JOHNS HOPKINS
SCHOOL of EDUCATION

Center for Research and Reform in Education

ALAN J. REID, PHD
STEVE ROSS, PHD

MARCH 2024

KneeBouncers

INSTRUCTIONAL DESIGN REVIEW

KNEEBOUNCERS

INTRODUCTION

KneeBouncers' educational games are designed for children ages 1 to 5 years old. The interactive learning platform is designed to strengthen foundational skills and to stimulate early learners through play-based developmental learning and game play. The serious games are age appropriate and are designed to spark kids' curiosity and creativity, exploration of the world, social understanding, communication skills and movement. There are more than 100 KneeBouncers games, developed with the help of Pre-K and Kindergarten teachers and parents, that emphasize various content areas including mathematical concepts, science, language and literacy, social and emotional development, arts and music and social studies. Games can be played on desktops, tablets, and smartphones, which fosters important multisensory and early motor skills. KneeBouncers is supplementary instruction for early childhood teachers and parents who wish to reinforce key educational concepts through engaging play that offers ranging complexity for children in different growth stages.

Research on digital game-based learning (DGBL) indicates that online learning with educational games is highly effective for strengthening early childhood thinking skills (Behnamnia et al., 2023) and are particularly impactful for learners with special needs (Kokkalia et al., 2016). Drawing from game-based design, KneeBouncers leverages intellectual, auditory, and tactile stimuli that present learners with games that are engaging and motivating.

The design review that follows is not limited to one specific game, but instead, evaluates the broader KneeBouncers learning product from an instructional design perspective that includes the program design framework, content selection, design, and development, evaluation, and interface.

REFERENCES

Behnamnia, N. et al. (2023). A review of using digital game-based learning for preschoolers. *Journal of Computers in Education* (the *Official Journal of the Global Chinese Society for Computers in Education*), *10*(4), 603-636.

Kokkalia, G. et al. (2016). The Role of Games in Special Preschool Education. *International Journal of Emerging Technologies in Learning (Online)*, *11*(12), 30-35.

KNEEBOUNCERS

DESIGN REVIEW

The Design Review rubric includes thirteen evaluative criteria organized into four broad categories. For each criterion, a rating of Limited, Moderate, or Strong, is indicated by one, two, or three stars, respectively.

Program Design Framework & Process

Specific ToA or Logic Model	★★★
Systematic Design Process	★★★

Program Content Selection & Design

Specific Instructional Needs	★★★
Comprehensive Design Plan	★★
Addresses Individual Learners	★
Instructional Objectives	★★
Instructional Sequencing	★★

Program Evaluation

Formative Evaluation	★★★
Summative Evaluation	★★★

Materials Interface / Design

Costs/Resources are Specified	★★★
Support for Users	★★★
Student Feedback	★★★
Teacher Assessment Data	★★

KNEEBOUNCERS

PROGRAM DESIGN & FRAMEWORK

The program design clearly specifies a systemic Theory of Action (or Logic Model).

The logic model for KneeBouncers games starts with engaging the child through interactive and fun inputs and resources, leading to educational activities where learning objectives are reinforced. Feedback is integral to the game structures, ensuring that children understand their actions' outcomes and fostering a positive learning environment. This cycle promotes growth in key developmental areas, achieved through a structured yet flexible approach to increasing complexity and skill-building. KneeBouncers games emphasize several key components of their logic model including engagement, education, feedback, and growth.

A systematic design process was used to develop, evaluate, and refine materials.

An iterative design process was used in the development and refinement of KneeBouncers games. The origination of a game begins with an imagined concept brought to life by content developers and reviewed by educational practitioners and parents. Informal prototyping and formative evaluation are conducted by learners to ensure the game accomplishes its objectives and works properly.

PROGRAM CONTENT SELECTION & DESIGN

The program design addresses specified instructional/ curriculum needs.

KneeBouncers games are not aligned with a specific formal curriculum, but instead are developed in consultation with early childhood education experts to ensure that they support key developmental milestones and learning standards appropriate for toddlers and preschoolers. Using feedback and guidance from practitioners, games are structured around universal pre-kindergarten learning objectives that focus on the holistic development of the child, including cognitive and language development, fine motor skills, and social-emotional growth.

KNEEBOUNCERS

A comprehensive design plan was employed in developing the program.

A comprehensive design plan uses a needs analysis to identify and articulate instructional objectives, strategies, and methods to meet specific curricular needs. KneeBouncers have not conducted a formal needs analysis that informed the development of materials, and there is no alignment with a standard curriculum. However, the developers have consulted with various stakeholders – practitioners and parents – to inspire their content creation.

