Impact of the Joy of Engineering Social Immersion Module on Experiential Learning and Skill Development among First-Year Engineering Students

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***Abstract*—The present work studies the Joy of Engineering (JoE) Social Immersion Module that deals with combining both theoretical knowledge and practical focusing on community. Mixed method approach was used to collect the data. Total 543 participants have taken part in the survey. Quantitative analysis such as descriptive statistics, independent samples t-tests, Pearson's correlations, and Cronbach's Alpha were considered to the study. The qualitative responses were subjected to thematic analysis. The findings indicate that students are consistently very content, as evidenced by average scores exceeding 4.0 across all items, particularly regarding their observational skills, empathy for rural challenges, and willingness to assist with future community initiatives. Female participants have showed better high scores in all the categories and medium effect sizes with improved emotional and collaborative engagement. Positive correlations were observed between perceptions and skill development which clearly shows relation between engagement and competency growth. Among the qualitative tests the effective results are observed in direct communication with locals and the challenges faced by the populations and also the teamwork collaboration. Students were able to bring upon new ideas and fixing the issues for the problems with communication, logistics, and team coordination. Making the field trip longer, more communication and improving the project activities were some of the ideas. Overall, the present work finds that the JoE Social Immersion Module shows good way to teach the students about the community problems and solving them in real life.**

***Keywords*—Community Engagement, Engineering Education, Experiential Learning, Social Immersion.**

I. INTRODUCTION

In the recent years, engineering education has drastically taken a new shape with respect to artificial intelligence. However success doesn't only depend on the technical abilities but on need to get the ability and capacity to handle, resolve the societal challenges equally. There are Global educational frameworks such as National educational policy which works to highlight the need to combine the holistic and multidisciplinary approach to produce the graduates who are socially and emotionally responsible. Traditional approach towards teaching and learning were being during the past days, but skills and social awareness were lacking. To avoid the gap, the institution has introduced the course "Joy of Engineering" (JoE) for first-year B.Tech students as a part of curriculum.

The Social Immersion module was conducted in two semesters:
Semester I - Exploration Tasks: During the first semester, Students go to different regions of the community and map out the issues in regions to learn the essentials about how society operates, what it requires, and what challenges it has.
Semester II—Experience Tasks: Further in second semester, they get more involved by focusing on certain topics, undertaking in-depth problem analysis, and looking into viable technical solutions. For field visits reference photos are attached at the end of the section.

This hands-on, community-based approach connects what children learn in institution to how they can use it in the real world. It helps them learn skills like empathy, problem-solving, working with others, and thinking across disciplines. By dealing with these community related problems during their field work, the students can thus be aware of the societal challenges there by producing long last solutions.
The present study deals with the effectiveness and impact of the introduced module on field learning, societal awareness, building and upgrading the skills that are necessary for engineering practice. It also examines the optimal strategies, challenges, and techniques for adapting and enhancing this model to align with other engineering curriculum. Field visit of

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students is attached below as Fig 1

