

The Cognitive Effect Lego Has on Children

By Josh Schuessler

As a young boy, I played with Legos. Even today, I still build with Legos; in fact, two weeks ago my roommate and I constructed a set with just under 3,000 pieces. It was a toy that all my friends, brothers, sister, parents, and even my grandparents would put together and play with. It was always great to see both boys and girls and young and elderly people build with the same bricks as me, sharing the same smiles and sparks of joy when one Lego brick connects to another. Counting out the pieces and studs and figuring out similar colors or piece shapes was always something that inspired debate and deep thought with whomever I built with. When the set was complete, I also felt a feeling of pride and togetherness that was unmatched to any other activity I partook in at that age. However, some individuals show understandable concern about the potential there is for Lego to indirectly teach irresponsible behavior. Despite this, through childhood memories and much research into the topic, it is my belief that Legos are the best toy for children's cognitive development.

History

Lego bricks were first invented in 1932 by a carpenter named Ole Kirk Christiansen. What started out as building roofs turned into wooden ducks, then into early versions of the Lego brick of today. He lived and worked in the small and quiet town of Billund, Denmark. However, upon the creation of the Lego (which translates to "play well") company, there were speedbumps. The Great Depression and the German occupation in World War II proved to be challenging times for the 6,000 people living in Billund. However, Christiansen's diligence and kind heart kept his toy business alive and the community afloat (Baichtal, 2011, p. 5-10).

Stereotypes

Lego bricks are a timeless staple piece in the world of toys. With this timelessness, however, comes controversy. There is debate over whether Lego has potential to indirectly teach gender stereotypes. Research has been done by Dr. Stephanie Reich, Dr. Rebecca Black, and Dr. Tammie Foliaki to determine what may make a Lego set do this. These individuals all have degrees in relevant fields, such as Psychology or Gender Studies. One practice examined was color. For example, pink and brighter colors were selected more by girls and blue and duller colors were selected more by boys (Reich, 2017). This can be translated to Lego Friends, marketed and created with bright colors, and Lego City sets that are marketed and created with dull colors. Lego Friends also have a higher frequency of settings in malls or bakeries, whereas Lego City sets have a higher frequency of settings in police stations or general motor vehicles (2017).

Lego Friends sets include more doll-like minifigures and include themes such as sharing, learning something new, or caring for or nurturing something or someone. A prime example is set number 41683, Forest Horseback Riding Center (Official, 2022). This set includes a girl learning how to ride a horse, as well as another girl feeding another horse. Lego City, on the other hand, has regular minifigures and includes themes such as peril or adventure. One popular example is set 60314, Ice Cream Truck Police Chase (2022). Both Lego set themes have personal themes that have been attributed to society's perception of feminine traits in Lego Friends and masculine traits in Lego City (2017). In addition to these findings, it was found that males are more likely to buy sets like Lego City or Ninjago, and females are more likely to buy Friends and Disney Princess sets. Despite this, the research is inconclusive as to who plays with the set after purchase, whether online or in-store. Additionally, it is inconclusive as to whether or

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not children make decisions or treat others differently because of learned behavior that comes from the play and learning found in a particular Lego set (Reich, 2017).

In addition to gender, however, there is also concern that Lego may reinforce racial stereotypes and profiling. Lego minifigures were created with yellow, smiling faces that one could perceive to be any race. However, this was stopped in 2003 when Lego introduced the now discontinued Basketball series. These characters featured black skin and noses, features never seen on any prior Lego set. Other new prints occurred such as slanted eyes for the Ninjas theme and war paint on Native Americans in the Wild West theme. These new printing capabilities left debate amongst many parents and fans of Lego. Some claimed that these new faces were offensive, while many others said that it represented themselves or their people (Baichtal, 2011, p. 59) Similarly to gender stereotyping, however, there is no conclusive evidence that children learn or apply stereotypes into play or other real-world situations. For example, children do not perceive that only a basketball player can be black (Lego Basketball) or only a female can be royalty (Disney Princess).

