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A Meta-Analysis of the Impact of Enrichment Program on Future Problem-Solving Skills of Gifted Students

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Abstract

The current study analyzes the studies concerned with the impact of enrichment programs on the skills of future problem-solving of gifted students between 2010-2023. The sample comprised (16) studies: (4) were correlative, and (12) were quasi-experimental. The study adopted the descriptive analytical approach using the meta-analysis method. It aimed to identify the efficacy of gifted enrichment programs in developing future solving-problem skills. According to the correlative and quasi-experimental designs, the results revealed a significant impact of such programs on developing the skills mentioned above. They also unveiled that there were differences with statistical significance attributed to academic-level variables according to the correlative designs. Still, no differences were attributed to that same variable regarding the quasi-experimental designs. As for gender variables, differences with statistical significance were found, according to the correlative and quasi-experimental. The study, a rare of its kind, recommends conducting further research in the field to enable researchers of this study to generalize its results.

Keywords: *Enrichment programs; Future problem-solving; Gifted students; Meta-analysis.*

1. Introduction

The rapid changes that the modern age has been undergoing with regard to technological and cognitive revolution oblige researchers to keep pace with such changes through developing gifted teaching to match the twenty-first-century challenges, which require developing high-level skills. Therefore, designers of enrichment programs had to pay more attention to the skills that develop creative thinking by creating educational situations, activities, and strategies to be used in such programs to encourage students to be creative and innovative. The future-solving skills program is one of those through which gifted students can predict the challenges, difficulties, and problems that any society may encounter in the future (Naseri, 2022).

Future problem-solving is one of the foremost education programs that enhance positive future thinking in the gifted (Zahrani et al.,2020). Notably, researchers showed great interest in developing such activities through experimental and field studies to measure the efficacy of gifted enrichment-based programs on these students. (Bukhari & Qutami, 2014) Pointed out that gifted specialized programs were needed to develop the thinking skills of future problem-solving by conducting studies relevant to the issue. Despite the

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various studies, our knowledge about how gifted students acquire and practice those skills still needs to be examined to determine its benefits.

With regard to the studies of concern, many of them tackled the variable of future problem-solving. Among those was the study by (Mabrook et al., 2020), which noted that the programs based on problem-solving were influential in developing self-creativity in the students. The study by (Harthy, 2020) confirmed the effectiveness of an enrichment training program based on the "Kawkeb" model in developing gifted science problems. The study by (Qutami & Sakaker, 2010) and that by (Battoosh & Drabkeh 2017) also confirmed the effectiveness of a training-enrichment program based on future problem-solving strategies in developing gifted critical thinking skills. These results differed from their counterparts in the current study with regard to age and gender variables. The results also differed with those of (Shaikh, 2012), who concluded that there were no differences with statistical significance concerning critical thinking that might be attributed to the future problem-solving program. On the other hand, some studies, like that by (Sultan & Harbi, 2021), linked future problems to creative thinking skills, gender, and academic level variables. That study aimed to measure the efficacy of distance training programs based on problem-solving strategies in developing gifted creative thinking. The results revealed that such a program did not develop gifted creative thinking that might be attributed to classroom variables. The study by (Naseri, 2022) pointed out that the problem-solving gained by teaching methods played an essential role in developing creative thinking in outstanding and gifted students. However, such a result disagreed with that of (Mirdas, 2018), which showed no correlative relationship with statistical significance between creative thinking and problem-solving of students at the secondary level.

On the other hand, this type of methodology, the Meta-analysis, was not given adequate interest by researchers in the Arab World despite its significance. (Streenbergen- Hu & Olzewski Kubilius, 2016) Confirmed that the Meta-analysis might provide unique contributions to gifted education because first, it is reliable for it is based on repeatable steps of methodology (Fidler, 2010); second, Meta-analyses provide researchers with a chance to explore a good number of independent variables and their probable impacts. (Shokraneh, 2019) confirmed that the Meta-analysis is a more comprehensive method for evaluating gifted education programs because it simultaneously covers a wide range of median and independent variables. It will also help researchers and practitioners absorb different studies' results better.