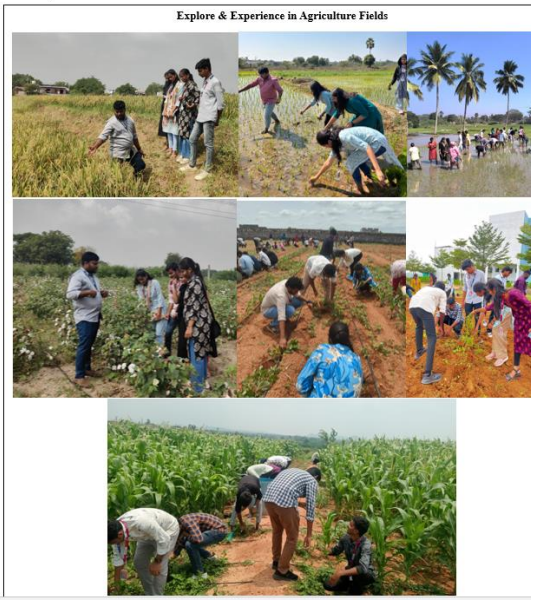

Fig. 1. Few pictures taken during filed visit

II. REVIEW OF LITERATURE

Experiential learning has become a significant part to create a link between theory and practice in engineering education. Kolb's experiential learning cycle includes various phases of experience, observing, conceptualization and experimenting, which makes a strong multiphase learning module. When a curriculum is designed to show importance in identifying the issue before solving it, students can develop a ability to understand the concept and apply the same in practical. (Kolb, D. A. 1984). Replicating and reflecting makes a connecting bridge between the experience and abstraction making the students successful in implementing their ideas. The systematic reviews have shown that community engagement is becoming a crucial aspect in engineering education (Natarajarathinam et al.,2021) recognized common models like service-learning, Engineering Projects in Community Service (EPICS), and capstone partnerships, while showing the major issues such as lack of partner perspective and strict assessment methods.(Tembrevilla et al.,2024) defined experiential learning as a "self–school–community" ecosystem, emphasizing the importance of repetitive cycles of practice and reflection, as well as the necessity for sophisticated assessment procedures to accurately evaluate learning results. These results provide robust support for the implementation of structured reflection as a means to engage students over multiple semesters.
Numerous case studies have demonstrated the practical application of these frameworks. (Godihal and Gopalakrishnan.,2020) described a social immersion project focused on sustainable agriculture. In this project, engineering students met with local farmers in person through field visits and interviews, which helped them understand the context better. (Mehta and Mehta's.,2023) netnographic study revealed that experiential activities, based on Kolb's framework, enhance cooperative learning, relevance, and transparency in student experiences. In progressive phase, (Leidig et al.,2023) integrated the EPICS model into capstone projects, aligning with ABET learning objectives using rubrics specifically prepared for hard challenges. The comprehensive EPICS literature offers operational direction for partner selection, maintaining collaborative teams, and evaluating engineering deliverables (Coyle et.al.,2005). At the same time, researchers have started to mix experiential learning with embedded research methodologies and better ways to test. (Bhogayata et al.,2025) proposed three phase curriculum which includes evaluate, gap analysis and reframing to increase the participation. (Panditrao et al.,2025) showed that structured trips to businesses greatly improved logical reasoning and job abilities, as seen by tests done before and after the visits. (Nagamalla et al.,2024) demonstrated that project-based learning in sustainability contexts enhances creativity, communication, and flexibility, with these conclusions corroborated by community feedback. Bibliometric studies indicate a significant increase in service-learning research after 2010, emphasizing topic clusters related to partnerships, pedagogy, and evaluation on a global scale (Narong and Halliger,2024). Acut's autoethnographic narrative underscores the imperative of thorough preparation, deliberate reflective planning, and curriculum consistency for the efficacy of immersion programs (Acut 2024). Institutional perspectives are crucial; Bandi et al. find out that it is important to have institutional support and the alignment of objectives are highly necessary for the faculty motivation to go to the community engagement. Even the incentives for staff also crucial for a better community program (Bandiet.al.,2024). The introduction of modern technology had increased and widened the evaluating opportunities. Analytics and artificial intelligence have been a key to investigate the scalable and formative feedback and also the leaner behavior (Ifenthaler et al.,2023). Finally, project-based learning shows its impact on the authenticity, and assessment alignment drastically which further improves thinking abilities and preparing for the best outcome (Strobel 2009).

III. NEED FOR THE STUDY

Most of the previous studied experimental models for example service learning, project-based learning, EPICS model are broadly explained and these studies showed short term results but continuous long-term results and engaging the students and effective the engineering students was not so evident. Also, there was lack of assessing the frameworks that could evaluate the behavioral, cognitive results. In underprivileged regions, the partner perspectives were not reflected which in turn effected faculty competencies further lacking the overall priority. Based on the above mentioned problems, there is a need for a research based engineering curriculum that is systematic, assess the results efficiently and a multiphase experimental learning. The proposed module can have long term community involvement and evaluating them on regular bases. Along with regular assessment, it also needs to mention, identify the institutional conditions that inspire teachers for active participation. The present study makes an attempt to fulfill these conditions by improving both theoretical framework and implementing the experimental learning. This strong body of evidence backs up a mixed-methods evaluation methodology that uses surveys, rubric assessments, reflective outputs, and community feedback for experiential learning modules.

