

Unveiling Experiential Learning: Saudi Female Undergraduates' Perceptions and Challenges in the Marshmallow Challenge within OB Class

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Abstract: The Marshmallow Challenge, a popular activity in classrooms and team-building exercises in offices promotes teamwork, communication, and collaboration. Despite its widespread use, its application within the Saudi educational context remains underexplored. Therefore, this research delves into the experiences and perceptions of 43 Saudi female undergraduate students participating in the Marshmallow Challenge in Organizational Behaviour (OB) class at the University of Hail, Saudi Arabia. Utilizing semi-structured interviews, the study aims to understand the nuances of this experiential learning activity, focusing on teamwork, communication, leadership, collaboration, and related responses. The findings reveal a spectrum of reactions from initial apprehension and nervousness to subsequent collaborative problem-solving and reflection. Ultimately, this research paper contributes to the broader literature on experiential learning in OB education, offering educators actionable insights to optimize student engagement, collaboration, and skill learning.

Keywords: collaborative problem-solving, experiential learning, marshmallow challenge, organizational behavior.

1 INTRODUCTION

The Marshmallow Tower Challenge (also called Spaghetti Tower) focuses on a competitive and problem-solving approach that emphasizes creativity and innovation [1]. Developed by Peter Skillman at Stanford University, this activity tasks participants with building the tallest freestanding structure using spaghetti sticks, tape, and a marshmallow within a specified timeframe [2]. While the goal of this activity might appear easy and simple, this fosters a depth of learning. As teams, navigate the iterative planning process, using problem-solving, critical thinking, and collaboration to achieve the task [3]. This activity mimics the challenges faced in organizational settings, where adaptability, communication, and teamwork are crucial for success [4][5][6][7].

Below few studies focusing on marshmallow activity on student learning that offer valuable insights into design thinking, experiential, and active learning. In general, Hughes & Denson advocate for the use of the scaffold for teaching; it can be implemented during a tower design challenge [8]. Furthermore, Elsbach & Stigliani [4] and Micheli et al. [9] underline the correlation between design thinking and organizational structure/culture, interpreting how the Marshmallow Challenge cultivates organizational culture and psychological empowerment within educational environments. Additionally, Paulus and Brown [10] and Dorst [11] delve into strategies for understanding that group activities like the Marshmallow challenge can cultivate design-thinking skills like ideation, iteration, and connectivity. In link to group connectivity, Tuckman's [12] classic model of group development (Forming, Storming, Norming, Performing, and Adjourning) can provide insights into the stages teams might go through during activities like the Marshmallow Challenge.

In specific to the marshmallow challenge, Kiyani et al. developed creative and multimodal STEM lesson plans for an interactive experience and to engage and spark the interest of slum underprivileged students (2 -5 grade) in Pakistan, they started with a 'Break the Ice' session, which include Marshmallow tower building activity in groups of 3-4 students each [6][7]. Throughout the activities, students are provided with scaffolding tips, and participant observations are recorded to evaluate their performance. Condoor and Keogh [13] use weekly innovation challenges, also Korach and Gargac [5] highlight the use of entrepreneurial mindset exercises in engineering courses. These exercises were introduced periodically within the course schedule to complement the existing learning objectives and goals of the introductory course. These exercises including the Marshmallow challenge, fostered critical thinking skills and team dynamics and its performance.

Zhou et al. conducted a two-week workshop on engineering students' self-efficacy and used the timeline of a team performing the marshmallow activity on two trials, combining the categories of plan, build, and test [14]. In the first trial: the team spent most of their early efforts in planning, and later moving on to building, continuing to switch between building and testing, with some movement back into planning. In total, the team spent 30% of their total time planning, 46% of their time building, and 11% on testing. This contrasts with their second trial, where they spent only 11% of time planning, 13% of time testing, and 76% of time in building. In addition, the students transitioned from planning into building much earlier in the second trial than in the first trial.

Further, to improve teamwork and potential long-term effects on students' collaboration skills, Reeping & Reid explore the iterative design tailored to students of the 6th class, which may provide insights into the long-term impact of design-based activities such as the Marshmallow Activity on students' learning and skill development [3].

On a similar note, Suzuki et al. case study indicates that the Marshmallow challenge may offer valuable insights into the collaborative and teamwork aspects of the activity [15]. Moreover, Klotz & Nemeth's research findings concluded that teams with open brainstorming and less pressure to conform outperformed those with a designated leader [16]. Randomly shuffling group roles enhanced creativity. These findings suggest that the Marshmallow activity can have an impact on students' interpersonal skills and ability to work effectively in teams.

