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Instructional Value and Quality of Science, Technology, Engineering, and Mathematics (STEM) Engagement Activities for Educators

Tulio Sulbaran[1], Sandeep Langar[1], Amani Qasrawi[1]
[1]University of Texas at San Antonio

Science, Technology, Engineering, and Mathematics (STEM) education is critical as it equips students with the skills needed to succeed in a rapidly evolving, technology-driven workforce. Central to this effort are K-12 educators, who play a pivotal role by translating complex STEM concepts into engaging, accessible learning experiences that inspire curiosity and critical thinking among students. The K-12 educators' ability to connect STEM content to real-world applications is essential for preparing them to thrive in future academic and career pathways. Therefore, the objective of this study is to examine the instructional value and quality of various STEM engagement activities designed for K–12 educators as a part of a one-week workshop. Through structured feedback from participants (K-12 educators), the study evaluated multiple hands-on and experiential learning activities across two key dimensions: Instructional Value (IV) and Instructional Quality (IQ). Data were collected using a standardized online evaluation instrument, enabling comparative analysis of educator perspectives across twelve distinct STEM activities. Findings indicate that activities were well received, perhaps because they were directly linked to real-world STEM careers, such as job shadowing and site visits. Additionally, K-12 educators who participated in the study rated the activities that emphasized teamwork and problem-solving very highly.

Keywords: K-12 Educators, Professional Development, Program Evaluation, STEM Activities, Teachers' Workshop

Introduction

In an age characterized by rapid technological progress and a continuously transforming global economy, equipping students for future employment is of utmost importance (Doly, 2024). K-12 Science, Technology, Engineering, and Mathematics (STEM) education has emerged as a pivotal foundation for equipping students with the competencies and knowledge required to excel in this competitive workforce landscape (Doly, 2024). Therefore, Professional Development (PD) for effective K-12 educators is crucial to bridge classroom instruction with real-world industry demands. However, the investment in PD may not guarantee a substantial return (Daniels et al., 2022). Therefore, PD must be rigorously evaluated based on educators' perceived value and quality to ensure successful curriculum enhancement. Furthermore, most PD have seven elements that focus on: content-focused learning, active learning, collaboration, modelling, coaching and expert support, feedback and reflection, and sustained duration (Daniels et al., 2022), without necessarily providing industry exposure and practical applications.

This study reports on the initial evaluation of the STEM Educators Summer (E-Sum) Workshop, a PD experience designed to equip a diverse group of K-12 educators and counselors with direct insights into contemporary STEM careers and innovative pedagogical methods. The workshop's structure emphasized practical, hands-on learning, including job shadowing, industry professional roundtables, and the development of instructional modules.

The primary objective of this study was to conduct a descriptive quantitative assessment of the immediate participant perspective with the workshop's activities, focusing on two core measures: (1) Instructional Value and (2) Instructional Quality. By analyzing these metrics across all workshop activities, this research aims to identify a successful model of professional development that directly supports educators in enhancing curriculum and improving career-readiness outcomes for a large student population.

Literature Review

The prosperity of the modern workforce and the capacity for national innovation can be linked to the quality of STEM education. Educators play a vital role in STEM Education; however, scientific and engineering skills development presents a challenge for teachers (Christian et al., 2021). Therefore, high-quality PD is essential for teachers to engage with their learning, to try it out in their classrooms, and to integrate it into their instructional routine (Desimone, 2023). Effective STEM PD must go beyond content; it must be valuable and of high quality, foster an understanding of current industry trends and real-world value to enable educators to translate complex concepts into applicable and engaging activities for their students.

A persistent critique of traditional educator-focused PD is that it separates learning from real day-to-day workplace contexts and the learning needs of professionals (Holdsworth et al., 2022). To address this, contemporary PD models advocate for experiential learning opportunities that place educators directly into professional contexts. Industry engagement activities, such as job shadowing and professional mentorship, are critical for improving educators' self-efficacy in delivering career-readiness content. Educators with rich industry experience often include more descriptive examples of real-world applications when defining skills for industry-specific tasks (Hu et al., 2019).

