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## THE EFFECTIVENESS OF THE SPAGHETTI TOWER MARSHMALLOW CHALLENGE ON STUDENTS' SELF- CONFIDENCE AND SOFT SKILLS AT HENRY GURNEY SCHOOL

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### Abstract:

Experiential learning activities are becoming more widely recognized as an effective way to build students' self-confidence and soft skills especially in rehabilitation-based education. The Spaghetti Tower Marshmallow Challenge (STMC) is often used for this purpose, but quantitative evidence of its effectiveness is still limited, particularly among students in rehabilitation institutions such as Henry Gurney School. To address this gap, this study explores how STMC contributes to the development of students' intrapersonal skills specifically self-confidence, as well as their interpersonal skills. A total of 40 students completed pre and post intervention surveys using two validated instruments, namely the General Self-Efficacy Scale (GSE) and the Group Social Skills Inventory (GSSI). These instruments measured self-confidence, teamwork, communication, and problem-solving skills. The comparison of scores before and after the activity showed a clear and significant improvement across all skill domains. The findings provide quantitative support that experiential learning activities such as STMC can enhance students' personal and social development. This supports the incorporation of similar activities should be incorporated into rehabilitation education programs to strengthen students' reintegration into society. Overall, this study contributes empirical evidence on the usefulness of experiential learning in alternative education settings.

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## Introduction

Rehabilitation education plays an important role in shaping the behaviour, values and skills of individuals involved in the juvenile justice system. Its main purpose is to help them return to society and function in a positive and responsible manner (Ministry of Education Malaysia, 2019). In Malaysia, Henry Gurney Schools are specialized institutions that provide academic education together with rehabilitation focused training for adolescents placed under welfare orders. In this setting, education is not limited to academic achievement. It also focuses on the development of soft skills such as self-confidence, communication, cooperation, and problem solving. These skills are essential for supporting students' social reintegration and personal growth (Mohd Nor et al., 2020).

However, conventional teacher centred approaches are often less effective in meeting the emotional and social needs of students in rehabilitation settings (Hussin & Tamuri, 2019). Many students in these institutions come from difficult life backgrounds. They often have low self-confidence and limited interpersonal skills. Therefore, they require teaching approaches that are more interactive and motivating. Learning activities based on real life experiences are also important to help rebuild their psychosocial strengths and support positive change (Hayat, & Shokrpour, 2021).

In this context, experiential learning has gained wide recognition as a more holistic approach with strong potential to support students' interpersonal development. The experiential learning model introduced by Kolb (1984) emphasizes learning as a continuous cycle involving concrete experience, reflection, conceptual understanding and active experimentation. This approach is particularly suitable for rehabilitation education. It encourages active student participation and allows learning to occur through real experiences. Students are given opportunities to make mistakes in a controlled setting. Through this process, they develop understanding, resilience, and self-confidence within a safe and supportive environment (Choi & Yang, 2021; Zainal & Siraj, 2022).

One experiential learning activity that has gained increasing attention across education and training contexts is the Spaghetti Tower Marshmallow Challenge (STMC), widely introduced by Tom Wujec (2010). It's a group task where teams must build the tallest, most stable structure they can by using limited materials such as spaghetti, adhesive tape, string and one marshmallow that must go on top within a fixed time frame (Wujec, 2010). At its core, this

activity works like a simulation. It requires students to communicate effectively, practice flexible leadership, think outside the box and solve problems together while the clock is ticking (Kamarudin et al., 2021). In theory, this process engages multiple dimensions of soft skills that are critical for life success.

Although STMC is commonly used in corporate training and general education, very few quantitative studies have examined its effects on rehabilitation students, especially in terms of self-confidence and interpersonal skills (Lee & Subramaniam, 2021). Most existing studies rely on qualitative methods or descriptive observations. Others focus mainly on cognitive learning outcomes. As a result, there is limited quantitative evidence on how STMC influences students' emotional and social development in rehabilitation settings (Mohd Noor et al., 2022). This lack of empirical evidence makes it difficult to justify the systematic use of STMC in rehabilitation education programmes that aim to be evidence based.

Therefore, this study was conducted to address this gap by examining the effectiveness of the Spaghetti Tower Marshmallow Challenge in improving self-confidence as a core of interpersonal skills, particularly communication, cooperation and problem solving among students at Henry Gurney School. Using a quantitative pre and post-test design, this study aims to provide concrete data on the pedagogical value of experiential learning activities in an alternative education context. The findings are expected to contribute empirical evidence on experiential learning in rehabilitation education. They may also serve as a practical reference for educators, counsellors and policymakers in planning and implementing more systematic, evidence based and student-centred pedagogical interventions.

