NWEA Lab Application Discovery

Credential & Login Experiences for Early Elementary Students

Published Jul 31, 2023

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Executive Summary

After identifying opportunities to broadly enhance the NWEA Lab Application for K-4th grade students, the TheoremOne discovery team narrowed focus to the Application's login experience. We sought to understand how the design of the credential distribution system and product experience may better serve the needs of the early elementary audience.

The team conducted primary research through in-person and virtual interviews with students ranging from 1st-4th grade. Our interview questions and supporting design prototypes were built on prior insights around the cognitive needs, device usage, and UI/UX expectations of K-4th grade students.

This report is intended as a guide for future product teams when making design and development decisions and prioritizing backlog items.

Our findings focus on four areas of the Lab Application login experience.
1. Audience Customization
2. Accessibility & Scalability
3. Supporting Issues & Errors
4. Credential Design, Creation, and Mgmt.

Business Impact

A 2023 study of potential Ontos buyers found that a 3rd grade focused solution was of most interest. Enhancing the Lab Application with solutions for early elementary students will allow researchers to access and understand this high-value audience.

Login Experiences Research

In June and July of 2023, the TheoremOne discovery team conducted a series of interviews with 1st-4th grade students from a range of states, populations, and school districts.

The interviews explored four key lines of inquiry:

1. What are students' current experiences with credentials and logins?
2. What are successful design approaches to providing new credentials to students?
3. What are efficient and approachable user experiences for students to login?

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4. How do you best support students in solving login issues?

Process

Design Prototype Development

The discovery team used the design principles and user needs found in <u>our previous research</u> to guide the creation of a series of design prototypes. These prototypes explored three potential login solutions for early elementary students: *a Number Pin, Pattern Pin, and Symbol Pin*. We also designed corresponding credential information cards in order to test the entire student experience.
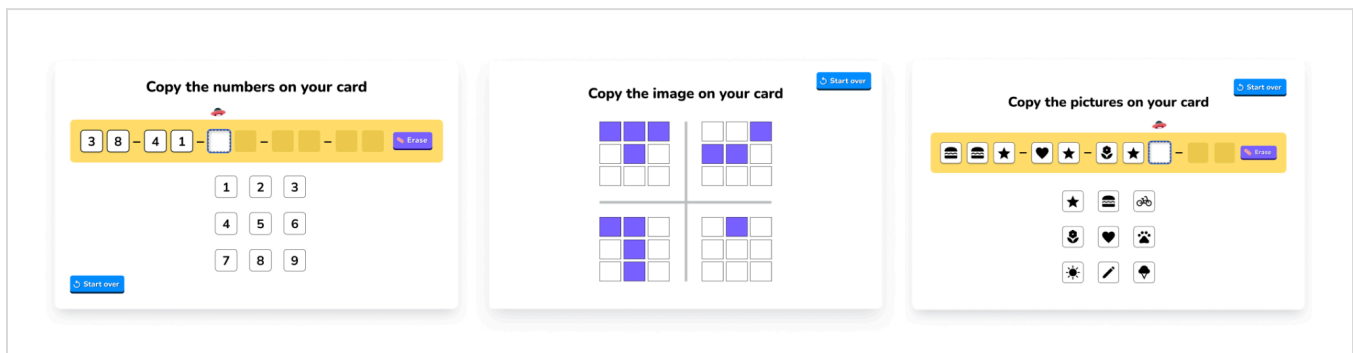
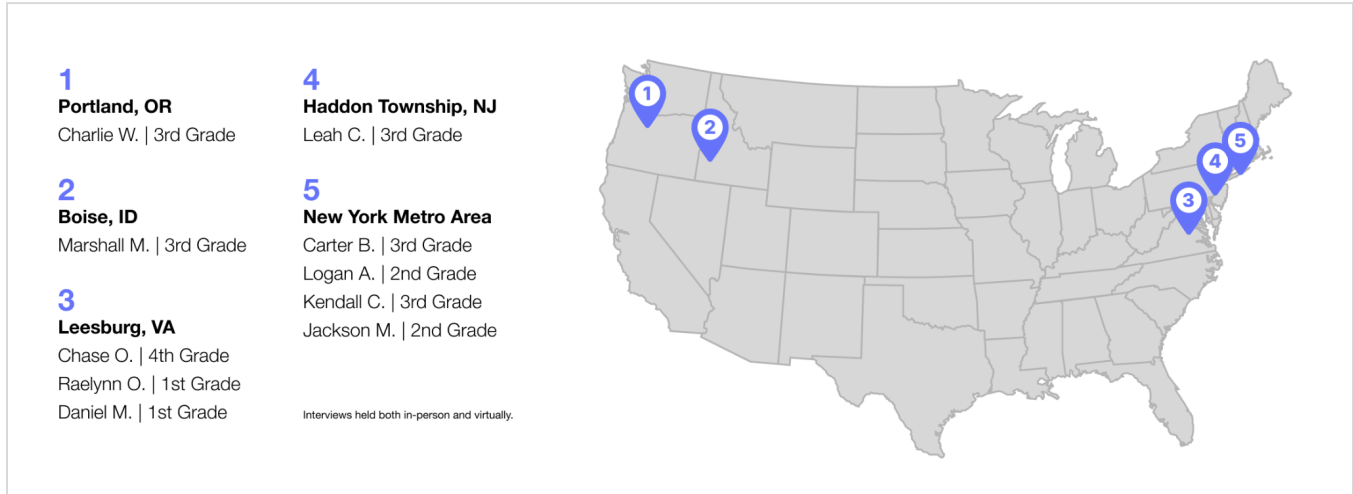**Image:** Interactive login prototypes: *Number Pin, Pattern Pin, Symbol Pin.*
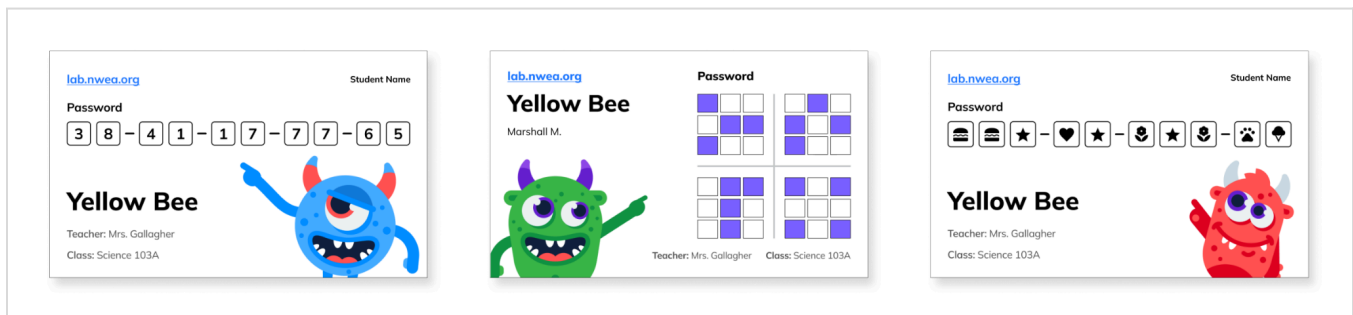
Image: Credential information cards. A series of iterations were tested with students to find the most effective layouts and print sizes.

