SESI Classroom Outreach Training Workshop

*K’NEX With Your Community*

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Thursday, March 7th, 2019
Session Outline

- Introduction/Vision of SESI
- Brief Overview of Curriculum
- Hands-on K’NEX Activity
- How to Get Involved & Best Practices
- Q&A / Freeform Discussion
What is SESI?

SESI = School Earthquake Safety Initiative

“SESI is a global and collaborative network of diverse, expert, and passionate professionals who are committed to creating and sharing knowledge and tools that enable progressive, informed decision making around school earthquake safety”
Vision:
“Serving the world as a leader in the science, public policy, and advocacy of school earthquake safety.”

Mission:
“We are a global and collaborative network of diverse, expert, and passionate professionals committed to creating and sharing knowledge and tools that enable progressive, informed decision making around school earthquake safety. We serve everyone with a stake in school earthquake safety, from children and their parents, to teachers and administrators; from developers and architects, to engineers and builders; from financial institutions and building officials, to government agencies and emergency managers; from civil servants and commissioners, to local politicians and state and federal legislators.
We leverage our extensive expertise and reputation to conduct regionally appropriate actions that make a tangible and positive difference in communities around the world, by protecting the lives of all who inhabit school buildings.”
The Problem & Motivation

● Shelter or Not?
  ○ Schools are often used as emergency shelters but under seismic building codes schools are not defined as shelters, which are subject to more strict building rules

● Required to be there
  ○ Occupants compelled by law to be in school buildings
  ○ Vulnerable population – relying on “adults” to make safety decisions

● Recovery Efforts
  ○ Disruption of education can cripple recovery
  ○ Housing / Jobs / Schools
The Solution & Action: EERI School Earthquake Safety Initiative

- Multi-pronged approach using top-down and grassroots strategies
- To promote appropriate actions that create a safer environment worldwide for people that inhabit school buildings.
- Collaborative project consisting of diverse, expert, and passionate professionals who are committed to creating and sharing knowledge and tools that enable progressive, informed decision making around school earthquake safety

March 5-8, 2019

EERI 2019 Annual Meeting

Vancouver, BC, Canada
SESİ Classroom Education & Outreach Subcommittee

Use Education in the classroom to:

● Create ongoing dialog with parents, teachers, and administrators about earthquake safety
● Grow advocates for school earthquake safety
Curriculum Objectives

- "Grassroots" side of SESI.
- Make connections with schools to aid in future efforts.
- Incorporate Earthquake science and safety topics.
- Develop exciting, hands-on, project based engineering curriculum.
- Utilize shake table technology to aid instruction.
- Create Win-Win situation.
- Give school immediate benefit.
- Satisfy latest education standards including Next Generation Science Standards and Common Core.
- Complete curriculum in 2-4 visits.

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What we have done

● Developed program in which regional & student EERI chapters collaborate on:
  ○ Delivering age-appropriate seismic design challenges
  ○ Serving as informed enthusiastic resources for stakeholders

● Identified and packaged design challenges
● Developed informational materials for parents and teachers about safety in the classroom
● Developed training program for EERI student and professional volunteers on delivery of activities, speaking with young people, and proper messaging

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Future Goals

● Make use of EERI student chapter and professional regional chapter membership to complete lesson delivery in their region
  ○ More than 60 EERI Student Chapters and 13 EERI Regional Chapters
  ○ Student chapters consists of civil and geotechnical engineering students obtaining undergraduate, masters and PhD degrees.
  ○ Regional chapters consists of professional engineers, geoscientists, architects, planners, public officials, and social scientists—all focusing on earthquake risk reduction.

