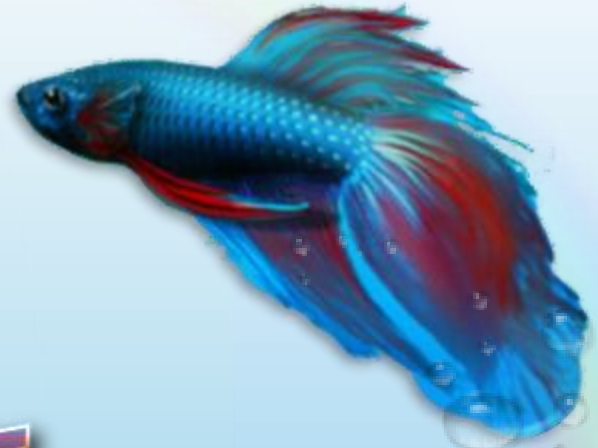


TEAM CRYSTAL

ACCESS TO QUALITY EDUCATION

Meet the Team (1/2)

Lee Klaus
An undergraduate at ODU majoring in Computer Science, minoring in Cyber Security
He enjoys videos and loves cats.

Didi Kone-Sow
An undergraduate at ODU majoring in Computer Science.
Didi enjoys reading, writing, and playing chess during her free time.

Cam Montgomery
An undergraduate at ODU majoring in Computer Science.
Cam enjoys making music, reading, and anything sci-fi.

Meet the Team (2/2)

		
Maddie Ray An undergraduate at ODU majoring in Computer Science. They enjoy video games, digital art, and reading.	**Stanley Synenko** An undergraduate at ODU majoring in Computer Science. He enjoys a fair few TCGs as well as some online games like EVE Online.	**Jayson Yates** An undergraduate at ODU majoring in Computer Science. He enjoys video games, hanging out with friends, anime and animals.

Elevator Pitch

Access to quality education remains a major challenge, especially for underserved communities and students with diverse learning needs. Traditional teaching methods fail to adapt to individual learning styles, leaving many without the resources to succeed.

Our solution is an educational platform that personalizes learning experiences through adaptive lesson plans, multimodal tools like text-to-speech and close-captioning.

With built-in accessibility features, gamified learning, and multilingual support, we make education inclusive and engaging at scale.

Problem Statement

Access to quality education remains a pervasive issue, particularly in underserved communities and for individuals with diverse learning needs. Traditional teaching methods often fail to address different learning styles, disabilities, or socio-economic challenges, leaving many students without the necessary resources to thrive. Despite advances in technology, the education system struggles to integrate tools that promote equitable and personalized learning opportunities at scale.

Problem Characteristics

- Teachers on average spend 12+ hours a week looking for materials for their students, either online or creating their own.
- Some teachers in poverty zones and less experienced teachers are more likely to report the provided materials are too hard for their students.
- For teachers who reported their materials to be too challenging for their students, math teachers reported that they were less likely to use their materials for their class instruction time.
- In economically challenged cities such as Baltimore, the proficiency rates for students is below the average.
- The NAEP (National Assessment of Educational Progress) showed that 81% of fourth graders that qualified for free/reduced lunches had low literacy levels and were four times less likely to graduate high school.
- The USA spends more money on average for student education than most of the other **OECD** countries. **(Organization for Economic Cooperation and Development)**

Solution Statement

The solution will have **mobile application** that personalizes learning through adaptive lesson plans, multimodal accessibility tools, and gamified modules (similar to applications like Duolingo). It will foster collaboration with dashboards for students, teachers, and parents while providing a resource library and multilingual support.

Leveraging modular learning, cloud technologies, and real-time communication, this platform enhances engagement and ensures equitable education for all.

What it will do

- The platform will provide **personalized learning** lesson plans that adjust to each student's strengths and weaknesses.
- It will feature **multimodal accessibility tools** such as text-to-speech, closed captioning, and visual aids to support diverse learners.
- **Gamified modules** will enhance engagement through interactive lessons and quizzes.
- A **collaborative dashboard** will connect students, teachers, and parents, offering progress tracking and real-time communication.
- A **comprehensive resource library** will include videos, exercises, and virtual tutoring options.
- **Multilingual compatibility** that allows languages to be modularly implemented in the future.
- **Secure authentication** will maintain user privacy and role-based access.

What it won't do

- It will not replace standard K-12 or secondary education. The software will act as an enhancement for students already enrolled in education programs.
- It will not provide any sort of certification or degree.
- It will not guarantee improvement in a student's education or a reduced workload for educators; it is a tool that can be used.
- It will not provide any personnel for helping educational outcomes for individual students; it is a purely premade curriculum that is accessible at anytime and anyplace (with internet access).

Competition Matrix 	**Minnow (The best one)**	**KhanAcademy**	**IXL**	**Duolingo**	**Canvas** 
Price	Subscription based, free with ads	Free	Subscription based	Subscription based, free with ads and less features	Free
Platforms	Mobile application	Desktop mostly	Desktop, mobile and web application	Mobile apps, and web based	Desktop and mobile
Scale of topics	Vast, expandable and flexible	Nearly all grade-school topics	Nearly all grade-school topics	Languages, Math and Music	Content must be manually added
Age/Grade range	K-12 and secondary education	K-12 and secondary education	K-12	All grades and ages	K-12 and secondary education
Credibility/ Cohesion	Review based credibility	Review based credibility	Review based credibility	Review based credibility	*Not Applicable*
Multimodal capability	Yes	Yes	Yes	Yes	Yes
Customizability	Modules can be mixed and matched to fit individual preferences	Pre-set modules	Pre-set modules	Pre-set modules	No built-in modules

