

An Investigation into the Effects of Teacher Involvement and Influence on the Creativity of Children in the Classroom

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Abstract: Children have potential for demonstrating increased creativity where certain negative influences are removed during the creative process. These negative influences include the involvement of the teacher in the art and design class at school. This study establishes through primary and secondary research the different ways that teachers engage with children as potential influences that are tested through experimentation. The study was concerned with revealing levels of creativity in designs as well as sign of adult influence. The results revealed that different types of involvement do have a negative impact on creativity, especially giving children instructions.

Keywords: Uninfluenced design, Child's imagination, Creativity, Adult involvement and influence, Curriculum, Teaching.

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Introduction

This paper is based on the idea that children have creative ability in art and design and are capable of producing pure or raw designs from their imaginations in the classroom, however, this creative ability is negatively influenced by the involvement of adult involvement during the creative process (Einarsdottir et al., 2009, Read et al., 2002, Roth, 1996, Gardner, 1990). This involvement by teachers manifests in different ways which includes giving instruction, making suggestions and giving advice, and judgement and evaluation. The study is also based in the premise that whatever children produce is pure or raw art and that this is lost when work exhibits signs of being influenced by teacher involvement.

Towards achieving understanding of creativity in children where adults are also engaged in the process, in this case in a school setting, this study tests the idea that different aspects of teacher involvement in the art and design class negatively influence children's creativity. This is achieved not only through considering the different aspects of teacher involvement but also the different dimension of creativity. Primary and secondary research in this study reveals these aspects as well as the structure and duration of the classes. Specifically, the study first reveals the different ways teachers are involved with children during the creative process towards establishment of variables that are tested through experimentation in the art and design classroom. Different approaches to participatory design include potentially influential adult involvement in numerous ways, even where the focus is on allowing the child more independence in the design process and the adult is merely a facilitator. This study highlights both negative and positive aspects of participatory design in terms of influence on children's work and demonstrates the possibility for leaving the participatory design continuum towards a new independent design where the adults are not required.

Literature Review

The review of the literature was concerned with children, their imaginations and creativity, the different types of participatory design in which children find themselves and the different types of involvement and potential influence on creativity.

2.1 The Imagination and Creativity

In relation to creativity, an important dimension has been proposed by Fuchs Holzer (2009), who says it is important for teachers to understand imagination and creativity and they must learn how to foster the imagination. Amabile (1995) uses the attribution approach to conceptualise creativity through asking *what*, *where* and *why* questions. In response to the *what* question Amabile (1995) provides two possible approaches; the

dispositional perspective which says that creativity is a quality of a person and their personal style, and the attribution perspective that considers social influences. The latter perspective says that creativity is a quality of ideas or products achieved through social judgment, and that creativity is about the individual, their situation and the interaction between the two (Amabile, 1995). As for the question *why*, Amabile (1995) answers this through a social-situational approach that considers independent variables that are controlled or manipulated, and creativity is measured through consensual judgment (Amabile, 1995). The disadvantage of the dispositional approach is that it is narrow and limits the understanding of creativity (Amabile, 1995). Kasof (1995) also supports the situational (attributional) approach and criticises the idea that creativity research is often concerned with personality and cognitive psychology focusing on the characteristics of creative people, while at the same time neglecting external influences (Kasof, 1995).

2.2 Participatory Design

Children should be engaged in the creativity process and their intelligence should be respected discuss the importance of engagement models that respect the intelligence of children and clichés about children's creativity should be avoided (Gattenhof and Radvan, 2009). Hart (1992) says child participation is the process of sharing decisions, which affect the lives of people and the community and that child participation builds democracy.

In participatory design, there are varying degrees of child participation. Read et al. (2002) identifies different types of participatory design which include informant design, where the child informs the adult, balanced design, where there is equal participation and facilitated design, where the adult is merely the facilitator as is the case in a school setting. Read et al. (2002) say that when children are engaged in participatory design they tend to demur to adults. Moreover, children are not afforded the opportunity to express their own opinions and be appreciated by adults (Druin, 2005). Taxen et al. (2001) says that there is a power structure between the child and the adult that should be negotiated because none of them are completely in control of the design process, however, this is especially difficult in a school environment where a power structure exists.

