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Effectiveness of Role-play Method: A Meta-analysis

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To investigate the effectiveness of role-play methods in education. Meta-analysis was conducted, and publication bias test and heterogeneity test were performed. Robustness was also tested by the removal-by-removal method. Finally, subgroup analyses were conducted to explore the effects on teaching effectiveness under different moderating variables. Twelve articles with 22 effect size samples involving 907 participants, including 821 university students and 86 secondary school students, were finally included. Meta-analysis demonstrated that teaching with the role-play method had a more significant positive effect on students than the control group (ES=0.818, 95% confidence interval 0.600-1.035). We also found that the role-play method had the most significant impact on students' Skills. This study demonstrates that role-play can enhance learning in all dimensions by allowing students to take on different roles and situations.

Keywords: role-play, meta-analysis, learning effect, performance, teaching

INTRODUCTION

The traditional teaching method based on lectures has always occupied a major position in education and teaching (Ferreira et al., 2024). However, traditional lectures emphasize the transmission of theoretical knowledge and lack the enhancement of practical experience (Gregorius, 2017). This may lead to a gap between theory and practical application, making it challenging to apply what is learned to practical problem-solving (Zhang, 2021). Based on this kind of problem, many ways have been thought of to solve it, such as enhancing practical skills by engaging students in social practice (Turner et al., 2023). In the classroom, teachers can also use situational simulation to teach(Gong et al., 2022), which requires restoring the environment similar to the actual students as much as possible to promote students' understanding and deepen their knowledge. The role-playing method is a situational simulation teaching method. It can simulate real-life situations by having students take on specific roles, and the teacher lays out the scenario for them (Bajis et al., 2021). The role-playing method is being looked at by educational staff because it is highly interactive, making it easier for participants to become involved and increasing learner engagement and enjoyment.

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Literature review

A review of the relevant literature revealed many studies on the role-playing method. For example, Carbajal and Angulo (2019) stimulated students' mathematical knowledge by asking them to choose an "occupation." They found that team participation and social interaction were enhanced. Hye- Yun and Kyeong- Hwa (2023) explored the role of the role-playing method in fostering group creativity in a 9th-grade maths activity in Korea and found that role-playing can foster group creativity by increasing creative synergy.Svensson and Regnell (2017) application in demand engineering education found that role-playing item scores were positively correlated with students' scores on written exams had a positive correlation. Lee and Kim (2022) conducted a non-equivalent control group design with nursing students and found that role-playing significantly improved patients' communication skills and clinical performance.

Chen et al. (2021) conducted an experimental study comparing role-playing and traditional teaching methods. They found that the role-playing teaching method not only improved students' test scores but also enhanced learners' case study skills.Aura et al. (2023) examined the effect of the role-playing method on the disposition of twenty-first-century skills of sixth-grade students in Finland and found that significant positive correlation between role-playing experience and skill propensity. As seen from the above studies, researchers have covered various role-playing methods. In addition, among the previous review studies, we found a meta-analysis on role-playing. This meta-analysis explored the impact of role-playing on nursing practice education in Korea, and the authors found that role-playing significantly impacted students' interpersonal, communication, and problem-solving skills (Am Seo et al., 2019). We also found a Systematic Review of Peer role-play. This study assessed the effectiveness of peer role-playing on the development of communication competence in medical students and found that PRP improved medical students' communication skills (Gelis et al., 2020).

The importance of the role-playing method in education can be seen in the many studies conducted by scholars in previous research on role-playing. By combing through previous meta-analysis studies, it can also be found that previous meta-analyses were only aggregations carried out for a single country and lacked data from multiple countries. Moreover, it is also restricted to a specific discipline. This shows that there needs to be more empirical studies that provide an overall quantitative synthesis of role-playing methods to draw general conclusions about role-playing methods and how role-playing methods affect student learning outcomes. On the other hand, meta-analysis can aggregate the findings from multiple samples to draw more comprehensive and accurate conclusions. Therefore, this study uses meta-analysis to explore the effectiveness of the role-play method in teaching and learning by quantifying and evaluating the literature on the subject to provide scholars with comprehensive conclusions. This study also considered what characteristics make a difference to the effectiveness of the role-play method, so some moderating variables were included: the type of experiment, specialism, country, and the teaching style of the control group to explore the differences between the effects.The aim is to explore the following questions:

1. Compared with traditional teaching methods, is the effect of the role-play method on teaching significant?

2. How do various moderator variables influence the effects of the Role-playing?

METHOD

The selection of studies adhered to the recommendations specified in the Preferred Reporting Items for Systematic Reviews and Meta-Analysis guidelines (Moher et al.,2009).

Search strategy

The literature analysed in this study was mainly sourced from EBSCO, ProQuest, ScienceDirect, SpringerLink, Web of Science, and Google Scholar and was searched up to 15 July 2023. There were two main groups of keywords used in the literature search: (1) Role play related keywords, including Roleplay, role-play, role-playing, role-playing, and RP; (2) Learning outcomes related keywords, including performance, effectiveness, and Effect; finally, the Boolean operators "AND" and "OR" were used to connect the out-group and in-group keywords, respectively.

The keyword search initially yielded 1,148 documents from EBSCO, 100 from ProQuest, 56 from ScienceDirect, 84 from SpringerLink, 286 from Web of Science, and 913 from Google Scholar. Nine hundred thirteen documents were obtained from Google Scholar, totalling 2587 documents.

