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The Gizmo Project: Collaborative and Experiential Learning to Benefit All

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Abstract
A science lesson can be anything but ordinary when accompanied by hands-on demonstrations, as is evidenced by the chorus of excited shouts and the wide eyes of school-aged students during a recent Gizmo Expo that was held on a college campus. Professors of an education course and an engineering course joined together at an institution of higher education to have their students work together to meet the needs of children in the community. When engineering and education students collaborate to design and build "gizmos," which are defined as interactive devices that foster learning within integrated units, and work together to develop corresponding lesson plans, this Gizmo Collaboration provides similarly engaging and productive hands-on education for the college students while also benefiting the recipient in-service teachers and their school-aged students.

Keywords
teacher preparation; hands-on learning; engineering concepts; collaboration

Introduction

This paper describes a special collaboration between education and engineering students at Franciscan University of Steubenville in Ohio, as well as in-service teachers. The larger effort aims to foster experience with and interest in engineering and engineering design, in science, and in mathematics among younger children and their teachers. The initiative enhances the quality of instruction in these subjects by intentionally designed experiential learning, embodied in interactive devices ("gizmos") and the corresponding educational units. In 2005, Bucknell

University in Lewisburg, Pennsylvania, started the Gizmo Project and Expo as a collaboration between engineering students and education students. In 2015, an engineering professor (who was a graduate of Bucknell University) and education professor adapted and implemented this model at the university where they worked: Franciscan University of Steubenville. The collaboration across the two departments of engineering and education began when Dr. Justin Greenly reached out to the Education Department to see if any of the faculty would like to collaborate on this new project. Dr. Megan Reister leapt at the opportunity to try this innovative idea, which led to the last seven years of interdisciplinary connections. Over the years, the two courses have occurred on different days and at different times, which was actually beneficial for the collaboration. Since the classes were not in conflict with one another, students were able to attend their classes and then connect outside of class time with one another as they brainstormed and shared information.

Students who collaborate for the Gizmo Project engage in creating “gizmos” or educational devices that help to bring science and social studies concepts to life. The students include first-year engineering students and occasional second-year students in Engineering Innovations I and second- or third-year education majors or pre-service teachers (i.e., pre-professional educators who have not yet begun formally working in the field) in Active Learning: Science and Social Studies for the Young Child. Joining the engineering foundations course and a methods education course for pre-service teachers allows for a collaboration that has provided direct benefits to the local community, students, and teachers, as well as the college students in both classes. Here, we review some of the unique benefits of such a collaboration.

During an evening at the Gizmo Expo, children and families local to the university might be found watching a demonstration of how a tornado cyclone forms in a vacuum/plastic bottle tornado, adjusting ramps of various angles and frictional surfaces for a ball race, and playing a pinball-style game to explore various bee habitats as put on by the university students. This is done to allow the college students to showcase their hard work and allow the children to interact with the gizmos and learning activities. These engaging activities bring the concepts to life, fostering greater Science, Technology, Engineering, and Math (STEM) learning and interest, but the collaborative process in preparing the gizmos is equally beneficial to the college students whose work is showcased at the event, as their building of the gizmos and writing of corresponding lesson plans is equally hands-on. The following response from an engineer highlights the benefits of holding the Gizmo Expo,

> I found the Gizmo Expo to be an experience that created enough pressure, because of how it was framed, to treat it as we are really helping a client, and guiding us to take it seriously. I think it’s also the professors’ focus on professional development that led me to become excited enough about growth and being a serious mature adult in my career, and seeing how central problem solving or this whole process was to engineering, that made me so excited to do all I could to fully follow the Engineering process and be able to carry that with me in the years to come.

Once the Gizmo Expo concludes, the gizmos and accompanying lessons are sent to the recipient teachers’ classrooms either through mail or hand-delivery, depending on proximity to the university. In-service teachers will then be free to carry out the lessons upon receipt of the materials.