## Literature Review

### *Rehabilitation Education and the Needs of At-Risk Students*

Rehabilitation education aims to support the development of adolescent involved in the juvenile justice system. It uses an educational approach that focuses on changing behaviour, social adjustment and building personal skills. In this context, education functions not only as a means of delivering academic knowledge, but also as a form of social intervention that supports students' reintegration into society (Barnert et al., 2016). Students in rehabilitation institutions often experience disrupted learning histories. They often struggle with low self-confidence and poor social skills. As a result, they need a teaching approach that is more supportive and focused on their overall development.

Studies show that successful social reintegration among at risk adolescents depends greatly on the development of soft skills such as self-confidence, communication, cooperation and problem-solving abilities (OECD, 2018). Without these abilities, students risk remaining isolated and will likely struggle to adapt to their communities after they complete their rehabilitation. Therefore, rehabilitation education needs to focus on teaching strategies that do more than just cover academic material. They must also actively and systematically build a student's personal and social skills.

### *Experiential Learning Theory*

Experiential learning is a teaching approach that focuses on active learning. Students learn by taking part in meaningful real-life experiences. Kolb (1984) explained that learning happens in

four stages: concrete experience, reflective observation, abstract conceptualization and active experimentation. This cycle helps students build understanding and skills from their own experiences, rather than passively receiving information.

In education, experiential learning has been shown to enhance student engagement, self-directed learning, and the development of social and emotional skills (Kolb, 2015). A systematic review by Morris (2020) found that this approach contributes significantly to the development of soft skills especially when students participate in collaborative activities that require interaction and reflection. These characteristics make experiential learning highly suitable for rehabilitation education. This field places a strong emphasis on personal development and learning through real-life experience.

### ***Experiential Learning through Collaborative Activities***

Collaborative activities are a form of experiential learning that emphasizes social interaction, idea sharing, and group problem solving. Through these activities, students not only build knowledge but also develop social skills such as effective communication, leadership and teamwork (Johnson & Johnson, 2019). These activities give students a space to experience real situations that require negotiation, shared decision-making and collective responsibility.

For at risk students, collaborative experiential learning provides a safe environment to try, make mistakes and learn from experience. This approach supports the development of self-confidence and interpersonal skills through meaningful direct experiences and reflection with peers (Beard & Wilson, 2013). Therefore, collaborative experiential activities are considered an effective approach to support the learning needs of students in rehabilitation institutions.

### ***The Spaghetti Tower Marshmallow Challenge as an Experiential Learning Activity***

The Spaghetti Tower Marshmallow Challenge (STMC) is an experiential learning activity. It involves students in a collaborative task where they must build a structure using limited materials and a strict time limit. This activity requires participants to plan, communicate, and work together to achieve a common goal. In this way, it directly reflects the core principles of Experiential Learning (Wujec, 2017).

By taking part in the STMC, students get directly involved in a challenging, hands-on experience. This is followed by discussions and reflections on the strategies they used and the results they achieved. This process allows students to build a real-world understanding of the importance of communication, teamwork, and problem-solving. Although STMC is often used in training and educational settings, there is still a lack of quantitative research on how well it works in rehabilitation education. Specifically, there are few studies that measure its impact on the psychosocial well-being of students.

### ***Self-Confidence and Interpersonal Skills in Rehabilitation Education***

Self-confidence, which is tied to the idea of self-efficacy, means a person's belief that they can handle tasks and meet challenges effectively (Bandura, 1997). In education, when students have strong self-efficacy, they tend to participate more actively, bounce back better from setbacks, and can engage more positively with the people around them (Schunk & DiBenedetto, 2020).

Interpersonal skills such as communication, teamwork and problem-solving are also a component of a student's social and emotional development. A meta-analysis by Durlak et al. (2011) shows that educational programs focusing on social and emotional learning have a significant positive impact on students' social skills and overall well-being. Therefore, experiential learning activities like the STMC could be an effective way to build self-confidence and interpersonal skills together for students in rehabilitation education. Thus, self-confidence and interpersonal skills are important constructs in rehabilitation education that should be fostered through active, experience-based learning approaches.