McArdle (2002) says that children should be given freedom of self-expression and allowed to be spontaneous. Similarly, Franz Cizek advocated allowing freedom to foster self-expression and Cassou (2004) said that self-expression and pure creativity are one of the same and spontaneity of creative self-expression was encouraged by Drew and Rankin (2004). Unfortunately, children are not given the opportunity to express their opinions and are not taken seriously by adults (Druin, 2005). In order for ideas to be original children's independent creativity should be encouraged and that teachers should stand aside (Jackson, 2009). Children are naturally creative and innovative and therefore should be left to be self-reliant throughout the design process (Cassou, 2004). Approaches to participatory design clearly demonstrate that supervision and observation are significant adult influences. Craft (2001) says that over-supervision can be an impediment to creativity and Gable (2000) says that being observed by adults while engaged in creative processes can impede creativity.

2.3 Involvement and Influence in the Classroom

Classroom learning impedes the child's ability to be creative in an alternative way and influences the style (Gardner (1990 p.ix) argued that. Kano and Read (2005) The agenda of the design process itself has an impact on design outcomes. Similarly, McArdle (2001) says that learning experiences should be unstructured. Dubuffet and Franz Cizek both believed in the untainted purity of child art whereby it is not tainted by artistic culture and imitation (Dubuffet Foundation, 2013). Therefore, these ideas support a non-interventionist approach. Dubuffet disagreed with giving instructions where the subject would come from convention, thus instruction is best kept to a minimum (Dubuffet Foundation, 2013). Franz Cizek says that the teacher should not interfere and should leave the child to be creative (Viola, 1942). Classroom learning can have an influence on the style of the art (Gardner (1990 p.ix) and education can inhibit the development of creativity in children where children are constrained by social conventions or school generally (Meador, 1992). Creativity is enabled by the teacher standing back and allowing the child time and space (Craft et al., 2014). However, Read et al. (2002) says that where adults only have the intention of facilitating the process, or a 'hands-off' approach it is not effective as solely facilitation was found to be impossible; because it was inevitable that adults became involved. Roth (1996) says that teacher can influence the child in designing in three ways which include making suggestions about shapes and forms, hints about how to improve existing designs and finally, setting constraints. The idea of adult influence is also supported by Einarsdottir et al. (2009) who say that provisions, interactions and support from adults influence children's drawings. Rose et al. (2006) said the influences that effect children's drawing include the attitude of teachers towards drawing, what teachers thought the purpose of drawing was, and the support that teachers provide to children.

Methodology

The research included a number of primary and secondary research methods in order to achieve the aims. The secondary research method that was adopted was a review of the literature. The primary research methods included questionnaires, interviews, observation and document analysis of curriculum documents. These methods were designed to reveal aspects about teachers' involvement with children in the art and design class, and the ways that their approach is informed by the curriculum towards the development of the experiments. The experiments were also a primary research method which included evaluation of experiment outcomes using CPSS, an evaluation instrument. The results of the experiments were analysed using SPSS, a software for statistical analysis. The research methodology includes both quantitative data from the questionnaires and qualitative data from the questionnaires, interviews, observation and document analysis. Thus, a mixed methods approach is adopted in the study. Mixed methods research is considered to be an additional research paradigm to quantitative research and qualitative research (Johnson et al. 2007). Researchers adopt research methods in the social sciences because of the belief that quantitative and qualitative data are both useful for addressing research questions (Johnson et al. 2007). This is achieved in this study through the use of qualitative and quantitative data from questionnaires, interviews, observation and document analysis (curriculum) which provide a more comprehensive understanding of the teaching approach and class structure. Triangulation of the results is carried out in order to check for validity and reliability. Patton (1999) says that triangulation is a way to check consistency of the findings from different research methods, in the case of this study questionnaires, interviews and observation. Specifically, the data will be inputted into SPSS to check validity and reliability using Cronbach's Alpha.

2.4 Teacher Questionnaires

Questionnaires were conducted in order to investigate the current pedagogical approaches by teachers, the role of the teacher and the role that the curriculum plays in the way they engage with children. The results of this questionnaire are used to inform the variables of the experiments. There was a total of 40 respondents who were art and design teachers in the Makkah region, Saudi Arabia. The questionnaires revealed that the structure of the class was generally well defined and included giving instructions, being engaged with children during the creative stage through offering advice and feedback, and then evaluation of the work.

