Formative Evaluation: Ignite by Hatch Early Learning is Fit For Young Children's Learning

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Executive Summary

This study examines the effectiveness of the Ignite by Hatch™ activities for young learners. The analyses were conducted by a third-party researcher and examined the entire population of 3-, 4-, and 5-year-old children who used Ignite™ during the 2022–2023 school year. The analyses focused on the differences in performance between 3-, 4-, and 5-year-olds and assessed the alignment between activity difficulty and intended skill levels. Notably, older children demonstrated increased success rates, affirming Ignite's alignment with age-appropriate developmental stages. The structured design of Ignite is evident in its clear developmental paths, seamlessly transitioning from easier to more challenging activities within each learning domain. Additionally, the analysis reveals a diverse range of game difficulty levels, from easy to difficult, showcasing Ignite's adaptability and support for continuous growth and learning. Overall, these findings underscore Ignite's efficacy in meeting developmental goals and providing a well-organized and effective learning journey for young students.

Introduction

Ignite by Hatch™ is a digital learning platform anchored in a child-facing app that delivers engaging learning experiences through a dynamic digital play environment. Ignite™ is built to promote children's growth and development across seven domains: Mathematics, Literacy, Language & Communication Development, Social and Emotional Learning, Science & Technology, Physical Development, and Social Studies. As children play the Ignite experiences, they move through a series of eight levels of skills in each domain that become progressively more rigorous. Levels 1–3 in Ignite are aligned to the pre-foundational skills children are expected to learn in preschool. Level 4 skills are aligned with kindergarten readiness, and Levels 5–8 move into elementary-school skills. To further determine the educational efficacy of Ignite, this study was designed as a formative evaluation of the Ignite experiences to determine whether the game difficulty levels progress as intended.

There were two primary goals of this study. The first was to investigate the developmental validity of Ignite experiences. For Ignite to be developmentally valid, 5-year-old children should outperform 4-year-olds and 4-year-olds should outperform 3-year-olds across all levels and domains. The second goal was to evaluate the validity of the difficulty progression of Ignite levels. The difficulty progression of Ignite is valid if initial pass rates are highest at beginning levels and gradually diminish as the levels increase from emerging, to intermediate, to accomplishing, and finally to proficient. This study provides valuable insights into the developmental validity of Ignite experiences, confirming age-related performance trends and the intended difficulty progression. These findings contribute to our understanding of the educational efficacy of Ignite and offer implications for its continued refinement and optimization in educational contexts.

SAMPLE

This validity study examined the entire population of 3-, 4-, and 5-year-old children who used Ignite during the 2022–2023 academic year (n = 63,780). There was an almost even gender split between females (50.1%) and males (49.9%). The sample comprised 35.9% of 3-year-olds, 61.4% of 4-year-olds, and 2.7% of 5-year-olds. The racial and ethnic composition of the sample was made up of 35.1% of children who identified as Black (non-Hispanic), 31.7% of children who identified as White, 24.8% of children who identified as Hispanic, 3.6% of children who identified as multiple races, 3.1% of children who identified as Native American, and 1.7% of children who identified as Asian. Geographically, the sample comprised children from across the entire customer base and, therefore, was national in scope. For each domain-specific analysis, all 3-, 4-, and 5-year-old children who attempted at least one experience within that domain were included, resulting in the following sample sizes: Social Studies (n = 63,285), Literacy (n = 52,369), Language & Communication Development (n = 51,922), Physical Development (n = 50,860), Mathematics (n = 50,689), Science & Technology (n = 49,328), and Social and Emotional Learning (n = 47,071).

METHOD

To evaluate the developmental validity of Ignite games and ensure the validity of the difficulty progression, we conducted an analysis of pass rates within the Ignite Core Experiences. We focused exclusively on Ignite Core Experiences—the game-based activities within Ignite designed to evaluate children's developmental progress in each domain. Furthermore, our analysis was confined to Core Experiences children completed at school and only included games with nominal skill levels below 6. This decision was based on the observation that Skill Levels 6, 7, or 8 were rarely passed by 3-, 4-, or 5-year-olds, making them unsuitable for meaningful analysis. Finally, if a child engaged with any activities within a specific domain at Levels 1–5, the experiences they did not attempt were classified as "not passed."

Conversely, completed activities within a specific domain at Levels 1–5 were considered "passed." To assess the developmental appropriateness of Ignite's Core Experiences, we examined the number of attempts made by children to pass games and the corresponding percentage of successful attempts across different age groups. Additionally, we examined the validity of the difficulty progression of Ignite games in two ways. First, we investigated whether the progression of Ignite game difficulty aligned with its intended trajectory by examining if initial game pass rates exhibited a decrease corresponding to nominal experience skill level increases. Second, we examined the extent to which the nominal levels of Ignite Core Experiences matched the data-driven difficulty levels of the experiences.

