts.
- Model how to compare and contrast the plot development and character changes in a science fiction and a fantasy story using online graphic organizers and interactive tools.

Guided Practice:

- Provide students with online excerpts from science fiction and fantasy stories to analyze plot development and character evolution.
- Use breakout rooms for small group discussions and online polls for interactive questioning.
- Monitor student progress through virtual check-ins and provide feedback via chat or audio messages.

Independent Practice:

- Assign students the task of exploring digital libraries for science fiction and fantasy e-books, with text-to-speech options for auditory support.
- Task students with completing the digital graphic organizer with drag-and-drop features to compare and contrast the plot and character development in the two chosen books.

Closing:

- Summarize the lesson using interactive slides and ask students to share their insights using the chat feature or virtual hand raising.
- Encourage students to reflect on their learning through a digital exit ticket or online journal entry.

Extension Activity:

- Provide links to online storytelling platforms where students can create and share their own science fiction or fantasy stories incorporating the lesson elements.

Homework:

- Homework suggestion: Create a digital presentation or video summarizing a science fiction or fantasy story of their own creation, focusing on plot development and character evolution.

Standards Addressed:

- CCSS.ELA-LITERACY.RL.6.3
- CCSS.ELA-LITERACY.RL.6.9

These adaptations aim to make the lesson accessible and engaging for students with dyslexia in an online learning environment. Let me know if you need further adjustments or specific online resources to support this lesson.

(Final plans for this lesson output were not created since the teacher deemed initial results to be geared towards higher achievers; the teacher later incorporated aspects of these suggested activities into her introductory content on genre; activities were designed to study genre, and sort symbols/tropes related to different genres into types.)

Mathematics Lesson Plan

MagicSchool Prompt #1:

Grade Level: 6th grade

Topic, Standard, or Objective:
The student will represent relationships between quantities using ratios, and will use appropriate notations, such as a/b, a to b, and a:b.

6.RP.A.1

Additional Criteria

- Make the lesson with these pieces:
- Start by conducting a poll to ask the students a simple question with two possible answers. For instance, if you had to choose, would you choose cats or dogs?

- Take the survey data and discuss it. Which animal is more preferred? By how much? How do we know?
- Make a visual of the information by using images in a Nearpod or even tiles on a doc camera. For example, if it's 12 dogs and 8 cats, put 12 blue tiles and 8 red tiles on the screen
- Ask "How many dog lovers per cat lover do we have in this class?" Have the students discuss and debate. Use the visuals to describe what they're saying
- Explain that this is a ratio. A ratio is when you compare two things to each other. An important feature of ratios is that they stay consistent as they get larger or smaller
- Write out the ratios as a/b, a:b, and a to b. Explain how they're read and what they mean
- Do some more samples of ratios and what they are
- Show videos about ratios

MagicSchool Output #1

Exploring Ratios Through Visual Representations

Objective:

Students will be able to represent relationships between quantities using ratios, and will use appropriate notations such as a/b, a to b, and a:b.

Assessment:

Students will be assessed through a worksheet where they will have to compare quantities and write ratios in different notations.

Key Points:

- Understanding what a ratio is and how it compares two quantities.
- Recognizing and utilizing the notations a/b, a to b, and a:b.
- Interpreting visual representations of ratios using images or tiles.
- Maintaining consistency in ratios as quantities change.
- Applying ratios to real-life scenarios.

Opening:

- Conduct a poll asking students if they prefer cats or dogs.
- Discuss survey data to determine the more preferred animal and by how much.
- Introduce the concept of ratios by visually representing the survey results with blue and red tiles.
- Pose the question: "How many dog lovers per cat lover do we have in this class?"

Introduction to New Material:

- Explain that a ratio compares two quantities to each other.
- Present ratios in different notations (a/b, a:b, a to b) and explain their meaning.
- Address the common misconception that ratios involve addition or subtraction.

Guided Practice:

- Provide examples of ratios for students to work on.
- Scaffold questioning from simpler ratios to more complex ones.
- Monitor student understanding through guided discussions and responses to examples.

Independent Practice:

- Students will work on calculating ratios for given scenarios independently.
- Assign a worksheet where they will write out ratios in different notations and compare quantities.

Closing:

- Have students share their answers and discuss any common misconceptions.
- Summarize the key points learned about ratios and their importance in comparing quantities.

Extension Activity:

Students who finish early can create their own survey question and graph the results, then write ratios to compare the data.

Homework:

For homework, students can create ratios comparing quantities in their home environment, such as the number of different colored items in a room.

Standards Addressed:

- CCSS.Math.Content.6.RP.A.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- CCSS.Math.Content.6.RP.A.3.A: Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane.

MagicSchool Prompt #2

Can you make this more geared towards a virtual classroom?