2.5 Interviews with Teachers

Part of the overall methodology adopted a phenomenological approach towards understanding with a greater insight the experiences of teachers teaching children in art and design classes. These interviews served two main purposes, firstly, to reveal the potential involvement factors that may have an influence on creativity, and secondly, to show, as a justification of the study, the way that teachers perceive their role in the art and design class. In total 10 teachers were interviewed from different schools in the study area.

2.6 Observation of Classroom Teaching

In addition to the above methods for revealing the factors of teacher engagement with children, the researcher observed art and design classes in the research area. The researcher observed how the teacher engaged the children and conducted the class. Specifically, the researcher was interested in observing how the teacher structured the class, explained ideas, gave instructions, offered encouragement and feedback and the methods used for evaluation. The observation showed that each school was very similar in the way that classes were conducted in terms of the instruction, engagement and evaluation. Evaluation was observed to be giving opinions about work and assessment according to the curriculum.

2.7 Analysis of Curriculum

Analysis of the curriculum, from the researcher area, was conducted to further understand how teachers engage with children in the art and design class. This analysis offered insight why the teacher deals with children in certain ways, for example, the instruction they give, the support they offer children and how they evaluate, all of which are informed by the curriculum. The primary research with the teachers revealed that most teachers agreed that the curriculum was appropriate for judging creativity.

2.8 Experiments

Experiments were conducted in the normal classroom setting in order to test the effect on creativity of the various involvement variables. The design and the structure of the experiments is explained and justified towards understanding the effect of these variables on children's creativity.

2.8.1 Experiment Variables

The primary research revealed a number of variables which were categorised under instruction, engagement and evaluation. The results showed that teachers were involved with children at numerous instances which included introducing and discussing a topic, categorised under instruction, feedback, suggestion, discussion and encouragement, categorised under engagement and finally, assessing, judgement and their opinion, categorised

under evaluation. The observation of the class revealed a structure within the stages where different types of involvement were observed. Categorisation of the different types of involvement under the three main stages of a class was reflective of a normal class structure.

2.8.1.1 Instruction

As a potential influence on creativity, the primary and secondary research showed instruction to be an integral part of the art and design class. Moreover, primary research showed that a significant amount of time was allocated for giving instruction and introducing the idea or topic, which is to be tested as form of influence as it was expressed by teachers that instructions were a negative influence on the child's ability to concentrate. In support of this idea, Roth (1996) says teachers influence children by setting constraints about what should be created and Freeman (1980) says that stimuli can influence a child. Therefore, instruction was introduced as one of the variables of the experiment.

Where instruction was tested normal instructions were given to the children as in the normal art and design class. Where instruction was excluded for comparison purposes minimal instruction was given as absolutely no instruction would be impossible to achieve. This was achieved through the 'pen and paper' principle according to the principles of Dubuffet where children are given a pen and paper and left to their own devices.

2.8.1.2 Engagement

The primary and secondary research also revealed different types of involvement by the teacher with children, these have been categorised under the engagement variable. They include engagement included feedback, suggestion, discussion and encouragement. The literature has revealed that these aspects of engagement can have negative and positive effects on influence (Gardner, 1990, Pavlou, 2006, Garaigordobil, 2006, Rose et al., 2006, Roth, 1996, Einarsdottir et al., 2009, Burnett and Mandel, 2010, Cassou, 2004, McArdle, 2001). A questionnaire with teachers was conducted to determine the extent and type of involvement they had with children which revealed encouragement, suggestion, feedback and discussion. Teachers in the experiments were briefed to engage with children in these ways as they would normally in the art and design class, where engagement is excluded in the experiments teachers were briefed to refrain from these aspects of involvement.

2.8.1.3 Evaluation

The secondary research revealed that where a child was aware that they were being assessed against criteria and there were expectations of them, it negatively affected creativity (Amabile, 1996, cited in Baer & McKool, 2009). Cassou (2004) says that where children plan and focus on the outcome they orientate to achievement rather than being creative and spontaneous. Amabile (1998) says that evaluation is an inhibitor of creativity where evaluation may be inequitable and expectations unrealistic. The primary research also showed that teachers felt their personal opinion was appropriate for judging creativity. Additionally, teachers also felt that standards established in the curriculum were appropriate for evaluating creative ability. The inclusion and exclusion of evaluation was tested in the experiments through children being informed that their work would or would not be evaluated, respectively.