To review the extent of these matches between nominal and data-driven levels of the Ignite Core Experiences, we employed the Rasch measurement model as an exploratory tool to estimate game difficulty. This approach contextualizes difficulty relative to all other experiences within the same domain, quantified in logit units. Experiences with a model-estimated difficulty of .5 logits or higher were classified as "difficult," indicating a location at least .5 logits above the average difficulty within the domain. Conversely, experiences with a model-estimated difficulty of -.5 logits or lower were labeled as "easy," signifying a location at least .5 logits below the average difficulty. Those within .5 logits of the average difficulty level were deemed "average."

After using the Rasch measurement model, we compared empirical experience difficulty levels to the nominal or intended skill level for each experience. Mismatches were identified when a nominal skill level of beginning or emerging coincided with a model-estimated difficulty level of "difficult," or vice versa, or when a nominal skill level of accomplishing or proficient coincided with a model-estimated difficulty level of "easy," or vice versa. This evaluation pathway aimed to determine whether the order of experience difficulty generally aligned with the expected hierarchy of skill levels within each domain.
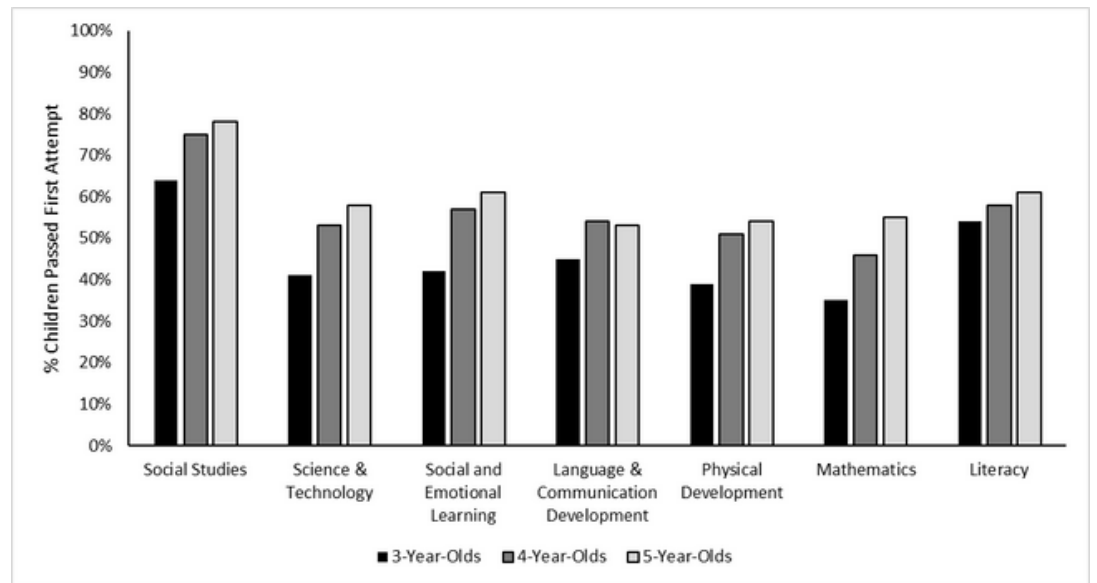
RESULTS

Developmental Validity

The analyses revealed a valid developmental progression of Ignite games. The pattern of age-related increases in success rates was very distinct for Social Studies, Science & Technology, Social and Emotional Learning, Mathematics, and Literacy domains. The domains of Language & Communication Development and Physical Development showcased moderate, but not as distinct, age-related increases in success rates. The detailed success rates for each group across all domains can be found in Table 1 and visualized in Figure 1. Collectively, these findings demonstrate an age-associated increase in the percentage of attempts resulting in game completion. Overall, 5-year-olds consistently outperformed 4-year-olds, who, in turn, surpassed the success rates of 3-year-olds across domains.

