CSUN | CALIFORNIA STATE UNIVERSITY NORTHRIDGE

PROJECT MANAGEMENT HANDBOOK

MSE 402 PROJECT MANAGEMENT

FALL 2024

SUBMITTED BY: STEMX TEAM (GROUP 1)

TEAM MEMBERS:

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Ganesh Baburao Gujjeti

Shruthi Raveendran

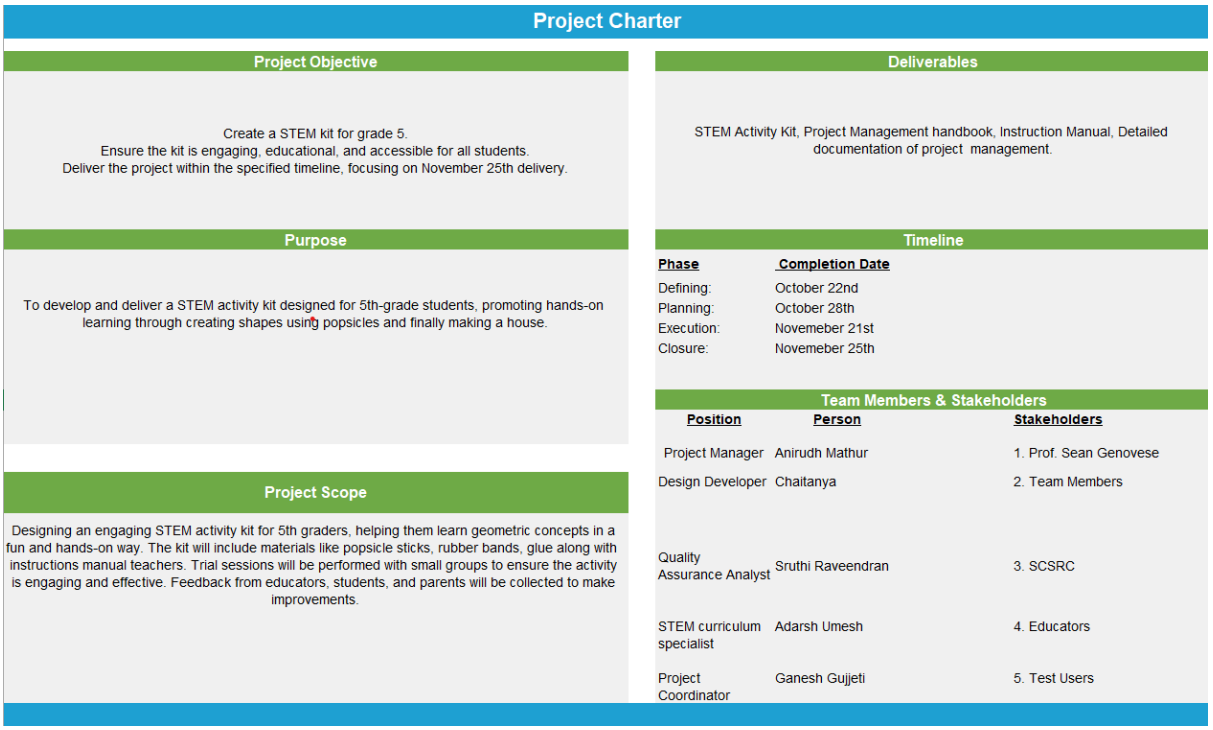
GUIDED BY: PROF. SEAN GENOVESE

Introduction

Our project aims to develop a hands-on STEM activity kit for elementary students in Grade 5. The kit will guide students in building a model house using popsicle sticks. For students in Grade 5, the activity expands to include area calculations, helping students deepen their understanding of this key math concept. To ensure the activity aligns with classroom needs and enhances learning, we incorporated feedback from teachers, parents, and kids through surveys. With detailed instructions and all required materials included, our goal is to equip teachers with a fun, creative lesson that integrates math, creativity, and practical applications.

Project Management Process

1. Defining: In this phase, we set the foundation of the project, by identifying the purpose, project objective, and scope. These key elements were added to the Project Charter, to get a high-level overview of our project.



Project Charter

Project Objective

Create a STEM kit for grade 5.
Ensure the kit is engaging, educational, and accessible for all students.
Deliver the project within the specified timeline, focusing on November 25th delivery.

Deliverables

STEM Activity Kit, Project Management handbook, Instruction Manual, Detailed documentation of project management.

Purpose

To develop and deliver a STEM activity kit designed for 5th-grade students, promoting hands-on learning through creating shapes using popsicles and finally making a house.