1.1 Significance of the study:

The study's significance lies in its contribution to the gifted research field by using this type of analysis, the meta-analysis, has rarely been adopted. It also helps identify the range of benefits from the educational programs that develop skills of future problem-solving in the gifted, as it allows researchers to examine the size of the difference between sample means and the community. Thus, it reflects the effect size that leads to a better understanding of the study results. Through meta-analysis, the factors affecting teaching gifted problem-solving skills will be identified. Therefore, the study's contribution to the field of gifted teaching will be unique since the descriptive meta-analysis is one of the methods that provide a more advanced and comprehensive analysis of gifted teaching programs, which enables researchers to concurrently study a wide range of independent and moderation variables (Vaughn et al., 1991). The study might also guide future research and studies on future problem-solving.

1.2 Questions of the study:

The study attempts to answer the following questions:

1- What is the average effect size of gifted enrichment program interventions on developing future problem-solving skills according to correlative designs?

2- How different is the average effect size of gifted enrichment program interventions on developing future problem-solving skills according to correlative designs of participants' gender (males, females, both males, and females) and academic level (primary, intermediate, and secondary)?

3- According to the quasi-experimental designs, what is the average effect size of gifted program interventions on developing future problem-solving skills?

4- What is the extent of variation in the average effect size of gifted enrichment program interventions on developing future problem-solving skills according to quasi-solving experimental designs about participants' gender and academic level?

1.3 Definitions of concepts:

- Meta-analysis: The concept was defined by (Galss, 1976) as stated in (Armstrong, 2016), to be a statistical analysis of many study results to integrate abstracts or information to develop integrated results for the same subject. It is a way of comprehending the increasing number of relevant studies. The concept was given many names: meta-analysis, super-analysis, and dimension-analysis.

- Future-solving: (Darabkeh 2017: 79), based on Torrance's definition, defined it as "the skill that is used to analyze or put down strategies to solve any problems, difficulties, or any unexpected and non-specified obstacles that might occur in the upcoming (25) years or less."

Gifted Students:

The General Administration for gifted care in Saudi Arabia defines a gifted student to be "The student who possesses abnormal capabilities or is distinguished for outstanding performance among his peers in one field or more that are valued by the society, such as mental excellence, innovative thinking, academic achievement, or special skills and capabilities. He needs special educational care that is missing from the regular school curriculum". (Ministry of Education General Administration for the Gifted).

Enrichment Programs:

Hamouri (2009) defined them as "A set of training programs the trainer uses to develop students' skills, being mental, social, intellectual, or any other skills that enrich their capabilities."

2. Study procedures:

2.1 Study methodology

The study adopted the analytical descriptive approach using the meta-analysis method, which suits the nature and objectives of the study. This method is considered one of the advanced approaches for analyzing previous research and studies, which helps explicate the vast literature beyond academic issues. It is the approach that elicits potential results based on individual studies.

It achieves that by surveying the relevant phenomenon and examining the theoretical framework of such studies besides the problem statement, procedures, and results. It afterward put down standards for the studies whose results are subjected to reanalysis and taking the relevant decision (Faculty, 2015).

2.2 Sample of the study:

The sample comprised (16) articles published in Arabic and Foreign refereed electronic or paper journals between (2010-2023).

2.3 Method:

(Shokraneh, 2019) recommended documenting the strategies and steps approved for meta-analysis to facilitate repetition or upgrading. The current study adopted the following analytical steps:

- First: Data Collection

This step involves collecting research works published between (2010-2023) through two steps; the first was conducting a computer search using keywords such as: "gifted," "gifted-caring programs," "gifted caring," "gifted student," "higher thinking skills," "thinking strategies," "thinking skills," "gifted programs," "creative thinking," "critical thinking" and "future problem-solving skills." The studies containing these keywords in the abstracts or titles were selected to be reviewed individually to get more references.

- Manual search for articles relevant to giftedness such as Journal for the Education of the Gifted, Roeper Review, Gifted Child Quarterly, Gifted Education, Journal of Advanced Academics, Journal of Umm Al-Qura University, International Journal of United Arab Emirates, and Educational Journal of Taif University were examined. In addition, a search was conducted on the research database Google Scholar, ERIC, Google Drive, and Dar Al-Manthooma Drive. The total number of articles obtained was (282).

