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PIRKKO LIIKANEN

**INCREASING CREATIVITY  
THROUGH ART EDUCATION  
AMONG PRE-SCHOOL CHILDREN**

UNIVERSITY OF JYVÄSKYLÄ, JYVÄSKYLÄ 1975

EDITOR: Lea Pitkänen, Ph.D.

Department of Psychology  
University of Jyväskylä

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ACADEMIC DISSERTATION TO BE PUBLICLY DISCUSSED, BY PERMISSION  
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## Preface

This report is a summary of the main results in the following four reports published by the author within the project "INCREASING CREATIVITY THROUGH ART EDUCATION AMONG PRE-SCHOOL CHILDREN":

- (A) Liikanen, P. (1974a) Stimulerande miljö och kognitiv utveckling hos 6-åriga barn. Nordisk Psykologi, 4, 271 - 281. (Stimulating environment and cognitive development in 6-year-old children, in Swedish)
- (B) Liikanen, P. (1974b) Luovuuden yhteydet eräisiin muihin kognitiivisiin kehitystason muuttujiin kuusivuotiailla lapsilla. Kasvatustieteiden tutkimuslaitoksen julkaisuja, 244. Jyväskylän yliopisto. (Creativity and its relationship to some other cognitive developmental variables in 6-year-old children, in Finnish with English summary)
- (C) Liikanen, P. (1974c) Taidekasvatus ja luovuus: harjoituksen vaikutus kuusivuotiaiden lasten luovuuteen. Kasvatustieteiden tutkimuslaitoksen julkaisuja, 245. Jyväskylän yliopisto. (Art education and creativity: the effect of training on the creativity of 6-year-old children, in Finnish with English summary)
- (D) Liikanen, P. (1974d) Kuusivuotiaiden lasten luovuutta virittävät rikastuttamisohjelmat. Liite tutkimusraporttiin 'Taidekasvatus ja luovuus'. Kasvatustieteiden tutkimuslaitoksen julkaisuja, 246. Jyväskylän yliopisto. (Enrichment programmes for stimulating the creativity of 6-year-old children. Appendix to research report 'Art education and creativity', in Finnish with English summary)

The project was started on the initiative of Professor Martti Takala and has been carried out at the Institute for Educational Research and at the Department of Psychology at the University of Jyväskylä with the author as the project leader. I am grateful to the Institute for Educational Research for including this project in its research programme.

I also wish to express my gratitude to Mr. Esko Haapala, Director of Social Affairs in Jyväskylä for giving me permission to carry out this study in the kindergartens of the city. I also owe a debt of gratitude to number of persons for their valuable assistance in this study; I thank kindergarten-teachers Anita Harlin, Heli Hongisto, Marjatta Kaidesoja, Aulikki Mirkkola, Kaisa Parkkonen and Elsa Ranta for carrying out the experimental programmes. My thanks are due to Anna-Liisa Kolehmainen, Marja-Terttu Kuparinen, Anja Lahtinen, Sirkka-Liisa Niiles, Marjatta Saarnivaara, Maire Salmela, Helena

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I thank Professori Raimo Konttinen and Professor Tapio Nummenmaa for methodological advice. Professor Isto Ruoppila and Professor Raimo Konttinen have read the manuscripts of the reports and given me many valuable and useful suggestions for improvements for which I am grateful.

I wish to express my thanks to Mr. Sauli Takala for translating this report.

The execution of the entire project and the analysis of empirical data were supported by scholarships from the Finnish Cultural Fund in 1970, 1971 and 1972 and from the Ellen and Artturi Nyysönen Foundation in 1971. I thank for this support. Finally I thank the University of Jyväskylä for accepting this report for publication in its series "Jyväskylä Studies in Education, Psychology and Social Research".

Jyväskylä, December, 1974

Pirkko Liikanen

## Tiivistelmä

Tässä tutkimuksessa käsiteltiin luovuutta ja harjoituksen vaikutusta luovuuteen. Tutkimuksen tarkoituksena oli selvittää (1) onko kodin sosiaalisilla taustamuuttujilla yhteyttä luovuuteen, (2) onko kasvuympäristön muulla virikkeistöllä yhteyttä luovuuteen, (3) missä määrin leikin pohjalta arvioitu kehitystaso, älykkyys, kieli, koulukypsyys ja sukupuoli ovat yhteydessä luovuuteen, (4) lisäävätkö kulttuuriperinnettä välittävät ja kulttuurin vastaantottovalmiuksia kehittävät toimintaohjelmat lasten luovuutta, (5) miten toimintaohjelman rakenne (strukturoitu vs. strukturoimaton) on yhteydessä luovuuden lisääntymiseen ja kehittymiseen, (6) onko lasten kognitiivisen kehitystason ja toimintaohjelman rakenteen vastaavuudella yhteyttä luovuuden lisääntymiseen ja (7) onko lapsen sukupuolella merkitystä ohjelmien vaikutuksesta tapahtuvaan luovuuden lisääntymiseen?

Kodin sosiaalinen tausta arvioitiin sosiaalisen statuksen, vanhempien koulutustason, tulojen ja ruokakunnan koon mukaan, ja kasvuympäristön muu kulttuurinen virikkeistö kodin ja lapselle hankittua esineellistä virikkeistöä, varojen käyttöä lasten luovan toiminnan edistämiseksi, vanhempien osoittamaa luovaa toimintaa ja taideharrastuksia, taidetottumusten kehittämistä, sosiaalista vuorovaikutusta, vanhempien käsityksiä lasten taideharrastusten ja luovan toiminnan aloittamisesta sekä vanhempien halukkuutta lasten taideharrastuksiin osoittavien muuttujien pohjalta.

Kehitystaso arvioitiin leikin pohjalta, älykkyys Ravenin matriisien ja PMA:n (primary Mental Abilities) testistön, kieli Ruoppilan kuvasanavaraston ja PMA:n "Verbal Meaning" osatestin sekä koulukypsyys Lehtovaaran koulukypsyyskokeen perusteella.

Luovuuden testistöön valittiin piirrostehtävä (piirrettävä "satukala") ja Torrance, Wallachin ja Koganin kehittämien divergenttiä ajattelua mittaavia testejä, joiden lähtökohtana on yhden ja saman käsitteen laajentaminen ja yleistäminen erilaisiin yhteyksiin. Tehtävät valittiin siten, että ne edustivat Kephartin esittämiä tiettyä kehitysjärjestystä noudattavia tiedonjäsentämistapoja: motorista (liikuntatesti), havaintomotorista (ympytä- ja neliohtävät), havaintokäsitteellisiä (koiratehtävä - Product Improvement Task) ja käsitteellistä (esinealuokat: osiot pehmeä, pyörällinen ja kiiltävä) vaiheita. Piirrostehtävästä "satukala" arvioitiin väri, muoto ja kompositio, kaikista muista testeistä sujuvuus, joustavuus, originaalisuus, virhereaktiot ja yhdistetty sujuvuuden, joustavuuden ja originaalisuuden summamuuttuja. Eri osatehtävien sujuvuuden, joustavuuden, originaa-



lisuuden, virheiden ja summamuuttujien z-pistemäärät laskettiin 1. ja 2. mittauksen luovuuden testauksista. Vastaavasti piirrostehtävän väri-, muoto- ja kompositioarvioinnit yhdistettiin yhdeksi summamuuttujaksi. Luovuuden muuttujia oli kaikkiaan kuusi: sujuvuus, joustavuus, originaalisuus, virheet, piirrostehtävä ja ns. summamuuttuja (sujuvuuden, joustavuuden ja originaalisuuden yhdistetty summamuuttuja).

Luovuuden kehittämissuunnitelmista ns. toimintakaavojen laajentamissuunnitelma edusti luovaa liikuntaa ja havaintomotoriset ohjelmat kuvataidetta. Ohjelmien rakenne ja tehtävät strukturoitiin ajattelun kehityksessä alimpien kehitystasoryhmien vastaanotto- ja toimintaedellytyksiä vastaaviksi. Kummankin ohjelman perusrunko rakentui ainoastaan yhteen toimintasuunnitelmaan. Toimintakaavojen laajentamissuunnitelmassa tämä toimintamalli käsitti perusliikkeet (liikkuminen paikasta toiseen ryömimällä, hyppimällä, juoksemalla jne.), havaintomotorisissa suunnitelmissa muotokäsitteen (ympyrä, neliö jne.). Jokaisella opetuskerralla käsiteltiin ainoastaan yhtä toimintasuunnitelmaa. Luovuuden virittäminen perustui yksinkertaisen toimintasuunnitelman määrittelyyn, vahvistamiseen ja laajentamiseen erilaisin ongelmanratkaisua ja kekseliäisyyttä edellyttävin tehtävin. Toimintakaavojen oheismateriaalina oli klassista musiikkia, lasten lauluja, iskelmiä ja päivittäisiin toimintasuunnitelmiin liittyviä ääniä ja muuta musiikkia ja filmejä liikunnasta ja musiikista. Havaintomotorisen ohjelman kulttuuriperinnettä välittävä ja kokemuksia lisäävä aineisto perustui 400 kuultokuvaan tunnetuista taideteoksista ja 30 filmiin. Havaintomotorisia suunnitelmiä kokeiltiin kahta eri tyyppiä. Kummankin ohjelman perusrunko oli kuitenkin täsmälleen sama. Ohjelmat erosivat toisistaan ainoastaan peruskäsitteiden sovellutuksiltaan. Ohjelmassa I tuotettiin perusmuotoja käyttämällä apuna värikyniä, liituja, vesivärejä, muovailuvahaa, pesusieniä ja rättejä, ohjelmassa II taas joko eri muotoisia, värisiä, kokoisia ja eri aineesta tehtyjä palikoita. Ohjelma II:een kuului lisäksi perusmuotojen hallintaa edellyttäviä Erie-ohjelman pelejä. Ohjelmat toteutettiin viidesti viikossa kuuden viikon ajan.