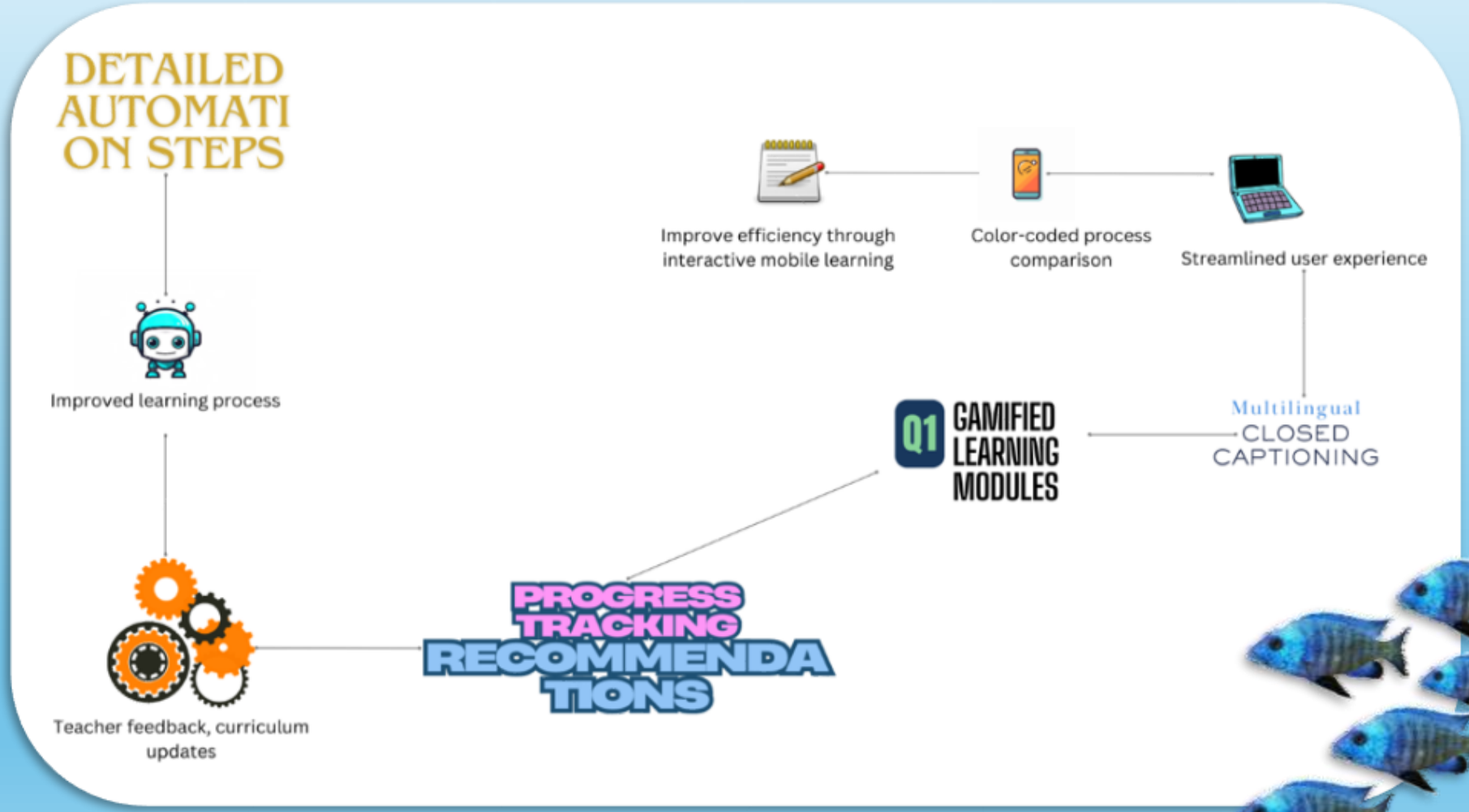
Development Tools

- IDE – VS Code
- Version Control - GitHub
- CI and CD - GitHub Actions and Workflows
- Backend language - Python
- Frontend language – HTML, CSS, & JavaScript
- Testing Frameworks – PyTest & Jest
- Documentation Tool - Pydoc

Major Functional Components

- **L – Docker**
- **A – Django**
- **M - PostgreSQL**
- **P - Python**

Major Functional Components Diagram



Risk Matrix

Likelihood of Occurrence	Impact (Scale 1-5)				
	Very Low 1	Low 2	Medium 3	High 4	Very High 5
Very Low 1					
Low 2					
Medium 3			C1	L1 L2	
High 4					
Very High 5		S1	T1 T2		

Customer and End user:
C1: Unable to find benefits

Technical:
T1: Downtime
T2: Network Issues

Security:
S1: Data leaks

Legal:
L1: Copyright
L2: Private lawsuits

Mitigation (1/2)

Customer and End User

- The application being free with ads offers a degree of mitigation already, but surveys and other user feedback options can reduce probability from 3 to 2.

Technical Risk

- Offer offline copies of certain lessons before lesson times to minimize reliance on the server, mitigating probability to 4 and impact to 2.

Mitigation (2/2)

Security

- Utilize and split data centers to minimize leaks, such that if one center is hacked it will not impact others. This does not impact probability but will reduce impact from 5 to 4.

Legal

- Cite all sources in the correct format, all modules should be unique and created by our company.
- Legal binding contract that we our company is not solely responsible for students to pass their classes. Clause that prevents suing of our company for student failing classes.

Mitigation Matrix

Likelihood of Occurrence	Impact (Scale 1-5)				
	Very Low 1	Low 2	Medium 3	High 4	Very High 5
Very Low 1					
Low 2			MC1 ML1		
Medium 3			C1	L1	
High 4		MT1 MS1			
Very High 5		S1	T1		

Customer and End user:

C1: Unable to find benefits

MC1: Mitigated by feedback

Technical:

T1: Downtime / Server Issues

MT1: Offline copies

Security:

S1: Data leaks

MS1: Split data center

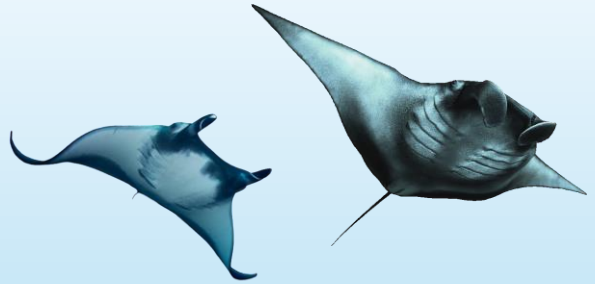
Legal:

L1: Copyright / Private lawsuits

ML1: Citations / End User agreement

Work Breakdown Structure

Algorithms



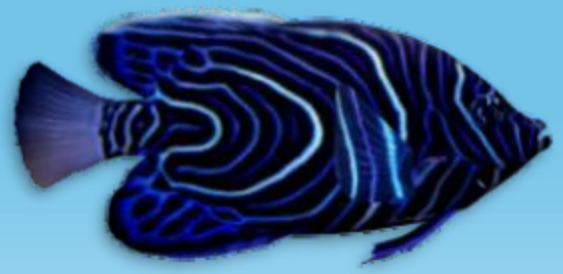
- Markov Decision Process (MDP) for adaptive test-type scenarios that can update based on the skill of the student.
- Item Response Theory (IRT) for dynamically fitting content difficulty to student ability.
- Inverted Index for storing subject content and question banks, as well as efficient keyword searching
- Mastery-based learning for ensuring student completion of a topic before progressing
- Word Embedding (such as fastText) for determining additional correct or semantically similar answers for word-based questions