Literature strongly supports the use of experiential learning, such as Project-Based Learning (PBL), Inquiry-Based Learning (IBL), and hands-on simulations, as superior instructional techniques for STEM disciplines. PBL significantly improved students' learning outcomes and positively contributed to academic achievement, affective attitudes, and thinking skills, especially academic achievement (Zhang & Ma, 2023). Findings indicate that IBL positively impacts students' critical thinking skills, motivation, and academic performance (Sam, 2024). Hands-on simulation provides a way for students to engage in the classroom, increasing their attention and interest (Aqlan & Zhao, 2022).

Although there is no standard approach to evaluate educators’ PDs, multiple models exist, such as: Guskey's Five-Level Model (Firman et al., 2022), Huber's Model (Huber, 2011), Adey's Model of Factors (Adey et al., 2004), and Kirkpatrick's Model of Evaluation (Kirkpatrick & Kirkpatrick, 2006), among others. The model used in this study to evaluate the PD was Kirkpatrick's Model, more specifically, level 1. Level 1 of the Kirkpatrick Model was used to assess participants’ immediate satisfaction and perceived value (Reaction). This practical, cost-effective approach provides rapid post-activity feedback essential for improving future professional development.

Methodology

A quantitative research methodology was used to evaluate (1) Instructional Value (IV) and (2) Instructional Quality (IQ) of STEM Activities for teachers and counselors. Teachers and counselors were recruited in partnership with the Texas State Region 20 via conference presentation, mailing list, direct e-mails, and phone calls. The data were collected through anonymous participant evaluation surveys using Qualtrics and analyzed using Key Performance Indicators (KPIs) for each activity. The data was analyzed through measures of central tendency and variability.

The data collection instrument consisted of an online survey administered at the conclusion of each day. The instrument utilized a Likert-type scale, where a score of 1 represented the highest/top possible rating (e.g., "Excellent" or "Strongly Agree"). Five KPIs were collected:

1. *Usefulness of content:* Measures the practical benefit of the material. It answers the question: How helpful and immediately applicable is the content of the activity?
2. *Importance of content:* Quantifies the significance of the content. It answers the question: How crucial is the knowledge or skill for the participant's career, education, or professional development?
3. *Delivered Clearly & Organized*: Assesses the quality of the execution and presentation of the activity. It evaluates whether instructions, materials, and the flow of the session were logical, structured, and easy for participants to follow. A top score means the delivery minimized confusion and maximized the efficiency of the learning process.
4. *Communicated the Importance:* Assessed how effectively the presenter motivated participants by explaining the activity's relevance to future careers or professional growth. A top score indicates participants clearly understood the purpose and value of their effort.
5. *Overall Rating:* Represents the participant's holistic view of the activity delivery. A top score signifies that the presentation was of high quality

These five KPIs were grouped into Instructional Value (IV) and Instructional Quality (IQ). IV assessed the intrinsic worth and relevance of the material and included "*Usefulness of content and Importance of content*." IQ evaluated the effectiveness of delivery and execution, including "*Delivered clearly & organized, Communicated the importance, and Overall rating*."

Data analysis consisted of descriptive statistics (central tendency and variability) for the five KPIs across the twelve workshop activities. Eleven of those activities are presented in this paper due to length limitations. The central tendency measurements were the Maximum (Max.), Minimum (Min.), Mode, Median, and Mean. The variability measures included Interquartile Range (IQE), Variance, and Standard Deviation (SD). The Mode and Median were used to identify the most frequent and central scores, while the Mean indicated the overall average rating. SD and Variance assessed the degree of consensus among participants, with lower values indicating stronger, more uniform agreement.