Timeline

Phase	Completion Date
Defining:	October 22nd
Planning:	October 28th
Execution:	Novemeber 21st
Closure:	Novemeber 25th

Project Scope

Designing an engaging STEM activity kit for 5th graders, helping them learn geometric concepts in a fun and hands-on way. The kit will include materials like popsicle sticks, rubber bands, glue along with instructions manual teachers. Trial sessions will be performed with small groups to ensure the activity is engaging and effective. Feedback from educators, students, and parents will be collected to make improvements.

Team Members & Stakeholders

Position	Person	Stakeholders
Project Manager	Anirudh Mathur	1. Prof. Sean Genovese
Design Developer	Chaitanya	2. Team Members
Quality Assurance Analyst	Sruthi Raveendran	3. SCSRC
STEM curriculum specialist	Adarsh Umesh	4. Educators
Project Coordinator	Ganesh Gujjeti	5. Test Users

Image shows the Project Charter created for the STEM Design Project

We sectioned our project into actionable tasks using Work Breakdown Structure (WBS), which helped in detailed planning and execution. The entire project was divided into 4 phases - Defining, Planning, Execution, and Closure. Each of the tasks were identified and marked under these 4 phases which helped in smooth execution.

	Work Breakdown Structure(WBS)
2	**Task Name**
3	**Defining**
4	Requirements analysis
5	Project Deliverable and scope
6	**Planning**
7	Develop project plan and timeline
8	Resource planning
9	Project Budget and Procurement
10	Create Communication plan
11	Review and Approval of Project Proposal document
12	**Execution**
13	Develop initial design
14	Create instruction guide
15	Build initial prototype
16	Internal testing and revision
17	Make changes based on feedback
18	Testing and Validation [Real time]
19	Make revisions based on feedback
20	Finalise the kit
21	Documentation of Project Management
22	Execution Deliverables
23	**Closure**
24	Final review
25	Project Handbook
26	Project Handbook Handover
27	Project Presentation
28	Project Presentation to the Board

Image shows the Work Breakdown Structure created for the STEM Design Project in MS Project

2. Planning

1. **Project Plan and Timeline:** We developed a detailed schedule outlining all tasks, milestones, and deadlines. This helped us stay organized and focused as we progressed through key phases such as research, activity design, kit development, testing, and final delivery.

	Task Mode	Task Name	Duration	Start	Finish
1		Requirement analysis(Definition)	2 days	Fri 10/18/24	Mon 10/21/24
2		Project Deliverables and Scope	1 day	Mon 10/21/24	Tue 10/22/24
3		Develop Project Plan and Timeline	1 day	Tue 10/22/24	Wed 10/23/24
4		Resource Planning	1 day	Wed 10/23/24	Thu 10/24/24
5		Project Budget and Procurement	1 day	Thu 10/24/24	Fri 10/25/24
6		Create Communication plan	1 day	Fri 10/25/24	Mon 10/28/24
7		Project Proposal Document	0 days	Mon 10/28/24	Mon 10/28/24
8		Develop Initial Design	1 day	Mon 10/28/24	Mon 10/28/24
9		Create Instruction Guide	2 days	Tue 10/29/24	Wed 10/30/24
10		Build Initial Prototype	2 days	Tue 10/29/24	Wed 10/30/24
11		Internal Testing and Revision	2 days	Wed 10/30/24	Fri 11/1/24
12		Make changes based on Feedback	2 days	Fri 11/1/24	Tue 11/5/24
13		Testing and Validation (Real Time)	4 days	Tue 11/5/24	Fri 11/8/24
14		Make Revisions based on Feedback	3 days	Fri 11/8/24	Wed 11/13/24
15		Finalize the kit	3 days	Wed 11/13/24	Fri 11/15/24
16		Documentation of Project Management	4 days	Mon 11/18/24	Thu 11/21/24
17		Execution Deliverables	0 days	Thu 11/21/24	Thu 11/21/24
18		Final Review	2 days	Thu 11/21/24	Mon 11/25/24
19		Project handbook	3 days	Mon 11/25/24	Wed 11/27/24
20		Project handbook handover	0 days	Wed 11/27/24	Wed 11/27/24
21		Project Presentation	2 days	Wed 11/27/24	Mon 12/2/24

Image showing Project Plan with Start and Finish dates

2. **Roles and Responsibilities:** We identified the roles and responsibilities of the team members according to their strengths.