Table 1

3-, 4-, and 5-Year-Olds' Initial Pass Rates Across Each Ignite Domain

	3-Year-Olds	4-Year-Olds	5-Year-Olds
Social Studies	64.07%	75.10%	78.02%
Science & Technology	41.10%	52.80%	57.84%
Social and Emotional Learning	42.48%	56.63%	61.04%
Mathematics	35.31%	46.39%	54.99%
Literacy	54.16%	58.36%	60.62%
Language & Communication Development	44.55%	54.16%	53.40%
Physical Development	38.76%	51.39%	53.71%

Figure 1

Developmental Progression of Ignite Core Experiences Across Each Domain

Difficulty Progression Validity

   The results reveal a valid difficulty progression of Ignite experiences. On average, across domains, the pass rate for Core Experiences decreases as the level of the experience increases. In addition, the Rasch measurement model reveals that 97.3% of the Core Experiences across the domains demonstrate a close match between the intended skill level and the initial pass rates and game difficulty levels. This valid difficulty progression is demonstrated in all domains. Both the percentage of children passing their first attempt and the model-estimated difficulty levels contribute to this observed pattern. The findings for each domain are reviewed in depth in the following sections.

Science & Technology

The Science & Technology experiences were represented relatively equally across the "easy," "average," and "difficult" model-estimated difficulty levels. The results showed a full range of experience difficulty levels, from as low as -3.99 logits to as high as 3.41 logits. The beginning-level experiences (four in total) were uniformly classified as "easy," with initial pass rates ranging from 27.9% to 69.6%. Emerging-level experiences (four in total) included a mix of "easy" and "average" classifications, with pass rates ranging from 15.4% to 23.4%. Intermediate-level experiences (four in total) were uniformly labeled as "easy" or "average," with pass rates ranging from 17.7% to 24.6%. Accomplishing-level experiences (four in total) exhibited a balance of "average" and "difficult" classifications, with pass rates ranging from 4.6% to 14.2%. Proficient-level experiences (four in total) were uniformly classified as "difficult," with pass rates ranging from 1.4% to 7.8%.

Social and Emotional Learning

The Social and Emotional Learning domain includes a full range of experience difficulty levels, from as low as -5.13 logits to as high as 1.69 logits. There was a reasonable match between nominal and data-driven game difficulty levels for 100% of the games in the Social and Emotional Learning domain. Within the domain, three beginning-level experiences were identified, with two classified as "easy" and one as "average," with initial pass rates ranging from 16.4% to 85.3%. Moving to emerging-level experiences (four in total), the model designated three as "easy" and one as "average," with initial pass rates ranging from 21.5% to 32.1%. Further challenge was presented to children in the four intermediate-level experiences, with two labeled as "average" and two as "difficult" and with pass rates ranging from 10.5% to 21.6%. Moreover, at the accomplishing level, two experiences were classified as "difficult" and two as "average," with pass rates ranging from 8.2% to 22.4%. Concluding with the proficient experiences, all four were uniformly classified as "difficult," with pass rates ranging from 8.1% to 13.0%.

Language & Communication Development

Across the Language & Communication Development domain, there was a full range of experience difficulty levels, from as low as -8.36 logits to as high as 10.08 logits. There was a reasonable match between nominal and data-driven game difficulty levels for 96% (23 out of 24) of the games in the Language & Communication Development domain. The beginning-level experiences (three in total) were uniformly classified as "easy," with initial pass rates ranging from 32.8% to 83.6%. The measurement model classified one experience with a nominal skill level of emerging as "easy," with a pass rate of 27.6%, and one as "difficult." The one emerging-level experience classified as "difficult" was the only game for which a mismatch between nominal and empirical difficulty was identified. This emerging-level experience had an initial pass rate of 7.2% and an estimated game difficulty of .74 logits, which falls in the "difficult" range. The intermediate-level experiences included a mix of "easy," "average," and "difficult" classifications, with pass rates ranging from 0.0% to 18.8%. The measurement model classified three experiences with a nominal skill level of accomplishing as "average" and four as "difficult," with pass rates ranging from 2.6% to 10.7%. Finally, the measurement model classified one experience with a nominal skill level of proficient as "average" and six as "difficult," with pass rates ranging from 4.1% to 9.7%.

Physical Development

The results for the Physical Development domain showed a full range of Core Experience difficulty levels, from as low as -2.34 logits to as high as 3.40 logits. Overall, the initial pass rates became systematically lower as the nominal skill level of the experiences progressed from beginning to proficient. In addition, there was a reasonable match between nominal and empirical game difficulty levels for 93.3% of the games, such that there was only one mismatch out of the 15 experiences between intended and empirical-experience difficulty levels. The measurement model classified all three experiences with a nominal skill level of beginning as "easy," with initial pass rates ranging from 26.3% to 44.9%.