IV. OBJECTIVES OF THE STUDY

1. To assess the effectiveness of the JoE Social Immersion Module in improving experiential learning.
2. To assess the degree to which community-based inquiry and experiences foster student engagement, empathy, social consciousness, and critical thinking abilities.
3. To determine the fundamental skills developed through the two-phase immersion model and their relevance to engineering practice.
4. To look at the best ways to carry out the Social Immersion Module and the problems that come up.
5. To suggest methods for expanding and scaling the approach to other engineering programs.

V. RESEARCH METHODOLOGY

The present work includes 543 first-year Bachelor of Technology students from the institution in all fields of engineering. Every student in the Joy of Engineering (JoE) program for 2024–2025 were required to finish the Social Immersion Module. Students were put in small, interdisciplinary groups to work together, learn from each other, and solve problems in different fields. Trained faculty members were assigned to evaluate the students, and the assessment was conducted using standardized rubrics designed for experiential learning.

A. Structure of the Social Immersion Module

The two-semester Social Immersion Module was In the first semester, students look into real-life situations and helped them to identify the social problems. As they explored semi-urban and rural villages, student groups learned about agriculture, farming methods, rural life, business opportunities, and infrastructure such as drinking water, transportation, and drainage, public services for health care and education, Local customs and cultural heritage, Managing natural resources. During these trips, students interacted with different members of the community directly as the institution is collaborated with communities by village adoption partnership (i.e., university community partnership), took field notes, photos, and videos, and put together their first results for analysis.
Phase II: Experience (the second semester) looked more closely at the subjects that were brought up in Phase I. Students went back to their villages to help fix problems through participatory involvement. For example, agriculture teams worked with farmers on irrigation problems or agricultural tasks. Healthcare teams watched doctors or took part in community health programs. Students comprehended contextual challenges and suggested pragmatic, technically feasible solutions tailored to the local environment through immersive engagement.

B. Methods to Collect Data

A standardized survey form was used to collect data from all 560 students following the module. Out of which 543 valid responses were filtered. The survey had five-point Likert scale closed-ended items to measure perceptions, learning outcomes, and shifts in attitude. Used open-ended questions to get qualitative input on the experience of immersion.

C. Analyzing Data:

For qualitative data, manual thematic coding was employed. For quantitative data, Microsoft Excel and IBM SPSS Statistics was used. For all the Likert scale questions, mean and standard deviation were performed. For gender between groups, independent t-tests to look at the differences. Pearson's correlation coefficients were employed to study the significant variable relationships. For open ended responses, thematic analysis was performed to understand the results by interpreting the patterns and the themes.
This mixed-method approach showed how the Social Immersion Module changed how students learned, how they felt about other people, and how aware they were of other people.

VI. LIMITATIONS

1.The present study was limited to an only a single institution, and may not be generalized.
2.The findings observed for the results were self-reported data which can be affected by errors.
3.Short-term assessment prevented evaluation of long-term learning retention.
4. Data collection was restricted to surveys, omitting other qualitative methods.
5.Differences in community contexts led to variability in student experiences.

VII. DATA ANALYSIS

For analyzing both quantitative and qualitative data a mixed-methods approach was employed. Quantitative data were analyzed using IBM SPSS Statistics and Microsoft Excel, while qualitative data were examined through manual thematic coding of open-ended responses. The objective was to consider both measurable trends and in-depth reflections on the Social Immersion Module.

A. Quantitative Analysis

1) Descriptive Statistics

Descriptive statistics were computed to summarize responses to all Likert-scale items. For each variable, the mean and standard deviation (SD) were calculated to determine central tendency and variability.