After conducting 70 design workshops across the world, Wujec examined the success rate of different teams and approaches [2]. Surprisingly, kindergarten children built the tallest tower structures, outpacing business students, lawyers, and even CEOs. His observation revealed that kids began building immediately, creating prototypes and reusing broken spaghetti. Additionally, children also collaborated freely and naturally, showing minimal concern about the power dynamic. Due to these reasons, kindergarten children constructed stable and high towers. On the other hand, business students spent a considerable amount of time finding the right plan, which led to distractions, and occasional cheating and ultimately resulted in weaker and less stable structures.

Similarly, Zappe et al. conducted an interactive workshop, using the marshmallow activity as an introduction to discuss creativity and teams, focusing on the factors in teams (i.e. group composition, team size, group processes) that may lead to more innovative solutions [17]. They identified barriers to facilitating creativity in the classroom included the following: lack of time, need to know how to develop tasks, student reluctance or resistance, difficulty with assessment, and lack of rewards for instructor. Further, it should be noted that one of the challenges of team-based projects that has been noted is the social loafer [18].

Most of the existing literature focuses on primary students or engineering students, and no research has been found from a Middle Eastern perspective, specifically from female business management students, about this activity. This research aims to bridge existing gaps by exploring the perspectives of Saudi female students on the Marshmallow Challenge in an OB class. Delving into their experiences with this widely used activity provides valuable insights into fostering inclusive and meaningful learning experiences in OB education.

2 RESEARCH QUESTIONS

1. How do Saudi female undergraduate students perceive the Marshmallow Challenge in OB class?
2. What challenges do they encounter during the activity?

3 METHODOLOGY

This research adopted a qualitative research approach, utilizing semi-structured interviews to gather insights from 43 female Saudi students enrolled in an undergraduate Organizational Behavior (OB) course at the University of Hail, Saudi Arabia, on 8 November 2023. Organizational Behavior is a third-level course in the management study plan and this course offers students a valuable preview of their future workplace. Consequently, at this level, students are generally highly focused, eager to learn, and serious about their grades.

To ensure unbiased team formation and fair competition, the instructor divided 43 students into 14 teams, 3 members in each team by drawing names from the class list. Each team received a pack with necessary materials that included 20 sticks of spaghetti, one yard of masking tape, one yard of string, and a marshmallow. To avoid confusion and ensure everyone in the class understood the challenge, the instructor outlined clear instructions, goals, and time limits through a PowerPoint presentation.

After an 18-minute time limit, the instructor assessed each team's freestanding towers topped with a marshmallow. Out of fourteen teams, two teams were successful in constructing the tallest towers and they were awarded three bonus marks in their assessment marks for their performance in the activity. Six teams constructed a tall but fragile tower; they needed ceiling support to make sure marshmallows would not fall off. Four teams attempted to create a small-sized tower, while the remaining two teams were not able to finish the tower within the time.

Adopting a qualitative lens, this study seeks to understand the female students' experiences and perceptions of the Marshmallow Challenge. Semi-structured interviews were conducted in English and transcribed verbatim. This data was then analysed to identify recurring themes and interpret the underlying meanings embedded within the participants' narratives.

4 FINDINGS

1. Initial Apprehension and Nervousness

Out of 43 students, 29 mentioned feeling nervous about the activity and working with classmates initially. This apprehension is likely because the activity is new to them, they find it challenging and requires collaboration. Many students echoed similar sentiments and confided to this statement of their teammate: *"When the instructor announced the activity, doubts came that can we do this-What if we mess up? we were nervous as we have not done anything like it before"*. This suggests that a significant subset of students experienced collective apprehension or anxiety at the beginning of the Marshmallow Challenge.

2. Brainstorming and Setting Expectations

Out of 43 students, approx. 21 students highlighted the value of brainstorming and setting specific expectations at the beginning of the activity. This underscores the value placed on collaborative planning and clarity of objectives. However, some 11 students identified the approach *"We just jumped into the building without a clear plan"* and *"We start building without discussing"*.

3. Opinion Sharing and Understanding

Out of 43 students, about 24 students indicated that they shared their opinions during the planning phase, but only 12 felt that their group members understood their opinions. This disparity suggests potential communication gaps within some teams. One of the team members shared, *"We hesitated to voice our ideas for fear of offending each other, which slowed down the decision-making process."* Additionally, some students expressed concerns about voicing their opinions due to worries about failure and potential blame within the group.