The measurement model classified two out of three emerging-level games as "easy," and found one mismatched emerging game that was categorized by the model as "difficult." The mismatched game had an initial pass rate of only 8.7% and an empirical difficulty level of .96 logits. Consequently, the initial pass rates for the emerging-level games ranged from 8.7% to 33.3%. The measurement model classified one intermediate-level game as "easy" and two as "average," with initial pass rates ranging from 12.4% to 23.1%. Furthermore, the measurement model classified one accomplishing-level game as "average" and two as "difficult," with initial pass rates ranging from 8.1% to 14.1%. Finally, the measurement model classified all three proficient-level games as "difficult," with pass rates ranging from 1.3% to 9.8%.

Mathematics

The results for the Mathematics domain showed a full range of experience difficulty levels, from as low as -2.91 logits to as high as 3.17 logits. Across the Mathematics domain, there was a relatively clear progression of increasing experience difficulty from the beginning skill level to the proficient skill level. In addition, the model identified a reasonable match between nominal and empirical difficulty levels, with only one game demonstrating a mismatch. The only mismatched game was a beginning-level experience that was classified by the model as "difficult." The remaining nine beginning-level experiences were classified by the model as "easy." The pass rates for beginning-level experiences ranged from 4.5% to 50.2%. The Mathematics domain analyses included 10 emerging-level experiences: six of them were classified as "easy" and four as "average." The initial pass rates for the emerging-level experiences ranged from 13.0% to 43.3%. The Mathematics domain analyses included 11 intermediate-level experiences: six of them were classified as "easy," three as "average," and two as "difficult." The initial pass rates for the intermediate-level experiences ranged from 2.5% to 34.9%.

The Mathematics domain analyses included 11 accomplishing-level experiences. The model classified six of them as "average" and five as "difficult." The initial pass rates for the accomplishing-level experiences ranged from 1.8% to 16.2%. Finally, the Mathematics domain analyses included 11 proficient-level experiences. The model classified all of them as "difficult." The initial pass rates for the proficient-level experiences ranged from 1.2% to 8.1%.

Literacy

Across the Literacy domain, there was a full range of experience difficulty levels, from as low as -6.48 logits to as high as 3.51 logits. These experience difficulty levels demonstrated a relatively clear progression of increasing experience difficulty from the beginning skill level to the proficient skill level. In addition, there was a reasonable match between nominal and empirical difficulty levels for 96.4% (53 out of 55) of the games. The two mismatches included one experience with a nominal level of accomplishing that was classified as "easy" and one experience with a nominal level of emerging that was classified as "difficult." All other experiences had a nominal and empirical level match. Specifically, the Literacy domain analyses included eight beginning-level experiences: seven of them had a model-estimated difficulty level of "easy," and one was classified as "average." The initial pass rates for the beginning-level experiences ranged from 14.6% to 85.7%. The Literacy domain analyses included eight emerging-level experiences, and the model classified five of them as "easy," two as "average," and one as "difficult." The initial pass rates for the emerging-level experiences ranged from 5.2% to 66.6%. The Literacy domain analyses included 10 intermediate-level experiences: two of them were classified as "easy," six as "average," and two as "difficult."

The initial pass rates for the intermediate-level experiences ranged from 0.8% to 19.7%. The Literacy domain analyses included 14 accomplishing-level experiences. The model classified one of them as "easy," four as "average," and nine as "difficult." The initial pass rates for the accomplishing-level experiences ranged from 1.7% to 22.4%. Finally, the Literacy domain analyses included 15 proficient-level experiences. The model classified all of them as "difficult." The initial pass rates for the proficient-level experiences ranged from 1.8% to 8.1%.

Summary and Conclusion

In summary, the results of this study provide valuable insights into how well Ignite activities work for young learners. We specifically looked at how 3-, 4-, and 5-year-olds performed, considering whether the difficulty of the activities matched their intended skill levels. Interestingly, we found that as children grew older, their success rates increased, supporting the idea that Ignite aligns well with age-appropriate developmental stages. The structured and well-thought-out design of Ignite becomes evident as we observe clear developmental paths, smoothly transitioning from easier to more challenging activities in each learning domain. Importantly, these pathways closely follow the intended skill levels, confirming the intentional and organized nature of the Ignite program.

Furthermore, our examination uncovered a wide range of difficulty levels for games across all seven developmental domains, showcasing Ignite's ability to engage children of different skill levels. The diversity in difficulty levels, ranging from easy to difficult, highlights Ignite's effectiveness in accommodating and fostering the continuous growth and learning of children. The discernible developmental paths from the simplest to the most advanced games, coupled with the consistent alignment between how well children perform initially and the difficulty of the games across different domains, emphasizes the systematic and educationally sound nature of Ignite. Collectively, these findings emphasize Ignite's strength in meeting developmental goals and providing an organized, effective learning journey for young students.