Eligibility criteria

The screening of the literature was carried out according to the following criteria: (1)Deletion of duplicated literature (2) The research topic of the literature must be the effect of role-playing method on students' learning effectiveness (3) The experiment must contain both experimental and control groups, and the control group must be the learning carried out by the traditional teaching method, eliminating the articles containing only single-group pre and post-tests (4) The experimental data in the literature are complete, and must contain the sample sizes of the experimental group and the control group, mean, variance, etc. (5) The research subjects in the literature must be students. According to the above criteria, the 2587 retrieved literature were screened, and the screening process is shown in Figure 1. In the end, 12 pieces of literature meet the requirements.

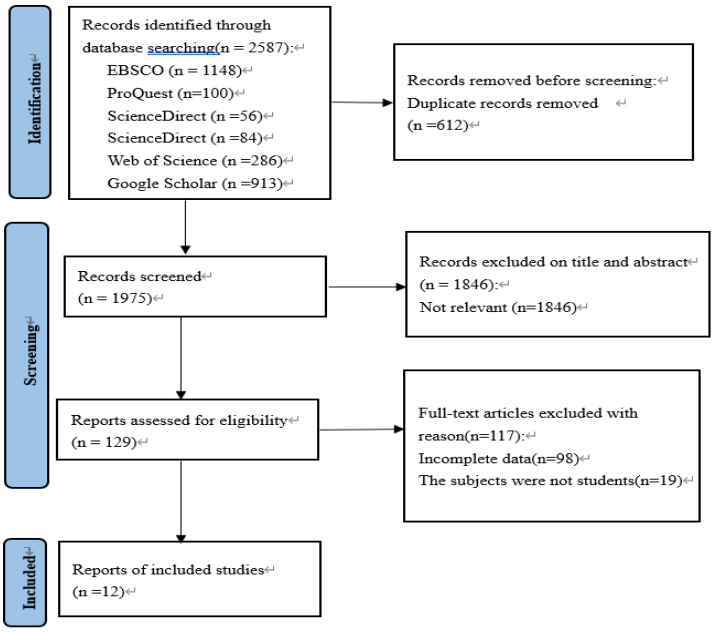

Figure 1
Flow chart

Data encoding and effect size

The coding in this study covered author, year of publication, type of experiment, sample size, speciality, assessment tool, country, journal type and learning outcomes.

Effect size is a statistical indicator that summarises the results of relevant studies and is calculated according to specific criteria (Kvarven et al., 2020). Hedges'g is corrected for small samples, reducing the bias in the effect size estimation (Zhang et al., 2022). Therefore, this study used Hedges' g as the effect size indicator.

research quality

Assessing research quality is a crucial step in meta-analyses (Aljaberi et al., 2021), helping to ensure that appropriate studies are included and considering the impact of study quality on outcomes. Meta-analyses can use quality assessment tools to assess the quality of each study quantitatively. These tools score studies based on a set of criteria that reflect their internal and external validity. We assessed the quality of our included sample based on an assessment scale created by Jadad et al. (1996). The scale assesses three main areas: randomised grouping, blinding and withdrawal from missed visits. Randomised grouping and double blinding scored 2 points for being appropriate and 1 point for being unclear; if otherwise, no points were given. A score of 1 was given if there was a description of withdrawal or loss of visit, and 0 if not. Scale scores ranged from 0 to 5, with higher numbers indicating higher quality. Two authors independently assessed the quality of each eligible paper, and all 24 articles scored more than 2, indicating high-quality research.

FINDINGS

Publication bias

Publication Bias refers to the fact that significant findings are more likely to be published (Nakagawa et al., 2022). In contrast, some non-significant results may not be published due to editing or authors' self-selection, resulting in incomplete or somewhat biased findings in the literature (Rahman and Lewis, 2020). Therefore, to safeguard the scientific validity of the meta-analysis results, the independent study samples must be assessed and tested for publication bias (Gauthier et al., 2019). Among these tests, funnel plots are presented in a visual form. The funnel plot in this study is shown in Figure 2. The points in the plot show a roughly symmetrical distribution.

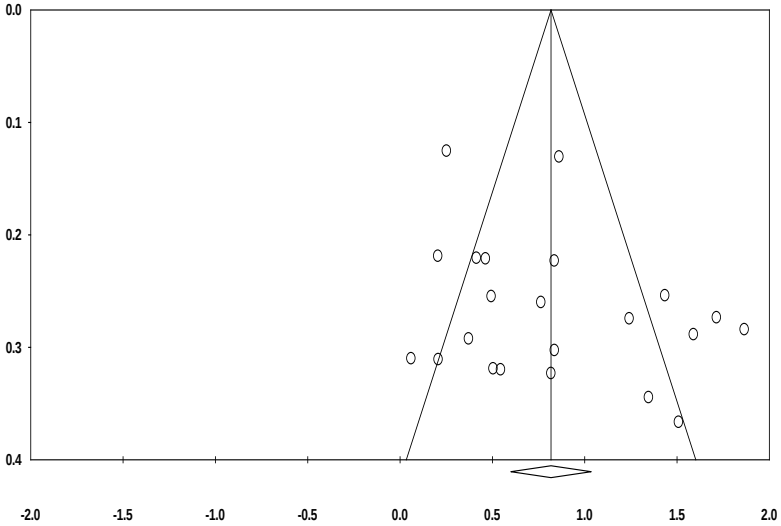

Figure 2
Funnel plot

Begg's test is based on rank and rank correlation, usually used to assess small sample bias in research findings (Dai et al., 2018). Egger's test is a regression analysis method used to detect publication bias. It is more suitable for large samples. For the sake of the comprehensiveness of the test, therefore, both tests are used in this study. In this study, The Begg and Mazumdar rank correlation (Kendall's $\tau = 0.20$, $p = 0.18$) and Egger's regression test for intercept (intercept = 2.30, 95% CI [-0.54, 5.16], $t = 1.68$, $df = 20$, $p = 0.10$), in which the p-values were greater than 0.05 In summary, this indicates that the present study sample did not suffer from significant publication bias and can be used for further analysis.

