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Formative Evaluation of the Ignite Games for Young Children from Hatch Early Learning

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Executive Summary

Each game within the Ignite by Hatch™ gaming environment belongs to an overall developmental domain and skills-based subdomain and is intended to meet the developmental needs of children at specific skill levels. These skill levels (Beginning, Emerging, Intermediate, Accomplishing, and Proficient+) form an intended developmental pathway. Children make progress through games of increasing difficulty and complexity to the focal skills as they complete the games. The skills they acquire in this process build upon each other. The purpose of this study was to examine how children perform in the gaming environment to determine if there is evidence that the game difficulty level actually progresses as intended. We gathered evidence in three ways. First, we assumed that 5-year-old children would perform better than 4-year-old children, and 4-year-old children would perform better than 3-year-old children, across all games given their expected higher developmental level. To test this assumption, we compared initial pass rates of the age groups across all games. Second, we assumed that initial and final pass rates would be highest for Beginning games and then would decline as game difficulty level increased in turn for Emerging, Intermediate, Accomplishing, and Proficient games. To test this assumption, we compared initial and final pass rates and game difficulty levels across the skill levels within each domain. Third, we assumed that children who engage with the Ignite system at recommended levels of usage should outperform children who do not use the system at recommended levels. To test this assumption, we compared the highest game levels achieved by children in subgroups according to usage levels.

The results of this study demonstrated strong validity evidence for the Ignite learning games by supporting all three assumptions. First, we used a higher standard for validity evidence for analyses of the 2021–2022 data than had been used in previous studies. We used three age groups for comparison, adding 5-year-olds. We also examined both initial and final passing rates by game. The results across all domains of development were very positive. Five-year-old children

outperformed 4-year-old children, and 4-year-old children outperformed 3-year-old children, for the majority of the games. The initial passing rates followed this expected rank order across the age groups for 100.0% of the games in three of the domains. Across all domains, a strong pattern of rank order by age groups emerged across most games for both initial passing rates (76.5% of games) and final passing rates (74.5% of games). There were only a few exceptions to these patterns: (1) games with very high initial or final passing rates and very small differences between the age groups in final passing rates, and (2) games with low difficulty levels (levels 1 or 2) and small differences between the age groups. For most of these games, nearly all children, regardless of age, passed the games after repeated attempts. Some of the disordinal patterns across the age groups emerged for games with higher difficulty levels (level 6 or higher), small differences between the age groups, and relatively lower passing rates. These games are intended for older children, first grade and above, and therefore were not attempted by many younger children. Tables 2 through 8 illustrate these findings.

Second, a wide range of game difficulty levels, from easy to difficult, emerged for all seven developmental domains. This finding demonstrates that the children can be challenged and continue to grow, develop, and learn at all skill levels. Very well defined and sequenced developmental pathways emerged for all seven domains from Beginning to Proficient games with matching initial passing rates and game difficulty levels. This finding indicates a substantial improvement from previous formative evaluation studies (Lambert, 2020; Lambert, 2021), which found a substantial number of games with potential mismatches between intended and actual game difficulty levels. For 90.7% of the games, 351 of the 387 games evaluated across the domains, the results demonstrated a close match between the intended skill level and the initial passing rates and game difficulty levels. Almost all of the games with potential mismatches (88.9%) occurred in situations in which (1) the domain included games with difficulty levels above Proficient (level 6 or higher), (2) games had high nominal difficulty levels (Accomplishing or Proficient), and (3) games had a relatively low initial

passing rate (< 17.0%). The statistical model identified these games as potential mismatches because, relative to other games within their domain with very high difficulty levels, they were easier than expected. Only four of the 387 games yielded results that may need to be investigated for potential mismatches between nominal and actual difficulty level. Tables 9 through 15 illustrate these findings.

Third, we defined three groups of children according to usage levels. We defined the low-use group as those children who used the Ignite system for less than 2 months and did not meet the 30 minutes per week recommendation. We defined the medium-use group as those children who used the Ignite system for 2–4 months and at least 30 minutes per week. We defined the high-use group as those children who used the Ignite system for at least 5 months and at least 30 minutes per week. It is important to note that this "high"-use group may not have used the Ignite system for the entire 9 or 10 months of a typical academic year. These criteria were based on previous research that illustrated patterns of growth in children with varying usage levels (Lambert, 2021; Luce & Lambert, 2022). Across all seven domains, the low-use group of children completed approximately one level on average. The medium-use group of children completed approximately two or three levels on average. If a child started at the beginning of the sequence of experiences and completed two or three levels, the child would be functioning at the Emerging or Intermediate level. The high-use group of children completed approximately four or five levels on average. If a child started at the beginning of the sequence of experiences and completed four or five levels, the child would be functioning at the Accomplishing or Proficient level. A substantial percentage of high-use 3-year-olds (38.7%–64.7%, depending on domain) reached at least level 4 during the academic year. The overwhelming majority of high-use 4-year-olds (74.5%–92.8%, depending on domain) reached level 4 during the academic year. Similarly, the overwhelming majority of high-use 5-year-olds (89.8%–97.5%, depending on domain) reached level 4 during the academic year. Tables 16 through 21 illustrate these findings.

Formative Evaluation of the Ignite Games for Young Children from Hatch Early Learning

Similar to the previous report in 2021 (Lambert, 2021), this study was designed as a formative evaluation. It provides some beginning validation evidence to support the instructional use of the Ignite experiences and may offer evidence-based identification of experiences that can be investigated for revision and enhancement. Since the previous report, a wide range of improvements has been made to the experiences, and the analyses and reporting in this report are designed to explore the impact of the revisions.

Each game within the Ignite by Hatch™ gaming environment belongs to an overall developmental domain and skills-based subdomain and is intended to meet the developmental needs of children at specific skill levels. These skill levels (Beginning, Emerging, Intermediate, Accomplishing, and Proficient) form an intended developmental pathway. Children make progress through games of increasing difficulty and complexity to the focal skills as they complete the games. The skills they acquire in this process build upon each other. The purpose of this study was to examine how children perform in the gaming environment to determine if there is evidence that the game difficulty level actually progresses as intended.

We gathered evidence in three ways. First, we assumed that 5-year-old children would perform better than 4-year-old children, and 4-year-old children would perform better than 3-year-old children, across all games given their expected higher developmental level (Aim 1). To test this assumption, we compared initial pass rates of the age groups across all games. Second, we assumed that initial pass rates would be highest for Beginning games and then would decline as game difficulty level increased in turn for Emerging, Intermediate, Accomplishing, and Proficient games. To test this assumption, we compared the initial pass rates and game difficulty levels across the skill levels within each domain (Aim 2). Third, we assumed that children who engage with the Ignite system at recommended levels of usage would outperform children who do not use the system at

recommended levels (Aim 3). To test this assumption, we compared the highest game levels achieved by children in subgroups according to usage levels. The results of this study are reported by study aim and domain of development.

Description of the Sample

The analyses outlined in this report were conducted using data from the entire population of 3-, 4-, and 5-year-old children who used Ignite during the 2021–2022 academic year (n = 63,465). For each domain-specific analysis, all 3-, 4-, and 5-year-old children who attempted at least one experience within a given domain were retained. This process resulted in the following domain-specific sample sizes:

- Social Studies (n = 61,373)
- Science & Technology (n = 57,078)
- Social and Emotional Learning (n = 53,343)
- Language & Communication Development (n = 60,948)
- Physical Development (n = 59,615)
- Mathematics (n = 58,582)
- Literacy (n = 62,247)

For this report, domain-specific analyses were the focus, and, therefore, if a child attempted any experience within a particular domain, the experiences they did not attempt were considered not passed, given that the child did not progress through the experiences far enough to attempt the more advanced experiences. In a few cases, no children in the sample attempted a particular experience, and, therefore, that experience was removed from its respective domain-specific analysis.

The sample was split almost evenly between female (49.5%) and male (50.5%) children. Three-year-olds comprised 29.0% of the sample, 4-year-olds comprised 68.3% of the sample, and 5-

year-olds comprised 2.6% of the sample. The racial and ethnic composition of the sample was as follows: white (non-Hispanic) = 32.1%, black (non-Hispanic) = 34.8%, Hispanic = 26.8%, multiple races = 2.6%, Asian = 1.9%, and Native American = 1.9%. Geographically, the sample comprised children from across the entire customer base, and, therefore, was national in scope.

Methods

First, to address Aim 1, we examined the initial passing rates for each experience, which are the percentages of children passing on first attempt. We compared 3- and 4-year-olds as in previous reports and added 5-year-olds for this report. This method was adopted for the purposes of evaluating experience difficulty independent of practice effects. Next, we examined final passing rates, meaning the percentage of children who passed each game after repeated practice. We compared the three age groups to determine if passing rates increased with age as expected.

Next, to address Aim 2, we examined whether the passing rates tended to decrease in a way that corresponded with increases in nominal experience skill level. Specifically, this means that Beginning skill-level experiences should be passed at a higher rate than Emerging experiences, which, in turn, should be passed at a higher rate than Intermediate experiences, followed by Accomplishing experiences, and finally by Proficient experiences.

The Rasch measurement model was used as an exploratory strategy to estimate difficulty. This approach estimates difficulty relative to all other experiences within the same domain in terms of logit units. Experiences with model-estimated difficulty of .5 logits or higher, meaning an experience location of at least .5 logits above the average experience difficulty within the respective domain, were considered "Difficult." Experiences with model-estimated difficulty of -.5 logits or lower, meaning an experience location of at least .5 logits below the average experience difficulty

within the respective domain, were considered "Easy." Experiences with locations on the ability scale within .5 logits of the average difficulty level for the respective domain were considered "Average." We then compared these empirical experience difficulty levels to the nominal or intended skill level for each experience. Experiences were labeled a mismatch if they had a nominal skill level of Beginning or Emerging and a model-estimated difficulty level of Difficult, or conversely, a nominal skill level of Accomplishing or Proficient and a model-estimated difficulty level of Easy. We examined the developmental pathway generated by the Rasch model. Each of the tables in this report are arranged so that the experiences are listed in descending order of model-estimated difficulty. As one reads from the bottom of each table to the top, the results progress from the easiest experiences to the most difficult experiences. This pathway evaluates whether the rank order of experience difficulty generally followed the expected hierarchy of skill level for each domain.

Finally, to address Aim 3, we used multiple regression to predict higher level achieved based on time spent engaged with the Ignite system. We also divided the children into subgroups by usage levels to examine whether high users achieved more levels than children who had not used the system at recommended levels.

Results

Aim 1 - Initial Passing Rates

Social Studies

The system developers intended the game experiences in the Social Studies domain to be introductory and relatively easy. Children experience these games early in their engagement with the

Ignite system as they become familiar with the process. During the 2019–2020 academic year, there were very few differences between 3-year-olds and 4-year-olds in terms of their initial passing rates for the experiences in the Social Studies domain. The results of the analyses from the 2020–2021 academic year indicated a large improvement in the experience-specific differences between 3-year-olds and 4-year-olds in terms of initial passing rates within the Social Studies domain. Specifically, the results from the 2020–2021 academic year indicated that 4-year-old children had higher initial passing rates than 3-year-old children for every game.

The results of the 2021–2022 academic year, which included 5-year-olds and final passing rates, demonstrated further evidence that games in the Social Studies domain are now functioning as intended. For all games in this domain, pass rates are high across all age groups, and the number of attempts needed to pass is low. As shown in Table 2, for 18 of the 18 games in this domain (100.0%), the initial passing rate results indicate that either the intended rank order of passing rates across the age groups or all age groups passed with equal rates. For six of the 18 games (33.3%), 5-year-olds initially passed at a higher rate than 4-year-olds, who passed at a higher rate than 3-year-olds. For the remaining 12 of the 18 games (66.7%), all age groups passed at a very high and equal rate (99%–100%). The final pass rates demonstrated the same pattern, meaning that after repeated attempts, all or almost all children of all age groups passed the games.

Games 198 and 202 illustrate these patterns. For game 198, 66.7% of 3-year-olds passed their initial attempt, and 89.6% passed their final attempt. For 4-year-olds, 77.2% passed their initial attempt, and 84.7% passed their final attempt. For 5-year-olds, 84.7% passed their initial attempt, and 100.0% passed their final attempt. For game 202, nearly all children passed their initial attempt, and all children passed their final attempt after only a few more attempts.

Science & Technology

For the 2019–2020 academic year, 4-year-olds did not outperform 3-year-olds for many of the experiences in the Science & Technology domain. Overall, the results of the analyses from the 2020–2021 academic year indicated a large improvement in the experience-specific differences between 3-year-olds and 4-year-olds in terms of initial passing rates within the Science & Technology domain. Specifically, the results from the 2020–2021 academic year indicated that 4-year-old children had higher initial pass rates than 3-year-old children for every experience.

The results from the 2021–2022 academic year show further and significant improvement, as both the initial and final passing rates demonstrated the intended rank order across the age groups. As shown in Table 3, for 20 of the 20 games in this domain (100.0%), the initial passing rate results indicate the intended rank order of passing rates across the age groups. For 15 of the 20 games (75.0%), 5-year-olds passed their final attempt at a higher rate than 4-year-olds, who passed at a higher rate than 3-year-olds. For the remaining five of the 20 games (25.0%), all age groups passed their final attempt at very high rates, and the differences between the age groups were small. The final pass rates demonstrated that the majority of children across all age groups passed the games after repeated attempts.

To illustrate these patterns, consider game 81, where 12.1% of 3-year-olds passed their initial attempt, and 55.8% passed their final attempt. For 4-year-olds, 27.2% passed their initial attempt, and 83.9% passed their final attempt. For 5-year-olds, 68.0% passed their initial attempt, and 90.7% passed their final attempt.

Social and Emotional Learning

For the 2019–2020 academic year, 4-year-olds did not outperform 3-year-olds for many of the experiences in the Social and Emotional Learning domain. Overall, the results of the analyses from the 2020–2021 academic year indicated a large improvement in the experience-specific

differences between 3-year-olds and 4-year-olds in terms of initial passing rates within the Social and Emotional Learning domain. Specifically, the results from the 2020–2021 academic year indicate that 4-year-old children had higher initial pass rates than 3-year-old children for every experience.

The results from the 2021–2022 academic year show further and significant improvement, as almost all the initial and final passing rates demonstrate the intended rank order across the three age groups. As shown in Table 4, for 31 of the 41 games in this domain (75.6%), the initial passing rate results indicate the intended rank order of passing rates across the age groups. For the 10 games with disordinal passing rates across age groups, most of those results (eight of 10; 80.0%) were related to high difficulty levels for the games (level 6 or higher), lower final passing rates, and very small differences between the age groups.

For 28 of the 41 games (68.3%), 5-year-olds passed their final attempt at a higher rate than 4-year-olds, who passed at a higher rate than 3-year-olds. For almost all the remaining games, all age groups passed their final attempt at a very high rates, and the differences between the age groups were small. The final pass rates demonstrated that the majority of children across all age groups passed the games after repeated attempts.

Game 118 illustrates these patterns. For game 118, 31.8% of 3-year-olds passed their initial attempt, and 82.2% passed their final attempt. For 4-year-olds, 45.7% passed their initial attempt, and 92.7% passed their final attempt. For 5-year-olds, 67.7% passed their initial attempt, and 96.5% passed their final attempt.

Language & Communication Development

For the 2019–2020 academic year, 4-year-olds did not outperform 3-year-olds for many of the experiences in the Language & Communication Development domain. Overall, the results of the analyses from the 2020–2021 academic year indicated a large improvement in the experience-specific

differences between 3-year-olds and 4-year-olds in terms of initial passing rates within the Language & Communication Development domain. Specifically, the results from the 2020–2021 academic year indicated that 4-year-old children had higher initial pass rates than 3-year-olds for almost every experience.

The results from the 2021–2022 academic year show further and significant improvement, as almost all the initial and final passing rates demonstrated the intended rank order across the age groups. As shown in Table 5, for 43 of the 51 games in this domain (84.3%), the initial passing rate results indicate the intended rank order of passing rates across the age groups. For the eight games with disordinal passing rates across age groups, most of those (six of eight; 75.0%) were related to high difficulty levels for the games (level 7 or higher), lower final passing rates, and very small differences between the age groups.

For 39 of the 51 games (76.5%), 5-year-olds passed their final attempt at a higher rate than 4-year-olds, who passed at a higher rate than 3-year-olds. For all the remaining games, all age groups passed their final attempt at very high rates, and the differences between the age groups were small. These games were either low difficulty levels (levels 1 or 2) in which almost all children passed their final attempt, or games with high difficulty levels (level 7 or higher) in which fewer children passed their final attempt. Again, the final pass rates demonstrated that the majority of children across all age groups passed the games after repeated attempts.

Game 111 illustrates these patterns. For game 111, 30.1% of 3-year-olds passed their initial attempt, and 76.3% passed their final attempt. For 4-year-olds, 36.0% passed their initial attempt, and 89.0% passed their final attempt. For 5-year-olds, 45.4% passed their initial attempt, and 93.3% passed their final attempt.

Physical Development

For the 2019–2020 academic year, 4-year-olds did not outperform 3-year-olds for many of the experiences in the Physical Development domain. Overall, the results of the analyses from the 2020–2021 academic year indicated a large improvement in the experience-specific differences between 3-year-olds and 4-year-olds in terms of initial passing rates within the Physical Development domain. Specifically, the results from the 2020–2021 academic year indicate that 4-year-old children had higher initial pass rates than 3-year-old children for every experience.

The results from the 2021–2022 academic year show further and significant improvement, as almost all the initial and final passing rates demonstrate the intended rank order across the age groups. As shown in Table 6, for 16 of the 16 games in this domain (100.0%), the initial passing rate results indicate the intended rank order of passing rates across the age groups. For 11 of the 16 games (68.8%), 5-year-olds passed their final attempt at a higher rate than 4-year-olds, who passed at a higher rate than 3-year-olds. For all the remaining five games, all age groups passed their final attempt at very high rates, and the differences between the age groups were small. These games were low difficulty levels (levels 1 or 2) in which almost all children pass their final attempt. The final pass rates demonstrated that the majority of children across all age groups passed the games after repeated attempts.

Game 84 illustrates these patterns. For game 84, 45.7% of 3-year-olds passed their initial attempt, and 86.8% passed their final attempt. For 4-year-olds, 52.6% passed their initial attempt, and 94.5% passed their final attempt. For 5-year-olds, 71.4% passed their initial attempt, and 95.8% passed their final attempt.

Mathematics

For the 2019–2020 academic year, 4-year-olds did not outperform 3-year-olds for many of the experiences in the Mathematics domain. Overall, the results of the analyses from the 2020–2021

academic year indicated a large improvement in the experience-specific differences between 3-year-olds and 4-year-olds in terms of initial passing rates within the Mathematics domain. Specifically, the results from the 2020–2021 academic year indicate that 4-year-old children had higher initial pass rates than 3-year-old children for every experience.

The results from the 2021–2022 academic year show further improvement, as almost all the initial and final passing rates demonstrate the intended rank order across the age groups. As shown in Table 7, for 68 of the 107 games in this domain (63.8%), the initial passing rate results indicate the intended rank order of passing rates across the age groups. For most of the games with disordinal initial passing rates across the age groups (79.5%), the experiences had high difficulty levels (level 6 or higher), and the differences between the age groups were small.

For 72 of the 107 games (67.3%), 5-year-olds passed their final attempt at a higher rate than 4-year-olds, who passed at a higher rate than 3-year-olds. For all the remaining 35 games, all age groups passed their final attempt at very high rates, and the differences between the age groups were small. These games were almost all either low difficulty levels (levels 1 or 2) in which almost all children passed their final attempt, or high difficulty levels (levels 6 or higher). Again, the final pass rates demonstrated that the majority of children across all age groups passed the games after repeated attempts.

Game 214 illustrates these patterns. For game 214, 55.2% of 3-year-olds passed their initial attempt, and 84.8% passed their final attempt. For 4-year-olds, 76.8% passed their initial attempt, and 95.8% passed their final attempt. For 5-year-olds, 93.6% passed their initial attempt, and 98.7% passed their final attempt.

Literacy

For the 2019–2020 academic year, 4-year-olds did not outperform 3-year-olds for many of the experiences in the Literacy domain. Overall, the results of the analyses from the 2020–2021 academic year indicated a large improvement in the experience-specific differences between 3-year-olds and 4-year-olds in terms of initial passing rates within the Literacy domain. Specifically, the results from the 2020–2021 academic year indicate that 4-year-old children had higher initial pass rates than 3-year-old children for every experience except one.

The results from the 2021–2022 academic year show further improvement, as almost all the initial and final passing rates demonstrated the intended rank order across the age groups. As shown in Table 8, for 101 of the 135 games in this domain (74.8%), the initial passing rate results indicate the intended rank order of passing rates across the age groups. For most of the games with disordinal initial passing rates across the age groups, the games were either high difficulty level (level 6 or higher) (73.5%) and the differences between the age groups were small, or were low difficulty (5.9%) levels (levels 1 or 2).

For 106 of the 135 games (78.5%), 5-year-olds passed their final attempt at a higher rate than 4-year-olds, who passed at a higher rate than 3-year-olds. For all the remaining 29 games, all age groups passed their final attempt at very high rates, and the differences between the age groups were small. These games were almost all either low difficulty levels (levels 1 or 2) in which almost all children passed their final attempt, or high difficulty levels (level 6 or higher). The final pass rates demonstrated that the majority of children across all age groups passed the games after repeated attempts.

Games 87 and 146 illustrate these patterns. For game 87, 52.9% of 3-year-olds passed their initial attempt, and 77.2% passed their final attempt. For 4-year-olds, 68.2% passed their initial attempt, and 90.4% passed their final attempt. For 5-year-olds, 81.8% passed their initial attempt, and 96.0% passed their final attempt. For game 146, 35.8% of 3-year-olds passed their initial

attempt, and 82.4% passed their final attempt. For 4-year-olds, 46.1% passed their initial attempt, and 91.9% passed their final attempt. For 5-year-olds, 77.6% passed their initial attempt, and 97.2% passed their final attempt.

Aim 1 - Summary

We used a higher standard for validity evidence for analyses of the 2021–2022 data than had been used in previous studies. We used three age groups for comparison, adding 5-year-olds. We also examined both initial and final passing rates by game. The results across all domains of development were very positive. Five-year-old children outperformed 4-year-old children, and 4-year-old children outperformed 3-year-old children, for the majority of the games. The initial passing rates followed this expected rank order across the age groups for 100.0% of the games in three of the domains. Across all domains, a strong pattern of rank order by age groups emerged across most games for both initial passing rates (76.5% of games) and final passing rates (74.5% of games). A few exceptions to these patterns were (1) games with very high initial or final passing rates and very small differences between the age groups in final passing rates, and (2) games with low difficulty levels (levels 1 or 2) and small differences between the age groups. For most of these games, nearly all children, regardless of age, passed the games after repeated attempts. In addition, some of the disordinal patterns across the age groups emerged for games with high difficulty levels (level 6 or higher), small differences between the age groups, and relatively lower passing rates. These games are intended for older children, first grade and above, and, therefore, were not attempted by many younger children. Tables 2 through 8 illustrate these findings.

Aim 2 - Game Difficulty Levels by Domain

Social Studies

For the 2019–2020 academic year, there were large differences between intended and empirical-experience difficulty levels for many of the Social Studies experiences. For the 2020–2021 academic year, there were fewer mismatches between intended and empirical-experience difficulty levels. For the 2021–2022 academic year, there were substantial improvements. The problem with unidimensionality identified in previous reports, an assumption of the measurement model used to estimate difficulty levels, was no longer evident. This means it is reasonable to assume that the games in this domain are measuring a single underlying construct. The measurement model classified all four of the six Social Studies experiences with nominal skill levels of Beginning as Easy. The Beginning experiences had initial passing rates that ranged from 55.0% (game 148) to 92.5% (game 1). The measurement model classified three of the five Social Studies experiences with nominal skill levels of Emerging as Easy. The Emerging experiences had initial passing rates that ranged from 24.2% (game 168) to 47.4% (game 69). However, two Emerging skill-level experiences were classified as Difficult. The first mismatch was game 16, which had a nominal skill level of Emerging, a model-estimated difficulty level of Difficult, and an initial passing rate of only 0.4%. The second mismatch was game 30, which had a nominal skill level of Emerging, a model-estimated difficulty level of Difficult, and an initial pass rate of only 0.3%. These games need to be investigated to determine the mismatch between intended and empirical difficulty levels.

The Social Studies domain analyses included three experiences with Intermediate nominal skill levels. Of these experiences, one was classified as Average, and two were classified as Easy. The Intermediate experiences had initial passing rates that ranged from 15.9% (game 108) to 22.8% (game 60). The Social Studies domain analyses included six experiences with nominal skill levels of Accomplishing or Proficient. The measurement model classified all six experiences as Difficult. These experiences had initial passing rates that ranged from 4.6% (game 193) to 10.2% (game 97).

These results, when taken together, demonstrate a clear progression of increasing experience difficulty from the Beginning skill level to the Proficient skill level. This pattern emerged as measured by both the percentage of children passing their first attempt and model-estimated difficulty levels (excluding the two experiences identified for further investigation). The results in Table 9 illustrate a well-defined developmental pathway of skills acquisition through which children can progress as they engage with the experiences in the Social Studies domain. The results showed a full range of experience difficulty levels ranging from as low as -9.91 logits to as high as 4.72 logits. The easiest experience was "I Can Draw My Myself," which had a nominal skill level of Beginning, a model-estimated difficulty level of Easy (-9.91 logits), and an initial pass rate of 92.5%. The most difficult experience, "I Can Draw Myself Continued Practice," had a nominal skill level of Proficient, a model-estimated difficulty level of Difficult (4.72 logits), and an initial pass rate of only 4.6%.