The hands-on instruction is beneficial to learning for our college students, such as the first-year engineering students who would not otherwise have significant opportunities to work on projects with real benefits to clients, a very real possibility of failure, budget and time constraints, and the need to communicate externally during and after the design. Active learning—in a variety of forms—has been shown to enhance undergraduate student mastery of concepts (Freeman et al., 2014; Ladson-Billings, 1994). This advantage over the traditional lecture-based mode of teaching is expected to translate to primary and secondary classrooms (Armon & Morris, 2008; Copple & Bredekamp, 2009). Engaging in collaboration—in this case collaboration between the pre-service educators, engineering students, professors, and elementary classroom teachers—is also beneficial for students on the undergraduate level. Crack (2007) notes the essentiality of group work as a foundation for developing skills needed in the workplace, particularly those skills related to interpersonal communication and leadership. Learning to effectively collaborate is especially crucial for pre-service educators, as teacher collaboration is increasingly emphasized as one successful method for enhancing student learning and meeting diverse student needs (Ricci & Fingon, 2018; Virtue, 2021; Yopp & Guillaume, 1999). Furthermore, the engineering students gain an appreciation for the importance of careful educational design, enhancing their motivation beyond the norm for a typical first-year engineering design project.

The Gizmo Project supports the findings of current literature about the benefits of hands-on learning, active learning, and general postsecondary collaboration. It addresses the current gap in research about the effect of interdisciplinary collaboration for pre-service educators via a partnership in which they work closely with professionals and pre-professionals involved in fields of study outside of education (e.g., engineering). After many years in practice, the Gizmo Project provides a concrete example for the structure of such a collaboration. Additionally, it shows how this type of cooperation affects not only the collaborating students and university professors, but also the larger community through its impact on local elementary teachers, their students, and their students' families.

Pre-service educators are charged with creating engaging lessons that excite a variety of diverse students about the topic being studied (Ladson-Billings, 1995), that are closely aligned with educational standards and display assessment plans and incorporate accommodations to ensure learning is occurring, and that build and scaffold on prior knowledge. The pre-service educators work with one another, the receiving classroom teacher, and the engineering students as a team. Additionally, the education students incorporate an understanding of the engineering design process which will enhance their future teaching in general and within STEM applications in particular. Regarding culturally responsive instruction, the education and engineering students, for some of the recipient students, made the conscious decision to live in the same community as the children and were able to design meaningful learning moments or opportunities using shared resources from the community as a result (Ladson-Billings, 1995).

Other advantages of active learning techniques such as involving designed gizmos are suggested by Roth (2001). He notes that physical engineering design allows for an externalization of ideas, which makes ideas concrete and accessible, thus constituting starting points for critical reflection and a rich ground for even more ideas. In addition to the concretization of ideas within a gizmo, Roth's work also can be seen to indicate that science and related concepts taught through gizmos will offer students modes of communication beyond the language in books to express their questions and understanding in physical demonstration and gestures. As an example, learning about the effects of earthquakes from a textbook and traditional classroom explanation relies heavily on specific technical language that is—at best—unfamiliar to the learner and the educator. A gizmo designed to shake a platform under a structure built from spaghetti conveys the principal concepts directly through other senses, not necessarily communication by verbal or written means.

Project Overview

The collaboration for the Gizmo Project begins with identifying partner teachers who are recipients of the gizmos. These in-service teachers (i.e., teachers currently working in the field) are already established school partners, have met the professors through professional development opportunities, or were recommended by others as potential recipients who might benefit from this collaboration. Each semester, during the partnership or collaboration, the in-service teachers suggest topics for the gizmos, and—after the Gizmo Expo where all gizmos are available for community view and interaction—receive the gizmos for use in their classroom. The list of possible topics is often generated by the scope and sequence of the curriculum or pacing guide being used by the classroom teachers. Oftentimes, they will turn to their textbooks or curricula to determine where they will be in their instruction by the end of the semester, when they will receive the gizmos, and generate a list of possible topics based on the instruction being planned for that time of the year.

As stated earlier, the receiving classroom teachers provide the pre-service educators with the standards the school follows and a list of suggested topics or ideas. Culturally responsive principles promote the development and success of all students and can be incorporated in learning environments by communicating high expectations, reshaping the curriculum to reflect all students' experiences, and engaging students in activities that treat their background, knowledge, and experiences as assets (King et al., 2009). Recognizing that not all students come to the learning situations with the same background knowledge, resources, or preparation, the learning activities have been designed such that common or shared experiences are brought to the forefront in terms of the recipient students' knowledge and experience bases (Gay, 2010; Tiedt & Tiedt, 2010; Weber, 2005). Gay (2010) goes on to say that this natural diversity in previous experiences and background knowledge is acceptable as a natural feature of humanity and provides a rationale for teachers to purposefully select and design a variety of learning opportunities and experiences for students.