Heterogeneity tests

Heterogeneity tests for meta-analyses are used to assess the extent to which effect sizes differ between independent studies (Tipton et al., 2023). The purpose of the

heterogeneity test is to determine whether there is sufficient evidence of significant differences between the effect sizes of the independent studies to decide whether it is appropriate to combine the results of these studies (Muncer et al., 2022). Conducting a heterogeneity test usually uses two methods to determine the heterogeneity of the sample: the Q test and the I2 test (Macaskill et al., 2023). When Q is more fantastic than K-1 (K is the number of effect sizes), a random effects model should be used, with $p \leq 0.1$ indicating heterogeneity between samples. A high degree of heterogeneity will be considered to exist when I2 > 50% (Johnson-Gentile et al., 1994). In this study, the Q value was 92.575, p < 0. 001, and the I2 was 77.316%. Because the number of effect sizes in this paper is 22, the Q value is much larger than the critical value of 22. I2 of 77.316% indicates a high degree of heterogeneity in the sample, and 77.316% of the variance is due to actual differences in effect sizes. In summary, there is significant heterogeneity in this study, so the random effects model was used for analysis (Wu and Shen, 2022).

Overall effect test results

Cohen's d measures the effect size and is often used in Standardised Mean Difference (Cohen, 1969). When the effect size is less than 0.2, the effect size is insignificant; when the effect size is between 0.2 and 0.5, the effect is small; when the effect size is between 0.5 and 0.8, it has a medium effect; and when the effect size is >0.8, it has a high effect. Figure 3 shows the combined effect value of the role-playing method for the effect sizes of the 22 studies after the randomised model was chosen to be 0.818, with a 95% confidence interval of 0.600-1.035 and a statistically significant level (P<0.001), which indicates that the role-playing method has a positively significant effect.

Study name	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
Sturges1	0.252	0.125	0.016	0.006	0.498	2.012	0.044
Sturges2	0.862	0.131	0.017	0.606	1.117	6.598	0.000
Ahmady	1.509	0.367	0.134	0.791	2.227	4.117	0.000
Lee and Kim1	0.205	0.219	0.048	-0.223	0.634	0.939	0.348
Lee and Kim2	0.414	0.221	0.049	-0.018	0.847	1.878	0.060
Lee and Kim3	0.464	0.221	0.049	0.030	0.897	2.096	0.036
Nasr-Esfahani	1.865	0.284	0.081	1.308	2.422	6.564	0.000
Krebt	1.347	0.345	0.119	0.671	2.022	3.908	0.000
Khalaf	0.836	0.223	0.050	0.399	1.274	3.748	0.000
Su1	0.818	0.323	0.104	0.185	1.452	2.532	0.011
Su2	0.060	0.310	0.096	-0.547	0.668	0.195	0.846
Su3	0.207	0.311	0.097	-0.402	0.817	0.667	0.504
Yu1	0.495	0.255	0.065	-0.005	0.994	1.942	0.052
Yu2	1.242	0.274	0.075	0.704	1.780	4.525	0.000
Yu3	1.589	0.289	0.083	1.024	2.155	5.508	0.000
Yu4	0.764	0.260	0.068	0.254	1.273	2.937	0.003
Heidarzadeh1	0.372	0.292	0.086	-0.201	0.945	1.272	0.203
Heidarzadeh2	0.837	0.303	0.092	0.244	1.430	2.765	0.006
Larti	1.435	0.254	0.064	0.937	1.933	5.650	0.000
Dyson1	0.505	0.319	0.102	-0.120	1.130	1.582	0.114
Dyson2	0.545	0.320	0.102	-0.082	1.172	1.705	0.088
Jasemi	1.714	0.274	0.075	1.178	2.250	6.267	0.000
	0.818	0.111	0.012	0.600	1.035	7.361	0.000

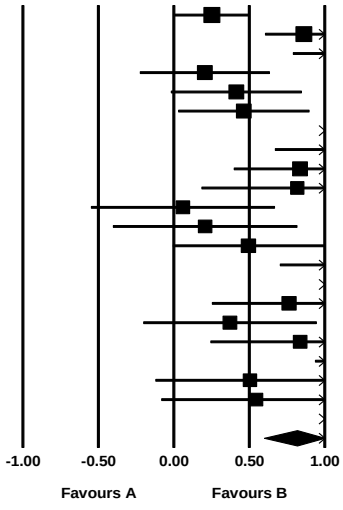

Figure 3
Forest plot for the random-effects model

Robustness check

In order to ensure the robustness and reliability of our results in this study, we tested them by excluding one study at a time (Eljaaly et al., 2021). The aim was to see if any individual study results significantly impacted the overall combined results of our meta-analysis. If the results are susceptible to the exclusion of a particular study, that study may have a significant impact on the combined results and may need to be excluded (Wang et al., 2021). The forest plot using the case-by-case exclusion method is shown in Figure 4. As can be seen from the figure, no matter which study we excluded, the confidence intervals were not found to change very much, and none of the confidence intervals included 1, so our result is robust.

