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Abstract: This study was derived from the review of literature on motivation to learn, and creative thinking, in kindergarten children. While both these themes are explored reasonably in depth, there is very little research on motivation to learn creative thinking, which is a pillar of educational development. The researcher found the reason was that there was no Scale to measure this aspect, and so he constructed a new Motivation to Learn Creative Thinking Scale (MLCT-Scale) among kindergarten children. He also investigated the psychometric characteristics of the Scale. This Scale construction and investigation findings are reported here. The methodology used in this study was Descriptive survey. In all, 21 items formed the MLCT- scale within 5 dimensions. It uses a 5-points Likert Scale. Before conducting the Study, the two validities of the scale, concept and concurrent validities, were assessed. The study sample size was a random selection of 360 Kindergarten children, restricted to Amman city in Jordan. As this was a new Scale, the researcher took utmost care, through a series of statistical tests, to ensure Reliability, Concept validity and Construct validity of the Scale. He also ensured that the factor loading of each of the 21 items onto 5 factors was very strong. The study findings showed high coefficient correlations for Reliability, Concept and Concurrent Validity. There was a strong loading of the 5 scale dimensions as shown by Exploratory Factor Analysis. It is strongly recommended by the researcher that motivation to learn creative learning in kindergarten can be assessed by implementing the Motivating Children to Learn Creative Thinking Scale.

Keywords: Motivation; Learning; Creative Thinking; Validity; Reliability; Psychometric Tests; Kindergarten Children.

1 Introduction

The educational stage of early childhood is essential or a child. This is the foundation on which later school grades are built. Therefore, the researcher belief that this stage is considered a very important stage and needs to more focus by researchers in order to make improvements and developments reflected on next learning stages. Moreover, this is where the learning of children starts for writing, reading and mathematics [1]. It has been shown by many studies that higher achievement and performance later on in education is linked to receiving education in early childhood [2] [3].

Motivation to learn is an essential component of the early childhood educational process, as it is considered a basic pillar of learning. A student's academic achievement levels can be raised if motivation to learn is strengthened. Motivation to learn has been the focus of pedagogical research in the last three decades. This showed that motivation, particularly motivation in the process of learning, was considered important by researchers [4] [5-8].

[9] [10] showed how motivation in the educational process was instrumental in driving the excitement to perform well in different activities, thereby leading to academic success. Motivation is a desired learning objective that would help lead the learning process. In kindergarten, Motor and Emotional activities are an indication of motivation in kindergarten. This impacts students' behaviour significantly. It encourages them to increase their effort and persist in improving academic performance as well as achieving learning objectives and [4] [10].

Creativity is another element in improving academic performance. Motivation is related to creativity through four common elements. the ability to ask questions not expected the ability to turn chaos to order, be willing to accept challenges, and be a willing risk-taker. For learning, it is essential to have creative thinking, and creativity is at its core.

Creativity can be defined in different contexts. According to [11], creativity is the start of something new, say like an innovation. It is creating entering uncharted domains, a new synthesis of existing challenges. Being new is essential, like an alternate way to do things. According to him, creativity can be seen even in human relations and the sciences and is not just restricted to the art such as music and painting. In [12] definition, creativity combines movement and thought that help in learning how to imagine by generating alternate innovative responses. [12] was more focused on

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defining creativity as a process of problem solving through producing some outcomes or products.

According to [13], creative abilities, motives and skills are the three factors on which creativity models are based. Drawing from these models, many studies have explored providing learning activities to emphasis how creativity can be taught in kindergartens. They stated that creativity takes place in an appropriate environment and using materials and techniques that are well-structured. It is essential that the environment is positive for developing creativity.

[14] [15] From the various contexts of creativity, mostly problem solving is what is intended by referring to creative thinking ability. According to Harris (1998) creative is applied to problem solving when new methods are generated. Guilford's (1956) [16] view is that it is a cognitive process with originality, flexibility, fluency, and elaboration being the characteristics. These are used to solve problems. Studies show that high academic achievements among students, one of the learning objectives, are the result of high creative thinking levels [17].

Pre-school students are able to improve their learning outcomes due to creative thinking; therefore, in kindergarten, creative thinking is considered an important component (Isenberg & Jalongo, 2017). As noted by Breckenridge and Murphy (1963), reading helps kindergarten children develop multiple aspects related to creative thinking. Creativity develops and flourishes in children in the ages four and half to six years [18] [11]. These children think more freely and creatively compared with older children.

The educational process is seen to have two important variables in the educational process – having the learning motivation and learning to think creatively. The linkage between the two is very important. Motivation to learn is a prime mover of learning creative thinking as well as creativity. Extant literature bears this out – both learning motivation and thinking creatively among children in kindergarten - are widely researched. These variables are either studied separately or together. According to Marhoon and Jamean (2019), globally there is a lot of concern about motivation in the pre-school stage. They studied a program on children's motivation to learn implemented in Riyadh, Saudi Arabia, by kindergarten teachers. Through this they confirmed that learning cognitive skills was impacted positively by motivation. This led them to suggest that studies should be made to link motivation to other variables in the preschool stage.