Therefore, the learning activities designed out of this collaboration are appropriately diverse and appeal to the wide range of recipient students who participate. Culturally responsive instruction has been evident through the gizmos that have been directly connected to the receiving students' backgrounds based on where they live, such as, the Locks and Canals Gizmo, which featured the nearby Ohio River as part of the function of the gizmo to demonstrate the systems of locks and canals in boating commerce. Once the list of suggested topics or ideas has been provided, the pre-service educators then use the standards to select a topic for their units to guide the construction of the gizmos.

Receiving classrooms have varied in grade levels and content areas and have been both general education and special education settings within private and public schools. For example, gizmos have gone to a Head Start classroom in West Virginia, a third-grade classroom in California, a fifth-grade classroom in Pennsylvania, a sixth-grade special education class in Ohio, a vocational high school in Austria, an English as a Second Language classroom in Abu Dhabi, and a group of fifth-grade Scouts. In its relationship with in-service teachers and recipient classrooms, the Gizmo Project promotes university-school partnerships.

Each semester, classroom recipients are determined based on the number of students in the two courses. Course enrollment also affects the number of recipient teachers. When working with smaller class sizes, one or two recipient in-service teachers will be invited to collaborate; when classes are made up of a higher quantity of students, more groupings can occur, yielding a higher number of gizmos and collaboration with multiple in-service teachers. A list of possible topics from the in-service teachers is generated. The students in both the education and engineering classes are placed into small groups to work with the receiving teachers. Three engineering students initiate planning for a gizmo in consultation with at least a similar number of education students. The number of new gizmo designs per semester is, therefore, tied closely to the engineering student enrollment. The students begin working on the gizmos and the lesson plans based on the provided topics at around the mid-point of the semester.

Throughout the collaboration, the students work closely with the faculty and the receiving teachers as needed. Frequent check-ins occur with the pre-service educators providing drafts of their lessons for feedback and the engineering students sharing their progress on gizmo construction and presenting their ideas throughout the semester.

The concluding Gizmo Expo event held during the last week of classes and at which the gizmos are revealed to the community. The in-class presentation follows the evening event and is held during the final exam session a few days after the Gizmo Expo takes place. The students are able to share their process of artifact creation and are able to also discuss the experience of presenting at the Gizmo Expo. Finally, the faculty distribute the gizmos and provide access to the units and associated materials to the receiving teachers. The authors hope that the readers will see the rich potential of this partnership on multiple levels: within the university, through the cross-disciplinary partnerships for students, and with the community-facing aspect as described here. All have led to opportunities to learn relevant content within meaningful, authentic contexts.

Importance of Collaboration

The Council for the Accreditation of Educator Preparation requires educator preparation providers to ensure that effective partnerships and high-quality clinical practice are central to preparation so that candidates develop the knowledge, skills, and dispositions necessary to demonstrate positive impact on all P-12 students' learning and development. The National Network for Educational Renewal offers an agenda for education in a democracy that is organized around the four purposes of educating children and youth, preparing educators, providing professional development, and conducting inquiry. These four purposes are reflected in the Gizmo Project through creating units and gizmos to help educate children and youth; providing real-world experience and collaboration for pre-service educators and engineering students; offering professional development for in-service educators by giving them the units and training them on how to use the gizmos in their classrooms; and fostering a sense of inquiry through the Gizmo Expos and lessons that are designed.

Perhaps the greatest insight from using the Gizmo Project over the last seven years is of the value of collaborative, project-oriented classroom work for both the pre-service educators and the engineering students. Anytime we engage our students in completing real, authentic projects, the process is messier, potential for frustration is higher, the workload is heavier, and benefits may not be fully realized until long after the semester has come to an end (West, 2011).

This collaboration prepares pre-service educators for the types of collaborative professional relationships they will need in order to build successful inclusive learning environments in their future in-service roles. All students, including those with significant disabilities, benefit academically, behaviorally, and socially from practices that support inclusion, and effective inclusive practices require collaborations across departmental and programmatic functions (Copeland & Cosbey, 2008; Jameson et al., 2007; Rea et al., 2002). Throughout implementation of the Gizmo Project, by pairing up pre-service educators with engineering students, a collaboration and unique partnership has occurred that promotes inclusion through working together toward a common goal: meeting the needs of the receiving teacher and classroom students as gizmo recipients.

