

The Young Engineers Project

One Library's Collaboration to Foster Fun and Literacy

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It started with a phone call from Jovette Hiltunen, director of Teaching and Learning at the Lake County Educational Service Center in Painesville, Ohio, in the fall of 2012, and, unfortunately, it appears to have ended when the money ran out from the grant in the summer of 2014. However, it was an amazing experience, and the kids we worked with touched our hearts. We are so proud of our young engineers.

The Grant Call

Hiltunen called the library after she had been referred to us by Angela Smith, the assistant superintendent of Madison (Ohio) Local Schools, the district in which our library is located. They were working on applying for grant funds disbursed by the Ohio Department of Education. These came from money allocated by the state legislature to be given to school districts doing creative things to help students in danger of not passing the Third Grade Reading Guarantee. Preference would be given to applications that had schools partnering with community entities to help these at-risk students. The public library seemed like a good potential partner.



Young Engineer Campbell works on a WeDo construction at the Cleveland Botanical Gardens.

Hiltunen and Shawn Walsh, the emerging services and technologies librarian, but also the face of the library with the schools, talked about various possibilities. The school wanted to concentrate on helping the students gain proficiency and competency with informational texts. Eventually the two arrived at using LEGOs and STEM concepts to support the students' work with these informational texts. The library's part of the grant would focus on LEGOs.

As a result of this first phone call, Walsh and two other members of the staff at Madison Public Library began their own self-guided crash course in contemporary educational jargon before things went any further. Thank goodness for the Ohio Department of Education website.

For Library Director Nancy Currie to sign off on this potential partnership, Walsh had to clarify what the library was doing as part of the grant and why they were doing it. Things needed to be very clearly spelled out. Enter Head of Public Services Melanie Lyttle, who very quickly reacquainted herself with where education had gone since she got her bachelor's degree in elementary education almost fifteen years earlier. And as it



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turned out, she would play a sizable support role in the grant program.

Before going too much further, it's important to know the critical terms and ideas that shaped this whole grant process.

Third Grade Reading Guarantee

This is a component of the new education standards the state of Ohio included when they adopted the Common Core State Standards. It puts an emphasis on the ability to read in the early grades and favors rigorous intervention at that time if it appears a child is not reading on grade level. At the end of third grade, if a child is not reading at grade level as determined through standardized testing, he or she can be retained in third grade until the test is passed.

Staying in third grade another year comes with a battery of reading-based requirements and activities designed to get the child where he or she should be academically. Not all states have adopted this as part of Common Core, but Ohio did. This was going to be very important in the 2013-2014 school year when the Third Grade Reading Guarantee would be enforced for the first time.

Informational Text

These are generally non-fiction texts, except when they are not. In extremely broad terms, it is non-fiction minus folktales, fairy tales, and a bunch of the things in the 800s of the Dewey Decimal System. But for the purposes of this article and how it was dealt with in the grant, informational texts were things that talked about STEM (Science, Technology, Engineering, and Math).

Pre-Literacy Skills

Skills that are present in the Every Child Ready to Read program come back to “haunt” children who are reading below grade level. Without pre-literacy skills solidly in place, it is hard for children to read on their own.

The Grant Is Approved

With research done and many planning meetings completed, the Madison Local School District, in partnership with Lake County Educational Service Center and Madison Public Library, received a grant from the Ohio Department of Education for approximately \$100,000, of which about \$25,000 was for the materials and staff associated with the program and the library. Several components to the grant included teacher in-service and new materials for classroom teachers. The parts that concerned the library were the tutoring that children would receive

at the school, transportation from the schools to the library, and LEGO-based activities at the library.

The library pushed LEGOs as a concrete way to reinforce STEM readings for several reasons. LEGOs were extremely popular in the area, and the library already had a successful LEGO Club. This group, conceived of and run by middle school student Wyatt Vernyi, had children ages five and up bringing their LEGO creations to the library once a month to meet with other enthusiasts to play with and discuss their creations.

The library also had a history of unsuccessful “educational programs,” so LEGOs fit the criteria of something that could be educational but appeared to be simply play and fun. The library also had carved its niche in the community as a place for messy, hands-on experiences for children, so LEGOs fit with that image.