[19] looked at both variables, thinking creatively and motivation for learning, in children in pre-school. He emphasized that both variables must be integrated to achieve higher results in the educational process. His recommendation was that studies of these two variables must be carried out in multiple environments and cultures, so that the relevance of this link between the two variables can be established. [20] confirmed that motivation for learning and thinking creatively thinking relate positively, and the educational process sees positive results because of the relationship of the two variables. The importance of measuring both variables together was emphasised by them as important for the educational process.

To briefly summarise, the review of literature regarding motivation to learn and creative thinking shows the following:

1. They are important at the pre-school stage. Studies do confirm it is necessary to develop both motivation to learn and creative thinking at this stage [20].
2. Measuring motivation to learn in kindergarten children is seen in a number of studies with reference to the variables of mathematics, writing and reading. However, there is no strong literature on measuring motivation to learn creative thinking, despite accepting that measuring them together is important. This gap in the body of knowledge needs addressing.
3. The researcher did not find any evidence in literature that there is a Scale of Measurement that can be used to assess the relation of motivation for learning and creative thinking amongst children in pre-school. The current study is a result of this conclusion.

To assess the level of students' level of learning creative thinking and motivation for the same, it is essential to measure it on a scale which consists of both variables – learning of creative thinking and motivation for learning the same. The researcher did not find such a scale in his review of literature. Therefore, the researcher developed and implemented the Motivation to Learn Creative Thinking Scale (MLCT Scale) for this purpose. Once developed, it was implemented in kindergarten to assess the impact of using the scale to measure teaching and learning process. In the researcher's opinion, the scale has the potential for generalising the results, and also be implemented in later school stages.

The population of the current study were pre-school students at kindergartens in Jordan. The sample of study were selected in a random way in Amman city. In this study, the following two important questions were addressed specifically:

Q1. What is the reliability of the researcher-developed Motivation to Learn Creative Thinking Scale among children studying in kindergarten?

Q2. What is the scores validity on the researcher-developed Motivation to Learn Creative Thinking Scale among children studying in kindergarten?

1.1 Objectives of the study

1. To develop a scale and construct it so as to reveal the motivation level in children to learn creative thinking.
2. To establish the psychometric variables that make up the Motivation to Learn Creative Thinking Scale at the level of kindergarten children. This includes validity and reliability of the scale that is newly developed.

1.2 Significance of the study

1. Learning Motivation and Creative Thinking have attracted a strong scientific interest, particularly among children. However, there is no instrument to assess the effectiveness of this relation. The researcher has designed such an instrument and reported its effectiveness in this study.
2. The instrument monitors motivation to creative thinking learning levels among children. The outcome is useful to design intervention in the learning process.
3. The process of creative thinking learning is facilitated and developed by this instrument. Arab and International Scholars should find it a useful tool in their quest to understand motivation among children to learn creative thinking.

1.3 Operational definitions

Preschool students: is a place where kids can get a head start on their education before, they have to start going to primary school. It could be publicly or privately run, with public money subsidizing one or the other [21, 22].

Motivation: An individual's motivation for beginning, maintaining, or ending a behavior at any particular time. People typically think of motivational states as internal forces that lead to a propensity for goal-directed action. It's commonly believed that competing mental states ultimately decide how an individual acts [23].

Creativity: Creativity is a process via which something novel and useful emerges. The thing that has been made can be either ethereal (like a thought, a scientific hypothesis, or a piece of music) or tangible (like a building) (such as an invention, a printed literary work, or a painting) [24].

2 Methodology

The descriptive survey method was used by the researcher to get the psychometric characteristics of the MLCT-Scale for children in kindergarten.

The Scale was constructed based on Intrinsic Motivation and Learning Motivation Scales, described in a subsequent section. Guided by literature, 5 dimensions were used to construct the MLCT Scale. Each dimension incorporated a few items.

Testing was done using the observation measure, on a 5-point Likert scale. Demographic data was also included in the study.

Random sampling was used to identify the children to be included in the study. A conscious decision was made to take a sample quantity which exceeded the recommended size of sample, to ensure robustness of the psychometric validation robust.

The demographic variables of the sample were summarised through descriptive statistics. Validity was examined through Pearson's product-moment correlation coefficient which showed if two metrics correlated concurrently with one another. Cronbach’s alpha. Was used to investigate consistency of the scale. Exploratory Factor Analysis (EFA) tested the one-dimensional factor structure, hypothesised by the author. Different metrics were used to determine the fit of models with one another. IBM SPSS Statistics for Windows, version 26.0 (IBM Corp., Armonk, N.Y., USA)

2.1 Population and Sampling

All the kindergartens in the capital, Amman, totalling 1013 public and private schools, constituted the population of the current study. The private kindergartens constitute the majority (818, 81%) while the public kindergartens are the rest (195, 19%). The total of 117,559 kindergarten children is distributed between the public kindergartens (33763, 29%) and private kindergartens (83,796, 71%). Within the kindergartens the children are further distributed into KG1 (4 years) and KG2 (5 years). Table (1) represents this distribution.