Yaşar et al. (2006) developed a survey to probe K-12 teachers' perceptions of engineers and familiarity with teaching the concepts of design, engineering, and technology. Relevant findings include the recognition that administrative support and personal familiarity with an engineer increased the likelihood that teachers would utilize preparation and class time for design projects. The authors found that certain teachers held the view that engineers were people with poor writing, verbal, and people skills, even if they would likely demonstrate good mathematics and science skills. This misrepresentation of the necessary skill set for a career in engineering could negatively influence many students who would otherwise consider this option, and educators who subscribe to it themselves may apply this prejudice to their students. Involvement in this project likely counteracts this tendency and, in the process, makes the pre-service educators familiar with the engineering design process.

Pickering et al. (2004) note that cross-disciplinary collaborations in outreach programs with and for young children offer noteworthy benefits to engineering students themselves. These benefits, which the authors especially highlight are realized by young women engineers, include important opportunities to develop leadership skills and enhance their self-confidence in the technical discipline. An example of this self-confidence is reflected in one student's end-of-semester comment that "being able to actually do real engineering work, building a gizmo and presenting it to the public … will really help me in the future."

Benefits for Diverse Learners

Pre-service and in-service teachers ought to prepare materials that cater to all types of learners. Although it may take more preparation and time on the teachers' end, it is the responsibility of every educator to diversify instruction to meet the needs of all students within the classroom (Gardner, 1999). This is especially crucial as more classrooms become inclusive and serve students with special needs, students from differing cultural backgrounds, and those who may speak languages other than English (Vacca et al., 2014). Data from the Ohio Department of Education show an increasingly diverse population of students across the state, particularly those who are English Language Learners. Additionally, the majority of students with disabilities, ages 6-21, spend part or all of their school day in general education classrooms (Institute of Education Sciences, 2022). As students with learning difficulties and/or who are learning English as a second language spend more and more time in general education classrooms, it is imperative that all teachers and administrators have the knowledge and skills necessary to effectively address their diverse needs as part of district and school continuous improvement efforts.

Gizmo recipients have included both general education teachers and special education teachers in efforts to help make science concepts (and language arts, math, and social studies) more tangible and hands-on for diverse learners. Universal Design for Learning (UDL), accommodations, and repetition of academic concepts are built into the lessons, which are tailored to meet the students' needs through the units (Hall et al., 2003).

UDL looks at how teachers can design or build their lessons in such a way that all learners of all ability levels will receive access to the information being taught. Barriers to access and inclusion include the amount of time it takes to design thoughtful lessons and variations to those lessons (Ruppar et al., 2011), lack of expertise in adapting and modifying instruction and materials (Kurth & Keegan, 2014), and challenges with communication between teachers (Petersen, 2016). It is a hope that through this Gizmo Project, pre-service and in-service teachers and engineers are able to communicate with one another to discuss the needs of the students in the receiving classroom and to help promote learning opportunities and multiple levels of complexity (Gay, 2010). The education and engineering majors are then able to take the time to modify and make changes to the gizmo or lessons planned around the gizmo to ensure students will have access to the material being covered in the units. This hands-on approach to adapting instructions and materials is invaluable, and it is our hope that the pre-service educators will take these skills and lived experiences with them into their future classrooms as they seek to provide educational experiences for all of their diverse learners.

Applying UDL principles in conjunction with practices that promote inclusion can also improve outcomes for students with disabilities (Hehir, 2009; Rose & Gravel, 2010). The key principles of UDL include presenting information and content in various ways, allowing students to express what they know in various ways, and stimulating interest and motivation for learning (Rose & Meyer, 2006). Meeting the diverse needs of students with disabilities and learning difficulties in inclusive classrooms and school settings requires a combination of knowledge and skills, including the use of evidence-based practices and the ability to use relevant data at the local level to support instructional decisions (Blanton et al., 2011; Voltz et al., 2010). An increasing number of authors and researchers (e.g., Darling-Hammond, 2010; DuFour & Marzano, 2011; Gallimore et al., 2009; Leithwood & Jantzi, 2008; Schmoker, 2006) advocate for the use of team structures to facilitate shared learning for instructional improvement. They note that no single person has all the necessary knowledge, skills, and talents to meet the needs of all children. This finding is reflective of the growing body of evidence in support of teachers working together to inform each other's instructional practice and to share meaningfully in school leadership functions (Gallimore et al., 2009).