Database Schema

Teacher	Student	Module	Class	Subject	School
School (1-M)	School (1-M)	Subject (1-M)	Teacher (1-N)	Class (1-M)	Student (M-1)
Class (1-M)	Class (M-N)	Student (M-N)	Student (M-N)	Type (Attribute)	Teacher (M-1)
Name (Attribute)	Module (M-N)	Length (Attribute)	Subject (1-N)		Location (Attribute)
Username (Attribute)	Name (Attribute)		Year (Attribute)		Name (Attribute)
Password (Attribute	Username (Attribute)				
	Password (Attribute)				

Real World Product vs. Prototype

Features & Functionality	RWP	Prototype (Planned)	Prototype (Actual)
• Personalized learning • Multimodal tools • Gamified modules • Multilingual compatibility • Resource Library • Collaborative Dashboard	• Personalized learning • Multimodal tools • Gamified modules • Multilingual compatibility • Resource Library • Collaborative Dashboard	• Collaborative Dashboard • Gamified modules	N/A



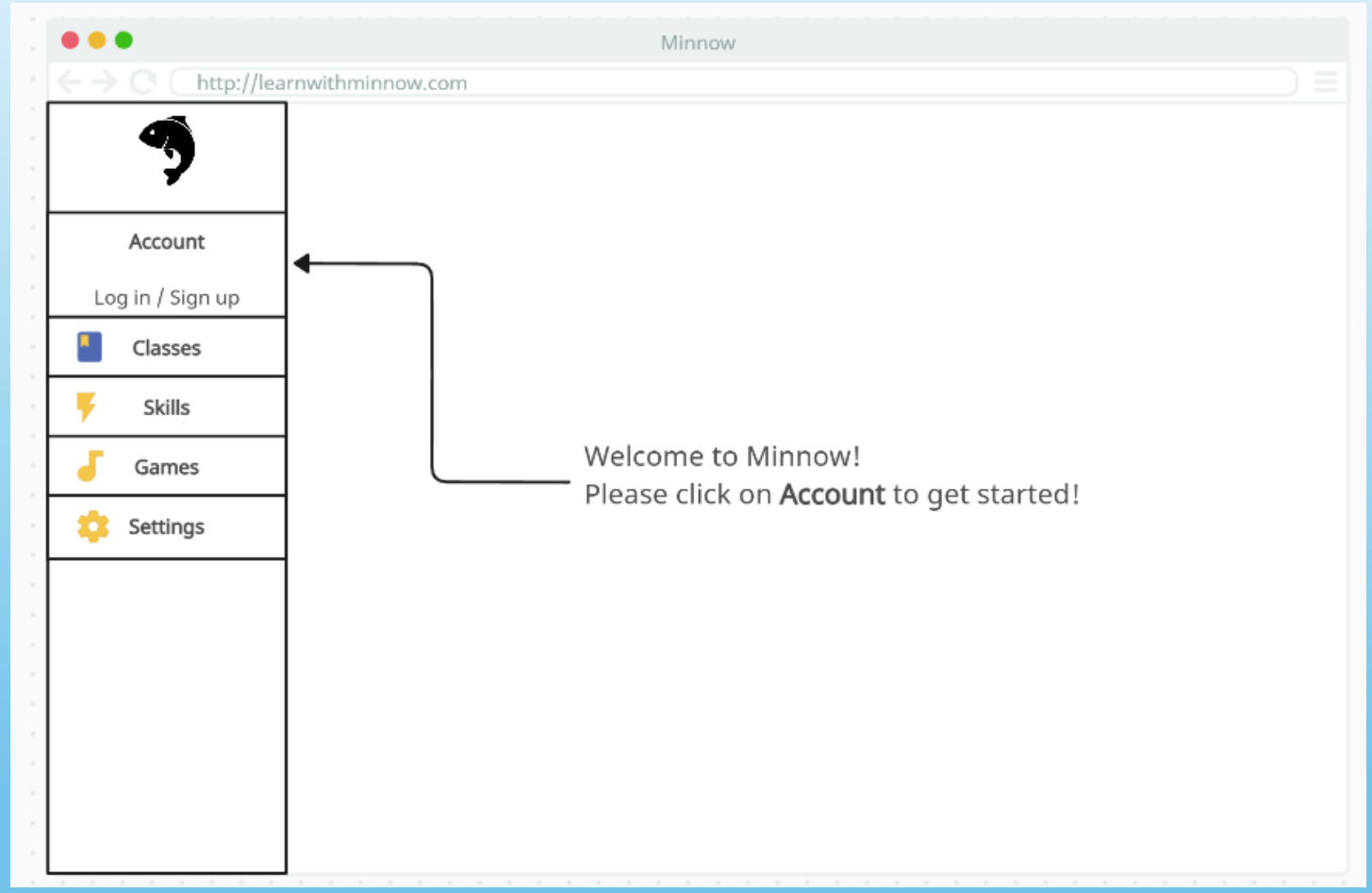
Required Libraries, Tools, & Technologies (Dependencies)

Libraries	Languages	Frameworks	Other Technologies
Docker SDK/ docker-py	Python	Django	PostgreSQL
Psycopg2/psycopg 2-binary	HTML	PyTest	PyDoc (Documentation)
	CSS	Jest	Github/Git
	Javascript		VS Code

Story, Home Screen

Our student is Jon Arbuckle. Having had his lunch stolen (again) by a mysterious feline, decides to help himself to an early dinner and make progress on his schoolwork.

After bringing his plate to his desk, he considers what to do. His first task is to go to www.learnwithminnow.com and sign in to his account.