MagicSchool Output #2

Exploring Ratios Through Visual Representations in a Virtual Classroom

Objective:

Students will be able to represent relationships between quantities using ratios, and will use appropriate notations such as a/b, a to b, and a:b.

Assessment:

Students will be assessed through an online worksheet where they will compare quantities and write ratios in different notations.

Key Points:

- Understanding what a ratio is and how it compares two quantities.
- Recognizing and utilizing the notations a/b, a to b, and a:b in a virtual setting.
- Interpreting visual representations of ratios using digital images or virtual manipulatives.

- Maintaining consistency in ratios as quantities change in an online environment.
- Applying ratios to real-life scenarios through virtual examples.

Opening:

- Conduct a virtual poll using a polling tool or chat feature asking students if they prefer cats or dogs.
- Discuss survey data virtually to determine the more preferred animal and by how much.
- Introduce the concept of ratios by visually representing the survey results with digital images or virtual tiles.
- Pose the question: "How many dog lovers per cat lover do we have in this virtual class?"

Introduction to New Material:

- Explain that a ratio compares two quantities to each other using virtual examples.
- Present ratios in different notations (a/b, a:b, a to b) and explain their meaning in the context of online learning.
- Address the common misconception that ratios involve addition or subtraction through virtual demonstrations.

Guided Practice:

- Provide virtual examples of ratios for students to work on using digital tools.
- Scaffold questioning from simpler ratios to more complex ones in an online setting.
- Monitor student understanding through virtual discussions and responses to examples.

Independent Practice:

- Students will work on calculating ratios for given scenarios independently using online resources.
- Assign a digital worksheet where they will write out ratios in different notations and compare quantities virtually.

Closing:

- Have students share their answers in the virtual classroom and discuss any common misconceptions through online communication tools.
- Summarize the key points learned about ratios and their importance in comparing quantities in a virtual setting.

Extension Activity:

Students who finish early can create their own survey question using virtual platforms, graph the results digitally, then write ratios to compare the data in an online environment.

Homework:

For homework, students can create ratios comparing quantities in their home environment virtually, such as the number of different colored items in a room using online tools.

Standards Addressed:

- CCSS.Math.Content.6.RP.A.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities in a virtual learning environment.
- CCSS.Math.Content.6.RP.A.3.A: Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane using digital resources.

(**Comment**: *MagicSchool AI did a little bit, but it's probably better for idea generation or if you don't have any experience in lesson planning. Frankly, I liked my lesson better. But I can imagine that if I didn't have any experience, it could have helped me come up with ideas to teach ratios.*)

Final Lesson Plan for Implementation

Unit 2, Lesson 1 - Identifying Ratios

Objective:
The student will represent relationships between quantities using ratios, and will use appropriate notations, such as a/b, a to b, and a:b.

Standard(s) Addressed:

- 6.RP.A.1 - Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*

Key Points:

- Nearpod lesson about Ratios
- Activity where students find real ratios around their house

Lesson Structure:

Nearpod Lesson:

- Start by conducting a poll to ask the students a simple question with two possible answers. For instance, if you had to choose, would you choose cats or dogs?
- Take the survey data and discuss it. Which animal is more preferred? By how much? How do we know?
- Make a visual of the information by using images in a Nearpod or even tiles on a doc camera. For example, if it's 12 dogs and 8 cats, put 12 blue tiles and 8 red tiles on the screen.
- Ask "How many dog lovers per cat lover do we have in this class?" Have the students discuss and debate. Use the visuals to describe what they're saying
- Explain that this is a *ratio*. A ratio is when you compare two things to each other. An important feature of ratios is that they stay consistent as they get larger or smaller. Have students give examples of different ratios they might know of or that they have experience with.
- Write out the ratios of cats to dogs as a/b, a:b, and a to b. Explain how they're read and what they mean. Explain that the order of the units matters. It's very helpful to use visuals to show this. Create different ratios on the Nearpod of visuals with the units flipped. For example, 6 chicken nuggets to 1 cup of sauce, and then 1 cup of sauce to 6 chicken nuggets. Ask the students if they can think of times where the order really matters.
    - Note: if the students can't think of any, prompt them to think of units of time. For example, my bike moves 6 miles per hour vs 1 hour per six miles. Which makes more sense? It's not critical at this stage that students understand this concept, but it's good to give them exposure now. Sometimes ratios can be flipped, and other times, it doesn't make sense.
- Do some more samples of real ratios and what they are

- Show videos about ratios
    - Introduction to Ratios (What Are Ratios?) | Ratio Examples and Answers

Activity:

- Have each student create their own ratio of something in their home or family and come back and share it. Remind them that a ratio is just comparing two things....it can be any two things! Ask them questions about their ratios when they come back. Have them write the ratio out in the different forms.

Homework:

- Assign DeltaMath assignment to students:
    - Intro to Ratios (Level 1)
    - Intro to Ratios (Level 2)