Study name	Point	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
Sturges1	0.851	0.111	0.012	0.634	1.068	7.691	0.000
Sturges2	0.817	0.121	0.015	0.579	1.055	6.732	0.000
Ahmady	0.791	0.112	0.013	0.571	1.010	7.062	0.000
Lee and Kim1	0.850	0.113	0.013	0.627	1.072	7.492	0.000
Lee and Kim2	0.839	0.116	0.013	0.612	1.066	7.248	0.000
Lee and Kim3	0.837	0.116	0.013	0.609	1.064	7.203	0.000
Nasr-Esfahani	0.767	0.105	0.011	0.560	0.973	7.270	0.000
Krebt	0.796	0.113	0.013	0.575	1.018	7.045	0.000
Khalaf	0.817	0.117	0.014	0.588	1.047	6.991	0.000
Su1	0.818	0.115	0.013	0.592	1.044	7.103	0.000
Su2	0.850	0.112	0.013	0.630	1.071	7.561	0.000
Su3	0.844	0.114	0.013	0.622	1.067	7.431	0.000
Yu1	0.834	0.116	0.013	0.607	1.061	7.205	0.000
Yu2	0.798	0.114	0.013	0.575	1.021	7.010	0.000
Yu3	0.781	0.110	0.012	0.565	0.997	7.095	0.000
Yu4	0.821	0.116	0.014	0.593	1.049	7.065	0.000
Heidarzadeh1	0.838	0.115	0.013	0.613	1.063	7.308	0.000
Heidarzadeh2	0.817	0.115	0.013	0.591	1.043	7.081	0.000
Larti	0.786	0.111	0.012	0.568	1.005	7.058	0.000
Dyson1	0.831	0.115	0.013	0.606	1.057	7.233	0.000
Dyson2	0.830	0.115	0.013	0.604	1.055	7.212	0.000
Jasemi	0.773	0.108	0.012	0.562	0.984	7.184	0.000
	0.818	0.111	0.012	0.600	1.035	7.361	0.000

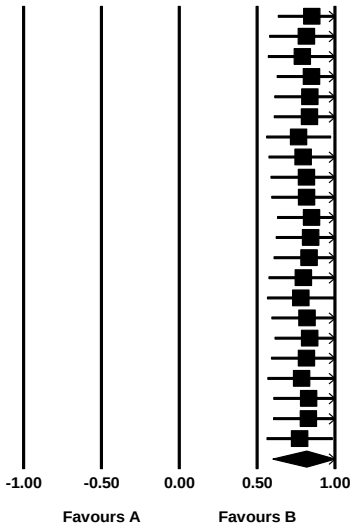

Figure 4
Forest Plot of Sensitivity Analysis for the one study removed

Subgroup analysis of different outcomes

The role of the role-playing method on students' learning outcomes was measured from different results to explore the effectiveness of its application, and the results are shown in Table 1. The results from the heterogeneity test show that QB=26.45, $p<0.001$, which indicates a significant difference in the effect of the role-play method on the learning outcomes of different dimensions. The effect values on learners' Attitude, Communication,Comprehend,Creativity,Emotional,knowledge, knowledge, Satisfaction and Skill were 0.836 ($p<0.005$), 0.727 ($p< 0.001$), 0.223 ($p<0.05$), 0.525 ($p<0.05$), 0.745 ($p<0.001$), 0.371 ($p>0.05$), 0.958 ($p<0.001$), 0.985 ($p<0.001$), and 1.170 ($p<0.001$) for attitude, performance, satisfaction, and Skill produced large effects, moderate effects on Communication, Creativity, Emotional, and small effects on comprehend. Of these,

only Knowledge did not reach a statistically significant level, and the learning effect had the best effect at the learner Skill level. This is consistent with the results obtained by previous scholars (Nasr-Esfahani et al., 2019).

Table 1
The influence of outcomes on effect

	N	ES	95%CI	Q value	I^2
Attitude	1	0.836**	[0.24, 1.43]	0.00	0.00
Communication	3	0.727***	[0.44, 1.01]	14.63	89.33***
Comprehend	3	0.223*	[0.01, 0.43]	0.33	0.00
Creativity	2	0.525*	[0.08, 0.96]	0.00	0.00
Emotional	3	0.745***	[0.47, 1.01]	10.59	81.12***
knowledge	1	0.371	[-0.20, 0.94]	0.000	0.00
Performance	2	0.958***	[0.62, 1.29]	12.63	92.08***
Satisfaction	3	0.985***	[0.76, 1.20]	3.81	47.58
Skill	4	1.170***	[0.89,1.44]	9.66	68.97**

Subgroup analysis of different experimental types

Randomised controlled trials and quasi-experiments are two different types of research designs (Casselman et al., 2019) used to assess an intervention or causality. Because of the design gap, this study analysed subgroups using different types of experiments as a basis for delineation. As can be seen in Table 2: quasi-experiment (ES=0.883, P<0.05) and true experiment (ES=0.354, P>0.05). In the test of heterogeneity, QB=4.189, P<0.05, indicating significant differences in the results of different types of experiments.