- At the second stage of the search, the standards of including search and studies in the current one were applied by examining measurement tools and statistical results before they were finally included in the study. That was done by sieving out the studies about their use of the standard criteria for measuring future problem-solving skills and adequate statistical information that helped elicit size (e.g., means, standard deviations, P values, and ANOVA); the total number ended up with (12) studies to be examined.

Impact of inclusion and exclusion standards:

The inclusion standards of studies were applied in compliance with the following controls:

- Select the articles published in Arabic and Foreign journals between 2010-2023.
- Select the Open Access Journals.
- Select the studies using the correlative and quasi-experimental approaches.
- Select the studies whose sample numbers are specified.
- Select the studies applying the parametric tests such as Pearson Correlative Test, (T) Test, and (F) Test.
- Select the studies with data correlating interventions of gifted enrichment programs to the development of future problem-solving skills or their impact on (correlation coefficient, sample size, arithmetic means, and standard deviations).

The aforementioned specified standards were used to examine the previous (16) selected studies. Figure (1) illustrates the plan of the selection process.

Figure (1): A stage plan of studies' selection and exclusion

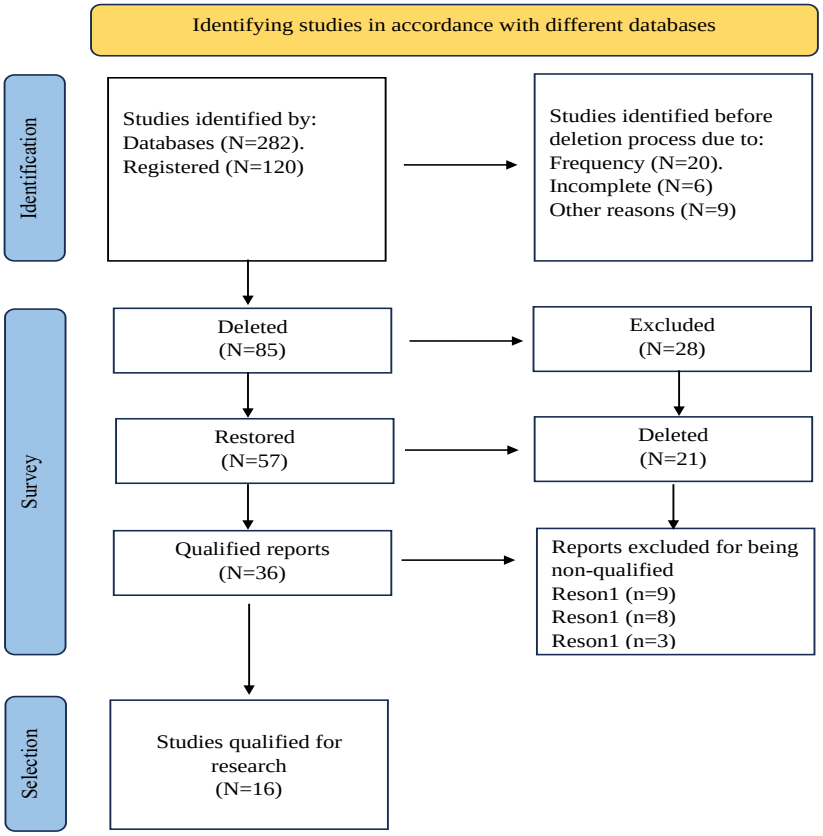

Table (1): Description of the research sample subjected to Meta-analysis

No	Author	Year	Dependent	Sample type Male/female	Academic level Primary Intermediate Secondary	Design type Quasi-experimental Correlative
1	Kitani	2019	Problem-solving	Both	Secondary	Quasi-experimental
2	Ramasamy	2021	Problem-solving	Females	Secondary	Correlative
3	Shanta	2022	Problem-solving	Both	Secondary	Quasi-experimental
4	Guner	2021	Problem-solving	Both	Intermediate	Correlative
5	Main	2017	Problem-solving	Both	Intermediate	Quasi-experimental
6	Azevedo	2017	Problem-solving	Males	Secondary	Correlative
7	Kim	2019	Problem-solving	Both	Primary	Quasi-experimental
8	Zahrani	2020	Problem-solving	Both	Intermediate	Quasi-experimental
9	Horak	2017	Problem-solving	Females	Intermediate	Quasi-experimental
10	Ballah	2022	Problem-solving	Both	Secondary	Correlative
11	Bukhari	2017	Problem-solving	Males	Secondary	Quasi-experimental
12	Battoosh	2017	Problem-solving	Both	Intermediate	Quasi-experimental
13	Ali	2017	Problem-solving	Males	Secondary	Quasi-experimental
14	Shammari	2016	Problem-solving	Males	Intermediate	Quasi-experimental
15	Hasan	2020	Problem-solving	Males	Secondary	Quasi-experimental
16	Niglamsunt Horn	2020	Problem-solving	Both	Secondary	Quasi-experimental

Table (2) Outlines the study distribution.

Table (2): Study distribution according to gender, participants and academic level

Study type	No.	Males	Females	Males & Females (Both)	Primary	Intermediate	Secondary
Correlative	4	1	1	2	0	1	3
Quasi-experimental	12	4	1	7	1	5	6

Third: Coding of study qualities

A coding protocol was designed to reflect information on the essential qualities of the study: experimental situations (if available), participants, samples, and result qualities (Cooper, 2010). Thus, the modified coding of the current study was as follows:

A- Study design