Science & Technology

For the 2019–2020 academic year, there were large differences in intended and empirical-experience difficulty levels for many of the Science & Technology experiences. For the 2020–2021 academic year, there were no mismatches between intended and empirical-experience difficulty levels. Again, for the 2021–2022 academic year, there were no mismatches between intended and empirical-experience difficulty levels. This pattern is evident in several important ways. First, the measurement model did not classify any experiences with a nominal skill level of Beginning or Emerging as Difficult. Similarly, the measurement model did not classify any experiences with a nominal skill level of Proficient or Accomplishing as Easy. Furthermore, the initial pass rates became systematically lower as the nominal skill level of the experiences progressed from Beginning to Proficient.

For the 2021–2022 academic year, the Science & Technology domain analyses included four Beginning-level experiences, and all four had a model-estimated difficulty level of Easy. The initial pass rates for the Beginning experiences ranged from 30.6% (game 25) to 70.0% (game 48). The Science & Technology domain analyses included four Emerging-level experiences. The model classified three of these experiences as Easy and one as Average. The initial pass rates for the Emerging experiences ranged from 15.4% (game 43) to 23.4% (game 72). The Science & Technology domain analyses included four Intermediate-level experiences. The model classified all four of these experiences as Average. The initial pass rates for the Intermediate experiences ranged from 13.9% (game 53) to 16.2% (game 112). The Science & Technology domain analyses included four Accomplishing-level experiences, and all four were classified as Difficult. The initial pass rates for the Accomplishing experiences ranged from 4.2% (game 81) to 10.3% (game 93). The Science & Technology domain analyses included four Proficient-level experiences, and the model classified all four as Difficult. The initial pass rate for Proficient experiences ranged from 1.0% (game 161) to 4.7% (game 134).

These results, when taken together, demonstrate a clear progression of increasing experience difficulty from the Beginning skill level to the Proficient skill level. This pattern emerged as measured by both the percentage of children passing their first attempt and model-estimated difficulty levels. The results in Table 10 illustrate a well-defined developmental pathway of skills acquisition through which children can progress as they engage with the experiences in the Science & Technology domain. The Science & Technology experiences were relatively equally represented across the Easy, Average, and Difficult model-estimated difficulty levels. The results showed a full range of experience difficulty levels ranging from as low as -4.41 logits to as high as 3.75 logits. The easiest experience was "Nature Scavenger Hunt," which had a nominal skill level of Beginning, a model-estimated difficulty level of Easy (-4.41 logits), and an initial pass rate of 70.0%. The most

difficult experience was "Recycling and Reusing," which had a nominal skill level of Proficient, a model-estimated difficulty level of Difficult (3.75 logits), and an initial pass rate of 10%.

Social and Emotional Learning

For the 2019–2020 academic year, there were large differences in intended and empirical difficulty levels for many of the Social and Emotional Learning experiences. For the 2020–2021 academic year, there were no mismatches between intended and empirical experience difficulty levels. For the 2021–2022 academic year, the results were also very encouraging. This pattern is evident in several important ways. First, the measurement model did not classify any Social and Emotional Learning experiences with a nominal skill level of Beginning or Emerging as Difficult. The measurement model classified two experiences with a nominal skill level of Proficient or Accomplishing as Easy. The statistical model identified these games as potential mismatches because, relative to other games within the respective domain with very high difficulty levels, they were relatively easier than expected. However, the initial passing rates for these two games were still low (10.9% and 15.3%). Overall, the initial pass rates became systematically lower as the nominal skill level of the experiences progressed from Beginning to Proficient.

Specifically, the Social and Emotional Learning domain analyses included six Beginning-level experiences, and all of them had a model-estimated difficulty level of Easy. The initial pass rates for the Beginning experiences ranged from 19.1% (game 66) to 89.8% (game 276). The Social and Emotional Learning domain analyses included five Emerging-level experiences, and the model classified four as Easy and one as Average. The initial pass rates for the Emerging experiences ranged from 7.2% (game 288) to 29.4% (game 9). The Social and Emotional Learning domain analyses included five Intermediate-level experiences, and the model classified four as Easy and one as Average. The initial pass rates for the Intermediate experiences ranged from 6.7% (game 291) to

17.4% (game 279). The Social and Emotional Learning domain analyses included five Accomplishing-level experiences, and one was classified as Difficult, two as Average, and two as Easy. The initial pass rates for the Accomplishing experiences ranged from 3.8% (game 293) to 15.3% (game 280). The Social and Emotional Learning domain analyses included 20 Proficient+ experiences, and 16 of them were classified as Difficult and four as Average. The initial pass rates for Proficient or higher experiences ranged from 0.0% (game 400) to 5.8% (game 201).

Similar to the results for Science & Technology, these results demonstrate a clear progression of increasing experience difficulty from the Beginning skill level to the Proficient skill level. This pattern emerged as measured by both the percentage of children passing their first attempt and model-estimated difficulty levels. The results in Table 11 illustrate a well-defined developmental pathway of skills acquisition through which children can progress as they engage with the experiences in the Social and Emotional Learning domain. The results showed a full range of experience difficulty levels ranging from as low as -8.60 logits to as high as 6.15 logits. The easiest experience was "Responding to Emotions 1," which had a nominal skill level of Beginning, a model-estimated difficulty level of Easy (-8.60 logits), and an initial pass rate of 89.8%. The most difficult experience was "Executive Functioning 8," which had a nominal skill level of Proficient+, a model-estimated difficulty level of Difficult (6.15 logits), and an initial pass rate of 0.0%.

Language & Communication Development

For the 2019–2020 academic year, there were some differences in intended and empirical-experience difficulty levels for a few of the Language & Communication Development experiences. For the 2020–2021 academic year, there were matches between intended and empirical-experience difficulty levels for most of the experiences. For the 2021–2022 academic year, the results were also very encouraging. This pattern is evident in several important ways. First, the measurement model

classified only one experience with a nominal skill level of Beginning or Emerging as Difficult. This experience (game 75) needs to be investigated to determine why it had such a low passing rate and high difficulty level. The measurement model classified five experiences with a nominal skill level of Proficient or Accomplishing as Easy. However, the statistical model identified these games as potential mismatches because, relative to other games within the respective domain with very high difficulty levels, they were relatively easier than expected. However, the initial passing rates for these five games were still low (6.2% to 8.2%). Overall, the initial pass rates became systematically lower as the nominal skill level of the experiences progressed from Beginning to Proficient.

Specifically, the Language & Communication Development domain analyses included four Beginning-level experiences, and all of them had a model-estimated difficulty level of Easy. The initial pass rates for the Beginning experiences ranged from 36.9% (game 21) to 87.8% (game 4). The Language & Communication Development domain analyses included six Emerging-level experiences, and the model classified four as Easy, one as Average, and one as Difficult. The initial pass rates for the Emerging experiences ranged from 0.0% (game 75) to 59.9% (game 16). The Language & Communication Development domain analyses included seven Intermediate-level experiences, and the model classified six as Easy and one as Difficult. The initial pass rates for the Intermediate experiences ranged from 0.0% (game 85) to 15.5% (game 57). Given that game 85 had such a dramatically low initial pass rate, it too may need to be investigated. The Language & Communication Development domain analyses included eight Accomplishing-level experiences, and one was classified as Difficult, three as Average, and four as Easy. The initial pass rates for the Accomplishing experiences ranged from 2.0% (game 264) to 8.2% (game 78). The Language & Communication Development domain analyses included 26 Proficient+ experiences, and 20 of them were classified as Difficult, five as Average, and one as Easy. The initial pass rates for Proficient or higher experiences ranged from 0.1% (game 406) to 6.3% (game 130).

These results demonstrate a clear progression of increasing experience difficulty from the Beginning skill level to the Proficient skill level. This pattern emerged as measured by both the percentage of children passing their first attempt and model-estimated difficulty levels. The results in Table 12 illustrate a well-defined developmental pathway of skills acquisition through which children can progress as they engage with the experiences in the Language & Communication Development domain. The results showed a full range of experience difficulty levels ranging from as low as -8.36 logits to as high as 10.08 logits. The easiest experience was "Classroom Cleanup," which had a nominal skill level of Beginning, a model-estimated difficulty level of Easy (-8.36 logits), and an initial pass rate of 87.8%. The most difficult experience was "Print Versus Pictures," with a nominal skill level of Emerging, a model-estimated difficulty level of Difficult (10.08 logits), and an initial pass rate of 0.0%. However, this experience needs to be investigated, given its very low initial passing rate. A more realistic experience to illustrate the top of the difficulty levels is game 406, "Academic Vocabulary 8C," with a model-estimated difficulty level of Difficult (4.35 logits), a nominal difficulty level above Proficient, and an initial pass rate of 0.1%.

Physical Development

For the 2019–2020 academic year, there were large differences in intended and empirical-experience difficulty levels for many of the Physical Development experiences. For the 2020–2021 academic year, there were no mismatches between intended and empirical-experience difficulty levels for 15 of the 16 experiences. For the 2021–2022 academic year, there were also no mismatches between intended and empirical-experience difficulty levels for 15 of the 16 experiences. Again, this pattern is evident in several important ways. First, the measurement model classified only one experience with a nominal skill level of Beginning or Emerging as Difficult. This experience (game 32) needs to be investigated to determine why it had such a low passing rate and high

difficulty level. The measurement model did not classify any of the seven experiences with a nominal skill level of Proficient or Accomplishing as Easy. Overall, the initial pass rates became systematically lower as the nominal skill level of the experiences progressed from Beginning to Proficient.

Specifically, the Physical Development domain analyses included three Beginning-level experiences, and all of them had a model-estimated difficulty level of Easy. The initial pass rates for the Beginning experiences ranged from 28.7% (game 17) to 51.4% (game 5). The Physical Development domain analyses included three Emerging-level experiences, and the model classified two as Easy and one as Difficult. The initial pass rates for the Emerging experiences ranged from 7.8% (game 32) to 30.8% (game 10). The Physical Development domain analyses included three Intermediate-level experiences, and the model classified two as Average and one as Easy. The initial pass rates for the Intermediate experiences ranged from 10.2% (game 114) to 18.3% (game 68). The Physical Development domain analyses included three Accomplishing-level experiences, and the model classified two as Difficult and one as Average. The initial pass rates for the Accomplishing experiences ranged from 5.7% (game 137) to 10.3% (game 119). The Physical Development domain analyses included four Proficient-level experiences, and all of them were classified as Difficult. The initial pass rates for Proficient experiences ranged from 0.9% (game 179) to 6.7% (game 196).

These results demonstrate a clear progression of increasing experience difficulty from the Beginning skill level to the Proficient skill level. This pattern emerged as measured by both the percentage of children passing their first attempt and model-estimated difficulty levels. The results in Table 13 illustrate a well-defined developmental pathway of skills acquisition through which children can progress as they engage with the experiences in the Physical Development domain. The results showed a full range of experience difficulty levels ranging from as low as -3.27 logits to as high as 3.66 logits. The easiest experience was "Self-Care Game Show," which had a nominal skill level of

Beginning, a model-estimated difficulty level of Easy (-3.27 logits), and an initial pass rate of 51.4%. The most difficult experience was "Making a Healthy Meal," which had a nominal skill level of Proficient, a model-estimated difficulty level of Difficult (3.66 logits), and an initial pass rate of 0.9%.

Mathematics

For the 2019–2020 academic year, there were some differences in intended and empirical-experience difficulty levels for a few of the Mathematics experiences. For the 2020–2021 academic year, there were matches between intended and empirical-experience difficulty levels for most of the experiences. For the 2021–2022 academic year, there were also matches between intended and empirical-experience difficulty levels for most of the experiences. However, the measurement model identified 11 of the 107 experiences as mismatches. The statistical model classified 10 experiences with a nominal level of Accomplishing and one Proficient experience as Easy. The statistical model identified these games as potential mismatches because, relative to other games within the respective domain with very high difficulty levels, they were relatively easier than expected. The initial passing rates for these 11 games were still low (4.9% to 14.2%). The statistical model did not classify any of the experiences with a nominal difficulty level of Beginning or Emerging as Difficult. Overall, the initial pass rates became systematically lower as the nominal skill level of the experiences progressed from Beginning to Proficient.

Specifically, the Mathematics domain analyses included 12 Beginning-level experiences, and all of them had a model-estimated difficulty level of Easy. The initial pass rates for the Beginning experiences ranged from 4.7% (game 104) to 51.8% (game 65). The Mathematics domain analyses included 12 Emerging-level experiences, and 11 of them were classified as Easy and one as average. The initial pass rates for the Emerging experiences ranged from 4.0% (game 100) to 39.0% (game

117). The Mathematics domain analyses included 12 Intermediate-level experiences. Ten of them were classified as Easy, one as Average, and one as Difficult. The initial pass rates for the Intermediate experiences ranged from 2.0% (game 96) to 31.9% (game 169). The Mathematics domain analyses included 14 Accomplishing-level experiences. The model classified 10 of them as Easy, two as Average, and two as Difficult. The initial pass rates for the Accomplishing experiences ranged from 1.4% (game 131) to 14.2% (game 184). The Mathematics domain analyses included 57 Proficient+ experiences. The model classified 50 of them as Difficult, six as Average, and one as Easy. The initial pass rates for all Proficient experiences were less than 7.0%.

These results demonstrate a relatively clear progression of increasing experience difficulty from the Beginning skill level to the Proficient skill level. This pattern emerged as measured by both the percentage of children passing their first attempt and model-estimated difficulty levels. The results in Table 14 illustrate a plausible developmental pathway of skills acquisition through which children can progress as they engage with the experiences in the Mathematics domain. The results showed a full range of experience difficulty levels ranging from as low as -5.50 logits to as high as 4.73 logits. The easiest experience was "Matching Simple Shapes," which had a nominal skill level of Beginning, a model-estimated difficulty level of Easy (-5.50 logits), and an initial pass rate of 51.8%. The most Difficult experience, "Subitizing 8," had a nominal skill level of Proficient +, a model-estimated difficulty level of Difficult (4.73 logits), and an initial pass rate of only 0.1%.

Literacy

For the 2019–2020 academic year, there were some differences in intended and empirical-experience difficulty levels for a few of the Literacy experiences. For the 2020–2021 academic year, there were matches between intended and empirical-experience difficulty levels for most of the experiences. For the 2021–2022 academic year, there were also matches between intended and

empirical-experience difficulty levels for most of the experiences. However, the measurement model identified 14 of the 134 experiences as potential mismatches. The statistical model classified nine experiences with a nominal level of Accomplishing and five Proficient experiences as Easy. The statistical model identified these games as potential mismatches because, relative to other games within the respective domain with very high difficulty levels, they were relatively easier than expected. The initial passing rates for these 14 games were still low (3.6% to 16.8%). The statistical model did not classify any of the experiences with a nominal difficulty level of Beginning or Emerging as Difficult. Overall, the initial pass rates became systematically lower as the nominal skill level of the experiences progressed from Beginning to Proficient.

Specifically, the Literacy domain analyses included nine Beginning-level experiences, and all of them had a model-estimated difficulty level of Easy. The initial pass rates for the Beginning experiences ranged from 13.9% (game 8) to 92.2% (game 71). The Literacy domain analyses included 10 Emerging-level experiences, and the model classified all of them as Easy. The initial pass rates for the Emerging experiences ranged from 4.7% (game 23) to 61.9% (game 89). The Literacy domain analyses included 11 Intermediate-level experiences. Nine of them were classified as Easy, one as Average, and one as Difficult. The initial pass rates for the Intermediate experiences ranged from 0.9% (game 298) to 19.3% (game 125). The Literacy domain analyses included 15 Accomplishing-level experiences. The model classified nine of them as Easy, four as Average, and two as Difficult. The initial pass rates for the Accomplishing experiences ranged from 1.6% (game 80) to 16.8% (game 142). The Literacy domain analyses included 89 Proficient+ experiences. The model classified 73 of them as Difficult, 11 as Average, and five as Easy. The initial pass rates for all Proficient or higher experiences were less than 9.0%.

These results demonstrate a relatively clear progression of increasing experience difficulty from the Beginning skill level to the Proficient skill level. This pattern emerged as measured by both

the percentage of children passing their first attempt and model-estimated difficulty levels. The results in Table 15 illustrate a plausible developmental pathway of skills acquisition through which children can progress as they engage with the experiences in the Literacy domain. The results showed a full range of experience difficulty levels ranging from as low as -11.39 logits to as high as 3.83 logits. The easiest experience was "Key Ideas and Details 1A," which had a nominal skill level of Beginning, a model-estimated difficulty level of Easy (-11.39 logits), and an initial pass rate of 92.2%. The most difficult experience, "Comprehending Non-Fiction 8B," had a nominal skill level of Proficient +, a model-estimated difficulty level of Difficult (3.83 logits), and an initial pass rate of only 0.1%.

Aim 2 - Summary

A wide range of game difficulty levels, from easy to difficult, emerged for all seven developmental domains. This finding demonstrates that children can be challenged and continue to grow, develop, and learn at all skill levels. Very well defined and sequenced developmental pathways emerged from Beginning to Proficient games, with matching initial passing rates and game difficulty levels for all seven domains. This finding indicates a substantial improvement from previous formative evaluation studies, which found a substantial number of games with potential mismatches between intended and actual game difficult levels. For 90.7% of the games, 351 of the 387 games evaluated across the domains, the results demonstrated a close match between the intended skill level and the initial passing rates and game difficulty levels. This pattern was consistent across all seven domains as follows:

1. Social Studies: 88.9%
2. Science & Technology: 100.0%
3. Social and Emotional Learning: 95.1%

4. Language & Communication Development: 88.2%
5. Physical Development: 93.8%
6. Mathematics: 89.7%
7. Literacy: 89.6%

Almost all of the games with potential mismatches (32 of 36; 88.9%) occurred in situations in which (1) the domain included games with difficulty levels above Proficient (level 6 or higher), (2) the games had high nominal difficulty levels (Accomplishing or Proficient), and (3) the games had low initial passing rates (< 17.0%). The statistical model identified these games as potential mismatches because, relative to other games within the respective domain with very high difficulty levels, these games were relatively easier than expected. Only four of the 387 games yielded results that may need to be investigated for potential mismatches between nominal and actual difficulty level.

Aim 3 – Highest Developmental Levels Achieved by Usage Levels

To test the assumption that more engagement with the Ignite system would lead to higher levels achieved, we examined the correlation between the amount of time engaged with the Ignite system and the number of levels achieved. This correlation was very high ($r = .849$), indicating a strong linear positive relationship between time spent engaged with the games and the highest level achieved. We also tested a regression model with minutes engaged with the games, with months during the academic year during which a child engaged with the Ignite system and child age as predictors. All predictors in the model were statistically significantly associated with levels achieved, and the total r^2 for the model was .735. These results indicate that this set of predictor variables is strongly associated with the number of levels achieved. Total minutes engaged with the experiences is predictive of the number of levels a child achieves. Predictor variables beyond simply time spent

engaged also contributed to the model. For example, it is important to note that child age contributed to the model, illustrating how older children benefited from the experiences more, and progressed through the levels further, than their younger peers. Furthermore, the number of months during the academic year during which a child engages with the experiences added to the predictive power of the model, illustrating how sustained engagement over time, separate from total minutes spent using the system, benefits children because they continue to practice and apply the skills they are gaining through the Ignite system during other classroom activities.

To illustrate how this relationship works, we defined three groups of children according to usage levels. We defined the low-use group as those children who used the Ignite system for less than 2 months and did not meet the 30 minutes per week standard. The majority of children in this study were classified in this group (63.3%). We defined the medium-use group as those children who used the Ignite system for 2–4 months and at least 30 minutes per week. This group comprised 25.9% of all children in this study. We defined the high-use group as those children who used the Ignite system for at least 5 months and at least 30 minutes per week. It is important to note that this "high"-use group may not have used the Ignite system for the entire 9 or 10 months of a typical academic year. This group comprised 10.8% of all children in this study.

We then compared the number of levels achieved across the usage groups. Table 16 contains the average number of levels achieved for children of all age groups by usage level. Children in the high-use group achieved more levels on average than children in the medium-use group, who, in turn, achieved higher levels than children in the low-use group. Specifically, children in the low-use group achieved approximately one or two levels on average. The means ranged from as low as 1.16 for Science & Technology to as high as 1.85 for Mathematics. Children in the medium-use group achieved approximately two or three levels on average. The means ranged from as low as 2.52 for Science & Technology to as high as 3.46 for Mathematics. Children in the high-use group achieved

approximately four or five levels on average. These means ranged from as low as 4.17 for Social Studies to as high as 4.96 for Mathematics.

Table 17 contains the average number of levels achieved for 3-year-old children by usage level. Children in the high-use 3-year-old group achieved more levels on average than children in the medium-use group, who, in turn, achieved higher levels than children in the low-use group. Specifically, children in the low-use group achieved approximately one level on average. These means ranged from as low as 1.09 for Science & Technology to as high as 1.67 for Mathematics. Children in the medium-use group achieved approximately two or three levels on average. These means ranged from as low as 1.94 for Science & Technology to as high as 2.91 for Mathematics. Children in the high-use group achieved approximately three or four levels on average. These means ranged from as low as 3.44 for Social Studies to as high as 4.04 for Mathematics.

Table 18 contains the average number of levels achieved for 4-year-old children by usage level. Children in the high-use 4-year-old group achieved more levels on average than children in the medium-use group, who, in turn, achieved higher levels than children in the low-use group. Specifically, children in the low-use group achieved approximately one or two levels on average. These means ranged from as low as 1.18 for Science & Technology to as high as 1.93 for Mathematics. Children in the medium-use group achieved approximately two or three levels on average. These means ranged from as low as 2.66 for Science & Technology to as high as 3.59 for Mathematics. Children in the high-use group achieved approximately four or five levels on average. These means ranged from as low as 4.28 for Social Studies to as high as 5.09 for Mathematics.

Table 19 contains the average number of levels achieved for 5-year-old children by usage level, where a similar pattern emerged compared to other age groups. Children in the high-use 5-year-old group achieved more levels on average than children in the medium-use group, who, in turn, achieved higher levels than children in the low-use group. Specifically, children in the low-use

group achieved approximately one or two levels on average. These means ranged from as low as 1.56 for Social Studies to as high as 2.38 for Mathematics. Children in the medium-use group achieved approximately three or four levels on average. These means ranged from as low as 3.66 for Social Studies to as high as 4.63 for Mathematics. Children in the high-use group achieved approximately five or six levels on average. These means ranged from as low as 4.69 for Social Studies to as high as 6.00 for Mathematics.

Next, we examined the percentage of children who achieved at least level 4 as their maximum level achieved. Level 4 represents the expected level for children at the end of preschool. Table 20 contains the results of this analysis for all usage groups by age. It is important to note that these results were impacted by the fact that most children (63.3%) were classified in the low-use group. For 3-year-olds, a small minority of children achieved at least level 4. These percentages varied by domain, from as low as 3.2% for Social Studies to as high as 11.8% for Mathematics. A small minority of 3-year-olds achieved level 3. These percentages varied by domain, from as low as 3.5% for Literacy to as high as 20.1% for Mathematics.

For 4-year-olds, a larger minority of children achieved at least level 4. These percentages varied by domain, from as low as 14.7% for Social Studies to as high as 31.7% for Mathematics. A small minority of 4-year-olds achieved level 3. These percentages varied by domain, from as low as 6.6% for Literacy to as high as 23.6% for Mathematics. For 5-year-olds, a larger minority of children also achieved at least level 4. These percentages varied by domain, from as low as 12.7% for Social Studies to as high as 29.3% for Mathematics. A small minority of 5-year-olds achieved level 3. These percentages varied by domain, from as low as 5.9% for Literacy to as high as 24.1% for Mathematics.

Finally, we examined the same percentages displayed in Table 20 for medium- and high-use groups. The medium-use group displayed a pattern that was very similar to the low-use group.

However, the high-use group displayed a substantially different pattern. Table 21 contains the results for the high-use group. The percentages of children reaching at least level 4 were substantially higher for the high-use group. For high-use 3-year-olds, the majority of children achieved at least level 4. These percentages varied by domain, from as low as 38.7% for Social Studies to as high as 64.7% for Mathematics. In addition, a substantial minority of high-use 3-year-olds achieved level 3. These percentages varied by domain, from as low as 13.0% for Literacy to as high as 42.1% for Social Studies.

For high-use 4-year-olds, a larger minority of children achieved at least level 4. These percentages varied by domain, from 74.5% for Social Studies to 92.8% for Mathematics. In addition, a small minority of high-use 4-year-olds achieved level 3. These percentages varied by domain, from as low as 4.8% for Literacy to as high as 21.7% for Social Studies. For high-use 5-year-olds, a large majority of children achieved at least level 4. These percentages varied by domain, from 89.8% for Social Studies to 97.5% for Mathematics. In addition, a small minority of high-use 5-year-olds achieved level 3. These percentages varied by domain and reached as high as 10.3% for Social Studies.

Aim 3 – Summary

Across all seven domains and all three age groups, the low-use group of children completed approximately one level on average. The medium-use group of children completed approximately 2 or 3 levels on average. The high-use group of children completed approximately 4 or 5 levels on average. When these results were broken out by age group, the expected rank order by age (5-year-olds > 4-year-olds > 3-year-olds) emerged for all domains and usage levels. A substantial percentage of high-use 3-year-olds (38.7%–64.7%, depending on domain) reached at least level 4 during the academic year. The overwhelming majority of high-use 4-year-olds (74.5%–92.8%, depending on

domain) reached at least level 4 during the academic year. Similarly, the overwhelming majority of high-use 5-year-olds (89.8%–97.5%, depending on domain) reached at least level 4 during the academic year.

Additional Analyses by Child Race and Ethnicity

We conducted an initial examination of subgroup differences by child race and ethnicity. We restricted these analyses to three groups: white non-Hispanic children, black non-Hispanic children, and Hispanic children. The remaining groups contributed small numbers to the total user group. Table 22 contains the mean number of levels achieved for each group by age. For 3-year-olds, there were virtually no differences between the race and ethnicity groups across all domains of development, and the differences that did emerge were extremely small. For example, for the Language & Communication Development domain, white non-Hispanic children reached an average of 1.71 levels, and these values were nearly identical for the other two subgroups (black non-Hispanic = 1.71, Hispanic = 1.70).