Results

The workshop attracted ten educators and counselors from Independent School Districts. The majority (80%) were STEM teachers, and the remainder (20%) were counselors. The participants were high-impact educators, with seven out of ten mentoring over 140 students in the prior year. Their professional goals focused primarily on curriculum enhancement, PD, and student career readiness.

Job Shadowing

The *Job Shadowing* activity served as the workshop's first session and exposed participants to the STEM industry. Five STEM industry partners (profit and non-profit organizations) hosted the

educators for two days. During the time, participants closely followed industry professionals and were immersed in various business aspects. Their activities included gaining an up-close look at different career opportunities and job roles, participating in official site visits to company facilities, and engaging in hands-on activities. The activity was evaluated as exceptionally successful by the participants (Table 1). The consistent Mode and Median of 1 across all KPI highlight a consensus among participants that the experience exceeded expectations. The Mean scores (1.11-1.22) validate this strong positive rating. Moreover, the IQE of 0.00 across all metrics and the minimal SD values indicate virtually no variance in scores, confirming that all participants rated activity highly.

Table 1. Job Shadowing Key Performance Indicators (KPI)

	Max.	Min.	Mode	Median	Mean	IQE	Variance	SD
Usefulness of content	2	1	1	1	1.11	0.00	0.11	0.33
Importance of content	2	1	1	1	1.11	0.00	0.11	0.33
Delivered clearly & organized	3	1	1	1	1.22	0.00	0.44	0.67
Communicated the importance	2	1	1	1	1.22	0.00	0.19	0.44
Overall rating	3	1	1	1	1.22	0.00	0.44	0.67

Bingo

The *Bingo* activity was designed to develop Professional Marketable Skills (PMS) and facilitate participant introductions. Customized Bingo cards were generated, incorporating personal facts. Participants shared details about themselves (e.g., hobbies, interesting facts), and others marked matching information on their cards. Rules required that only information shared by others could be used. Winners were the first to complete a horizontal, vertical, or diagonal row, or the first to cover all boxes. For this activity, polarized responses were received (Table 2). Although the Mode was one across 4 of 6 metrics, the overall results showed some disagreement among participants. The high measures of spread, specifically the Variance (up to 0.77) and the large IQE (1.75), for "*Importance of content*" and "*Experience*" categories, indicate that scores were widely dispersed, suggesting that while many participants rated the activity highly, some participants found its importance to be lesser.

Table 2. Bingo Key Performance Indicators (KPI)

	Max.	Min.	Mode	Median	Mean	IQE	Variance	SD
Usefulness of content	3	1	1	1.50	1.70	1.00	0.68	0.82
Importance of content	3	1	1	2.00	1.90	1.75	0.77	0.88
Delivered clearly & organized	2	1	2	1.50	1.50	1.00	0.28	0.53
Communicated the importance	3	1	1	1.50	1.60	1.00	0.49	0.70
Overall rating	3	1	1	1.50	1.70	1.00	0.68	0.82

Higher Education Pathways

The *higher education pathways* activity aimed to have participants identify the necessary steps to pursue a successful STEM career(s). Participants began by choosing a specific STEM career, then used the internet to identify at least five universities or community colleges offering aligned programs. The participants outlined a complete career path, indicating recommended high school preparation, the necessary education (degrees and certifications), and the professional career path (entry-level roles and required skills). Finally, participants presented their pathways to the class. The evaluation data indicate that participants overwhelmingly rated the session activity as excellent (Table 3). All five metrics registered a Mode and Median of 1.00, underscoring strong positive feedback. Mean scores (1.30-1.50) were consistently low, indicating that the activity's perceived value and quality were well received. Furthermore, the low SD and Variance across all indicators suggest a high degree of uniformity and agreement in participant satisfaction with the activity.