Tutkimuksen koehenkilöinä oli 168 kuusivuotiaasta jyvaskyläläistä lastentarhaa käyvää lasta, joista 86 oli tyttöä ja 82 poikaa. Ensimmäisessä mittauksessa koe- ja kontrolliryhmien valintaa varten mitattiin 144 lapsen kehitystaso, älykyys, kieli ja luovuus. Näistä 144 lapsesta valittiin koekelun koeryhmiin 72 ja kontrolliryhmiin 24. Toiseen luovuuden mittaukseen osallistui 120 lasta, ensimmäisen mittaukseen osallistuneiden 96 lapsen lisäksi 24 esikoulua vuoden käynnyttä kuusivuotiaasta lasta. Tutkittaessa harjoituksen vaikutusta luovuuteen ryhmien muodostaminen suoritettiin verranta-

malla koehenkilöiden sukupuoli ja kehitystaso ryhmittäin. Valinta suoritettiin siten että jokaiseen ryhmään kuului 12 lasta: 6 poikaa ja 6 tyttöä, joista 3 poikaa ja 3 tyttöä kuului alhaiseen ja 3 poikaa ja 3 tyttöä korkeaan kehitystasoryhmään. Ryhmiä oli kaiken kaikkiaan kymmenen. Samaa ohjelmaa toteutettiin kahdessa ryhmässä, toisessa aamu-, toisessa iltapäivisin.

Luovuuden uusintatetaustausreliabiliteetit saivat seuraavia arvoja: sujuvuudessa .60, joustavuudessa .57, originaalisuudessa .61, piirrostehtävässä .73 ja summamuuttujassa .61. Sujuvuus, joustavuus, originaalisuus ja summamuuttuja korreloivat osittain teknisistä syistä korkeasti toisiinsa (.84 - .98), mutta heikosti piirrostehtävään (.24 - .30).

Kodin sosiaaliset taustamuuttujat kuten sosiaalinen status ja vanhempien koulutustaso, eivät olleet yhteydessä lasten luovuuteen ennen harjoitusohjelmaa. Harjoitusohjelman jälkeen ne korreloivat heikosti sujuvuuteen, joustavuuteen ja piirrostehtävään. Sen sijaan kodin muuta kulttuurista viirikkeistöä osoittavat muuttujat korreloivat merkitsevästi kaikkiin luovuuden muuttujiin. Erityisesti vanhempien lapsille näyttämä luovan toiminnan malli ja lasten taidetottumusten kehittäminen vaikuttivat lasten luovuuteen.

Leikin pohjalta arvioitu kognitiivinen kehitystaso korreloi positiivisesti joskaan ei kovin korkeasti luovuuden eri osatekijöihin. Sujuvuuden, joustavuuden ja originaalisuuden summamuuttujat olivat riippumattomia kaikista älykkyyden, kielen ja koulukypsyyden testeistä. Sen sijaan piirrostehtävä korreloi merkitsevästi älykkyyteen, kieleen ja koulukypsyyteen. Tytöt ja pojat eivät eronneet sujuvuuden, joustavuuden ja originaalisuuden suhteen, mutta kylläkin värien käytössä, tytöt olivat poikia parempia.

Harjoituksen vaikutusta koskevat tutkimustulokset osoittivat ongelmitain seuraavaa:

- Tähän tutkimukseen osallistuneiden opettajien toteuttama kognitiivinen esikouluohjelma kehitti traditionaalia lastentarhaohjelmaa enemmän kuusivuotiaiden luovuutta.
- Kulttuuriperinnettä välittävät ja kulttuurin vastaanottovalmiuksia kehittävät toimintaohjelmat lisäsivät traditionaalia lastentarhaohjelmaa enemmän kuusivuotiaiden lasten luovuutta.
- Strukturoidulla lyhytaikaisella luovuutta virittävällä ohjelmalla pystyttiin lisäämään kuusivuotiaiden lasten luovuutta kognitiivisesti orientoituneeseen vuoden ajan esikoulutoimintaan osallistuneen lapsiryhmän luovuuden tasolle.
- Ajattelun alimpien kehitystasoryhmien toimintaedellytyksiin strukturoitu harjoitusohjelma lisäsi sekä alhaisen että korkean kehitystasoryhmän

luovuutta, jopa siinä määrin että ennen harjoitusta esiintynyt alhaisen ja korkean kehitystasoryhmän välinen ero luovuudessa hävisi. Kuitenkin sekä alhainen että korkea kehitystasoryhmä lisäsi merkitsevästi luovuutta 1. mittauksesta 2. mittaukseen.

- Ohjelmat lisäsivät sekä tyttöjen että poikien luovuutta, mutta ohjelmien vaikutus näkyy luovuuden eri osatekijöissä tytöillä sujuvuudessa, joustavuudessa ja originaalisuudessa, pojilla piirrostentävässä.
- Harjoitus lisäsi tyttöjen ja poikien eroa luovuuden eräissä osatekijöissä (sujuvuudessa, joustavuudessa ja originaalisuudessa).

## 1. Introduction

### 1.1. General

The Finnish Committee on Cultural Activities (1974) designates "securing the right and capability of individual members of the society to engage in creative activity" as one of the main objectives of cultural policy by means of art education. The committee is of the opinion that pre-school curriculum should pay special attention to expressive and artistic instruction.

Art education can, however, only partly fulfill the requirement of original creative action. Besides art education, the cultural stimuli of the growing environment promote an individual's changes of becoming an active recipient, mediator and independent producer of different forms of culture. The stimulus environment also has a lasting effect on the formation of an individual's cultural conditions.

Although the Universal Declaration of Human Rights among other items states that "everyone has the right freely to participate in the cultural life of the community, and to enjoy the arts", it is obvious that the opportunities to do so vary. People are unequal with regard to educational and social status, wealth, place of residence but also in view of culture. This is also reflected in children's living conditions and development.

The 1971 Education Committee regards as one central objective of social policy a socially and regionally more equal and just distribution of material and mental benefits. The school system and early education, in particular, have a major responsibility for the transmission of cultural heritage and the development of creativity in making it possible "for an ever larger part of the population to enjoy the cultural services provided by the society and to acquire readiness to develop and enrich culture" (op.cit.,p.22).

The development of a child's cultural readiness and creativity is affected by the variables describing the home background such as socio-economic status, level of education, and other cultural stimuli in the growing environment. Preschool children have a variable cultural environment. The family background variables are cumulative. The availability of cultural services are determined by regional location of the home; high parental education, a high social status and good economic status increase the consumption and production of cultural services, increase the amount and enhance quality of material objects which mediate culture, support the development of art habits and create a positive attitude towards children's art interests.

#### 1.2. Art education and creativity

One of the aims of art education is to diminish and prevent cultural inequality. The transmission of cultural heritage and the development of cultural awareness are not, however, adequately represented in the curricula of early education, pre-school education and comprehensive school education (Committee reports 1972: A 13, 1970: A 4). The report of the Committee on the Training of Early Education Personnel (1974: 15) also neglects the transmission of cultural heritage from one generation to another and the significance of culture in general for the development of cultural awareness and creativity in children.

In the educational systems provided for children of different ages as well as in teacher education the systematic development of cultural awareness is given only little attention. Art culture is replaced by creative expression. The value of narrow superficial and one-sided creativity in the

school is questionable, if creativity cannot be identified, if children are constantly deprived of the opportunity of developing cultural awareness and if they lack experiences and capability to receive different kinds of culture let alone produce or create anything original.

Art education should consciously attempt to increase people's cultural knowledge and experiences in all fields of culture (music, art, movement, literature, theatre, film). This is not contradictory to the development of original production of art, but probably an essential condition for it.

The development of creativity is only a small part of the large domain of art education. Creativity training programmes have seldom dealt with cultural events (Torrance 1970; Torrance, Fortson & Orcutt 1967; Torrance & Fortson 1968; Torrance, Fortson & Diener 1968; Torrance & Phillips 1969). Creativity training programmes are actually closer to divergent thinking than to art education and culture. They may be described as self-sufficient units of activity divorced from culture, and they are only marginally associated with art education and the transmission of cultural heritage.

### 1.3. Creativity and creativity training

Figure 1 describes a chain of activities in developing self-initiated creative activities and art interests. Functional schema is one of the most important concepts of the chain. Knowledge is based on the functioning relation between the organism and the environment. Schemes underlie specific types of functioning and form a living structure in active relation to the environment. Knowledge is processed through the structures formed by schemes. Both the organism and the environment function through the structures and substructures formed by different schemes.