This sheds light on the following:

- Correlative studies: These tackled the correlative relationships between the interventions of gifted enrichment programs and the development of future problem-solving skills.

- Quasi-experimental studies: They were tackled if they discussed the impact of gifted enrichment programs on developing future problem-solving.

B- Types of participants: These were coded into (males, females, and both).

C- Academic level: They were coded into (primary, intermediate, and secondary).

Fourth: Strategy of data analysis:

The study adopted (Cohen's, 2011) standards to measure effect size, which was classified as follows: (0 – 0.10) Weak, (0.11 – 0.30) Fair, (0.31 – 0.50) Moderate, (0.51 – 0.80) Large, (0.81 – and more) very large.

The combined effect size of previous studies was calculated by selecting the used model exemplified by the random or fixed model whose determination depends on the heterogeneity test, which reveals whether the observed variance of the (Q) effect sizes differs to reflect the variance resulting from preview error (Cooper, 2010). Therefore, the (Q) value must be found and compared to the value degree (1-n=df) in the value table (X2) as follows: If the (Q) value is less than (X2), then the effect sizes of previous studies are considered homogeneous. The fixed-effect model calculates the combined effect size. However, if the (Q) value is more significant than (X2), then the effect size of the studies is considered heterogeneous. The random-effect model calculates the size of the combined effect.

The current study adopted the random-effect model for being propitious to its objectives. The heterogeneity test was administered, and the categorical moderator analysis was applied to detect whether the size of the combined interventions of the gifted enrichment program developing future problem-solving skills revealed any statistical difference (design type, participants' gender, and academic level). Determining whether the means were functional was tested via the (Q) value in light of the random-effect model.

Fifth: Effect of size computing:

The size of the effect of the Quasi-experimental studies was done by computing the difference between the two means of the Quasi-experimental and the Control groups divided by the combined standard deviation. Pearson's correlation coefficient was used to measure the impact of the studies of correlative design.

Sixth: Publication bias Evaluation:

Publication bias refers to the systematic under-representation of published studies in the literature that results from a higher probability of publishing functional studies. That bias may affect the results of meta-analysis (Rothstein & Borenstein, 2006). Researchers of meta-analysis studies were concerned with analyzing a group of studies published in scientific refereed journals and periodicals. However, some other similar studies, for one reason or another, were not given a chance to be published, and that aroused doubt about the probability of biased results the researchers were after. This is where publication bias lies. Due to that, Egger's Regression Analysis was adopted, as it was used whenever the funnel-shaped spread was heterogeneous. (T) value and its implications were taken into consideration. If the (T) value was functional, bias did not exist.

