Arouse, Analyze and Amplify Using TASEM:
Technology Assisted Science, Engineering and Mathematics

TASEM:

In an innovative Kindergarten through Ph.D. (or KPD) education and research program\textsuperscript{1,2,3}, developed at Michigan State University, graduate and undergraduate students mentor K-12 students in hands-on Technology Assisted Science, Engineering and Mathematics (TASEM). Since the TASEM environment uses technology as a vehicle for learning the SEM areas, it can help eradicate technology illiteracy at all levels. However, the real challenge is to ignite the interest of the learner.

To accomplish this difficult task, \textit{“We mix dry learning topics with Legos, drive them around with robots, and levitate them in the air with static charges from Lego Van de Graaff generators.”} Suddenly these topics become fun and everyone wants to learn them.

Efficacy of TASEM:

The TASEM modules have been offered to over 1,200 learners at all levels of K through 12 and 170 science teachers during 2003 - 2009. For innovation in education, the TASEM program was recognized through a best paper award by 2008 MANCEF conference\textsuperscript{4}. Detailed of the learning areas offered in NanoBio and Robotics camps and other similar activities are provided on the page 2 of this document.

Unique Business:

A unique business model is being studied for the commercialization of TASEM modules. One aspect of the model involves an \textit{integration of electronics and power sources} inside the custom made plastic blocks compatible with Lego\textsuperscript{©} and other Lego-like blocks as shown in the adjacent figure. An interesting feature of the custom made bricks is the \textit{open design approach}. This approach allows the learner to access and see the inside parts of the electronics. For example, a microcontroller chip mounted inside the \textit{microcontroller module} can not only be reprogrammed but also replaced by the learner. To our knowledge, such a degree of an open access design is not offered by any existing learning toy or system in the market today (see the details provided for the \textit{smart robot}). The robot, programmable in C code, offers over 8 user programmable ports that, depending upon the programming, can be used for motors or for sensors.

Arouse, Analyze and Amplify

ROBOTICS, NANO- & Bio-TECHNOLOGY

Innovative Micro- and Nano-Technology Short Courses for K-12

Offered by Michigan State U, NSF WIMS Center\(^2\) (U of M) & Nanobrick

Unique Learning with Fun:
“We mix dry learning topics with Legos, drive them around with robots, and levitate them in the air with static charges from Lego Van de Graaff generators.” Suddenly they become fun and everyone wants to learn them. In an innovative K through Ph.D. education and research program, developed at MSU, graduate and undergraduate students mentor K-12 students in hands-on Technology Assisted Science, Engineering and Mathematics (TASEM). The TASEM environment introduces micro and nano technologies to children in a very interesting and exciting manner.

Short Course and Cost
Short courses (SC) are offered in 8-hour segments. Each segment costs $150.00 per student. For example, if the short course consists of one segment, offered in a week (2 hours a day for 4 days) or in 8 weeks (one hour per week), the total cost is $150 per student. A short, or a sequence of SCs, can be designed according to the needs of a group.

Learning Areas: \(^1\)For More Information: aslam@msu.edu

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<thead>
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<th>Learning Area</th>
<th>Learning Goals/Objectives</th>
<th>Recom. Grades</th>
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<tr>
<td>Static Charge Fun Experiments</td>
<td>Computer switches &amp; logic gates: Use static charges to explain computer switches &amp; logic gates, sensors, circuits, charge storage, build &amp; program static charge generators</td>
<td>K - 12</td>
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<tr>
<td>DNA, Genes &amp; Computer switches</td>
<td>Common concepts in engineering and biosciences: Sensors, motors, control, programming</td>
<td>3 - 12</td>
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<tr>
<td>Programmable Robots, RCX/NXT</td>
<td>Engineering concepts: Sensors, motors, gears trains, control, programming</td>
<td>K - 12</td>
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<td>Microcontroller Programming</td>
<td>Build your own robots: Programming in C, compiling &amp; downloading into microcontrollers</td>
<td>8 - 12</td>
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<tr>
<td>Nanotechnology Experiments</td>
<td>Nano concepts: Miniaturization, definition of nano/nanotechnology, bubbles, static charges</td>
<td>6 - 12</td>
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<td>Table Top factory using TABI(^1)</td>
<td>New business and supply concepts using RFID tags and robotic RFID readers</td>
<td>7 - 12</td>
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<tr>
<td>High Definition Video</td>
<td>Shooting &amp; editing high definition video, video reporting</td>
<td>7 – 12</td>
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\(^1\) Technology Assisted Business Innovations
\(^2\) www.wimsrec.org