Table 2
The influence of outcomes on effect

	N	ES	95%CI	Q value	I^2
Quasi experiment	19	0.883***	[0.64,1.11]	84.56	78.71***
True experiment	3	0.354	[-0.09,0.80]	3.18	37.14

Subgroup analysis by specialty

There are differences in students' knowledge when learning with the role-play method, and this study explores the effect of the type of specialisation on students' learning outcomes by taking different specialisations as a basis for division. As can be seen in Table 3: Nursing (ES=0.975,p<0.001), Physiology (ES=0.556,p>0.05), Linguistics (ES=0.650,p<0.005), and others (ES=0.525,p<0.05). In this, Physiology did not reach statistical significance. Nursing had a high positive effect, and Linguistics had a moderate positive effect. However, in the test of heterogeneity between groups, QB=3.489, p>0.05 indicates no significant difference in the effect of different majors on learning outcomes.

Table 3
The influence of majors on effect

	N	ES	95%CI	Q value	I^2
Attitude	13	0.975***	[0.65, 1.29]	59.77	79.92***
Communication	2	0.556	[-0.04, 1.15]	11.33	91.17**
Comprehend	5	0.650**	[0.22, 1.07]	10.69	62.59*
Creativity	2	0.525*	[0.08,0.96]	0.00	0.00

Subgroup analysis by country

As can be seen in Table 4, there is a significant difference in the effect on the effect between countries (QB=14.335, p<0.05). In terms of countries, Jordan (ES=0.836, p=0<0.001), Iraq (ES=1.347, p=0<0.001) and Iran (ES=1.291, p=0<0.001) possessed high effects, and China (ES=0.419, p=0<0.001) possessed low effects.America (ES=0.556, p=>0.05) did not reach statistical significance.

Table 4
The influence of country on effect

	N	ES	95%CI	Q value	I^2
Jordan	1	0.836***	[0.39, 1.27]	0.00	0.00
Korea	7	0.714***	[0.36, 1.06]	21.78	72.46**
America	2	0.556	[-0.04, 1.15]	11.33	91.17**
Iraq	1	1.347***	[0.67, 2.02]	0.00	0.00
Iran	6	1.291***	[0.83, 1.75]	19.26	74.05**
China	5	0.419**	[0.14, 0.69]	3.55	0.00

Subgroup analysis of different control groups

In order to investigate whether there is a difference in the effect of different control groups on learning outcomes, subgroup analyses were conducted. The results are shown in Table 5, as can be seen in Table 6, traditional way (ES=0.976, P<0.001), LECTURE (ES=0.882, P<0.001) and Others (ES=0.419, P<0.005). The ES of both traditional way and collective were greater than 0.8, indicating a high positive effect on learning outcomes. Others had a smaller positive effect. The test of heterogeneity between groups (QB=6.704, P=<0.05) shows a significant difference in the effect on the effect value by using different control groups.

Table 5
The influence of control group on effect

	N	ES	95%CI	Q value	I^2
Traditional way	8	0.976***	[0.55, 1.39]	39.00	82.05***
Lecture	9	0.882***	[0.54, 1.21]	43.21	81.53***
Others	5	0.419**	[0.14,0.69]	3.55	0.00

DISCUSSION

This is important for satisfaction and performance, especially in situations that require teamwork. From the combined effect value (ES=0.818, p<0.001), it can be concluded

that the role-play method has a greater positive facilitating effect on students, consistent with the findings of mainstream research. Regarding learning effectiveness, the role-playing method significantly affected Attitude, Performance, Satisfactions and Skill. This may be because, in role-playing, participants may be asked to take on roles inconsistent with their original views or attitudes. This cognitive dissonance can prompt them to think and reassess their attitudes. The role-playing method involves participants taking on specific roles in virtual situations and simulating real-life situations. This practical exercise and application enables participants to translate their theoretical knowledge into real-life actions, thus enhancing their skill levels. Through hands-on experience and practice, they can better understand and cope with situations. Role-playing usually involves participant interaction, which helps build collaboration and communication skills. This is important for satisfaction and performance, especially in situations that require teamwork.

Although this study found significant differences in the results between the quasi-experiment and the actual experiment, the sample size may affect the significance of the results. The smaller samples in the randomised controlled experiments in our included studies may have led to non-significant results. Whereas the quasi-experimental design may have used a larger sample, thus increasing the likelihood of the results being significant.

There were no statistically significant differences between the different specialisms in the delivery of the role-play activity. This may be because. Participants from different professions may be very similar in key characteristics, such as age, gender, and education level. Out of the 12 studies we included, only one study had participants with secondary school education; all others had tertiary education. This could be the reason for this.

There are statistically significant differences between countries, meaning that role-playing varies from country to country. This may be because these countries are located in different geographical locations and have different geographic and climatic conditions. For example, Korea is located in East Asia, while Jordan is located in the Middle East. Each country has its own unique culture, language and religious traditions. For example, Iraq and Iran have an Islamic culture, while Korea has a Korean culture. This may account for the differences.

The choice of different control groups may affect the differences in results. Suppose the control group is chosen to be different from the experimental group in some ways, such as educational methods, materials, and instructors. In that case, these differences may lead to differences in the results. Our subgroup analyses revealed that the effect value of the role-play method was the largest for the control group using the traditional approach. The lecture was used in the control group, and the effect value of the role-playing method was lower than that of the control group using the traditional approach. This may be because most traditional teaching methods are in the form of textbooks or lectures, and this form does not bring better learning effects to the students. On the other hand, the lecture is mostly conducted in the form of PPT courseware, which can provide students with a better experience than traditional teaching methods.

