Linking 5E learning plan and Science that Matters framework in Ms. L’s classroom

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| **5E Planning Element** | **Pedagogical Practices** | **Outcomes**  |
| **Engage:** Teacher challenges students to engineer a design to foster sustainable classrooms (e.g., “happy and healthy classroom environment which is also good for the environment”). | *Recognize & Legitimize youth expertise*: * Students brainstormed as many ideas/experiences from their own lives as they could think of related to happy, healthy classroom communities and environment.
* Teacher drew upon student ideas to generate a 4-part definition of sustainable communities

*Share power*: * Students grouped ideas into related categories and collaboratively identified those which where most important for them to investigate.
* Students linked problem statements related to these ideas and sustainable communities.
 | *Equitable learning opportunities:** Lived experiences of students and community positioned as vital to addressing challenge
* Created spaces for students *to* integrate community and science expertise towards defining problems, including understanding the design task’s boundaries from this integrated vantage point
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| **Explore 1:** Students designed, administered and analyzed community data related to the problems they identified. | *Recognize & Legitimize youth expertise*: * Students determined who to interview and survey and what questions to ask in ways that bridged the problem they identified with the concept of sustainable communities.

*Share power*: * Students had the authority to design survey and analyze for relevant issues (i.e. bullying)

*Action taking as part of the learning experience:* * Teacher positioned community data collected and analyzed within the framework of doing something to address issues.
* Students sketched up design solutions drawing upon their personal and community insights and their STEM knowledge/practice.
 | *Equitable learning opportunities:** Lived experiences of students and community positioned as vital to addressing challenge

*Expansive ideas of science:* * Multiple areas of expertise important to process and outcomes of engaging in challenge
* Youths’ experiences of bullying and being bullied are central to identifying gaps in the school’s response to bullying.
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| **Explore 2:** Students used analyzed data + knowledge of energy transformation to sketch up realistic design solutions | *Recognize & Legitimize youth expertise*: * Students determined how these ideas connected with STEM content/practices, community input and student lived experiences
* Students sketched up design solutions drawing upon their personal and community insights and their STEM knowledge/practice.

*Share power*: * Students determine the engineering design they wanted to create given the technical specifications given by the teacher (e.g., must contain an energy transformation and use a renewable source of energy, such as a solar panel or handcrank; must use copper tape, LEDs, and any readily available materials in the classroom).
* Students were required by their teacher to include a rationale for both the technical and social dimensions of their sketch up.

*Action taking as part of the learning experience:* * Students engineering designs needed to be realistic and address the problems they identified.
 | *Equitable learning opportunities:** Creating spaces for students *to* integrate community and science expertise towards defining problems, including understanding the design task’s boundaries from this integrated vantage point

*Expansive ideas of science:* * Multiple areas of expertise important to process and outcomes of engaging in challenge
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| **Explain:** Bank of compliments project featuring four LED lights in parallel circuit powered by handcrank generator filled with over 20 compliments intended to impact both bullies and those that have been bullied | *Recognize & Legitimize youth expertise*: * Students shared their sketch ups with community visitors, revising their sketch-ups based on their feedback.
* Students built their designs, and developed plans for integrating their designs into classroom and school practice.
* Students wrote out explanations of how their projects worked in a format intended to educate the community.

*Share power*: * Students positioned with authority to sketch, optimize, and build their designs in ways that changed or enhanced classroom and/or school practice.

*Action taking as part of the learning experience:* * The purpose of engaging in the project was to impact their community. STEM knowledge/practices and expertise about the community were legitimized toward action.
 | *Equitable learning opportunities*: * Lived experiences of students and community positioned as vital to addressing challenge
* Creating spaces for students *to* integrate community and science expertise towards defining problems, including understanding the design task’s boundaries from this integrated vantage point
* Students expertise leveraged toward impacting most vulnerable populations.

*Expansive ideas of science:* * Multiple areas of expertise important to process and outcomes of engaging in challenge
* Youths’ experiences of bullying and being bullied are central to identifying gaps in the school’s response to bullying.
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| **Extend:** The injustices of bullying became a legitimate science-related issue that could be acted upon beyond their classroom and spread into the larger school community  | *Recognize & Legitimize youth expertise*: * Youths’ lived experience is vital to understanding and designing for improved classroom/school environment

*Action taking as part of the learning experience:* * Students see how action can extend beyond the walls of the classrooms into other parts of their communities.
 | *Expansive ideas of science:* * Youths’ experiences of bullying and being bullied are central to identifying gaps in the school’s response to bullying.
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| **Evaluate:** Teacher evaluates the ways in which students used multiple areas of expertise to impact local conditions, as well as her/his role in support such learning Students evaluate whether their actions produced the types of transformative outcomes they desired, and whether the inclusion of other perspectives may impact their project. | *Sharing power** Teacher reflects on the ways in which student and community expertise were legitimized toward action, and how power was shared in the project toward learning that was consequential for students.
* Students reflect on the diversity of perspectives included in the project, and how their own expertise mattered to the investigation.
 | *Equitable learning opportunities*: * Lived experiences of students and community positioned as vital to addressing challenge
* Creating spaces for students *to* integrate community and science expertise towards defining problems, including understanding the design task’s boundaries from this integrated vantage point

*Expansive ideas of science:* * Multiple areas of expertise important to process and outcomes of engaging in challenge
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