The program design addresses individual learner needs for high achievement.

KneeBouncers games are compatible with different device types (e.g., desktop, tablet, smartphone, Nintendo Switch) to accommodate learner preferences. However, game-based instruction is not automatically differentiated or adapted to learner behaviors; the learner selects (or is assigned) specific games rather than having a personalized learning pathway of games presented to them based on their performance and level of understanding.

Instructional objectives are systematically developed and clearly specified.

Instructional objectives related to early foundational learning skills inform the design of KneeBouncers games. These objectives were refined according to user feedback. The homepage for each game includes a section titled "Game Learning Focus", which identifies various skills (e.g., identifying shapes, observation, making predictions, etc.), but these often are either undefined or linked externally to a third-party website.

Instructional sequencing is aligned with objectives and adaptive to learner needs.

Many of the interactive games reinforce concepts but lack the initial presentation of an instructional strategy to teach the skill or concept being learned. Instead, the learner should be presented with an instructional component first and then engage in game play to reinforce their understanding. Some games, such as puzzles and matching games, allow the learner (or parent, or teacher) to select the level of complexity. This flexibility is important and recognizes different learner needs, ensuring appropriateness for age and ability.

KNEEBOUNCERS

PROGRAM EVALUATION

Formative evaluation was used to develop and refine the program.

KneeBouncers regularly solicits and implements feedback from users about their experiences and then makes the necessary changes to the games. This formative evaluation process is regular but informal; voluntary stakeholders participate in a game prototype and then complete an online survey that measures engagement, perceived impact, and motivation, and offer suggestions for improvement. Previous refinements have included more detailed instructions, changes to the pace of game play, and visual adjustments for better usability and understanding. Learner and user feedback are integral to game development, indicating that KneeBouncers games are sensitive to the needs of their learners.

Summative evaluation was used to obtain evidence on program effectiveness.

A summative evaluation to measure the effectiveness, impact, and overall quality of the program materials is anticipated. As KneeBouncers seeks to build more personalized, adaptive games through the incorporation of AI, it is strongly encouraged that this evaluation by an external educational research organization also investigates the impacts of KneeBouncers games on their learner objectives.

MATERIALS / INTERFACE DESIGN

Costs and resources needed for using the program are clearly specified.

Costs for membership are clearly stated on the website and multi-tiered plans are available for purchase. For members, KneeBouncers games are ad-free.

Support for users is timely and effective.

Support for using KneeBouncers is provided via multiple avenues, including a direct phone number, email address, and various social media accounts. Because of this, support for users is considered readily available.

KNEEBOUNCERS

Students receive clear and relevant feedback about their performance.

Each KneeBouncers game provides the learner with clear and immediate auditory and visual feedback, mostly centering on knowledge-of-correct-response, or KCR. As such, learners progress through games with a high level of interactivity and engagement. In addition, some games include a screen at the end of gameplay that shows a "Progress Report", detailing the number of attempts and correct and incorrect responses, though this information is not stored long-term, nor are identifying data collected.

Teachers receive assessment data for tracking students' progress.

Assessment data is not collected on learners, aside from the temporary "Progress Report" screen shown at the conclusion of some games. For members, recently played games and favorited games also are recorded.

TIER 4 EVIDENCE

According to the Every Student Succeeds Act (ESSA), Tier 4 evidence must demonstrate both of the following:

- a rationale in the form of a clearly articulated logic model
- current or future plans to study the effects of an intervention.

As indicated by this review, KneeBouncers has achieved Tier 4 evidence, set forth by ESSA.

RECOMMENDATIONS

General Usability

Adding a search feature to the website would allow users to more easily locate specific games that they want to play.

Instructional Presentation

Instructional strategies are lacking. Many games begin with an assessment, but it should provide an initial presentation of the concept or skill being learned. For example, in "Plane Fun", the child is asked to "Find the number 4", but they should be presented first with what the number 4 looks like. Consider a brief introduction that displays the number, asks the learner to repeat its name, and perhaps ask the learner to draw or trace the number 4. Then, proceed to the interactive where the number 4 is identified through game play.

Another example, "Feed the Frogs", does a good job of naming the shapes as they appear on the screen. It would be even more beneficial if the word appeared on the screen and if the learner was presented with a quick overview that presents the shapes and their names (this is the instructional strategy) prior to playing the game (assessment). For this, we would consider games like these more "interactives" than instructional games.