G O A L

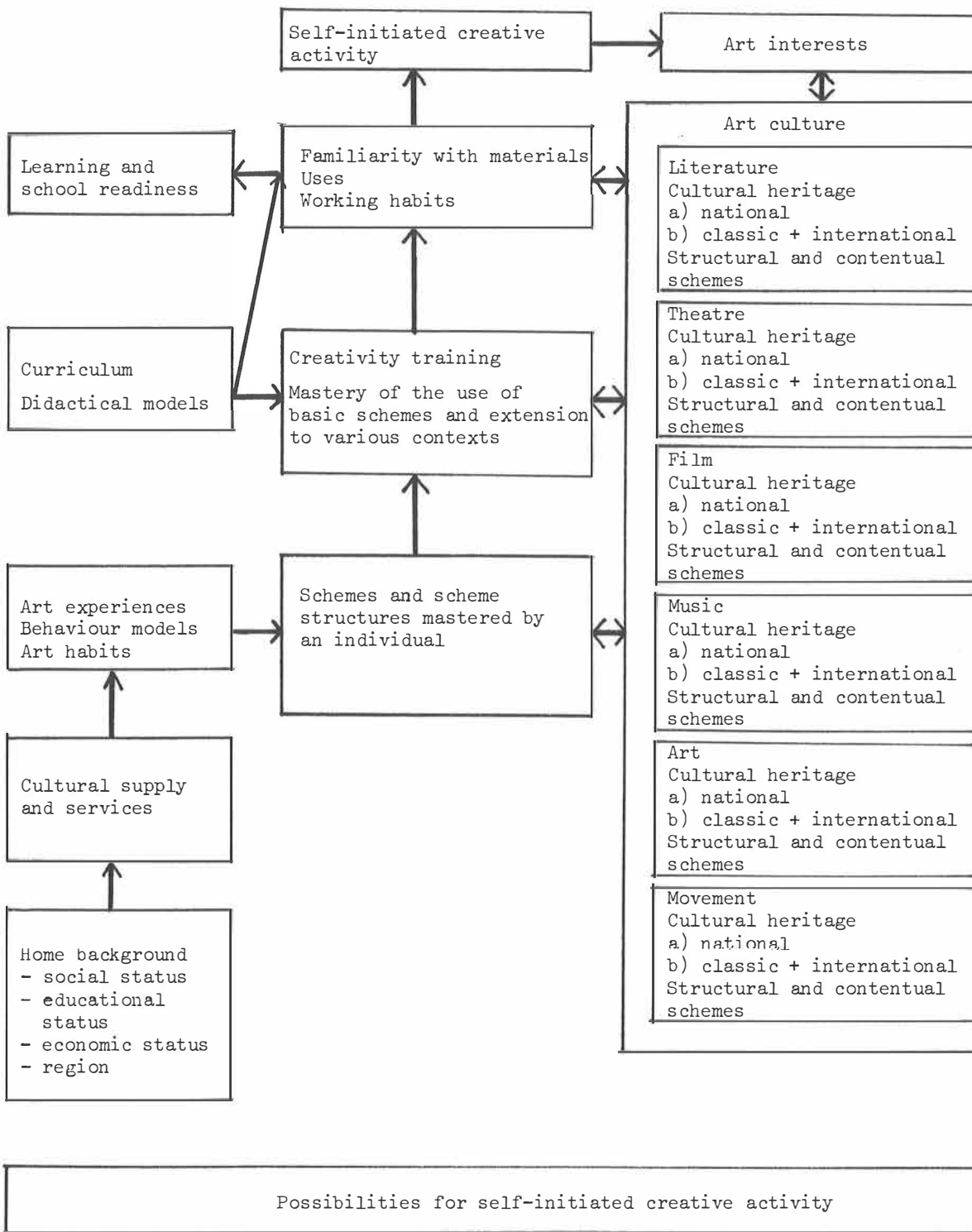


FIGURE 1. Sequence of events in fostering children's creative activity and art interests

The structure of each different culture is based on certain basic schemes, which are necessary for the total expression and transmission of each form of culture. Such basic schemes in art are e.g. colour, form, movement, balance, design, light and tension (Arnheim 1954), in music e.g. rhythm, melody, tone quality and dynamics (Aronoff 1969, 21 - 25). The child must master the schemes of colour, form, movement etc. and of rhythm, melody, tone quality etc. before he can receive and transmit visual art and music culture. Preschool children do not master such schemes.

An individual's scheme structures are not innate but change and develop continuously. The scheme structures used by very young children do not correspond to scheme structures relevant to external information and to the assimilation of information. A small child is not capable of receiving information adequately because he does not master the scheme structures required by the information that the environment transmits. He cannot retain the order of things and events. Successive events are not flexibly linked to each other as with adults.

The capability of children to receive culture are related to their mastery of schemes essential for the transmission of each particular form of culture. A necessary condition for the supply and transmission of culture is that the cultural stimuli are based on schemes mastered by the children. The opportunities of children to become a recipient of culture can be influenced by systematically increasing children's art experiences in different domains of culture. Self-initial creative activity presupposes the knowledge of materials, familiarity with their use and working habits characteristic of each culture. These activities can be developed by means of guidance and an adequate curriculum.



In the present study creativity is equated with the functional schemes between the individual and the environment. Information about the environment is transmitted on the basis of the schemes that the individual masters. Creativity is defined by their amount, quality and functioning.

"Environmental circumstances force accommodative modifications in schemata only when there is an appropriate match between the circumstances that a child encounters and the schemata that he has already assimilated into his repertoire" (Hunt 1961, 268). This accommodative modification of schemes according to the circumstances is here equated with creative activity. Creative activity presupposes (i) a sufficient number of existing schemes by means of which culture is gathered, processed and stored by a child, (ii) a sufficient match between the environmental circumstances and the child's existing schemes, and (iii) possibility for the child to accommodate and modify his existing schemes in his everyday life (cf. Figure 1). Creativity increases through the reinforcement, through the accommodative modifications and through the change of the functional relations between the child and his environment. Creativity training could be based on this knowledge about the functional relations between the child and his environment.

## 2. Problems

The following two sets of problems were studied:

### I. Problems related to creativity (A & B)

1. Are the social background variables of the home related to creativity? (A)
2. Are other cultural stimuli of the growing environment related to creativity? (A)

3. To what extent developmental level judged on the basis of play, intelligence, language, school readiness, and sex are related to creativity?  
(B)

## II. Problems related to creativity training (C & D)

4. Do activity programmes which transmit cultural heritage and develop capability to receive culture increase children's creativity? (C & D)
5. How is the structure of activity programmes (structured vs. unstructured) related to the development of creativity? (C & D)
6. Is the match between the child's cognitive developmental level and the structure of activity programmes related to the development of creativity? (C & D)
7. Has the child's sex any significance for the development of creativity due to the activity programmes? (C & D)

## 3. Execution of the study

The subjects were 168 six-year-old kindergarten children from the town of Jyväskylä in Central Finland, 86 girls and 82 boys (Table 1). At the first stage the children's stimulus environment was mapped, their developmental level was rated on the basis of play, the level of linguistic development, intelligence, and creativity were measured. After that experimental groups were given enrichment programmes during six weeks. After training the children's intelligence, school readiness and creativity were measured. The design of the problem about the effect of programmes on creativity is presented in Table 2.

TABLE 1. Number of subjects at different stages of the study

	Total	Experimental groups	Control groups
First measurement			
Number of subjects	144	72	24
Number of subjects about whom data concerning stimulus environment were obtained	131	69	22
Second measurement			
Number of subjects	120	72	48
Number of subjects about whom data concerning stimulus environment were obtained	114	69	45

In the present study children's stimulus environment is measured by variables describing on the one hand the social background of the home and the cultural stimuli on the other.

TABLE 2. Research design concerning the problem about the effect of activity programme on creativity (C & D).  
The figures in brackets show the number of cases in each cell.

		Experimental groups												Control groups							
<u>Programme</u> <sup>1)</sup>		Programme to expand motor schemes (24)				Perceptual-motor programme 1 (24)				Perceptual-motor programme 2 (24)				Kindergarten programme (24)				Pre-school programme (24)			
	<u>Teacher</u>	Group 1 (12)		Group 2 (12)		Group 3 (12)		Group 4 (12)		Group 5 (12)		Group 6 (12)		Group 7 (12)		Group 8 (12)		Group 9 (12)		Group 10 (12)	
<u>Developmental level</u>		+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
		(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)
<u>Sex</u>		T	B	T	B	T	B	T	B	T	B	T	B	T	B	T	B	T	B	T	B
		(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
		First measurement												Second measurement							

1) There were two groups for each programme, one carrying out it in the morning and the other in the afternoon.

### 3.1. Social background variables of the home

#### Social status

The criterion of social status is the social classification scale used by the Statistical Office of the City of Helsinki, which is based on occupation status: (1) professional or managerial, (2) business man (small enterprises), (3) skilled workers, and (4) semi-skilled or unskilled workers.

#### Level of education

Level of education is rated on the basis of father's and mother's educational attainment and it is divided in three groups: obtained academic degree, finished lower or upper secondary school, and finished elementary school.

#### Income

The economic status of the home has been described by the parents' monthly earnings, grouped into four classes (1) over 2.000 Fmk/month, (2) over 1.500 Fmk/month, (3) over 1.000 Fmk/month, and (4) less than 1.000 Fmk/month.

#### Size of household

The size of the household has been considered as a kind of indicant of social interaction. It has been divided into three groups (1) three or less members, (2) four members, and (3) five or more members of the family.

### 3.2. Cultural and environmental variables

#### Stimuli in the home

The items indicating the material stimuli in the home were, among other things, radio, television, record player, tape recorder, paintings, books (Liikanen 1973, 19 - 20).

### Stimuli for children

Stimuli acquired specifically for the child were described with a combined variable, which included e.g. books, records for children, games, building blocks, sport equipment, musical instruments, and playthings (Liikainen 1973, 20 - 21).

### Use of money

The possibilities of the homes to increase the cultural stimuli of their children was mapped with a variable which indicated the amount of money spent to further the child's creative activity (Liikainen 1973, 21-22).

### Parents as models

The parents' attitudes towards art culture and habits concerning creativity-furthering behaviours such as book reading, writing, painting, playing an instrument, singing, acting and movement constituted a variable which described the parents' behaviour as models for their children's creative behaviour (Liikainen 1973, 23-24).

### Art habits

The development of children's art habits was studied by asking the parents how often they took advantage of art services in the community by visiting the library, art exhibitions, concerts, theatre or cinema with their children (Liikainen 1973, 23-24).

### Social interaction

Social interaction was indexed by a variable which described how often the members of the family are together with the children and how often social games and other forms of play take place (Liikainen 1973, 24-25).

### Initiation of creative activity

The parents' views about the proper age for starting to promote children's creative activity were studied with questions asking about the age when children should start writing, making up stories, acting, playing an instrument, etc. (Liikainen 1973, 26-27).

### Desire for art interests

The parents' desire for their children's art interests was described with a variable which indicated how often they would like their children to participate in events which increase cultural experiences, such as art exhibitions, concerts, theatre performances, music and fairy tale sessions arranged by libraries, and in different art club activities (Liikanen 1973, 27-28).

### 3.3. Cognitive developmental variables

#### Play

Cognitive developmental level was determined by evaluating the children's combination ability on the basis of play. Combination ability is a qualitatively changing characteristic, which describes children's ability to combine different toys and sets of toys. It was judged on the basis of three different play materials A, B and C (Liikanen 1972). The children scoring at the three lowest levels for at least two of the three sets of toys were selected as subjects for low developmental group, those scoring at the four highest levels for at least two of the three sets were selected for the high developmental group.