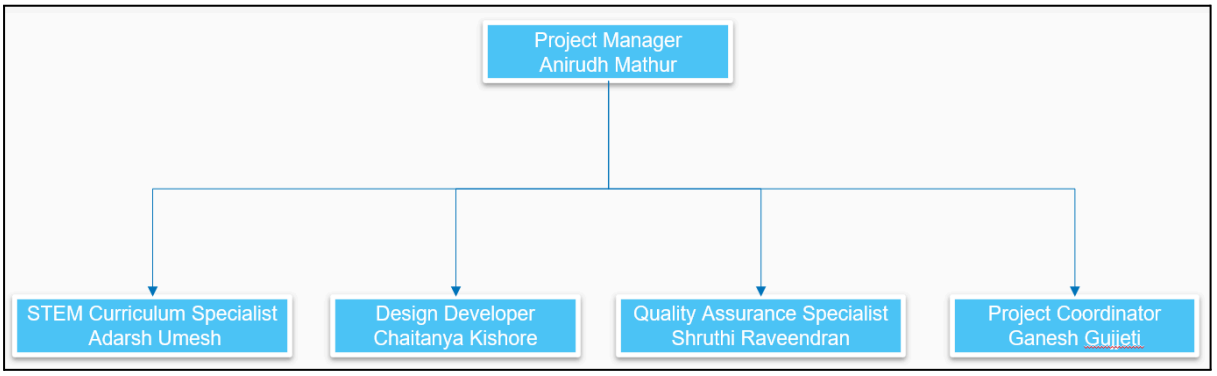


Image showing RACI matrix with Roles Assigned

3. **Resource Planning:** We identified all necessary resources, including STEM education experts and materials for the activity kits. Early planning allowed us to allocate resources effectively and ensure we had the right support in place.
4. **Project Budget and Procurement:** We estimated costs by breaking down expenses related to materials, labor, and any additional services. This budget helped us track spending and ensured all required items were procured without exceeding our limits.

Products	Cost
Popsicle Sticks	$0.75
Printout	$5
Prototype	$0.75
Total Cost	$6.50

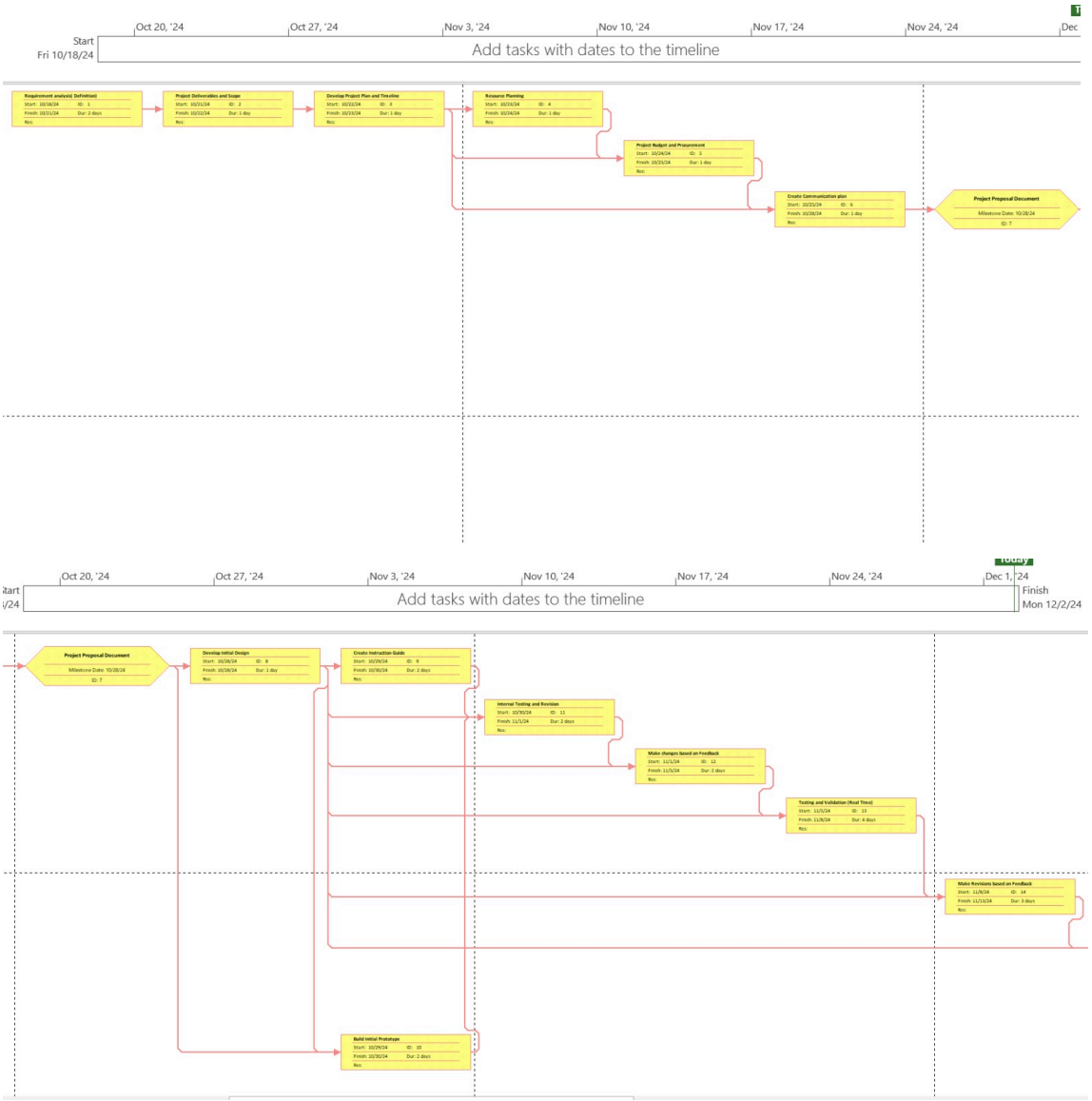
The above image shows the cost breakdown for one STEM activity kit we have designed. This cost was absorbed by the team internally.