Seventh: Assessment of heterogeneity:

The heterogeneity analysis, a common approach to the meta-analysis, examines how likely it is to notice the variance revealed by effect sizes if a sampling error makes them different (Cooper, 2010). Heterogeneity in this study was assessed by using Cochran's heterogeneity statistics (QT) and (I (2) statistics (Higgens et al., 2003). (Q) statistics follows the Key Square Distribution of freedom degrees (n – 1), while the (I (2) statistics represents a percentage of total variance across studies. This might be attributed to heterogeneity, not chance. The test also examines the null hypothesis, which points out that all studies assess the same impact (Higgins et al., 2003).

2.4 Data analysis:

In analyzing the data obtained from previous studies and research (26=n), the research used the comprehensive Mata-Analysis Program (CMA) V.3.307.

3. Study Results:

Results of the first question: The question reads, "What is the average effect of gifted enrichment programs interventions on developing future problem-solving skills according to correlative designs?"

In answering the question, the researchers used the following steps:

A- Heterogeneous test

The test was used to detect whether the noted variance of the effect size of studies and research unveiled any functional differences resulting from the sampling error, which determined the model to be used for collecting the effect sizes, as manifested in Table (3).

Table (3): Statistics of random and fixed effect models

Model	K	Effect Size	Standard Error	Confidence Period 95%		Heterogeneity			
				Lower limits	Higher Limits	Q	d f	P	I^2
Fixed effect model	4	0.716	0.017	0.673	0.754	29.14	3	<0.001	90%
Random effect model	4	0.737	0.031	0.57	0.845				

Table (3) shows that the (Q) value of the heterogeneous test amounted to (29.140), which was higher than the (X2) value at (11) degrees of freedom that amounting to (11.34) at the function level (0.01) indicating that the distribution of effect size was heterogeneous. Therefore, the analysis should be according to the random-effect model. According to

this, the combined effect size amounted to (0.737) with a standard error (of 0.031) and a confidence period of 95% (0.570, 0.845). According to (Cohen, 2011), this value falls within the high effect size. Hence, gifted enrichment program interventions in developing future problem-solving skills were high in the correlation designs.

B- Publication Bias Evaluation:

The researchers used Egger's Regression Test, which analyzed regression, due to the heterogeneity of the funnel-shaped spread. (T) value amounted to (0.4815) with freedom degree (2), which is functional at the level (P=0.6771) and reflects that the publication bias does not exist.

Results of the second question: The question reads, "How different is the average effect size of gifted enrichment programs on developing future problem-solving skills according to correlative designs of participants' gender (males, females, both males and females) and academic level (primary, intermediate, secondary)?

In answering the question, the researchers used the following:

A- Analyzing the modified variables:

The researchers used the modified analysis to detect whether gifted enrichment programs' interventions affect the development of future problem-solving skills with regard to participants' gender (males, females, both males, and females) and the academic level (primary, intermediate, and secondary). Table (4) illustrates that.

Table (4): Results differences of effect size therapies of non-modified variables

Model	**K**	**Effect Size**	**Confidence period %95**		**Heterogeneity**		
			Lower level	**Higher level**	**Q**	**d f**	**P**
Participants' Gender	4	0.716	0.673	0.754	*12.304	2	0.005
Males	1	0.859	0.806	0.898			
Females	1	0.625	0.549	0.687			
Both Males and Females	2	0.722	0.623	0.798			
Academic Level	4	0.705	0.554	0.811	*35.267	1	<0.001
Intermediate	1	0.639	0.374	0.808			
Secondary	3	0.758	0.563	0.873			

Table (4) reveals differences with statistical significance in the effect size of gifted enrichment programs on the development of future problem-solving skills at the academic level (primary, intermediate, and secondary) in favor of the secondary. It also found differences with statistical significance in the effect size of developing future problem-solving skills about participants' gender (males, females, both males and females) in favor of males.

Results of the third question: The question reads, "What is the effect size average of gifted program interventions on developing future problem-solving skills, according to the quasi-experimental designs?".

In answering the question, the researchers used the following:

A- Heterogeneity test

This test was used to detect whether the noted variance effect size of studies and research unveiled any functional differences resulting from the sampling error, which determined the model to be used for collecting effect sizes, as manifested in Table (5).