### **Research Gap**

Although experiential learning has been recognized as an effective approach for developing soft skills (Kolb, 1984; Tan et al., 2022; Zainal & Siraj, 2022), quantitative evidence on its impact in rehabilitation education remains very limited. Most existing studies focus on formal education or corporate training, while research involving adolescents in rehabilitation institutions are still rarely reported (Ungar et al., 2014; Hussin & Tamuri, 2019).

In the Malaysian context, studies on rehabilitation students have focused more on counselling, discipline and psychosocial support rather than on evaluating collaborative, experiential pedagogical approaches. Recent literature also indicates that data driven evaluations of learning activities such as STMC among rehabilitation students have not been widely conducted (Yusri et al., 2024).

Therefore, this study was conducted to address the research gap by examining the effects of STMC on self-confidence and interpersonal skills among students at Henry Gurney School. The findings aim to support evidence-based teaching and provide guidance for teachers and policymakers in designing suitable learning interventions for rehabilitation education in Malaysia.

### **Research Question**

Based on the identified research gap, this study was guided by the following research questions:

RQ1: Is there a significant difference in students' interpersonal skills (communication, cooperation and problem-solving) before and after the intervention?

RQ2: Is there a significant difference in students' interpersonal skills (communication, cooperation and problem-solving) before and after intervention)?

RQ3: What is magnitude of the change following the intervention?

### **Research Methodology**

This study uses a quantitative approach. It has a one-group pretest-posttest design, which is a type of pre-experimental design. This was used to assess the effect of the Spaghetti Tower Marshmallow Challenge (STMC) intervention on students' levels of self-confidence and interpersonal skills. This design allows for a direct assessment of change without involving a control group. This helps minimize disruption to the institution's routine and reduces administrative challenges, particularly in the context of rehabilitation education.

The study was conducted at Henry Gurney School, a rehabilitation education institution in Malaysia. It provides academic education and character development for adolescents under welfare supervision. In this context, learning focuses not only on academic achievement but also on the development of soft skills to prepare students for social reintegration. The STMC intervention was carried out in a controlled and safe environment. Teachers and researchers were present to monitor the activity.

The study sample consisted of 40 students ( $N = 40$ ) enrolled in the institution's education program. Participants were selected using purposive sampling. They were chosen based on criteria such as official student status, age between 15 and 17 years and the ability to understand instructions and complete written questionnaires. All participants took part voluntarily with official consent from the institution.

Two sets of instruments were used to measure the study's variables. The level of self-confidence was measured using the General Self-Efficacy Scale (GSES) developed by Schwarzer and Jerusalem (1995). This scale assesses an individual's belief in their own ability to face challenges and carry out tasks. This instrument has been widely used in education and psychology research.

Interpersonal skills were measured using a set of items adapted from the social skills constructs in the Social Skills Inventory (SSI) developed by Riggio (1989). This inventory assesses dimensions of social and emotional skills such as social expressiveness, social control and social sensitivity. For this study, the items were adjusted to fit the context of rehabilitation education and teamwork with a focus on three main aspects: communication, cooperation and problem-solving. All items were rated using a five-point Likert scale to ensure consistency in measurement.

The study procedure was conducted in two main phases. The first phase involved a pretest to assess students' self-confidence and interpersonal skills. The second phase included the implementation of the STMC intervention in groups, followed by a post-test using the same instruments. During the intervention, students were divided into four groups to build marshmallow towers using limited materials within a set time. The activity was designed to foster communication, cooperation, planning and collaborative problem solving. A reflection session was also conducted after the activity to help participants evaluate their experiences and group interactions.

Data was analysed using IBM SPSS Statistics version 28. Descriptive analysis was conducted to obtain the mean and standard deviation for each study variable. Instrument reliability was tested using Cronbach's Alpha. Paired sample *t* tests were used to examine significant differences between pretest and post-test scores. In addition, effect sizes (Cohen's *d*) were calculated to determine the magnitude of change. The significance level was set at  $p < 0.05$ .

All research ethics were strictly followed throughout this study. Official permission was obtained from the institution's administration before the study began. Student participation was completely voluntary. The confidentiality of respondents' data was fully guaranteed. A briefing session was also conducted to ensure the psychological well-being of the participants. All data is used solely for academic and research purposes.

## Findings

This study involved 40 male students between the ages of 15 and 17 from Henry Gurney School. As shows in Table 1, the reliability of the study's instruments as tested using Cronbach's Alpha coefficient. The results show that all constructs achieved a good level of reliability with alpha values above 0.80.