#### Intelligence

In the first measurement intelligence was evaluated on the basis of Raven's progressive matrices and in the second measurement with PMA tests. Raven matrices measure reasoning and logical thinking (R=reasoning). The PMA subtests included in the study measure children's ability to understand verbal information (VM=verbal meaning), to operate with numbers (NF= number facility), to perceive visual similarities and differences (PS=perceptual speed) and to visualize and localize objects (SR=spatial relations).

#### Language

Passive vocabulary was measured in the first measurement with Ruoppila's picture vocabulary test and in the second measurement with the Verbal meaning subtest of PMA.

#### School readiness

School readiness was rated on the basis of Lehtovaara's test battery.

It measures the visual factor and is so far the only school readiness test in use in Finland. Tests measuring verbal ability and reasoning ability, however, predict school readiness better than Lehtovaara's school readiness test.

### Creativity

The test battery to measure creativity was based on Kephart's (1968) theory about information processing: motor stage is represented by a Movement Test, perceptual-motor stage by Circles and Squares Tests, perceptual-conceptual stage by Product Improvement Task and Unusual Uses Test, conceptual stage by Instances Test, and conceptual-perceptual stage by Ask-And-Guess Test and Drawing Task "An Imaginary Fish". With the exception of the tests of the conceptual-perceptual stage all test performances were rated in terms of fluency, flexibility and originality. The Drawing Task was judged in terms of colour, shape and composition. In the Ask-And-Guess test fluency and questions concerning perceptual, functional and causal as well as irrational questions were classified as separate variables.

### 3.4. Structured programmes in art education and creativity

Since six-year-old children generally master basic motor schemes and of basic visual concepts at least form, cultural domains linked with these two schemes were chosen as basis of art education programmes aiming at furthering creativity, i.e. creative movement and visual arts. The structure and tasks of the programmes were structured so as to correspond to the reception and action capability of the lowest developmental levels. Each programme was based mainly on one scheme. The stimulation of creativity was based on the definition reinforcement and extension of this simple scheme by means of various tasks requiring problem solving and discovery.

In the programme for creative movement this scheme included basic motor activities (moving from one place to another by crawling, skipping, running, etc). The supplementary material used in the programme for creative movement



was classical music, children's songs, pop-songs, sounds connected with everyday schemes, and other music as well as films about music and movement.

Form was chosen as the basic concept of perceptual-motor programmes representing visual arts (i.e. circle, square etc). The material transmitting cultural heritage and increasing experience in the perceptual-motor programme was based on four hundred slides about well-known works of arts and on thirty films. Two types of perceptual-motor programmes were tried out. The basic outline of each programme was identical. They varied only in terms of the applications of basic concepts. In the first programme basic forms were produced by using crayons, chalks, water colours, modelling clay, sponges and cloths. The second programme used building blocks of different forms, colours, size and materials. It also included games from Erie-programmes, which require the mastery of basic forms.

#### 4. Results

##### 4.1. The reliability of creativity measurement

Test-retest reliability coefficients of sum scores describing components of creativity obtained the following values: fluency .60, flexibility .57, originality .61, and the combined sum score of the evaluations of colour, form and composition of the drawing task .73 (Table 3). The correlations of the fluency, flexibility and originality of individual tests with the corresponding sum scores ranged between .42 and .78. In the drawing task the evaluations of three persons correlated in the evaluation of colour from .61 to .70, in the evaluation of form from .61 to .79, and in the evaluation

of composition from .35 to .81. The tester had significant influence on the overall evaluation of the components of creativity: in the first measurement on fluency, flexibility and the sum variable, and in the second measurement on flexibility and the functional and irrational questions of the Ask-And-Guess test.

Fluency, flexibility, originality and the sum variable correlated, mainly for technical reasons, highly with each other (.84-.98) (Table 3) but weakly with the drawing task (.24-.30) (cf. Appendices 1 & 2).

Table 3. The reliability coefficients of creativity (N=72). The figures in the lower triangle are for the first measurement and those in the upper triangle for the second measurement

Variables	Fluency	Flexibility	Originality	Drawing task	Sum variable
Fluency	-	.92	.84	.26	.98
Flexibility	.90	-	.79	.24	.95
Originality	.88	.78	-	.25	.92
Drawing task	.30	.28	.27	-	.26
Sum variable	.98	.94	.93	.30	-
Test-retest reliability (two months)	.60	.57	.56	.73	.61

#### 4.2. The effect of social background and cultural environment on creativity (A)

The social background factors of the home were not related to children's creativity before the training programme. After training the background variables (e.g. social status) correlated, although rather weakly, with fluency, flexibility and the drawing task. No single social background

variable correlated significantly with creativity.

Other cultural and environmental variables were significantly related to all creativity variables both in the first and second measurements. Before the training programme, the model given by parents with regard to creative activity, in particular, had an effect on children's creativity. In other words, the more creative activities and art interests the parents had, the more fluent ( $p < .05$ ), the more flexible ( $p < .01$ ), the more original ( $p < .05$ ) were the children, and the higher the sum score of creativity ( $p < .05$ ) of their 6-year-old children. After training it was particularly the development of art habits that was significantly reflected in fluency ( $p < .05$ ), originality ( $p < .10$ ) and sum score ( $p < .10$ ).

In spite of the fact that the social background factors of the home explain a large part of the variation in the cultural stimuli of the environment (Liikanen 1973, 71) and that the children in this study may be regarded as culturally deprived, even very modest parental art interests and inappreciable development of children's art habits are significantly related to the development of children's creativity.

It is more difficult to change the connections between social structure and children's cognitive development and learning readiness than the effects of the other cultural stimuli in children's growing environment on such cognitive development. Since in the present study the variables of cultural stimuli correlated with cognitive factors and creativity, which are associated with children's learning readiness, it appears that educational inequality can be diminished, for instance, by enriching children's cultural activities before school and at school. This would also reduce and prevent cultural inequality.

#### 4.3. Creativity among six-year-old children and its relation to other developmental cognitive variables (B)

If the criterion of creativity is children's ability to extend a given conceptual scheme to new and different contexts and situations, it is obvious that the creativity of 6-year-olds is rather limited indeed. In the present study children gave on an average two to five answers to different tests. They figured out an average of three different ways to move, named three objects with wheels or square objects, five soft objects, and changed the toy dog (Product Improvement Task) in three different ways on the average. Training added a few reactions to children's answers. It appears that 6-year-olds are only acquiring the functional and conceptual schemes necessary for the gathering, processing and storing of information. For this reason they do not yet master a sufficient amount of different schemes to be able to act creatively. Repina (1971, 255-256) thinks that "some experimental investigations indicate that the observed richness of the child's fantasy is an expression of the weakness of his critical thinking, an ability to differentiate the possible from the impossible".

The developmental level estimated on the basis of play was positively correlated to different components of creativity, although the degree of relationship was not very high (cf. Table 4).

The sum variables of fluency, flexibility and originality were independent of all tests of intelligence, language and school readiness. On the other hand, the drawing task correlated significantly with intelligence, language, and school readiness (Table 4). Before the training girls and boys did not differ from each other in fluency, flexibility or originality, while there was observed a difference in the use of colours, girls being better than boys. Girls also asked more questions about causality than boys.

Table 4. Correlations between creativity and developmental level estimated on the basis of play, language, intelligence, and school readiness (N = 96)

Variables	Components of creativity									
	Fluency		Flexibility		Originality		Drawing Task		Sum variables	
Measurement	1.	2.	1.	2.	1.	2.	1.	2.	1.	2.
<u>Play:</u> test A	.07	.15	.15	.17	.09	.01	.23 <sup>x</sup>	.30 <sup>xx</sup>	.11	.12
test B	.31 <sup>xx</sup>	.27 <sup>xx</sup>	.30 <sup>xx</sup>	.23 <sup>x</sup>	.36 <sup>xx</sup>	.20 <sup>x</sup>	.25 <sup>xx</sup>	.36 <sup>xx</sup>	.34 <sup>xx</sup>	.25 <sup>xx</sup>
test C	.23 <sup>x</sup>	.21 <sup>x</sup>	.21 <sup>x</sup>	.20 <sup>x</sup>	.30 <sup>xx</sup>	.14	.22 <sup>x</sup>	.23 <sup>x</sup>	.26 <sup>xx</sup>	.20 <sup>x</sup>
tests ABC	.24 <sup>xx</sup>	.22 <sup>x</sup>	.25 <sup>xx</sup>	.20 <sup>x</sup>	.28 <sup>xx</sup>	.11	.32 <sup>xx</sup>	.37 <sup>xx</sup>	.27 <sup>xx</sup>	.20 <sup>x</sup>
<u>Language:</u>										
Picture vocabulary test	.12	.02	.21 <sup>x</sup>	.02	.16	.02	.24 <sup>xx</sup>	.11	.17	.01
PMA: Verbal Meaning	.09	-.05	.18	-.04	.14	-.04	.11	.11	.14	-.05
<u>Intelligence:</u>										
Raven	.13	.02	.19	-.04	.21 <sup>x</sup>	.02	.23 <sup>x</sup>	.20	.19	.06
PMA: Perceptual speed	-.04	.12	.03	.12	.01	.12	.08	.27 <sup>xx</sup>	-.00	.13
Number facility	.11	.05	.17	.01	.11	.02	.26 <sup>xx</sup>	.21 <sup>x</sup>	.14	.03
Spatial relations	.06	.18	.18	.14	.13	.19	.27 <sup>xx</sup>	.27 <sup>xx</sup>	.14	.18
<u>School readiness:</u>										
School readiness test	.06	.13	.15	.08	.10	.07	.14	.21	.12	.10

Significance:  $p < .01$ ,  $r \geq .24$ , marked xx  
 $p < .05$ ,  $r \geq .20$ , marked x

#### 4.4. The effect of the programmes on creativity (C & D)

It is possible to even out the cultural inequality of children by including in the programmes of day nurseries, pre-schools and children's clubs subject-matter that promotes culture. In this study the programmes aimed at stimulating creativity were selected so that the programme to extend motor schemes represented creative movement and music and the perceptual-motor programmes visual arts. The representativeness of the selected cultural contents has not been empirically tested. Programmes aimed at developing the cultural awareness of different target groups e.g. with regard to music, literature, visual arts, movement etc. forms a large field of research, which has so far received little or no attention from researchers. The starting point of material selection was the idea that any art culture selected into the programmes and structured to the developmental level of children increases children's experiences and transmits the cultural heritage, because of the children taking part in the study 87 per cent had never been to a concert, 78 per cent not visited a museum, and 76 per cent not attended an art exhibition (Liikanen 1973).