Table 1: Study population demographic characteristics

Type of Kinder-garten	Number	%	Number of Children	%	Type of Class/ Variable	Number of Children	%
Public	195	19	33763	29	KG1	0	0
					KG2	33763	100
					Total	33763	100
Private	818	81	83796	71	KG1	20742	25
					KG2	63054	75
					Total	83796	100
Total	1013	100	117559	100			

The sample size was 360 kindergarten children, ages four to five (average 4.5), from the academic year 2019-2020 first semester. The survey system website (https://www.surveysystem.com/sscalc.htm) along with [25] suggestion were used to determine sample size The study population and the study sample's proportionality and proportion were used to calculate sample size, , which came to 354 children minimum.

1. After determining the sample size, the question arose as to where to draw this sample from. Many factors shaped the final choice of kindergartens from where to draw the sample.
2. The sample size was far lower than the number of kindergartens. It seemed sensible to reduce the number of kindergartens from where to sample, less even in random sampling by replacement, some kindergartens could land up with only one student drawn.
3. Logistically, to monitor the study, it was essential to narrow the sample to a smaller geographic area.
4. Also logistically, it made sense to have a cluster of students in each kindergarten rather than spread it thin.

This was a new Scale being developed and so a control over the study had a lot of importance. Based on the above, with convenience being a major consideration, the author narrowed down the number of kindergartens to 26, with a reasonable confidence that they were representative of the total 1013 kindergartens in Amman.

Thereafter, the student's sample was drawn from the 26 kindergartens in Amman by stratified random method. The study samples' demographic characteristics are presented in table 2.

Table 2: Study sample's demographic characteristics

Type of Kindergarten	Number	%	Type of Class/ Variable	Number of Children	%
Public	6	20	KG1	0	0
			KG2	72	100
			Total	72	100
Private	20	80	KG1	72	25
			KG2	216	75
			Total	288	100
Total	26	100	Sample Size	72+288 = 360	

Developing the Motivation to Learn Creative Thinking Scale (MLCT-Scale)

2.2 The Approach

Self-determination theory was used by the researcher to construct the Motivation to Learn Creative Thinking Scale among children in kindergarten. The relevance of this theory is that it is concerned fully with motivation and its distinct set of scales has practical educational applications for students. The theory focuses on motivation, both extrinsic and intrinsic, and their mechanisms.

The IMI or Intrinsic Motivation Inventory Scale [26] [27] is perhaps the most important from amongst different scales. The multidimensional IMI scale looks at the students' subjective experience related to an educational experience in a targeted activity. Many psychological pedagogical researches about self-regulation and self-motivation have used this scale. The scale uses the Likert measure on six dimensions with six sub-scores The six dimensions assessed while performing a particular activity are: Perceived competence, Interest of learning, Value or Usefulness of Learning, Effort, Perceived Choice, and Stress and Tension. Coefficients of validity and reliability of this scale have been extracted by many studies. The coefficients are found to be high enough to make the scale very suitable for applying in the field of education [28] [27] [29].

The Learning Motivation Scale, designed by [30], was used by the researcher in addition to the IMI Scale This LM

Scale deals with the students' feelings while relating with the teacher, and also their literacy and mathematics competences. This Scale, in turn, was derived from Valeski and Stipek's (2001) "Feeling About School" [FAS] measure. Opposite poles for each item made up the construction of the Scale. The positive pole scored 5 (high) and the negative pole 1 (low). There was also representation by bars, 5 being the highest and 1 the lowest bar. The bars at 2, 3, and 4 were appropriately sized between 1 and 5.

The initial form of the MLCT Scale developed by the researcher had five main dimensions (based on Learning Motivation Scale [30] and IMI Scale [26] and 30 items. It is important when a psychological scale is developed that a specific step should be sequentially followed before the final version is adopted. The steps comprise: determining the scale's theoretical dimensions; building the initial scale; extracting the scale's 'content' validity by presenting to a group of specialized professors; extracting reliability and 'internal consistency' validity of the scale through a pilot study [31].

2.3 The Steps in Developing the MLCT-Scale

2.3.1 First step: Determine the Theoretical Dimensions of the Scale

Initially, the researcher reviewed literature related to kindergarten children concerning teaching of creative thinking and the children's motivation to learn. Also reviewed were scales that were applied to learning motivation for all ages. The Internal Motivation Inventory Scale (IMI) [26] was of interest to the researcher because internal motivation is important in learning. Also, the IMI scale relied on the Self-Determination Theory which mostly pertains specifically to internal motivation. In addition, the IMI Scale is very successful in its theoretical grounding and practical application. However, the IMI Scale was not constructed for preschoolers; hence the Learning Motivation Scale [30] was included, as it is a specialized for kindergarten children's learning motivation. The Motivation to Learn Creative Thinking Scale (MLCT-Scale) for children in kindergarten was based on the theoretical context provided by both the Learning Motivation Scale and the IMI Scale.