Table (5): Statistics of random and fixed model effects

Model	K	Effect Size	Standard Error	Confidence Period 95%		Heterogeneity			
				Lower level	Higher level	Q	d f	P	I^2
Fixed Effect Model (FEM)	12	0.615	0.007	0.576	0.651	*52.25	11	<0.001	%53
Random Effect Model (REM)	12	0.599	0.016	0.526	0.664				

Table (5) revealed that the (Q) value of the test amounted to (52.25), which was higher than the (X2) value at (11) degrees of freedom and (24.72) at the function level (0.01). Such a difference reflected that the distribution of effect sizes was heterogenous, so REM Analysis Model should be used. The combined effect size was (0.599) with a standard error (0.016) and 95% confidence period (0.526, 0.664), according to this model. Such a value falls within the excellent effect size value, as pointed out by (Cohen, 2011). Hence, the impact of gifted enrichment programs on developing future problem-solving skills was significant.

B- Publication Bias Evaluation:

The researchers used Egger's Regression Analysis Test. The (T) value amounted to (0.6621) with (10) freedom degrees at the level (P=0.5229), which was statistically non-functional, reflecting that the publication bias did not exist.

Results of the Fourth question: What is the extent of variation in the average effect size of gifted enrichment program interventions on the development of future problem-solving skills, according to quasi-experimental designs pertaining to participants' gender and academic level?

In answering the question, the researchers used the following:

1- Analysis of modified variables:

The researchers analyzed these variables to detect whether the impact of gifted enrichment programs affected the development of future problem-solving skills at the academic level. Table (6) unveils the results.

Table (6): Differences in results of treated effect size via modified variables

Model	K	Effect Size	Confidence Period %95		Heterogeneity		
			Lower Limits	Higher Limits	Q	d f	P
Participants' Gender	12	0.612	0.562	0.658	*13.257	2	0.017
Males	4	0.579	0.388	0.721			
Females	1	0.621	0.561	0.674			
Both- Males and Females	7	0.496	0.378	0.614			
Academic Level	12	0.613	0.566	0.656	1.061	2	0.351
Primary	1	0.754	0.570	0.855			
Intermediate	5	0.609	0.557	0.657			
Secondary	6	0.562	0.381	0.701			

Table (6) shows that there were no differences with statistical significance in the effect size of gifted enrichment programs on the development of future problem-solving skills according to academic level. However, there were differences with statistical significance of effect size on the development of the skills mentioned above in favor of females.

4. Discussion of study results

In this part of the study, the researchers will discuss the results that pertain to answers to each question as follows:

First, Discussion of answers to the first question:

It reads, "What is the average effect size of enrichment program interventions on developing future problem-solving skills according to correlative designs?

In answering this question, the effect size of (26) studies was computed. The results revealed that the impact of the combined effect size amounted to (0.737) with a standard error of (0.031) and a confidence period (0.570, 0.845), a value that falls within the effect size, according to (Cohen, 2011). Hence, the impact of gifted enrichment program interventions on developing future problem-solving skills was high in connection with the correlative designs.

Enrichment programs meet the needs of the gifted by providing academic challenges propitious for their abilities and developing their higher skills, such as critical thinking, problem-solving, making decisions, and helping them use their capabilities effectively. These programs usually include specialized classes and research, besides chances to study advanced academic subjects (Reis & Renzulli, 2011).

The active enrichment programs focus on training students on how to solve future complicated problems by concentrating on skills like strategic planning, determining options, absorbing multifaceted information, discovering alternative scenarios, option evaluation, and making multi-dimensional and tough decisions (Metsapelto et al., 2022).

Such skills prepare students to confront the challenges they might face in the world's rapid changes. Thus, the skills enable them to use their mental and creative potential to solve complicated social problems. Therefore, developing these skills during childhood and adolescence is basic for active enrichment programs to fully actualize gifted students'

capabilities (Bonnie & Backers, 2019). The results indicate that enrichment program interventions greatly affect future problem-solving skills development.

The researchers attribute such results to the accurate designs of enrichment programs that give the gifted a chance to challenge and innovative thinking to solve problems. The academic material and training they were offered helped them develop their skills in this respect. The enrichment programs also reinforce curiosity and innovation. They also assist in detection and continuous learning, which help raise students' skills in solving future problems. In addition, the program encourages teamwork and interaction with colleagues by securing chances for cooperation and ideas exchange which also help develop problem-analysis skills and search for solutions.