IMPLICATIONS

The study results show that the role-playing method has a more significant positive facilitating effect in education. This reminds us that diversity of teaching methods and strategies should be encouraged in educational practices to meet different students' learning needs and learning styles. In addition, the role-play method produced more excellent effects on ATTITUDE, PERFORMANCE, SATISFACTION and SKILL. This suggests that educational methods should focus on transferring knowledge and skills (cognitive dimension) and students' emotional experience and satisfaction (affective dimension). Balancing these two dimensions can improve the comprehensiveness and depth of learning. The role-play method emphasises practical application and situational simulation. It reminds us that combining theoretical knowledge with real-life situations improves students' understanding and retention of what they have learned and enhances their skills and performance abilities.

The role-play method has similar effects on students from different disciplines. This could mean that the role-play method is a universal educational method that can be used across different subject areas. This finding may encourage educators to use this method across multiple majors and fields. The lack of significant differences between majors may indicate that role-playing activities can promote interdisciplinary collaboration. This provides opportunities for students from different majors to learn and collaborate (Yancey, 2019), which develops teamwork and communication skills. This calls for educational administrators or relevant departments to develop inter-professional synergistic activities that will help in interdisciplinary communication among learners and promote the development of students' innovative skills (Tsai et al., 2016).

The results suggest that cultural factors significantly impact the effectiveness of role-playing activities. This emphasises the importance of culture and that cultural contexts may influence learning styles, interaction patterns and cognitive differences. Educational research and educational methodology theories should consider cultural factors more (Majadly et al., 2024). This requires governments and educational institutions to adapt educational policies and curricula to the country's culture and the students' needs.

Finally, the effectiveness of educational methods is influenced by several factors. This reminds us that the effectiveness of educational methods is a complex issue that requires the consideration of multiple variables, including instructional design, student characteristics, and the educational environment. Practical assessment and feedback are needed to understand educational methods' effectiveness better. Educators should use a variety of assessment methods. They can cite valuable results from the engineering disciplines, integrate them with education to understand students' learning progress and improve teaching methods based on feedback. In the future, teachers can introduce computer-supported simulation teaching (Vallespin & Prudente, 2024)). This can increase the attractiveness of teaching to students.

LIMITATIONS

The first limitation is that the characteristics of the sample we included in this study needed to be more comprehensive; for example, in the sample we included, the educational qualifications of the educated were a constraint to our analysis. We covered secondary schools and universities in this study and did not retrieve a sample of primary education. This makes our findings in this study more applicable to higher education, and therefore, subsequent studies should consider the effects of other role-playing methods in other stages of education as the sample size increases.

The second limitation is that we did not include a large enough sample size in this study, which may affect our results. For example, after subgroup analyses of the types of experiments in the sample, only three studies included actual experiments. This is because designing and executing randomised controlled experiments may require more time, resources and effort, including recruiting many students, implementing random allocation, and conducting long-term follow-up. This may make quasi-experimental designs more attractive because they may be easier to implement, especially for educators and researchers constrained by time and budget. However, the number of studies on randomised controlled experiments is believed to increase over time.

REFERENCES

Ahmady, S., Shahbazi, S., Khajeali, N. (2021). Comparing the effect of traditional and r ole-play training methods on nursing students' performance and satisfaction in the princi ples of patient education course. *Journal of Education and Health Promotion*. 10.https:/ /doi.org/10.4103/jehp.jehp_722_20

Aljaberi, M.A., Alsalahi, A., Juni, M.H., Noman, S., Al-Tammemi, A.a.B., Hamat, R.A. (2021). Efficacy of interventional programs in reducing acculturative stress and enhanc ing adjustment of international students to the new host educational environment: A syst ematic review and meta-analysis. *International journal of environmental research and p ublic health*. *18*(15), 7765.https://doi.org/10.3390/ijerph18157765

Am Seo, Y., Yoon, S., Kim, Y.A. (2019). The effects of domestic nursing practical educ ation using role-play: A systematic review and meta-analysis. *The Korean Data & Infor mation Science Society*. *30*(2), 309-321.https://doi.org/10.7465/jkdi.2019.30.2.309

Aura, I., Järvelä, S., Hassan, L., Hamari, J. (2023). Role-play experience's effect on stu dents' 21st century skills propensity. *The Journal of educaTional research. 116*(3), 159-170.https://doi.org/10.1080/00220671.2023.2227596

Bajis, D., Chaar, B., Basheti, I., Moles, R. (2021). Teaching asthma first aid to pharmac y students: A comparative study between an online course and simulation by role-play. *Pharmacy Education*. *21*, 92-104.https://doi.org/10.46542/pe.2021.211.92104

Carbajal, R.M., Angulo, C.V. (2019). Role playing games for mathematics education. *E ducation in the Knowledge Society*. *20*, 1-13.https://doi.org/10.14201/eks2019_20_a7

Casselman, M.D., Atit, K., Henbest, G., Guregyan, C., Mortezaei, K., Eichler, J.F. (201 9). Dissecting the flipped classroom: Using a randomized controlled trial experiment to

determine when student learning occurs. *Journal of Chemical Education*. 97(1), 27-35.https://doi.org/10.1021/acs.jchemed.9b00767