Major milestones were identified and total labor hours were calculated in the number of days as shown below.

Milestone	Finish Date
Project Proposal Document	10/22/2024
Execution Deliverables	11/25/2024
Total Labour hours	254

The final CPI and SPI came out as 1 (on time, on budget) even after the delay in external testing around Nov 5th. We rectified this by adding more resources to this activity.

5. **Communication Plan:** We created an effective communication strategy that defined how updates were shared, the frequency of team meetings, and methods for team members and stakeholders to provide feedback.
6. **Review and Approval of Project Proposal:** We prepared a comprehensive project proposal document and presented it to key stakeholders. We received feedback from the SCSRC.
7. **Changes were made according to Board Feedback:** We made adjustments to the project based on feedback from the board, ensuring alignment with their expectations and requirements. The critical path was identified with **key tasks** that require close monitoring to ensure timely project delivery. Below is the critical path with the changes suggested that were incorporated to finish the project as per the guidelines of SCSRC.



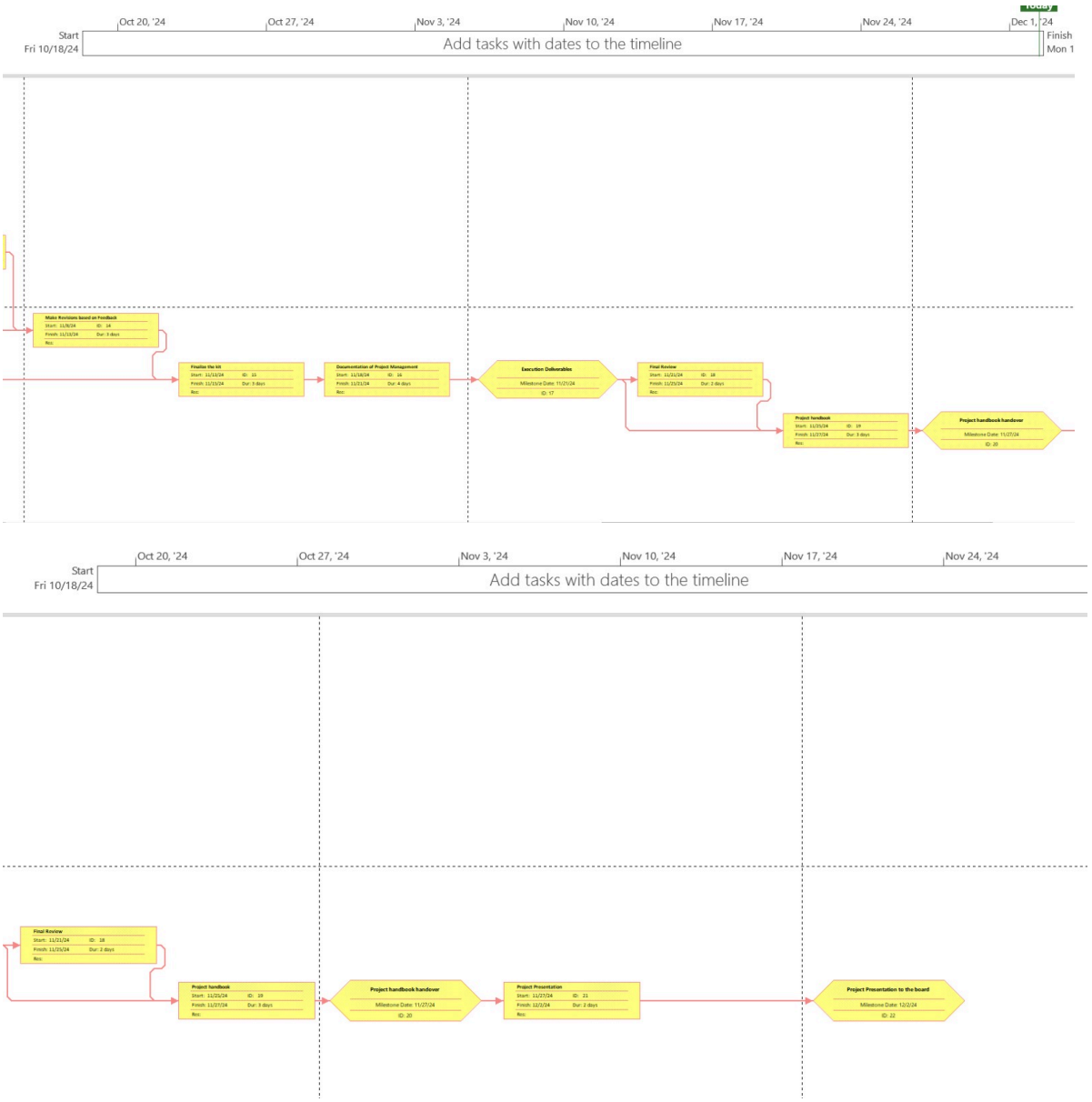


Image showing Critical Path from MS Project

8. **Prototype Development:** We developed a prototype of the activity kit, incorporating the planned features and designs.
9. **Internal Prototype Testing:** We tested the prototype internally to identify any issues or areas for improvement. Necessary changes were implemented to enhance functionality and usability.
10. **Instruction Manual Creation:** We created a clear and detailed instruction manual for teachers to guide them in facilitating the activity effectively.

11. **External Testing:** We tested the activity kit with a group of children to evaluate its effectiveness and engagement. Based on their feedback, further refinements were made.
12. **Final Activity Kit Creation:** We assembled the final version of the activity kit, incorporating all improvements and ensuring it was ready for classroom use.

2. Execution

The Execution Phase is where we bring our STEM activity kit project to life. Below is a step-by-step outline of how this phase will unfold:

1. **Develop Initial Design:** We started the project by drafting the initial project design, including the layout of the activity, its key components, and the specific learning objectives it aims to achieve. This was taken care of by the STEM Curriculum Specialist.