The five dimensions (with totally 30 Likert items) of the MLCT Scale are detailed below:

1. Interest in learning: What is the child's interest to learn in the lessons of creative thinking, as also the overall generic interest to learn new things.
2. Perceived Competence of learning: This focuses on the child's competence seen in its performance during the learning process and thereafter.
3. Tension and Pressure of learning: This looks at how the learning process brings about tension, stress and anxiety in the child.
4. Effort of learning: How much effort does effort the child put in during the learning. Both their best interest and continuous attempt to achieve positive results are considered.
5. Enjoyment of learning: How much enjoyment during the learning process is shown by the child.

2.3.2 Second step: Building the Initial Scale

A five-graded Likert scale was adapted based on five levels of applicability: from very high, graded down to very low. 0 was used to indicate not applicable.

The normal practice is to use the Likert scale in educational and psychological sciences. Also, most early childhood studies prefer to use a 5-point Likert scale. The same practices are adopted for this study.

2.3.3 Third step: Extracting the Scale's 'Content 'Validity by running it through some Specialized Professors

Ten professors were identified from areas of motivation, thinking, educational psychology, and preschoolers. Feedback was solicited if the five dimensions were well represented in the scale items, and if there was clarity of the linguistic formulation. Additional feedback was requested regarding how much the items' content and scale objectives were correlated, as well as how the items' content matched the actual practices among children in kindergarten. They were also invited to give any other additional suggestions as they deemed necessary. The unanimous agreement of the professors was to delete nine items and rephrase some others. This resulted in modifying and reducing the scale to 21 items.

2.3.4 Fourth step: Pilot Study for the purpose of extracting Reliability and 'Internal Consistency' Validity of the Scale

The researcher conducted a pilot study on 45 children, both genders female and male, not a part of the sample for the study. The researcher explained to the teachers how the scale can be implemented by making observations of the child and recording them on the scale items. Pearson Correlation Coefficient for validity of the scale's coefficient of internal

consistency, and Cronbach's Alpha equation to check reliability, were the statistical tools to analyze the data from the pilot study sample. Pearson Correlation Coefficient was 0.84, and the Cronbach coefficient alpha was 0.91. These were both relatively high, thereby confirming the scale's reliability and validity.

2.4 The Study

After selecting the 26 kindergartens, the researcher trained their teachers to carry out the MLCT-Scale. Then, one class in each kindergarten was selected. The average number of students in each class was 13. The teachers observed all students for a period of 4-5 days. They recorded their observations on the MLCT-Scale. These observations were taken up for Statistical Analysis

2.5 Statistical analysis

SPSS program, Exploratory Factor Analysis, Pearson Correlation Coefficient and Cronbach's Alpha were used to analyze the data of the study The Results are described here:

First: Reliability of Motivation to Learn Creative Thinking Scale and its Significance

Q1 is addressed here: What is the reliability of the Motivation to Learn Creative Thinking Scale among kindergarten children, developed by the researcher?

The scale's reliability was verified using a number of methods: Cronbach's alpha and half-segmentation applied to the 360 children of kindergarten in the sample. Table (3) shows the results.

Table 3: Reliability of Motivation for Learning Creative Thinking scale

Dimension	Cronbach's Alpha	Guttman (Split- half Basic Concepts)
Learning Interest	0.869	0.817
Perception of Learning Competence	0.911	0.877
Learning Tension and Pressure	0.843	0.799
Learning Effort	0.902	0.883
Learning Enjoyment	0.916	0.901
Scale Total	0.939	0.901

The scale's five dimensions had good stability coefficients, by the Split-Half methods as well as by Cronbach alpha. As a whole, the reliability coefficient was 0.901 by the Half-segment method and 0.939 by Cronbach's alpha method and. These stability coefficients indicate high reliability of the scale.

The implications are that the MLCT Scale is robust enough for using in educational studies.

Second: Validity of Motivation to Learn Creative Thinking Scale and its Implication.

Q2 is addressed here: What is the scores validity on the Motivation to Learn Creative Thinking Scale among kindergarten children, developed by the researcher?

2.5.1 Content Validity

The ten professors mentioned earlier were asked for feedback on the following.

i) Are the five dimensions matched by the scale items and does each item have clear linguistic formulation.

ii) How do the items correlate to scale objectives, and to what extent is there a correspondence between the items' content and kindergarten children's actual practices.

iii) Any other suggestions with reference to the scale.

90% agreement on each item in the scale was deemed acceptable by the researcher.

A summary of the remarks follows:

A - Change font style of the items for easy and correct understanding.

B - Some unclear items to be rephrased.

C. Nine items to be deleted as they were inappropriate.

The above suggestions were accepted and implemented. Hence, 21 items were retained in the scale in version 2.