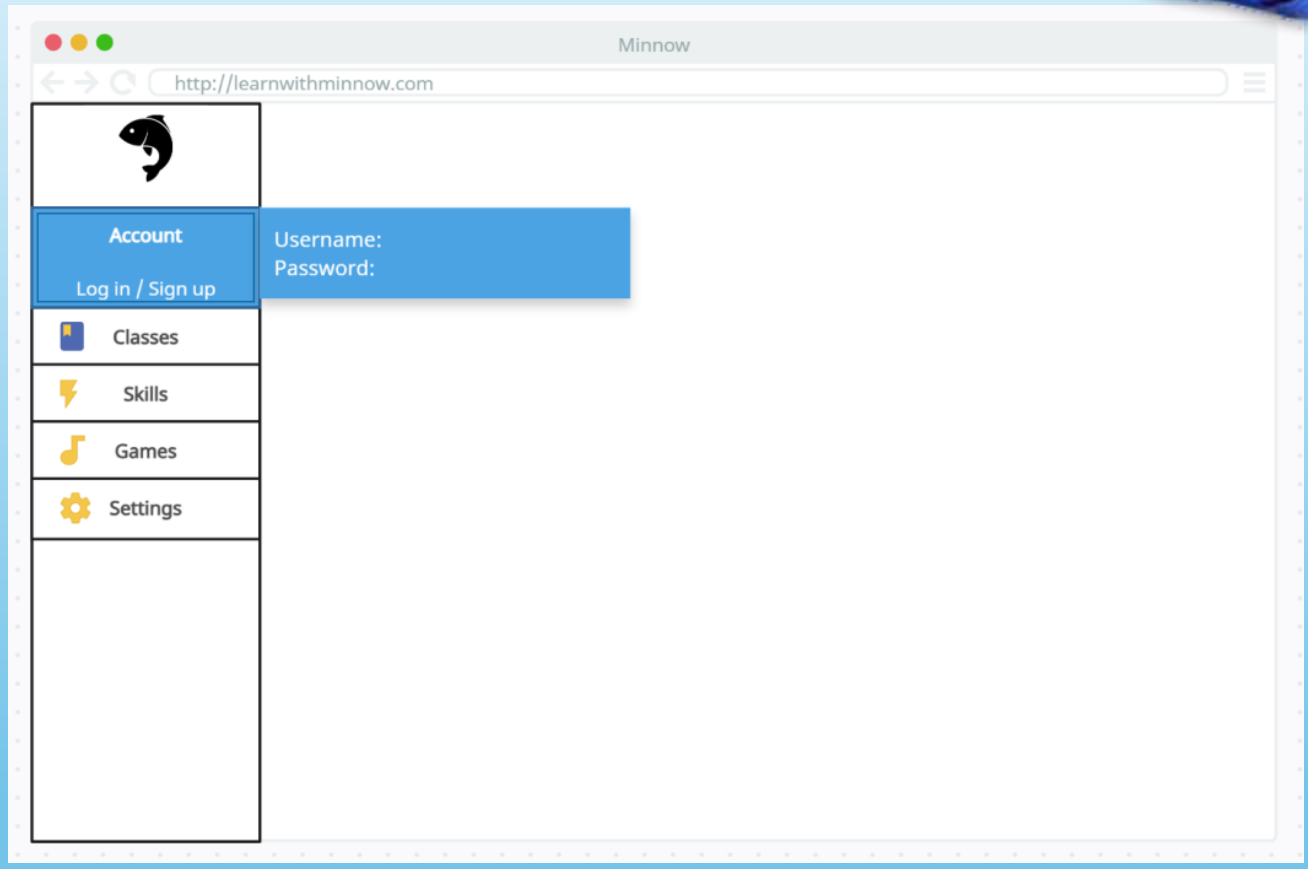


Story, The Login

After somehow remembering his password, Jon now considers which option in the Minnow's friendly menu he should choose.

Settings would let him adjust the website and courses, Games would be fun to do, and Skills would provide different subjects to work on (like in Duolingo). However, he decides that Classes should be his starting point for today.

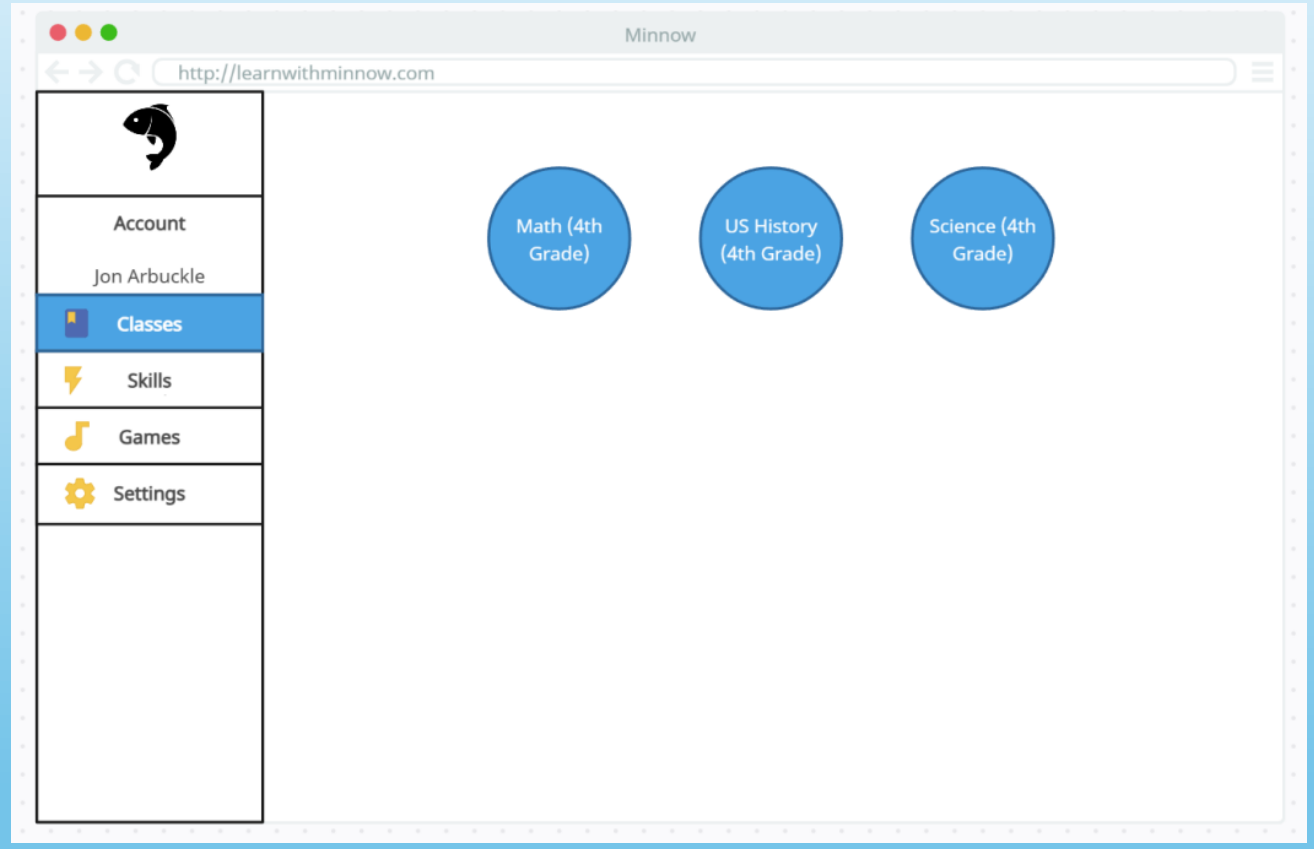
He thinks he hears a sniffing sound, so he looks up, but nobody else is around.



Story, Your Classes

Upon clicking Classes, Jon is presented with a menu between his current three courses, Math, US History, and Science (all 4th grade). He decides to select the first one, Math.

He gets the feeling he is being watched, but a quick glance reveals nothing.