The previous studies proved that enrichment program interventions are one active method that consolidates gifted student skills. For example, one study analyzed the results of (16) previous studies regarding the effectiveness of enrichment program interventions in developing gifted student skills and concluded that such interventions positively affect gifted students' academic, creative, social, and emotional skills (Morgan, 2007). These results agree with those of the study conducted by (Kim, 2016), who analyzed the results of (26) previous studies in this field. He found that interventions in enrichment programs greatly affected the development of gifted skills, including problem-solving, creativity, critical thinking, and communication (Kim, 2016).

Another study conducted by (Garcia-Martines et al., 2021) came up with similar results. They analyzed the results of previous (30) field studies; they found that interventions of enrichment programs greatly affected the development of gifted skills.

Second, Discussion of answers to the second question:

It reads, "How different is the average effect size of gifted enrichment program interventions on developing future problem-solving skills according to correlative designs that pertain to participants' gender (males, females, both males and females) and the academic level (primary, intermediate, secondary?).

In answering the question, the researchers used the modified analysis to detect whether the gifted enrichment programs affected the development of future problem-solving skills in accordance with correlative designs pertaining to participants' gender and academic level. The results unveiled that there were differences with statistical significance in the effect size of gifted enrichment program interventions on developing future problem-solving skills with regard to academic level in favor of the secondary. It also found that there were differences with statistical significance in the effect size on the development of future problem-solving skills according to gender in favor of males.

A study was conducted on (363) students of primary and intermediate levels by (Batterjee,2010). The results revealed that enrichment programs help develop gifted future problem-solving skills. Another study was conducted by (Dhhamit et al.,) on (156) secondary stage students. The results revealed that enrichment programs helped develop future problem-solving and reinforced academic achievement. The researchers believe that this difference in the results might be the outcome of intelligence and educational challenges the males and females encounter and affect their response to enrichment programs. Also, other factors not linked to gender might affect the impact of enrichment programs on developing future problem-solving skills.

In general, many studies pointed out that enrichment programs help develop future problem-solving skills of the gifted and enhance their mental, creative, and innovative capabilities. They also catalyze innovative and critical thinking and help them deal with challenges besides personal social, and economic life problems.

As for gender differences in the effect size of enrichment programs on future problem-solving, they might be attributed to differences between the two sexes regarding interest,

education, and vocational options. Hence, the programs might be steered to better ones to serve the need of gifted students in this respect. It is also essential to consider the cultural and societal factors that might affect students' choices and their vocational attitudes, which must also be considered when designing enrichment programs (Chen & Chen, 2020).

Third, Discussion of the results of the third question:

The question reads, "According to the quasi-experimental designs, what is the average effect size of gifted program interventions in developing future problem-solving skills?"

In answering the question, the heterogeneity test was used to detect whether the noted variance of studies and research samples showed any functional differences in the expected variance of the sampling error. The combined effect size amounted to (0.599) with (0.016) and a confidence period of 95% (0.526, 0.664), a value that falls within the big effect sizes, according to (Cohen, 2011). Hence, the impact of gifted enrichment programs on developing future problem-solving skills on them was big.

Gifted enrichment programs are among the active methods that develop future problem-solving skills, as they focus on developing critical and creative thinking through securing challenging learning chances and training the gifted to use alternative problem-solving methods. The curricula these programs use adopt methods that focus on problem-solving and multi-specialized projects that allow the gifted to practically train on how to utilize critical and creative thinking for problem-solving (Elhoweris. et al., 2022).

These results for the researchers rely on assigning the gifted challenging tasks and activities that require critical and creative thinking. These two types of thinking are essential for solving complicated problems. The programs use the learning-based experience of the student through project activities to solve problems. This provides the gifted with practical training on how to apply higher thinking skills to problem-solving. The programs also focus on relevant future challenges which put the gifted in an actual situation to practice future problem-solving skills. This program also focuses on world future problems, thus providing the students with practical experience to solve problems within authentic contexts. The practical designs of such programs revealed clear positive impacts on developing the abilities of the gifted to solve future problems (Cosino Garcia et al., 2021).