The research results (Appendices 3-5) concerning the effects of training on creativity can be summarized by the problem as follows:

- A cognitive pre-school programme carried out by teachers who participated in the investigation developed the creativity of six-year-olds more than the traditional kindergarten programme (Figure 2).
- Activity programmes which transmit cultural heritage and develop capability to receive culture increase the creativity of six-year-olds more than the traditional kindergarten programme (Figures 2 and 3).
- A short structured creativity stimulating programme can raise the creativity of six-year-olds to the level obtained by a group of children who have had

a year of cognitively oriented pre-school education and even surpass that level (Figure 2).

- In perceptual motor programmes creativity increased from the first measurement to the second measurement, but not in the programme for extending motor schemes.
- With regard to the lowest levels of thinking, a structured programme increases the creativity of both high and low developmental groups, even to such an extent that the difference in creativity between the high and low developmental groups before training disappears. Still, both the low and the high developmental group improved significantly creativity from the first to the second measurement (Figure 4).
- Programmes increase both boys' and girls' creativity, but their effect is seen in fluency, flexibility and originality with girls and in the drawing task with boys (Figure 5).
- Training increased the difference between girls and boys in some components of creativity (fluency, flexibility and originality) (Figure 5).

The results of this study confirm earlier investigations (Torrance et al. 1967; 1968; 1969) according to which a structured, even short, programme increases children's creativity more than traditional unstructured kindergarten activity. In the present investigation it was possible to reach the creativity level of a group of children who had attended a cognitively oriented pre-school programme for one year, by means of a daily programme over six weeks, which takes into account the abilities of the lowest developmental levels. A traditional kindergarten programme did not bring children to the same level. The fact that a structured programme was able to increase creativity is a very important starting point for the planning of the whole year's activities. A six-week programmes of 26 hours represents a very small part of children's other activities, if we compare it, for instance,

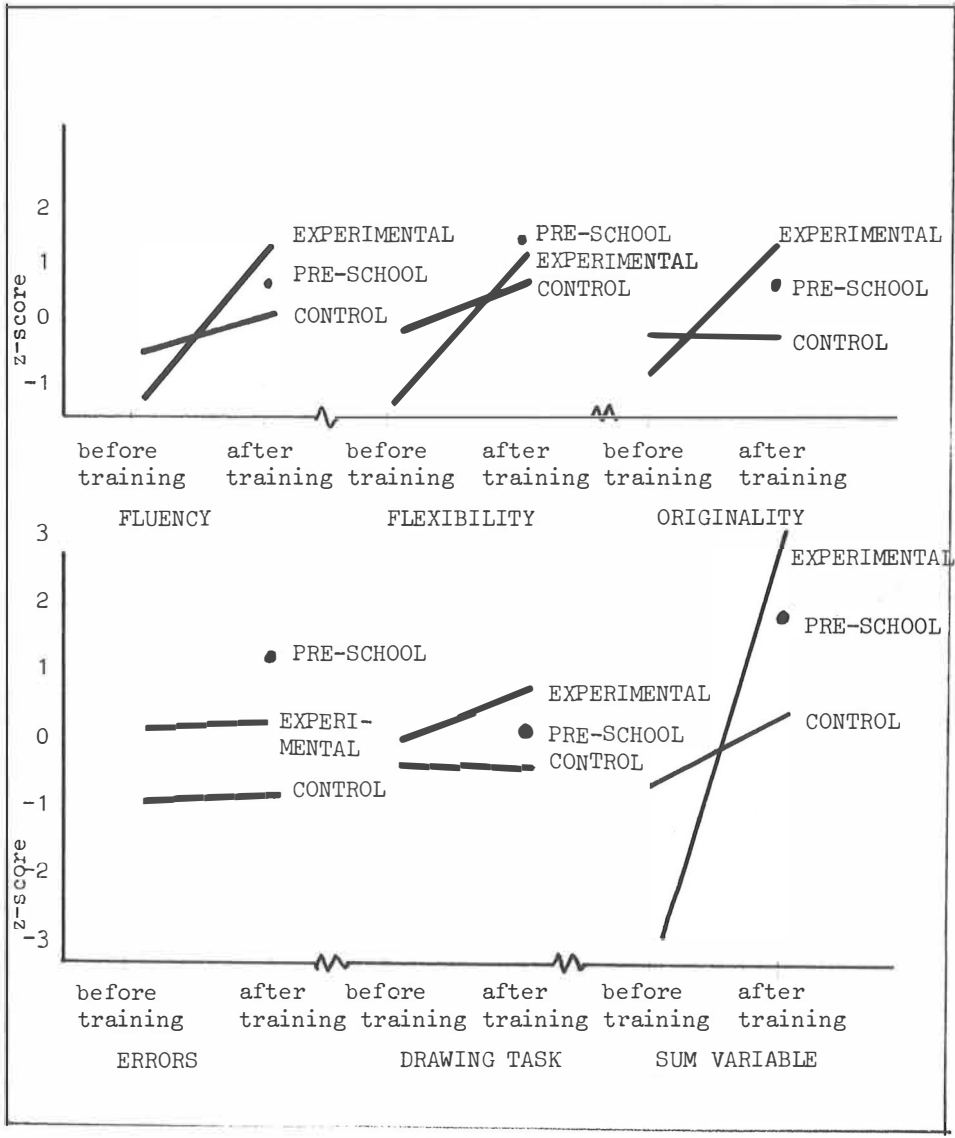


FIGURE 2. Mean sum scores of experimental and control groups before and after training