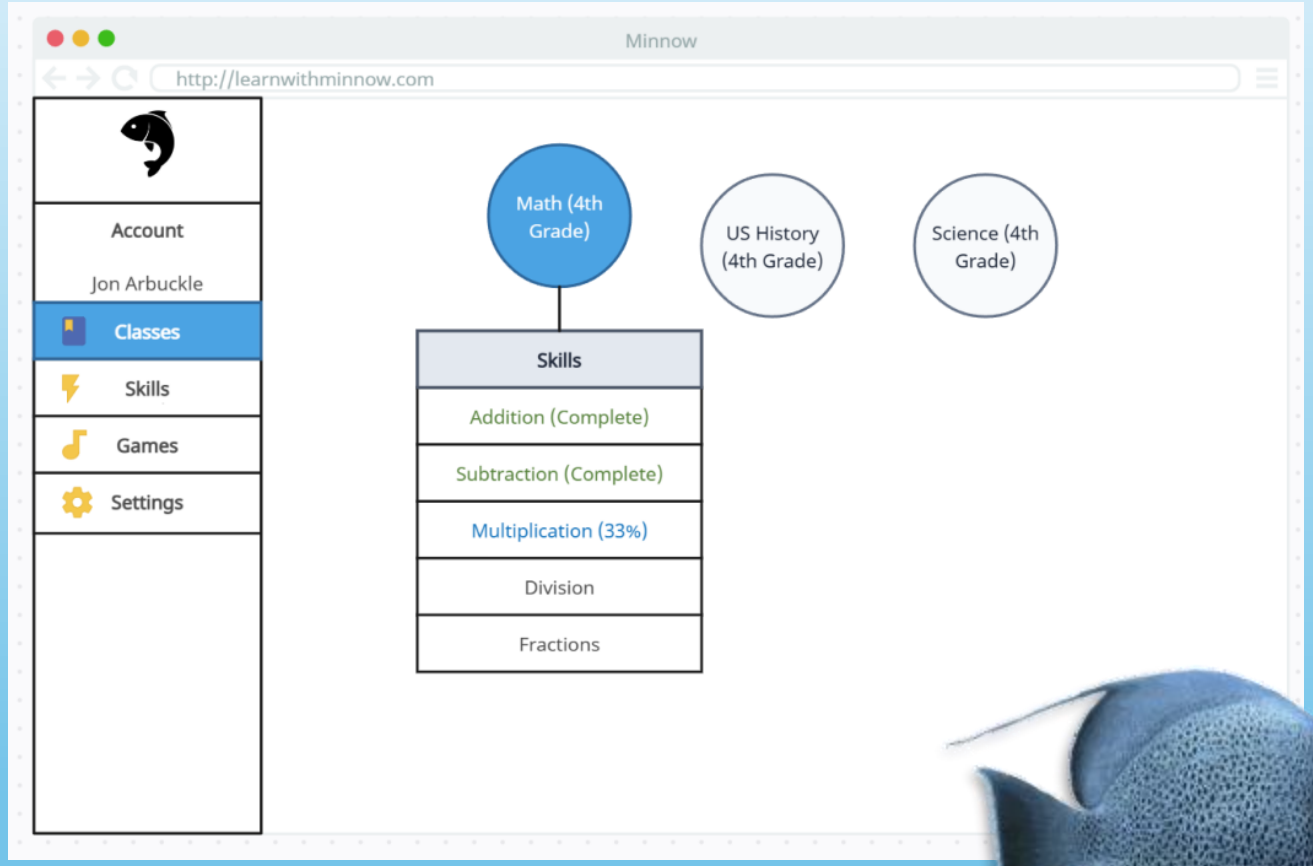


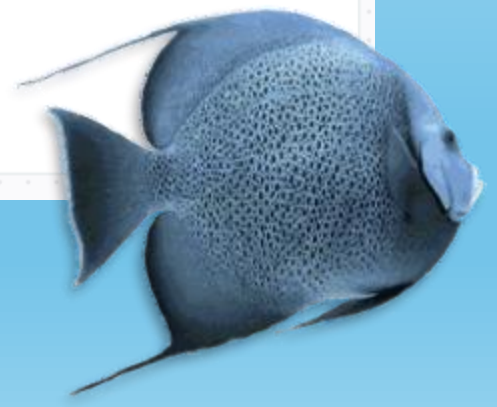
Story, Class-> Skills

Jon was able to breeze through addition and subtraction with ease, but unfortunately his expertise in multiplication has been lacking lately. He is going to choose his multiplication task this time around…. He already dreads what division and fractions will look like soon.

He hears what he thinks is a creek in the floorboards, so he whips up his head, but there is no one else in the room.

“Must be Odie in the other room,…”