Traditionally, science lessons have begun with teachers presenting students with science vocabulary words and asking them to write the words, find the definitions in a dictionary or the glossary of the textbook, match the words to definitions, or use the words in a sentence (Carrier, 2012). Science words seem like a new language for many English-speaking students, and to English language learners, these words are a new language, which emphasizes the crucial importance of providing kinesthetic and tactile ways of learning knowledge (Carrier, 2012). Additionally, there is increasing evidence that language development is best achieved in the context of content learning which enables the student to actively engage and learn the material by activating the schema or prior knowledge and building upon that knowledge within a contextual framework rather than through isolated lessons (Bautista & Castañeda, 2011).

The aim of this Gizmo Project is to provide a student-centered and inquiry driven approach in teaching a variety of subjects, such as social studies, language arts, mathematics, and science. The two main subjects or content areas of focus in this collaboration are social studies and science. The aim of science education, in particular, is to teach students how to use thematic patterns of science to communicate meanings, "talking science" to solve problems in writing or speaking about issues in which science is relevant, and to carry these skills or processes into other areas (Carrier, 2012; Peters & Stout, 2011). Additionally, the two primary goals of social studies instruction are to foster social understanding and to help promote civic education (National Council for the Social Studies, 2002; Parker, 2012). Through lesson plans that utilize the created gizmos in some way, emphasis can be placed on social studies topics. For instance, a Bee Launcher Gizmo was created for a teacher who wanted to teach about bees, pollination, and the industry of beekeeping. Through the hands-on activities that were designed utilizing the Bee Launcher Gizmo, the children were able to consider how bees engage in pollinating the flowers in their town and the impact that the beekeeping industry had on the town or what eliminating some of the habitat in which bees thrive might mean for local commerce. These social understandings, as related to bees, helped the children to better grasp the impact bees had on their community and were taught in a more engaging way to the students rather than having the students passively sit and listen to a lecture.

Growing in Professional Dispositions as Pre-Service Teachers

Throughout their collaborations with the in-service teachers and engineering student partners, the pre-service teachers are able to develop their professional skills in a way that a traditional lecture-based class would not provide. They are also able to practice preparing lessons by incorporating UDL, the 6E model, culturally responsive principles, and Bloom's Taxonomy (Anderson et al., 2001; Gay, 2010). "Hands-on" education is again at play as the pre-service educators create actual lesson plans using these instructional design methods and enhancing their understanding of these concepts and practicing their use. To echo Gay's (2010) sentiments regarding culturally responsive instruction, every teaching exchange involves describing, analyzing, and documenting experiences or events as shared by the students and instructors, both at the individual and group level, through personal and professional reflections, and finally, through learning by doing.

The pre-service educators incorporate inquiry-based learning and active learning principles in the lessons they write for the classroom teachers. They also incorporate two different instructional frameworks when planning lessons and activities for their units. The 6E model consists of six steps to consider when designing learning activities to make the lessons more robust and meaningful for the learners. These six steps are: engage, exploration, explanation, expand, evaluation, e-learning (Burke, 2014). The Backward Design Model is made up of three steps and encourages teachers to consider the desired end result of instruction, what the assessment evidence of the desired learning will look like, and what steps to take to carry out instruction in a learning plan (Wiggins et al., 1998).

This project seeks to incorporate aspects of Bloom's Taxonomy to define student behaviors (Anderson et al., 2001) as education majors or pre-service educators design lesson plans to foster higher-level thinking skills. Pre-service educators strive to write detailed lesson plans outlining expectations for the children's behaviors by embedding language and vocabulary from the

Bloom's Taxonomy Chart, demonstrating how the children will analyze, apply, and create knowledge from what is being taught and presented in the units. Use of the gizmo within the science lessons allow the classroom teachers to add another layer of learning to their classrooms through the hands-on interaction with gizmos.

Challenges and Lessons Learned

As the education professor (Reister) guiding my students to create these integrated interdisciplinary units that focused on a social studies concept while collaborating with the engineers and in-service classroom teachers, I learned that the clearer I could be in my instructions, the easier the process went. I developed exemplars or sample projects, tutorials, and strategies each year that improved upon the process and provided more scaffolding earlier by explaining the assignment halfway through the semester, providing in-class workshops to work on smaller chunks of the large project, and providing extensive feedback on the lessons as they were drafted throughout the semester. I learned that we needed to begin the project early in the semester and take time in class to explain various steps in the brainstorming, planning, and writing process of the units and then communicate in a more efficient way with the engineers. When I did this, and was more directed and explicit in my instructions, the students performed better. We also began to co-teach a couple of our classes so that the students in our respective classes could better understand what the purpose of the collaboration was (Friend et al., 2010).