Table 3. Higher Education Pathways Key Performance Indicators (KPI)

	Max.	Min.	Mode	Median	Mean	IQE	Variance	SD
Usefulness of content	2	1	1	1.00	1.40	1.00	0.27	0.52
Importance of content	2	1	1	1.00	1.40	1.00	0.27	0.52
Delivered clearly & organized	2	1	1	1.00	1.30	0.75	0.23	0.48
Communicated the importance	2	1	1	1.00	1.40	1.00	0.27	0.52
Overall rating	2	1	1	1.00	1.40	1.00	0.27	0.52

STEM Industry Professionals Round Robin

The *STEM Industry Professionals Round Robin* session identified the duties, responsibilities, industry opportunities, and required skillsets associated with various STEM careers. The activity used a rotational format where participants, in small groups, rotated among four tables hosted by Industry Professionals. Each rotation involved a brief five-minute career description followed by a ten-minute Q&A segment. This rotational process was completed three times, providing teachers with direct industry insights. The results indicate that the activity was successful in achieving top-tier scores uniformly (Table 4). All KPI show a Mode and Median of 1.00, meaning the highest rating was the most common and central score. The tight grouping of ratings is evidenced by minimal dispersion metrics, such as the low SD (min. 0.48) and the minimal IQE (0.75 for 'Delivered clearly & organized'), which confirm that participants were satisfied with the value and quality of the session.

Table 4. STEM Industry Professionals Round Robin Key Performance Indicators (KPI)

	Max.	Min.	Mode	Median	Mean	IQE	Variance	SD
Usefulness of content	2	1	1	1.00	1.40	1.00	0.27	0.52
Importance of content	2	1	1	1.00	1.40	1.00	0.27	0.52
Delivered clearly & organized	2	1	1	1.00	1.30	0.75	0.23	0.48
Communicated the importance	2	1	1	1.00	1.40	1.00	0.27	0.52
Overall rating	2	1	1	1.00	1.40	1.00	0.27	0.52

Build the Tower

The *Build the Tower* activity's objective was to have teams apply problem-solving skills to design, budget, and construct a two-foot tower. Teams of 3 to 4 participants were first given 10 minutes to design the tower, calculate the quantities of the materials needed, and determine the total cost. After purchasing materials from a vendor station, teams had 20 minutes to construct the tower. The final tower had to be free-standing, built only with purchased materials, and capable of holding one Marshmallow at the top for 60 seconds. The winners were the team with the lowest cost, the best quality, and the shortest time. This activity was generally well-received, but with a more moderate and varied evaluation compared to other activities (Table 5). The mode and median were 2 and 1.5, respectively, across all KPI, suggesting a positive but not top-tier overall rating. The key finding is the relative dispersion of the scores: the SD (0.53 for most metrics) and the IQE (1.00) indicate activity's value and quality were less uniform than in other sessions.

Table 5. Build the Tower Key Performance Indicators (KPI)

	Max.	Min.	Mode	Median	Mean	IQE	Variance	SD
Usefulness of content	2	1	2	1.50	1.50	1.00	0.28	0.53
Importance of content	2	1	2	1.50	1.50	1.00	0.28	0.53
Delivered clearly & organized	2	1	2	1.50	1.50	1.00	0.28	0.53
Communicated the importance	2	1	2	1.50	1.50	1.00	0.28	0.53
Overall rating	2	1	2	1.50	1.50	1.00	0.28	0.53

Field Trip

The *Field Trip* was held at the Museum of Science and Technology. Museum exhibits and activities covered a wide range of STEM topics, including robotics, surgery, construction in space, autonomous driving, 3D Printing, and others. The field trip's goal was to provide participants with the opportunity to experience a place where they could take their students. Field Trip received a near-unanimous rating, confirming its success as a program component (Table 6). Mode and Median were 1.00 across all metrics, and the Mean scores were exceptionally low (1.20-1.50), indicating that participants overwhelmingly agreed that the experience was excellent. The data is characterized by extremely low measures of dispersion, particularly the IQE (0.00) and the SD (0.42) for the 'Communicated the importance' metric, highlighting an exceptionally tight cluster of higher scores.