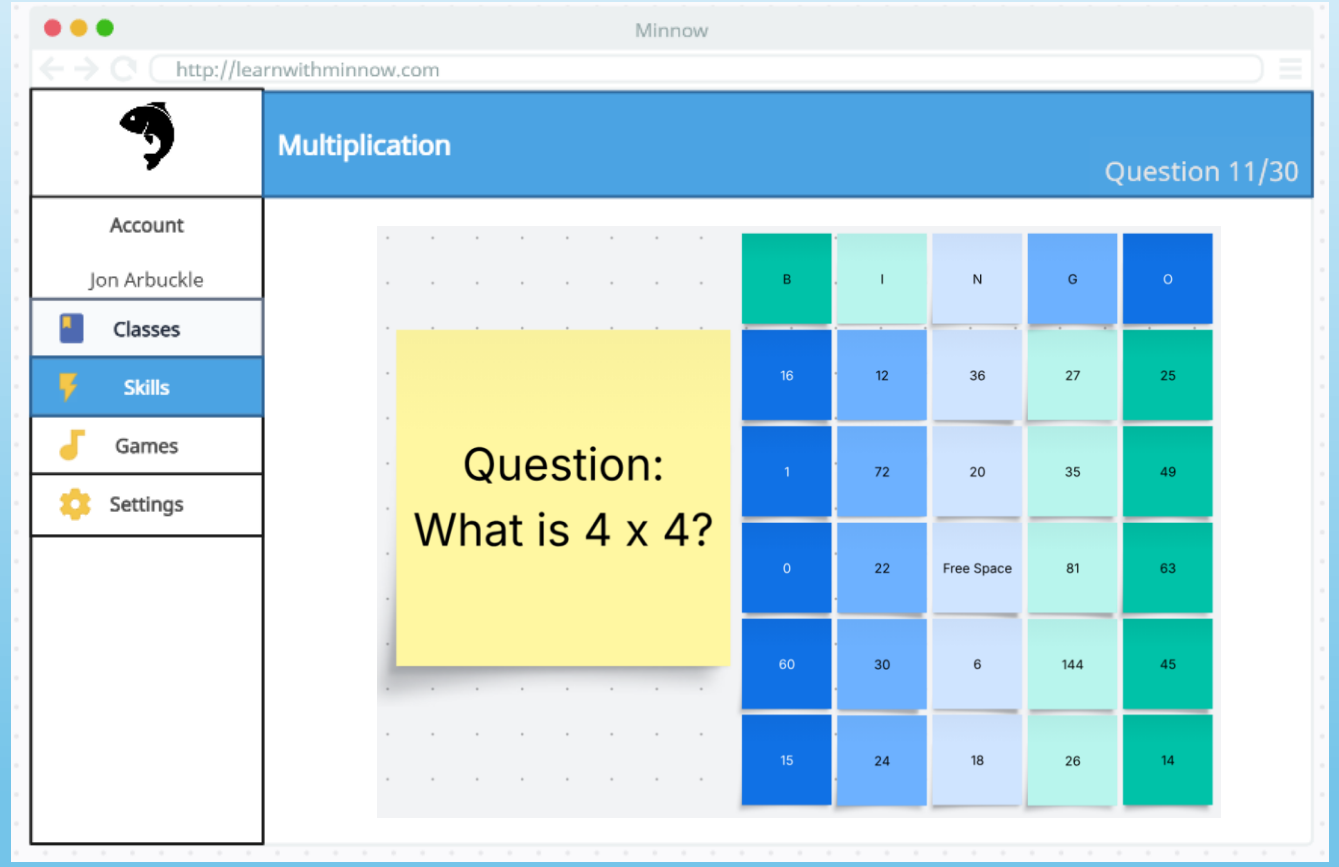




Story, Multiplication Skill

Jon is excited to work on his multiplication when he sees that he has a game lined up for this section. Its one of his favorite learning games as well… Bingo! He gets the question on the yellow sticky note correct, then the tile coordinating to the answer is marked.

He thinks he sees a flash of orange out of the corner of his eye, but he ignores it.

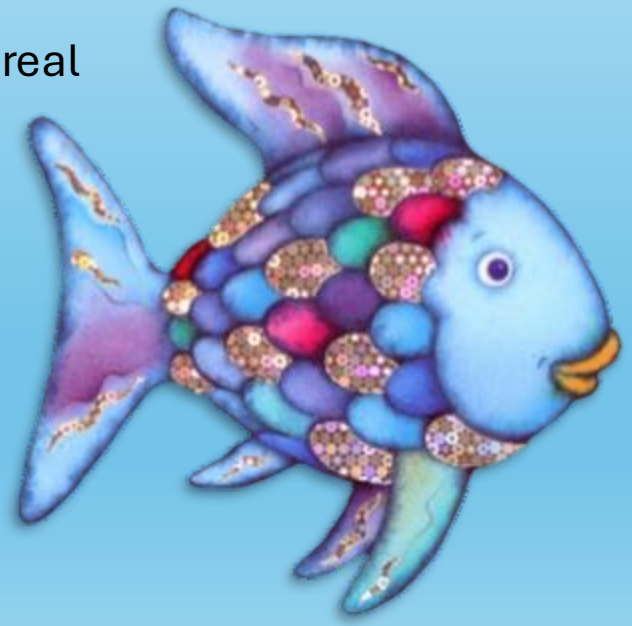


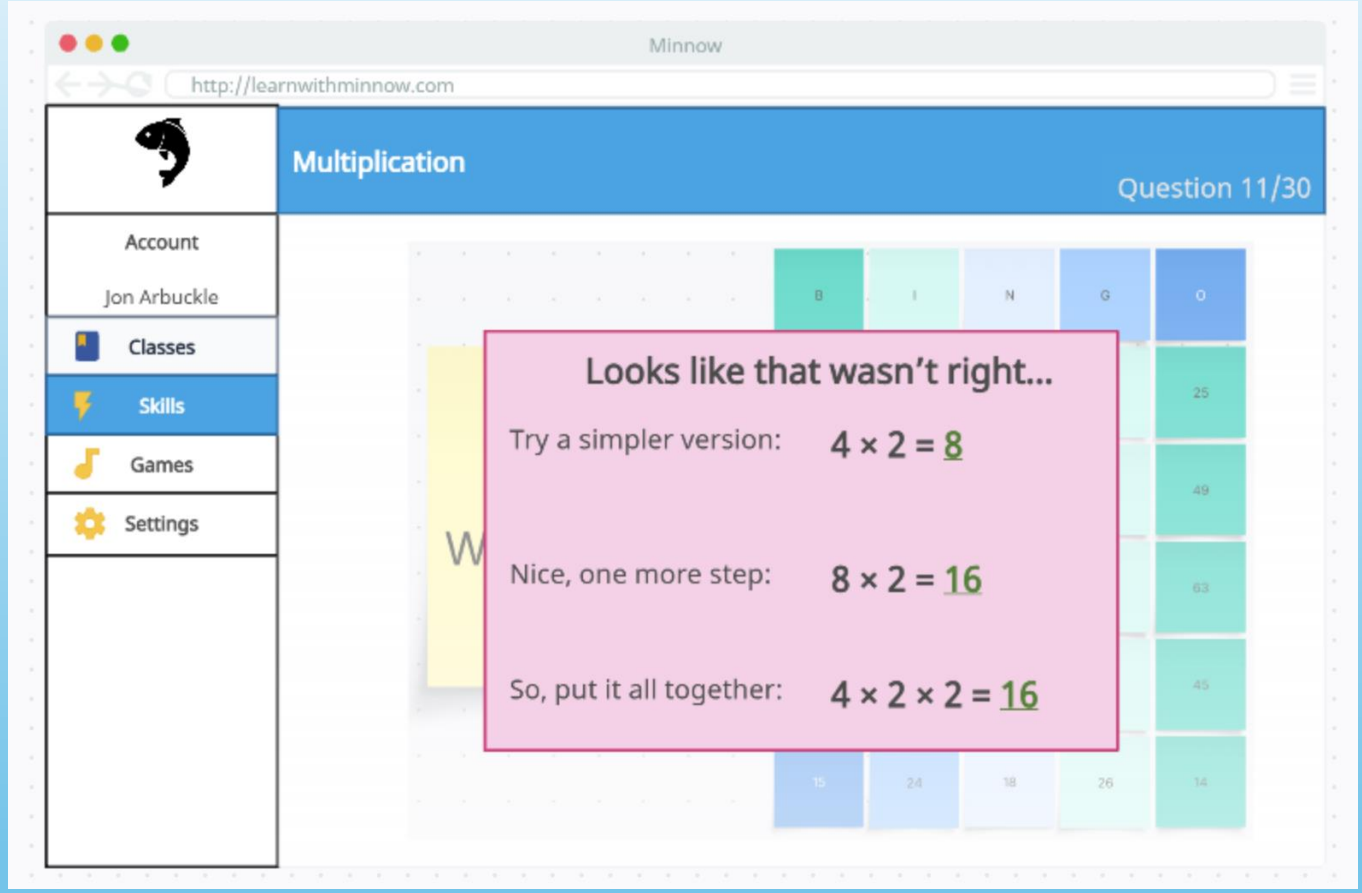
Story, The Problem

“Opps!”