2.5.2 Construct Validity (Concept):

By matching the correlation coefficients of the scale's sub-dimensions with the scale's total score, content validity was

extracted. Table (4) represents this.

Table 4: The values of the correlation coefficients of the scale's sub-dimensions with the scale's total score

Dimension	Scale Total Score
Learning Interest	.619 **
Perception of Learning Competence	.878 **
Learning Tension and Pressure	.786 **
Learning Effort	.686 **
Learning Enjoyment	.798 **

** significance level at 0.01

The coefficients of correlation between total scale score and the scale dimensions were all good. The highest correlation coefficient, 0.878, was seen in "perceived competence learning", while the lowest, 0.619, was for "Interest of learning". Both these scores are acceptable.

2.5.3 Correlative Validity

Correlative validity was calculated for the full sample of 360 children, 180 each from ages 4 and 5. The calculation was between the Motivation to Learn Creative Thinking Scale and the Test of Creative Thinking (TCAM) Torrance (1981). The value of 0.817, was statistically significant. Correlative validity was also established between the Motivation to Learn Creative Thinking Scale and the Stanford-Binet Intelligence Test, where the value of 0.713 was also statistically significant. This correlative validity, grouped by age, is shown in Table 5

Table 5: Correlative validity between the Motivation to Learn Creative Thinking Scale and the Stanford-Binet Intelligence Test, grouped by age.

Age in Years	Number	TCAM		Stanford-Binet Intelligence Test	
		Correlation Coefficient	Significance	Correlation Coefficient	Significance
4	75	0.601	0.001	0.634	0.000
5	75	0.508	0.001	0.622	0.000
Validity Sample	150	0.817	0.000	0.713	0.000

As seen in the Table, the coefficient of correlation of the Motivation to Learn Creative Thinking Scale for both the Stanford-Binet test and the TCAM test for were positive, high, and statistically significant. Table (6) shows the correlative validity of these two tests according to each dimension of the Scale.

Table 6: Correlative validity between the Motivation to Learn Creative Thinking Scale with the Stanford-Binet Intelligence Test and TCAM test, according to the scale dimensions

Dimension	TCAM		Stanford-Binet Intelligence Test	
	Correlation Coefficient	Significance	Correlation Coefficient	Significance
Learning Interest	0.591	0.001	0.671	0.001
Perception of Learning Competence	0.588	0.001	0.692	0.001
Learning Tension and Pressure	0.641	0.001	0.561	0.001
Learning Effort	0.538	0.001	0.499	0.001
Learning Enjoyment	0.522	0.001	0.581	0.001

As per this Table, each dimension showed that the correlation coefficients were both positive and high for the Stanford Binet Intelligence test as also the TCAM test. This shows a high correlative validity for the Motivation to Learn Creative Thinking Scale.

The significance of the validity tests was that the items forming the scale and the dimensions of the scale are very representative of educational reality.

Motivation to Learn Creative Thinking Scale – Factorial Validity prepared by the researcher.

Factor analysis explains correlation amongst a set of dimensions by reducing the factor formations to fewer factors. This determines the correlation coefficient between a factor and each item in the scale.

Before commencing exploratory factor analysis, the following conditions required to analyze the data were ensured:

1. The population to be represented by a random sample.
2. The data to be normally distributed.
3. Applying Bartlett's test and Olkin-Meyer-Kaiser test for sample adequacy
4. There should not be any written accreditation.

Random, representative sampling was used, and verification was done of the normal distribution of the variables (see Figure (1)).

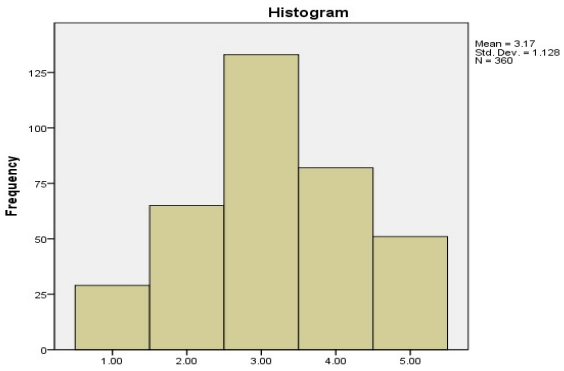

Fig. 1: Motivation to Learn Creative Thinking Scale: Normal distribution curve of the variables

Additionally, the researcher used the Olkin-Meyer-Kaiser test to verify the sample's adequacy for performing the exploratory factor analysis, and the value obtained was 0.59, which is greater than the required 0.50. The Bartlett's test was used to verify the correlation matrix, and the value was 59.1627, which is statistically significant. It was clear that the minimum correlation for exploratory factor analysis was present. It also showed that linear dependence was not there between variables.

2.5.4 Factor analysis steps:

a) Data to be classified and monitored.

b) To calculate Scale Items Score: Correlate total scale items score with each one of the scale items.