The greatest challenge, but also the greatest learning, came in managing interpersonal challenges within the groups collaborating on the gizmo. We set up or encouraged the students to schedule a "meet and greet" introductory meeting at the start of the collaboration and encouraged the students to keep the dialogue of communication open between the groups. Time is needed for consultation to occur (Wallace et al., 2002). We encouraged students to select someone as the Lead Communicator to avoid miscommunication. The students learned that it was often important to meet together in person at the beginning of the collaboration to create norms for gizmo design and unit expectations and to develop agreement with regard to the receiving teacher's requests and receiving students' needs. When conflicts arose, the education and engineering majors learned to work them out rather than cover them up as the goal was no longer simply to complete an assignment but to produce a legitimate product for a classroom that had their names attached to it. They held each other to high standards and learned critical group collaboration skills (West, 2011).

In my view as the engineering professor (Greenly), the areas of greatest challenge for first-year engineering students correspond to the greatest growth opportunities for these young professionals. As a key part of learning and immediately applying the engineering design process in a team setting, engineering students need to develop and refine key soft skills like balancing their familiarity with elementary science concepts and their emerging technical knowledge with a client-centric outward focus. As they are beginning to gain more familiarity with and focus on the design process—including problem definition, research, design criteria enumeration, and creative problem-solving techniques—they must also maintain unity and attention as a team on being patient and professional with collaborators and clients who might not immediately have a clear idea of the ideal design, let alone the design process. Clear and consistent communication was just as important on their side of the collaboration as the gizmo design took shape in parallel with the lesson plans. Some short-term failures to maintain this professionalism and good communication quickly become teachable moments for these students at the very beginning of their engineering careers. In subsequent semesters, stories of past missteps in team function and participation were shared with students to guide them more clearly in the process. Student engineering team members needed to recognize that working as a team with a client focus required flexibility regarding meeting times to solicit input from education students. Meetings could be scheduled around client and collaborator availability, even if only a part of the engineering team could be present. Engineering students were encouraged to recognize the subtle distinction between open and inviting communication during brainstorming sessions with their collaborators and the more critical engineering decisions at subsequent meetings where some ideas would need to be excluded from the final gizmo design.

Opportunities for Expansion

In the future, The Gizmo Project could expand to a wider audience, specifically including educators from high-need local education agencies. Virtual mini-sessions for educators could be provided before attending the Gizmo Expo to allow for teaching about the engineering design process and examples of ways to demonstrate this in the classroom. Pre-service educators currently create digital infomercials that they share with their peers and with the receiving classroom teachers explaining their units, so this virtual mini-session for educators on the engineering design process seems like a logical next application step.

We can continue teaching educators the engineering design process and convey practical tips for demonstration in classrooms through a series of professional development workshops, and we would like to eventually publish a website designed to facilitate in-service teacher access to instructional materials. A future direction might be to present a series of workshops or professional development trainings for the in-service teachers to create their own units and/or gizmos utilizing the components of the Engineering Design Process and the lesson plan frameworks of the 6E Model and Backwards Design Model.

Further, these materials will eventually be compiled into an “Inspiration for Innovation” Gizmo Project cookbook to facilitate distribution of content that contains detailed gizmo designs and engaging lesson plans from related content areas. Based on the work of Nadelson et al. (2015), these key activities and sub-activities will directly impact the ability of Ohio in-service teachers to provide STEM education and will result in measurable improvements for both educators and students. Primary outcomes will include increased teacher knowledge, an increase in hands-on STEM activities in classrooms, and enhanced school achievement in science scores.

Conclusion

The Gizmo Project enhances student competencies and motivation by providing professional development, materials and resources, and motivation for educators to introduce STEM concepts within the context of the engineering design process. College students, as well as in-service teachers, are given real-life applications of the content, children are exposed to engineering through innovative and hands-on lessons, gizmos are embedded into thoughtfully designed lessons, and community engagement is highlighted in an area where there is a need for access to STEM concepts through the implementation of the Gizmo Project. It is hands-on education at all levels, from the college students to the recipients in elementary and secondary schools: collaboration for a win-win-win.

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