However, despite these accusations and occurrences, Lego has stated that it includes diversity and equality in both the workplace and their set representation (Official, 2022). Lego has still taken steps to appease those with concerns by discontinuing minifigures or sets that are perceived as stereotypical by many people. An example of this is when Lego temporarily stopped marketing Lego police sets after the death of George Floyd. In the world of political correctness and appealing to all audiences, there is “no winning” (Baichtal, 2011, p. 59). Lego has taken steps to ensure that children do not learn sexist or racist stereotypes or behaviors and it is ultimately left to the perceptions of parents to determine whether they should allow their child(ren) to play with a Lego set.

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In a one-question, personal survey sent to friends and parents, there were interesting results. The sample size is small, and there must be more participants for future research; but despite this, the survey yielded interesting results. The question was, “Does Lego reinforce gender or racial stereotypes?” Amongst twenty-three peers, six (26%) said that Lego does reinforce these stereotypes in their toys. One such peer is Cody Starks, a college student at Fredonia, who states the following:

I believe that Lego has done a much better job in recent years trying to remove stereotypes for both gender and race, but there’s still work to be done obviously to make it as inclusive as possible. But the fact that they are making strides is a good sign.

Mr. Starks understands that Lego does their best to be inclusive but acknowledges that there is always room for improvement and that the creators of each Lego set work their hardest to be not only bold and creative, but considerate of race and gender. The parent group had similar answers, with only one out of nine (11%) saying that Lego did instill stereotyping in children. One parent who said they did not, who wished to be unnamed, states:

With the changes going on in the world, you have to always be on your toes, but nobody is perfect. And I am sure that there are Lego people (minifigures) or sets that are a little messed up, but Lego hires the best to try their best. Whatever stereotypes there might be, they are definitely accidental, and most kids understand that they can still be whoever they want to try and be when they grow up.

Education

Many parents throughout the world purchase Lego products, and educators have followed suit. Time and time again, playing and learning have gone hand in hand, and Lego bricks are no

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exception. Several pieces of research have been done to show that learning with Lego leads to better understanding of mathematical concepts.

One such research is that conducted by Mina Ahmadi, Saeideh Akbari, Mahya Rahimzadeh and Dr. Yalda Delgoshaei. All these individuals have degrees in relevant educational fields, such as Educational Science or Psychology, and work in these departments at Islamic Azad University. They are all from Tehran, Iran and conducted research and observed first grade students, thirty females and thirty males, in the country. The study took half of the children from each group and taught using Lego bricks, whereas the other half of the children learned using traditional methods (Ahmadi, p. 3, 2021).

The findings showed that students who were taught several topics such as symmetrical shape or numerical and geometric patterns, with Lego-based curriculum did better than those who did not. However, not every Lego-based curriculum topic did better; showed no correlation or even where non-Lego-based curriculum scored better. The main difference between the two groups was that Lego bricks and workbooks allowed the students to reach the correct answer in more ways than one (Ahmadi, pp. 3-6, 2021). The test results were also validated by four experts in mathematics curriculum courses and two psychologists specialized in child psychology for evaluation (p. 3).

In addition to workbooks or the bricks themselves, Lego can also be used to teach mathematics through video. Fractions and PEMDAS can be taught through video, either through YouTube or programs from the Lego company itself. Topics such as Lent or economics can also be learned through Lego's presence in video (The Plastic Architect, 2021). However, it is also likely to become more confused about a concept if the topic of Lego is brought up by any means. It is important to note that there is no set correct way to teach a child a topic because every child

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learns a topic differently. Gardner's theory of multiple intelligences states that intelligence falls into several categories and students may have an easier or more challenging time grasping a particular concept depending on the method it is taught.