Note: Our prototypes did not explore the use of QR code scanning. Although this is a strong solution for early elementary logins, considerations such as varying camera capabilities, credential management requirements, and the need for backup login methods led the team to focus on other options.

Primary Research: Student Interviews

We held a dozen interviews with students to understand their experience with logins and test our design prototypes. The goal of these interviews was to find the most effective interface and user experience out of our proposed solutions and identify best practices.

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The first round of interviews focused primarily on older students (3rd-4th grade). Our second round was split between interviews with younger students (1st-2nd grade) and follow-up conversations with older students (3rd-4th grade) previously interviewed. This allowed us to identify nuance between age groups and validate design iterations.

1
Portland, OR
Charlie W. | 3rd Grade

2
Boise, ID
Marshall M. | 3rd Grade

3
Leesburg, VA
Chase O. | 4th Grade
Raelynn O. | 1st Grade
Daniel M. | 1st Grade

4
Haddon Township, NJ
Leah C. | 3rd Grade

5
New York Metro Area
Carter B. | 3rd Grade
Logan A. | 2nd Grade
Kendall C. | 3rd Grade
Jackson M. | 2nd Grade

Interviews held both in-person and virtually.

Interview Results Overview

Our interviews focused on a number of product suitability and usability questions, including students' initial reactions and familiarity with our designs, the speed at which they completed tasks, the amount of errors committed, and how they approached editing mistakes. The resulting insights served as the foundation for our final recommendations.

Familiarity with Proposed Designs

The interviews aimed to understand which of our proposed designs felt the most familiar to students. The goal was to find a solution that was most welcoming and efficient.

1
Number Pin
HIGH FAMILIARITY

Uses paradigms students are most accustomed to in current login systems.

3rd+ grade students felt this was most age appropriate as they are starting to use numbers regularly.

2
Pattern Pin
LOW FAMILIARITY

Design and interaction was completely new to students in a login context.

Students found this solution the most entertaining and interesting but viewed it more as a game than a login, which can limit efficiency.

3
Symbol Pin
MED / HIGH FAMILIARITY

While the symbol content may not be traditional, the interactions felt familiar.

K-2nd grade students gravitated most to this visual language, and 3rd+ graders backed up that symbols could work well for younger literacy levels.

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Time to Completion and Errors

Our prototypes also aimed to test the speed at which students finished each login. The discovery team sought to understand how the interface, interaction approach, and layout contributed to speed and errors.

1

Number Pin
FAST | LOW ERROR

Students felt very comfortable with this approach and completed the login faster than any other option.

The pin length, chunking layout, and number content all contributed to this.

2

Pattern Pin
MODERATE | LOW ERROR

Students made few errors in completing the login but worked at slower speeds.

The input being non-linear, with a lot of user freedom, meant students had less guidance and could take many approaches to completion.

3

Symbol Pin
FAST | LOW ERROR

Students completed this login quickly but slightly slower than the Number Pin.

Some of this slight delay in speed may be due to the clarity of the icons and length of the pin – both of which can be explored in further rounds.

Recommended Solution

Number & Symbol Pin: Hybrid Approach

We found that a hybrid solution of the *Number Pin* and *Symbol Pin* was the strongest approach. To make this final decision we focused on three pieces of criteria:
1. Which is most efficient and approachable?
2. Which provides the best options for accessibility?
3. Which is most scalable and sustainable for development?