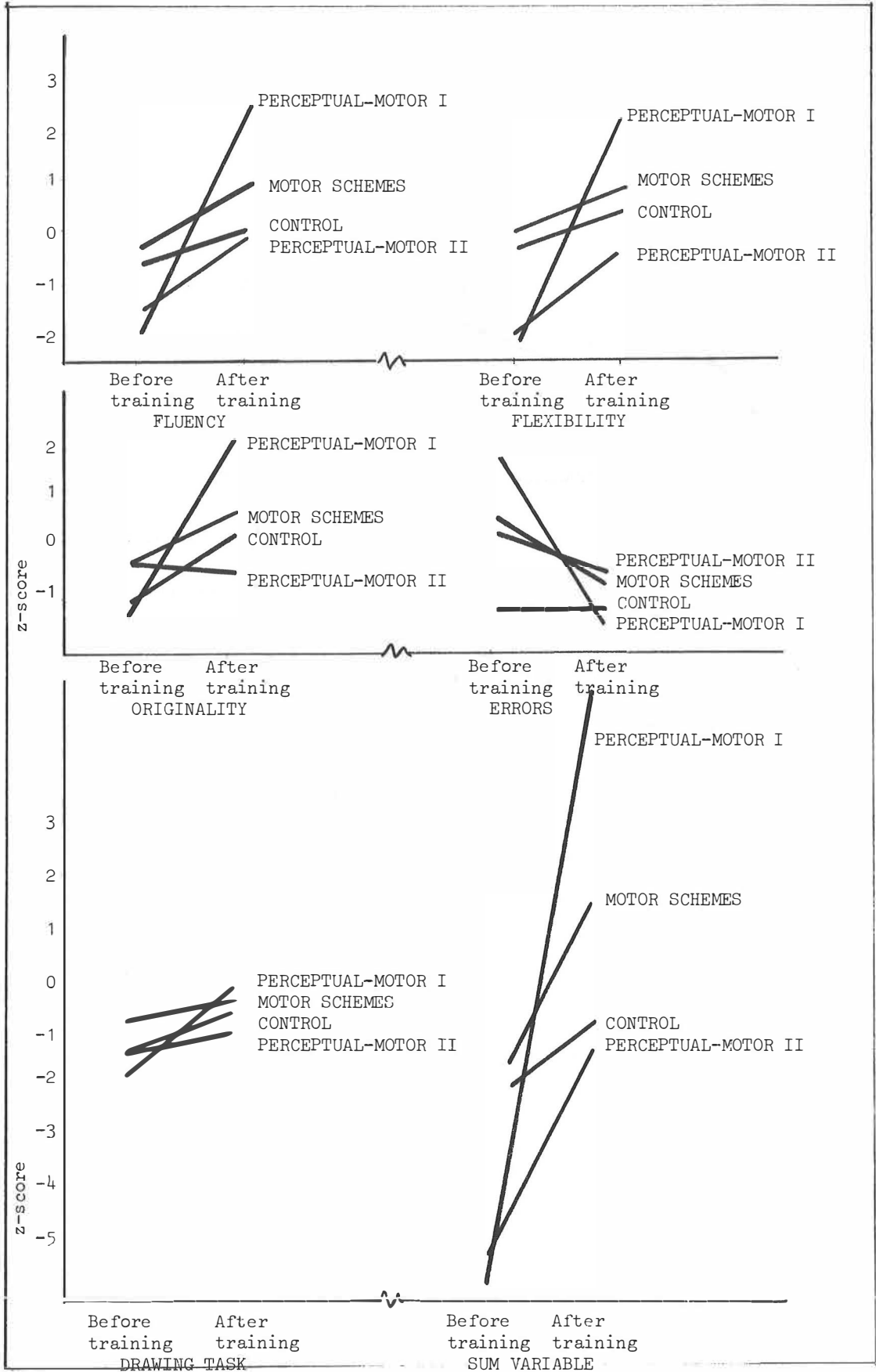


FIGURE 3. Mean sum scores of different programmes before and after training

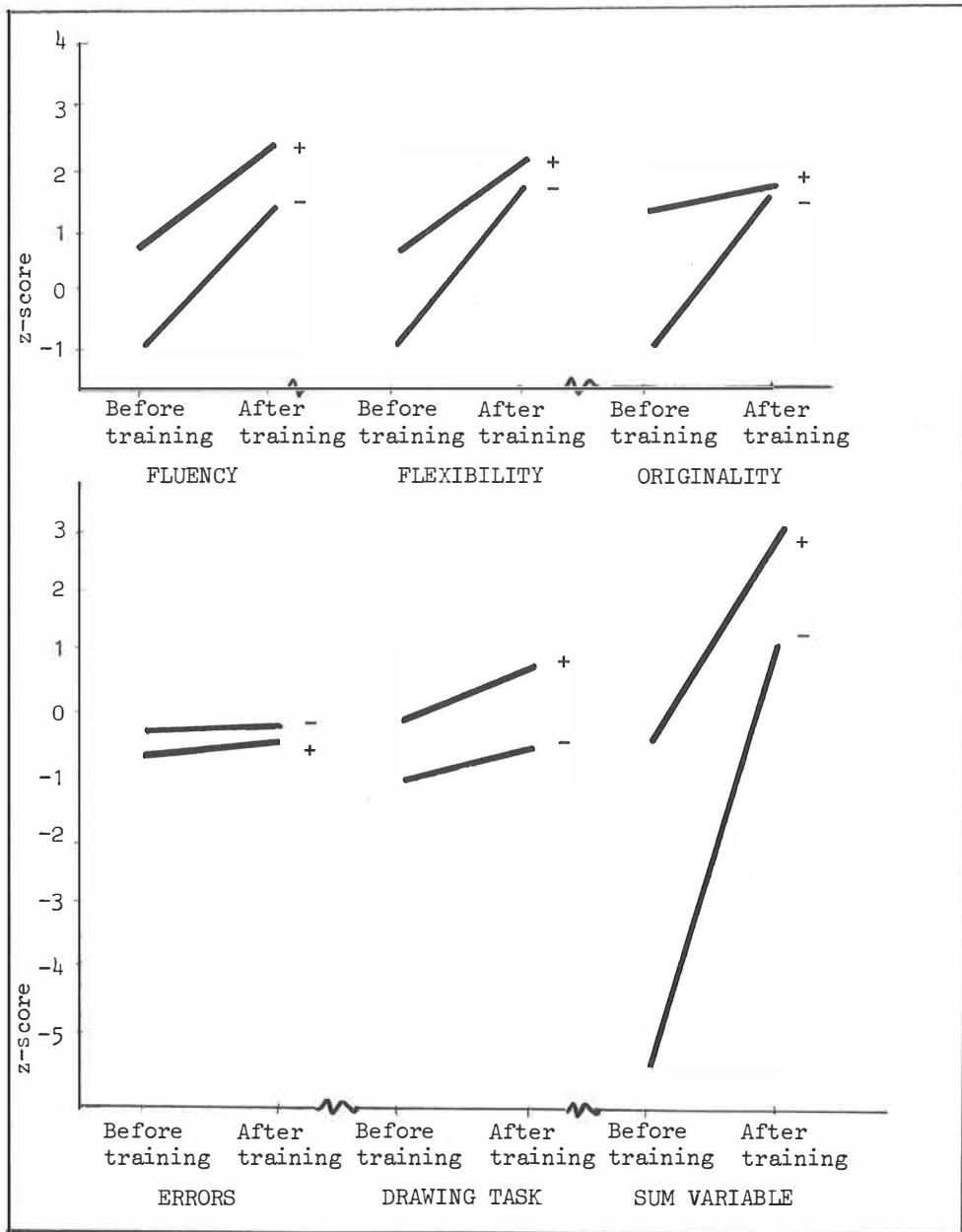


FIGURE 4. Mean creativity sum scores of low and high developmental groups before and after training

(- = low developmental group, + = high developmental group)

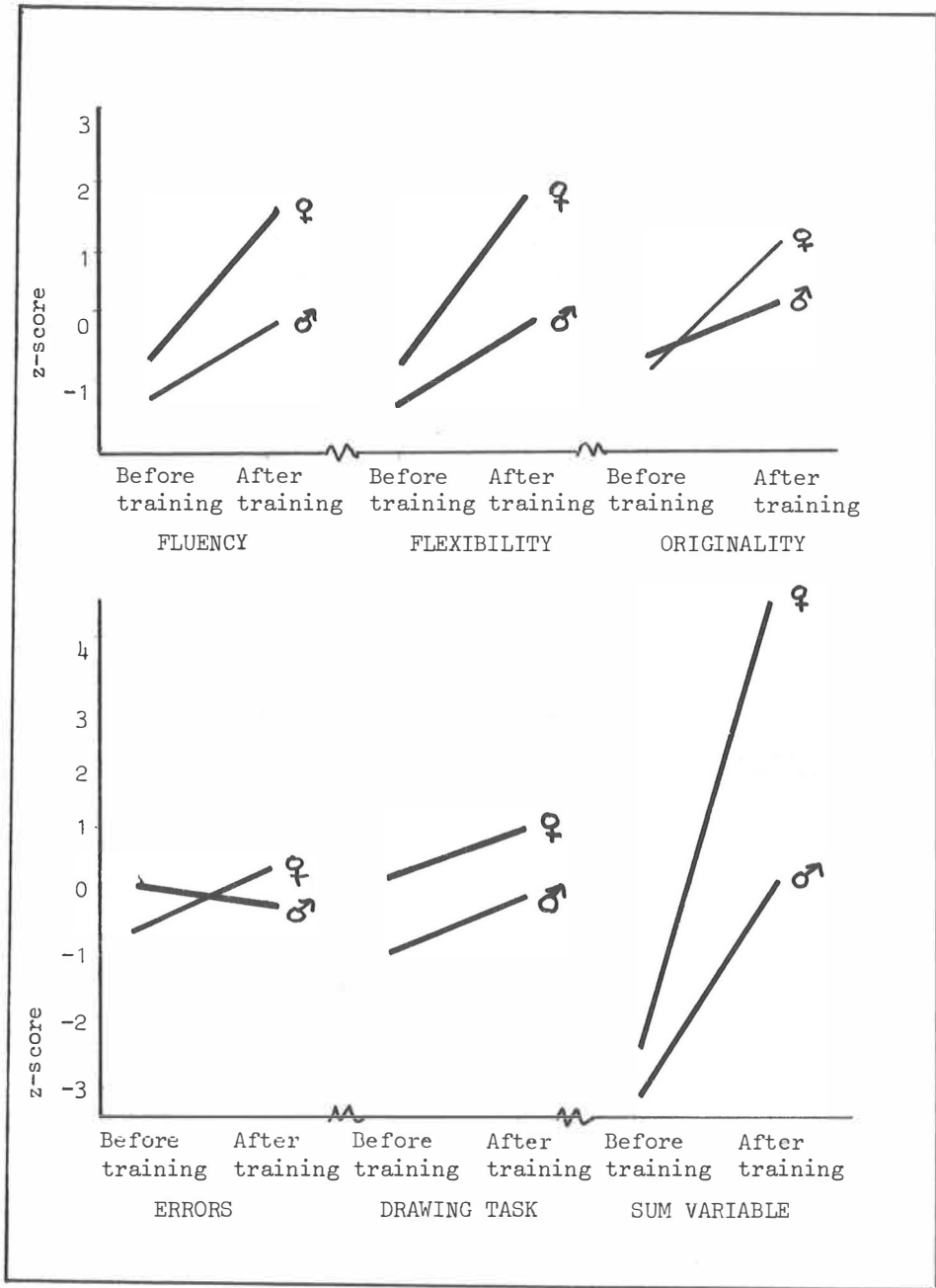


FIGURE 5. Boys' and girls' mean sum scores of creativity before and after training ( ♀ = girls, ♂ = boys)

with the total of some 750 hours in a school year.

Even structured programmes, which aim at the stimulation of pre-school children's creativity cannot alone increase or equalize the opportunities to enjoy the cultural services of the community. Nor can they develop sufficient capacity for children under compulsory school age to develop and enrich culture in accordance with the principles laid down by the 1971 Education Committee, if the curricula of early education besides attending to develop creativity do not pay attention to the transmission of the cultural heritage (including art culture) in a way which corresponds to children's ability to receive and act on cultural stimuli.

## 5. Discussion

The theme of the project "Increasing creativity through art education among pre-school children" set a certain limits to the objectives and problems of the investigation. Four different factors had to be combined: (1) target group, pre-school children, (2) art education, (3) creativity, and (4) creativity stimulation. The first task was to define what is meant by art education and to determine why the art education of children under the age of compulsory education was necessary. The primary objective of the study was, however, the attainment of a specific objective (creativity) by means of a short specific programme (art education) in a given target group (children under the age of compulsory school entrance).

Before the contents of the programmes could be approved, it was necessary to review the significance of art education in children's cultural

environment, in other words, to find out which factors are related to cultural stimuli and in what way cultural stimuli in turn are related to children's cognitive development or creativity.

During the 1960's experimental research has attempted to fight the educational inequality of children under compulsory school age. The group with learning difficulties has usually been found to come from culturally deprived environments. In the present study the concept of cultural inequality is limited to art culture, and factors related to it formed other cultural stimuli of the growth environment. The results indicated that most children had no experiences of art culture. Their parents also had relatively few art interests. If children are compared with their parents, it is found that the cultural experiences of both are scanty. This shows that art culture is not transmitted from one generation to another. Such a handing down of culture is limited to a small part of the population. Consequently it may be said that deprivation with regard to art culture affects a large part of the population.

Another large problem of the project concerned the concept of creativity (the definition and measurement of creativity, the relationship between art education and creativity, the preparation of a programme on art education with the objective of increasing creativity). In art culture creativity probably means something other than what has been measured in the present investigation as creativity. Art culture is seldom included in cognitively oriented activity programmes aimed at stimulating creativity (Torrance et al. 1967, 1968, 1969, 1970). In the present study an attempt was made to improve creativity by means of a programme on art culture.