Chen, Y., Zhang, X., Shi, L., Yang, X., Liu, X., Ye, F., Lin, S. (2021). Role-playing: An effective method for clinical novitiate teaching of infectious diseases. *Medical Science Educator*. *31*, 53-57.https://doi.org/10.1007/s40670-020-01031-x

Cohen, J. (1969). Statistical Power Analysis for the Behavioral Sciences. *The SAGE Encyclopedia of Research Design*.https://doi.org/10.2307/2529115

Dai, R.-x., He, X.-J., Hu, C.-L. (2018). Maternal pre-pregnancy obesity and the risk of macrosomia: a meta-analysis. *Archives of gynecology and obstetrics*. *297*, 139-145.https://doi.org/10.1007/s00404-017-4573-8

Dyson, S.B., Chang, Y.-L., Chen, H.-C., Hsiung, H.-Y., Tseng, C.-C., Chang, J.-H. (2016). The effect of tabletop role-playing games on the creative potential and emotional creativity of Taiwanese college students. *Thinking Skills and Creativity*. 19, 88-96.https://doi.org/10.1016/j.tsc.2015.10.004

Eljaaly, K., Bidell, M.R., Gandhi, R.G., Alshehri, S., Enani, M.A., Al-Jedai, A., Lee, T. C. (2021). Colistin nephrotoxicity: meta-analysis of randomized controlled trials. Open forum infectious diseases 8, ofab026.https://doi.org/10.1093/ofid/ofab026

Ferreira, M., & Marques, A. (2024). Foundations of teaching and learning–a study with teachers on conceptions and pedagogical practices. *International Journal of Instruction*, *17*(2), 67-84.

Gauthier, A., Kato, P.M., Bul, K.C., Dunwell, I., Walker-Clarke, A., Lameras, P. (2019). Board games for health: A systematic literature review and meta-analysis. *Games for health journal*. *8*(2), 85-100.https://doi.org/10.1089/g4h.2018.0017

Gelis, A., Cervello, S., Rey, R., Llorca, G., Lambert, P., Franck, N., Dupeyron, A., Delpont, M., Rolland, B. (2020). Peer role-play for training communication skills in medical students: a systematic review. *Simulation in Healthcare*. *15*(2), 106-111.https://doi.org/10.1097/SIH.0000000000000412

Gong, T., Wang, Y., Pu, H., Yin, L., Zhou, M. (2022). Study on the Application Value of PBL Combined with Situational Simulation Teaching Method in Clinical Practice Teaching of Radiology Department. *Computational and Mathematical Methods in Medicine*.https://doi.org/10.1155/2022/6808648

Gregorius, R.M. (2017). Performance of underprepared students in traditional versus animation-based flipped-classroom settings. *Chemistry Education Research and Practice*. *18*(4), 841-848.https://doi.org/10.1039/c7rp00130d

Heidarzadeh, H., Heidarzadeh, Z., Azadi, A. (2020). Comparison of pre- hospital triage training by role playing and lecture on nursing students' knowledge, attitude and performance. *Nursing Open*. *7*(4), 935-942.https://doi.org/10.1002/nop2.464

Hye- Yun, J., Kyeong- Hwa, L. (2023). Nurturing Group Creativity in Mathematical Modeling through Role Playing. *The Journal of Creative Behavior*.https://doi.org/10.1002/jocb.583

Jadad, A.R., Moore, R.A., Carroll, D., Jenkinson, C., Reynolds, D.J.M., Gavaghan, D.J., McQuay, H.J. (1996). Assessing the quality of reports of randomized clinical trials: is blinding necessary? *Controlled clinical trials. 17*(1), 1-12.https://doi.org/10.1016/0197-2456(95)00134-4

Jasemi, M., Goli, R., Zabihi, R.E., Khalkhali, H. (2022). Educating ethics codes by lecture or role-play; which one improves nursing students' ethical sensitivity and ethical performance more? A quasi-experimental study. *Journal of Professional Nursing*. *40*, 122-129.https://doi.org/10.1016/j.profnurs.2021.11.002

Johnson-Gentile, K., Clements, D., Battista, M. (1994). Effects of Computer and Noncomputer Environments on Students' Conceptualizations of Geometric Motions. *Journal of Educational Computing Research*. *11*, 121-140.https://doi.org/10.2190/49EE-8PXL-YY8C-A923

Khalaf Alzboun, B.K., Smadi, O., Baniabdelrahman, A. (2017). The effect of role play strategy on Jordanian EFL tenth grade students' speaking skill. Arab World English Journal (AWEJ) Volume. 8.https://doi.org/10.24093/awej/vol8no4.8

Krebt, D.M. (2017). The effectiveness of role play techniques in teaching speaking for EFL college students. *Journal of language Teaching and Research*. *8*(5), 863.https://doi.org/10.17507/jltr.0805.04

Kvarven, A., Strømland, E., Johannesson, M. (2020). Comparing meta-analyses and preregistered multiple-laboratory replication projects. *Nature Human Behaviour*. *4*(4), 423-434.https://doi.org/10.1038/s41562-019-0787-z

Larti, N., Ashouri, E., Aarabi, A. (2018). The effects of an empathy role-playing program for operating room nursing students in Iran. *Journal of educational evaluation for health professions*. 15.https://doi.org/10.3352/jeehp.2018.15.29

Lee, B.G., Kim, S.-H. (2022). Development and effects of a high-risk pregnancy emotive role-play program for nursing students: a quasi-experimental study. Korean *Journal of Women Health Nursing*. *28*(4), 317-328.https://doi.org/10.4069/kjwhn.2022.12.06