For 4-year-olds, there were also very small differences between the three subgroups across all domains. However, 4-year-old black non-Hispanic children did score slightly lower than children in the other two subgroups did for all seven domains. For example, for the Literacy domain, white non-Hispanic children reached an average of 2.56 levels, as compared to 2.50 for Hispanic children and 2.38 for black non-Hispanic children. For 5-year-old children, a consistent pattern emerged across all seven domains. Hispanic 5-year-old children scored highest, white non-Hispanic children next highest, and black non-Hispanic children lowest on average. For example, for the Literacy domain, the means were as follows: Hispanic = 3.27, white non-Hispanic = 2.35, and black non-Hispanic = 2.12.

Table 23 contains the results of examining these same subgroup differences in terms of the percentage of children in each age group that achieved level 4 or above. For 3-year-old children, there were very small differences between the subgroups. For example, in the Social Studies domain, 3.2% of black non-Hispanic children reached level 4 or above, as compared to 3.1% for white non-Hispanic children and 2.9% for Hispanic children. For 4-year-olds, a somewhat different picture emerged with a consistent pattern of small differences. The range of percentages for the three subgroups was between 4% and 6% within a given domain of development. White non-Hispanic children showed the highest percentage reaching level 4 or above. Hispanic children showed the next-highest percentage, which was consistently higher than the overall percentage for black non-Hispanic children. For example, within the Literacy domain, 26.5% of white non-Hispanic 4-year-old children reached level 4 or above, followed by 23.9% of Hispanic children and 21.4% of black non-Hispanic children.

For 5-year-old children, a different pattern of moderately sized differences emerged. The range of percentages for the three subgroups was between 28% and 35% within a given domain of development. Hispanic children showed the highest percentage reaching level 4 or above. White non-Hispanic children showed the next-highest percentage, which was consistently higher than the overall percentage for black non-Hispanic children. For example, within the Literacy domain, 43.9% of Hispanic 5-year-old children reached level 4 or above, followed by 24.6% of white non-Hispanic children, and 15.7% of black non-Hispanic children.

The differences between the three racial and ethnic subgroups were minimal for 3- and 4-year-old children. However, some of the differences between the subgroups for 5-year-old children were moderately sized. When the same analyses were restricted to only high-use children within each subgroup, the subgroup differences remained minimal for 3- and 4-year-old children. The more substantial differences between the subgroups for 5-year-old children remained as well. The

subgroup of Hispanic 5-year-old children were more likely to be in the high-use group, explaining the apparent advantage for that group.

Summary and Conclusion

This report outlines additional validity evidence for the instructional usefulness of the Ignite experiences. The main focal points were performance differences between 3-year-olds, 4-year-olds, and 5-year-olds for both initial and final passing rates by experience; the match or mismatch between intended experience skill levels and empirically generated experience difficulty levels; and the relationship between time spent engaged with the games and the levels achieved.

Overall, the findings of this study present strong validity evidence suggesting that the Ignite experiences are generally functioning as intended. The results also highlight some substantial improvements to the experiences. Child age was related to both initial and final passing rates as expected. A plausible developmental pathway emerged for each domain that ranged from the easiest experiences to the most difficult experiences, and the pathway generally corresponded very well to the intended nominal skill levels. Fewer experiences presented potential mismatches between intended skill level and empirical difficulty level than were identified in previous research. A small number of experiences could be investigated for substantial mismatches between nominal and empirical difficulty levels.

Usage level was strongly correlated with the number of levels achieved as expected. Specifically, the results of this study demonstrate that when children engage with the Ignite experiences at recommended usage levels, they can reach levels 4 and 5. When analyses were limited to high-use children, the results show that these children completed approximately 4 or 5 levels on average, depending on the domain of development. This means that if a child started at the

beginning of the sequence of experiences and completed 4 or 5 levels, the child would be functioning at the Accomplishing or Proficient level. Specifically, the overwhelming majority of high-use 4-year-olds (74.5%–92.8%, depending on domain) reached a level 4 during the academic year. Similarly, as report earlier in this report, the overwhelming majority of high-use 5-year-olds (89.8%–97.5%, depending on domain) reached a level 4 during the academic year.

Future research will need to focus on the factors that are associated with higher usage levels in classrooms. Only a small minority of children used the Ignite system for at least 30 minutes per week across at least 5 months of the academic year. It will be important to provide teachers with resources that inform their instructional practice, illustrate the benefits of child engagement with the system, and support instructionally appropriate and consistent use of the Ignite system throughout the academic year. The development of an implementation fidelity guide for teachers may help in this regard. It will also be important to gather information that can help demonstrate whether the child gains made within the system generalize to demonstrated skills and abilities in both classroom activities and external measures of child developmental progress.

The results of this study indicate that some preschool-aged children reach more advanced levels intended for elementary-aged children. Future research is needed that includes older elementary-aged children and separate analyses of the experiences rated higher than Proficient. Future research is also needed to undertake a more detailed examination of potential differences by race and ethnicity. These findings need to be monitored going forward to develop a robust set of findings regarding how children from diverse racial and ethnic backgrounds make progress within the Ignite system. The analyses could include differential item functioning and measurement invariance analyses and a more robust analysis of subgroup differences that includes a wider range of demographic variables.

Table 1
Characteristics of the Sample

Variable	Category	Percentage
Gender	Male	50.5%
	Female	49.5%
Age level	3-year-old	29.0%
	4-year-old	68.3%
	5-year-old	2.6%
Race/ethnicity	White (non-Hispanic)	32.1%
	Black (non-Hispanic)	34.8%
	Asian (non-Hispanic)	1.9%
	Native American (non-Hispanic)	1.9%
	Multiple races	2.6%
	Hispanic	26.8%

Table 2

Passing Rate for First Attempts - Social Studies

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
1	I Can Draw Myself	3-year-olds	98.9	99.6	1	1.00	1.02	0.16	3
		4-year-olds	99.0	99.7	1	1.00	1.03	0.18	12
		5-year-olds	99.8	99.9	1	1.00	1.01	0.09	2
16	Moon Mission	3-year-olds	44.8	44.8	2	1.00	1.00	0.00	1
		4-year-olds	55.3	55.3	2	1.00	1.00	0.00	1
		5-year-olds	----	----	2	----	----	----	----
22	I Can Draw My Home	3-year-olds	100.0	100.0	2	1.00	1.01	0.10	2
		4-year-olds	100.0	100.0	2	1.00	1.01	0.08	2
		5-year-olds	100.0	100.0	2	1.00	1.00	0.07	2
30	The "What" Machine Continued Practice	3-year-olds	67.9	67.9	2	1.00	1.00	0.00	1
		4-year-olds	79.3	79.3	2	1.00	1.00	0.00	1
		5-year-olds	100.0	100.0	2	1.00	1.00	----	1
40	I Can Draw My Neighborhood	3-year-olds	99.9	100.0	1	1.00	1.01	0.10	5
		4-year-olds	100.0	100.0	1	1.00	1.01	0.10	5
		5-year-olds	99.9	100.0	1	1.00	1.01	0.10	2
60	I Can Draw My Family	3-year-olds	100.0	100.0	3	1.00	1.01	0.07	2
		4-year-olds	100.0	100.0	3	1.00	1.01	0.08	3
		5-year-olds	100.0	100.0	3	1.00	1.00	0.07	2
69	Building a Neighborhood	3-year-olds	100.0	100.0	2	1.00	1.01	0.10	2
		4-year-olds	100.0	100.0	2	1.00	1.01	0.09	3
		5-year-olds	100.0	100.0	2	1.00	1.00	0.05	2
97	I Can Draw My Interests	3-year-olds	100.0	100.0	4	1.00	1.01	0.08	2
		4-year-olds	100.0	100.0	4	1.00	1.01	0.08	3
		5-year-olds	100.0	100.0	4	1.00	1.00	0.00	1
108	Uses of Neighborhood Features	3-year-olds	73.5	93.3	3	1.00	1.36	0.79	10
		4-year-olds	83.4	97.6	3	1.00	1.22	0.63	11
		5-year-olds	91.8	99.4	3	1.00	1.11	0.40	4
135	I Can Draw About Myself	3-year-olds	100.0	100.0	5	1.00	1.01	0.08	2
		4-year-olds	100.0	100.0	5	1.00	1.01	0.09	2
		5-year-olds	100.0	100.0	5	1.00	1.00	0.00	1
148	I Can Draw Myself Continued Practice	3-year-olds	100.0	100.0	1	1.00	1.01	0.09	2
		4-year-olds	100.0	100.0	1	1.00	1.01	0.09	4
		5-year-olds	100.0	100.0	1	1.00	1.00	0.06	2
168	I Can Draw My Home Continued Practice	3-year-olds	100.0	100.0	2	1.00	1.01	0.10	2
		4-year-olds	100.0	100.0	2	1.00	1.01	0.08	3
		5-year-olds	100.0	100.0	2	1.00	1.01	0.08	2
175	I Can Draw My Family Continued Practice	3-year-olds	100.0	100.0	3	1.00	1.01	0.10	2
		4-year-olds	100.0	100.0	3	1.00	1.01	0.08	2
		5-year-olds	100.0	100.0	3	1.00	1.01	0.07	2
177	I Can Draw My Interests Continued Practice	3-year-olds	100.0	100.0	4	1.00	1.00	0.05	2
		4-year-olds	100.0	100.0	4	1.00	1.01	0.09	2
		5-year-olds	100.0	100.0	4	1.00	1.00	0.00	1

Table 2 (continued)

Passing Rate for First Attempts - Social Studies

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
178	Building a Neighborhood 2	3-year-olds	74.4	94.2	4	1.00	1.29	0.61	6
		4-year-olds	83.6	97.4	4	1.00	1.19	0.52	14
		5-year-olds	88.9	99.5	4	1.00	1.15	0.52	6
193	I Can Draw About Myself Continued Practice	3-year-olds	100.0	100.0	5	1.00	1.00	0.00	1
		4-year-olds	100.0	100.0	5	1.00	1.01	0.10	2
		5-year-olds	100.0	100.0	5	1.00	1.02	0.15	2
198	Identifying Community Helpers	3-year-olds	66.7	89.6	5	1.00	1.55	1.87	21
		4-year-olds	77.2	95.6	5	1.00	1.40	1.09	18
		5-year-olds	84.7	100.0	5	1.00	1.26	0.82	7
202	I Can Draw My Neighborhood Continued Practice	3-year-olds	100.0	100.0	1	1.00	1.01	0.10	3
		4-year-olds	100.0	100.0	1	1.00	1.01	0.09	4
		5-year-olds	100.0	100.0	1	1.00	1.00	0.07	2

Table 3

Passing Rate for First Attempts - Science & Technology

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
2	Living or Nonliving?	3-year-olds	34.4	84.9	1	2.00	2.56	2.25	40
		4-year-olds	50.3	93.8	1	1.00	2.01	1.72	49
		5-year-olds	64.3	91.9	1	1.00	1.62	1.32	19
25	Object Properties	3-year-olds	32.1	83.2	1	2.00	2.65	2.47	33
		4-year-olds	45.4	92.6	1	2.00	2.09	1.85	56
		5-year-olds	55.5	86.0	1	1.00	1.66	1.13	18
29	Which Is a Living Thing 2	3-year-olds	45.5	85.0	2	1.00	1.87	1.39	16
		4-year-olds	63.2	94.5	2	1.00	1.57	1.06	18
		5-year-olds	81.6	96.5	2	1.00	1.21	0.56	5
37	Simple Scientific Tools	3-year-olds	43.3	87.6	1	2.00	2.17	1.86	23
		4-year-olds	56.7	94.5	1	1.00	1.79	1.43	31
		5-year-olds	66.7	90.2	1	1.00	1.53	1.04	13
42	Basic Needs	3-year-olds	47.5	87.9	3	1.00	1.80	1.29	17
		4-year-olds	62.3	95.5	3	1.00	1.54	1.02	30
		5-year-olds	79.1	97.2	3	1.00	1.30	0.82	8
43	Senses and Texture	3-year-olds	47.2	86.1	2	1.00	1.84	1.30	12
		4-year-olds	58.8	94.1	2	1.00	1.64	1.16	29
		5-year-olds	77.5	95.8	2	1.00	1.32	0.84	9
48	Nature Scavenger Hunt	3-year-olds	90.3	98.3	1	1.00	1.12	0.46	12
		4-year-olds	93.2	99.2	1	1.00	1.09	0.42	17
		5-year-olds	94.7	98.4	1	1.00	1.06	0.28	4
53	What Our Senses Do	3-year-olds	57.2	89.2	3	1.00	1.68	1.37	22
		4-year-olds	71.8	96.1	3	1.00	1.45	1.12	30
		5-year-olds	80.4	97.4	3	1.00	1.27	0.75	8
62	Environmental Changes	3-year-olds	45.7	88.7	2	1.00	1.77	1.16	14
		4-year-olds	58.6	94.8	2	1.00	1.57	0.97	19
		5-year-olds	74.3	93.2	2	1.00	1.27	0.57	5
72	Everyday Tools	3-year-olds	42.7	86.3	2	2.00	2.00	1.51	23
		4-year-olds	57.9	94.1	2	1.00	1.72	1.30	20
		5-year-olds	72.3	93.7	2	1.00	1.36	0.81	10
81	How Living Things Change	3-year-olds	12.1	55.8	4	3.00	4.16	4.30	44
		4-year-olds	27.2	83.9	4	2.00	3.10	3.05	35
		5-year-olds	68.0	90.7	4	1.00	1.64	1.69	18
93	Sorting Living Things	3-year-olds	67.1	93.4	4	1.00	1.44	0.85	11
		4-year-olds	75.8	97.1	4	1.00	1.33	0.74	12
		5-year-olds	76.0	98.2	4	1.00	1.29	0.58	4
95	Weather Game Show	3-year-olds	64.3	91.2	3	1.00	1.54	1.04	10
		4-year-olds	71.9	96.1	3	1.00	1.41	0.91	16
		5-year-olds	84.6	97.0	3	1.00	1.19	0.54	5
112	Sorting Scientific Tools	3-year-olds	64.3	93.4	3	1.00	1.43	0.75	6
		4-year-olds	79.7	98.0	3	1.00	1.24	0.56	8
		5-year-olds	89.0	99.2	3	1.00	1.13	0.41	4

Table 3 (continued)

Passing Rate for First Attempts - Science & Technology

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
127	Living Things Game Show	3-year-olds	43.4	82.1	5	1.00	1.79	1.13	7
		4-year-olds	58.5	93.4	5	1.00	1.59	1.03	15
		5-year-olds	79.4	97.7	5	1.00	1.23	0.56	5
134	Magnet Fun	3-year-olds	75.8	91.6	5	1.00	1.25	0.60	4
		4-year-olds	88.0	98.2	5	1.00	1.14	0.44	7
		5-year-olds	92.9	100.0	5	1.00	1.08	0.28	2
154	Weather Windows	3-year-olds	62.9	88.8	4	1.00	1.41	0.75	7
		4-year-olds	73.3	96.2	4	1.00	1.32	0.65	10
		5-year-olds	89.4	96.3	4	1.00	1.10	0.38	4
161	Recycling and Reusing	3-year-olds	10.9	64.0	5	2.00	2.83	2.17	18
		4-year-olds	14.8	79.6	5	2.00	2.97	2.16	28
		5-year-olds	24.4	89.9	5	2.00	2.44	1.51	11
187	Which Tools to Use?	3-year-olds	41.0	88.0	4	2.00	1.77	0.95	7
		4-year-olds	43.8	93.3	4	2.00	1.71	0.87	11
		5-year-olds	50.4	95.1	4	1.00	1.56	0.77	6
195	Uses of Scientific Tools	3-year-olds	29.9	73.4	5	2.00	2.72	2.76	25
		4-year-olds	32.0	82.9	5	2.00	2.78	2.82	46
		5-year-olds	39.5	87.9	5	2.00	2.15	1.61	10

Table 4
Passing Rate for First Attempts - Social and Emotional Learning

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
3	Identifying Basic Emotions	3-year-olds	62.4	91.9	1	1.00	1.75	1.65	43
		4-year-olds	72.3	96.5	1	1.00	1.49	1.20	58
		5-year-olds	80.8	94.7	1	1.00	1.31	0.88	13
9	Causes of Basic Emotions	3-year-olds	43.0	87.5	2	2.00	1.85	1.31	21
		4-year-olds	62.9	95.2	2	1.00	1.48	0.90	23
		5-year-olds	78.1	95.1	2	1.00	1.25	0.64	11
66	Recognizing Social Problems	3-year-olds	17.5	70.2	1	3.00	4.20	4.57	61
		4-year-olds	27.5	84.9	1	2.00	3.36	3.74	71
		5-year-olds	36.9	75.1	1	2.00	2.35	2.03	19
76	Identifying Complex Emotions	3-year-olds	41.5	86.9	3	2.00	1.88	1.38	32
		4-year-olds	52.8	94.2	3	1.00	1.70	1.07	19
		5-year-olds	70.0	96.1	3	1.00	1.42	0.82	7
99	Pro-Social Behaviors	3-year-olds	59.8	91.6	2	1.00	1.62	1.14	13
		4-year-olds	72.4	96.4	2	1.00	1.41	0.98	36
		5-year-olds	83.6	95.9	2	1.00	1.20	0.54	5
118	Causes of Complex Emotions	3-year-olds	31.8	82.2	4	2.00	2.06	1.28	16
		4-year-olds	45.7	92.7	4	2.00	1.77	1.06	17
		5-year-olds	67.7	96.5	4	1.00	1.41	0.79	7
123	Solving Social Problems 3	3-year-olds	65.8	91.6	3	1.00	1.52	1.12	13
		4-year-olds	75.8	97.2	3	1.00	1.34	0.81	17
		5-year-olds	84.3	97.1	3	1.00	1.17	0.47	5
139	Identifying Emotions 5	3-year-olds	57.9	82.1	5	1.00	1.78	1.67	11
		4-year-olds	69.5	93.4	5	1.00	1.62	1.52	21
		5-year-olds	80.2	97.7	5	1.00	1.44	1.22	9
170	Solving Social Problems	3-year-olds	73.2	91.7	4	1.00	1.34	0.86	12
		4-year-olds	83.5	97.3	4	1.00	1.24	0.69	9
		5-year-olds	94.2	100.0	4	1.00	1.08	0.36	4
201	Addressing Our Own Emotions	3-year-olds	82.5	94.7	5	1.00	1.28	1.58	22
		4-year-olds	88.6	97.9	5	1.00	1.13	0.46	10
		5-year-olds	95.7	99.1	5	1.00	1.04	0.24	3
259	Solving Social Problems 6	3-year-olds	73.0	81.1	6	1.00	1.16	0.37	2
		4-year-olds	77.0	95.1	6	1.00	1.33	0.96	13
		5-year-olds	95.2	100.0	6	1.00	1.10	0.48	4
260	Identifying Emotions 6	3-year-olds	92.3	97.4	6	1.00	1.08	0.30	3
		4-year-olds	91.8	98.7	6	1.00	1.09	0.33	5
		5-year-olds	95.2	100.0	6	1.00	1.06	0.29	3
276	Responding to Emotions 1	3-year-olds	100.0	100.0	1	1.00	1.01	0.09	2
		4-year-olds	100.0	100.0	1	1.00	1.01	0.09	3
		5-year-olds	100.0	100.0	1	1.00	1.00	0.05	2
277	Responding to Emotions 1 Continued Practice	3-year-olds	100.0	100.0	1	1.00	1.01	0.10	2
		4-year-olds	100.0	100.0	1	1.00	1.01	0.08	3
		5-year-olds	100.0	100.0	1	1.00	1.00	0.07	2

Table 4 (continued)
Passing Rate for First Attempts - Social and Emotional Learning

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
278	Responding to Emotions 2	3-year-olds	74.5	94.1	2	1.00	1.40	0.96	13
		4-year-olds	85.1	97.7	2	1.00	1.25	0.83	27
		5-year-olds	92.6	98.4	2	1.00	1.12	0.51	7
279	Responding to Emotions 3	3-year-olds	77.6	94.2	3	1.00	1.31	0.87	13
		4-year-olds	87.1	98.2	3	1.00	1.18	0.65	17
		5-year-olds	93.0	98.5	3	1.00	1.09	0.34	4
280	Responding to Emotions 4	3-year-olds	83.4	95.6	4	1.00	1.35	2.46	69
		4-year-olds	87.6	98.0	4	1.00	1.20	0.68	9
		5-year-olds	94.1	98.2	4	1.00	1.08	0.35	3
281	Responding to Emotions 5	3-year-olds	82.0	97.3	5	1.00	1.41	2.15	26
		4-year-olds	85.9	97.6	5	1.00	1.23	0.82	14
		5-year-olds	90.6	100.0	5	1.00	1.17	0.57	5
282	Responding to Emotions 6	3-year-olds	86.7	93.8	6	1.00	1.11	0.39	3
		4-year-olds	88.0	97.1	6	1.00	1.15	0.48	6
		5-year-olds	93.5	98.7	6	1.00	1.12	0.49	4
286	Executive Functioning 1	3-year-olds	40.8	80.1	1	2.00	2.86	3.59	57
		4-year-olds	57.4	91.0	1	1.00	2.22	2.98	79
		5-year-olds	61.9	83.9	1	1.00	1.63	1.32	14
287	Executive Functioning 1 Continued Practice	3-year-olds	63.8	89.7	1	1.00	1.76	1.82	23
		4-year-olds	69.2	94.6	1	1.00	1.70	1.96	42
		5-year-olds	78.6	91.5	1	1.00	1.37	1.26	17
288	Executive Functioning 2	3-year-olds	16.9	62.2	2	3.00	4.35	4.64	45
		4-year-olds	25.6	79.7	2	2.00	4.01	5.12	79
		5-year-olds	35.7	81.6	2	2.00	3.00	3.72	35
289	Executive Functioning 2 Continued Practice	3-year-olds	36.8	75.7	2	2.00	3.08	3.52	33
		4-year-olds	45.1	87.5	2	2.00	2.93	3.92	65
		5-year-olds	58.1	92.1	2	1.00	2.23	3.26	44
290	Executive Functioning 3	3-year-olds	40.0	76.1	3	2.00	2.81	3.08	21
		4-year-olds	48.3	88.0	3	1.00	2.81	3.90	67
		5-year-olds	63.6	88.9	3	1.00	1.92	2.36	21
291	Executive Functioning 3 Continued Practice	3-year-olds	47.2	77.2	3	1.00	2.59	3.02	33
		4-year-olds	51.6	89.1	3	1.00	2.48	3.19	49
		5-year-olds	61.5	91.3	3	1.00	2.30	3.19	33
292	Executive Functioning 4	3-year-olds	33.8	70.1	4	2.00	3.05	3.79	27
		4-year-olds	38.3	83.8	4	2.00	3.29	4.77	71
		5-year-olds	49.2	88.8	4	1.00	2.65	3.94	40
293	Executive Functioning 4 Continued Practice	3-year-olds	40.6	76.7	4	1.50	2.57	3.04	25
		4-year-olds	42.4	84.5	4	2.00	3.15	4.49	55
		5-year-olds	44.5	89.0	4	2.00	2.41	2.75	25
304	Executive Functioning 5	3-year-olds	38.3	79.2	5	2.00	2.81	3.60	31
		4-year-olds	36.7	74.3	5	2.00	4.25	7.06	167
		5-year-olds	41.1	82.2	5	2.00	3.82	6.41	41

Table 4 (continued)
Passing Rate for First Attempts - Social and Emotional Learning

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
305	Executive Functioning 5 Continued Practice	3-year-olds	34.2	65.8	5	2.00	3.42	4.29	27
		4-year-olds	32.3	75.0	5	2.00	4.28	6.38	108
		5-year-olds	30.6	80.0	5	2.00	3.79	4.94	33
306	Executive Functioning 6	3-year-olds	50.0	61.1	6	1.00	1.50	1.04	5
		4-year-olds	42.0	76.3	6	2.00	3.77	5.86	53
		5-year-olds	50.0	85.7	6	1.00	2.43	3.63	20
307	Executive Functioning 6 Continued Practice	3-year-olds	27.5	70.6	6	2.00	3.18	2.96	12
		4-year-olds	34.9	75.4	6	2.00	3.88	5.52	67
		5-year-olds	47.4	82.5	6	1.00	2.77	4.40	30
388	Social Problem Solving 7	3-year-olds	87.5	93.8	7	1.00	1.19	0.54	3
		4-year-olds	92.5	98.3	7	1.00	1.11	0.52	9
		5-year-olds	92.0	100.0	7	1.00	1.08	0.28	2
389	Identifying Emotions 7	3-year-olds	36.4	86.4	7	2.00	2.73	2.05	7
		4-year-olds	65.5	92.6	7	1.00	1.62	1.44	26
		5-year-olds	72.2	88.9	7	1.00	1.25	0.55	3
390	Responding to Emotions 7	3-year-olds	80.0	93.3	7	1.00	1.13	0.35	2
		4-year-olds	93.1	98.3	7	1.00	1.08	0.35	4
		5-year-olds	91.7	100.0	7	1.00	1.17	0.56	3
391	Executive Functioning 7	3-year-olds	45.5	63.6	7	1.00	1.91	1.87	7
		4-year-olds	43.1	87.9	7	2.00	2.42	2.17	21
		5-year-olds	54.5	86.4	7	1.00	2.14	2.44	11
392	Executive Functioning 7 Continued Practice	3-year-olds	40.0	80.0	7	2.00	2.00	1.00	3
		4-year-olds	53.0	87.2	7	1.00	1.76	1.33	10
		5-year-olds	57.1	92.9	7	1.00	1.93	1.94	8
397	Social Problem Solving 8	3-year-olds	100.0	100.0	8	1.00	1.00	0.00	1
		4-year-olds	95.7	97.5	8	1.00	1.23	1.27	16
		5-year-olds	94.1	100.0	8	1.00	1.06	0.24	2
398	Identifying Emotions 8	3-year-olds	87.5	87.5	8	1.00	1.13	0.35	2
		4-year-olds	83.6	97.0	8	1.00	1.20	0.52	5
		5-year-olds	82.4	94.1	8	1.00	1.18	0.53	3
399	Responding to Emotions 8	3-year-olds	28.6	57.1	8	1.00	1.57	0.79	3
		4-year-olds	71.5	92.5	8	1.00	1.41	0.91	9
		5-year-olds	88.2	94.1	8	1.00	1.06	0.24	2
400	Executive Functioning 8	3-year-olds	25.0	50.0	8	2.00	3.25	3.20	8
		4-year-olds	7.9	65.1	8	3.00	4.51	3.40	20
		5-year-olds	16.7	91.7	8	3.00	3.17	1.64	5
401	Executive Functioning 8 Continued Practice	3-year-olds	16.7	16.7	8	1.00	1.50	0.84	3
		4-year-olds	18.5	64.6	8	2.00	3.71	3.45	20
		5-year-olds	23.1	61.5	8	2.00	3.46	4.58	18