● Goal of engaging existing EERI chapters:
  ○ Use chapter internal organizational structures and annual leadership transfer to facilitate sustainability of outreach program over time.
  ○ Teaching K-12 students about earthquake engineering concepts should reinforce the knowledge and skills of participating university students and young professionals.
  ○ Partnering student instructors with professionals will enhance networking and knowledge of participating university students while also providing school teachers and administrators access to experts in earthquake risk reduction.
Classroom Curriculum for School Earthquake Safety Initiative (SESII)

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High School Physics Curriculum

basic structure  →  retrofitted structure  →  shake table testing
Visit 1
Preliminary Engineering Concepts

- What is an earthquake?
- What is a structure?
- Capacity vs. demand

Visit 2
Structural Systems

- Gravity vs. lateral force resisting systems
- Stability
- Natural frequency & period
Visit 3
Seismic Response Prediction

- Maximum acceleration as a function of period
- Period as a function of mass & stiffness

Visit 4
Shake Table Testing

\[ PI = s \cdot \frac{\text{number of EQs}}{\text{weight}} \cdot \text{cost}^{e_2} \]
4th – 6th Grade Curriculum

compare structures  “optimal” design”  shake table testing
Visit 1: Study Configurations & Materials

- Column & Structure Height
- Brace Placement
- Brace Shape
- Materials
- Wall Placement
- Walls vs. Braces
Visit 2: “Optimal Design” & Shake Table Testing
Now it’s your turn...

- Let’s build!

- Rules:
  - Only use your own K’Nex kit
  - No exchanging pieces with other groups
  - Base must be flat and 6”x6” (red pieces)
  - Try to make your structure as tall as possible!
  - 30 min to build + 15 min to test. GO FOR IT!
What do I need?

- **Instructional shake table**
  - $3500
  - Can be shared by teachers in your district
  - For info: sales@engineeringeducation.biz

- **K’Nex pieces**
  - $25/kit
  - $75 for in-class experimental pieces
  - You will need extra pieces!

- **Manual shake table**
  - $20

- **Disposable materials for high school project**
  - Balsa wood
  - Super glue
  - Cutting devices

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Vancouver, BC, Canada
How do I get started?

Reach out to us

Download the curriculum

Classroom Curriculum

1. Intro to Teachers Material [Download Material (1.1 MB .zip)]
   - Lesson Summary and Curriculum Mapping (.docx, PDF)
   - Materials List (.docx, PDF)

2. Posters Material [Download Material (7.8 MB .zip)]
   - Engineering Design Process (.docx, PDF)
   - Talk Like Scienist (.docx, PDF)
   - Vocabulary List (.docx, PDF)

3. Lessons 1-3 [Download Material (22 MB .zip)]
   - Lessons 1.2 Combined (.docx, PDF)
   - Design Element Workbooks - Teacher version with answers (.docx, PDF)
   - Data Sheets (.docx, PDF)
   - Lesson 1 Supplement (.docx, PDF)
   - 30 Day M & A Earthquakes Worldwide (.png)
   - Performance Description Chart (.png)
   - Earthquake Engineering Presentation (.ppt)

4. Lessons 4-6 [Download Material (7 MB .zip)]
   - Lessons 3-4 Combined (.docx, PDF)
   - Oakland Design Challenge Worksheet (.docx, PDF)

Watch the lectures

See the classroom curriculum in action!
Here is someone delivering the 4th grade curriculum in two parts:

Resources within EERI

EERI National
• SESI Classroom Outreach subcommittee members
• Program Managers
• Younger Member Committee members

Regional Chapters
• Local members

Student Chapters
• Student Leadership Council members

Reach out for help getting started!
We will connect you with these resources.

sesi@eeri.org
Resources within your Community

Local Industry
• Engineering firms
• Non-technical businesses
• $300-500 donations

Schools
• Connect to local schools through regional chapter members

Community Organizations
• K-12 focused groups (4-H, Boys & Girls Club, ACE Mentor Program...)
• Social or philanthropic clubs (Junior League, PEO, Rotary Club...)

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Where are we headed?

- **4th Grade Curriculum**

- **High School Curriculum**

- **Soliciting Input!**
  - Regional modules
    - California – seismically-focused area
    - Pacific NW – tsunami hazard
    - Great Lakes – regional geology
    - New Madrid – historical seismicity
    - New York - Northeast – lower seismicity, higher consequences
    - Oklahoma – induced seismicity
  - In low seismicity areas, connect seismic design concepts with design for other hazards in the region

Contact:

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