Jon made a mistake. Now what is he going to do?

“That's not a real fish *Jon*...”

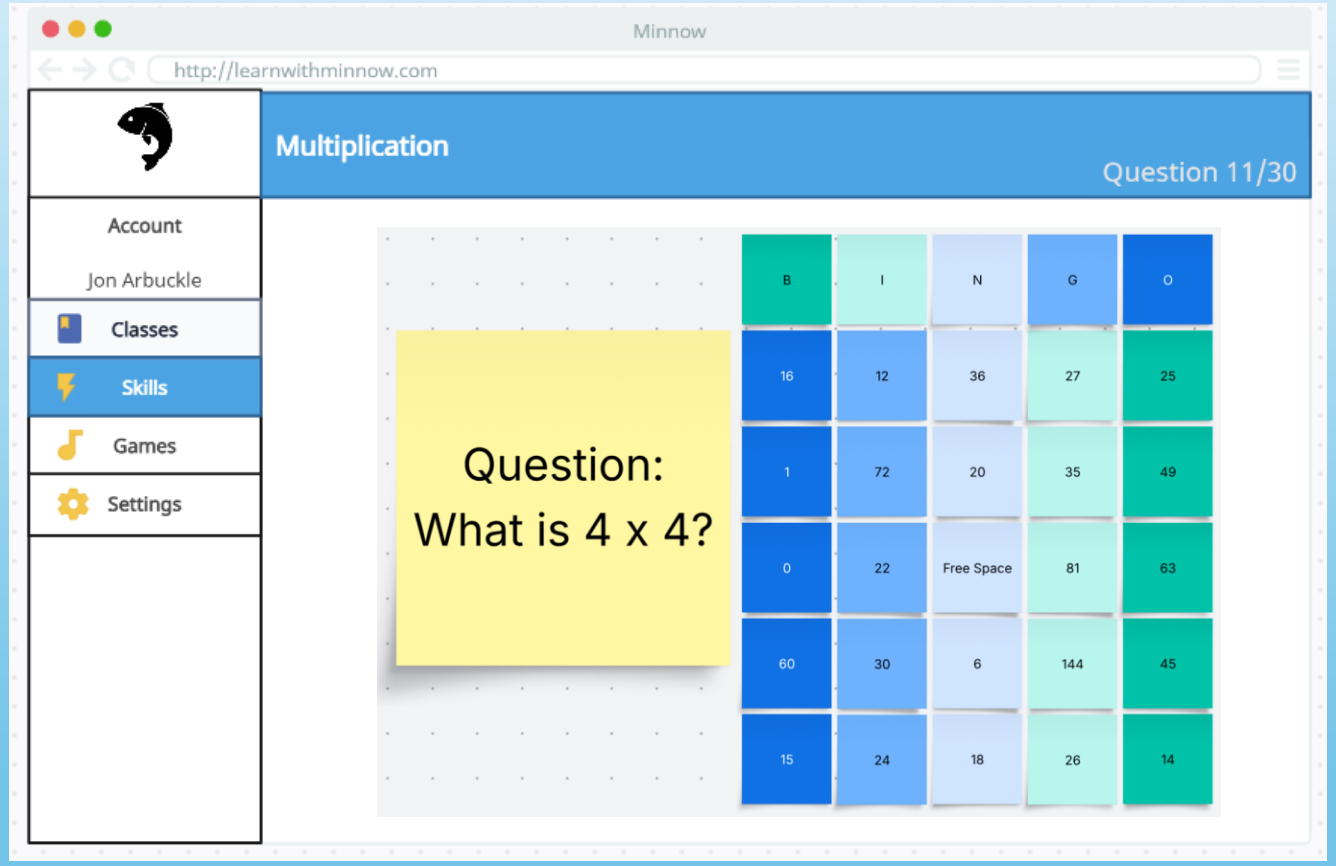




Story, Try, try again...

Jon sighs and decides to try again.

He suddenly thinks he hears a munching sound, but he ignores it, intent on solving the problem in front of him.