Table 5
Passing Rate for First Attempts - Language & Communication Development

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
4	Classroom Cleanup	3-year-olds	90.3	98.7	1	1.00	1.14	0.57	17
		4-year-olds	96.8	99.7	1	1.00	1.05	0.30	12
		5-year-olds	98.0	99.6	1	1.00	1.03	0.23	4
7	Basic Words	3-year-olds	35.2	84.8	1	2.00	2.58	2.40	31
		4-year-olds	51.6	93.7	1	1.00	1.95	1.66	40
		5-year-olds	58.2	88.0	1	1.00	1.67	1.13	10
14	Color Words	3-year-olds	51.4	89.7	1	1.00	2.28	2.45	42
		4-year-olds	66.4	95.9	1	1.00	1.68	1.59	45
		5-year-olds	74.7	93.2	1	1.00	1.44	1.26	19
16	Moon Mission	3-year-olds	96.5	99.3	2	1.00	1.05	0.31	17
		4-year-olds	97.4	99.8	2	1.00	1.03	0.22	12
		5-year-olds	98.0	99.6	2	1.00	1.02	0.16	3
21	Basic Words Continued Practice	3-year-olds	57.9	90.1	1	1.00	1.80	1.58	23
		4-year-olds	71.3	95.9	1	1.00	1.48	1.15	33
		5-year-olds	79.5	92.6	1	1.00	1.25	0.68	7
24	The "What" Machine	3-year-olds	49.7	86.3	2	1.00	2.13	2.11	29
		4-year-olds	61.0	94.1	2	1.00	1.79	1.62	37
		5-year-olds	76.3	93.9	2	1.00	1.35	0.92	12
28	Categorizing Words	3-year-olds	10.0	66.9	2	3.00	3.89	3.48	39
		4-year-olds	12.3	83.3	2	3.00	3.32	2.74	80
		5-year-olds	30.3	77.7	2	2.00	2.20	1.59	18
30	The "What" Machine Continued Practice	3-year-olds	60.9	88.9	2	1.00	1.83	1.71	19
		4-year-olds	67.7	95.0	2	1.00	1.65	1.46	26
		5-year-olds	81.4	96.2	2	1.00	1.29	0.78	7
35	2-Step Directions	3-year-olds	33.2	76.3	3	2.00	2.43	2.02	19
		4-year-olds	37.2	88.5	3	2.00	2.43	2.01	25
		5-year-olds	45.8	88.9	3	1.00	2.01	1.49	12
36	Categorizing Words Continued Practice	3-year-olds	42.1	83.1	2	2.00	2.22	1.98	24
		4-year-olds	54.3	93.4	2	1.00	1.85	1.50	27
		5-year-olds	74.5	95.5	2	1.00	1.38	0.88	8
41	The "Where" Machine	3-year-olds	61.8	90.1	3	1.00	1.71	1.45	18
		4-year-olds	68.1	95.2	3	1.00	1.57	1.31	36
		5-year-olds	81.5	97.3	3	1.00	1.28	0.76	8
50	The "Where" Machine Continued Practice	3-year-olds	64.3	91.7	3	1.00	1.65	1.30	14
		4-year-olds	73.2	96.8	3	1.00	1.46	1.12	20
		5-year-olds	79.8	97.1	3	1.00	1.26	0.65	7
55	2-Step Directions Continued Practice	3-year-olds	45.3	81.8	3	1.00	2.09	1.73	16
		4-year-olds	46.2	91.0	3	2.00	2.12	1.80	28
		5-year-olds	49.7	92.1	3	1.00	1.97	1.42	11
57	Comparative Adjectives	3-year-olds	61.8	91.0	3	1.00	1.57	1.13	13
		4-year-olds	68.5	96.4	3	1.00	1.47	0.97	22
		5-year-olds	82.8	96.5	3	1.00	1.25	0.69	8

Table 5 (continued)
Passing Rate for First Attempts - Language & Communication Development

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
64	Underwater Instructions	3-year-olds	44.6	84.1	4	1.00	2.03	1.64	14
		4-year-olds	52.8	92.4	4	1.00	1.83	1.51	40
		5-year-olds	54.1	93.1	4	1.00	1.73	1.26	10
67	Understanding Antonyms	3-year-olds	21.7	75.6	4	2.00	2.19	1.30	9
		4-year-olds	33.6	89.8	4	2.00	1.98	1.19	22
		5-year-olds	55.6	92.2	4	1.00	1.55	0.88	6
75	Print Versus Pictures	3-year-olds	----	----	----	----	----	----	----
		4-year-olds	0.0	0.0	2	1.00	1.00	----	1
		5-year-olds	----	----	----	----	----	----	----
78	Understanding Complex Sentences	3-year-olds	53.5	87.8	4	1.00	1.62	1.06	14
		4-year-olds	61.5	95.1	4	1.00	1.51	0.87	14
		5-year-olds	80.2	97.0	4	1.00	1.19	0.44	3
85	Print Directionality	3-year-olds	----	----	----	----	----	----	----
		4-year-olds	0.0	0.0	3	2.00	2.00	----	2
		5-year-olds	----	----	----	----	----	----	----
111	Building a Spaceship	3-year-olds	30.1	76.3	5	2.00	2.18	1.60	14
		4-year-olds	36.0	89.0	5	2.00	2.13	1.49	17
		5-year-olds	45.4	93.3	5	2.00	1.90	1.19	7
130	How Questions	3-year-olds	76.3	92.0	5	1.00	1.36	1.10	13
		4-year-olds	83.5	97.2	5	1.00	1.20	0.63	16
		5-year-olds	90.6	97.8	5	1.00	1.08	0.30	3
159	Another Day at the Museum	3-year-olds	48.9	82.8	5	1.00	2.05	2.12	20
		4-year-olds	55.7	92.2	5	1.00	1.77	1.44	21
		5-year-olds	70.0	95.5	5	1.00	1.48	1.16	11
181	Understanding Antonyms Continued Practice	3-year-olds	70.4	92.2	4	1.00	1.50	1.18	14
		4-year-olds	80.8	97.2	4	1.00	1.27	0.73	11
		5-year-olds	83.2	96.6	4	1.00	1.20	0.56	5
192	Building a Spaceship Continued Practice	3-year-olds	60.9	85.8	5	1.00	1.61	1.37	13
		4-year-olds	61.1	92.7	5	1.00	1.60	1.13	14
		5-year-olds	60.2	93.9	5	1.00	1.52	0.80	5
261	Listening and Understanding 6	3-year-olds	38.4	76.8	6	2.00	2.09	1.56	10
		4-year-olds	39.1	89.8	6	2.00	2.11	1.55	27
		5-year-olds	51.3	96.3	6	1.00	1.90	1.36	9
262	Vocabulary 6	3-year-olds	71.3	92.6	6	1.00	1.30	0.58	4
		4-year-olds	77.9	96.7	6	1.00	1.26	0.62	10
		5-year-olds	89.7	100.0	6	1.00	1.12	0.36	3
263	Academic Vocabulary 4A	3-year-olds	38.8	79.5	4	1.00	1.92	1.30	9
		4-year-olds	47.4	90.4	4	1.00	1.85	1.33	17
		5-year-olds	57.6	93.0	4	1.00	1.59	1.12	10
264	Academic Vocabulary 4B	3-year-olds	20.7	74.6	4	2.00	2.37	1.72	14
		4-year-olds	23.9	86.7	4	2.00	2.45	1.64	17
		5-year-olds	28.6	91.8	4	2.00	2.35	1.55	10

Table 5 (continued)
Passing Rate for First Attempts - Language & Communication Development

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
265	Academic Vocabulary 4C	3-year-olds	59.0	90.2	4	1.00	1.52	0.78	5
		4-year-olds	60.7	95.9	4	1.00	1.49	0.78	8
		5-year-olds	68.9	96.3	4	1.00	1.36	0.67	5
266	Academic Vocabulary 5A	3-year-olds	72.6	88.9	5	1.00	1.44	1.53	17
		4-year-olds	78.6	96.8	5	1.00	1.27	0.63	9
		5-year-olds	86.3	97.9	5	1.00	1.15	0.39	3
267	Academic Vocabulary 5B	3-year-olds	53.1	85.2	5	1.00	1.73	1.34	12
		4-year-olds	58.1	93.0	5	1.00	1.74	1.32	14
		5-year-olds	70.5	94.3	5	1.00	1.44	0.87	6
268	Academic Vocabulary 5C	3-year-olds	61.7	93.0	5	1.00	1.45	0.73	4
		4-year-olds	70.2	96.2	5	1.00	1.39	0.74	8
		5-year-olds	81.0	97.5	5	1.00	1.25	0.54	3
269	Academic Vocabulary 6A	3-year-olds	35.2	68.5	6	1.00	1.83	1.36	9
		4-year-olds	49.4	89.6	6	1.00	1.67	0.98	9
		5-year-olds	66.7	94.7	6	1.00	1.39	0.80	6
270	Academic Vocabulary 6B	3-year-olds	53.8	84.6	6	1.00	1.64	0.96	5
		4-year-olds	55.9	91.8	6	1.00	1.58	1.05	22
		5-year-olds	68.0	96.0	6	1.00	1.40	0.76	4
271	Academic Vocabulary 6C	3-year-olds	37.8	86.5	6	2.00	1.89	1.10	5
		4-year-olds	43.5	90.0	6	2.00	1.82	1.07	8
		5-year-olds	60.0	93.3	6	1.00	1.47	0.69	3
272	Conventions of Language 3	3-year-olds	43.9	86.5	3	1.00	1.79	1.06	12
		4-year-olds	50.9	93.5	3	1.00	1.74	1.08	15
		5-year-olds	62.2	96.5	3	1.00	1.49	0.82	7
273	Conventions of Language 4	3-year-olds	70.8	89.1	4	1.00	1.35	1.93	32
		4-year-olds	82.8	97.4	4	1.00	1.20	0.52	9
		5-year-olds	89.8	98.5	4	1.00	1.09	0.28	2
274	Conventions of Language 5	3-year-olds	69.4	92.5	5	1.00	1.38	0.67	4
		4-year-olds	81.8	97.1	5	1.00	1.22	0.57	7
		5-year-olds	90.3	99.0	5	1.00	1.12	0.40	4
275	Conventions of Language 6	3-year-olds	74.0	92.0	6	1.00	1.33	0.77	5
		4-year-olds	79.2	95.8	6	1.00	1.30	0.85	12
		5-year-olds	84.0	98.7	6	1.00	1.27	0.70	5
384	Listening and Understanding 7	3-year-olds	63.6	81.8	7	1.00	1.73	2.16	11
		4-year-olds	63.6	91.8	7	1.00	1.58	1.35	26
		5-year-olds	61.3	83.9	7	1.00	1.42	1.15	7
385	Academic Vocabulary 7A	3-year-olds	27.3	54.5	7	2.00	4.00	3.74	12
		4-year-olds	36.8	86.3	7	2.00	2.46	2.31	28
		5-year-olds	44.1	97.1	7	2.00	2.18	1.78	10
386	Vocabulary 7	3-year-olds	61.9	81.0	7	1.00	1.62	1.40	6
		4-year-olds	69.6	92.6	7	1.00	1.41	0.87	11
		5-year-olds	70.4	92.6	7	1.00	1.41	1.05	6

Table 5 (continued)
Passing Rate for First Attempts - Language & Communication Development

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
387	Conventions of Language 7	3-year-olds	63.6	90.9	7	1.00	1.45	0.86	4
		4-year-olds	61.0	92.9	7	1.00	1.49	1.30	31
		5-year-olds	68.6	91.4	7	1.00	1.34	0.76	4
393	Listening and Understanding 8	3-year-olds	28.6	28.6	8	2.00	3.86	4.18	12
		4-year-olds	28.5	69.0	8	2.00	2.95	3.24	35
		5-year-olds	52.9	76.5	8	1.00	2.59	4.03	17
394	Academic Vocabulary 8A	3-year-olds	42.9	85.7	8	2.00	1.86	0.90	3
		4-year-olds	42.2	87.8	8	2.00	1.70	0.85	5
		5-year-olds	60.0	90.0	8	1.00	1.30	0.47	2
395	Vocabulary 8	3-year-olds	16.7	66.7	8	1.50	1.67	0.82	3
		4-year-olds	41.2	84.1	8	1.00	1.74	1.39	17
		5-year-olds	70.6	94.1	8	1.00	1.24	0.44	2
396	Conventions of Language 8	3-year-olds	28.6	57.1	8	2.00	2.43	1.81	5
		4-year-olds	32.2	82.9	8	2.00	2.34	1.79	13
		5-year-olds	58.8	82.4	8	1.00	1.88	2.09	9
403	Academic Vocabulary 7B	3-year-olds	92.9	100.0	7	1.00	1.07	0.27	2
		4-year-olds	91.0	98.3	7	1.00	1.14	0.53	7
		5-year-olds	93.5	100.0	7	1.00	1.06	0.25	2
404	Academic Vocabulary 7C	3-year-olds	57.1	100.0	7	1.00	1.57	0.76	3
		4-year-olds	65.2	96.0	7	1.00	1.44	0.71	5
		5-year-olds	65.6	96.9	7	1.00	1.44	0.76	4
405	Academic Vocabulary 8B	3-year-olds	16.7	100.0	8	2.00	2.00	0.63	3
		4-year-olds	37.0	89.3	8	2.00	1.69	0.72	5
		5-year-olds	35.3	88.2	8	2.00	1.53	0.51	2
406	Academic Vocabulary 8C	3-year-olds	16.7	50.0	8	1.00	1.50	0.84	3
		4-year-olds	27.1	88.1	8	2.00	1.76	0.66	4
		5-year-olds	43.8	93.8	8	1.50	1.56	0.63	3

Table 6
Passing Rate for First Attempts - Physical Development

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
5	Self-Care Game Show	3-year-olds	46.5	86.9	1	1.00	2.46	2.59	34
		4-year-olds	57.9	94.4	1	1.00	1.94	1.85	47
		5-year-olds	66.2	90.5	1	1.00	1.62	1.74	38
10	Morning Routine	3-year-olds	55.4	87.4	2	1.00	1.71	1.25	14
		4-year-olds	74.7	95.9	2	1.00	1.39	0.93	16
		5-year-olds	84.4	95.0	2	1.00	1.21	0.65	8
17	Nutritious Meal	3-year-olds	22.2	83.9	1	2.00	2.68	1.90	22
		4-year-olds	37.1	92.5	1	2.00	2.18	1.60	45
		5-year-olds	45.6	87.0	1	2.00	1.92	1.37	12
32	Healthy Gormit	3-year-olds	13.8	74.8	2	2.00	2.76	2.01	27
		4-year-olds	21.0	88.1	2	2.00	2.53	1.93	41
		5-year-olds	36.4	84.7	2	2.00	2.01	1.57	20
45	Personal Safety	3-year-olds	43.4	87.8	1	2.00	2.17	1.91	24
		4-year-olds	66.3	95.9	1	1.00	1.61	1.34	29
		5-year-olds	78.4	93.6	1	1.00	1.36	1.00	16
68	Self-Care Shopping Trip	3-year-olds	72.5	93.5	3	1.00	1.34	0.76	10
		4-year-olds	81.8	97.9	3	1.00	1.24	0.62	10
		5-year-olds	89.1	98.2	3	1.00	1.12	0.40	4
74	Playing Safely	3-year-olds	50.2	87.3	2	1.00	1.77	1.30	14
		4-year-olds	65.9	95.6	2	1.00	1.49	1.05	34
		5-year-olds	79.7	96.3	2	1.00	1.24	0.67	10
84	Washing Your Hands	3-year-olds	45.7	86.8	4	1.00	1.80	1.23	13
		4-year-olds	52.6	94.5	4	1.00	1.65	1.03	16
		5-year-olds	71.4	95.8	4	1.00	1.36	0.75	7
105	Healthy Breakfast	3-year-olds	40.3	85.8	3	2.00	2.04	1.57	18
		4-year-olds	50.6	93.6	3	1.00	1.80	1.30	18
		5-year-olds	68.2	94.2	3	1.00	1.48	0.98	7
114	Safe & Healthy Behavior	3-year-olds	37.6	85.8	3	2.00	1.95	1.15	11
		4-year-olds	53.9	94.6	3	1.00	1.66	0.98	10
		5-year-olds	73.7	97.4	3	1.00	1.32	0.62	5
119	Healthy Menu	3-year-olds	57.9	88.6	4	1.00	1.57	0.94	7
		4-year-olds	74.4	96.4	4	1.00	1.34	0.75	12
		5-year-olds	82.8	96.7	4	1.00	1.18	0.47	4
137	Safe & Healthy Behaviors 2	3-year-olds	48.4	84.0	4	1.00	1.62	0.91	8
		4-year-olds	56.7	94.3	4	1.00	1.50	0.75	12
		5-year-olds	74.7	95.4	4	1.00	1.31	0.86	10
179	Making a Healthy Meal	3-year-olds	14.0	61.7	5	2.00	3.01	2.61	19
		4-year-olds	15.7	80.1	5	2.00	2.96	2.14	23
		5-year-olds	25.2	86.0	5	2.00	2.36	1.43	11
190	Self-Care Collage	3-year-olds	65.0	87.0	5	1.00	1.48	1.60	23
		4-year-olds	81.6	96.5	5	1.00	1.25	0.74	14
		5-year-olds	89.0	99.2	5	1.00	1.12	0.37	3

Table 6 (continued)
Passing Rate for First Attempts - Physical Development

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
196	Stay and Play or Walk Away?	3-year-olds	70.3	92.5	5	1.00	1.38	0.82	7
		4-year-olds	78.6	97.1	5	1.00	1.25	0.58	11
		5-year-olds	92.0	99.3	5	1.00	1.08	0.27	2
199	Self-Care Collage Continued Practice	3-year-olds	71.9	91.1	5	1.00	1.44	0.91	5
		4-year-olds	82.9	96.7	5	1.00	1.24	0.67	7
		5-year-olds	80.4	98.2	5	1.00	1.23	0.52	4

Table 7
Passing Rate for First Attempts - Mathematics

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
18	Set Counting 1	3-year-olds	47.8	87.5	1	1.00	2.04	1.92	44
		4-year-olds	54.5	93.3	1	1.00	1.92	1.77	41
		5-year-olds	66.8	91.0	1	1.00	1.47	1.04	15
20	Comparing Quantities 1	3-year-olds	47.6	87.4	1	1.00	2.26	2.18	34
		4-year-olds	47.5	91.3	1	1.00	2.28	2.10	44
		5-year-olds	48.4	78.6	1	1.00	2.02	1.54	13
26	First In Line	3-year-olds	41.4	88.4	1	2.00	2.09	1.68	34
		4-year-olds	63.4	95.9	1	1.00	1.59	1.22	60
		5-year-olds	72.6	93.8	1	1.00	1.35	0.69	6
31	Set Counting 2	3-year-olds	64.4	86.9	2	1.00	1.57	1.17	13
		4-year-olds	81.2	96.0	2	1.00	1.28	0.79	12
		5-year-olds	89.8	98.7	2	1.00	1.15	0.60	9
34	Comparing Quantities 2	3-year-olds	31.9	69.5	2	2.00	2.15	1.52	16
		4-year-olds	40.5	82.0	2	2.00	1.98	1.34	27
		5-year-olds	62.0	87.8	2	1.00	1.47	0.81	6
38	Last In Line	3-year-olds	24.6	67.2	2	2.00	1.80	0.97	21
		4-year-olds	40.3	84.2	2	2.00	1.62	0.67	15
		5-year-olds	62.5	88.3	2	1.00	1.36	0.58	6
51	Comparing Quantities 3	3-year-olds	58.8	85.9	3	1.00	1.58	1.05	20
		4-year-olds	68.5	92.3	3	1.00	1.42	0.83	15
		5-year-olds	80.6	94.5	3	1.00	1.25	0.72	11
54	Grocery Store Addition	3-year-olds	62.7	87.0	1	1.00	1.80	1.80	18
		4-year-olds	83.9	97.3	1	1.00	1.31	1.12	24
		5-year-olds	92.1	95.2	1	1.00	1.17	0.63	6
56	Direction Words	3-year-olds	46.5	88.5	1	1.00	2.15	2.07	38
		4-year-olds	62.0	95.1	1	1.00	1.73	1.59	50
		5-year-olds	67.0	91.9	1	1.00	1.51	1.11	12
61	Comparing Quantities 4	3-year-olds	36.3	73.8	4	2.00	1.84	1.11	10
		4-year-olds	49.4	85.7	4	1.00	1.71	1.07	12
		5-year-olds	67.9	92.0	4	1.00	1.43	0.83	6
63	Farm Addition	3-year-olds	65.9	87.3	2	1.00	1.54	1.32	12
		4-year-olds	79.3	95.9	2	1.00	1.29	0.74	10
		5-year-olds	89.3	97.3	2	1.00	1.11	0.33	3
65	Matching Simple Shapes	3-year-olds	77.2	96.4	1	1.00	1.39	1.04	20
		4-year-olds	84.1	98.5	1	1.00	1.24	0.72	18
		5-year-olds	89.1	96.7	1	1.00	1.14	0.43	5
79	Set Counting 3	3-year-olds	41.1	71.9	3	2.00	2.15	1.70	15
		4-year-olds	50.9	85.1	3	1.00	1.97	1.64	21
		5-year-olds	69.6	90.8	3	1.00	1.56	1.29	12
86	Comparing Quantities 5	3-year-olds	60.0	87.7	5	1.00	1.72	1.28	7
		4-year-olds	55.8	91.7	5	1.00	1.77	1.37	16
		5-year-olds	69.7	96.1	5	1.00	1.58	1.18	7

Table 7 (continued)
Passing Rate for First Attempts - Mathematics

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
90	Subtracting Socks	3-year-olds	33.1	78.5	1	2.00	2.63	2.73	39
		4-year-olds	43.9	90.4	1	2.00	2.27	2.11	43
		5-year-olds	59.4	89.0	1	1.00	1.67	1.14	7
94	Set Counting 4	3-year-olds	47.0	74.3	4	1.00	1.90	1.52	16
		4-year-olds	57.0	87.0	4	1.00	1.71	1.28	22
		5-year-olds	69.3	92.1	4	1.00	1.48	0.95	8
96	Adding Zebras	3-year-olds	63.9	90.3	3	1.00	1.50	0.99	6
		4-year-olds	63.0	91.9	3	1.00	1.58	1.10	17
		5-year-olds	81.9	95.2	3	1.00	1.28	0.77	6
98	Spatial Relationships 2	3-year-olds	32.6	74.4	2	2.00	2.09	1.50	27
		4-year-olds	47.1	87.5	2	2.00	1.81	1.25	33
		5-year-olds	55.6	83.8	2	1.00	1.56	0.82	8
100	Farm Subtraction	3-year-olds	58.2	84.8	2	1.00	1.53	0.84	5
		4-year-olds	62.9	91.4	2	1.00	1.51	0.92	12
		5-year-olds	75.0	96.4	2	1.00	1.29	0.58	5
101	Matching Simple Shapes 2	3-year-olds	82.8	94.5	2	1.00	1.20	0.56	8
		4-year-olds	85.0	97.1	2	1.00	1.18	0.54	13
		5-year-olds	87.6	96.9	2	1.00	1.14	0.48	6
104	Measurement 1	3-year-olds	5.9	55.0	1	4.00	5.50	5.04	53
		4-year-olds	9.1	74.8	1	4.00	4.91	4.55	58
		5-year-olds	17.3	55.3	1	2.00	3.09	2.70	28
107	Classification and Data 1	3-year-olds	25.0	77.5	1	2.00	3.74	3.80	42
		4-year-olds	42.0	90.2	1	2.00	2.66	2.82	63
		5-year-olds	49.6	83.3	1	1.00	2.09	2.20	33
110	Identifying First & Second	3-year-olds	27.4	57.5	3	2.00	2.10	1.34	15
		4-year-olds	44.3	75.0	3	2.00	1.80	1.13	13
		5-year-olds	65.5	84.8	3	1.00	1.43	0.84	8
113	Spatial Relationships 3	3-year-olds	64.4	91.5	3	1.00	1.36	0.59	6
		4-year-olds	71.2	95.3	3	1.00	1.31	0.56	12
		5-year-olds	80.4	94.7	3	1.00	1.20	0.47	4
117	Classification and Data 2	3-year-olds	64.9	92.5	2	1.00	1.40	0.68	9
		4-year-olds	72.1	96.4	2	1.00	1.33	0.64	15
		5-year-olds	83.5	95.9	2	1.00	1.18	0.44	5
120	Patterns 1	3-year-olds	31.0	78.8	1	2.00	2.98	3.14	39
		4-year-olds	44.8	91.1	1	2.00	2.37	2.79	60
		5-year-olds	56.3	84.6	1	1.00	1.79	2.18	30
124	Set Counting 5	3-year-olds	44.9	75.4	5	1.00	2.64	2.82	14
		4-year-olds	46.3	84.0	5	1.00	2.75	3.41	40
		5-year-olds	58.9	93.5	5	1.00	1.76	1.34	8
126	Spatial Relationships 4	3-year-olds	62.8	88.0	4	1.00	1.39	0.64	5
		4-year-olds	69.7	93.9	4	1.00	1.36	0.69	14
		5-year-olds	77.9	93.4	4	1.00	1.23	0.55	5