Image shows the Initial Design developed for our STEM Project - Make your house using popsicle stick

2. **Build Initial Prototype:** Once the design was approved, the prototype of the activity kit was constructed by the Design Developer. This hands-on model is helpful to validate our design and identify any potential issues before wider implementation.

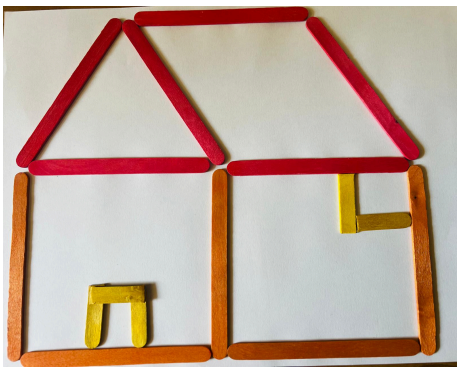


Image shows the Initial Prototype developed for our STEM Project

3. **Internal Testing and Revision:** Internal testing of the prototype is conducted to evaluate its functionality and ease of use within the team by the Quality Assurance Specialist. Feedback from team members is collected and noted.

Image shows Internal Testing Session of our STEM Project - Make your house using popsicle sticks

4. **Incorporate Feedback:** Based on the internal testing feedback, we refined the prototype to enhance its quality, usability, and effectiveness.
5. **Create Instruction Guide:** A comprehensive instruction guide is prepared for both teachers and students. This guide ensures clarity and consistency, enabling participants to engage effectively with the activity.
6. **Real-Time Testing and Validation:** The improved kit undergoes real-time testing in a classroom setting with actual students. This phase is critical to ensure the activity's functionality and assess the overall user experience.

Image shows External Testing Session of our STEM Project

7. **Refinements based on Real-Time Feedback:**
   Feedback from real-time testing is analyzed, and further adjustments are made to optimize the activity and kit for classroom use.

Image shows the Final result of the External Testing Session of our STEM Project

8. **Finalize the Kit:**
   Once all necessary revisions are complete and signed off by the Project Manager, the kit is finalized. This includes assembling all materials, ensuring instructions are clear, and verifying readiness for distribution.

Image shows the Finalized Kit of our STEM Project

9. **Document Project Management:**
   Throughout the process, we documented key activities, decisions, and changes. This record will serve as a valuable resource for future projects and reporting.
10. **Deliver Final Outputs:**
    The finalized kits, along with all accompanying materials for teachers and students, are delivered as per the project plan, marking the completion of the execution phase.