These results align with those of a study by (King, 2022), who conducted the study on a group of gifted students participating in a six-week training program. The results revealed a significant improvement in problem-solving skills and students' critical and creative thinking. The results of a study by (Welter et al., 2018) also revealed that an enrichment training program focusing on developing critical thinking affected gifted problem-solving and future thinking.

Fourth, Discussion of the results of the fourth question:

The question reads, "What is the extent of variation in the average effect size of gifted enrichment program interventions on the development of future problem-solving skills according to quasi-experimental designs about participants' gender and academic level?"

The results revealed no differences with the statistical significance of gifted enrichment programs on future problem-solving skills at the academic level. However, there were differences with statistical significance of the effect size on developing future problem-solving skills pertaining to participants' gender in favor of females.

The researchers see that the enrichment programs designed for such students greatly influence the development of future problem-solving skills because such programs provide the gifted with a chance to challenging learning that develops critical and creative thinking in them. These two skills are essential for solving complicated problems. Teaching methods in these programs concentrate on problem-solving and projects, giving

the students a chance for practical training on problem-solving skills. The contents of the programs mainly include world future challenges. Thus, the gifted are put in an actual situation to practice future problem-solving skills. Such a thing accounts for the significant impact that the special quasi-experimental studies revealed. In such a situation, the students acquire more practical skills and experience that facilitate future problem-solving for them.

These programs focus on developing critical and creative thinking, which are fundamental for solving complicated problems. Thus, the students acquire the ability to face future challenges. The programs secure for the gifted more challenging learning chances that encourage them to use alternative thinking methods by which they penetrate traditional problem-solutions. The teaching methods in such programs rely on training the students on how to practically solve problems via projects and multi-specialized activities (Mohamed & Elhoweris, 2022).

The results of the current study align with those of the study by (Rodriguez-Naveriras et al., 2019), which revealed that the gifted enrichment training programs significantly improved students' problem-solving skills and critical and creative thinking.

The results of a study by (Vessey & DeMarco, 2008) also revealed that the training program, which concentrated on developing critical thinking and using new methods for problem-solving, greatly improved gifted problem-solving skills.

5. Conclusion:

In this study, the researchers analyzed the results of previous studies published between 2010 -2023 and tackled the issue of gifted future problem-solving skills using the meta-analysis approach. The approach is based on analyzing the results of previous studies and quantitative evaluation through different statistical procedures such as effect evaluation, size, and control of probable publication bias. After examining databases and journals, (282) studies relevant to the title and objectives of the study were selected.

The studies that did not match the standards of the current study were excluded, ending up with (16) studies only.

The study tried to identify the efficacy of gifted enrichment program interventions in developing future problem-solving skills in accordance with the correlative and quasi-experimental designs. It also attempted to identify the average variance of effect size interventions of gifted enrichment programs on the development of future problem-solving that pertain to participants' gender and academic level. Results of the study indicated that the efficacy of gifted enrichment program interventions in future problem-solving skills according to correlative and quasi-experimental designs was very high. As for the average effect size of gifted enrichment program interventions on developing future problem-solving skills regarding the two designs about participants' gender and academic level. The results revealed a difference between the two designs; the correlative studies found that the difference was in the academic level in favor of the secondary, and the differences in participants' gender were in favor of males. However, the results of the quasi-experimental studies revealed no differences in the academic level, but concerning gender, there were statistical differences in favor of females.

6. Recommendations:

In light of the study results, the researchers would like to recommend the following:

- To conduct more studies on the meta-analysis type, of which the current one is an example, to be able to generalize its results.

- To consider the numerous factors, such as age, gender, and society's culture, when people in charge plan to put down gifted enrichment programs to develop future problem-solving skills.

- To conduct further meta-analysis studies to detect the impact of future problem-solving skills on other variables (psychological, social, and emotional) through the correlative and quasi-experimental designs.

- To conduct future meta-analysis studies on enrichment programs based on future problem-solving and published in referee Foreign and Arabic journals for the sake of comparison to

- explain the role of culture and obtain a clearer picture of the results.

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