Table 6. Field Trip Key Performance Indicators (KPI)

	Max.	Min.	Mode	Median	Mean	IQE	Variance	SD
Usefulness of content	2	1	1	1.00	1.30	0.75	0.23	0.48
Importance of content	3	1	1	1.00	1.50	1.00	0.50	0.71
Delivered clearly & organized	2	1	1	1.00	1.30	0.75	0.23	0.48
Communicated the importance	2	1	1	1.00	1.20	0.00	0.18	0.42
Overall rating	2	1	1	1.00	1.30	0.75	0.23	0.48

Pursue STEM - Treasure-Hunt

The *Pursue STEM* - Treasure-Hunt online activity was a scavenger hunt for the participants that focused on locating key university resources for student success. Participants had to find specific website names or locations by answering prompts covering topics such as applying for scholarships, locating academic advisors, accessing tutoring services, and others. The activity received a strong positive evaluation, with Mode being 1 for four of the five metrics (Table 7). However, there is evidence of some deviation from the highest scores. The persistent IQE (1.00) across all categories, combined with an SD (up to 0.73) for 'Importance of content' and 'Overall rating,' indicates that scores were somewhat distributed. This suggests that while most participants found the content highly useful, a segment rated the activity less favorably.

Table 7. Pursue STEM - Treasure-Hunt Online Key Performance Indicators (KPI)

	Max.	Min.	Mode	Median	Mean	IQE	Variance	SD
Usefulness of content	2	1	1	1.00	1.44	1.00	0.28	0.53
Importance of content	3	1	1	1.00	1.56	1.00	0.53	0.73
Delivered clearly & organized	3	1	1	2.00	1.67	1.00	0.50	0.71
Communicated the importance	3	1	1	2.00	1.67	1.00	0.50	0.71
Overall rating	3	1	1	1.00	1.56	1.00	0.53	0.73

Card Pyramid

The *Card Pyramid* activity contributed towards Professional Marketable Skills by requiring participants to build a four-level pyramid using provided jumbo playing cards in teams. The activity had a brief planning phase (1–3 min.) to assign roles and outline the method, followed by a construction phase (12–15 min.). The activity winner was the team that successfully built the complete four-level structure in the shortest time, or the one with the tallest standing structure if no team completed it. While metrics like 'Usefulness' and 'Overall rating' showed a Mode and Median of 1.00 and relatively low SD, the scores for 'Importance of content' and 'Experiences' exhibited extreme variation (Table 8). These categories recorded the highest SD (1.30 and 1.32) and Variance (up to

1.75) among the KPIs, suggesting that participants strongly disagreed about the activity's value and the overall quality of the experience.

Table 8. Card Pyramid Key Performance Indicators (KPI)

	Max.	Min.	Mode	Median	Mean	IQE	Variance	SD
Usefulness of content	2	1	1	1.00	1.44	1.00	0.28	0.53
Importance of content	5	1	1	1.00	1.78	1.00	1.69	1.30
Experiences of the participant	5	1	1	1.00	1.67	1.00	1.75	1.32
Delivered clearly & organized	3	1	1	1.00	1.56	1.00	0.53	0.73
Communicated the importance	3	1	1	1.00	1.44	1.00	0.53	0.73
Overall rating	2	1	1	1.00	1.33	1.00	0.25	0.50

Poly Bridge

The *Poly Bridge* activity was categorized under the STEM skill area and required participants to apply physics, forces, and materials knowledge to build bridges in a digital simulation. The activity lasted 25 minutes and was performed on iPads. Participants worked on their own bridge in a virtual environment and were encouraged to share strategies and construction techniques with their peers after completing a level. The participant who achieved the highest level within the allocated time was the activity winner. Participant ratings for the Poly Bridge activity reveal a strong, positive response with significant internal consistency across all metrics (Table 9). The Mode and Median were 1.00 for all KPI, reflecting overwhelming satisfaction. The measures of dispersion were identical and low across all categories, with a consistent SD (0.73) and Variance (0.53), indicating consensus on the activity's value and quality and a uniform degree of rating spread across all aspects measured.