3. Risk Management

Risks were identified at each phase of the project lifecycle and documented along with actionable mitigation strategies to minimize their impact and ensure project continuity. This proactive approach allowed the team to address challenges efficiently and maintain project momentum. Risks were grouped into the below Risk Assessment Matrix to understand the impact and likelihood of each one.

Risk ID	Description	Category	Likelihood	Impact	Risk Score	Mitigation Strategy	Owner	Status
1	Delay in providing the prototype to the QA specialist for real-time testing.	Schedule	High	High	High	Worked overtime and allocated additional resources to expedite prototype completion.	Project Manager	Mitigated
2	Delay in external testing due to not getting permission for an actual school.	External Testing	Medium	High	Medium	Spoke to parents in the neighborhood and arranged for kids in a similar age group to take part.	QA Specialist	Mitigated
3	Activity has to be finished in 30 minutes, requiring adjustments to fit.	Time Management	Medium	Moderate	Medium	Adjusted activity scope for 30-minute sessions.	Design Developer	Mitigated
4	Misalignment with curriculum. Kits were too complicated for younger kids.	Curriculum	Medium	High	Medium	Verified educational standards with teachers and made iterative reviews to simplify kits.	Curriculum Specialist	Mitigated
5	Safety concerns with items in the STEM kit.	Safety	Low	High	Medium	Conducted pre-testing of materials and removed hazardous items like scissors.	Project Coordinator	Mitigated
6	Ensuring availability of school supplies not included in the kit.	Resources	Low	Moderate	Low	Checked with the school to confirm the availability of items such as rulers, glue, and paper.	QA Specialist	Mitigated

Risks and Mitigation Strategies:

1. Risk: There was a delay in providing the prototype to the QA specialist for external testing. This affected the external testing schedule and pushed back timelines for feedback and revisions.

Strategy: Worked overtime to get back on track by allocating additional resources to expedite prototype completion. The delay was minimized, allowing QA testing to proceed with only minor timeline adjustments.

2. Risk: Delay in external testing due to not getting permission for an actual school setting.
Strategy: We identified this risk at an early stage and made necessary arrangements to handle this situation. We spoke to parents in the neighborhood and arranged a few kids in a similar age group 10-12, to take part in this activity.

3. Risk: The activity had to be finished in 30 minutes and we had to cut short some of the steps to fit our activity for 30 minutes.
Strategy: Adjusted activity scope for 30-minute sessions.

4. Risk: Misalignment with Curriculum. Kits were too complicated for younger kids.
Strategy: Verified educational standards with teachers and made changes accordingly to our original design by performing iterative reviews and including changes.

5. Risk: Checking for the safety of the items in the STEM Kit
Strategy: Conducted pre-testing of the materials to ensure safety and usability. We made sure that we were using items that won't cause any harm to the students. Initially, we were planning to provide a pair of scissors for the kids to cut the popsicle sticks but we had to remove it after our testing as we found it as a hazard for the kids.

6. Risk: Making sure of the availability of school supplies
Strategy: We checked with the Elementary school teacher to make sure that the school supplies contained items such as rulers, glue, and paper for conducting the activity in the classroom. These are the items that are not included in the kit that we are providing.

4. Team Collaboration

Team collaboration played a crucial role in the success of our project. We held weekly meetings to stay aligned, share updates, and address challenges. These meetings fostered open communication and ensured everyone was on the same page.

In addition to formal discussions, we established a team ritual to strengthen our bond. Every Tuesday, we would go out for coffee, creating an opportunity for casual conversations and team-building outside of work. This small but meaningful tradition helped boost morale and keep the team engaged.

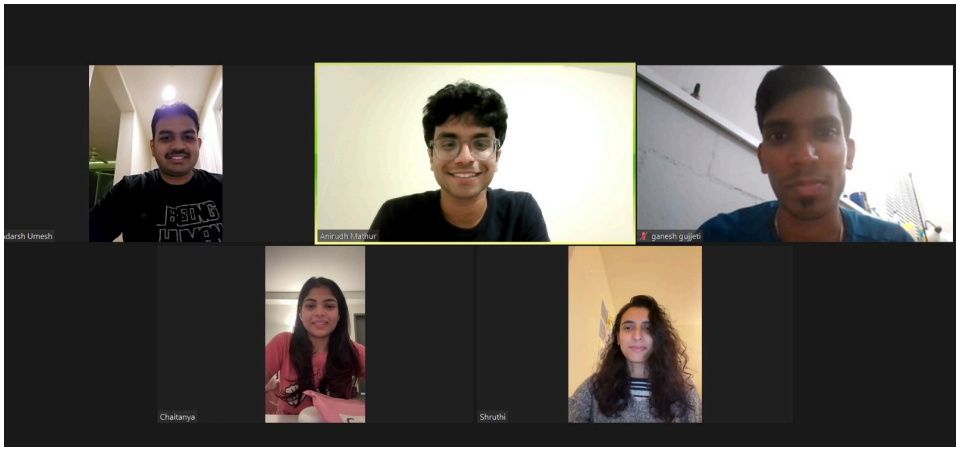


Image shows Zoom Project Meeting conducted to discuss the refinements to the STEM Design