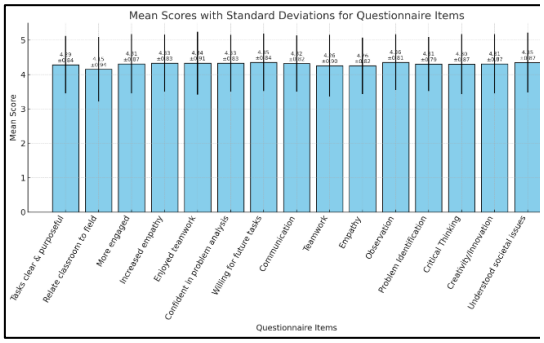

Fig. 2. Mean and Standard deviation for questionnaire items

Interpretation of descriptive statistics

From the above Fig.2, the results shown that students really liked the Social Immersion Module. The average score for all assertions was far over 4 on a 5-point scale. This shows that most of the people who took part agreed or strongly agreed with the claims regarding their experiences. The best scores were for Observation skills (M = 4.36, SD = 0.81), Willingness to take part in similar activities in the future (M = 4.35, SD = 0.83), and Increased empathy toward rural situations (M = 4.33, SD = 0.82). These results indicate that students acquired significant skills and were also inspired to persist in participating in community-based initiatives. The standard deviation shows that the replies were largely low to moderate, which means that most students felt the same way about each question. There was only a little greater variation in a few areas, such Relating classroom learning to field situations (M = 4.15, SD = 0.94). This could suggest that a lot of students were able to quickly connect what they learned in class to what they did in real life, while a smaller percentage found it harder to do so. These results tell a clear story: the curriculum had a big, lasting effect on students, helping them become more empathetic, collaborate better with others, communicate better, and observe and analyze real-world events.

2) Reliability Analysis

Cronbach's Alpha was used to check for internal consistency reliability. The scales and subscales were checked to make sure they were reliable. An α value of .70 or higher was acceptable, .80–.89 was good, and .90 or above was exceptional.

TABLE I
CRONBACH'S ALPHA OF VARIABLES

Variable	Items in SPSS*	No. of Items	Cronbach's Alpha	Reliability Level	Remarks
Perceptions – Overall	Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8	8	0.943	Excellent	Very high internal consistency; scale is highly reliable.
Skills – Overall	S1, S2, S3, S4, S5, S6, S7	7	0.943	Excellent	Very high internal consistency; scale is highly reliable.
Perceptions – Engagement & Relevance	Q1, Q3, Q4	3	0.856	Good	Strong consistency among items; reliable for research use.
Perceptions – Empathy & Social Awareness	Q5, Q7, Q8	3	0.876	Good	Items measure the construct well; scale is reliable.
Perceptions – Task Clarity & Teamwork	Q2, Q6	2	0.808	Good	Good reliability; items consistently measure the construct.

Skills – Interpersonal Skills	S1, S2, S3	3	0.861	Good	Strong reliability; items measure interpersonal skills consistently.
Skills – Cognitive Skills	S4, S5, S6, S7	4	0.920	Excellent	Excellent internal consistency; highly reliable scale.

*Q1 –Q8, S1-S7 in questionnaire attached in appendix

Interpretation of Cronbach's Alpha

A reliability test using Cronbach's Alpha was done on the overall scales and their subscales to make sure that the questionnaire was both consistent and reliable. The results were quite promising. From the results in table. I, it is observed that the overall perception scale (Q1–Q8) and the overall skills scale (S1–S7) both got an alpha value of 0.943, which is very high and shows that they are very reliable. This suggests that the items in each scale worked together very effectively to measure the ideas they were supposed to. The scores for the perception subscales were 0.856 for Engagement & Relevance (Q1, Q3, Q4), 0.876 for Empathy & Social Awareness (Q5, Q7, Q8), and 0.808 for Task Clarity & Teamwork (Q2, Q6). All of these are in the good reliability range, which means that the questions in each group consistently caught the same basic idea.

The skills subscales showed a similar pattern. Interpersonal Skills (S1, S2, S3) had an alpha of 0.861, which means they were very consistent. Cognitive Skills (S4, S5, S6, S7), on the other hand, got a great reliability score of 0.920. In short, these results show that the questionnaire was well-made and that the people who took it answered the questions in a consistent fashion. Because this data is so reliable, you may trust it and use it for more analysis.

3) Inferential Statistics

Separate samples were used t-tests to look at the differences in means between groups, such men and women. The results were given as t-values, degrees of freedom (df), p-values, and effect sizes (Cohen's d).