4. Effective Time Management

A majority of students (30) indicated the limited time constraint added another layer of complexity. Teams expressed difficulty balancing brainstorming and building phases, with six students commenting, *"We spent too much time planning and ran out of time to properly execute our marshmallow tower."* Thus, several students pointed out difficulties in managing time effectively, especially during the building phase of the activity.

5. Resource Utilization

Nearly 35 students expressed satisfaction with their team's effective use of resources such as tape, string, and spaghetti, highlighting the emphasis on resource efficiency. Some students were not sure how to use a string in constructing a marshmallow tower. *"wish we knew how to use string, but later saw another team who used it to make a suspension bridge for their marshmallow!"*

6. Leadership and Contribution

Some students (around 18) acknowledged the leadership qualities of certain team members, while others 29 students expressed concerns about unequal participation and reliance on select individuals to complete tasks. The positive aspect of this task was the realization that some students reported that their team members had better leadership qualities than they did. These students felt that they could learn from their team members and improve their leadership skills.

7. Creativity and Attempts

Around nine students stated that they attempted two or three prototypes before constructing the final tower. Another common comment emerged in retrospect, nearly 13 students remarked, *"We were too afraid to try different things and change our strategy even when we knew it was not working."* This fear of failure and hesitation to adapt likely hindered some teams from reaching their full potential.

8. Emotional Response

A notable 20 students expressed feelings of disappointment particularly concerning the Marshmallow tower's height, underscoring the emotional investment and expectations associated with the activity. However, this disappointment did not diminish their interest as a significant number expressed a desire to participate again, indicating the intrinsic value they perceived in the learning experience. Furthermore, witnessing their classmates' successes likely sparked excitement for their potential and a desire to refine their approach in another attempt. Around 17 students agree with similar thoughts *"Seeing other teams build these structures, we feel inspired. It's like, 'Okay, next time, we are going to build even higher!' It is not just about winning; it is about learning and pushing ourselves. We will definitely do it again"*. It was also observed that no matter the structure they built, they took pictures and shared them with friends and family on social media. When questioned about their feelings regarding not receiving the additional three bonus marks, many admitted to being disappointed about not securing those extra marks. As per 24 students on a lighter note, *"Losing those extra three marks was a bit disheartening. We put in a lot of effort, so it would have been nice to get at least 1 mark for our work."* Nonetheless, almost 37 students also expressed appreciation for the efforts of the winning team.

9. Desire for Repeat Participation

Another interesting finding emerged that eighteen students expressed a desire to participate in the activity again with the same team members, suggesting a positive overall experience with team collaboration despite challenges. Most of the students shared that *"Even though we didn't know each other well before, just casual greetings, the teamwork aspect creates a bond"*.

However, not everyone felt the same. Fifteen students expressed disappointment and frustration because their team was unable to achieve the highest possible height for the marshmallow tower. Some frustrations stemmed from not using resources effectively, like misused tape or broken spaghetti. Additionally, students cited pushy nature, a slow attitude of team members, or late arrival as contributing factors to their dissatisfaction with teammates. Due to certain reasons, they felt that they could improve their performance if they participated in the activity again but with new team members.

10. Reflection and Future Changes

When prompted about the most difficult phase (Beginning - Planning - Building – Last), and potential changes for future attempts, responses varied. 17 students identified the beginning phase, as the most difficult and overwhelming phase possibly due to initial uncertainty about the task, not knowing the team members, lack of clarity of their roles, and anxiety about collaboration.

Most of the students agreed that: *“The first few minutes were a blur!”* and *“Not knowing what to expect or how to do with teammates, felt stress!”*

13 students indicated that they struggle with planning allocating resources effectively, and overcoming difficulties during construction. Students pointed out: *“Maybe next time, we should be more strategic about the use of resources and have a designated role such as leader, or resource manager.”*

26 students indicated that they face difficulties with time pressure, constantly comparing with the other team, and adjusting to fix the tower in the building phase.

Out of 43 students, 19 students indicated that the last step was difficult as they encountered difficulties with dealing with the emotional stakes of not achieving the desired height.