Table 7 (continued)
Passing Rate for First Attempts - Mathematics

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
129	First, Second, & Last	3-year-olds	41.1	58.1	4	1.00	1.79	1.61	17
		4-year-olds	59.0	77.6	4	1.00	1.51	0.88	20
		5-year-olds	74.9	87.2	4	1.00	1.28	0.59	4
131	Adding 8 or Less	3-year-olds	54.4	78.9	4	1.00	1.67	1.27	7
		4-year-olds	54.6	87.2	4	1.00	1.68	1.09	10
		5-year-olds	83.9	98.4	4	1.00	1.24	0.56	3
133	Measurement 2	3-year-olds	54.0	84.8	2	1.00	1.74	1.28	23
		4-year-olds	68.7	92.8	2	1.00	1.47	0.96	22
		5-year-olds	81.6	94.6	2	1.00	1.22	0.56	5
138	Patterns 2	3-year-olds	34.3	70.3	2	2.00	2.09	1.50	19
		4-year-olds	46.8	85.4	2	1.00	1.88	1.33	31
		5-year-olds	65.8	89.3	2	1.00	1.48	0.92	11
141	Set Counting 5 Continued Practice	3-year-olds	40.0	72.0	5	2.00	2.68	2.75	17
		4-year-olds	44.4	84.6	5	2.00	2.92	3.76	48
		5-year-olds	60.2	92.9	5	1.00	1.95	2.80	27
143	Spatial Relationships 5	3-year-olds	35.2	81.6	5	2.00	2.11	1.75	12
		4-year-olds	35.4	88.2	5	2.00	2.09	1.54	22
		5-year-olds	50.0	94.3	5	1.00	1.73	0.95	5
150	Subtracting 6 or Less	3-year-olds	88.7	96.8	3	1.00	1.15	0.44	3
		4-year-olds	84.3	96.9	3	1.00	1.19	0.51	6
		5-year-olds	93.0	98.6	3	1.00	1.11	0.40	3
153	Shape Asteroids	3-year-olds	61.1	81.1	3	1.00	1.56	1.27	32
		4-year-olds	66.4	87.6	3	1.00	1.47	0.95	20
		5-year-olds	78.9	92.4	3	1.00	1.25	0.66	8
157	Lining Up For Snack Time	3-year-olds	97.9	100.0	5	1.00	1.03	0.17	2
		4-year-olds	97.9	99.7	5	1.00	1.03	0.17	4
		5-year-olds	97.5	100.0	5	1.00	1.03	0.21	3
158	Counting On to 10	3-year-olds	85.3	97.1	5	1.00	1.18	0.58	4
		4-year-olds	77.7	95.6	5	1.00	1.34	0.80	9
		5-year-olds	83.0	95.7	5	1.00	1.17	0.43	3
160	Subtracting 8 or Less	3-year-olds	57.7	88.5	4	1.00	1.56	0.94	6
		4-year-olds	61.4	90.5	4	1.00	1.59	1.13	16
		5-year-olds	82.3	98.4	4	1.00	1.27	0.85	7
162	Ice Cream Truck Shape Puzzle	3-year-olds	83.3	96.5	4	1.00	1.18	0.47	5
		4-year-olds	84.9	97.5	4	1.00	1.17	0.48	9
		5-year-olds	85.1	97.5	4	1.00	1.17	0.48	4
164	Counting Back to Subtract	3-year-olds	51.4	82.9	5	1.00	1.49	0.82	5
		4-year-olds	56.5	88.9	5	1.00	1.63	1.11	11
		5-year-olds	69.4	93.9	5	1.00	1.39	0.67	4
167	Measurement 3	3-year-olds	45.1	80.4	3	1.00	1.76	1.06	8
		4-year-olds	59.3	90.9	3	1.00	1.56	0.94	16
		5-year-olds	70.3	94.0	3	1.00	1.34	0.64	6
169	Camping Trip	3-year-olds	63.4	90.3	3	1.00	1.44	0.75	7
		4-year-olds	74.3	95.7	3	1.00	1.30	0.60	10
		5-year-olds	81.9	95.6	3	1.00	1.19	0.44	3
174	3-Dimensional Shape Spinner	3-year-olds	72.3	91.6	5	1.00	1.55	1.77	17
		4-year-olds	71.1	94.0	5	1.00	1.45	1.04	13
		5-year-olds	59.5	95.2	5	1.00	1.45	0.68	5

Table 7 (continued)
Passing Rate for First Attempts - Mathematics

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
176	Measurement 4	3-year-olds	82.7	93.3	4	1.00	1.23	0.76	11
		4-year-olds	90.6	97.8	4	1.00	1.11	0.42	8
		5-year-olds	94.1	97.3	4	1.00	1.06	0.25	3
182	Measurement 5	3-year-olds	16.7	60.7	5	2.00	3.13	3.50	27
		4-year-olds	23.5	73.8	5	2.00	3.23	3.51	37
		5-year-olds	47.8	86.6	5	1.00	1.64	0.87	5
183	Patterns 3	3-year-olds	57.6	84.6	3	1.00	1.57	1.00	10
		4-year-olds	69.2	94.6	3	1.00	1.40	0.78	11
		5-year-olds	79.2	96.2	3	1.00	1.26	0.64	6
184	Classification and Data 4	3-year-olds	46.0	73.2	4	1.00	1.95	1.69	22
		4-year-olds	55.7	83.0	4	1.00	1.77	1.44	33
		5-year-olds	69.2	89.1	4	1.00	1.42	0.93	10
186	Patterns 4	3-year-olds	62.0	85.8	4	1.00	1.39	0.61	4
		4-year-olds	71.6	91.7	4	1.00	1.31	0.60	6
		5-year-olds	81.9	96.3	4	1.00	1.21	0.52	5
191	Classification and Data 5	3-year-olds	42.0	77.1	5	2.00	2.42	3.07	37
		4-year-olds	37.9	84.1	5	2.00	2.68	2.86	45
		5-year-olds	46.6	90.1	5	1.00	2.05	1.67	12
194	Patterns 5	3-year-olds	13.9	59.7	5	2.00	3.93	3.50	17
		4-year-olds	19.1	75.8	5	3.00	3.88	3.87	41
		5-year-olds	42.4	87.8	5	2.00	2.14	1.85	14
211	Addition 6	3-year-olds	34.8	65.2	6	2.00	2.39	1.75	6
		4-year-olds	45.8	87.6	6	1.00	2.15	2.07	21
		5-year-olds	70.6	94.1	6	1.00	1.47	1.19	7
212	Subtraction 6	3-year-olds	40.0	80.0	6	1.00	1.92	1.38	5
		4-year-olds	60.5	91.8	6	1.00	1.63	1.10	8
		5-year-olds	75.7	91.9	6	1.00	1.19	0.46	3
213	Ordinal Numbers 6	3-year-olds	57.4	76.6	6	1.00	1.96	1.83	9
		4-year-olds	54.6	80.7	6	1.00	2.46	3.15	32
		5-year-olds	80.3	91.8	6	1.00	1.28	0.92	7
214	2-D Shapes 6	3-year-olds	55.2	84.8	6	1.00	1.67	1.13	7
		4-year-olds	76.8	95.8	6	1.00	1.36	0.96	15
		5-year-olds	93.6	98.7	6	1.00	1.18	1.04	10
216	Patterns 6	3-year-olds	62.8	79.1	6	1.00	1.56	1.18	7
		4-year-olds	69.1	93.0	6	1.00	1.50	1.21	13
		5-year-olds	69.6	89.3	6	1.00	1.30	0.63	4
217	Subitizing 6	3-year-olds	40.3	73.1	6	1.00	3.04	4.85	35
		4-year-olds	53.3	84.5	6	1.00	2.86	4.47	60
		5-year-olds	62.3	88.4	6	1.00	2.52	3.17	17
218	Number Sequencing 6	3-year-olds	41.7	91.7	6	1.50	3.58	6.79	25
		4-year-olds	41.2	84.0	6	2.00	2.41	2.97	31
		5-year-olds	64.3	89.3	6	1.00	1.71	1.78	10
219	Set Counting 6	3-year-olds	14.6	46.3	6	3.00	5.71	5.46	25
		4-year-olds	10.1	58.6	6	5.00	6.38	5.99	51
		5-year-olds	28.1	76.4	6	3.00	3.65	2.89	16

Table 7 (continued)
Passing Rate for First Attempts - Mathematics

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
220	Comparing Quantities 6	3-year-olds	11.6	39.5	6	3.00	4.60	4.05	16
		4-year-olds	4.9	47.8	6	5.00	6.47	5.92	42
		5-year-olds	5.5	50.9	6	3.00	4.36	3.13	14
221	Measurement 6	3-year-olds	69.1	87.3	6	1.00	1.67	1.41	8
		4-year-olds	71.3	95.4	6	1.00	1.48	1.22	21
		5-year-olds	80.7	98.2	6	1.00	1.23	0.57	4
222	Classification and Data 6	3-year-olds	36.4	83.9	6	2.00	2.41	1.82	8
		4-year-olds	43.7	89.5	6	2.00	2.22	1.98	24
		5-year-olds	57.8	95.1	6	1.00	1.73	1.25	9
228	Subitizing 3	3-year-olds	34.7	62.9	3	2.00	2.53	2.59	42
		4-year-olds	52.9	82.2	3	1.00	2.12	2.39	38
		5-year-olds	70.8	89.4	3	1.00	1.47	1.18	17
229	Subitizing 4	3-year-olds	65.4	82.6	4	1.00	1.60	1.42	18
		4-year-olds	71.9	90.7	4	1.00	1.52	1.45	33
		5-year-olds	79.8	93.9	4	1.00	1.25	0.75	10
230	Subitizing 5	3-year-olds	40.3	71.3	5	1.00	3.56	4.69	35
		4-year-olds	48.1	83.6	5	1.00	3.32	5.38	66
		5-year-olds	61.5	91.9	5	1.00	2.05	2.37	20
231	Number Sequencing 1	3-year-olds	90.4	97.9	1	1.00	1.11	0.38	7
		4-year-olds	91.2	99.1	1	1.00	1.11	0.39	10
		5-year-olds	94.7	97.8	1	1.00	1.07	0.32	4
232	Number Sequencing 2	3-year-olds	20.7	48.2	2	2.00	2.28	1.48	16
		4-year-olds	39.0	74.5	2	2.00	2.02	1.39	18
		5-year-olds	67.9	85.0	2	1.00	1.38	0.73	6
233	Number Sequencing 3	3-year-olds	68.5	89.0	3	1.00	1.53	1.19	14
		4-year-olds	77.1	95.0	3	1.00	1.35	0.89	16
		5-year-olds	81.7	94.6	3	1.00	1.24	0.64	6
234	Number Sequencing 4	3-year-olds	24.2	41.0	4	2.00	2.18	1.83	27
		4-year-olds	28.4	47.1	4	2.00	2.14	1.62	39
		5-year-olds	32.9	53.3	4	2.00	1.99	1.30	10
235	Number Sequencing 5	3-year-olds	66.7	88.9	5	1.00	1.52	0.80	4
		4-year-olds	54.4	93.2	5	1.00	1.80	1.35	15
		5-year-olds	64.3	95.2	5	1.00	1.64	1.06	5
236	Subitizing 4 Continued Practice	3-year-olds	67.5	88.2	4	1.00	1.69	1.94	19
		4-year-olds	69.6	93.0	4	1.00	1.75	2.16	32
		5-year-olds	77.2	98.3	4	1.00	1.43	1.26	13
237	Subitizing 6 Continued Practice	3-year-olds	66.7	86.7	6	1.00	1.89	2.10	11
		4-year-olds	56.9	88.5	6	1.00	2.35	3.77	48
		5-year-olds	68.3	91.7	6	1.00	2.30	4.67	35
238	Number Sequencing 4 Continued Practice	3-year-olds	32.6	53.9	4	2.00	1.99	1.86	25
		4-year-olds	34.2	56.3	4	2.00	2.09	1.46	15
		5-year-olds	36.8	66.7	4	2.00	1.88	1.04	6

Table 7 (continued)
Passing Rate for First Attempts - Mathematics

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
246	Subitizing 1	3-year-olds	45.5	83.7	1	1.00	2.68	3.42	50
		4-year-olds	60.0	93.2	1	1.00	2.13	2.99	86
		5-year-olds	68.1	88.9	1	1.00	1.60	1.36	13
247	Subitizing 2	3-year-olds	25.8	56.7	2	2.00	1.96	1.13	24
		4-year-olds	43.8	79.5	2	2.00	1.80	1.12	21
		5-year-olds	61.6	84.7	2	1.00	1.47	0.75	6
299	Composing Shapes 6	3-year-olds	100.0	100.0	6	1.00	1.01	0.10	2
		4-year-olds	99.6	99.9	6	1.00	1.01	0.10	2
		5-year-olds	98.6	100.0	6	1.00	1.03	0.17	2
308	Composing 6	3-year-olds	18.8	57.8	6	2.00	3.64	4.53	26
		4-year-olds	18.7	68.3	6	2.00	3.43	3.48	33
		5-year-olds	28.8	88.1	6	2.00	2.54	3.21	25
309	Composing 6 Continued Practice	3-year-olds	64.3	76.2	6	1.00	1.57	1.09	5
		4-year-olds	64.3	92.1	6	1.00	1.65	1.35	14
		5-year-olds	73.5	93.9	6	1.00	1.29	0.54	3
310	Decomposing 6	3-year-olds	55.4	76.8	6	1.00	1.84	2.03	15
		4-year-olds	67.6	90.6	6	1.00	1.68	1.74	19
		5-year-olds	89.7	96.6	6	1.00	1.12	0.50	4
311	Decomposing 6 Continued Practice	3-year-olds	76.3	89.5	6	1.00	1.58	1.76	11
		4-year-olds	84.2	96.7	6	1.00	1.27	0.91	13
		5-year-olds	96.1	100.0	6	1.00	1.04	0.20	2
336	Patterns 7	3-year-olds	57.1	57.1	7	1.00	1.71	1.25	4
		4-year-olds	33.7	69.6	7	2.00	3.46	3.87	25
		5-year-olds	70.6	100.0	7	1.00	1.29	0.47	2
337	Addition 7	3-year-olds	28.6	42.9	7	1.00	1.86	1.57	5
		4-year-olds	13.6	63.4	7	3.00	4.29	3.42	17
		5-year-olds	6.7	66.7	7	2.00	2.93	1.94	7
338	Subtraction 7	3-year-olds	57.1	57.1	7	1.00	2.00	1.73	5
		4-year-olds	10.3	66.8	7	3.00	4.09	3.09	19
		5-year-olds	18.8	68.8	7	2.50	2.81	1.94	6
339	Subitizing 7	3-year-olds	22.2	33.3	7	4.00	4.89	3.85	14
		4-year-olds	11.2	45.7	7	4.00	7.92	9.40	66
		5-year-olds	32.1	64.3	7	2.00	6.00	6.86	22
340	Number Sequencing 7	3-year-olds	40.0	60.0	7	2.00	1.60	0.55	2
		4-year-olds	43.5	76.1	7	1.00	2.83	3.25	22
		5-year-olds	42.9	85.7	7	2.00	2.93	2.43	8
341	Set Counting 7	3-year-olds	20.0	33.3	7	2.00	3.13	3.70	15
		4-year-olds	21.6	59.4	7	3.00	4.76	4.94	30
		5-year-olds	48.0	76.0	7	1.00	3.08	4.51	22
343	Comparing Quantities 7	3-year-olds	33.3	33.3	7	1.00	2.78	2.28	7
		4-year-olds	13.4	57.3	7	4.00	5.69	5.98	44
		5-year-olds	31.6	73.7	7	3.00	4.47	4.09	12
344	Ordinal Numbers 7	3-year-olds	42.9	71.4	7	2.00	3.43	4.28	13
		4-year-olds	45.7	83.5	7	2.00	2.32	2.45	20
		5-year-olds	82.6	95.7	7	1.00	1.17	0.49	3

Table 7 (continued)
Passing Rate for First Attempts - Mathematics

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
345	Composing 7	3-year-olds	50.0	60.0	7	1.00	2.20	2.30	8
		4-year-olds	49.2	84.4	7	1.00	2.26	2.17	17
		5-year-olds	60.0	90.0	7	1.00	1.65	0.93	4
346	Decomposing 7	3-year-olds	75.0	100.0	7	1.00	1.50	1.00	4
		4-year-olds	70.5	88.8	7	1.00	1.80	2.47	25
		5-year-olds	84.2	100.0	7	1.00	1.95	3.24	15
347	Measurement 7	3-year-olds	30.8	69.2	7	2.00	3.31	3.52	10
		4-year-olds	37.9	82.4	7	2.00	2.36	2.07	16
		5-year-olds	69.6	91.3	7	1.00	1.30	0.70	4
348	Classification and Data 7	3-year-olds	33.3	55.6	7	2.00	2.22	1.56	6
		4-year-olds	31.0	70.4	7	2.00	2.80	2.60	19
		5-year-olds	52.6	78.9	7	1.00	2.05	1.68	7
349	2-D Shapes 7	3-year-olds	57.1	78.6	7	1.00	1.86	2.11	9
		4-year-olds	77.3	93.6	7	1.00	1.28	0.65	5
		5-year-olds	88.0	100.0	7	1.00	1.12	0.33	2
350	Composing Shapes 7	3-year-olds	92.9	100.0	7	1.00	1.07	0.27	2
		4-year-olds	99.6	100.0	7	1.00	1.02	0.14	2
		5-year-olds	95.5	100.0	7	1.00	1.05	0.21	2
370	Patterns 8	3-year-olds	75.0	75.0	8	1.00	1.25	0.50	2
		4-year-olds	29.3	63.7	8	2.00	4.68	5.38	43
		5-year-olds	61.1	77.8	8	1.00	1.94	2.26	10
371	Addition 8	3-year-olds	100.0	100.0	8	1.00	1.00	0.00	1
		4-year-olds	67.1	90.5	8	1.00	1.54	1.13	9
		5-year-olds	70.0	90.0	8	1.00	1.70	1.49	5
372	Subtraction 8	3-year-olds	100.0	100.0	8	1.00	1.00	0.00	1
		4-year-olds	94.0	98.8	8	1.00	1.15	0.75	9
		5-year-olds	100.0	100.0	8	1.00	1.00	0.00	1
373	Subitizing 8	3-year-olds	50.0	50.0	8	1.00	1.00	0.00	1
		4-year-olds	15.2	48.7	8	3.00	6.23	7.33	44
		5-year-olds	35.7	57.1	8	1.00	2.14	1.61	6
374	Number Sequencing 8	3-year-olds	100.0	100.0	8	1.00	1.00	----	1
		4-year-olds	51.2	87.2	8	1.00	2.13	2.18	18
		5-year-olds	63.6	90.9	8	1.00	1.27	0.47	2
375	Set Counting 8	3-year-olds	20.0	20.0	8	1.00	2.20	2.68	7
		4-year-olds	28.2	63.2	8	2.00	3.16	2.92	15
		5-year-olds	18.2	72.7	8	2.00	2.73	2.28	9
377	Comparing Quantities 8	3-year-olds	100.0	100.0	8	1.00	1.00	0.00	1
		4-year-olds	56.3	88.1	8	1.00	2.00	2.36	20
		5-year-olds	83.3	83.3	8	1.00	1.33	1.15	5
378	Composing 8	3-year-olds	83.3	100.0	8	1.00	1.17	0.41	2
		4-year-olds	68.3	94.7	8	1.00	1.39	0.63	4
		5-year-olds	100.0	100.0	8	1.00	1.00	0.00	1
379	Decomposing 8	3-year-olds	40.0	80.0	8	3.00	2.40	1.34	4
		4-year-olds	43.2	75.9	8	2.00	2.45	2.40	15
		5-year-olds	75.0	93.8	8	1.00	1.63	1.75	8

Table 7 (continued)
Passing Rate for First Attempts - Mathematics

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
380	Measurement 8	3-year-olds	40.0	60.0	8	1.00	2.40	2.61	7
		4-year-olds	26.1	77.5	8	2.00	2.63	1.90	13
		5-year-olds	33.3	80.0	8	1.00	1.93	1.44	6
381	Classification and Data 8	3-year-olds	50.0	75.0	8	1.00	1.25	0.50	2
		4-year-olds	18.6	77.1	8	2.00	2.66	1.61	9
		5-year-olds	38.5	92.3	8	2.00	1.85	1.34	6
382	2-D Shapes 8	3-year-olds	16.7	50.0	8	2.00	2.67	2.25	7
		4-year-olds	32.7	78.5	8	2.00	2.32	2.07	22
		5-year-olds	26.7	86.7	8	2.00	2.67	2.23	9
383	Composing Shapes 8	3-year-olds	53.8	69.2	8	1.00	1.69	1.65	7
		4-year-olds	69.5	91.9	8	1.00	1.43	0.87	6
		5-year-olds	63.2	89.5	8	1.00	1.79	1.72	8

Table 8
Passing Rate for First Attempts - Literacy

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
8	Segmenting Sentences	3-year-olds	20.0	69.4	1	3.00	3.82	3.75	75
		4-year-olds	27.6	84.0	1	2.00	3.41	3.36	46
		5-year-olds	41.6	72.3	1	2.00	2.19	1.90	24
11	Rhyming	3-year-olds	100.0	100.0	1	1.00	1.01	0.10	2
		4-year-olds	100.0	100.0	1	1.00	1.01	0.10	6
		5-year-olds	100.0	100.0	1	1.00	1.01	0.09	2
13	Segmenting Compound Words	3-year-olds	20.1	65.1	2	2.00	2.09	1.20	28
		4-year-olds	31.9	80.5	2	2.00	1.93	1.00	13
		5-year-olds	48.4	83.9	2	1.00	1.61	0.77	5
19	Magic Hat 1	3-year-olds	70.5	94.2	1	1.00	1.48	1.12	18
		4-year-olds	72.7	96.7	1	1.00	1.49	1.23	33
		5-year-olds	78.0	94.8	1	1.00	1.38	1.03	13
23	Magic Hat 2	3-year-olds	14.0	58.7	2	2.00	2.35	1.67	33
		4-year-olds	13.8	72.3	2	2.00	2.27	1.19	20
		5-year-olds	20.5	73.0	2	2.00	2.07	1.02	8
27	Letter Jellies	3-year-olds	90.0	97.5	5	1.00	1.35	1.90	13
		4-year-olds	85.2	96.7	5	1.00	1.24	0.96	21
		5-year-olds	84.2	100.0	5	1.00	1.26	0.70	5
33	Segmenting Compound Words 2	3-year-olds	43.2	79.7	3	1.50	1.69	0.90	9
		4-year-olds	49.7	87.3	3	1.00	1.65	0.89	11
		5-year-olds	68.0	91.7	3	1.00	1.37	0.65	5
39	Magic Hat 3	3-year-olds	33.0	69.8	3	2.00	2.01	1.42	16
		4-year-olds	37.3	84.1	3	2.00	1.95	1.21	18
		5-year-olds	53.3	88.4	3	1.00	1.60	0.84	6
44	Letter Sounds 1	3-year-olds	58.6	83.8	5	1.00	1.42	0.82	5
		4-year-olds	75.6	95.6	5	1.00	1.39	0.94	10
		5-year-olds	85.4	97.6	5	1.00	1.23	0.65	5
46	Uppercase Space Letters 1	3-year-olds	41.7	60.1	3	1.00	2.07	2.13	30
		4-year-olds	58.9	79.8	3	1.00	1.73	1.52	37
		5-year-olds	74.3	91.0	3	1.00	1.38	0.94	8
49	Uppercase Space Letters 2	3-year-olds	36.7	61.9	4	2.00	2.08	2.23	28
		4-year-olds	45.7	74.4	4	1.00	1.84	1.33	20
		5-year-olds	53.6	85.5	4	1.00	1.67	1.22	11
52	Lowercase Letter Jellies	3-year-olds	74.4	86.0	4	1.00	1.29	0.75	7
		4-year-olds	80.3	94.6	4	1.00	1.27	0.84	22
		5-year-olds	86.5	99.0	4	1.00	1.17	0.47	4
58	Letter Sounds 1 Continued Practice	3-year-olds	69.1	92.8	5	1.00	1.37	0.70	4
		4-year-olds	77.1	95.6	5	1.00	1.36	1.01	23
		5-year-olds	87.0	100.0	5	1.00	1.17	0.47	4
59	Completing Compound Words	3-year-olds	23.4	81.1	1	2.00	2.27	1.37	15
		4-year-olds	34.7	91.2	1	2.00	2.00	1.20	21
		5-year-olds	48.5	83.8	1	1.00	1.66	0.88	8