2.8.2 Design of the Experiments

The experiment variables were established using the primary and secondary research. With consideration of these variables the structure and procedure of the experiments were designed to test these variables. The structure and procedure of the experiments are considered in their design, this includes the number of experiments, variable combination, piloting, sampling and the teacher brief to ensure that teachers conduct the class and engage the children according to the variables.

2.8.2.1 Experiment Procedure

The experimentation is designed to test the derived aspects of the presence and involvement of teachers in the traditional classroom layout, and to test the effects that this presence and involvement has on creativity. The effect of the identified variables is tested both for individual variables and variables in various combinations. These aspects of involvement have been derived from the literature, a review of current approaches to participatory, research with teachers, and a review of the curriculum from the study setting of the Makkah region in Saudi Arabia. These aspects of involvement were found to belong to a particular part of the class and were organised under instruction, engagement and evaluation as overall involvement factors.

The study hypothesises that these aspects of adult involvement in the classroom have a negative effect on the creativity in children and therefore, the experimentation tested these aspects. For example, the aspects discussion, feedback and encouragement are tested collectively under the variable of engagement. In order to verify the effects of the types of involvement the experiments involved the children designing with the inclusion

and exclusion of these variables in various combinations. Towards testing these variables in the traditional classroom setting, the experiments took place as the normal art and design classes during the normal timetabled slot in the usual classroom location so that the children are not aware that an experiment is taking place.

2.8.2.2 Experiment Structure

There are two control experiments designed to verify changes in creativity after the children have progressed through the experiments. The first control experiment (control 1, experiment 1) established creativity under the influence of all three variables, the second control (control 2, experiment 9) was designed to see if there were any changes in creativity after all experiments were completed, the results of the two control experiments were compared. The main experiments were designed to test all the three variables, individually and in possible various combinations. For example, ‘instruction’ is tested alone in Experiment 2 and in combination with ‘engagement’ in Experiment 3, and in combination with ‘evaluation’ in Experiment 4 (Table 1). These combinations are applicable to all three variables ‘instruction’, ‘engagement’ and ‘evaluation’. Moreover, Experiment 8 was designed to see the effect on creativity where no involvement variables are included, reflective of a situation where there is no adult involvement.

Table 1: Design Experiments

Experiments	Control / Variable	Involvement of Adults (Variables)		
		INSTRUCTION	ENGAGEMENT	EVALUATION
Experiment 1	Control 1	✓	✓	✓
Experiment 2	Variable 1	✓	✗	✗
Experiment 3	Variable 1+2	✓	✓	✗
Experiment 4	Variable 1+3	✓	✗	✓
Experiment 5	Variable 2+3	Minimal	✓	✓
Experiment 6	Variable 2	Minimal	✓	✗
Experiment 7	Variable 3	Minimal	✗	✓
Experiment 8	No Adult	✗	✗	✗
Experiment 9	Control 2	✓	✓	✓

2.9 Evaluation

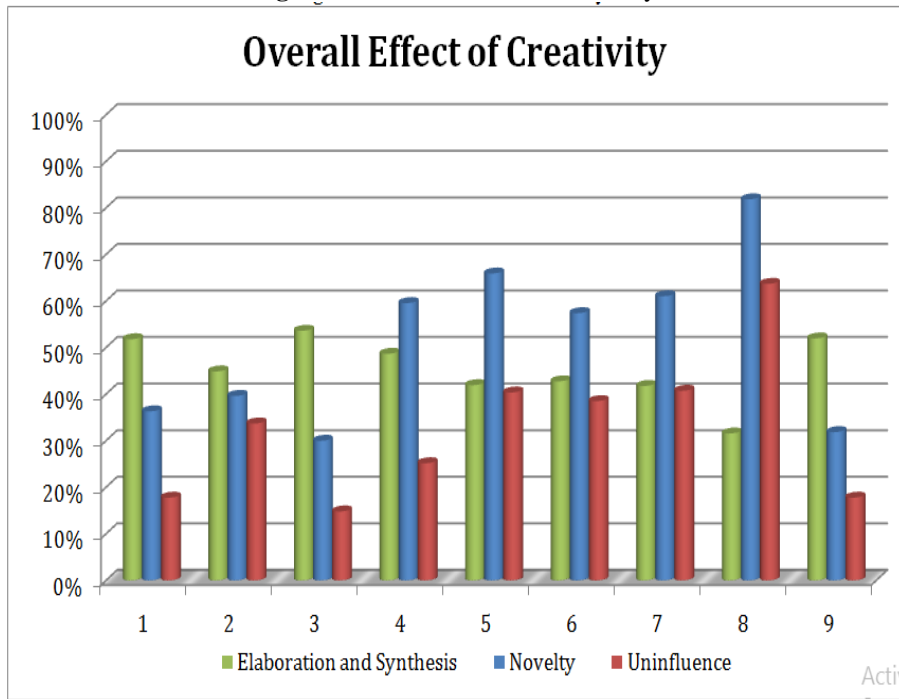
The design outcomes which were the designs that were produced by children were evaluated using CPSS instrument. The tool for assessing creativity was CPSS (Creative Product Semantic Scale), which is used by non-experts to judge creativity, this tool considered creative attributes such as novelty and elaboration and synthesis, as well as assessing for signs of influence. Three art and design teachers were selected as the non-expert judges from three different schools, excluding the school where experiments were taking place, so that they were not aware of each other to reduce bias.