Interpretation of Gender Differences (Independent Samples t-test)

In the below table II comparison of male and female students' responses to the Social Immersion Module showed consistent and statistically significant differences across all 15 variables that were examined ($p < 0.05$ for each item). In every example, female students did better than male students, which shows that they had a little more positive view of how the module affected

them. The most significant disparity was in comprehending real-world societal difficulties (Male: M = 33.53, Female: M = 35.66, d = -0.38, medium effect size), indicating that female participants may have engaged more profoundly with the societal challenges encountered during field visits. Other significant differences included empathy towards rural difficulties (Mdiff = -0.28, d = -0.36) and team enjoyment (Mdiff = -0.29, d = -0.34), both indicating that female students exhibited greater emotional and collaborative participation in the immersion activities. In areas where students were learning new skills, such communication (Male: M = 4.21, Female: M = 4.45),

TABLE II
INDEPENDENT T-TEST RESULTS PERFORMED IN SPSS

Variable	Male Mean	Male SD	Female Mean	Female SD	t-value	df	p-value	Mean Difference	Cohen's d	Interpretation
Q1: Real-life issues	33.53	6.81	35.66	3.95	-4.263	541	0	-2.12	-0.38263	Medium
Q2: Tasks clarity	4.16	0.97	4.44	0.57	-3.9	541	0	-0.27	-0.35196	Medium
Q3: Relating class learning	4.03	1.04	4.3	0.75	-3.36	541	0	-0.27	-0.29779	Medium
Q4: Engagement vs classroom	4.2	0.97	4.45	0.66	-3.3	541	0.001	-0.24	-0.30135	Medium
Q5: Empathy toward rural issues	4.21	0.96	4.49	0.56	-4.02	541	0	-0.28	-0.35629	Medium
Q6: Team enjoyment	4.2	1.04	4.5	0.66	-3.79	541	0	-0.29	-0.34444	Medium
Q7: Confidence in problem analysis	4.22	0.94	4.47	0.6	-3.5	541	0	-0.25	-0.31704	Medium
Q8: Future participation	4.26	0.93	4.47	0.66	-2.95	541	0.003	-0.21	-0.26042	Medium
Skill: Communication	4.21	0.89	4.45	0.68	-3.5	541	0	-0.24	-0.30303	Medium
Skill: Teamwork	4.15	1.01	4.38	0.69	-2.9	541	0.003	-0.23	-0.26592	Medium
Skill: Empathy	4.17	0.94	4.36	0.59	-2.7	541	0.006	-0.196	-0.24211	Medium
Skill: Observation	4.2	0.92	4.4	0.62	-2.4	541	0.015	-0.171	-0.25495	Medium
Skill: Problem Identification	4.2	0.87	4.41	0.63	-2.8	541	0.005	-0.19	-0.27648	Medium
Skill: Critical Thinking	4.18	0.99	4.44	0.65	-3.4	541	0.001	-0.26	-0.31047	Medium
Skill: Creativity/Innovation	4.19	1	4.46	0.6	-3.6	541	0	-0.26	-0.32742	Medium

critical thinking (Male: M = 4.18, Female: M = 4.44), and creativity/innovation (Male: M = 4.19, Female: M = 4.46), female students likewise gave slightly better scores. The middle effect sizes (Cohen's d ranging from -0.24 to -0.38) show that these differences are significant enough to be seen in real life, even though they weren't very big.
The results, which were all in the middle range, show that gender differences are stable and have a moderate effect. Based on the above results it can be said that female students have gained greater connections especially with regard to empathy, collaboration and awareness of the community when compared to male students. By this analysis the future programs or activities can be reshaped to involve both the male and female students equally while concentrating little more on male students for better engagement and at the same time preserving the female student's concentration.

4) Correlation Analysis

Pearson's correlation coefficients (r) were used to know how the variables are related. The obtained results included size, direction and statistical significance of the variables. Correlation matrix and heat map were used to show these connections.