Table 8 (continued)
Passing Rate for First Attempts - Literacy

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
70	Book Orientation	3-year-olds	42.2	87.3	1	2.00	1.99	1.52	26
		4-year-olds	53.7	94.4	1	1.00	1.70	1.14	21
		5-year-olds	62.1	87.5	1	1.00	1.48	0.81	7
71	Key Ideas and Details 1A	3-year-olds	100.0	100.0	1	1.00	1.01	0.10	3
		4-year-olds	100.0	100.0	1	1.00	1.01	0.11	6
		5-year-olds	100.0	100.0	1	1.00	1.01	0.09	2
73	Segmenting Words	3-year-olds	22.3	52.2	4	2.00	2.32	1.69	13
		4-year-olds	31.6	66.7	4	2.00	2.30	1.68	16
		5-year-olds	27.9	67.8	4	2.00	2.23	1.48	13
75	Print Versus Pictures	3-year-olds	8.4	40.9	2	2.00	2.98	2.31	38
		4-year-olds	13.9	57.8	2	2.00	2.92	2.17	41
		5-year-olds	27.4	63.2	2	2.00	2.16	1.38	15
80	Lowercase Letter Jellies 2	3-year-olds	30.8	56.1	4	2.00	2.18	1.45	10
		4-year-olds	39.1	70.3	4	2.00	1.94	1.29	14
		5-year-olds	64.9	84.5	4	1.00	1.61	1.20	7
82	Combining Two Words	3-year-olds	32.3	77.0	2	2.00	1.93	1.08	10
		4-year-olds	33.1	81.7	2	2.00	1.93	1.03	12
		5-year-olds	40.1	84.5	2	2.00	1.76	0.96	8
83	Letter Sounds 2	3-year-olds	48.4	71.0	4	1.00	1.75	1.23	14
		4-year-olds	67.6	88.6	4	1.00	1.46	0.92	14
		5-year-olds	78.5	93.4	4	1.00	1.30	0.80	7
85	Print Directionality	3-year-olds	4.6	23.2	3	2.00	3.49	2.76	24
		4-year-olds	5.6	44.1	3	3.00	3.83	2.94	32
		5-year-olds	16.0	60.8	3	2.00	2.83	1.91	13
87	Letter Sounds 3	3-year-olds	52.9	77.2	4	1.00	1.65	1.06	8
		4-year-olds	68.2	90.4	4	1.00	1.44	0.91	12
		5-year-olds	81.8	96.0	4	1.00	1.23	0.57	4
88	Lowercase Space Letters	3-year-olds	53.8	78.8	5	1.00	2.10	2.62	18
		4-year-olds	59.5	91.1	5	1.00	1.75	1.53	20
		5-year-olds	69.5	96.6	5	1.00	1.44	0.93	7
89	Key Ideas and Details 2A	3-year-olds	100.0	100.0	2	1.00	1.01	0.09	2
		4-year-olds	100.0	100.0	2	1.00	1.01	0.09	3
		5-year-olds	100.0	100.0	2	1.00	1.00	0.05	2
91	Do These Words Rhyme?	3-year-olds	39.6	76.4	2	2.00	1.84	1.16	18
		4-year-olds	50.9	87.6	2	1.00	1.68	1.00	20
		5-year-olds	63.1	87.6	2	1.00	1.46	0.79	7
92	Writing Development 1	3-year-olds	100.0	100.0	1	1.00	1.01	0.09	2
		4-year-olds	100.0	100.0	1	1.00	1.01	0.10	6
		5-year-olds	100.0	100.0	1	1.00	1.00	0.06	2
102	Isolating Onsets	3-year-olds	41.6	77.2	4	1.00	1.78	1.08	9
		4-year-olds	52.3	88.0	4	1.00	1.64	0.94	10
		5-year-olds	69.8	93.7	4	1.00	1.34	0.64	4

Table 8 (continued)
Passing Rate for First Attempts - Literacy

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
103	Print Directionality Continued Practice	3-year-olds	43.3	72.7	3	1.50	2.72	3.41	25
		4-year-olds	42.5	85.5	3	2.00	2.38	2.20	31
		5-year-olds	55.0	92.1	3	1.00	1.78	1.29	11
106	Combining Syllables	3-year-olds	62.1	89.7	3	1.00	1.48	0.80	7
		4-year-olds	70.2	94.9	3	1.00	1.37	0.69	8
		5-year-olds	80.4	96.3	3	1.00	1.25	0.60	6
109	Blending Onsets & Rimes	3-year-olds	24.8	68.7	4	2.00	2.01	1.10	7
		4-year-olds	27.6	84.8	4	2.00	2.06	1.08	10
		5-year-olds	64.6	93.7	4	1.00	1.43	0.72	5
115	Segmenting Simple Words	3-year-olds	92.6	96.7	5	1.00	1.08	0.42	4
		4-year-olds	94.8	99.3	5	1.00	1.07	0.32	5
		5-year-olds	92.4	100.0	5	1.00	1.10	0.36	3
116	Writing Development 2	3-year-olds	100.0	100.0	2	1.00	1.01	0.09	2
		4-year-olds	100.0	100.0	2	1.00	1.01	0.08	3
		5-year-olds	100.0	100.0	2	1.00	1.00	0.07	2
121	Sorting Words By Onset	3-year-olds	45.3	81.2	5	1.00	2.02	1.73	16
		4-year-olds	64.5	92.9	5	1.00	1.73	1.56	20
		5-year-olds	80.1	97.1	5	1.00	1.29	0.94	9
122	Identifying Book Features	3-year-olds	40.8	83.3	4	2.00	2.02	1.30	9
		4-year-olds	40.6	90.1	4	2.00	2.00	1.39	20
		5-year-olds	54.3	90.7	4	1.00	1.64	0.94	6
125	Writing Development 3	3-year-olds	100.0	100.0	3	1.00	1.01	0.08	2
		4-year-olds	100.0	100.0	3	1.00	1.01	0.08	3
		5-year-olds	100.0	100.0	3	1.00	1.01	0.07	2
128	Letter Leaves	3-year-olds	85.7	100.0	6	1.00	2.00	3.54	17
		4-year-olds	79.0	97.6	6	1.00	1.39	1.14	12
		5-year-olds	88.7	98.1	6	1.00	1.25	0.90	6
132	Asteroid Letters	3-year-olds	79.4	100.0	6	1.00	1.62	1.78	10
		4-year-olds	84.0	97.7	6	1.00	1.29	1.27	24
		5-year-olds	86.0	96.0	6	1.00	1.26	1.16	9
136	Letter Clouds	3-year-olds	81.3	93.8	6	1.00	1.53	2.30	14
		4-year-olds	83.9	97.0	6	1.00	1.36	1.46	22
		5-year-olds	91.5	100.0	6	1.00	1.09	0.28	2
140	Letter Rockets	3-year-olds	86.2	93.1	6	1.00	1.97	3.13	15
		4-year-olds	86.1	97.3	6	1.00	1.32	1.49	19
		5-year-olds	86.4	100.0	6	1.00	1.18	0.50	3
142	Writing Development 4	3-year-olds	100.0	100.0	4	1.00	1.01	0.09	2
		4-year-olds	100.0	100.0	4	1.00	1.01	0.08	3
		5-year-olds	100.0	100.0	4	1.00	1.01	0.10	2
144	Letter Leaves Continued Practice	3-year-olds	72.7	86.4	6	1.00	2.00	2.99	15
		4-year-olds	80.1	96.5	6	1.00	1.52	1.94	23
		5-year-olds	75.0	88.9	6	1.00	1.25	0.65	4
146	Blending Simple Words	3-year-olds	35.8	82.4	5	2.00	1.80	1.18	10
		4-year-olds	46.1	91.9	5	1.00	1.68	0.89	8
		5-year-olds	77.6	97.2	5	1.00	1.29	0.66	5

Table 8 (continued)
Passing Rate for First Attempts - Literacy

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
147	Asteroid Letters Continued Practice	3-year-olds	70.8	91.7	6	1.00	1.58	1.44	7
		4-year-olds	82.6	96.5	6	1.00	1.38	1.48	20
		5-year-olds	78.6	100.0	6	1.00	1.21	0.42	2
149	Matching Rhyming Words	3-year-olds	44.2	82.5	3	1.00	1.67	0.85	8
		4-year-olds	55.9	92.2	3	1.00	1.56	0.82	8
		5-year-olds	76.4	95.9	3	1.00	1.28	0.60	5
151	Letter Clouds Continued Practice	3-year-olds	66.7	85.2	6	1.00	1.78	1.85	8
		4-year-olds	77.7	95.7	6	1.00	1.41	1.28	14
		5-year-olds	83.7	100.0	6	1.00	1.35	1.40	10
152	Key Ideas and Details 3A	3-year-olds	64.6	88.7	3	1.00	1.37	0.62	6
		4-year-olds	73.2	93.5	3	1.00	1.31	0.60	9
		5-year-olds	81.1	94.5	3	1.00	1.19	0.45	4
155	Letter Rockets Continued Practice	3-year-olds	65.2	91.3	6	1.00	1.52	0.90	4
		4-year-olds	84.8	97.6	6	1.00	1.38	1.49	16
		5-year-olds	92.3	97.4	6	1.00	1.08	0.35	3
156	Print Versus Pictures Continued Practice	3-year-olds	38.5	79.0	2	2.00	2.36	2.33	34
		4-year-olds	45.9	87.3	2	2.00	2.32	2.43	38
		5-year-olds	59.1	90.8	2	1.00	1.85	1.73	17
163	Words That Don't Rhyme	3-year-olds	30.7	66.5	4	2.00	2.09	1.23	8
		4-year-olds	37.6	79.8	4	2.00	1.94	1.15	13
		5-year-olds	65.9	92.0	4	1.00	1.46	0.82	6
165	Key Ideas and Details 4A	3-year-olds	76.7	92.8	4	1.00	1.25	0.53	4
		4-year-olds	81.5	96.1	4	1.00	1.21	0.54	10
		5-year-olds	91.4	98.9	4	1.00	1.11	0.39	3
166	Letter Sounds 4	3-year-olds	53.1	82.8	6	1.00	2.52	2.54	15
		4-year-olds	61.4	91.6	6	1.00	1.84	1.91	31
		5-year-olds	83.1	96.9	6	1.00	1.25	0.61	4
171	Key Ideas and Details 4B	3-year-olds	63.1	88.9	4	1.00	1.36	0.59	5
		4-year-olds	71.9	95.4	4	1.00	1.32	0.60	6
		5-year-olds	76.0	95.2	4	1.00	1.26	0.49	4
172	Teddy Bear Rhyme	3-year-olds	40.2	83.4	5	2.00	2.26	1.89	14
		4-year-olds	44.2	89.0	5	2.00	2.19	1.94	39
		5-year-olds	64.4	94.8	5	1.00	1.56	1.04	8
173	Letters or Words?	3-year-olds	52.6	82.1	5	1.00	1.72	1.31	6
		4-year-olds	58.5	93.6	5	1.00	1.68	1.16	11
		5-year-olds	67.1	93.7	5	1.00	1.51	0.81	5
180	Key Ideas and Details 5A	3-year-olds	32.7	72.7	5	2.00	3.52	4.55	33
		4-year-olds	47.2	86.9	5	1.00	2.66	3.49	52
		5-year-olds	74.8	93.2	5	1.00	1.67	2.67	21
185	Writing Development 5	3-year-olds	100.0	100.0	5	1.00	1.02	0.13	2
		4-year-olds	100.0	100.0	5	1.00	1.01	0.09	3
		5-year-olds	100.0	100.0	5	1.00	1.01	0.10	2
188	Letter Sounds 5	3-year-olds	51.9	77.8	6	1.00	2.22	2.25	9
		4-year-olds	64.0	90.7	6	1.00	1.73	1.55	19
		5-year-olds	78.3	100.0	6	1.00	1.38	0.99	7

Table 8 (continued)
Passing Rate for First Attempts - Literacy

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
189	Key Ideas and Details 2B	3-year-olds	100.0	100.0	2	1.00	1.01	0.09	2
		4-year-olds	100.0	100.0	2	1.00	1.01	0.08	2
		5-year-olds	100.0	100.0	2	1.00	1.00	0.06	2
197	Writing Development 5 Continued Practice	3-year-olds	100.0	100.0	5	1.00	1.00	0.00	1
		4-year-olds	100.0	100.0	5	1.00	1.01	0.09	2
		5-year-olds	100.0	100.0	5	1.00	1.02	0.15	2
200	Letter Sounds 5 Continued Practice	3-year-olds	72.5	87.5	6	1.00	1.43	0.93	5
		4-year-olds	72.5	94.0	6	1.00	1.52	1.45	27
		5-year-olds	80.0	98.2	6	1.00	1.27	0.68	5
203	Writing Development 4 Continued Practice	3-year-olds	100.0	100.0	4	1.00	1.01	0.09	2
		4-year-olds	100.0	100.0	4	1.00	1.01	0.08	2
		5-year-olds	100.0	100.0	4	1.00	1.00	0.00	1
204	Blending 6	3-year-olds	36.0	80.0	6	2.00	1.68	0.80	4
		4-year-olds	43.9	89.0	6	2.00	1.78	1.05	10
		5-year-olds	61.8	94.1	6	1.00	1.35	0.54	3
205	Segmenting 6	3-year-olds	32.5	80.0	6	2.00	2.00	1.11	5
		4-year-olds	39.0	88.0	6	2.00	1.93	1.15	11
		5-year-olds	77.1	93.8	6	1.00	1.33	0.75	4
206	Rhyming 6	3-year-olds	55.6	89.9	6	1.00	1.60	0.97	6
		4-year-olds	66.1	95.3	6	1.00	1.48	0.85	7
		5-year-olds	78.7	98.7	6	1.00	1.28	0.53	3
207	Alliteration 6	3-year-olds	68.2	88.6	6	1.00	1.23	0.42	2
		4-year-olds	71.5	93.2	6	1.00	1.32	0.65	6
		5-year-olds	86.7	100.0	6	1.00	1.18	0.53	4
210	Concepts of Print 6	3-year-olds	43.8	60.4	6	1.00	2.60	2.66	11
		4-year-olds	65.8	90.2	6	1.00	2.11	2.98	48
		5-year-olds	83.6	94.5	6	1.00	1.35	1.29	10
215	Writing Development 6	3-year-olds	100.0	100.0	6	1.00	1.00	0.00	1
		4-year-olds	100.0	100.0	6	1.00	1.02	0.12	2
		5-year-olds	100.0	100.0	6	1.00	1.00	0.00	1
239	Writing Development 6 Continued Practice	3-year-olds	100.0	100.0	6	1.00	1.00	0.00	1
		4-year-olds	100.0	100.0	6	1.00	1.01	0.13	3
		5-year-olds	100.0	100.0	6	1.00	1.00	0.00	1
240	Alphabet Knowledge 2	3-year-olds	92.4	98.6	2	1.00	1.08	0.32	5
		4-year-olds	91.3	99.1	2	1.00	1.10	0.38	8
		5-year-olds	92.6	99.0	2	1.00	1.08	0.32	4
241	Alphabet Knowledge 5	3-year-olds	78.4	89.2	5	1.00	1.92	3.17	18
		4-year-olds	89.4	98.3	5	1.00	1.17	0.81	18
		5-year-olds	87.3	100.0	5	1.00	1.16	0.42	3
242	Alphabet Knowledge 6E	3-year-olds	67.6	91.2	6	1.00	1.76	1.56	8
		4-year-olds	76.5	94.4	6	1.00	1.48	1.34	14
		5-year-olds	76.6	100.0	6	1.00	1.43	1.10	7
244	Letter-Sound Correspondence 5B	3-year-olds	72.1	86.0	5	1.00	1.49	1.69	15
		4-year-olds	80.3	97.3	5	1.00	1.32	0.90	13
		5-year-olds	88.3	98.7	5	1.00	1.17	0.57	5

Table 8 (continued)
Passing Rate for First Attempts - Literacy

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
245	Letter-Sound Correspondence 5C	3-year-olds	70.7	92.0	5	1.00	1.31	0.64	3
		4-year-olds	79.2	97.2	5	1.00	1.34	0.89	12
		5-year-olds	87.7	97.3	5	1.00	1.18	0.48	3
248	Key Ideas and Details 1B	3-year-olds	100.0	100.0	1	1.00	1.01	0.10	2
		4-year-olds	100.0	100.0	1	1.00	1.01	0.10	7
		5-year-olds	100.0	100.0	1	1.00	1.00	0.07	2
249	Key Ideas and Details 1C	3-year-olds	100.0	100.0	1	1.00	1.01	0.09	2
		4-year-olds	100.0	100.0	1	1.00	1.01	0.09	3
		5-year-olds	100.0	100.0	1	1.00	1.01	0.08	2
250	Key Ideas and Details 2C	3-year-olds	100.0	100.0	2	1.00	1.01	0.10	2
		4-year-olds	100.0	100.0	2	1.00	1.01	0.08	3
		5-year-olds	100.0	100.0	2	1.00	1.00	0.06	2
251	Key Ideas and Details 3B	3-year-olds	76.2	92.0	3	1.00	1.24	0.56	6
		4-year-olds	81.1	95.2	3	1.00	1.23	0.58	14
		5-year-olds	85.8	98.3	3	1.00	1.18	0.62	8
252	Key Ideas and Details 3C	3-year-olds	74.4	88.6	3	1.00	1.29	0.64	6
		4-year-olds	76.6	94.0	3	1.00	1.30	0.69	8
		5-year-olds	82.5	95.2	3	1.00	1.18	0.46	4
253	Key Ideas and Details 4C	3-year-olds	63.7	88.6	4	1.00	1.37	0.68	6
		4-year-olds	69.4	93.3	4	1.00	1.38	0.73	6
		5-year-olds	71.8	96.6	4	1.00	1.32	0.58	4
254	Key Ideas and Details 5B	3-year-olds	48.4	73.7	5	1.00	2.39	3.03	17
		4-year-olds	45.6	86.7	5	1.00	2.40	2.71	31
		5-year-olds	57.5	94.5	5	1.00	1.93	2.42	20
255	Key Ideas and Details 5C	3-year-olds	59.5	79.7	5	1.00	1.84	2.55	21
		4-year-olds	66.7	93.2	5	1.00	1.74	2.15	41
		5-year-olds	81.7	98.6	5	1.00	1.32	1.35	12
256	Key Ideas and Details 6A	3-year-olds	25.8	83.9	6	2.00	2.61	3.01	18
		4-year-olds	33.7	88.2	6	2.00	1.95	1.25	17
		5-year-olds	35.6	91.1	6	2.00	1.76	0.83	5
257	Key Ideas and Details 6B	3-year-olds	40.7	81.5	6	1.00	1.56	0.89	5
		4-year-olds	50.7	93.2	6	1.00	1.79	1.16	11
		5-year-olds	70.0	92.5	6	1.00	1.55	1.28	8
258	Key Ideas and Details 6C	3-year-olds	40.7	81.5	6	1.00	2.37	3.15	17
		4-year-olds	49.0	92.1	6	1.00	1.85	1.34	15
		5-year-olds	64.7	91.2	6	1.00	1.53	1.33	8
283	Letter-Sound Correspondence 6C	3-year-olds	84.8	97.0	6	1.00	1.21	0.60	4
		4-year-olds	85.1	96.9	6	1.00	1.21	0.64	9
		5-year-olds	87.2	97.9	6	1.00	1.13	0.40	3
284	Letter-Sound Correspondence 6D	3-year-olds	74.2	96.8	6	1.00	1.29	0.53	3
		4-year-olds	82.0	96.8	6	1.00	1.26	0.77	10
		5-year-olds	85.0	97.5	6	1.00	1.15	0.43	3
285	Alphabet Knowledge 6E Continued Practice	3-year-olds	77.3	90.9	6	1.00	1.50	1.19	6
		4-year-olds	78.0	95.7	6	1.00	1.35	1.03	12
		5-year-olds	82.9	95.1	6	1.00	1.27	0.74	4

Table 8 (continued)
Passing Rate for First Attempts - Literacy

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
294	Decoding 6	3-year-olds	31.4	68.6	6	1.00	1.83	1.18	5
		4-year-olds	38.1	85.6	6	2.00	1.88	1.13	13
		5-year-olds	71.8	92.3	6	1.00	1.38	0.78	4
295	Comprehension - Fiction 6A	3-year-olds	68.3	90.2	6	1.00	1.73	2.27	15
		4-year-olds	72.5	94.7	6	1.00	1.33	0.74	12
		5-year-olds	72.7	95.5	6	1.00	1.34	0.75	4
296	Comprehension - Fiction 6B	3-year-olds	84.0	96.0	6	1.00	1.16	0.47	3
		4-year-olds	86.6	97.5	6	1.00	1.16	0.47	5
		5-year-olds	89.2	97.3	6	1.00	1.08	0.28	2
297	High-Frequency Words 6	3-year-olds	23.0	44.6	6	2.00	3.96	4.79	28
		4-year-olds	32.3	70.9	6	2.00	3.42	3.94	36
		5-year-olds	70.3	89.1	6	1.00	1.45	0.97	6
298	High-Frequency Words 6 Continued Practice	3-year-olds	51.7	75.9	6	1.00	2.38	2.26	11
		4-year-olds	54.6	86.2	6	1.00	2.14	2.50	38
		5-year-olds	80.9	97.9	6	1.00	1.32	0.75	5
300	Comprehension - Non-Fiction 6A	3-year-olds	65.0	80.0	6	1.00	1.48	0.99	5
		4-year-olds	85.0	95.6	6	1.00	1.22	0.87	18
		5-year-olds	87.8	95.1	6	1.00	1.07	0.26	2
301	Comprehension - Non-Fiction 6B	3-year-olds	71.4	92.9	6	1.00	1.25	0.52	3
		4-year-olds	76.7	95.9	6	1.00	1.33	0.82	10
		5-year-olds	84.6	100.0	6	1.00	1.15	0.37	2
302	Comprehension - Non-Fiction 6C	3-year-olds	72.0	96.0	6	1.00	1.28	0.46	2
		4-year-olds	77.0	95.9	6	1.00	1.30	0.74	9
		5-year-olds	89.5	100.0	6	1.00	1.11	0.31	2
303	Comprehension - Fiction 6C	3-year-olds	68.8	87.5	6	1.00	1.31	0.74	4
		4-year-olds	77.5	96.1	6	1.00	1.32	0.81	9
		5-year-olds	75.7	97.3	6	1.00	1.41	0.98	6
312	Blending 7	3-year-olds	50.0	90.0	7	1.00	1.60	0.84	3
		4-year-olds	45.4	89.7	7	2.00	1.78	1.10	11
		5-year-olds	60.0	88.0	7	1.00	1.40	0.87	5
313	Segmenting 7	3-year-olds	33.3	33.3	7	1.50	1.83	0.98	3
		4-year-olds	43.0	86.6	7	1.50	1.75	1.02	9
		5-year-olds	66.7	91.7	7	1.00	1.25	0.45	2
314	Alphabet Knowledge 7C	3-year-olds	55.6	77.8	7	1.00	2.00	2.00	7
		4-year-olds	65.8	90.6	7	1.00	2.20	3.94	40
		5-year-olds	77.3	95.5	7	1.00	1.27	0.55	3
315	Alphabet Knowledge 7D	3-year-olds	71.4	71.4	7	1.00	2.00	2.24	7
		4-year-olds	54.8	86.7	7	1.00	2.48	3.18	24
		5-year-olds	72.7	90.9	7	1.00	1.36	0.90	5
316	Alphabet Knowledge 7A	3-year-olds	38.5	61.5	7	1.00	2.38	2.40	8
		4-year-olds	34.5	73.0	7	2.00	3.74	5.06	57
		5-year-olds	53.6	92.9	7	1.00	2.04	1.60	7
317	Alphabet Knowledge 7B	3-year-olds	55.6	55.6	7	1.00	3.22	3.27	10
		4-year-olds	51.1	85.2	7	1.00	2.68	3.47	26
		5-year-olds	60.0	92.0	7	1.00	2.04	2.30	11

Table 8 (continued)
Passing Rate for First Attempts - Literacy

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
318	Letter-Sound Correspondence 7A	3-year-olds	60.0	73.3	7	1.00	3.80	5.72	22
		4-year-olds	57.1	86.4	7	1.00	2.03	2.20	18
		5-year-olds	81.8	100.0	7	1.00	1.23	0.53	3
319	Letter-Sound Correspondence 7B	3-year-olds	42.9	71.4	7	2.00	4.29	6.16	18
		4-year-olds	53.4	85.8	7	1.00	2.11	1.90	13
		5-year-olds	76.2	100.0	7	1.00	1.43	0.87	4
320	Decoding 7	3-year-olds	26.7	66.7	7	2.00	2.73	2.46	10
		4-year-olds	21.5	79.1	7	2.00	2.23	1.19	9
		5-year-olds	60.9	95.7	7	1.00	1.57	0.84	4
321	Concepts of Print 7	3-year-olds	75.0	87.5	7	1.00	1.38	0.52	2
		4-year-olds	48.4	81.0	7	1.00	1.88	1.68	15
		5-year-olds	78.6	100.0	7	1.00	1.29	0.61	3
322	Comprehension - Fiction 7A	3-year-olds	26.9	57.7	7	2.00	4.58	4.87	19
		4-year-olds	26.3	72.2	7	2.00	3.75	3.94	25
		5-year-olds	38.2	91.2	7	2.00	3.03	4.54	24
323	Comprehension - Fiction 7B	3-year-olds	75.0	75.0	7	1.00	2.00	2.83	9
		4-year-olds	74.4	94.7	7	1.00	1.43	1.06	11
		5-year-olds	52.9	88.2	7	1.00	1.53	0.87	4
324	Comprehension - Fiction 7C	3-year-olds	71.4	78.6	7	1.00	1.71	1.64	7
		4-year-olds	71.4	93.5	7	1.00	1.66	1.76	16
		5-year-olds	90.0	96.7	7	1.00	1.07	0.25	2
325	Comprehension - Non-Fiction 7A	3-year-olds	75.0	100.0	7	1.00	1.38	0.72	3
		4-year-olds	75.5	94.9	7	1.00	1.33	0.73	7
		5-year-olds	83.3	100.0	7	1.00	1.17	0.38	2
326	Comprehension - Non-Fiction 7B	3-year-olds	43.8	81.3	7	1.50	1.94	1.24	5
		4-year-olds	45.2	89.0	7	1.50	1.83	1.10	8
		5-year-olds	34.8	91.3	7	2.00	1.96	0.98	4
327	Comprehension - Non-Fiction 7C	3-year-olds	66.7	91.7	7	1.00	1.83	1.47	6
		4-year-olds	64.2	91.1	7	1.00	1.59	1.16	11
		5-year-olds	70.0	90.0	7	1.00	1.30	0.66	3
328	High-Frequency Words 7	3-year-olds	30.0	55.0	7	1.50	3.90	5.18	17
		4-year-olds	33.5	77.5	7	2.00	3.91	4.72	44
		5-year-olds	66.7	84.8	7	1.00	1.33	0.96	6
329	Key Ideas and Details 7A	3-year-olds	42.9	85.7	7	2.00	2.29	1.50	5
		4-year-olds	44.1	89.3	7	2.00	1.68	0.81	5
		5-year-olds	50.0	88.9	7	1.00	1.44	0.51	2
330	Key Ideas and Details 7B	3-year-olds	42.9	85.7	7	2.00	1.71	0.76	3
		4-year-olds	58.0	91.6	7	1.00	1.56	0.88	8
		5-year-olds	81.3	100.0	7	1.00	1.25	0.58	3
331	Key Ideas and Details 7C	3-year-olds	66.7	100.0	7	1.00	1.33	0.52	2
		4-year-olds	65.1	94.7	7	1.00	1.43	0.69	4
		5-year-olds	81.3	100.0	7	1.00	1.19	0.40	2
335	Writing Development 7	3-year-olds	100.0	100.0	7	1.00	1.00	0.00	1
		4-year-olds	100.0	100.0	7	1.00	1.01	0.12	2
		5-year-olds	100.0	100.0	7	1.00	1.00	0.00	1