Both designs use familiar credential paradigms and were completed the fastest. This approach also accounts for the nuanced literacy needs between 1st-2nd grade and 3rd+ grade students, while remaining low-lift from a development perspective.
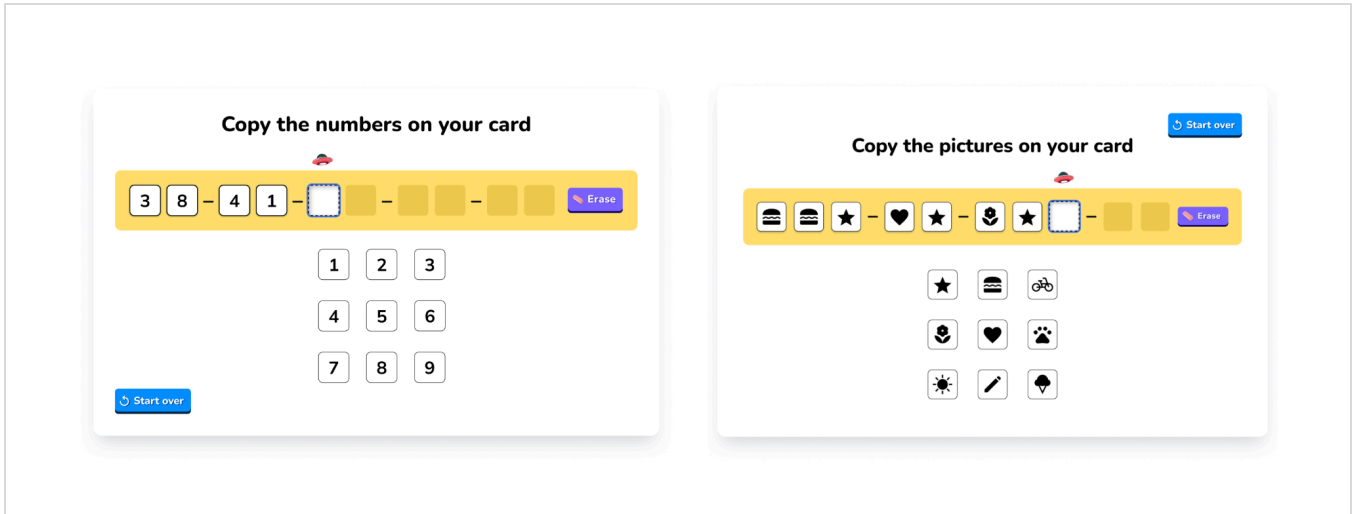
Image: The *Number Pin* and *Symbol Pin* are built on the same interface but allow for age appropriate content to be customized.

Interview Findings and Design Recommendations

The discovery team identified a number of insights to further guide final design and development. Our findings are organized into four areas:

1. Audience Customization
2. Accessibility & Scalability
3. Supporting Issues & Errors
4. Credential Design, Creation, and Mgmt.

Each of these areas has a series of user needs with corresponding insights, illustrations of proposed solutions, and potential next steps. The findings are not only valuable to the growth of the login experience but may also be leveraged to augment the overall product for new student audiences in the future.

1. Audience Customization

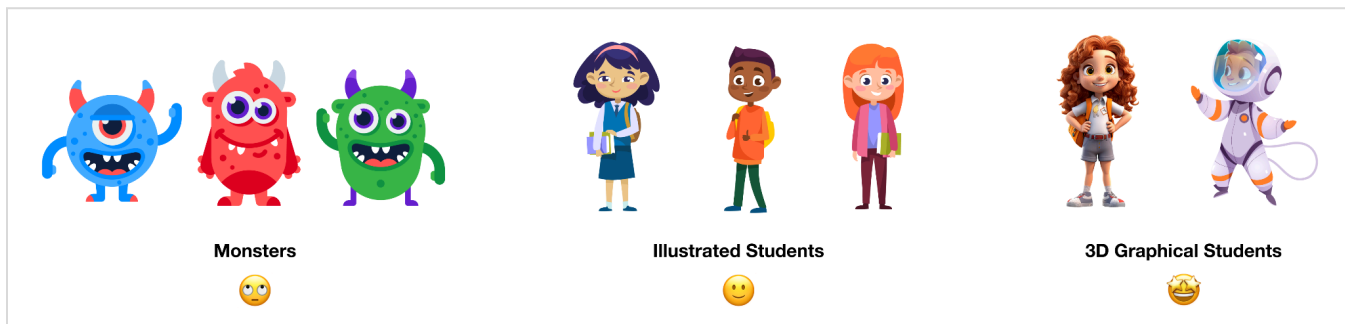### 1.1 Students need the experience to feel welcoming from the start.

What We Found

The student experience is an assessment first and foremost, which will inherently pose engagement challenges. Finding strategic design moments to provide a welcoming experience can create a more comfortable foundation and help mitigate polarization.

Options to Explore

1. Customizable visual themes.
   - Backgrounds
   - Characters
   - Typography & Color
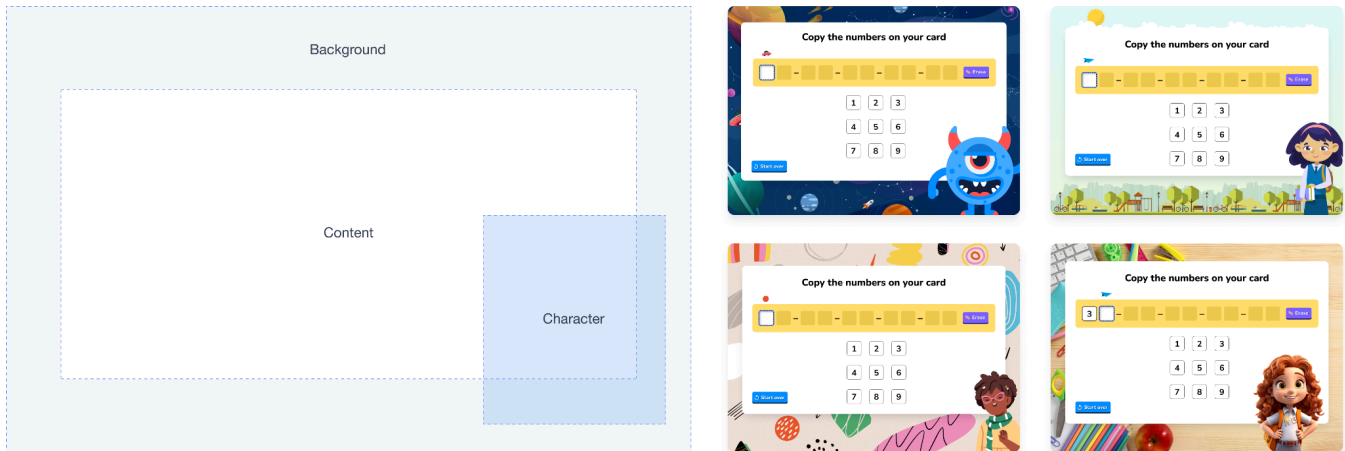
Image 1.1 Visual themes and graphics were a major driver in students having a welcoming experience. Students selected a range of characters and backgrounds as their favorite, which reinforced the need for a modular layout and flexible design compositions. The continuity between visual themes and the interfaces proved to be successful and has room to grow. For example, a student suggested using space-themed symbols in the *Symbol Pin* interface. Several participants gravitated toward the space theme and suggested using an astronaut character.