In order to conduct the data analysis, the researcher employed the Statistical Package for Social Sciences (SPSS). The researcher also employed appropriate statistical techniques to analyse the collected data, which included Cronbach's Alpha coefficient, a mathematical method to calculate reliability, is used for assessing the reliability of the scales. Kaiser-Meyer-Olkin (KMO) and Bartlett's Test, a measure of the adequacy of the sample size, to show that the sample size is statistically significant. In statistical analysis, a factorial experiment is an experiment that comprises of two or more factors, where each of these factors has their own discrete possible values or "levels", and where the experimental units can have all possible combinations of these levels across all of the factors. The P value showed statistical significance for all of the experiments.

The Results Of The Experiment

The overall results for all of the nine experiments are presented in Figure 1. The overall effect on creativity of the variables (instruction, engagement and evaluation) is measured according to Elaboration and synthesis, Novelty and Uninfluenced as dimensions of CPSS. Here the overall results are shown for the different combinations where all variables were tested together (experiments 1 and 9), in combination (experiments 3,4 and 5) individually (experiments 2,6 and 7) as well as creativity tests where no variables were present (experiment 8). Overall, the findings show that in each experiment, where the different variables were tested, there was variation in the results in terms of creativity of design outcomes for the Elaboration and Synthesis, Novelty and Uninfluenced dimensions where each variable had a differing effects on overall creativity.

Figure 1: Overall Effect of Creativity



Source: Researcher’s survey

Reliability analysis was conducted for the overall results. The first step of the reliability analysis is presented in Table 2. At the calculation, the Cronbach's Alpha was 0.774. The factor analysis indicates good KMO measure at 0.952, the sample size is adequate and factor analysis was performed Table 3.

Table 2: Cronbach's Alpha

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.774	.747	43

Table 3: Kaiser-Meyer-Olkin (KMO) and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	Approx. Chi-Square	.952 22483.576
Bartlett's Test of Sphericity	df	903
	Sig.	.000