The project manager played an integral role in maintaining balance and efficiency within the team. He divided the work equally, making sure that documentation and presentation tasks were shared fairly among all members. Continuous updates were requested to monitor progress and make adjustments as needed, ensuring that everyone stayed on track and deadlines were met.

We also celebrated milestones and small accomplishments along the way. Whenever we completed a significant phase of the project, we made it a point to acknowledge each other's contributions by congratulating and complimenting one another. This practice reinforced a positive team culture, motivating everyone to continue working hard and supporting each other throughout the project.

Lessons Learned

1. **Clear Communication**

   By refining our communication skills, we ensured clear alignment on goals, timelines, and responsibilities across the team.

   Challenges:

   - There were differing options on the construction method for shapes, some suggested overlaying the popsicle sticks while others suggested sticking them onto paper would work better.
   - There was a misunderstanding on how to assemble the final shape, a few members assumed the house would be glued to one A3 paper, while others believed the shape would be individually assembled and put together.

- There were a lot of ideas floating around and since there was no clear communication on the complexity of the task, the group struggled to agree on how to approach the calculations.

Solutions:

- The group discussed the pros and cons of each method of construction and that enabled us to make a decision.
- We had a group meeting to clarify the process for everyone and to make sure that everyone was on the same page regarding the assembly and the calculations.

2. **Responsibility Matrix**

To provide better structure and clarity in how tasks were assigned and executed individually, we developed a RACI Matrix.

Challenges:

- Without defined roles, multiple members ended up working on the same tasks or assumed it was being handled by someone else, leading to many delays.
- The workload was unbalanced, some people were underutilized while others ended up taking on more tasks.

Solutions:

- We developed a RACI matrix and clearly defined each group member's role and tasks. This minimized confusion and streamlined workflow.

Task/Responsibility	Anirudh	Adarsh	Chaitanya	Shruthi	Ganesh
Project Oversight	A	C	C	C	R
Development of Educational Objectives	I	A	R	I	C
Instructional Material Creation	R	A	I	I	C
Design and Construction of Prototypes	R	C	A	C	I
Testing and Validation	R	C	C	A	I
Quality Assurance Checks	R	C	C	A	I
Project Progress Reporting	A	I	I	I	R
Team Meeting Coordination	A	C	C	C	R
Documentation of Project Process	R	C	I	I	A
Feedback Sessions	A	C	C	C	R

3. Importance of Checklist

We created checklists to reduce errors, improve efficiency, and track the milestones of our project. Creating a checklist ensured that none of our tasks were overlooked.

Challenges:

- The team members missed out on some key steps such as measuring dimensions and ensuring there are sufficient materials leading to errors and delays.
- There was a lack of organization which caused confusion about the sequence of tasks.
- Errors in some tasks went unnoticed until later stages and required us to put in more time and effort into making the corrections.

Solution:

- We created a robust checklist for each task, making it easier for everyone to stay on track with the requirements of the project.
- Creating a checklist ensured uniformity in the process by clarifying the expected standards for each step.

4. **Creation of Project Plan and Critical Path**

   We utilized MS Project in our project, which allowed us to track the project timeline and gave us valuable insights into planning, and tracking.

   Challenges:

   - Many members were not familiar with MS Project, making it difficult to navigate through features like dependencies and timelines.
   - Installation of MS Project led to issues with the accessibility of other software, as everything began to crash afterward.

   Solution:

   - We looked into some videos about MS Project that explained how to create tasks and subtasks, add durations, view the Gantt Chart, and link the tasks to create the Critical Path.
   - To prevent all our laptops from crashing and malfunctioning, we decided to install MS Project on just two laptops.

5. **Risk was Multivariate**

   Risks in any project are not isolated events but rather a combination of factors that can affect multiple aspects of the project.

   Challenges:

   - Handover of the prototype to the person in charge of external testing was delayed due to transportation issues, which was not envisioned by the team, this put our project at risk.

   Solution:

   - Since we had only one person in charge of external testing, we involved more members to combat the delay, doing so we were able to get back on track as per our initial project plan.

Checklists

Checklists are essential for project success, providing structure and clarity at every stage. They help teams stay organized and ensure critical tasks are completed on time. From planning to delivery, checklists clarify objectives and roles, leading to consistent, efficient, and high-quality outcomes. Below are the checklists we developed and maintained throughout the project.