The coefficients of correlation between each scale item and the total score were calculated before factor analysis. See Table (7).

Table 7: Correlation coefficients between the total score and the items of the motivation scale for creative thinking learning.

Item number	Item- Total Correlation	Item number	Item- Total Correlation
1	.713 **	12	.792 **
2	.744 **	13	.838 **
3	.856 **	14	.744 **
4	.819 **	15	.871 **
5	.632 **	16	.689 **
6	.665 **	17	.814 **
7	.821 **	18	.893 **
8	.644 **	19	.728 **
9	.894 **	20	.787 **
10	.741 **	21	.699 **
11	.789 **		

** significance level at 0.01

c) Exploratory Factor Analysis on the Motivation to Learn Creative Thinking Scale developed by researcher.

Exploratory Factor Analysis (EFA) was used by the researcher additionally to the orthogonal rotation method (Varimax Rotation). The Kaiser test, a pure mathematical test (Guttman, 1954), is the basis of the Factorial analysis. Where this test gives and Eigenvalue greater than one for the resulting factors, they are determined as general factors. Furthermore, [32] principal components method, the most widely used method of factor analysis, was also applied because, compared

to all methods, its accuracy is good. Thus, least factors were obtained from the relational matrix. Rotation Proma (oblique rotation method) was used to rotate the axes ensuring no orthogonality. This resulted in an appropriate slope with the oblique factors overlapping and getting related.

2.5.5 Results of Exploratory factor analysis

The factor analysis resulted in 5 factors with Eigenvalue values more than one. These factors were totally loaded with 21 items. They explained 45.901% of the overall variance, Table (8) shows the factors, Eigenvalues, variance percentage for each factor, and cumulative percentage of the variances.

Table 8: factors, Eigenvalues, variance percentage for each factor, and cumulative percentage of the variances

Factor	Eigenvalue	Variance percentage	Cumulative variance percentage
First	10.569	21.289%	21.289%
Second	4.442	8.677%	29.966%
Third	3.291	6.813%	36.779%
Fourth	2.813	4.984%	41.763%
Fifth	2.141	3.901%	45.664%

Table 9 shows the loading coefficients for scale items and the dimensions arrived at by Exploratory Factor Analysis (EFA)

Table 9: Loading coefficients of the scale items and the dimensions using Exploratory Factor Analysis (EFA)

Factor	#	Item	Loading coefficients
First Factor	1	This child is interested in lessons of creative thinking	.903
	2	According to this child, creative thinking lessons are interesting.	.804
	3	This child feels it is enjoyable to learn drawing during lessons on creative thinking.	.736
	4	This child thinks it is enjoyable to paint during lessons on creative thinking lesson.	.639
	5	This child believes it is important to learn new things concerning creativity	.572
	6	This child puts effort to understand new things about thinking creatively.	.527
	7	When doing lessons on creative thinking, this child has a feeling of calm.	.487
Second Factor	8	During lessons on thinking creatively, the performance of this child is very good	.857
	9	The performance of this child is better than his classmates during lessons on creative thinking.	.795
	10	The efficiency of this child increases lessons on creative thinking.	.774
	11	During lessons on thinking creatively, this child has a satisfaction with his performance.	.603
	12	The child showed a lot of skill in creative thinking lessons.	.597
	13	This child's performance was high in the lessons on thinking creatively.	.522
Third Factor	14	During activities of thinking creatively, this child displayed high nervousness.	.887
	15	During activities of creative thinking, this child's behavior was tense.	.749
	16	During activities of thinking creatively, this child displayed high anxiety	.683
Forth Factor	17	The effort put in by this child is very high in lessons on creative thinking.	.813
	18	The child attempts to put in good work during lessons on creative thinking.	.699
	19	Achieving good results during thinking creatively lessons is	.550

		very important for this child	
Fifth Factor	20	The enjoyment of this child is high in lessons on creative thinking.	.811
	21	This child's enjoyment of lessons on creative thinking is significant.	.747

The basic factors of the dimensions of the scale were determined by a set of criteria set by the researcher:

1. Screen Plot – which represents repeated Eigenvalue values as a graphic curve. The point where the roots curve slope changed to horizontal from perpendicular to the x-axis gave a number of factors. This curve is demonstrated in Figure 2

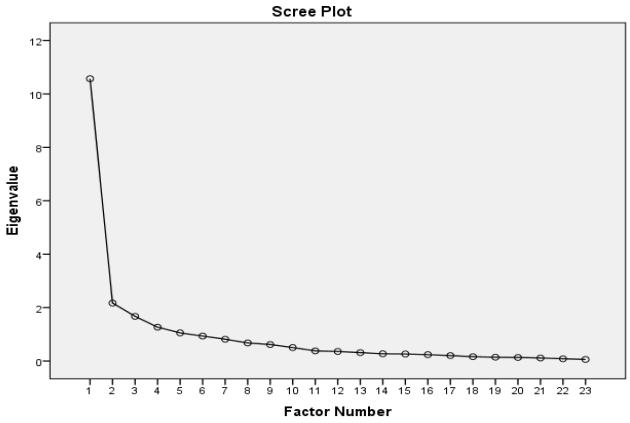

Fig. 2: Exploratory factor analysis leading to the Eigenvalues of the factors

2. Gorsuch Criterion [33] This test identifies scale items whose factor loading values were equal to or greater than 0.40. It also ensures the scale items do not load on more than one factor with the value of 0.40 or higher.