**Table 1: Reliability of the Study Instruments**

Variable	Number of Items	Cronbach's Alpha ( $\alpha$ )
Self Confidence (GSES)	10	0.89
Communication	5	0.84
Cooperation	5	0.82
Problem Solving	5	0.81

A paired-sample t-test was conducted to evaluate the difference in scores before and after the STMC intervention. Table 2 below shows the results of the analysis. It indicates a statistically significant improvement in all measured constructs ( $p < 0.001$ ). The students' self-confidence scores increased significantly after the STMC intervention. Their self-confidence mean score rose from 2.45 to 3.28, with a large effect size ( $d = 1.39$ ). Meanwhile, all three aspects of interpersonal skills also showed significant improvement: communication ( $d = 1.25$ ), cooperation ( $d = 1.45$ ) and problem-solving ( $d = 1.34$ ).

**Table 2: Comparison of Pretest and Post-test Scores for STMC Intervention (N = 40)**

Variable	Mean (Pra)	Mean (Post)	t	p	Cohen's d
Self Confidence (GSES)	2.45	3.28	8.76	< .001	1.39
Communication	2.81	3.65	7.92	< .001	1.25
Cooperation	2.78	3.72	9.14	< .001	1.45
Problem Solving	2.62	3.54	8.45	< .001	1.34

Note: All tests were significant at  $p < .001$ .

The findings show that the STMC intervention effectively improved self-confidence and interpersonal skills among Henry Gurney students. Significant gains with large effect sizes highlight STMC's potential as a practical, active and structured experiential learning approach.

## Discussion

The findings of this study indicate that the Spaghetti Tower Marshmallow Challenge (STMC) had a significant positive effect on students' self-confidence and interpersonal skills at Henry Gurney School. The clear improvement in the soft skills indicate that practical and structured experiential learning can support students' psychosocial development in rehabilitation education settings. These findings are consistent with previous studies that highlight the effectiveness of experiential learning in promoting self-development and prosocial behaviour among adolescents (Chan et al., 2021).

The greatest improvement was observed in cooperation. This aligns with the core features of STMC feature that requires groups to plan together, assign roles and communicate constantly under the time constraints. These task demands naturally encourage active interaction and shared responsibility. The improvement in communication and problem-solving skills further reflects how collaborative experiential activities provide a practical space for students to practise social engagement in a controlled environment.

From the perspective of rehabilitation education, social skills such as communication, cooperation and problem-solving are essential in supporting adolescents' adjustment and social reintegration. This aligns with contemporary rehabilitation approaches that focus on building social competence and a positive identity (Lesnick et al., 2023). The findings support the use of the STMC as a practical experiential learning intervention in rehabilitation education. However, further studies with a stronger designs and multiple institutions samples are recommended to strengthen the empirical evidence of its effectiveness.

A control group was not included because it would have been unethical to deny some students access to a potentially beneficial learning activity. Instead, a one-group pretest-posttest design was used. While this design limits causal claims, the findings align with previous experiential learning research which also reported improvements in self-confidence and teamwork. This alignment supports the credibility of the results. Future research could strengthen these findings by using quasi-experimental or multi-site designs.

This study also contributes new empirical evidence to the field of rehabilitation education. Although the STMC has been widely used in mainstream education and corporate training, quantitative studies involving adolescents under welfare supervision remain limited. By providing statistical evidence and effect size analysis within a Malaysian rehabilitation institution, this research extends existing literature into an underexplored educational context. The findings demonstrate how simple, low-cost experiential activities can be systematically integrated into rehabilitation programmes to support soft skill development.

## **Conclusion**

This study shows that the Spaghetti Tower Marshmallow Challenge is effective. It successfully increased the self-confidence and interpersonal skills of students at Henry Gurney School. The key finding is that hands-on learning through structured group activities is an effective approach in rehabilitation education. It helps students rebuild self-belief and learn how to communicate, cooperate, and solve problems together. For educators, this suggests that activities such as the challenge are valuable practical tools. They provide a meaningful way to develop the life skills these students need. Although this study involved a single group with a limited duration, the results are clearly positive. Further research with different groups and over a longer period is recommended. Nevertheless, these findings provide a strong evidence-based reason to incorporate more active and collaborative learning approaches in programmes that support at-risk youth.

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- Ethics Statement:** This study was conducted in accordance with ethical research standards. All procedures involving human participants complied with institutional and international ethical guidelines. Informed consent was obtained from all participants prior to data collection. Participation was voluntary, and respondents were assured of confidentiality and anonymity. The data collected were used solely for academic purposes. The research was conducted in accordance with accepted academic integrity and ethical publishing standards.
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