Macaskill, P., Takwoingi, Y., Deeks, J.J., Gatsonis, C. (2023). Understanding meta- analysis. Cochrane handbook for systematic reviews of diagnostic test accuracy. 203-247. https://doi.org/10.1002/9781119756194.ch9

Majadly, H., Awad, N., & Amasha, M. (2024). Online learning in higher education–learners' perceptions, interaction, flexibility and challenges. *International Journal of Instruction, 17*(3), 545-564.https://doi.org/10.29333/iji.2024.17330a

Mc Rollyn, D. V., & Prudente, M. S. (2024). Meta-analysis on the effectiveness of learning cycle models and online teaching strategies in chemistry education. *International Journal of Instruction*, *17*(2), 335-350.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G., Group*, P. (2009). Preferred reporti ng items for systematic reviews and meta-analyses: the PRISMA statement. *Annals of i nternal medicine*. *151*(4), 264-269.https://doi.org/10.7326/0003-4819-151-4-200908180 -00135

Muncer, G., Higham, P.A., Gosling, C.J., Cortese, S., Wood-Downie, H., Hadwin, J.A. (2022). A meta-analysis investigating the association between metacognition and math performance in adolescence. *Educational Psychology Review*. *34*(1), 301-334.https://doi .org/10.1007/s10648-021-09620-x

Nakagawa, S., Lagisz, M., Jennions, M.D., Koricheva, J., Noble, D.W., Parker, T.H., Sá nchez-Tójar, A., Yang, Y., O'Dea, R.E. (2022). Methods for testing publication bias in e cological and evolutionary meta-analyses. *Methods in Ecology and Evolution*. *13*(1), 4-21.https://doi.org/10.1111/2041-210X.13724

Nasr-Esfahani, M., Yazdannik, A., Mohamadiriz, S. (2019). Development of nursing st udents' performance in advanced cardiopulmonary resuscitation through role-playing le arning model. *Journal of education and health promotion*. 8.https://doi.org/10.4103/jeh p.jehp_125_18

Rahman, T., Lewis, S.E. (2020). Evaluating the evidence base for evidence- based instr uctional practices in chemistry through meta- analysis. *Journal of Research in Science Teaching*. *57*(5), 765-793.https://doi.org/10.1002/tea.21610

Sturges, D., Maurer, T.W., Cole, O. (2009). Understanding protein synthesis: a role-pla y approach in large undergraduate human anatomy and physiology classes. *Advances in Physiology Education*. *33*(2), 103-110.https://doi.org/10.1152/advan.00004.2009

Su, P.-c. (1990). The effectiveness of role-play activities in learning English as a foreig n language by Chinese college students.

Svensson, R.B., Regnell, B. (2017). Is role playing in Requirements Engineering Educat ion increasing learning outcome? *Requirements Engineering*. *22*, 475-489.https://doi.or g/10.1007/s00766-016-0248-4

Tipton, E., Bryan, C., Murray, J., McDaniel, M.A., Schneider, B., Yeager, D.S. (2023). Why meta-analyses of growth mindset and other interventions should follow best practi ces for examining heterogeneity. https://doi.org/10.1037/bul0000384

Tsai, C.-C., Corley, E.A., Bozeman, B. (2016). Collaboration experiences across scienti fic disciplines and cohorts. *Scientometrics*. *108*, 505-529.https://doi.org/10.1007/s11192 -016-1997-z

Turner, G.W., Round, R., Chhetry, D.S. (2023). Teaching social work practice skills: A collaborative autoethnography identifying key practice skills and modes of delivery in t he art of social work practice. *The British Journal of Social Work*. *53*(4), 2434-2453.htt ps://doi.org/10.1093/bjsw/bcac195

Wang, C., Kou, H., Li, X., Lan, J. (2021). Association between preoperative blood trans fusion and postoperative venous thromboembolism: review meta-analysis. *Annals of Va scular Surgery*. *73*, 463-472.https://doi.org/10.1016/j.avsg.2020.11.033

Wu, H., Shen, J. (2022). The association between principal leadership and student achie vement: A multivariate meta-meta-analysis. *Educational Research Review*. *35*, 100423. https://doi.org/10.1016/j.edurev.2021.100423

Yancey, N.R. (2019). Collaboration in teaching-learning: Honoring the wisdom of diver se perspectives. *Nursing Science Quarterly*. *32*(4), 278-282.https://doi.org/10.1177/089 4318419864329

Yu, M., ja Kang, K. (2017). Effectiveness of a role-play simulation program involving t he sbar technique: A quasi-experimental study. *Nurse Education Today*, *53*, 41-47.https: //doi.org/10.1016/j.nedt.2017.04.002

Zhang, A., Ji, Q., Zhang, K., Cao, Q., Chen, Y., Chen, J., DuVall, A. (2022). Solution-f ocused brief therapy for adolescent and young adult cancer patients in China: a pilot ran domized controlled trial. *Journal of psychosocial oncology*. *40*(6), 816-833.https://doi.o rg/10.1080/07347332.2021.1931627

Zhang, L. (2021). Practical Teaching System Reform for the Cultivation of Applied Un dergraduates in Local Colleges. *International Journal of Emerging Technologies in Lea rning (iJET). 16*(19), 59-68.https://doi.org/10.3991/ijet.v16i19.26159