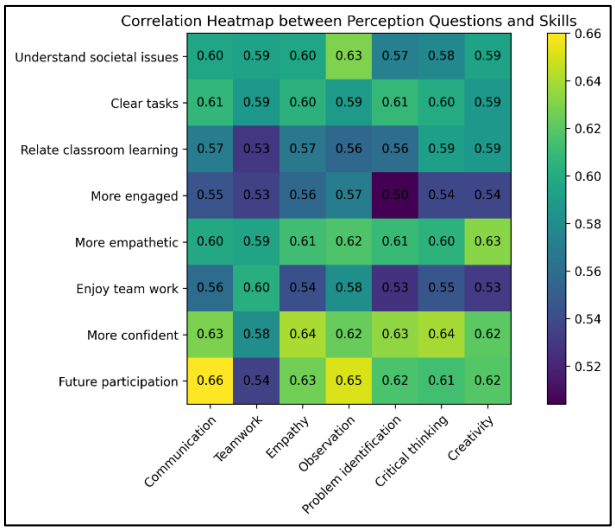

Fig. 3. Correlation Heatmap between questions and skills.

Interpretation of Correlation Heatmap

Fig 3 depicts the heat map shows positive connections between perception items and skill categories which are present in rows and columns respectively. All the obtained values are positive observed ranging from 0.50 to 0.66 indicating better perceptions linked to high skill evaluations. The strongest relation is seen in between the future participation in community tasks and communication with r= 0.66 value and observation with r=0.65. From this one can clearly interpret that people who want to participate in future community tasks are having excellent communication and observation skills. In row seven it can be observed that the results show high value i.e., r=0.64 to both empathy and critical thinking indication that people are more confident with good empathy and have advanced thinking level. In row 5 people who enjoy working are in team together and their observation skills are good. The weakest but still moderate results of connections are observed in row 4. For rest of the items such as understanding the societal issues, clearing the tasks, classroom learning, engagement level for all these the results are positive but bit low when compared to other items. As they are in positive for future tasks increased participation may definitely show upgraded skills. Experiences that help people become more empathetic toward rural issues (row 5) are highly linked to a wide range of skills, especially Creativity/Innovation (r = 0.63) and Observation (r = 0.62). This suggests that empathic reflection helps people acquire a wider range of skills.
The weakest connections are still in the moderate range. For instance, Engagement (row 4) has a weak link to Problem Identification (r = 0.50). The relationship is still positive here, which means that feeling involved still helps skills increase in a meaningful way.
The overall heat map results show that the module's perception measures are linked to majority of the skills in a moderate to strong way. This backs up the idea that more hands-on learning helps students communicate better, work together better, be more empathetic, observe more, find problems, think critically, and be more creative.

B Qualitative Data

1) Theme - Coding and Identification

Theme coding method was used for open ended questionnaire results. First all the comments were read, then filtered them by finding the common terms and words further made them into major themes. After finalizing the themes, common terms are referred as codes and the data is considered for percentage calculation.

1. Most impactful experience during community visit

TABLE III
COMMUNITY VISIT

Theme	Codes	% of Responses
Interaction & Communication with Locals	Talking, listening, asking questions, public speaking	31.30%
Understanding Rural Problems & Lifestyles	Identifying issues, observing daily life, agriculture	19.7%

Teamwork & Collaboration	Group work, leadership, mutual support	13.4%
Emotional Impact & Inspiration	Motivation, empathy, unity	10.5%
Agricultural & Farming Activities	Farming, cattle feeding, soil observation	9.6%
Personal Growth & Skill Development	Communication skills, confidence, empathy	7.9%
Application of Knowledge & Problem-Solving	Engineering solutions, low-cost innovations	5.2%
Cultural & Social Immersion	Traditions, festivals, local crafts	2.4%

2. *Challenges faced & how they were handled*

TABLE IV
CHALLENGES FACED AND HANDLED

Theme	Codes	Responses (%)
Communication Barriers with villagers	Verbal, not willing, accent	33.8%
Teamwork and collaboration	Lack of coordination, unclear roles	20.4%
Low participation in community	People not responding, avoiding to talk	16.7%
Resource & Logistics	Infrastructure, weather, transport	81.2%
Time issues	Short timeline, less hours	6.2%
Information Gaps	Inexperience, lack of technical skills	6.9%
Conflict issues	Not agreeing, inactive members	4.1%
Problem-Solving & Implementing	finding solutions, faculty encouragement	4.7%