Table 9. Poly Bridge Key Performance Indicators (KPI)

	Max.	Min.	Mode	Median	Mean	IQE	Variance	SD
Usefulness of content	3	1	1	1.00	1.56	1.00	0.53	0.73
Importance of content	3	1	1	1.00	1.56	1.00	0.53	0.73
Delivered clearly & organized	3	1	1	1.00	1.56	1.00	0.53	0.73
Communicated the importance	3	1	1	1.00	1.56	1.00	0.53	0.73
Overall rating	3	1	1	1.00	1.56	1.00	0.53	0.73

Instructional Techniques and Curriculum Development

The activity on *Instructional Techniques and Curriculum Development* exposed educators to innovative methods, such as Gamification and PBL/IBL, for developing course blueprints. The core practical exercise, the "Launch Pad – Module Development," required participants to create a comprehensive module blueprint for their classroom, detailing elements such as the Module Description, Learning Objectives, Skills Set, Instructional Materials, planned Learning Activities and Learner Interaction, and appropriate Assessments and Feedback. All six KPI reported a Mode and Median of 1.00, indicating the best possible rating was the most frequent and central score (Table 11). The Mean scores were uniformly low at 1.44. Crucially, the Variance (0.28) and SD (0.53) were identical and minimal across all metrics (Table 10). This consistency underscores participants' unanimous agreement on the high value and quality of the session.

Table 10. Instructional Techniques and Curriculum Development Key Performance Indicators

	Max.	Min.	Mode	Median	Mean	IQE	Variance	SD
Usefulness of content	2	1	1	1.00	1.44	1.00	0.28	0.53
Importance of content	2	1	1	1.00	1.44	1.00	0.28	0.53
Delivered clearly & organized	2	1	1	1.00	1.44	1.00	0.28	0.53
Communicated the importance	2	1	1	1.00	1.44	1.00	0.28	0.53
Overall rating	2	1	1	1.00	1.44	1.00	0.28	0.53

Module Development

The *Module Development* activity required participants to design a comprehensive course blueprint for their respective classrooms using a standardized template. The completed module was required to specify all foundational elements, including the module title and description, a complete list of learning objectives, the associated Soft or Hard STEM Skills being taught, and the instructional materials. Furthermore, the educators had to clearly define the planned learning activities and learner interaction, the precise assessment method, and the feedback type. This activity received a near-perfect evaluation, with participants reporting overwhelming satisfaction (Table 11). The Mode and Median were 1.00 for all KPI, supported by exceptionally low Mean scores (1.44). The measures of dispersion—IQE (1.00), Variance (0.28), and SD (0.53) were identical across all indicators, demonstrating consensus among participants.

Table 11. Module Development Key Performance Indicators (KPI)

	Max.	Min.	Mode	Median	Mean	IQE	Variance	SD
Usefulness of content	2	1	1	1.00	1.44	1.00	0.28	0.53
Importance of content	2	1	1	1.00	1.44	1.00	0.28	0.53
Delivered clearly & organized	2	1	1	1.00	1.44	1.00	0.28	0.53
Communicated the importance	2	1	1	1.00	1.44	1.00	0.28	0.53
Overall rating	2	1	1	1.00	1.44	1.00	0.28	0.53