Image 1.2 The use of characters was a successful design tactic and made students feel welcomed by the experience. Students favored the 3D "Pixar-esque" illustration style and showed a preference toward complex graphics. The majority of students thought the *Monster* characters were "too childish" and better suited for a younger audience in the K-1st grade range. Students related more to human characters but it's recommended to use more identity agnostic character-types to avoid underrepresented demographics.

Further Considerations & Next Steps

1. Theme solutions should be low lift and scalable from a development perspective.
2. Continue testing the success of different themes as there is nuance between age groups.
3. Visual solutions, especially character design, need to be accessible from an identity perspective. For example, using illustrations of human characters is a challenge as they do not represent the full audience and may not connect to the student individually.

1.2 Students need the UX & UI to be clearly segmented between K-2nd grade and 3rd+ grade.

What We Found

Our interviews found that K-2nd and 3+ grade students had different needs and expectations around credential content. Younger students gravitated toward the visually driven content of the *Symbol Pin* and *Pattern Pin*, where older students felt the *Number Pin* was more age appropriate as they are using numbers on a daily basis.

Options to Explore

1. Consistent UI/UX with customizable content.
    ○ A *Number Pin* experience for 3rd+ grade students
    ○ A *Symbol Pin* experience for K-2nd grade students
    ○ Suite of character styles
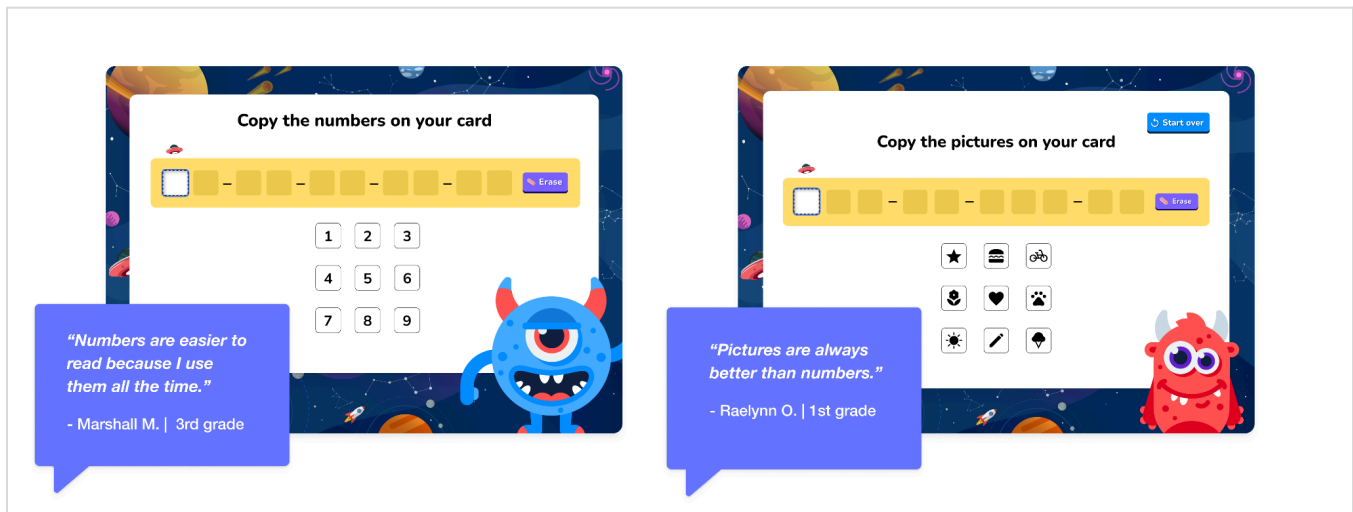
Image: 1.3 The design approach of the credential content became a key factor in usability. Older students were generally faster with the *Number Pin*, whereas younger groups were fastest using the *Symbol Pin*. The solution each student group verbally confirmed as their preference mirrored these results.

Further Considerations & Next Steps

1. Solutions must be scalable and repeatable for both development and credential management.
2. Student literacy levels must be understood and acknowledged as content types are created.

2. Accessibility and Scalability

## 2.1 Students need a range of interaction options for each input.

What We Found

Interviews showed that students expected a wide variety of input types when tasked with logging in. The design of our prototype focused on clicking buttons to make selections, but most students first attempted dragging and dropping characters into the blank field. Many others tried to type as an input for the *Number Pin* in particular*.*

Students consistently showed that they are capable of quickly switching to new input interactions when one method did not work. Overall, most students did not rank one option over another but did call out that the variety would be helpful — as all students have different needs. The *Pattern Pin* was the most limited in terms of interaction options.