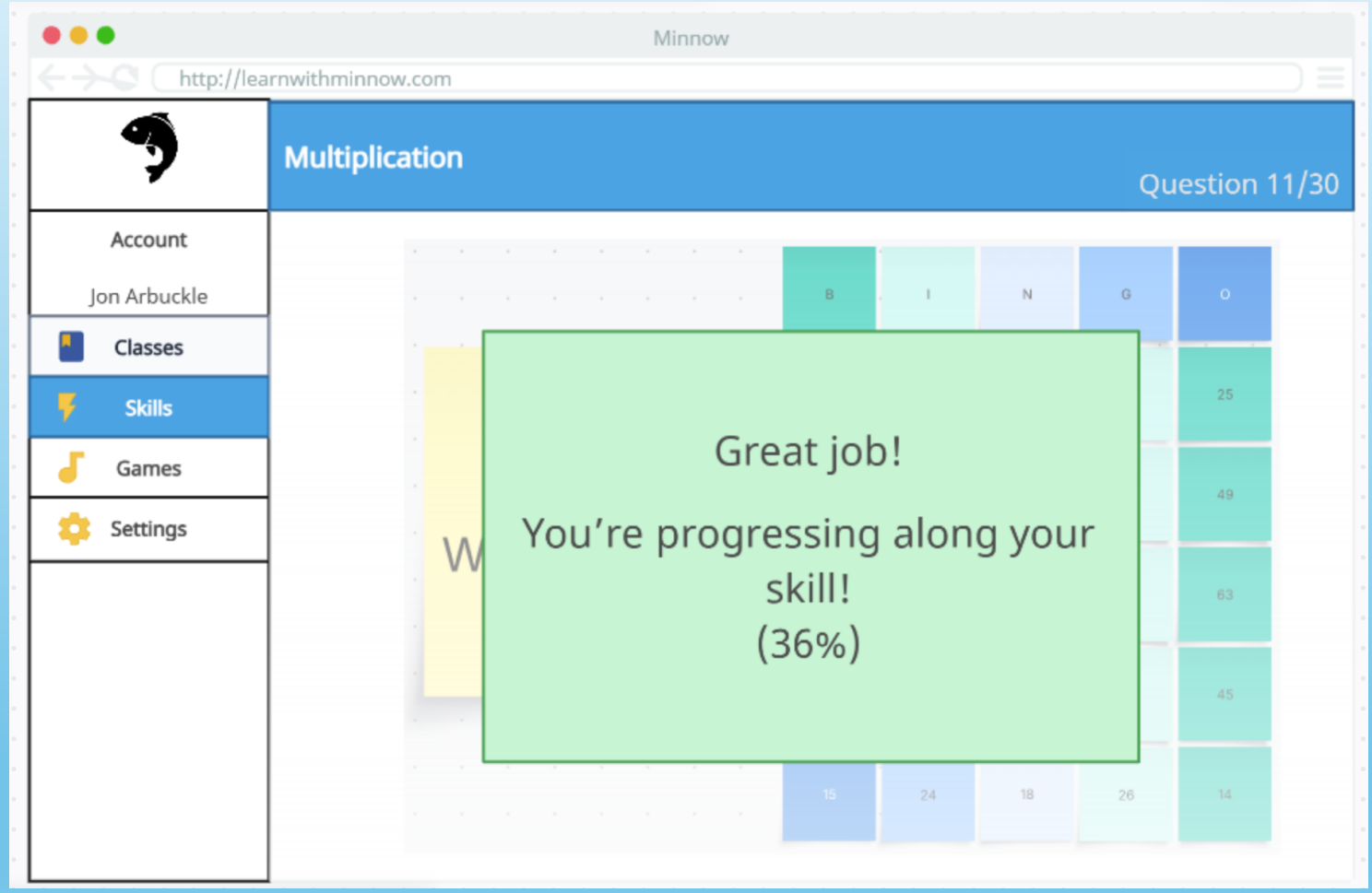


Story, He did it!

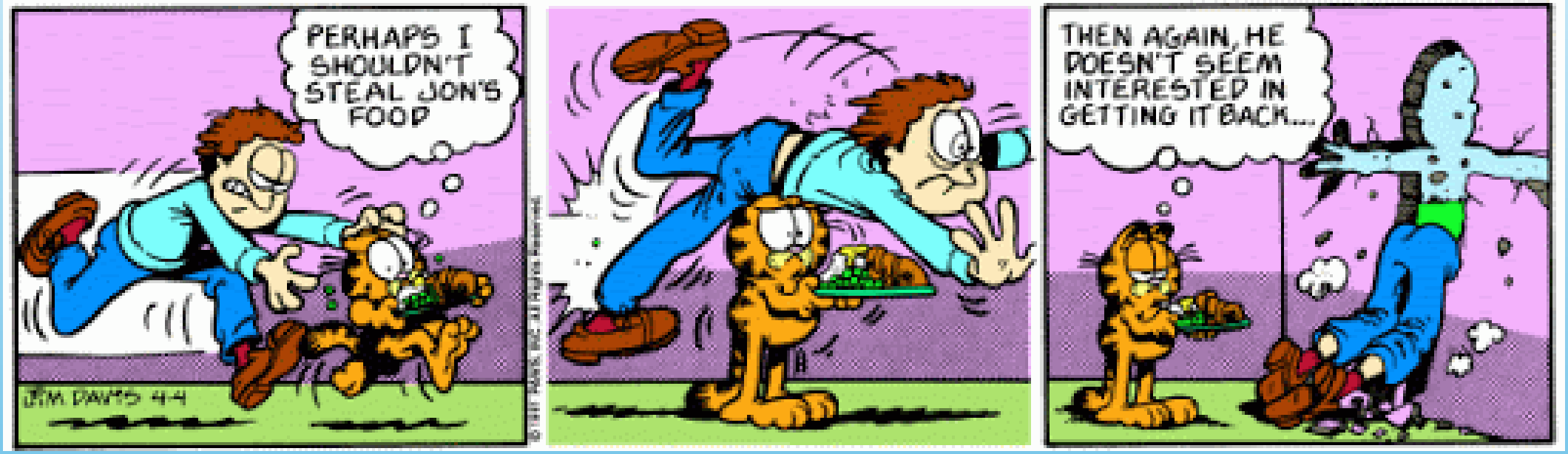
Success! He got the question right!

Happy with his work, Jon turns to his plate to enjoy some of his dinner, only to discover it's gone, plate and all.

"GARFIELD!!!"



Story, The End



Conclusion

In conclusion, our project is:

- **Bridging the Gap** - Ensuring quality education reaches all students, regardless of background or learning needs.
- **Personalized & Inclusive** - Adaptive lesson plans, accessibility features, and multimodal tools for diverse learners.
- **Engaging and Scalable** - Gamified learning, multilingual support, and the ability to facilitate custom learning paths creates a dynamic, inclusive learning environment.

Together, we're shaping the future of education — one student at a time!

So,...
What are you waiting for?

Schooling

Or...

Download *Minnow* to make schooling fun!

Thank You!

References

"Challenges of Traditional Schooling: World Schools." *World Schools - Find the Best International Schools Worldwide*, 17 Apr. 2024, https://world-schools.com/challenges-of-traditional-schooling/.

National Center for Education Statistics. *The Condition of Education 2024*. U.S. Department of Education, Institute of Education Sciences, 2024, https://nces.ed.gov/pubs2024/2024144.pdf.

Oudat, Qutaibah, and Mohammad Othman. *Embracing Digital Learning: Benefits and Challenges of Using Canvas in Education*. 06 2024, https://doi.org/10.5430/jnep.v14n10p39.

"What Is the Problem with Traditional Education Methods? - High School of America." *High School of America - High School Diploma Online | Online High School and Homeschool Curriculum*, 3 Aug. 2022, www.highschoolofamerica.com/why-traditional-education-methods-are-becoming-outdated/.

Manjaly, Stalin J. "Duolingo Accepted Universities in USA for 2024 Intake." LeapScholar, 13 Nov. 2024, https://leapscholar.com/blog/duolingo-accepted-universities-in-usa/.

"Learn a Language for Free." Duolingo, 11 Feb. 2025, https://www.duolingo.com/.

The unrealized promise of high-quality instructional materials. NASBE. (n.d.). https://www.nasbe.org/the-unrealized-promise-of-high-quality-instructional-materials/.

Do teachers think their curriculum materials are appropriately challenging for their students? findings from the 2023 American Instructional Resources Survey | rand. (n.d.). https://www.rand.org/pubs/research_reports/RRA134-21.html.

From the desk of the CEO: Changing the systems that perpetuate poverty and low literacy. ProLiteracy. (n.d.). https://www.proliteracy.org/news/from-the-desk-of-the-ceo-changing-the-systems-that-perpetuate-poverty-and-low-literacy/#:~:text=In%20the%20most%20recent%20National,of%20improvements%20among%20disadvantaged%20students.

Coe - education expenditures by country. (n.d.). http://nces.ed.gov/programs/coe/indicator/cmd/education-expenditures-by-country.

Davis, Jim. "Jon chasing Garfield for the food". *Fandom – The Parody Wikil* via Google search. 8 Apr 2025. https://parody.fandom.com/wiki/Jon_Chasing_Garfield_for_food.