Instructional Value

Instructional Value (IV) refers to the inherent, intrinsic worth and long-term relevance of the material being taught, focusing exclusively on the activity's content rather than its delivery. It is a measure of the educational merit and session utility, reflecting how participants perceive the practical usefulness of the skills and information for their immediate application, and the foundational importance of that content for their enduring professional or educational success. Essentially, the IV answers the question: "*Was the content itself valuable to me?*" and is a gauge of how well the subject matter contributes to the participant's overall objectives. In this research, the KPI used to measure IV was "*Usefulness of content*" and "*Importance of content*," and the content was viewed as exceptionally valuable (Table 12). Both indicators registered a Mode and Median of 1, reflecting a strong, near-unanimous rating, and both achieved excellent Mean scores (1.46 and 1.52). Notably, the SD for "Importance of content" (0.69) was marginally higher than for "Usefulness of content" (0.58). This slight increase in variability suggests a minor difference in participants' opinions regarding the instructional value of the content, despite acknowledging the value of the activities.

Table 12. Instruction Value of All Activities Key Performance Indicators (KPI)

	Max.	Min.	Mode	Median	Mean	IQE	Variance	SD
Usefulness of content	3	1	1	1	1.46	1.00	0.34	0.58
Importance of content	5	1	1	1	1.52	1.00	0.48	0.69

Instructional Quality

Instructional Quality (IQ) refers to the effectiveness of the delivery, assessing how well the educational content was conveyed to the participants. It is a set of measures that assesses the execution, clarity, and presentation skills used during the session, independent of the material's intrinsic worth. IQ corresponded to the KPI: "*Delivered clearly & organized, Communicated the importance*, and *Overall rating*." The highest score signifies a well-managed, clear, and engaging learning experience in which the instruction was successful and of the highest quality (Table 13). All three quality metrics consistently achieved a Mode and Median of 1, with Mean scores tightly clustered between 1.44 and 1.47. This consistent data pattern signifies that the instruction was perceived as highly effective, clear, and well-framed. The uniformly low Variance (0.32-0.38) and SD (0.56-0.61) across all measures confirm a robust consensus among participants that the instructional quality met the highest standards.

Table 13. Instructional Quality of all Activities Key Performance Indicators

	Max	Min	Mode	Median	Mean	IQE	Variance	Std Dev
Delivered clearly & organized	3	1	1	1	1.45	1.00	0.34	0.58
Communicated the importance	3	1	1	1	1.44	1.00	0.32	0.56
Overall rating	3	1	1	1	1.47	1.00	0.38	0.61

Summary

The STEM Educators Summer (E-Sum) Workshop effectively equipped educators and counselors with industry insights and practical teaching strategies, serving as a strong professional development model for improving curriculum and career readiness. Participant evaluations were highly positive, with Mean scores of 1.44–1.52 and a unanimous top rating (Mode and Median = 1.00) for IQ and IV, confirming the program's clear and valuable content. Activity analysis identified two components as especially strong in real-world relevance and instructional usefulness.

(1) Real-World Value: The activities designed to connect educators with the professional STEM environment were rated highest with the least variation. The job shadowing experience, STEM industry professionals round robin, and the field trip garnered near-perfect scores, demonstrating their critical role in providing direct, actionable, and unanimously valued insights into career readiness.

(2) High Instructional Utility: Practical application and curriculum-focused activities, such as the Instructional Techniques and Curriculum Development session, the culminating Module Development activity, and the Poly Bridge simulation, also achieved exceptional results. These sessions showed identical, minimal dispersion, indicating complete consensus on their high quality and immediate applicability to the participants' professional goals of curriculum enhancement.

Based on the results, educators are encouraged to prioritize industry-connected experiences such as job shadowing, industry round robins, and field trips, as these activities demonstrated the strongest real-world relevance and consensus in value.

The interpretation of these highly positive results must acknowledge some limitations. The study's small sample of only ten educators limits the generalizability of the findings. The sole reliance on self-reported ratings introduces potential bias. Future research could expand the number of participants and workshops to increase representativeness. Studies could incorporate objective pre- and post-tests to accurately quantify gains in industry knowledge and instructional design competence, providing a more robust measure of effectiveness. Lastly, a longitudinal impact study

could help determine the instructional value and quality of activities beyond immediate self-reported ratings.

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