Options to Explore

1. Variety of credential input options:
   - Typing, clicking, drag and drop, keyboard navigation
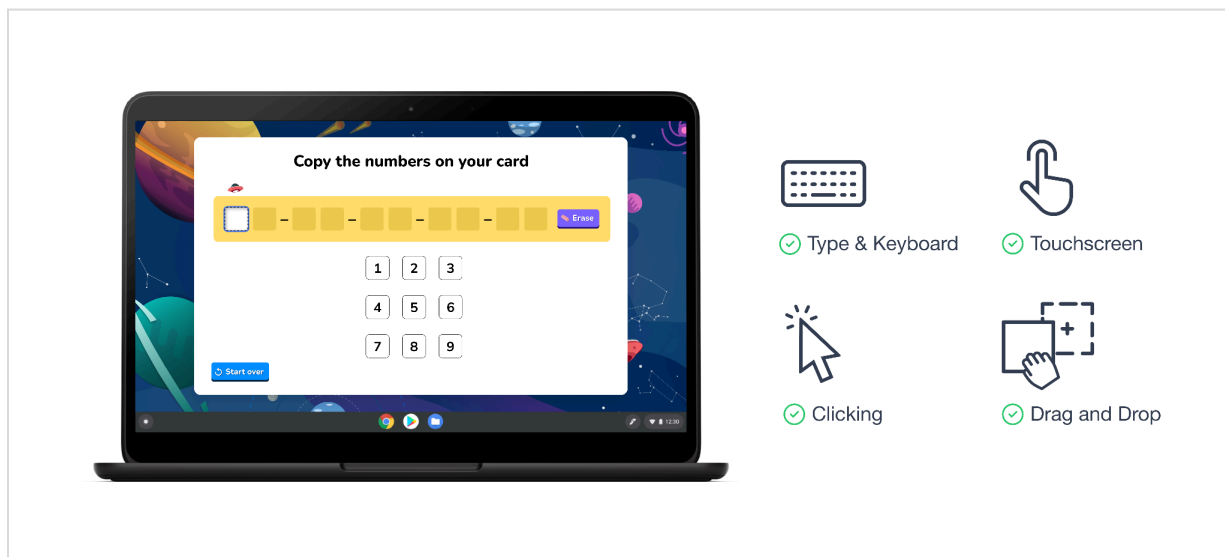
Image 2.1 Students tried many input options when using the *Number Pin* — shown above. The *Number Pin* offers the widest variety of interactions and is the most WCAG compliant, as it allows for typing, clicking, and keyboard navigation. Several students tried the drag and drop gesture with the *Number and Symbol Pins,* but expressed that the length of the pins would be tedious to complete.

Further Considerations & Next Steps

1. Explore how audio can also be a tool for inputs and outputs.

2.2 There needs to be potential for design scalability across device types.

What We Found

Researchers must be enabled to reach wider student audiences moving forward, this means being device agnostic where possible. Research shows that early elementary is a transitional time for the devices students use. This was validated in our interviews with a clear line being drawn from K-2nd grade students primarily using tablets and 3+ graders using laptops.

Options to Explore

1. UI/UX decisions should be prioritized by how well they function on both tablet and desktop.

Further Considerations & Next Steps

1. Research and interviews show that students predominantly use Chromebooks but solutions should be as responsive as possible.

2.3 Foundational UI & UX decisions should default to the youngest student group.

What We Found

Designing for such nuanced audiences can be a challenge. Factors such as cognitive abilities, literacy levels, and comfortability with technology change rapidly across early elementary students. Making UI/UX choices that work well for the audience who need the most support can bring success to all.

Options to Explore

1. UI, interaction, language, and overall layout decisions built around K-2nd grade needs.
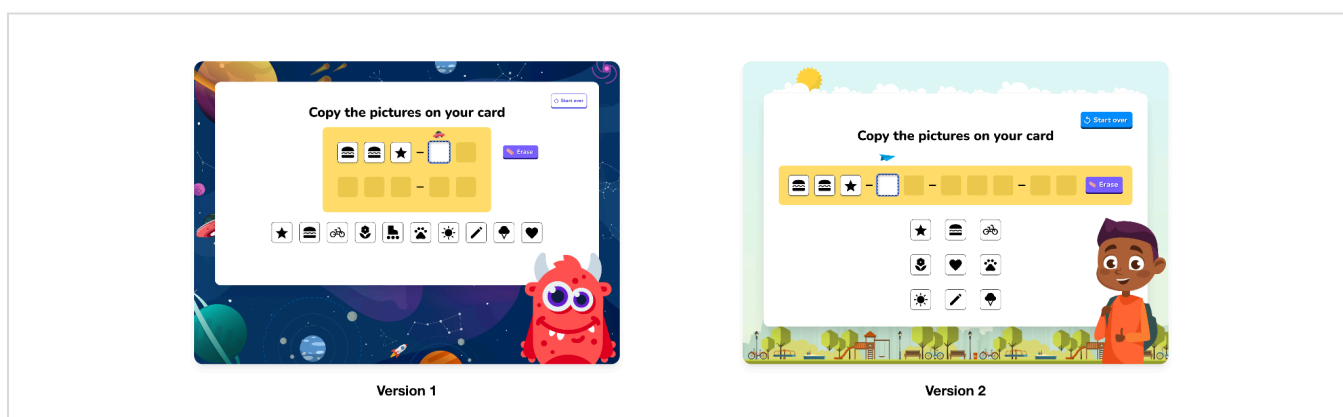
Image 2.3a The first round of testing showed 90% of students did not understand the chunking design of *Symbol Pin V1*. To address this, the second iteration was simplified to a single line field to clarify the input order. First iterations of the *Erase* and *Start Over* buttons were too subtle for students and were often missed altogether. Further iterations increased the size of the buttons, changed fill styles, and adjusted their placement to be more noticeable.