Table 4: Total Variance Explained

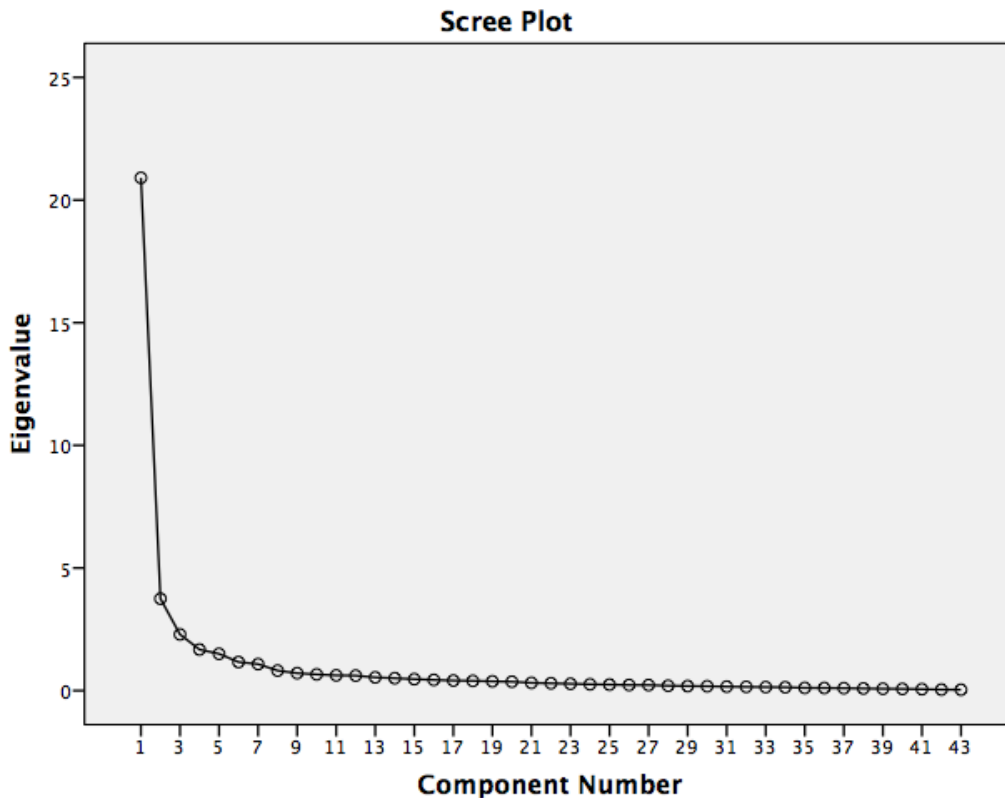
Total variance explained is indicated in the table below (Table 4). The first principal component has 48.6 percent of total variance. These figures are indicated on the scree plot for comparison (Figure 2).

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	20.905	48.617	48.617	20.905	48.617	48.617
2	3.748	8.717	57.334	3.748	8.717	57.334
3	2.292	5.330	62.664	2.292	5.330	62.664
4	1.675	3.896	66.560	1.675	3.896	66.560
5	1.501	3.491	70.051	1.501	3.491	70.051
6	1.165	2.710	72.761	1.165	2.710	72.761
7	1.082	2.515	75.276	1.082	2.515	75.276
8	.817	1.899	77.175			
9	.712	1.655	78.830			
10	.661	1.538	80.368			
11	.622	1.447	81.815			
12	.612	1.424	83.239			
13	.539	1.254	84.493			
14	.506	1.177	85.670			

15	.469	1.090	86.760		
16	.438	1.018	87.778		
17	.410	.953	88.732		
18	.398	.925	89.657		
19	.379	.882	90.539		
20	.365	.848	91.387		
21	.316	.736	92.123		
22	.299	.695	92.818		
23	.279	.650	93.468		
24	.257	.598	94.065		
25	.246	.571	94.636		
26	.229	.532	95.169		
27	.227	.528	95.697		
28	.198	.461	96.159		
29	.186	.432	96.590		
30	.179	.416	97.006		
31	.164	.381	97.387		
32	.154	.358	97.745		
33	.144	.335	98.080		
34	.136	.316	98.396		
35	.111	.259	98.655		
36	.108	.251	98.906		
37	.100	.232	99.137		
38	.088	.205	99.342		
39	.077	.178	99.520		
40	.070	.162	99.682		
41	.058	.135	99.817		
42	.042	.097	99.914		
43	.037	.086	100.000		

Extraction Method: Principal Component Analysis.

Figure 2: The items on the plane of the first two principal components



The P value showed statistical significance for all the experiments. Moreover, the result for R^2 was high at 0.8361 indicating statistical significance Table 5. All coefficient values on table 5 are correct because they are statistically significant indicated by the p value, which is less than 0.05.

Table 5: Multiple Response Regression

Y-hat Model		CREATIVITY				
Factor	Name	Coefficient	P(2 Tail)	Tolerance	β	σ
Constant		323.28	0.0000			
A	Instruction	-32.215	0.0000	1	X	
B	Engagement	-16.674	0.0000	1	X	
C	Evaluation	5.049	0.0018	1	X	
AB		-4.424	0.0060	1	X	
AC		12.549	0.0000	1	X	
BC		4.451	0.0057	1	X	
ABC		-14.410	0.0000	1	X	
	R²	0.8361				
	Adj R²	0.8277				
	Std Error	19.0325				
	F	99.1446				
	Sig F	0.0000				
	F_{LOF}	NA				
	Sig F_{LOF}	NA				
	Source	SS	DF	MS		
	Regression	251397.0	7	35913.9		
	Error	49264.3	136	362.2		
	Error_{Pure}	49264.3	136	362.2		
	Error_{LOF}	0.0	0	NA		
	Total	300661.3	143			

ANOVA is a method of analysis of variance is used to determine if there is a statistically significant difference between the means of three or more independent groups. Using ANOVA the P values also indicated statistical significance Table 6.