Science, technology, engineering, and mathematics (hereinafter STEM) are other subjects that Lego can be applied to in education. Many schools across America, including Dr. Laurence Schuessler's classes at the local Floyd C. Fretz Middle School in Bradford, Pennsylvania, have employed the use of Lego products in lessons. One Lego product used in his classroom is the Lego Mindstorm EV3 robot, which has been used in several research studies like the one mentioned previously.

Research conducted by Dr. Lukas C. Gerber, Agnes Calasanz-Kaiser, Dr. Luke Hyman, Dr. Kateryna Voitiuk, Dr. Uday Patil, and Dr. Ingmar H. Riedel-Kruse sought out to show the impact Lego has on STEM education, particularly engineering and computer programming. All of these individuals either have degrees or are college students with backgrounds in education, biology, and/or software design. Their research involves eight elementary level and nine middle school level students that worked in groups to practice various exercises surrounding water dilutions and sterilization. Each group consisted of eight or nine students that worked in pairs to program their Lego robot to perform the tasks of building the robot and then programming its motors to grasp vials and perform dilutions. After the researchers observed these activities, they distributed quizzes to the students asking about what they had done and how they felt about it. These activities were conducted with a high success rate at both education levels, and it was found that the students enjoyed doing the tasks as well (Gerber, 2017).

Although the Lego Mindstorm EV3 robot was used above for wet science experiments, it can be programmed to perform several other tasks. These include color and/or light detection,

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pushing objects, self-balance, and vending items (Baichtal, 2011, pp. 237-244). Additionally, Lego has produced lesser-known robots for students to learn with such as the Cybermaster or Scout (p. 242). All these robots were created either by or with Lego products and possibilities are endless as to what tasks they can be programmed to complete.

Socialization

Another positive effect Lego has on children is its ability to improve their socialization skills. By playing with Lego bricks in the classroom, children are drawn together to converse and practice sharing with each other. Lego brings children together and increases social interactions. The children also use their imagination and play out scenarios, such as grabbing food or saving the day (The Lego Group, 2021). These acts of play also improve the children's ability to read facial expressions, recognize emotion, and even become better speakers. In fact, speech therapists have used Lego to help children learn sounds (The Plastic Architect, 2021).

Although Lego improves socialization skills in all children, it is especially true about those with autism. Dr. Gina Gomez de la Cuesta, Michelle Ndebele, and Ula Bieganska are all educational professionals that work either for or with Lego. They discuss how Lego presents the opportunity to work with or without other people, and how those with autism may feel anxious around others. Additionally, they discuss the Lego Foundation and, more specifically, the Brick-by-Brick program. This foundation helps children and adults with autism de-stress through LEGO and instills a sense of fellowship and pride in them (The Lego Group, 2021).

Lego bricks, through this program or not, help children with autism cope and get along with other people. Instead of forcing them into an unwanted situation, Lego can act as a motivator for a child with autism to partake in dialogue and play with other children (Baichtal, 2011, p. 273). In fact, fourteen of fifteen studies observed by Sally Lindsay, Kara Grace

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Hounsell, and Celia Cassiani, showed that children with autism improved in at least one area of communication and social skills. The studies consisted of 293 individuals with autism, aged five to sixteen and included friendship building, social interactions, or reductions in playing alone (Lindsay, 2016) By involving a structured exercise (building and reading instructions) with other people with common interests, children with many conditions can more easily overcome concerns they may have. In addition to autism, this can be applied to children and adults with ADHD, anxiety, or even PTSD (The Lego Group, 2021).

Furthermore, an additional skill that building and playing with Lego improves is a child's spatial awareness. Spatial awareness is knowing where your body (or hands) are in relation to other people or objects. Children that build with Lego bricks are better able to tell how much farther or closer things are from themselves. This is important in many aspects of everyday life; whether it is walking to and opening a door or operating pieces of heavy machinery (The Plastic Architect, 2021).