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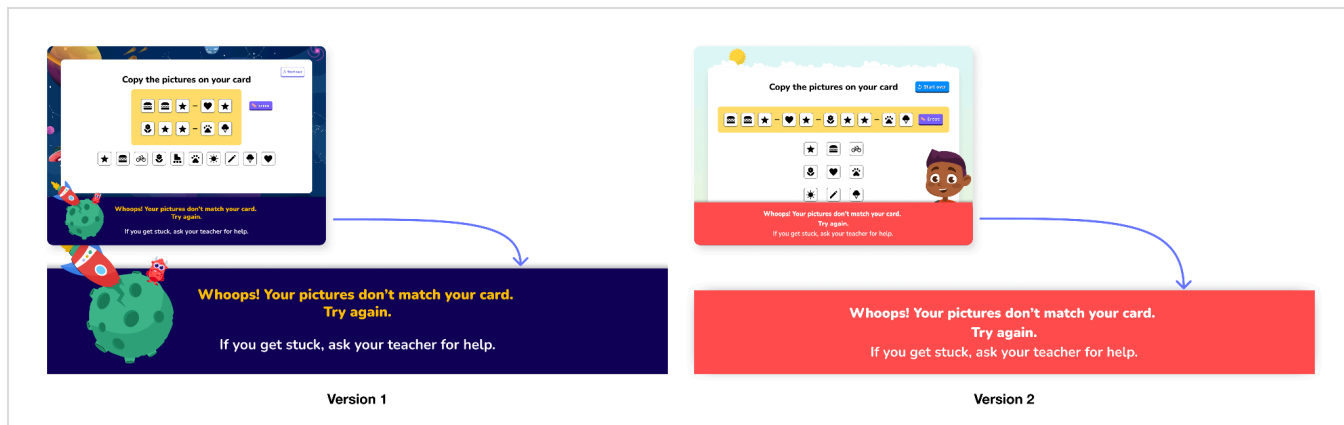
Image 2.3b The majority of students did well with comprehension of the error message. The current language is gauged to be around a K-2nd grade reading level and uses a friendly tone to feel more approachable. Students enjoyed the illustrations which reinforced the impact of visual themes on usability.

The message was placed at the bottom of the screen, versus as a pop-up window, to gain attention without requiring students to complete cumbersome steps (such as dismissing a window). Some students were unsure if they could interact with the message which led to the suggestion of an optional dismissal of the error notification.

The first design iteration used cool, dark, colors which made some students gloss over the information. To address this, the type and background colors were updated to be more vibrant. A subtle animation was also added to bring more attention to the message as it entered the screen.

Further Considerations & Next Steps

1. The nuanced expectations of different age groups are still important to consider here. Interviews showed that while interactions that work well for younger students will also be highly usable for older students they do not want to feel patronized by overly juvenile design.

3. Supporting Issues and Errors

3.1 3rd+ grade students expect more complex erasing options, where K-2nd graders need a singular option that is focused and simplified.
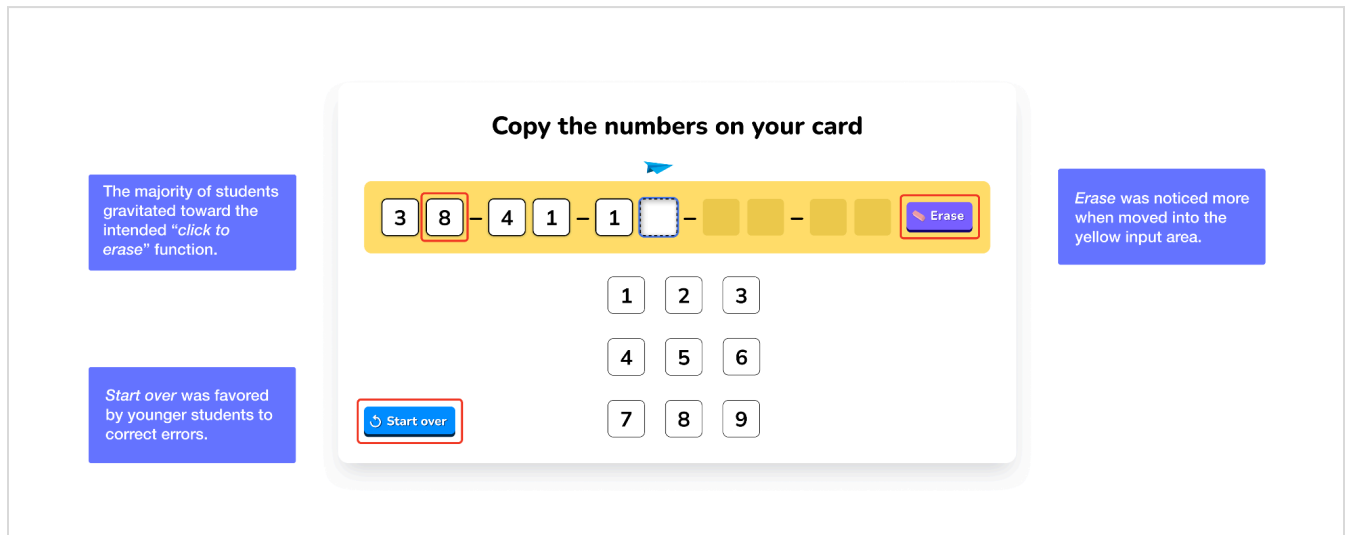
What We Found

Our prototypes tested multiple approaches to correcting input mistakes. These ranged from more abstract (clicking a field to remove its content) to more literal (clicking a *Start Over* button). Older students did not use the *Start Over* button and stated they need more exact control. Younger students struggled with more nuanced erasing options and gravitated toward the simplicity of the *Start Over* option.