3. *Community problem solving*

TABLE V
COMMUNITY PROBLEM SOLVING

Theme	Codes	Responses (%)
Water Issues	Drinking water, purification	31.2%
Waste Management Sanitation	Recycling, public toilets	17.8%
Agriculture and Farming Technology	Smart irrigation, soil testing,	15.4%
Architecture construction	Roads, lights, transport	14.8%
Education online Learning	Digital learning, school facilities	8.0%
Hospital and Medical	Clinics, health camps, awareness camps	6.6%
Environmental Sustainable	Solar energy, tree plantation electrical battery	3.4%
Other Community problems	Employment, awareness, security	2.9%

4. *Perception change with regard to engineering*

TABLE VI
PERCEPTION CHANGE

Theme	Codes	Responses (%)
Change from Theory to Practical Learning	Real life implementation, digital work	27.1%
Social Consciousness & Understanding	Human-centered approach, societal effect	23.9%
Problem-Solving, analyzing	Novelty, logical skills	17.1%
Communication & Teamwork Skills	Teamwork, control	15.2%
Applying ideas to Real world Problems	Practical solutions for daily issues	11.3%
Improved Motivation Commitment	Desire, interest, assurance	4.2%
No Major Change	clear perception	1.5%

5. *Suggestions for improving the module*

TABLE VII
SUGGESTIONS

Theme	Codes	Responses (%)
Time and visits more in fields	More villages, longer stays	30.2%
Increase Hands-On Activities	Real plans, follow-ups	18.7%
Improved Planning & Coordination	Clear instructions, timelines	14.4%
Public Interaction & Association	Cultural understanding, engagement	12.0%
Source & Capacity Expansions	Transport, water, equipment	9.6%
Team Formation & Participation	Smaller teams, choice-based	6.3%
T ask Scheme &Content Quality	Challenging, relevant tasks	5.2%
Assessment & Responsibility	Assessment, feedback	3.7%

Interpretation

The overall results observed in above five tables i.e., from Table III to VIII shows that many people said that their most memorable times were when they talked to locals, learned about their everyday lives, and worked together as a team to solve real-world problems. This was the first time many people had talked to people outside of school in such a close way, and it left a lasting impression. All these experiences made the people to think how crucial is to have empathy, working together as team and listening to others. Most of the students mentioned about the communication problems such as language barriers, villagers hesitant to talk, language accent these problems made students more difficult to identify the problem and also getting the right information. There were hurdles such as insufficient time, bad weather conditions, even the

transportation that impacted the work. To overcome these barriers most of the students started separating them into small groups and asking the faculty members to suggest for the assignments. Most of the students shown interest in solving the practical issues in the village such as drinking water, trash disposing, sanitization, new technology for easy and effective farming, healthcare facilities, solar energy by considering the engineering technological advancements. This connection between the community needs of people in alignment with the engineering technological aspects have more exploration in the future making it remarkable achievement. In traditional education system, engineering is confined to designs and formulas but implementing these techniques in community-based problems will make the difference in real world. Overall, the students expressed their opinions that their teamwork, coordination and analytical thinking have increased by taking part in this course. Even some of them has mentioned that their goals were redefined than previous making a remarkable change. The final suggestions of the students include to increase the time, give a sufficient logistics and transportation and to increase and expand these kinds of field trips to different villagers for larger exposer, and also to increase the activities for further interaction with the villagers. By the findings and recommendations, it is clearly seen that students like to be in taking part of such community activities with make them more engaging and meaning full and also helping the people.

VIII. FINDINGS

The findings of this study unequivocally demonstrate that the JoE Social Immersion Module exerted a significant, affirmative, and sustained impact on students' learning, skill acquisition, and awareness of community issues.

Quantitative data showed that students gave all parts of the module good marks, with average ratings considerably over 4 on a 5-point scale. The three areas with the highest ratings were empathy for the challenges faced by rural communities, a desire to participate in future activities, and observational skills. Cronbach's Alpha is used to examine reliability having great internal consistency for both perception and skill measurements. From the gender analysis it is clearly observed the female students performed well when compared to male students showing stronger connection and enjoyment in working in the community. In correlation study the association between the items and perceptions and skills such as critical thinking, problem identify, are seen. In other words, students' skills improved the more engaged and connected they felt. Qualitative responses supported these conclusions. The most significant events were face-to-face conversations, learning about the challenges faced by rural communities, and collaborating closely with colleagues. Students expressed a desire to address practical issues like water scarcity, waste disposal, and improving farming productivity. This demonstrated their ability to relate engineering knowledge to significant societal issues. Students also discussed issues they encountered, such as logistical challenges, coordination issues, and language barriers. The said challenges were handled with small group formation, team works, analyzing, support of the mentor. To further improve the present work more engaging field trips with longer duration and wide variety of activities in needed.