Table 6: Analysis of Variance ANOVA

Source	Sum of Squares	Degrees of Freedom	Creativity			
			Mean of Squares	F values	P values	% Contribute
Instruction	149446.7	1	149446.7	412.566	0.000	49.71%
Engagement	40033.3	1	40033.3	110.517	0.000	13.32%
Evaluation	3670.3	1	3670.3	10.132	0.002	1.22%
AB	2817.8	1	2817.8	7.779	0.006	0.94%
AC	22675.3	1	22675.3	62.598	0.000	7.54%
BC	2853.3	1	2853.3	7.877	0.006	0.95%
ABC	29900.2	1	29900.2	82.543	0.000	9.94%
Error	49264.278	136	362.237			16.39%
Total	300661.326	143				

One can see also that the control factors also interact (Table 5, Table 6), and this interaction is statistically significant. This also indicates that the total sample, when all three dimensions are mixed, indicate the mutually opposite influence and proves that the separately all these 3 sub-dimensions (“Elaboration and Synthesis”, “Novelty” and “Uninfluenced”) should be analysed.

The results of the experiment were the designs produced by the children judged using the aforementioned evaluation techniques. The results showed that the presence of all three variables, namely; instruction, engagement and evaluation resulted in a low creativity score and a high level of evidence of influence in the designs. In reference to the effect of individual variables, instruction received the lowest score for creativity, and therefore, instruction was found to have the most negative impact on creativity, specifically in terms of the novelty that the work exhibited. Engagement and evaluation were found to have similar effects on creativity in terms of the novelty and elaboration and synthesis exhibited in the designs, this effect was shown to be less than that of the instruction variable. In fact, instruction had less of an impact on the elaboration and synthesis aspect of creativity. However, it was found that instruction had the greatest impact on the influenced dimension, thus proving that giving children instructions was correlated with an increase in influence on the designs.

Where instruction was tested in combination with engagement this combination was found to have the greatest negative impact on creativity. The reason for this low score was the significant negative impact that this combination had on the novelty aspect of the design. Where instruction was combined with evaluation there was a much higher score for creativity, this was due to a high component score for novelty in the design. Similar findings were revealed for the engagement – evaluation combination where there was not much difference compared to instruction with evaluation. Where engagement was tested alone it had very little impact on

creativity and received similar creativity scores as evaluation. These results suggest that certain elements of engagement either do not have a negative impact on creativity or they do, to a certain extent, have a positive effect on creativity. Where the teacher is engaged with the child this is where the most aspects of involvement take place while the child is being creative so it would be expected that engagement would have some influence, either positively or negatively. This idea is supported by the literature where teachers can support creativity through their behaviour and activities which include offering alternative suggestions and criticism (Runco, 2014) or where the child is inspired by teachers and where the attitude of teachers can have a positive effect on the child's creativity (Tighe, Picariello and Amabile, 2003). In this study data was statistically analysed for each dimension and for all associated with these dimension's subscales. This analysis of the data was conducted for all of the experiments and for individual experiments where each variable was tested individually, in combination with another variable, all variables together and no variable at all.