Options to Explore

1. Create a variety of editing options that can be configured based on audience.
   - Traditional *Erase* button
   - Selection and deletion functionality

- ○ Click field to delete
- ○ Overarching *Start Over* button

The majority of students gravitated toward the intended "*click to erase*" function.

Erase was noticed more when moved into the yellow input area.

Start over was favored by younger students to correct errors.

Copy the numbers on your card

3 8 – 4 1 – 1 ☐ – ☐ ☐ – ☐ ☐   Erase

1 2 3
4 5 6
7 8 9

Start over

Image 3.1 About 70% of participants understood the functionality of clicking an inputted number or symbol to erase. All buttons were better received and noticed when the size was increased. The *Erase* button was quickly understood and used the mental model of a physical eraser often used in classrooms. Buttons were noticed by students more when a solid filled style was used.

Further Considerations & Next Steps

1. Continue testing in a fully developed environment. The current prototype is limited in its interactivity and can not execute all proposed editing options.
2. Consider a hover state including an eraser on the filled answer tiles to further indicate UI behavior.

4. Credential Design, Creation, and Mgmt.

4.1 Students need a visual connection between the credential card and on-screen experience.

What We Found

Interviews showed that using the same visual language and logical flow on the digital experience and physical card made logging in more efficient. Students found this mental bridge helpful when connecting the instructions on screen with the information on their card.

Options to Explore

1. Utilize consistent character design on card and on screen.
2. Design card layouts to match the order of operations of the task and follow student reading paradigms (left to right, top to bottom).

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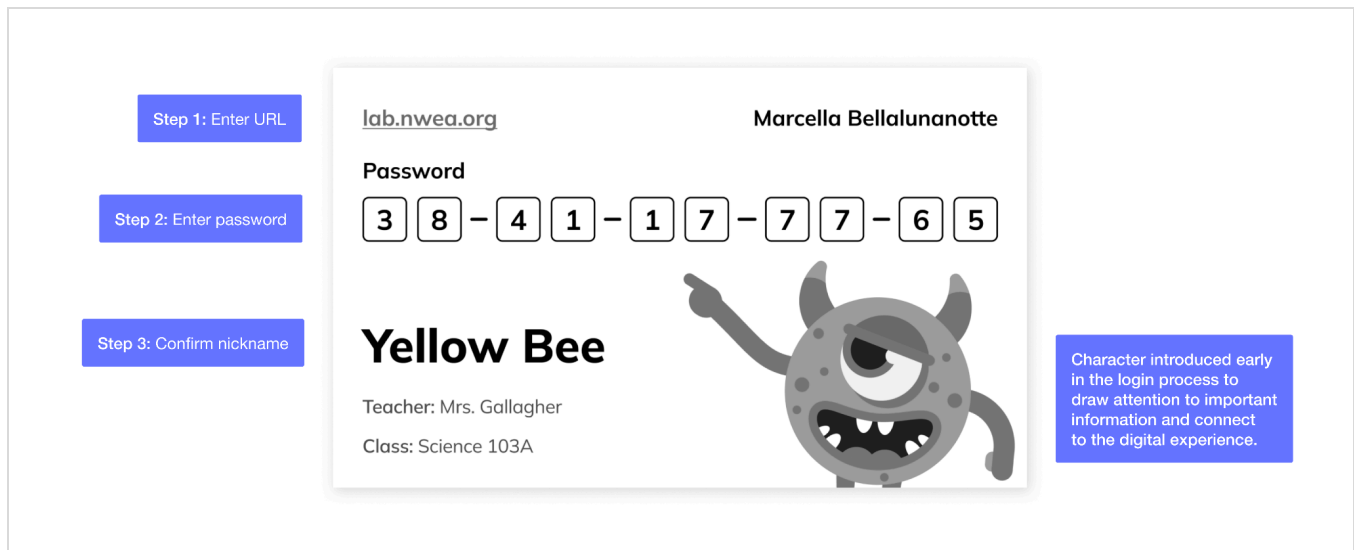
Image 4.1 Cards were designed with the goal of optimal scannability for both students and teachers. Students made strong connections between the character on the card and on-screen, which helped with efficiency and reinforced the effect of visual themes. One out of the ten students was distracted by small differences between print and screen (*the monster is pointing on the card but not on the screen*). Other students noticed and commented on the slight variants but were not hindered by the differences.

Further Considerations & Next Steps

1. Further research is needed to confirm the credential creation process can support new imagery and layout.

4.2 Card design must balance student legibility needs with teacher distribution needs.

What We Found

Students have particular design needs that need to be met to create strong legibility and readability. Alongside this, teachers need to be able to print multiple cards on a single page, reduce ink usage where possible, and spend little time cutting cards out.

Options to Explore

1. Printing 6 cards per page at 2.5" x 4.25".
2. Use larger type sizes than traditional body copy for credential information.
3. Make "teacher only" content small to not distract students from tasks.
4. Be considerate of how imagery works in black and white.