Table 8 (continued)
Passing Rate for First Attempts - Literacy

Game ID	Game Name	Age	% Passed First Attempt	% Passed Last Attempt	Skill Level	Number of Attempts			
						Median	Mean	SD	Max
351	Blending 8	3-year-olds	50.0	50.0	8	1.00	1.25	0.50	2
		4-year-olds	60.9	88.5	8	1.00	1.45	0.81	7
		5-year-olds	83.3	100.0	8	1.00	1.17	0.39	2
352	Segmenting 8	3-year-olds	100.0	100.0	8	1.00	1.00	----	1
		4-year-olds	48.8	90.8	8	1.00	1.57	0.75	5
		5-year-olds	63.6	100.0	8	1.00	1.36	0.50	2
353	Letter-Sound Correspondence 7C	3-year-olds	75.0	87.5	7	1.00	1.88	2.47	8
		4-year-olds	67.6	89.9	7	1.00	1.87	2.11	17
		5-year-olds	78.9	94.7	7	1.00	1.32	0.75	4
354	Letter-Sound Correspondence 8	3-year-olds	100.0	100.0	8	1.00	1.00	0.00	1
		4-year-olds	86.7	96.8	8	1.00	1.16	0.48	4
		5-year-olds	73.3	93.3	8	1.00	1.20	0.41	2
355	Decoding 8	3-year-olds	22.2	66.7	8	2.00	2.00	0.87	3
		4-year-olds	29.0	85.5	8	2.00	2.01	1.00	7
		5-year-olds	62.5	100.0	8	1.00	1.56	0.89	4
356	Comprehension - Fiction 8A	3-year-olds	100.0	100.0	8	1.00	1.00	0.00	1
		4-year-olds	89.8	97.5	8	1.00	1.14	0.44	4
		5-year-olds	100.0	100.0	8	1.00	1.00	0.00	1
357	Comprehension - Fiction 8B	3-year-olds	60.0	80.0	8	1.00	1.20	0.45	2
		4-year-olds	62.9	92.1	8	1.00	1.50	0.87	7
		5-year-olds	80.0	93.3	8	1.00	1.13	0.35	2
358	Comprehension - Fiction 8C	3-year-olds	50.0	66.7	8	1.00	1.33	0.82	3
		4-year-olds	88.3	95.8	8	1.00	1.23	0.61	5
		5-year-olds	86.7	100.0	8	1.00	1.13	0.35	2
359	Comprehension - Non-Fiction 8A	3-year-olds	80.0	80.0	8	1.00	1.00	0.00	1
		4-year-olds	41.7	84.5	8	2.00	2.51	2.56	23
		5-year-olds	40.0	80.0	8	2.00	2.40	2.29	9
360	Comprehension - Non-Fiction 8B	3-year-olds	40.0	60.0	8	1.00	2.60	2.30	6
		4-year-olds	35.0	84.1	8	2.00	2.77	2.61	20
		5-year-olds	75.0	100.0	8	1.00	1.42	0.90	4
361	Comprehension - Non-Fiction 8C	3-year-olds	33.3	50.0	8	1.00	2.17	1.83	5
		4-year-olds	35.9	76.2	8	2.00	3.00	4.22	34
		5-year-olds	28.6	78.6	8	2.00	3.43	4.64	19
362	High-Frequency Words 8	3-year-olds	50.0	50.0	8	2.00	2.00	1.41	3
		4-year-olds	54.4	82.3	8	1.00	2.15	2.10	15
		5-year-olds	76.5	82.4	8	1.00	1.24	0.75	4
363	Key Ideas and Details 8A	3-year-olds	100.0	100.0	8	1.00	1.00	0.00	1
		4-year-olds	100.0	100.0	8	1.00	1.20	1.19	14
		5-year-olds	100.0	100.0	8	1.00	1.00	0.00	1
364	Key Ideas and Details 8B	3-year-olds	100.0	100.0	8	1.00	1.00	0.00	1
		4-year-olds	100.0	100.0	8	1.00	1.11	0.52	5
		5-year-olds	100.0	100.0	8	1.00	1.00	0.00	1
365	Key Ideas and Details 8C	3-year-olds	100.0	100.0	8	1.00	1.00	0.00	1
		4-year-olds	100.0	100.0	8	1.00	1.02	0.13	2
		5-year-olds	100.0	100.0	8	1.00	1.00	0.00	1
369	Writing Development 8	3-year-olds	100.0	100.0	8	1.00	1.14	0.38	2
		4-year-olds	100.0	100.0	8	1.00	1.17	0.85	9
		5-year-olds	100.0	100.0	8	1.00	1.00	0.00	1
402	Letter-Sound Correspondence 7D	3-year-olds	44.4	66.7	7	3.00	2.44	1.33	5
		4-year-olds	67.7	92.3	7	1.00	1.71	1.76	17
		5-year-olds	61.1	94.4	7	1.00	1.39	0.61	3

Table 9
Difficulty Levels for Games within Social Studies

	Game ID	% Attempted and Passed	Skill Level		Difficulty Level	Game Difficuly	Game Name
Social Studies	30	0.3	***Emerging***	***2***	***Difficult***	***9.28***	The "What" Machine Continued Practice
	16	0.4	***Emerging***	***2***	***Difficult***	***9.15***	Moon Mission
	193	4.6	Proficient	5	Difficult	4.72	I Can Draw About Myself Continued Practice
	198	4.9	Proficient	5	Difficult	4.55	Identifying Community Helpers
	135	7.5	Proficient	5	Difficult	3.2	I Can Draw About Myself
	178	9.1	Accomplishing	4	Difficult	2.52	Building a Neighborhood 2
	177	9.3	Accomplishing	4	Difficult	2.44	I Can Draw My Interests Continued Practice
	97	10.2	Accomplishing	4	Difficult	2.11	I Can Draw My Interests
	108	15.9	Intermediate	3	Average	0.45	Uses of Neighborhood Features
	175	19.9	Intermediate	3	Easy	-0.54	I Can Draw My Family Continued Practice
	60	22.8	Intermediate	3	Easy	-1.19	I Can Draw My Family
	168	24.2	Emerging	2	Easy	-1.46	I Can Draw My Home Continued Practice
	22	27.2	Emerging	2	Easy	-2.01	I Can Draw My Home
	69	47.4	Emerging	2	Easy	-4.53	Building a Neighborhood
	148	55.0	Beginning	1	Easy	-5.4	I Can Draw Myself Continued Practice
	202	59.0	Beginning	1	Easy	-5.87	I Can Draw My Neighborhood Continued Practice
	40	73.4	Beginning	1	Easy	-7.51	I Can Draw My Neighborhood
	1	92.5	Beginning	1	Easy	-9.91	I Can Draw Myself

Note. n = 61,375. ***Bolded and italicized*** games may represent mismatch between intended and empirical difficulty.

Table 10
Difficulty Levels for Games within Science & Technology

	Game ID	% Passed first attempt	Skill Level		Difficulty Level	Game Difficuly	Game Name
Science and Technology	161	1.0	Proficient	5	Difficult	3.75	Recycling and Reusing
	195	3.0	Proficient	5	Difficult	2.42	Uses of Scientific Tools
	81	4.2	Accomplishing	4	Difficult	1.95	How Living Things Change
	127	4.4	Proficient	5	Difficult	1.87	Living Things Game Show
	134	4.7	Proficient	5	Difficult	1.80	Magnet Fun
	187	7.1	Accomplishing	4	Difficult	1.17	Which Tools to Use?
	154	9.2	Accomplishing	4	Difficult	0.74	Weather Windows
	93	10.3	Accomplishing	4	Difficult	0.56	Sorting Living Things
	53	13.9	Intermediate	3	Average	0.03	What Our Senses Do
	42	14.7	Intermediate	3	Average	-0.07	Basic Needs
	43	15.4	Emerging	2	Average	-0.17	Senses and Texture
	95	15.7	Intermediate	3	Average	-0.20	Weather Game Show
	112	16.2	Intermediate	3	Average	-0.27	Sorting Scientific Tools
	29	19.8	Emerging	2	Easy	-0.67	Which Is a Living Thing 2
	62	20.7	Emerging	2	Easy	-0.75	Environmental Changes
	72	23.4	Emerging	2	Easy	-1.01	Everyday Tools
	25	30.6	Beginning	1	Easy	-1.62	Object Properties
	2	43.1	Beginning	1	Easy	-2.52	Living or Nonliving?
	37	44.6	Beginning	1	Easy	-2.62	Simple Scientific Tools
	48	70.0	Beginning	1	Easy	-4.41	Nature Scavenger Hunt

Note. n = 57,081. ***Bolded and italicized*** games may represent mismatch between intended and empirical difficulty.

Table 11
Difficulty Levels for Games within Social and Emotional Learning

	Game ID	% Passed first attempt	Skill Level		Difficulty Level	Game Difficuly	Game Name
Social Emotional	400	0.0	Proficient +	8	Difficult	6.15	Executive Functioning 8
	401	0.1	Proficient +	8	Difficult	5.30	Executive Functioning 8 Continued Practice
	392	0.2	Proficient +	7	Difficult	4.01	Executive Functioning 7 Continued Practice
	391	0.4	Proficient +	7	Difficult	3.52	Executive Functioning 7
	399	0.4	Proficient +	8	Difficult	3.31	Responding to Emotions 8
	306	0.5	Proficient +	6	Difficult	3.19	Executive Functioning 6
	397	0.5	Proficient +	8	Difficult	3.06	Social Problem Solving 8
	398	0.6	Proficient +	8	Difficult	3.04	Identifying Emotions 8
	307	0.9	Proficient +	6	Difficult	2.44	Executive Functioning 6 Continued Practice
	390	1.0	Proficient +	7	Difficult	2.38	Responding to Emotions 7
	389	1.0	Proficient +	7	Difficult	2.34	Identifying Emotions 7
	388	1.1	Proficient +	7	Difficult	2.26	Social Problem Solving 7
	305	1.4	Proficient	5	Difficult	1.92	Executive Functioning 5 Continued Practice
	259	1.5	Proficient +	6	Difficult	1.86	Solving Social Problems 6
	304	2.2	Proficient	5	Difficult	1.35	Executive Functioning 5
	293	3.8	Accomplishing	4	Difficult	0.58	Executive Functioning 4 Continued Practice
	282	3.9	Proficient +	6	Difficult	0.56	Responding to Emotions 6
	292	4.2	Accomplishing	4	Average	0.46	Executive Functioning 4
	260	4.2	Proficient +	6	Average	0.43	Identifying Emotions 6
	281	4.9	Proficient	5	Average	0.23	Responding to Emotions 5
	139	5.6	Proficient	5	Average	0.02	Identifying Emotions 5
	201	5.8	Proficient	5	Average	-0.05	Addressing Our Own Emotions
	118	6.5	Accomplishing	4	Average	-0.23	Causes of Complex Emotions
	291	6.7	Intermediate	3	Average	-0.27	Executive Functioning 3 Continued Practice
	288	7.2	Emerging	2	Average	-0.40	Executive Functioning 2
	290	7.9	Intermediate	3	Easy	-0.55	Executive Functioning 3
	289	9.3	Emerging	2	Easy	-0.82	Executive Functioning 2 Continued Practice
	170	10.9	***Accomplishing***	***4***	***Easy***	-1.11	Solving Social Problems
	76	12.7	Intermediate	3	Easy	-1.39	Identifying Complex Emotions
	280	15.3	***Accomplishing***	***4***	***Easy***	-1.77	Responding to Emotions 4
	123	15.6	Intermediate	3	Easy	-1.80	Solving Social Problems 3
	279	17.4	Intermediate	3	Easy	-2.03	Responding to Emotions 3
	66	19.1	Beginning	1	Easy	-2.23	Recognizing Social Problems
	278	24.3	Emerging	2	Easy	-2.78	Responding to Emotions 2
	287	26.7	Beginning	1	Easy	-3.01	Executive Functioning 1 Continued Practice
	99	28.1	Emerging	2	Easy	-3.14	Pro-Social Behaviors
	9	29.4	Emerging	2	Easy	-3.25	Causes of Basic Emotions
	286	36.4	Beginning	1	Easy	-3.83	Executive Functioning 1
	3	55.1	Beginning	1	Easy	-5.25	Identifying Basic Emotions
	277	63.3	Beginning	1	Easy	-5.88	Responding to Emotions 1 Continued Practice
	276	89.8	Beginning	1	Easy	-8.60	Responding to Emotions 1

Note. n = 53,347. ***Bolded and italicized*** games may represent mismatch between intended and empirical difficulty.

Table 12
Difficulty Levels for Games within Language & Communication Development

	Game ID	% Passed first attempt	Skill Level		Difficulty Level	Game Difficuly	Game Name
Language & Comm.	75	0.0	***Emerging***	***2***	***Difficult***	***10.08***	Print Versus Pictures
	85	0.0	Intermediate	3	Difficult	10.08	Print Directionality
	406	0.1	Proficient +	8	Difficult	4.35	Academic Vocabulary 8C
	393	0.1	Proficient +	8	Difficult	4.22	Listening and Understanding 8
	396	0.2	Proficient +	8	Difficult	4.03	Conventions of Language 8
	405	0.2	Proficient +	8	Difficult	3.90	Academic Vocabulary 8B
	395	0.2	Proficient +	8	Difficult	3.85	Vocabulary 8
	394	0.3	Proficient +	8	Difficult	3.54	Academic Vocabulary 8A
	385	0.5	Proficient +	7	Difficult	2.89	Academic Vocabulary 7A
	404	0.7	Proficient +	7	Difficult	2.39	Academic Vocabulary 7C
	271	0.7	Proficient +	6	Difficult	2.38	Academic Vocabulary 6C
	384	0.8	Proficient +	7	Difficult	2.32	Listening and Understanding 7
	387	0.8	Proficient +	7	Difficult	2.30	Conventions of Language 7
	386	0.8	Proficient +	7	Difficult	2.28	Vocabulary 7
	403	1.1	Proficient +	7	Difficult	1.95	Academic Vocabulary 7B
	270	1.1	Proficient +	6	Difficult	1.90	Academic Vocabulary 6B
	269	1.1	Proficient +	6	Difficult	1.87	Academic Vocabulary 6A
	261	1.6	Proficient +	6	Difficult	1.42	Listening and Understanding 6
	264	2.0	Accomplishing	4	Difficult	1.13	Academic Vocabulary 4B
	267	2.6	Proficient	5	Difficult	0.75	Academic Vocabulary 5B
	268	2.9	Proficient	5	Difficult	0.61	Academic Vocabulary 5C
	275	2.9	Proficient +	6	Difficult	0.61	Conventions of Language 6
	262	3.0	Proficient +	6	Difficult	0.52	Vocabulary 6
	192	3.1	Proficient	5	Average	0.48	Building a Spaceship Continued Practice
	159	3.2	Proficient	5	Average	0.47	Another Day at the Museum
	111	3.2	Proficient	5	Average	0.44	Building a Spaceship
	266	3.7	Proficient	5	Average	0.22	Academic Vocabulary 5A
	67	3.8	Accomplishing	4	Average	0.20	Understanding Antonyms
	274	4.3	Proficient	5	Average	-0.02	Conventions of Language 5
	265	4.4	Accomplishing	4	Average	-0.03	Academic Vocabulary 4C
	263	4.5	Accomplishing	4	Average	-0.09	Academic Vocabulary 4A
	28	5.7	Emerging	2	Average	-0.45	Categorizing Words
	273	6.2	***Accomplishing***	***4***	***Easy***	***-0.60***	Conventions of Language 4
	130	6.3	***Proficient***	***5***	***Easy***	***-0.61***	How Questions
	64	6.3	***Accomplishing***	***4***	***Easy***	***-0.63***	Underwater Instructions
	35	7.5	Intermediate	3	Easy	-0.92	2-Step Directions
	55	7.6	Intermediate	3	Easy	-0.95	2-Step Directions Continued Practice
	181	7.8	***Accomplishing***	***4***	***Easy***	***-0.98***	Understanding Antonyms Continued Practice
	78	8.2	***Accomplishing***	***4***	***Easy***	***-1.07***	Understanding Complex Sentences
	272	9.2	Intermediate	3	Easy	-1.28	Conventions of Language 3
	50	13.2	Intermediate	3	Easy	-1.97	The "Where" Machine Continued Practice
	41	13.9	Intermediate	3	Easy	-2.07	The "Where" Machine
	57	15.5	Intermediate	3	Easy	-2.29	Comparative Adjectives
	36	16.0	Emerging	2	Easy	-2.36	Categorizing Words Continued Practice
	30	19.1	Emerging	2	Easy	-2.73	The "What" Machine Continued Practice
	24	25.5	Emerging	2	Easy	-3.38	The "What" Machine
	21	36.9	Beginning	1	Easy	-4.30	Basic Words Continued Practice
	7	38.0	Beginning	1	Easy	-4.39	Basic Words
	14	56.7	Beginning	1	Easy	-5.67	Color Words
	16	59.9	Emerging	2	Easy	-5.89	Moon Mission
	4	87.8	Beginning	1	Easy	-8.36	Classroom Cleanup

Note. n = 60,952. ***Bolded and italicized*** games may represent mismatch between intended and empirical difficulty.

Table 13
Difficulty Levels for Games within Physical Development

	Game ID	% Passed first attempt	Skill Level		Difficulty Level	Game Difficuly	Game Name
Physical Development	179	0.9	Proficient	5	Difficult	3.66	Making a Healthy Meal
	199	4.9	Proficient	5	Difficult	1.51	Self-Care Collage Continued Practice
	190	5.6	Proficient	5	Difficult	1.31	Self-Care Collage
	137	5.7	Accomplishing	4	Difficult	1.27	Safe & Healthy Behaviors 2
	196	6.7	Proficient	5	Difficult	1.04	Stay and Play or Walk Away?
	32	7.8	***Emerging***	***2***	***Difficult***	0.78	Healthy Gormit
	84	8.1	Accomplishing	4	Difficult	0.73	Washing Your Hands
	114	10.2	Intermediate	3	Average	0.34	Safe & Healthy Behavior
	119	10.3	Accomplishing	4	Average	0.33	Healthy Menu
	105	10.4	Intermediate	3	Average	0.31	Healthy Breakfast
	68	18.3	Intermediate	3	Easy	-0.73	Self-Care Shopping Trip
	74	18.4	Emerging	2	Easy	-0.74	Playing Safely
	17	28.7	Beginning	1	Easy	-1.68	Nutritious Meal
	10	30.8	Emerging	2	Easy	-1.84	Morning Routine
	45	47.7	Beginning	1	Easy	-3.02	Personal Safety
	5	51.4	Beginning	1	Easy	-3.27	Self-Care Game Show

Note. n = 59,617. ***Bolded and italicized*** games may represent mismatch between intended and empirical difficulty.

Table 14
Difficulty Levels for Games within Mathematics

	Game ID	% Passed first attempt	Skill Level		Difficulty Level	Game Difficuly	Game Name
Mathematics	373	0.1	Proficient +	8	Difficult	4.73	Subitizing 8
	338	0.1	Proficient +	7	Difficult	4.63	Subtraction 7
	337	0.1	Proficient +	7	Difficult	4.56	Addition 7
	381	0.1	Proficient +	8	Difficult	4.16	Classification and Data 8
	375	0.1	Proficient +	8	Difficult	4.14	Set Counting 8
	343	0.1	Proficient +	7	Difficult	4.10	Comparing Quantities 7
	220	0.1	Proficient +	6	Difficult	3.96	Comparing Quantities 6
	374	0.1	Proficient +	8	Difficult	3.78	Number Sequencing 8
	380	0.1	Proficient +	8	Difficult	3.77	Measurement 8
	339	0.1	Proficient +	7	Difficult	3.70	Subitizing 7
	382	0.1	Proficient +	8	Difficult	3.70	2-D Shapes 8
	370	0.2	Proficient +	8	Difficult	3.55	Patterns 8
	341	0.2	Proficient +	7	Difficult	3.35	Set Counting 7
	340	0.2	Proficient +	7	Difficult	3.34	Number Sequencing 7
	377	0.2	Proficient +	8	Difficult	3.30	Comparing Quantities 8
	371	0.2	Proficient +	8	Difficult	3.27	Addition 8
	379	0.2	Proficient +	8	Difficult	3.24	Decomposing 8
	336	0.2	Proficient +	7	Difficult	3.08	Patterns 7
	348	0.2	Proficient +	7	Difficult	3.04	Classification and Data 7
	218	0.3	Proficient +	6	Difficult	2.84	Number Sequencing 6
	372	0.3	Proficient +	8	Difficult	2.83	Subtraction 8
	344	0.3	Proficient +	7	Difficult	2.79	Ordinal Numbers 7
	378	0.4	Proficient +	8	Difficult	2.58	Composing 8
	219	0.4	Proficient +	6	Difficult	2.57	Set Counting 6
	345	0.4	Proficient +	7	Difficult	2.47	Composing 7
	347	0.4	Proficient +	7	Difficult	2.47	Measurement 7
	383	0.5	Proficient +	8	Difficult	2.25	Composing Shapes 8
	211	0.5	Proficient +	6	Difficult	2.15	Addition 6
	308	0.5	Proficient +	6	Difficult	2.13	Composing 6
	346	0.6	Proficient +	7	Difficult	2.07	Decomposing 7
	212	0.7	Proficient +	6	Difficult	1.84	Subtraction 6
	235	0.7	Proficient	5	Difficult	1.83	Number Sequencing 5
	349	0.7	Proficient +	7	Difficult	1.77	2-D Shapes 7
	182	0.8	Proficient	5	Difficult	1.66	Measurement 5
	350	0.9	Proficient +	7	Difficult	1.57	Composing Shapes 7
	164	1.0	Proficient	5	Difficult	1.43	Counting Back to Subtract
	309	1.2	Proficient +	6	Difficult	1.21	Composing 6 Continued Practice
	213	1.2	Proficient +	6	Difficult	1.19	Ordinal Numbers 6
	158	1.3	Proficient	5	Difficult	1.12	Counting On to 10
	237	1.4	Proficient +	6	Difficult	1.02	Subitizing 6 Continued Practice
	131	1.4	Accomplishing	4	Difficult	0.96	Adding 8 or Less
	194	1.4	Proficient	5	Difficult	0.96	Patterns 5
	216	1.5	Proficient +	6	Difficult	0.89	Patterns 6
	160	1.5	Accomplishing	4	Difficult	0.88	Subtracting 8 or Less
	217	1.6	Proficient +	6	Difficult	0.81	Subitizing 6
	311	1.6	Proficient +	6	Difficult	0.79	Decomposing 6 Continued Practice
	86	1.7	Proficient	5	Difficult	0.77	Comparing Quantities 5
	310	1.7	Proficient +	6	Difficult	0.75	Decomposing 6
	141	1.8	Proficient	5	Difficult	0.69	Set Counting 5 Continued Practice
	221	1.8	Proficient +	6	Difficult	0.67	Measurement 6
	222	2.0	Proficient +	6	Difficult	0.56	Classification and Data 6
	96	2.0	Intermediate	3	Difficult	0.55	Adding Zebras
	143	2.0	Proficient	5	Difficult	0.53	Spatial Relationships 5
	124	2.1	Proficient	5	Average	0.47	Set Counting 5
	238	2.2	Accomplishing	4	Average	0.40	Number Sequencing 4 Continued Practice
	150	2.3	Intermediate	3	Average	0.34	Subtracting 6 or Less

Table 14 (continued)
Difficulty Levels for Games within Mathematics

Game ID	% Passed first attempt	Skill Level		Difficulty Level	Game Difficuly	Game Name
191	2.7	Proficient	5	Average	0.11	Classification and Data 5
214	3.0	Proficient +	6	Average	-0.01	2-D Shapes 6
174	3.1	Proficient	5	Average	-0.04	3-Dimensional Shape Spinner
230	3.4	Proficient	5	Average	-0.17	Subitizing 5
299	3.4	Proficient +	6	Average	-0.20	Composing Shapes 6
100	4.0	Emerging	2	Average	-0.41	Farm Subtraction
234	4.2	Accomplishing	4	Average	-0.48	Number Sequencing 4
104	4.7	Beginning	1	Easy	-0.64	Measurement 1
61	4.9	***Accomplishing***	***4***	***Easy***	***-0.68***	Comparing Quantities 4
63	5.3	Emerging	2	Easy	-0.82	Farm Addition
129	5.6	***Accomplishing***	***4***	***Easy***	***-0.88***	First, Second, & Last
186	6.2	***Accomplishing***	***4***	***Easy***	***-1.04***	Patterns 4
157	6.3	***Proficient***	***5***	***Easy***	***-1.08***	Lining Up For Snack Time
94	7.9	***Accomplishing***	***4***	***Easy***	***-1.41***	Set Counting 4
236	8.0	***Accomplishing***	***4***	***Easy***	***-1.43***	Subitizing 4 Continued Practice
79	8.3	Intermediate	3	Easy	-1.49	Set Counting 3
167	9.5	Intermediate	3	Easy	-1.70	Measurement 3
229	9.5	***Accomplishing***	***4***	***Easy***	***-1.71***	Subitizing 4
183	10.1	Intermediate	3	Easy	-1.81	Patterns 3
90	10.5	Beginning	1	Easy	-1.87	Subtracting Socks
176	11.2	***Accomplishing***	***4***	***Easy***	***-1.98***	Measurement 4
126	11.5	***Accomplishing***	***4***	***Easy***	***-2.03***	Spatial Relationships 4
110	11.6	Intermediate	3	Easy	-2.05	Identifying First & Second
138	12.9	Emerging	2	Easy	-2.23	Patterns 2
162	13.2	***Accomplishing***	***4***	***Easy***	***-2.27***	Ice Cream Truck Shape Puzzle
38	13.3	Emerging	2	Easy	-2.28	Last In Line
34	13.3	Emerging	2	Easy	-2.29	Comparing Quantities 2
184	14.2	***Accomplishing***	***4***	***Easy***	***-2.40***	Classification and Data 4
232	14.6	Emerging	2	Easy	-2.44	Number Sequencing 2
51	17.2	Intermediate	3	Easy	-2.75	Comparing Quantities 3
228	17.9	Intermediate	3	Easy	-2.82	Subitizing 3
233	18.2	Intermediate	3	Easy	-2.85	Number Sequencing 3
54	20.3	Beginning	1	Easy	-3.07	Grocery Store Addition
120	20.3	Beginning	1	Easy	-3.07	Patterns 1
31	21.4	Emerging	2	Easy	-3.18	Set Counting 2
153	22.5	Intermediate	3	Easy	-3.29	Shape Asteroids
247	24.7	Emerging	2	Easy	-3.48	Subitizing 2
133	25.3	Emerging	2	Easy	-3.54	Measurement 2
113	26.6	Intermediate	3	Easy	-3.65	Spatial Relationships 3
18	30.1	Beginning	1	Easy	-3.94	Set Counting 1
101	30.7	Emerging	2	Easy	-3.98	Matching Simple Shapes 2
169	31.9	Intermediate	3	Easy	-4.07	Camping Trip
20	32.0	Beginning	1	Easy	-4.08	Comparing Quantities 1
98	34.2	Emerging	2	Easy	-4.25	Spatial Relationships 2
107	34.9	Beginning	1	Easy	-4.30	Classification and Data 1
117	39.0	Emerging	2	Easy	-4.61	Classification and Data 2
26	40.3	Beginning	1	Easy	-4.69	First In Line
246	43.1	Beginning	1	Easy	-4.90	Subitizing 1
231	45.7	Beginning	1	Easy	-5.08	Number Sequencing 1
56	50.6	Beginning	1	Easy	-5.42	Direction Words
65	51.8	Beginning	1	Easy	-5.50	Matching Simple Shapes

Note. n = 58,586. ***Bolded and italicized*** games may represent mismatch between intended and empirical difficulty.