In response to research question 2, the research found that Saudi female students encountered few challenges during the Marshmallow Challenge activity. Initially, they experienced anxiety and uncertainty. They faced difficulties in planning and effectively allocating resources. Time constraints added pressure, as did comparing their progress with that of other teams. Additionally, students faced emotional pressures when they did not achieve their desired outcomes. Communication was another hurdle, with students expressing concerns about sharing their opinions openly. Some teams experienced unequal participation, relying heavily on specific individuals. Furthermore, there was hesitation among students to adapt and explore different strategies due to a fear of failure.

Based on the above findings, several subtle observations and insights were extracted:

1. **Bonding through Challenge:** Through the Marshmallow activity, we found that although all female students were Saudi, they were not known to each other before. From this activity, we found that challenging tasks that require collaboration among individuals who are unfamiliar with each other can stimulate quicker bonds and form interpersonal relationships. This aligns with Hoegl & Gemuenden [19], who emphasize that collaborating with other new people provides the opportunity for learning social, project management, technical, and creative skills, suggesting that collaboration can indeed lead to the development of interpersonal relationships.
2. **Fear Hinders Performance:** The fear of risk of sharing the wrong idea/suggestion leads to increased social loafing, even if the individual possesses the skills and potential to contribute significantly. Unlikely, Christensen in his book ‘The Innovator’s Dilemma’ [21] emphasizes the need for organizations to encourage risk-taking and experimentation. If fear of failure dominates, valuable ideas and innovations may be overlooked, regardless of individual capabilities.
3. **Challenging Task Unveiled Hidden Qualities:** Through this activity, the research identified that novel tasks and challenges can unveil underlying positive qualities among individuals, regardless of their obvious demeanor and personalities (shy, reserved, non-serious, care-free). Likewise, the literature also suggests that novel tasks can push individuals outside their comfort zones, eliciting creativity, leadership, resilience, and problem-solving skills that may not be evident in routine situations [21].
4. **Inward Focus Yields Results:** Teams that focus on their process and avoid comparing their progress with other teams during the Marshmallow Challenge achieve better outcomes. This finding resonates with Bunderson & Sutcliffe [22], who advocate for internal learning within teams, rather than comparing across teams, which was more effective for performance improvement.
5. **Mindset Matters-Calm minds, clear results:** Maintaining a **calm and composed mindset** during collaborative activities like the Marshmallow Challenge can lead to more effective problem-solving and better outcomes compared to feeling anxious or nervous. Research also agrees with the fact that anxiety can cloud judgment and hinder clear thinking, impacting collaborative problem-solving, and suggests that managing emotions and maintaining composure contributes to effective decision-making [23].
6. **Non-Serious Attitude Affects Resource Use:** Teams that approached the Marshmallow Challenge with a non-serious or casual attitude were more likely to waste resources, such as misusing tape or breaking spaghetti, as they did not value the importance of each component. Amabile [24] identifies that intrinsic motivation for optimal individual contribution is mainly needed to achieve the task, but if team members are disinterested in it, they are less likely to utilize their full potential or engage in resource-saving behaviors.
7. **Intrinsic vs. extrinsic motivators:** Striking a balance between intrinsic motivation (e.g., the joy of learning, team bonding) and extrinsic motivation (e.g., extra grades) significantly influences student engagement, performance, and satisfaction in collaborative tasks. In considering that, Goncalo & Gruenfeld propose a dynamic model of how intrinsic and extrinsic motivations interact within teams to influence creativity [25].
8. **The task experience matters more than the result:** Students’ eagerness to share their structures on social media platforms, even when the target height was not achieved, suggests that the act of participation and the novelty of the activity were more significant than the actual results or outcomes for them. Concerning that, Häggström & Hansen review the connection between novelty seeking and social media engagement, self-presentational motivation highlighting their new experiences and trends [26].
9. **Communication Caution Affects the Outcome:** Overly cautious communication (due to fear of offending or being wrong) hindered decision-making and progress. As Van den Bosch & Verhulp point out, fear of negative evaluation and failure can prevent individuals from voicing their opinions, ultimately hindering group decision-making and performance [27].

10. **Action speaks louder than just thinking:** Teams that start structure "just start building" the base of the tower without spending much time on how to build the tallest structure (overthink), lead to effective results in terms of tower height and structure stability. A recent study by Gupta & Somers also agrees with the fact the impact of time pressure on creativity and decision-making within projects, offers insights into balancing efficiency with thoughtful approaches [28]. Flegal & Anderson further support this by demonstrating that greater amounts of time spent thinking about an action correlates with worse task performance [29]-[31]. This is relevant to the task as it emphasizes the negative impact of overthinking on performance.