3 Discussion

This study concerned the Motivation to Learn Creative Thinking Scale among kindergarten children and its psychometric characteristics. The researcher developed the scale, relying on literature of learning motivation and creative thinking. The scale items' coefficients of reliability and validity were calculated. The Scale had 21 items covered in five dimensions: Perceived Competence of Ability to Learn, Interest to Learn, Learning Effort, Learning Tensions and Pressure, and Learning Enjoyment. Likert scales of 5 were used to show applicability: ranging in steps from very high to very low. The child was solely observed by the teacher who recorded the behaviours of the child as responses. Each child was observed on an average for 10 to 15 minutes. Scores ranged from 5 for "very high" to 1 for "very low". 0 was used for not applicable. The overall score range was between 21 and 105. The results were divided into three categories:

i) low motivation to learn – score 21 to 49, 36 students out of 360. These students' motivation level for learning creative thinking was weak. Training programs to raise their motivation level are needed.

ii) average motivation to learn – score 50 to 78, 236 students out of 360. Most of the students were grouped here. These students would benefit from specialised programs to raise their motivation level.

iii) high motivation to learn – score more than 79, 88 students out of 360. Appropriate enrichment will help invest in their potential, thereby maintaining this motivation level to learn.

This study showed there was good agreement amongst the psychometric characteristics of the Motivation to Learn Creative Thinking Scale for Kindergarten Children. Exploratory Factor Analysis showed that each of the scale dimensions (5 in all) had a strong homogeneity of values. Scale Reliability using Cronbach Alpha revealed high and positive values. Finally, Discrimination Coefficients showed correlations that were positive and high for each scale item.

The conclusion is that the MLCT Scale is a robust instrument that can be effectively used by researchers interested in motivation for learning creative thinking among kindergarten children.

4 Suggestions and recommendations

Based on the current study results, adopting the Motivation to Learn Creative Thinking Scale (MLCT Scale) to measure the levels of motivation is strongly recommended by the researcher for the children in kindergarten. Furthermore, he recommends including as a mandatory official measurement instrument the Motivation to Learn Creative Thinking Scale for children in kindergarten. In addition, the researcher recommends further research about the MLCT scale among students in first through third grades.

Conflict of interest

The author declares that there is no conflict regarding the publication of this paper.

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References

[1] G. S. Morrison, *Fundamentals of early childhood education*: Pearson Higher Ed, 2013.

[2] R. S. Al-Mawadiah and M. A. Al-Zu'bi, "The degree of availability of the standards of the national framework for academic qualifications in early childhood in Jordan from the point of view of female teachers," *International Journal of Childhood, Counselling and Special Education (CCSE),* vol. 2, pp. 103-112, 2021.

[3] F. Wang, M. B. Kinzie, P. McGuire, and E. Pan, "Applying technology to inquiry-based learning in early childhood education," *Early Childhood Education Journal,* vol. 37, pp. 381-389, 2010.

[4] M. A. A. AL-ZU'BI, "The Effects of IPad Applications on Creative Thinking and Learning Motivation Among Preschool Children In Jordan," Doctoral dissertation, Universiti Utara Malaysia, 2019.

[5] K. I. Al-Mseidin and M. A. Al-Zu'bi, "THE EFFECTS OF COGNITIVE BEHAVIORAL THERAPY ON ACADEMIC ADJUSTMENT AMONG JORDANIAN STUDENTS," *Journal of Evidence-Based Psychotherapies,* vol. 21, 2021.

[6] S. Safdari and P. Maftoon, "The development of motivation research in educational psychology: the transition from early theories to self-related approaches," *Advanced Education,* pp. 95-101, 2017.

[7] E. M. Tucker-Drob and K. P. Harden, "Learning motivation mediates gene-by-socioeconomic status interaction on mathematics achievement in early childhood," *Learning and Individual Differences,* vol. 22, pp. 37-45, 2012.

[8] S. O. Ulstad, H. Halvari, Ø. Sørebø, and E. L. Deci, "Motivation, learning strategies, and performance in physical education at secondary school," *Advances in Physical Education,* vol. 6, pp. 27-41, 2016.

[9] M. A. Al-Zu'bi, K. I. Al-Mseidin, A. F. Almajali, R. S. Al-Mawadieh, H. Khafajeh, and N. Abutayeh, "Motivating Pre-School Children to Learn Creative Thinking in Jordan Using iPad Applications: A Mixed-Methods Approach," in *2022 International Arab Conference on Information Technology (ACIT)*, 2022, pp. 1-7.