Since children under compulsory school age do not master the schemes through which culture is transmitted, the concept of creativity was delimited to schemes mastered by children and to accommodative modifications between the

environment and existing schemes. The operationalization of the concept was made according to the same principle the measurement of creativity being based on the concept of scheme, however, so that their items of the test battery of creativity included all stages of processing information because it was not possible to know what level children participating in the investigation had reached. The majority of children probably still functions at levels preceding the perceptual or perceptual-conceptual stages. The reliability and validity of the measurement instrument are discussed in detail in report B (cf. Appendices 1 and 2).

The operationalization of creativity in such a way leaves out working habits, familiarity with materials and their uses, different products created from different materials and their adequacy. Neither is information obtained about those factors of creativity which are related to a creative individual (versatile, independent, sensitive, etc.), to different stages of a continuous creative process, to a creative product (surprising, useful, adequate, etc), and to creativity-stimulating environment (psychologically secure socially suitable, flexible, etc.).

The extent of the use of each single scheme could have been estimated by combining the adequate and differing answers, which would show the extent of the child's use of that particular scheme at that point of time better than if either of the two measurements of creativity were used as the criterion of creativity. Such a procedure might also help to avoid a psychological ceiling effect; it is considerably easier to increase creativity from a low score in the initial measurement than from a high creativity score.

The creativity stimulating programmes were structured in order to match with the abilities of the lowest developmental levels. Structuring is obviously necessary if we aim at supporting the creative development of all children, because the children in the same age group do not function at the

same developmental level (Liikanen 1972). In the present investigation, perceptual-motor programmes had the greatest effect on children's creativity development. It is worth nothing that the contents of perceptual-motor programmes, i.e. the teaching of forms by drawing, painting, modelling, building blocks, also was part of the traditional kindergarten activities. Yet the programmes (traditional kindergarten vs. perceptual-motor programme) had a different effect on the development of creativity. In the former, teaching was unstructured, in the latter structured. In another study (Fouts & Liikanen, in print) a high developmental group of children under compulsory school age imitated an abstract behaviour model mediated through television more than a low developmental group when the model was not structured to comply with the children's capability of assimilating it. The high developmental group was able to sort out essential information, retain and recall what was seen, which the low developmental group could not do equally well. Unstructured actives have a different effect on children of similar age at different levels of development.

In the programme aiming at the extension of motor schemes creativity training was based on the scheme of movement. The ways of extension were not structured in accordance with the developmental level as strictly as in the perceptual-motor programmes. In the latter all developmental stages of processing information were taken into account. The practising of motor schemes was not based on models which transmit cultural heritage. In the perceptual-motor programmes the scheme of form was extended to works of art and films that directly transmit visual arts. Besides, form is one of the basic schemes of visual arts. The programme to extend motor schemes did not increase children's creativity, which may be due to the fact that every day music and movement were combined with the instruction of "you may do what you wish". The task should have been given for children to solve in the

form of a simple problem, which is connected with the scheme to be practised.

The results cannot be generalized without qualifications, because the amount of subjects was small representing six-year-old kindergarten children in Jyväskylä and because the duration of the programmes was relatively short. The results lend, however, sufficient support to the superiority of structured programmes which transmit cultural heritage and increase capability to receive culture compared with traditional kindergarten activity in developing the abilities of pre-school children to engage in self-initiated creative action. Besides, there are obvious links between programmes transmitting cultural heritage and various components of learning readiness, important from the school's point of view. Structured programmes are necessary in the guidance of children under the age of compulsory school age, because unstructured cultural services are feasible only after children master the schemes and their combination structured that are essential conditions for the transmission of each particular culture.

The generalizability of results is also limited by the fact that it is not possible to control sufficiently teachers' teaching skill and motivation; that the teacher-pupil ratio is normally greater than in the present investigation (1/25 vs. 1/12); that children's developmental level varies from kindergarten to kindergarten, which calls for a flexible adaptation of programmes which is virtually never done; that the programmes were so short and their contents too limited in order to be able to create a lasting interest in cultural heritage and art culture.

There is no doubt, on the other hand, that cultural subject-matter is suitable for programmes aiming at the stimulation of creativity and that it is indubitably better than present popular methods of reinforcing creativity e.g. those proposed by working party on art education of The Finnish Cultural Fund (1974, 43-45, 55-58): relaxation and concentration exercises, methods



of relieving tension, exercises in contact and security, improvised pair and small-group exercises to express forms of creativity. They are, however, artificial and divorced from culture. Such artificial methods of improving creativity do not, however, develop capability to assimilate culture. Nor do they enrich cultural experiences or facilitate the attainment of the objectives of aesthetic and art education. It is self-evident that if art subjects at school also emphasize artificial and isolated methods of developing creativity, national, international and classic culture remains strange to the children and must be acquired outside and after school, which few children have any concrete opportunities to do owing to the limitations of the local cultural services.

## 6. Outlook

The analysis of the data could be elaborated by examining how an increase in creativity is related to the social background factors of the home, and to other cultural environment, to programme vs. developmental level and to teacher vs. developmental level. This might be done by choosing groups whose creativity has increased most and least, and studying if the two extreme groups differ with regard to the above-mentioned factors. Such an analysis was not undertaken at this stage.

Self-initiated creative activity and art interests linked to early childhood and childhood art culture are necessary conditions for an active participation in cultural services in adult age (Figure 1), and for the attainment of the goals of cultural policy (Report of the Committee on

Cultural Activities 1974, 111).

Further studies might profitably concentrate on problems such as:

- (1) What is the minimum amount and quality of art culture during early education (movement, music, visual arts, literature, theatre, film) to ensure sufficient cultural experiences and to develop art habits. The later are necessary conditions for an active use of the cultural services of the community.
- (2) What is the structure of selected art education programmes and how should they be structured so that they would comply with the capability of heterogeneous groups to assimilate and utilize them?
- (3) What are the other potential goals of selected art education programmes (increasing creativity, developing school and learning readiness, diminishing educational and cultural inequality, etc.)? How should programmes be structured in view of the assimilation and utilization possibilities of the target group, and considering goals other than those pertaining to the transmission of cultural heritage and creative expression?
- (4) What is the share of art education aiming at developing school and learning readiness in the curriculum of early childhood education with regard to the attainment of the total objectives of early education (teaching in the early grades)?
- (5) In what way can culture reach children under the age of compulsory education (clubs and other interest groups, other municipal or private cultural services, public information and mass media)?
- (6) How can the work concerning the problems of creativity best be continued and developed?
- (7) How can the evaluation of creativity of pre-school children be developed? What is the role and significance of creativity in art education?

The experimental programmes of this investigation can as such be used in the education of pre-school children but they are not sufficient to prevent potential art culture deprivation. For this reason, early education should adopt the following programme and action in order to prevent cultural deprivation:

(1) A systematic development of ability to assimilate culture

Basic materials suitable for different age and developmental levels and covering both national, international and classic culture should be created, so that on entering school children have a solid experiential foundation in movement, visual arts, music, film, literature, and theatre. Music education, for instance, would include about 200 compositions, songs, song games, folk dances, marches; literature c. 500 fairy tales, stories, poems; visual arts c. 2 000 pictures of paintings. In addition films, records, slides, etc. can be used.

(2) The teaching of schemes typical of the culture

Basic schemes are selected from each domain of art culture. Their recognition and use is practised, and simultaneously creativity is enhanced. The teaching of schemes presupposes, however, a carefully thought-out curriculum and teaching materials. Because of this it is necessary to plan and construct structured programmes for each scheme as it was done in the present study with regard to form scheme in the perceptual-motor programme. In visual arts balance, shape, form, light, colour, rhythm and tension constitute each a separate and extensive programme structure (Arnheim 1954). In a similar way musical schemes are in need of their own structured programmes for rhythm with variation in beat, accent, meter, shape, patterns, rests and prose rhythm, for agogics with variation in tempo and changing rate, for melody in variation with pitch, direction, and shape, for tone quality in variation with voices, raw sounds, stringed instruments and wind instruments, for dynamic with variation in accent, changing, soft and loud, for design with variation in repetition and contrast, and for texture with variation in single line and combinations (Aronoff 1969, 42-43).

(3) The development of habits of using cultural services

Children are habituated to regularly borrow and return library books and records, to listen to concerts, also through radio and record player, to visit art exhibitions (or to get to know visual art through films and books) to use films and television programmes to widen their view of the culture outside their own country, etc.

(4) The development of creative activity

Teaching working habits, familiarity with materials, and adequate use of tools promote self-initiated creative activity. Cognitive abilities and practical skills develop creativity, but, however, there has to be a match between the cultural environment and the existing schemes mastered by a child. Systematic art education also improves various components of school readiness; music develops auditive discrimination ability, visual arts improve visual discrimination ability, movement promotes perceptual-motor functioning, literature develops language skills and concept formation, and acting fosters communication skills and sociability.