The grant paid for the purchase of two different types of LEGOs to be used in the program. There were LEGO Simple Machines and WeDo Construction sets, enough for all the children to work in pairs. It also paid for the staff time of Walsh, Lyttle, and Courtney Davisson, a library page and freshman education major at a local college, to run this program two days a week for an hour each day.

Originally Lyttle and public services assistant Kylie Coy each served as the program helper one day a week while Walsh and Davisson worked the two days. Halfway through the program, staffing schedules were switched. Lyttle took on a second LEGO day and Coy shifted her focus to working with middle school students after school.

This grant from the state offered a unique opportunity to close to seventy-five first, second, and third grade children who were identified in the two area schools as in danger of failing the Third Grade Reading Guarantee. Once a week after the school day ended, they stayed at school for a snack and approximately forty-five minutes of intensive group tutoring from current teachers in the district. They used texts during these sessions that included words that were used later at the library.

Walsh and Lyttle created a vocabulary list of STEM terms that the children would be exposed to while working on their LEGO projects. The idea was to use the “correct” words during their construction time, not simpler synonyms. After tutoring, the students were bussed from the school to the public library where they would work for about forty-five minutes constructing different machines with LEGOs. Then they were bussed from the library to their homes. One elementary school came on Mondays. Another school came on Tuesdays.

On LEGO Days

Walsh, Lyttle, and Davisson met the bus at the library and lead a long single-file line through the library to the program room where the LEGOs were. Coats, book bags, and assorted sundries

were deposited in the same place every week, and each child was to sit facing his or her assigned partner.

This was always an adventure because absenteeism seemed constant. We don't think we had a week the whole year where everyone in the group was there. Partners could be temporary if permanent partners were absent. Once everyone was partnered, seated, and quiet, which sometimes seemed to take an extraordinary amount of time, directions for the afternoon were given and work commenced.

Each group had a teacher or teachers from their respective elementary school at the library during the LEGO program. We really enjoyed getting to work with Cynthia Paparizos and Vickie Smith of North Elementary School and Dianna Misich of South Elementary School. These teachers were there every week with their respective school's students, handling discipline, sickness, bathroom visits, parent pick-up confusion, bus drama, and any number of other things, which allowed us to concentrate solely on the children and their projects. They also circulated through the room as we did, helping partners when they got stuck working on their constructions.

The first thing we did with the students on their first day was a LEGO partner exercise. One person had a small construction built of five or six bricks. The other student had to recreate that construction without seeing it. Asking questions, using descriptive words, and cooperating were all part of that first day. This laid the foundation for what the students would be doing for the rest of the year.

The first few months, the students used the Simple Machine kits. These DUPLO-sized blocks came with perspective drawing diagrams to help the students properly create their construction. First, the students needed to get out all the pieces they would need for their construction. When that was approved by an adult, they could begin building.

After they were done building, they took it to Walsh for approval. If it was identical to the diagram, the students were done (sort of). If they were the first pair done, that was exciting. The entire room was halted while the pair stood before their classmates and were congratulated for their speed and accuracy. Then the pair took a bow. Once that was done, they were allowed to roam the room finding other pairs of students they could help. But their hands had to be in their pockets or behind their backs. They could only help with their words, not their hands.

The last half of the school year the students used the WeDo Construction kits. These kits used LEGOs and had detailed step-by-step exploded diagrams. Student pairs worked on their own advancing through the at least twenty-five steps necessary to create the constructions. Then these constructions were brought to Walsh.

However, WeDo sets are basic robotics sets. So not only did all the LEGO pieces have to be correctly placed, but when hooked to the computer, it had to operate correctly. As with the DUPLO projects, the first group to correctly complete their construction got to bow in front of the rest of the group. However, they did not then immediately start helping other groups with their words. Instead they were given some type of additional task to reconfigure their construction in some way to get it to operate differently when hooked up to the computer. It usually took at least two, sometimes three, sessions for the entire group to finish their initial constructions and have them operate correctly. But, they were so proud when everything worked!



Young Engineers Timothy and Samuel pose with some of the LEGO constructions they brought to the library's display at the Cleveland Botanical Gardens.

What We Observed

Over the seven months that we worked with these students, we saw a lot of growth. We also saw a lot of triumphs and meltdowns as well. It was amazing to watch "our kids" grow.