[10] W.-q. Shen, H.-l. Chen, and Y. Hu, "The validity and reliability of the self-directed learning instrument (SDLI) in mainland Chinese nursing students," *BMC medical education,* vol. 14, pp. 1-7, 2014.

[11] E. Kirk and C. Lewis, "Gesture facilitates children's creative thinking," *Psychological Science,* vol. 28, pp. 225-232, 2017.

[12] R. E. Mayer, "22 fifty years of creativity research," *Handbook of creativity,* vol. 449, 1999.

[13] E. P. Torrance and H. T. Safter, *Making the creative leap beyond*: Creative Education Foundation Press, 1999.

[14] M. A. A. Al-Zu'bi, M. S. Omar-Fauzee, and A. Kaur, "The Relationship between Creative Thinking and Motivation to Learn Creative Thinking Among Pre-Schoolers in Jordan," *European Journal of Education Studies,* 2017.

[15] N. Leggett, "Early childhood creativity: Challenging educators in their role to intentionally develop creative thinking in children," *Early Childhood Education Journal,* vol. 45, pp. 845-853, 2017.

[16] J. Guilford, "The relation of intellectual factors to creative thinking in science," in *The 1955 University of Utah research conference on the identification of creative scientific talent*, 1956, pp. 69-95.

[17] A. Zu'bi, M. A. Abdelaziz, M. S. Omar Fauzee, and A. Kaur, "The effect of iPad apps on creative thinking among preschoolers in Jordan," *International Journal of Multidisciplinary Education and Research,* vol. 2, pp. 29-35, 2017.

[18] F. Algahtani, "The Effectiveness of Computer-Based Learning in Developing Academic Skills for Children with Intellectual Disabilities."

[19] M. A. A. Al-Zu'bi, "IPad as a New Educational Technology: A Review of the Literature," *International Journal of Childhood, Counselling and Special Education,* vol. 1, pp. 1-10, 2020.

[20] S. Agnoli, M. A. Runco, C. Kirsch, and G. E. Corazza, "The role of motivation in the prediction of creative achievement inside and outside of school environment," *Thinking Skills and Creativity,* vol. 28, pp. 167-176, 2018.

[21] K. I. M. Al-Mseidin and M. A. A. Al-Zu'bi, "The Level of Social and Academic Adjustment among Syrian Refugee Students in Jordan and its Relation with Underachievement students."

[22] D. H. H. Drwish , O. A.Almukdad , M. A. & Engin , A. O., "Developing the Educational Program in Kindergartens in the Syrian Arab Republic in Light of the European Model (An Empirical Study on Female Kindergarten Directors and Teachers in the Damascus Education Directorate). International Journal of Childhood, Counselling, and Special Education, 4 (1), 11-19, 10.31559/CCSE2022.4.1.2," 2022.

[23] A. Fishbach and K. Woolley, "The structure of intrinsic motivation," *Annual Review of Organizational Psychology and Organizational Behavior,* vol. 9, pp. 339-363, 2022.

[24] S. A. Abdeen, "The effect of exploitation strategy on concurrent thinking ability abilities of students in Saudi Arabia," *International Journal of Childhood, Counselling and Special Education,* vol. 3, 2021.

[25] R. M. Heiberger, B. Holland, R. M. Heiberger, and B. Holland, "Multiple Comparisons," *Statistical Analysis and Data Display: An Intermediate Course with Examples in S-Plus, R, and SAS,* pp. 155-185, 2004.

[26] R. M. Ryan, "Control and information in the intrapersonal sphere: An extension of cognitive evaluation theory," *Journal of personality and social psychology,* vol. 43, p. 450, 1982.

[27] R. M. Ryan, R. Koestner, and E. L. Deci, "Ego-involved persistence: When free-choice behavior is not intrinsically motivated," *Motivation and emotion,* vol. 15, pp. 185-205, 1991.

[28] R. M. Ryan, J. P. Connell, and R. W. Plant, "Emotions in nondirected text learning," *Learning and individual differences,* vol. 2, pp. 1-17, 1990.

[29] E. L. Deci, H. Eghrari, B. C. Patrick, and D. R. Leone, "Facilitating internalization: The self-determination theory perspective," *Journal of personality,* vol. 62, pp. 119-142, 1994.

[30] G. Stephanou, "Feelings towards child–teacher relationships, and emotions about the teacher in kindergarten: effects on learning motivation, competence beliefs and performance in mathematics and literacy," *European Early Childhood Education Research Journal,* vol. 22, pp. 457-477, 2014.

[31] D. M. Mertens, *Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative, and mixed methods*: Sage publications, 2019.

[32] H. Hotelling, "Analysis of a complex of statistical variables into principal components," *Journal of educational psychology,* vol. 24, p. 417, 1933.

[33] R. L. Gorsuch, "Exploratory factor analysis: Its role in item analysis," *Journal of personality assessment,* vol. 68, pp. 532-560, 1997.