Table 15
Difficulty Levels for Games within Literacy

	Game ID	% Passed first attempt	Skill Level		Difficulty Level	Game Difficuly	Game Name
Literacy	361	0.1	Proficient +	8	Difficult	3.83	Comprehension - Non-Fiction 8B
	360	0.1	Proficient +	8	Difficult	3.70	Comprehension - Non-Fiction 8A
	355	0.2	Proficient +	8	Difficult	3.53	Letter-Sound Correspondence 8
	352	0.2	Proficient +	8	Difficult	3.48	Blending 8
	359	0.2	Proficient +	8	Difficult	3.31	Comprehension - Fiction 8C
	320	0.2	Proficient +	7	Difficult	3.29	Letter-Sound Correspondence 7B
	313	0.2	Proficient +	7	Difficult	3.26	Blending 7
	362	0.2	Proficient +	8	Difficult	3.21	Comprehension - Non-Fiction 8C
	321	0.2	Proficient +	7	Difficult	3.17	Decoding 7
	351	0.2	Proficient +	8	Difficult	3.06	Writing Development 7
	315	0.3	Proficient +	7	Difficult	3.05	Alphabet Knowledge 7C
	316	0.3	Proficient +	7	Difficult	3.04	Alphabet Knowledge 7D
	329	0.3	Proficient +	7	Difficult	2.91	High-Frequency Words 7
	317	0.3	Proficient +	7	Difficult	2.89	Alphabet Knowledge 7A
	357	0.3	Proficient +	8	Difficult	2.87	Comprehension - Fiction 8A
	314	0.3	Proficient +	7	Difficult	2.78	Segmenting 7
	358	0.3	Proficient +	8	Difficult	2.73	Comprehension - Fiction 8B
	330	0.3	Proficient +	7	Difficult	2.70	Key Ideas and Details 7A
	331	0.3	Proficient +	7	Difficult	2.67	Key Ideas and Details 7B
	322	0.4	Proficient +	7	Difficult	2.65	Concepts of Print 7
	319	0.4	Proficient +	7	Difficult	2.63	Letter-Sound Correspondence 7A
	402	0.4	Proficient +	7	Difficult	2.61	Writing Development 8
	354	0.4	Proficient +	8	Difficult	2.59	Letter-Sound Correspondence 7C
	312	0.4	Proficient +	7	Difficult	2.58	Comprehension - Fiction 6C
	363	0.4	Proficient +	8	Difficult	2.55	High-Frequency Words 8
	364	0.4	Proficient +	8	Difficult	2.53	Key Ideas and Details 8A
	328	0.4	Proficient +	7	Difficult	2.51	Comprehension - Non-Fiction 7C
	353	0.4	Proficient +	7	Difficult	2.49	Segmenting 8
	326	0.4	Proficient +	7	Difficult	2.39	Comprehension - Non-Fiction 7A
	369	0.4	Proficient +	8	Difficult	2.38	Key Ideas and Details 8C
	356	0.4	Proficient +	8	Difficult	2.37	Decoding 8
	323	0.4	Proficient +	7	Difficult	2.34	Comprehension - Fiction 7A
	318	0.5	Proficient +	7	Difficult	2.29	Alphabet Knowledge 7B
	365	0.5	Proficient +	8	Difficult	2.23	Key Ideas and Details 8B
	204	0.5	Proficient +	6	Difficult	2.15	Blending 6
	256	0.5	Proficient +	6	Difficult	2.15	Key Ideas and Details 6A
	327	0.5	Proficient +	7	Difficult	2.10	Comprehension - Non-Fiction 7B
	294	0.6	Proficient +	6	Difficult	2.00	Alphabet Knowledge 6E Continued Practice
	258	0.6	Proficient +	6	Difficult	1.93	Key Ideas and Details 6C
	324	0.7	Proficient +	7	Difficult	1.78	Comprehension - Fiction 7B
	205	0.7	Proficient +	6	Difficult	1.76	Segmenting 6
	257	0.7	Proficient +	6	Difficult	1.76	Key Ideas and Details 6B
	144	0.8	Proficient +	6	Difficult	1.67	Letter Leaves Continued Practice
	325	0.8	Proficient +	7	Difficult	1.66	Comprehension - Fiction 7C
	285	0.8	Proficient +	6	Difficult	1.62	Letter-Sound Correspondence 6D
	155	0.8	Proficient +	6	Difficult	1.56	Letter Rockets Continued Practice
	335	0.9	Proficient +	7	Difficult	1.46	Key Ideas and Details 7C
	298	0.9	Proficient +	6	Difficult	1.45	High-Frequency Words 6
	85	0.9	Intermediate	3	Difficult	1.43	Print Directionality
	147	0.9	Proficient +	6	Difficult	1.42	Asteroid Letters Continued Practice
	151	0.9	Proficient +	6	Difficult	1.41	Letter Clouds Continued Practice
	297	0.9	Proficient +	6	Difficult	1.38	Comprehension - Fiction 6B
	302	1.1	Proficient +	6	Difficult	1.19	Comprehension - Non-Fiction 6B
	303	1.1	Proficient +	6	Difficult	1.16	Comprehension - Non-Fiction 6C
	140	1.1	Proficient +	6	Difficult	1.14	Letter Rockets
	301	1.1	Proficient +	6	Difficult	1.13	Comprehension - Non-Fiction 6A

Table 15 (continued)
Difficulty Levels for Games within Literacy

Game ID	% Passed first attempt	Skill Level		Difficulty Level	Game Difficuly	Game Name
284	1.1	Proficient +	6	Difficult	1.11	Letter-Sound Correspondence 6C
296	1.2	Proficient +	6	Difficult	1.10	Comprehension - Fiction 6A
242	1.2	Proficient +	6	Difficult	1.08	Alphabet Knowledge 6E
210	1.2	Proficient +	6	Difficult	1.05	Concepts of Print 6
136	1.2	Proficient +	6	Difficult	1.04	Letter Clouds
295	1.2	Proficient +	6	Difficult	1.04	Decoding 6
88	1.2	Proficient	5	Difficult	1.00	Lowercase Space Letters
207	1.3	Proficient +	6	Difficult	0.98	Alliteration 6
128	1.3	Proficient +	6	Difficult	0.89	Letter Leaves
132	1.3	Proficient +	6	Difficult	0.88	Asteroid Letters
300	1.4	Proficient +	6	Difficult	0.87	High-Frequency Words 6 Continued Practice
200	1.5	Proficient +	6	Difficult	0.74	Letter Sounds 5 Continued Practice
188	1.5	Proficient +	6	Difficult	0.72	Letter Sounds 5
173	1.5	Proficient	5	Difficult	0.70	Letters or Words?
80	1.6	Accomplishing	4	Difficult	0.68	Lowercase Letter Jellies 2
241	1.6	Proficient	5	Difficult	0.67	Alphabet Knowledge 5
27	1.6	Proficient	5	Difficult	0.64	Letter Jellies
254	1.6	Proficient	5	Difficult	0.62	Key Ideas and Details 5B
166	1.7	Proficient +	6	Difficult	0.58	Letter Sounds 4
109	1.7	Accomplishing	4	Difficult	0.56	Blending Onsets & Rimes
239	1.9	Proficient +	6	Average	0.42	Writing Development 6 Continued Practice
255	2.0	Proficient	5	Average	0.31	Key Ideas and Details 5C
215	2.1	Proficient +	6	Average	0.22	Writing Development 6
146	2.2	Proficient	5	Average	0.19	Blending Simple Words
122	2.2	Accomplishing	4	Average	0.18	Identifying Book Features
206	2.3	Proficient +	6	Average	0.09	Rhyming 6
180	2.4	Proficient	5	Average	0.06	Key Ideas and Details 5A
245	2.5	Proficient	5	Average	-0.01	Letter-Sound Correspondence 5C
244	2.7	Proficient	5	Average	-0.15	Letter-Sound Correspondence 5B
73	2.7	Accomplishing	4	Average	-0.16	Segmenting Words
103	2.7	Intermediate	3	Average	-0.16	Print Directionality Continued Practice
58	2.8	Proficient	5	Average	-0.18	Letter Sounds 1 Continued Practice
44	3.0	Proficient	5	Average	-0.28	Letter Sounds 1
172	3.0	Proficient	5	Average	-0.30	Teddy Bear Rhyme
49	3.0	Accomplishing	4	Average	-0.32	Uppercase Space Letters 2
52	3.4	Accomplishing	4	Average	-0.50	Lowercase Letter Jellies
115	3.6	***Proficient***	***5***	***Easy***	***-0.60***	Segmenting Simple Words
253	4.1	***Accomplishing***	***4***	***Easy***	***-0.78***	Key Ideas and Details 4C
121	4.2	***Proficient***	***5***	***Easy***	***-0.84***	Sorting Words By Onset
23	4.7	Emerging	2	Easy	-1.00	Magic Hat 2
197	4.7	***Proficient***	***5***	***Easy***	***-1.01***	Writing Development 5 Continued Practice
163	4.7	***Accomplishing***	***4***	***Easy***	***-1.03***	Words That Don't Rhyme
102	5.0	***Accomplishing***	***4***	***Easy***	***-1.10***	Isolating Onsets
75	5.0	Emerging	2	Easy	-1.12	Print Versus Pictures
185	5.2	***Proficient***	***5***	***Easy***	***-1.18***	Writing Development 5
171	6.0	***Accomplishing***	***4***	***Easy***	***-1.43***	Key Ideas and Details 4B
39	6.7	Intermediate	3	Easy	-1.62	Magic Hat 3
165	7.4	***Accomplishing***	***4***	***Easy***	***-1.79***	Key Ideas and Details 4A
252	7.7	Intermediate	3	Easy	-1.85	Key Ideas and Details 3C
87	7.9	***Accomplishing***	***4***	***Easy***	***-1.90***	Letter Sounds 3
33	8.2	Intermediate	3	Easy	-1.96	Segmenting Compound Words 2
156	8.4	***Proficient***	***2***	***Easy***	***-2.02***	Print Versus Pictures Continued Practice
46	9.3	Intermediate	3	Easy	-2.21	Uppercase Space Letters 1
83	9.5	***Accomplishing***	***4***	***Easy***	***-2.24***	Letter Sounds 2
82	9.7	Emerging	2	Easy	-2.28	Combining Two Words
251	10.2	Intermediate	3	Easy	-2.37	Key Ideas and Details 3B
203	10.9	***Accomplishing***	***4***	***Easy***	***-2.51***	Writing Development 4 Continued Practice
149	11.0	Intermediate	3	Easy	-2.53	Matching Rhyming Words

Table 15 (continued)
Difficulty Levels for Games within Literacy

Game ID	% Passed first attempt	Skill Level		Difficulty Level	Game Difficuly	Game Name
106	11.1	Intermediate	3	Easy	-2.54	Combining Syllables
13	11.8	Emerging	2	Easy	-2.66	Segmenting Compound Words
8	13.9	Beginning	1	Easy	-3.00	Segmenting Sentences
91	15.0	Emerging	2	Easy	-3.17	Do These Words Rhyme?
59	16.0	Beginning	1	Easy	-3.30	Completing Compound Words
152	16.1	Intermediate	3	Easy	-3.32	Key Ideas and Details 3A
142	16.8	***Accomplishing***	***4***	***Easy***	***-3.41***	Writing Development 4
125	19.3	Intermediate	3	Easy	-3.73	Writing Development 3
116	26.3	Emerging	2	Easy	-4.52	Writing Development 2
70	29.1	Beginning	1	Easy	-4.79	Book Orientation
250	33.9	Emerging	2	Easy	-5.25	Key Ideas and Details 2C
240	35.3	Emerging	2	Easy	-5.38	Alphabet Knowledge 2
189	43.1	Emerging	2	Easy	-6.07	Key Ideas and Details 2B
19	58.0	Beginning	1	Easy	-7.37	Magic Hat 1
89	61.9	Emerging	2	Easy	-7.74	Key Ideas and Details 2A
92	63.9	Beginning	1	Easy	-7.93	Writing Development 1
249	67.9	Beginning	1	Easy	-8.32	Key Ideas and Details 1C
11	68.2	Beginning	1	Easy	-8.35	Rhyming
248	87.8	Beginning	1	Easy	-10.64	Key Ideas and Details 1B
71	92.2	Beginning	1	Easy	-11.39	Key Ideas and Details 1A

Note. n = 62,252. ***Bolded and italicized*** games may represent mismatch between intended and empirical difficulty.

Table 16
Number of Levels Reached by Usage Group: 3-, 4-, and 5-year-olds

Domain	Usage Group	*n*	Mean	*SD*
Social Studies	Low	33419	1.24	0.487
	Med	14413	2.59	0.900
	High	6039	4.17	0.993
Science & Technology	Low	26146	1.16	0.474
	Med	14399	2.52	1.129
	High	6035	4.26	0.959
Social and Emotional Learning	Low	25164	1.22	0.530
	Med	14434	2.57	1.201
	High	6039	4.63	1.474
Language & Communication Development	Low	32322	1.47	0.597
	Med	14418	2.73	1.053
	High	6039	4.69	1.463
Physical Development	Low	28880	1.18	0.471
	Med	14387	2.56	1.105
	High	6036	4.29	0.966
Mathematics	Low	27152	1.85	0.773
	Med	14439	3.46	1.003
	High	6039	4.96	1.261
Literacy	Low	33827	1.48	0.598
	Med	14444	2.84	1.132
	High	6040	4.78	1.381

Table 17
Number of Levels Reached by Usage Group: 3-year-olds

	Usage Group	*n*	Mean	*SD*
Social Studies	Low	11774	1.15	0.398
	Med	3315	2.16	0.735
	High	808	3.44	1.058
Science & Technology	Low	8445	1.09	0.370
	Med	3305	1.94	0.962
	High	807	3.51	1.148
Social and Emotional Learning	Low	8159	1.13	0.414
	Med	3314	1.98	0.927
	High	807	3.57	1.372
Language & Communication Development	Low	11164	1.36	0.539
	Med	3308	2.31	0.717
	High	808	3.63	1.325
Physical Development	Low	9657	1.11	0.375
	Med	3299	1.98	0.932
	High	807	3.51	1.165
Mathematics	Low	8842	1.67	0.700
	Med	3317	2.91	0.894
	High	808	4.04	1.066
Literacy	Low	11974	1.37	0.542
	Med	3321	2.36	0.805
	High	808	3.80	1.301

Table 18
Number of Levels Reached by Usage Group: 4-year-olds

	Usage Group	*n*	Mean	*SD*
Social Studies	Low	20965	1.28	0.514
	Med	10787	2.69	0.884
	High	5192	4.28	0.934
Science & Technology	Low	17204	1.18	0.499
	Med	10783	2.66	1.100
	High	5189	4.37	0.871
Social and Emotional Learning	Low	16494	1.26	0.559
	Med	10810	2.71	1.186
	High	5193	4.79	1.415
Language & Communication Development	Low	20489	1.53	0.613
	Med	10799	2.82	1.069
	High	5192	4.85	1.409
Physical Development	Low	18665	1.21	0.496
	Med	10777	2.70	1.077
	High	5190	4.41	0.873
Mathematics	Low	17730	1.93	0.779
	Med	10812	3.59	0.950
	High	5192	5.09	1.225
Literacy	Low	21124	1.53	0.612
	Med	10812	2.94	1.146
	High	5193	4.92	1.325

Table 19
Number of Levels Reached by Usage Group: 5-year-olds

	Usage Group	*n*	Mean	*SD*
Social Studies	Low	680	1.56	0.690
	Med	311	3.66	1.086
	High	39	4.69	0.655
Science & Technology	Low	497	1.59	0.765
	Med	311	3.79	1.127
	High	39	4.77	0.583
Social and Emotional Learning	Low	511	1.65	0.772
	Med	310	4.07	1.506
	High	39	5.87	1.641
Language & Communication Development	Low	669	1.70	0.727
	Med	311	4.09	1.513
	High	39	5.92	1.562
Physical Development	Low	558	1.56	0.728
	Med	311	3.81	1.150
	High	39	4.79	0.570
Mathematics	Low	580	2.38	1.003
	Med	310	4.63	1.302
	High	39	6.00	1.433
Literacy	Low	729	1.71	0.765
	Med	311	4.25	1.447
	High	39	5.95	1.521

Table 20
Highest Levels Achieved by Usage Groups and Age Levels

Domain	Max Level Achieved	3-year-olds	4-year-olds	5-year-olds
Social Studies	Below 3	89.2	70.0	73.4
	3	7.6	15.4	13.8
	4 or Above	3.2	14.7	12.7
Science & Technology	Below 3	87.8	68.2	70.2
	3	5.9	10.4	10.6
	4 or Above	6.4	21.3	19.2
Social and Emotional Learning	Below 3	89.2	69.8	71.8
	3	4.1	7.3	7.9
	4 or Above	6.8	22.9	20.3
Language & Communication Development	Below 3	88.9	69.8	73.3
	3	6.5	12.3	11.2
	4 or Above	4.6	17.8	15.5
Physical Development	Below 3	89.0	69.8	71.9
	3	5.3	9.7	9.9
	4 or Above	5.7	20.4	18.2
Mathematics	Below 3	68.1	44.6	46.6
	3	20.1	23.6	24.1
	4 or Above	11.8	31.7	29.3
Literacy	Below 3	89.8	70.7	74.5
	3	3.5	6.6	5.9
	4 or Above	6.7	22.6	19.6

Table 21
Highest Levels Achieved by High Users Across Age Groups

Domain	Max Level Achieved	3-year-olds	4-year-olds	5-year-olds
Social Studies	Below 3	19.2	3.8	0.0
	3	42.1	21.7	10.3
	4 or Above	38.7	74.5	89.8
Science & Technology	Below 3	23.6	4.9	2.6
	3	21.9	9.8	0.0
	4 or Above	54.4	85.4	97.5
Social and Emotional Learning	Below 3	27.7	6.4	2.6
	3	16.2	6.5	2.6
	4 or Above	56.0	87.2	94.8
Language & Communication Development	Below 3	23.1	4.5	0.0
	3	29.7	13.8	7.7
	4 or Above	47.1	81.6	92.4
Physical Development	Below 3	24.6	5.2	2.6
	3	21.9	9.0	0.0
	4 or Above	53.5	85.8	97.4
Mathematics	Below 3	3.3	0.4	0.0
	3	27.2	6.8	2.6
	4 or Above	69.5	92.8	97.5
Literacy	Below 3	22.3	4.5	2.6
	3	13.0	4.8	0.0
	4 or Above	64.7	90.8	97.4

Table 22
Highest Levels Achieved by Race/Ethnicity Across Age Groups

Domain	Race/Ethnicity	3-year-olds Mean	3-year-olds *SD*	3-year-olds *n*	4-year-olds Mean	4-year-olds *SD*	4-year-olds *n*	5-year-olds Mean	5-year-olds *SD*	5-year-olds *n*
Social Studies	White (non-Hispanic)	1.49	0.83	4843	2.24	1.33	11990	2.08	1.32	192
	Black (non-Hispanic)	1.51	0.83	5649	2.09	1.24	12524	1.88	1.05	174
	Hispanic	1.49	0.82	209	2.16	1.34	9303	2.85	1.58	333
Science & Technology	White (non-Hispanic)	1.48	0.94	3920	2.29	1.46	11067	2.17	1.46	172
	Black (non-Hispanic)	1.48	0.92	4529	2.12	1.37	11181	1.92	1.18	153
	Hispanic	1.46	0.92	3140	2.19	1.45	8431	3.07	1.63	286
Social and Emotional Learning	White (non-Hispanic)	1.53	0.99	3843	2.43	1.62	10821	2.30	1.56	168
	Black (non-Hispanic)	1.52	0.95	4470	2.24	1.53	11054	2.01	1.39	155
	Hispanic	1.54	0.97	3080	2.40	1.75	8267	3.45	2.08	289
Language & Communication Development	White (non-Hispanic)	1.71	0.91	4663	2.53	1.51	11857	2.32	1.46	184
	Black (non-Hispanic)	1.71	0.88	5454	2.33	1.41	12358	2.07	1.31	178
	Hispanic	1.70	0.88	3824	2.47	1.61	9233	3.26	2.06	332
Physical Development	White (non-Hispanic)	1.47	0.91	4221	2.28	1.45	11391	2.15	1.45	180
	Black (non-Hispanic)	1.47	0.89	4958	2.11	1.36	11742	1.88	1.19	160
	Hispanic	1.46	0.88	3447	2.19	1.44	8781	2.97	1.64	310
Mathematics	White (non-Hispanic)	2.19	1.09	4092	3.10	1.50	11264	2.93	1.54	174
	Black (non-Hispanic)	2.15	1.06	4634	2.89	1.44	11355	2.70	1.40	165
	Hispanic	2.12	1.07	3251	2.99	1.60	8540	3.88	1.90	307
Literacy	White (non-Hispanic)	1.72	0.93	4951	2.56	1.53	12078	2.35	1.48	199
	Black (non-Hispanic)	1.73	0.91	5702	2.38	1.45	12564	2.12	1.35	191
	Hispanic	1.72	0.93	4022	2.50	1.63	9335	3.27	2.06	342

Table 23

Highest Levels Achieved by Race/Ethnicity Across Age Groups

Domain	Race/Ethnicity	3-year-olds		4-year-olds		5-year-olds	
		3 or below	4 or above	3 or below	4 or above	3 or below	4 or above
Social Studies	White (non-Hispanic)	96.9%	3.1%	82.6%	17.4%	84.9%	15.1%
	Black (non-Hispanic)	96.8%	3.2%	86.7%	13.3%	93.1%	6.9%
	Hispanic	97.1%	2.9%	84.1%	15.9%	63.7%	36.3%
Science & Technology	White (non-Hispanic)	93.6%	6.4%	75.3%	24.7%	77.3%	22.7%
	Black (non-Hispanic)	93.8%	6.2%	80.1%	19.9%	87.6%	12.4%
	Hispanic	94.2%	5.8%	77.6%	22.4%	53.1%	46.9%
Social and Emotional Learning	White (non-Hispanic)	92.8%	7.2%	73.4%	26.6%	75.6%	24.4%
	Black (non-Hispanic)	93.6%	6.4%	78.8%	21.2%	86.5%	13.5%
	Hispanic	93.6%	6.3%	75.5%	24.5%	51.9%	48.1%
Language & Communication Development	White (non-Hispanic)	95.3%	4.7%	78.8%	21.2%	81.0%	19.0%
	Black (non-Hispanic)	95.5%	4.5%	83.7%	16.3%	90.4%	9.6%
	Hispanic	96.0%	4.0%	81.0%	19.0%	61.4%	38.6%
Physical Development	White (non-Hispanic)	94.3%	5.7%	76.1%	23.9%	78.3%	21.7%
	Black (non-Hispanic)	94.3%	5.7%	81.0%	19.0%	87.5%	12.5%
	Hispanic	95.0%	5.0%	78.3%	21.7%	57.1%	42.9%
Mathematics	White (non-Hispanic)	87.5%	12.5%	63.5%	36.5%	66.1%	33.9%
	Black (non-Hispanic)	89.1%	10.9%	69.3%	30.7%	77.0%	23.0%
	Hispanic	89.6%	10.4%	68.7%	31.3%	48.2%	51.8%
Literacy	White (non-Hispanic)	93.3%	6.7%	73.5%	26.5%	75.4%	24.6%
	Black (non-Hispanic)	93.5%	6.5%	78.6%	21.4%	84.3%	15.7%
	Hispanic	93.6%	6.4%	76.1%	23.9%	56.1%	43.9%

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