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Reliability of creativity tests (Liikanen 1974 a, 66)

Trait/subtest	Correlations with sum score		Test-retest reliability time interval 2 months (N=72)
	1st measure- ment (N=96)	2nd measure- ment (N=120)	
<u>Fluency</u>			
Movement Test	.66	.76	.51
Circles Test	.78	.74	.52
Squares Test	.66	.68	.52
Instances soft/glossy	.75	.78	.58
wheels/glossy	.62	.78	.09
Product Improvement Test/ Unusual Uses Test	.66	.57	-.04
Sum score	-	-	.60
<u>Flexibility</u>			
Movement Test	.62	.72	.40
Circles Test	.74	.69	.50
Squares Test	.68	.71	.48
Instances soft/glossy	.69	.70	.45
wheels/glossy	.42	.70	.02
Product Improvement Test/ Unusual Uses Test	.67	.54	.01
Sum score	-	-	.57
<u>Originality</u>			
Movement Test	.57	.67	.53
Circles Test	.76	.67	.48
Squares Test	.68	.49	.35
Instances soft/glossy	.73	.71	.31
wheels/glossy	.44	.71	.03
Product Improvement Test/ Unusual Uses Test	.49	.53	-.03
Sum score	-	-	.56
<u>Drawing task</u>			
Colour	.83	.87	.59
Form	.88	.91	.67
Composition	.89	.88	.68
Sum score	-	-	.73
Sum score	-	-	.61

## Appendix 2

Correlations of creativity subtests with sum variables (Liikainen 1974 a, 69)

Creativity test Trait/test	1st measurement						2nd measurement					
	Fluency	Flexibility	Originality	Errors	Drawing task	Sum variable	Fluency	Flexibility	Originality	Errors	Drawing task	Sum variable
Fluency:												
movement	.66	.61	.56	.21	.24	.65	.76	.71	.62	.29	.24	.74
circle	.78	.73	.76	-.02	.22	.80	.74	.73	.60	.04	.24	.73
square	.66	.68	.66	-.19	.31	.70	.68	.70	.56	.04	.29	.68
soft/glossy	.75	.67	.72	.23	.30	.75	.78	.63	.64	.31	.16	.73
wheels/glossy	.52	.36	.37	.23	.21	.44	.78	.63	.64	.31	.16	.73
Product Improvement Test/Unusual Uses Test	.66	.56	.48	.25	.01	.60	.57	.56	.58	.00	.04	.60
Flexibility:												
movement	.62	.62	.56	.18	.23	.63	.67	.72	.57	.23	.22	.69
circle	.75	.74	.70	-.02	.22	.77	.68	.69	.55	.05	.23	.68
square	.60	.68	.59	-.20	.29	.66	.65	.71	.54	.07	.30	.67
soft/glossy	.59	.69	.59	.21	.18	.66	.64	.70	.57	.24	.10	.67
wheels/glossy	.34	.42	.19	.13	.17	.33	.64	.70	.57	.24	.10	.67
Product Improvement Test/Unusual Uses Test	.55	.67	.38	.10	.03	.56	.43	.54	.41	-.05	.04	.49
Originality:												
movement	.58	.55	.57	.29	.20	.60	.64	.60	.67	.42	.26	.67
circle	.63	.58	.76	.00	.14	.69	.62	.61	.67	.06	.24	.67
square	.57	.55	.68	-.11	.21	.63	.43	.48	.49	.04	.18	.49
soft/glossy	.63	.58	.73	.21	.24	.68	.53	.44	.71	.27	.16	.59
wheels/glossy	.48	.25	.44	.26	.11	.41	.53	.44	.71	.27	.16	.59
Product Improvement Test/Unusual Uses Test	.39	.36	.49	-.08	.11	.44	.43	.40	.53	-.03	.07	.47
Errors:												
movement	-.04	.00	-.00	.46	-.12	-.01	.02	.02	.12	.11	-.04	.05
circle	.10	.01	.03	.77	-.02	.05	.04	-.06	.02	.53	.03	-.03
square	.18	.07	.08	.73	-.09	.12	.03	-.04	.03	.51	.00	-.02
soft/glossy	.36	.32	.43	.33	.06	.39	.36	.30	.37	.80	.12	.36
wheels/glossy	.15	.13	.14	.58	-.04	.15	.36	.30	.37	.80	.12	.36
Product Improvement Test/Unusual Uses Test	-.02	-.04	-.04	.22	.16	-.04	.02	.06	.04	.63	.02	.04
Ask-And-Guess:												
fluency	.33	.32	.38	.12	.07	.36	.47	.48	.42	.16	.01	.48
perceptual	.30	.30	.36	.02	.10	.34	.38	.41	.36	.15	-.02	.41
functional	.19	.19	.24	.11	.02	.22	.38	.37	.34	.15	.04	.38
causal	.22	.17	.21	.20	.00	.21	.29	.27	.20	.00	.04	.27
irrational questions	.20	.17	.10	.00	-.04	.17	.01	.03	.00	.02	-.03	.01
Drawing task:												
colour	.19	.18	.15	-.02	.83	.18	.18	.17	.19	.07	.87	.19
shape	.30	.27	.27	-.05	.88	.29	.20	.17	.21	-.03	.91	.20
composition	.30	.28	.28	-.11	.86	.30	.34	.31	.36	.21	.88	.35



Summary of results of the first and second measurement concerning the significance of the differences between means in different subgroups (t-test, correlated means)

Independent variables	N	Sum variables of creativity					
		Fluency	Flexibility	Originality	Errors	Drawing task	Sum variable
Experimental groups (1-6)	72	4.68(.01)	4.96(.01)	4.18(.01)	0.22	3.59(.01)	5.06(.01)
Control groups (7-8)	24	0.62	0.80	0.10	0.00	0.26	0.50
<u>Programmes</u>							
Programme for expansion of Motor schemes	24	1.26	0.88	1.33	1.58	0.94	1.23
Perceptual motor I	24	4.94(.01)	5.56(.01)	3.78(.01)	2.21(.05)	4.11(.01)	5.35(.01)
Perceptual motor II	24	2.54(.05)	3.43(.01)	2.33(.05)	1.15	1.35	3.19(.01)
Kindergarten	24	0.62	0.80	0.10	0.00	0.26	0.50
<u>Teachers</u>							
Group 1	12	1.16	1.68	1.13	1.41	0.33	1.36
Group 2	12	0.67	0.07	0.79	0.82	1.17	0.53
Group 3	12	3.29(.01)	3.53(.01)	3.69(.01)	1.83(.10)	2.64(.05)	3.70(.01)
Group 4	12	3.83(.01)	4.40(.01)	1.97(.10)	.40	3.22(.01)	3.88(.01)
Group 5	12	1.11	2.20(.05)	1.07	1.23	0.60	1.68
Group 6	12	2.59(.05)	2.67(.05)	2.28(.05)	0.60	2.61(.05)	2.88(.05)
Group 7	12	1.03	0.93	0.12	0.45	0.67	0.68
Group 8	12	0.01	0.29	0.02	1.14	0.30	0.10
<u>Developmental level</u>							
High	48	2.55(.02)	2.27(.05)	0.79	0.14	2.50(.02)	2.10(.05)
Low	48	3.53(.01)	4.33(.01)	4.24(.01)	0.17	1.63	4.32(.01)
<u>Sex</u>							
Girls	48	3.74(.01)	4.20(.01)	3.35(.01)	1.36	2.18(.05)	4.05(.01)
Boys	48	2.29(.05)	2.14(.05)	1.69(.10)	1.24	1.93(.10)	2.25(.05)

Summary of the results of a one-way analysis of variance in examining the effects of programme, teacher, developmental level and sex on creativity

Independent variables	Sum variables of creativity					
	Fluency	Flexibility	Originality	Errors	Drawing task	Sum variable
<u>Programmes</u>						
1st measurement F (3/96)	1.11	2.61(.05)	0.42	2.08(.05)	0.75	1.33
2nd measurement F (4/119)	1.21	1.36	1.37	1.99	1.21	1.34
<u>Teachers</u>						
1st measurement F (7/95)	0.79	1.68	0.91	1.00	0.88	1.07
2nd measurement F (9/119)	0.85	0.94	0.88	1.15	0.82	0.90
<u>Developmental level</u>						
1st measurement F (1/95)	4.46(.05)	4.58(.05)	9.09(.01)	0.26	3.54	6.53(.05)
2nd measurement F (1/119)	3.44	2.01	1.05	0.91	9.70(.01)	2.35
<u>Sex</u>						
1st measurement F (1/95)	0.71	0.52	0.03	1.04	5.94(.05)	0.23
2nd measurement F (1/119)	4.38(.05)	6.94(.01)	1.80	0.49	9.86(.01)	4.62(.05)

The first measurement contained a kindergarten control groups, the second measurement both kindergarten and pre-school control groups.

Summary of the results of a two-way analysis of covariance in studying the effect of teaching on creativity (covariate = 1st measurement)

Independent variables	Fluency	Flexibility	Originality	Errors	Drawing task	Sum variable
<u>All subjects (N=96)</u>						
Sex x programme	-	-	-	-	-	-
sex programme	-	7.84 <sup>x</sup>	-	-	-	4.82 <sup>x</sup>
	3.43 <sup>x</sup>	4.21 <sup>xx</sup>	3.32 <sup>x</sup>	2.77 <sup>x</sup>	3.67 <sup>x</sup>	4.30 <sup>xx</sup>
Developmental level x programme	-	-	-	-	-	-
dev. level programme	-	-	2.62 <sup>x</sup>	-	-	-
	3.47 <sup>x</sup>	4.08 <sup>xx</sup>	3.42 <sup>x</sup>	2.72 <sup>x</sup>	3.53 <sup>x</sup>	4.19 <sup>xx</sup>
Sex x teacher	-	-	-	-	-	-
sex teacher	-	-	-	-	-	4.91 <sup>x</sup>
	-	2.19 <sup>x</sup>	-	-	-	2.23 <sup>x</sup>
Sex x developmental level	-	-	-	-	-	-
sex dev. level	-	7.00 <sup>xx</sup>	-	-	-	-
	-	-	-	-	-	-
<u>Girls (N=48)</u>						
Developmental level x programme	-	-	-	-	-	-
dev. level programme	-	-	-	-	-	-
	4.48 <sup>xx</sup>	4.86 <sup>xx</sup>	3.43 <sup>x</sup>	-	-	4.82 <sup>xx</sup>
Developmental level x teacher	-	-	-	-	-	-
dev. level teacher	-	-	-	-	-	-
	-	-	-	-	-	2.27 <sup>x</sup>
<u>Boys (N=48)</u>						
Developmental level x programme	-	-	-	-	-	-
dev. level programme	-	-	4.15 <sup>x</sup>	-	-	-
	-	-	-	-	3.47 <sup>x</sup>	-
Developmental level x teacher	-	-	-	-	-	-
dev. level teacher	-	-	-	-	-	-
	-	-	-	-	-	-

(only significant F-ratios have been entered  $F < .01^{xx}$ ,  $F < .05^x$ )