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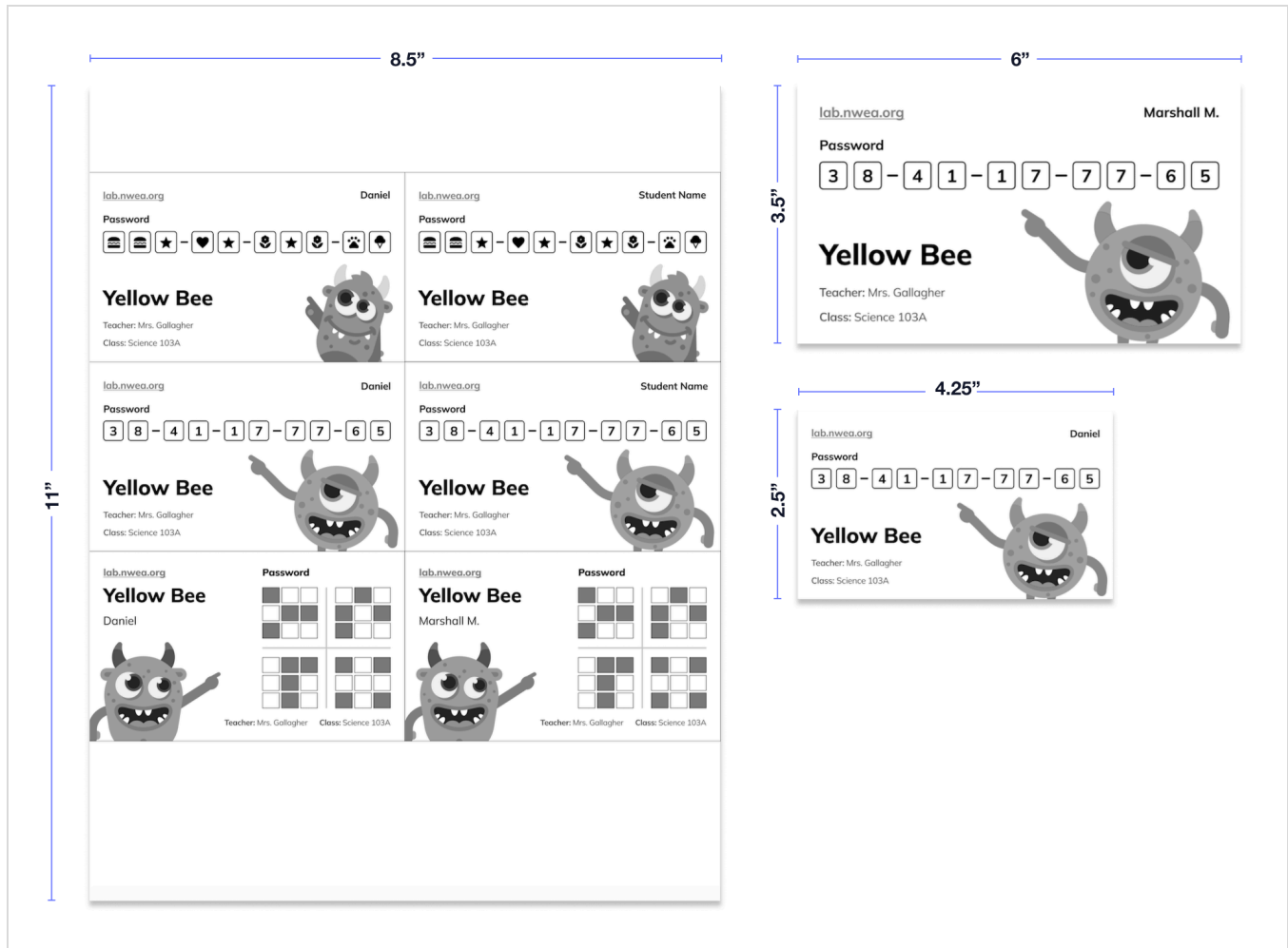
Image 4.2 Two card sizes were tested, shown above. Students found both options readable and were able to log in efficiently using the smaller print option. The design used larger type sizing and heavy weights for important student information (*nickname* and *pin*) which became notably important on the smaller scale card. Distribution information used to share credentials and troubleshoot issues (*student name, teacher,* and *class*) remained clear at smaller sizes.

Further Considerations & Next Steps

1. Test with teachers to get their perspective on ease of distribution and thoughts on readability.

4.3 Researchers need to select from multiple experience options when generating credentials.

What We Found

The current credential generation process must be redesigned to provide the ability to customize content.

Options to Explore

1. UI driven restructure of the credential creation workflow.
2. API driven restructure of the credential creation workflow.

Link: An illustration of the proposed workflows can be found [here](#).

Further Considerations & Next Steps

1. Continue validating the needs of the NWEA research team. Both proposed options address the need to choose from multiple templates but also aim to address broader researcher pain points – these need to be defined and validated further.

Moving Forward

Student Usability Testing

- Testing proposed designs in a fully developed environment to study more complex interactions.
- Conducting further suitability interviews with youngest student groups (K-2nd grade).
- Refining and evolving proposed designs based on resulting findings.

Primary Research with Teachers

- Conducting interviews with teachers as subject matter experts on proposed solutions.
- Refining and evolving proposed designs based on resulting findings.

Exploration of Credential Creation Workflows

- Conducting further interviews with researchers to validate their pain points.
- Developing technical prototypes of proposed solutions.

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Appendix

Phase 1 Research Report

1. *[Design Enhancements for Early Elementary Students | Phase 1 May '23](#)*

Prototypes and Designs

1. *[NWEA K-4 Login: Q2 '23](#)* - *Figma*

Interview Synthesis Board

1. *[NWEA Lab Application | Early Elementary Login Research '23](#)* - *Miro*

Credential Mgmt. Workflows

1. *[Credential Creation Process](#)* - *Miro*

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