Additional Benefits

Children with autism, ADHD, or PTSD are not the only individuals whose lives are improved by Lego. There are Lego bricks specifically designed to teach the visually impaired Braille (The Plastic Architect, 2021). Braille is printed on Lego bricks so that students can feel and learn Braille, which is very similar to that of the speech therapy mentioned previously. The students quite literally construct sentences, as well. Additionally, many engineers prototype prosthetics after Lego pieces. The Open Prosthetics Project is an organization that produces and provides technology to amputees to improve their quality of life. A volunteer named John Bergman designed a fully functional hand made entirely of Lego; however, the proper

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myoelectric (which is the electric energy in muscle and nerves) needed to operate it is expensive (Baichtal, 2011, p. 285).

The technology surrounding the production of this strong plastic has improved since its creation in 1932. However, in exchange for improved quality and production speed, there is potential for negative environmental impacts. Lego bricks are made from acrylonitrile butadiene styrene (ABS) plastic and are very durable (Totp, 2022). However, the durability of Lego bricks in turn have difficulty biodegrading in nature. To counter their environmental impact, Lego has taken multiple steps to reduce its carbon footprint and pollution. They have been experimenting with recycled plastic to use in new Lego bricks. In addition to this, Lego has switched from plastic to paper bags in their stores and switching to LED lights and solar panels in their factories and offices (2022).

Conclusion

Overall, Lego is beneficial to children in more ways than one. They help students learn a variety of topics, whether it be mathematics, communication, hand-eye coordination, and similar subjects. Additionally, Lego has made leaps and bounds in being inclusive of others in their Lego sets; as well as in the world of political correctness and environmental activism. Mentioned previously, Lego translates to “play well” and their toys allow children to play better than just “well”. They help bring children from all walks of life together and help stimulate learning and creativity.

References

- Ahmadi, M. (2021). Effect of LEGO-based curriculum on better understanding of mathematical concepts among first-grade students. *Turkish Journal of Computer and Mathematics Education*, 12(13), 1–7. <https://turcomat.org/index.php/turkbilmat/article/view/9652/7361>
- Baichtal, J. & Meno, J. (2011). *The cult of LEGO* (1st edition). No Starch Press.
- Gerber, L.C., Calasanz-Kaiser, A., Hyman, L., Voitiuk, K., Patil, U., & Riedel-Kruse, I.H. (2017). Liquid-handling Lego robots and experiments for STEM education and research. *PLOS Biology*. 15(3): 1-9. <https://doi.org/10.1371/journal.pbio.2001413>
- Lindsay, S., Hounsell, K. G., & Cassiani, C. (2016, November 10). *A scoping review of the role of Lego® therapy for improving inclusion and social skills among children and youth with autism*. Disability and Health Journal. Retrieved August 5, 2022, from <https://www.sciencedirect.com/science/article/abs/pii/S1936657416301728>
- Official Lego Shop US. Home. (n.d.). Retrieved July 21, 2022, from <https://www.lego.com/en-us>
- The Lego Group. (2021). *Our Lego® stories episode 5 - Build vital skills with Lego bricks*. [Video]. YouTube. Retrieved July 17, 2022, from <https://www.youtube.com/watch?v=UwhECvhXkV4>.
- The Plastic Architect. (2021). *Why lego is good for your brain - Childcare development | The Plastic Architect*. [Video]. YouTube. Retrieved July 17, 2022, from https://www.youtube.com/watch?v=m_Ao2Tsmoj8.
- Totp. (2022, May 14). *Is Lego bad for the environment? Think of the Pandas*. Retrieved July 28, 2022, from <https://thinkofthepandas.com/2021/09/30/is-lego-bad-for-the-environment/>

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Reich, S. M., Black, R. W., & Foliaki, T. (2017). Constructing difference: Lego® set narratives promote stereotypic gender roles and play. *Sex Roles*, 79(5-6), 285–298.

<https://doi.org/10.1007/s11199-017-0868-2>