IX. DISCUSSION

Students expressed their view that the present social immersion course is not only just a visit to the villages but also it helped them to get more connected to the theoretical classes in practical way and changed their view of learning and executing new ideas. In another way it goes in line with Kolb's experiential learning cycle which says that learn when doing the work, think what oneself is doing, and trying out new things.

The program achieved its educational objectives, as evidenced by consistently high ratings and robust reliability scores. The moderate gender disparities in involvement suggest that while the module benefits all learners, there is potential to create activities that appeal uniformly to diverse student demographics, thereby ensuring equitable participation and influence. The findings of gender differences clearly shows the female students showed greater emotional engagement, particularly in empathy, collaboration, and community awareness, compared to male students. This shows that there is a need to incorporate certain strategies to get male students engaged and motivated to work in the community. The connections between perceptions and skills bolster a significant assertion in the literature: when students are genuinely engaged and emotionally invested in their learning, they enhance their professional thinking and actions. In continuous with the previous research, it clearly shows that emotional engagement in community learning will improve logical thinking, creativity. Thus, student improvement reflected how this module positively impacted them. People in the community who interacted with each other directly learned to care about others, understand other cultures, and find a sense of purpose. Engineers work on problems like water, waste, farming, and infrastructure that are very similar to the ones they wanted to solve. These problems are also important for the UN Sustainable Development Goals and sustainable development.

During these community visits, students faced problems for which they have learned how to solve the problem logically adapting to the situations and utilizing the limited resources. Suggestions were given for the future programs to make the activities more in number with longer duration and also to increase the villagers for better exposure and experience.

CONCLUSION

From the initiation of the immersion module in the academics, it has been a great path for the future engineers to become socially aware, learning with joy. The combination of both technical learning along with engaging to people matches with National Education Policy 2020. Overall program success is seen the results obtained in high satisfaction scores, greater connections between perception skills and the qualitative insights. Difference in gender groups indicate that more involvement is necessary so that students can participate in future problems. The point of looking the engineering course has changed from technical aspects to living in the community for making live happier. It clearly shows that it is not only about the new idea generation, but also being responsible towards the society. The overall problem that students deal is transforming the students in a way how to tackle the situation and making the students more adaptable to the situations and issues to find the best solutions. The present immersion module can become one of the best courses in the nation, by focusing more on the more planning, greater collaborations with the community. It is a strong example of how immersive, multi-phase experiential learning may get future engineers ready to solve difficult problems in society with both talent and compassion.

APPENDIX

Section A: Demographic Information

1. Name (optional):
2. Branch of Engineering:
3. Gender: □ Male □ Female □ Other
4. Age (optional):

Section B: Perception and Experience
(Use a 5-point scale: 1 = Strongly Disagree, 5 = Strongly Agree)

Statement	1 2 3 4 5 N/A
Q1. The community visits helped me understand real-life societal issues.	
Q2. The tasks assigned during the visits were clear and purposeful.	
Q3. I could relate classroom learning with the problems I saw in the field.	
Q4. I felt more engaged than in traditional classroom sessions.	
Q5. The immersion helped me become more empathetic toward rural issues.	
Q6. I enjoyed working in a team during the immersion module.	
Q7. I feel more confident in identifying and analyzing real-world problems.	
Q8. I would like to participate in similar community-based tasks in future.	

Section C: Skill Development

Skill	**1 2 3 4 5**
S1. Communication	
S2. Teamwork	
S3. Empathy	
S4. Observation	
S5. Problem Identification	
S6. Critical Thinking	
S7. Creativity/Innovation	

Section D: Open-Ended Questions

1. What was the most impactful experience during your community visit?
2. What challenge did you or your group face, and how did you handle it?
3. What community problem would you like to solve using engineering knowledge?
4. How has this module changed your perception of engineering education?
5. Any suggestions to improve the Social Immersion Module?
6. Any other comments?

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