Checklists:

1. **Planning Checklist:**
    - Objectives defined.
    - Roles assigned.
    - Milestones set.
2. **Execution Checklist:**
    - Materials prepared.
    - Instructions reviewed.
    - The testing schedule is finalized.
3. **Post-Testing Checklist:**
    - Feedback collected.
    - Refinements incorporated.
    - Final delivery signed off.

We included all these above items in the table below for ease of documentation.

Phase	Checklist Item	Details	Assigned To	Status
Planning	Objectives Defined	Clearly outline goals, project budget, project plan, and communication plan.	Project Manager (Anirudh)	Done
Planning	Roles Assigned	Assign roles (e.g., Project Coordinator, Quality Assurance Specialist) and communicate responsibilities.	Project Coordinator (Ganesh)	Done
Planning	Milestones Set	Establish milestones for testing, feedback, and delivery phases with specific timelines using MS projects.	Project Manager	Done
Planning	Project proposal approval	Prepare a detailed proposal and present it to stakeholders	Project Manager	Done
Planning	Submitting the proposal to SCSRC	Submitting it to SCSRC and making changes accordingly	Project Manager	Done
Planning	Survey Feedback Analyzed	Review feedback from parent surveys to understand the challenges and preferences of the target audience.	STEM Curriculum Specialist (Adarsh)	Done
Execution	Materials Prepared	Ensure materials (popsicle sticks, rulers, glue, templates, etc.) are available in sufficient quantities.	Project Coordinator	Done
Execution	Instructions Reviewed	Verify the clarity and appropriateness of the instructional guide. Ensure steps are easy to follow for teachers and students.	Quality Assurance Specialist (Shruthi))	Done
Execution	Activity Kit Assembled	Assemble kits with all required materials, and instruction guide.	Design Developer (Chaitanya)	Done
Execution	Prototype Tested (Internal)	Test the activity internally to confirm it works as intended and can be completed smoothly. Make note of any problems that arise and document how they are resolved.	Entire Team	Done
Execution	Testing Schedule Finalized	Plan internal and external testing sessions, setting timelines for feedback collection and refinement.	Project Coordinator	Done

Post-Testing	External Testing	Gather structured feedback from stakeholders (students, teachers, parents) and document areas of improvement.	Quality Assurance Specialist	Done
Post-Testing	Refinements Incorporated	Made adjustments based on feedback, such as improving formulas, and activity components.	Design Developer	Done
Post-Testing	Safety Standards Verified	Verify all materials are safe for Grade 5 students (e.g., non-toxic glue, smooth edges) through testing and approvals.	Quality Assurance Specialist	Done
Post-Testing	Final Delivery Signed Off	Review and finalize activity kits, ensuring all components meet quality standards and project objectives. Get sign-offs from key stakeholders.	Entire Team	Done

Best Practices

- Engage stakeholders early and regularly: Getting everyone involved early on and keeping them in the loop is key to a smooth project. Regular updates and discussions with stakeholders help clarify expectations and allow for course corrections along the way. It also builds a stronger sense of teamwork, ensuring that everyone feels heard and invested in the project's success.
- Prototype and test iteratively to refine the product: Trying things out in smaller steps and testing as you go makes a huge difference. Each round of testing reveals areas for improvement and brings the product closer to what people need and want. It's a great way to catch issues early and make sure the final result is something you're proud of.
- Maintain comprehensive documentation for traceability: Good documentation might not be the most exciting part of a project, but it's a lifesaver. It keeps everyone on the same page and ensures you have a record of what was done and why. Plus, when things get hectic, or someone new joins the team, having everything written down can save so much time and confusion.

Appendices

- Height of a parallelogram formula -what is height of a parallelogram formula?. Cuemath. (n.d.). https://www.cuemath.com/height-of-a-parallelogram-formula/
- IXL: Math, Language Arts, science, Social Studies, and Spanish. IXL Learning. (n.d.) https://www.ixl.com/?partner=google&campaign=71585968&adGroup=127340411978&gad_source=1&gclid=CjwKCAiA3ZC6BhBaEiwAeqfvygi1MHGu4_d2oo2xfnMlX9HMRPgJtYlZmPV7W3YP0Q-4CoiOo4mpFxoCQbAQAvD_BwE

- *Project Management for STEM students*. Study Abroad Programs. (n.d.). https://www.studiesabroad.com/en/destinations/europe/spain/barcelona/international-studies-business--culture/ibry1224/project-management-for-stem-disciplines-610471#:~:text=Project%20management%20is%20of%20paramount,optimizes%20processes%20and%20enhances%20productivity.