The variables involved in this study are given in Fig. 1.

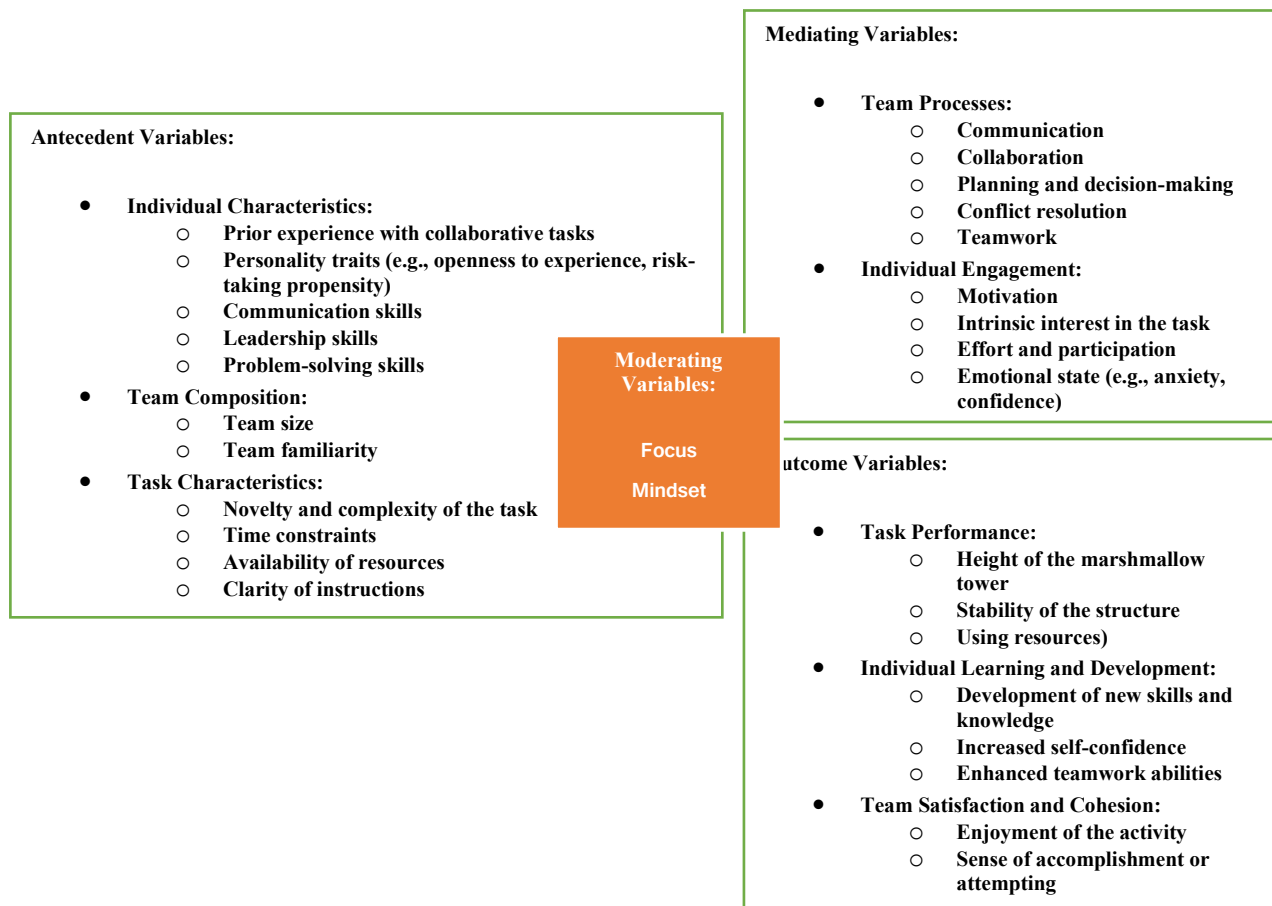


Fig. 1. Antecedents, Mediators, and Outcomes of Collaborative Learning: Insights from the Marshmallow Challenge

The Marshmallow Challenge offers a valuable opportunity to explore the complex interplay of individual, team, and task factors that influence performance and learning. By considering the antecedent variables of individual characteristics, team composition, and task characteristics, we can gain insights into the unique challenges and opportunities each group faces. The mediating variables of team processes and individual engagement act as bridges, translating these initial conditions into concrete outcomes. Ultimately, the success of the activity, both in terms of task performance and individual development, hinges on the interplay of these factors, moderated by crucial elements like focus, mindset, and motivation. This holistic framework provides a valuable lens for understanding and enhancing collaborative learning experiences like the Marshmallow Challenge, paving the way for further research and intervention strategies to maximize individual and team potential.