The reliability of the data was tested using Cronbach's Alpha criterion and the Kaiser-Meyer-Olkin Bartlett's Test was used to test for Factor Analysis separately. Once the reliability of the data had been verified, further factor statistical analysis could then take place; this was illustrated by correlation matrix and Total Variance Explained analysis. The Analysis of Fractional Factorial Design was used to test the P value of R². The first two dimensions, namely; Elaboration and Synthesis and Novelty, adopted from Besemer, it was shown that there was a significant change between all experiments conditions. This change was also observed in the Uninfluenced dimension, developed in this study, in all experiments conditions. For the Elaboration & Synthesis dimension the P value for R² showed statistical significance for all of the experiments at 0.7994 (Table 7). For all the variables tested individually, instruction combined engagement and all variables tested together in combination, there a positive impact on creativity indicated by positive coefficient values. The instruction and evaluation combination and the engagement and evaluation combination had a negative impact on creativity. The Novelty dimension P value for R² showed statistical significance for all the experiments where the result was high at 0.9111 (Table 7). The table shows that instruction had the most significant negative impact on creativity in children, evidenced by a coefficient value of -33.993, this was followed by engagement at -17.701. The effect of instruction when combined with engagement also had a negative impact on creativity with a coefficient value of -4.493. Finally, there was also a negative impact on creativity where all variables were tested together, evidenced by a coefficient value of -14.493. However, evaluation alone had positive impact on creativity with a coefficient value of 4.715. The effect of evaluation when combined with instruction or engagement also had a positive impact on creativity with a coefficient value of 13.007 and 5.299 respectively. The Uninfluenced dimension P value for R² showed statistical significance for all of the experiments at 0.8820 (Table 7). Instruction had the most negative impact on the signs of influence in the work with a coefficient value of -12.056. A negative impact was also found for engagement and evaluation tested alone with coefficient values of -6.806 and -3.500 respectively. The instruction and engagement combination also had a negative impact on creativity, evidenced by a coefficient value of -0.09722. Where all three variables were combined, there was a negative impact on creativity evidenced by coefficient values of -1.750. For the instruction and evaluation combination and the engagement and evaluation combination there was a positive impact on creativity with coefficient values of 2.042 and 4.764 respectively.

Table 7: Multiple Response Regression for All Dimensions

		P value R ²	Instruction	Engagement	Evaluation	Instruction & Engagement	Instruction & Evaluation	Engagement & Evaluation	Instruction &Engagement & Evaluation
1	Elaboration & Synthesis	0.7994	13.833	7.833	3.833	0.16667	-2.500	-5.611	1.833
2	Novelty	0.9111	-33.993	-17.701	4.715	-4.493	13.007	5.299	-14.493
3	Uninfluenced	0.8820	-12.056	-6.806	-3.500	-0.09722	2.042	4.764	-1.750

Conclusion

Where children are engaged in creative art and design activities they are under the influence of teacher involvement. This study set out to investigate the effect that the teacher and the different aspects of the teacher's role had on the creativity in children, where it was found that such involvement can both negatively and positively impact creativity. Creativity was considered as a construct that is comprised of three dimensions, and the results showed that adult involvement had different influencing effects on these dimensions. Elaboration and Synthesis was more often positively influenced in terms of creativity where tested against various variable combinations. The dimensions Novelty and Uninfluenced were mostly negatively influenced in this way. Moreover, understanding of the influence of involvement was achieved through considering the involvement itself as different elements, namely, instruction, engagement and evaluation which were shown to have different

influences on creativity. Specifically, instruction was shown to have the most negative influence but was mitigated by the least negatively influencing aspect of involvement; evaluation. Overall, therefore, the study has shown that both the aspects of influence and dimensions of creativity have relationships that result in negative and positive outcomes in terms of creativity in children. The study has implications for those whose design curricula and are responsible for the development of pedagogy. Specifically, the results showed that there needs to be a reconsideration of the instructions that are given to children as this has been shown to have a detrimental impact on creativity. Furthermore, this study showed that curricula influences pedagogy which in turn influences creativity. Moreover, the exclusion of teacher influences reveals a new design paradigm where there is increased creativity, this not only has implications for those interested in art and design but also those concerned with the psychological implications of creativity and children.

Reliability analyses indicated good choices of items in these experiments. The KMO and Bartlett's test is a measure of the adequacy of the sample size, to show that the sample size is statistically significant. Factor analysis results for all three dimensions of creativity, namely; Elaborations & synthesis, Novelty and Uninfluenced dimensions, indicates that the main underlying factors that give an impact on creativity (principal components which represent items within the dimensions) are just a few, and the first principal components were 34% Elaborations & synthesis, 76% Novelty, 77% Uninfluenced, of total variance. This is in good agreement with multiple response regression which indicates that the first control variable, instruction, contributes approximately 50% to the variance of all dimensions.

Fractional Factorial Design conducted in the experiments ranks the influence of all three variables. The coefficient values were correct because they were found to be statistically significant indicated by the p value, which is less than 0.05. The instruction variable indicates that the highest negative impact on Novelty dimension with a coefficient value of 34, and contributes to 55% of dispersion. The Elaboration & Synthesis dimension indicated a positive influence on instruction with a coefficient value of 14 and contributes to 50% of dispersion. The Uninfluenced dimension indicated a negative impact and contributes 55% of dispersion.

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