It was a mystery to us for a long time what the proper educational term was for what we knew the LEGOs were doing to help the students. We knew it was helping, but what was the word? It was pre-reading skills. Many of these students had challenges in sequencing

as well as discerning minor differences in the diagrams and the blocks. In broad terms, these related back to the Narrative Skills and Print Awareness concepts of Every Child Ready to Read (ECRR) 1.

"Close is good enough" was a common behavior with the partners building their constructions. Getting them to be able to see how the piece they chose and the one in the diagram were different could be quite a challenge at times. Slowing down to count the studs—the proper name for the "bumps" on a LEGO brick—to make sure it was the correct sized piece was a tough skill to learn.

Working with partners could sometimes be a challenge, especially when one partner was bossy or one was passive and inert. When we started the WeDo kits, it became abundantly obvious the challenges many of these students had with sequencing. To follow each step completely and in order was a problem.

This was especially problematic when it turned out it was in the early steps of a project that they made a mistake and that was why their construction did not work properly. However, by the end of the students' time with us, many of them had grown so much from when they started. It was amazing and heart-warming to witness.

The Program Ends

In mid-May 2014, the Young Engineers graduated. Their families were invited to the library for pizza, cookies, and a ceremony. The assistant superintendent was there to recognize each of the students with a certificate and goody bag, all provided by the grant, and the students' families and classmates could see how far they had come. We couldn't stop smiling, and neither could our library director who also was on hand to see the culmination of this program. The school principals, tutors from the school, and lots of grandparents came to see these kids get their paperwork that said they were a "Certified Young Engineer."

Some of the students had one more thing to do after the Young Engineers program was over. Cleveland Botanical Gardens hosted a sculpture display by LEGO artist Sean Kinney for several months during the summer. They invited local organizations that had LEGO Clubs to come and do a display during that time and be available to answer questions. Four Young Engineers, the most talented in the two groups, were asked to join the library's existing LEGO Club members on their display day.

Through the remainder of the summer of 2014, there was hope both on the part of the library and the school district that there was a way to find the money to continue the Young Engineers program another year. While that hasn't happened yet for a full school year, the Young Engineers program does live on in the Madison community.

Moving Forward

In summer 2015, Madison Local Schools and Madison Public Library teamed up for a weeklong Young Engineers camp. This time, ten first-grade students and ten second-grade students spent an hour and a half each day for a week getting intensive reading tutoring followed by an hour and a half of work with both the DUPLO simple machines and the LEGO WeDo robotics kits. Students worked on their sequencing and visual

discernment skills. Tremendous progress could be seen in the short span of a week.

For the 2015–16 school year, the Young Engineers model has been reimagined with the help of a grant from Better World Books. Walsh and Lyttle as well as some additional Madison Public Library staff are taking the DUPLOs and LEGOs on the road to Madison Latchkey, after-school care provided at the two Madison Local Schools' elementary buildings, and East End YMCA in Madison.

During the school year, children at these two facilities will receive hands-on learning with different STEAM (Science, Technology, Engineering, Arts, and Math) concepts. Focusing on enrichment and broadening the experiences of the more than one hundred fifty students served through these two programs, the library brings its style of educational programs to children whose parents are working and may not as easily provide these experiences themselves.

The Benefits

Obviously the students in the original program learned things as a result of the tutoring and time spent learning the concepts presented through the LEGO projects. The teachers got an opportunity to see some of these students in a different light than in the classroom. It was more often than not that the challenging child of the classroom was the successful LEGO constructor of the library, and conversely, some of the docile, quiet children of the classroom were most challenging when working with their partners and a box of LEGOs.

For us at the library, we know we now have almost seventy-five children who have positive memories associated with the library, and after this school year it will be well over two hundred. Even more than that, each member of the library staff grew a little bit as a person from the experience with the original grant.

Davisson got real-world experiences to begin to develop classroom management skills that will serve her well in her own classroom in a few years. Lyttle grew in her ability to visualize, use diagrams, and construct things; whereas before, she claimed that "wasn't her thing." Walsh got to see without a doubt that he could be more than the IT guy. He could lead a group of children and adults and teach them about STEM and also help the children learn to read better. 🔄