5. DISCUSSION ON MARSHMALLOW MASTERCLASS: LESSON LEARNED FROM EXPERIENTIAL LEARNING AND COLLABORATIVE PROBLEM-SOLVING

While seemingly simple, the Marshmallow Challenge, requiring participants to build the tallest tower using limited resources, offers valuable insights for educators seeking to optimize student engagement, collaboration, and learning potential. Based on the findings from this research involving Saudi female undergraduate students, here are some actionable takeaways:

- a) **Promote Experiential and Reflective Learning:** Educators should incorporate reflective exercises or debriefing sessions following experiential learning activities. Encourage students to reflect on their experiences, identifying lessons learned, and areas for improvement. The varied responses regarding the most difficult phase and potential changes for future attempts highlight the individual nature of learning experiences. Some students might struggle with initial uncertainty, while others might find the building phase or pressure of the final stage more challenging. Also noted that the presence of both strong leadership and concerns about unequal participation points, and fear of offending others can affect team dynamics and collective efficacy. While initial nervousness and communication challenges are present, the overall experience fosters learning and reflection. Students gain valuable insights into their strengths and weaknesses in a collaborative setting, identifying areas for improvement in communication, planning, and problem-solving. The desire to repeat the activity with the same team members suggests a positive learning experience despite the challenges faced. This emphasizes the need for educators to reflect on their teaching methods and adapt to cater to experiential learning styles and needs.
- b) **Integrate Theory and Practice:** Educators should ensure that experiential learning activities are integrated with theoretical courses and their objectives. It helps students to connect theoretical concepts to real workplace applications, reinforcing their understanding and enhancing their practical skills. Through this activity, the instructor can link to the OB theory of stages of group development [12], Social Loafing [18], Goal Setting Theory, Self-efficacy Theory, Experiential Learning Theory, and Resource Dependence Theory. Moreover, the Marshmallow Challenge can serve as a powerful metaphor for any business project. It seems effortless to place a light, airy, and fluffy marshmallow on the spaghetti sticks tower. However, after building the structure placing the final marshmallow proves challenging, causing the tower to bend and wobble. The lesson in the marshmallow challenge highlights to identification of the balanced approach and mechanisms that lead to effective innovation in business projects considering the crucial factors such as customer needs, cost, and service delivery/quality. Such experience can prepare students for valuable insights into the complex interplay of these factors in the real world.
- c) **Conduct comparative studies and mixed-methods research:** Educators should investigate the effectiveness of the Marshmallow Challenge with larger and more diverse samples. This research has a limited sample size and might not be representative of all Saudi female students or other student populations. Thus, the findings might not be generalizable to different cultural or educational contexts. Similarly, quantitative data could have supplemented the findings by providing statistical evidence and broader patterns. Further research needs to be conducted combining quantitative and qualitative methods to gain a more holistic understanding of the activity's impact on learning domains. In addition, there is a need to explore the Marshmallow Challenge alongside other forms of experiential learning.

These actionable insights highlight the valuable learning opportunities embedded within the Marshmallow Challenge. Such a challenge seemingly looks simple task, but by understanding Saudi female students' perceptions and experiences, educators can refine their approaches and unlock a collaborative and reflective learning environment that prepares students for the challenges of the real world.

6. CONCLUSION

This study contributes to an understanding of how Saudi female students perceive and experience the Marshmallow Challenge in OB class. Despite challenges such as communication gaps and unequal participation, the activity underscored the importance of focused tasks and shared learning experiences. Students desire for repeat participation, highlighting the intrinsic value and unlocking their hidden leadership and task-managing potential. Ultimately, by consistently implementing such forms of learning—including active learning, design thinking, and collaborative experiences—educators can equip students with essential skills like time management, teamwork, creativity, and problem-solving abilities, both at individual and group levels, to navigate the complexities and intricacies of organizational behavior.

ETHICS STATEMENT

This study did not involve any human or animal subjects and, therefore, did not require ethical approval.

STATEMENT OF CONFLICT OF INTERESTS

The authors declare no conflicts of interest related to this study.

LICENSING

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