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THE EFFECT OF PROJECT-BASED METHOD OF INSTRUCTION ON THE CREATIVITY LEVEL OF VOCATIONAL EDUCATION STUDENTS AT THE UNIVERSITY LEVEL*

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Abstract:

The purpose of this study was to determine whether there are differences in creativity level, as measured by Test your Creativity Level Scale (TYCL) between a group of vocational education students who were taught utilizing project-based method of instruction and a comparable control group taught via traditional method of instruction. The TYCL was administered as a pre-test and post-test for both groups of students (63 in the experimental group and 62 in the control group). Analysis of Covariance (ANCOVA) on the post-test results of the TYCL with the pretest scores as a covariate indicated significant differences between the groups at the .05 alpha level for the favor of the experimental group on the overall creativity level and on each dimension's scores (intuitive awareness, external locus of control, self-confidence, and originality). The study ended by offering a number of theoretical and practical implications for the field of study.

Key words: Project-based instruction, creativity, vocational education, students, ANCOVA, and Jordan.

1. Introduction:

There is a general agreement among academics and practitioners that success in life, in general, and education, in specific, are based on the ability to have a high level of creativity [4]. To maximize human potential (i. e., improve capacity for thought, nurture feelings) which is the gateway to remain competitive, educators need to recognize the importance of developing students' creativity resulting in having that special edge compared to those who don not utilize it [10].

Creativity is defined as "the ability to produce something new through imaginative skills, whether new solutions to a problem, a new method or device, or a new artistic object or form" [5]. According to many researchers [8]; [22]; [23], most of the studies that addressed the definition of creativity pointed out that it can be approached from several perspectives: (a) from the person carrying out the task, which can be described with descriptors such as fluency, flexibility, origination, intuition, independence, intelligence, self-confidence, risk-taking, curiosity, complexity, imagination, openness, commitment, and have external locus of control; (b) from the product that arises from the effects of the person; where a person is expected to come up with a new product that is novel and unconventional to the individual creator; (c) from the process that brings out the novel idea or product, which includes mess finding, fact finding, problem finding, idea finding, solution finding, and acceptance finding; and (d) from the creative/supportive environment. Creative environments should be free of fear, structured but not rigid, and open to new ideas with respect.

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Such environment is necessary to support the encouragement and development of creativity [7]; [39].

Creativity is essential for students especially at higher education institutions. Students must have the ability to see multiple points of view, to analyze a situation and arrive at an appropriate answer, to have an open mind, and to avoid rigidity in thoughts and actions. Stenberg and Lubart [36] stated “it is through creativity that we can cope with significant challenges in our environments in novel and appropriate ways. Indeed, given the rate at which the world is changing, the importance of creativity to our lives is likely to increase” (p. 678). Kessler [24] wrote that creating the climate and the skills for fostering creativity are essential to educating a generation of young people who can visualize new solutions to the problems of today’s and tomorrow’s workforce. Csikszentmihalyi [8] stated that “creativity is a central source of meaning in our lives. Most of the things that are interesting, important, and human are the result of creativity” (p. 36). If we develop creativity in educational systems then we can maximize the powerful capacity of human intelligence [31]. Therefore, because of the importance of creativity to the entire human society and to each individual, educational systems especially at higher education institutions should try to preserve and promote the most important feature of human mind represented by its creativity [16].

In order to develop students’ creativity, education should become less instructor-centered and more student-centered with students taking a more active role in their learning. Moreover, there is increasing pressure on university professors to implement student-centered teaching strategies [25]. A shift from lecture-based learning environment to a project-based learning environment in which students are encouraged to work collaboratively in solving problems and to complete projects that support curriculum outcomes is now needed so that university

students are provided with a well-rounded educational experience that prepares them for the workplace [13]; [29]. It is well documented that students who learn by projects either in groups or individually surpass the performance levels and motivation of students who learn via conventional teaching strategies [28]. Moreover, research showed that project-based learning can improve academic achievement of students [15]; [20], research skills [11], higher-order thinking skills, and opportunity to work on real issues with depth, complexity, and duration [21].

Hence, based on the above discussion, we can conclude that project-based learning environments can contribute to fostering creativity level of students [21]; [25]; [31]. Project-based instruction (PBI) may promote gateways for students to collaborate with others, independence in thinking, flexibility, self-confidence, taking risks, better imagination, openness to new teaching strategies, commitment to the project, and motivation to complete the project without reward [37]. All the above mentioned descriptors are the main features of creativity. The project-based learning approach appears to be the most effective teaching-learning tool that enhances creativity. According to Diffily [11], PBI can be defined as a teaching/learning approach based on the principle that students work on real-life issues individually or in small groups, or “a model that organizes learning around projects” [40].

Curtis [9] and Solomon [37] developed a list of criteria for project-based instruction including: (a) building upon students’ interest and uses that to encourage them, (b) is meaningful and authentic, (c) puts students in a real-life situation through field work, (d) allows students to create all the decisions and choices in regards to how to solve the problem, (e) utilizes expert resources from the community to aid student learning, (f) requires students to demonstrate skills and knowledge, (g) allows student opportunities for self-evaluation and reflection, (h) results in students developing useful products to demonstrate understanding, and

(i) provides presentations to an authentic audience. Others [41]; [2] emphasized the importance of group-based collaboration and cooperative learning systems rather than individual based study in the classroom.

2. Statement of the Problem:

Creativity is a universal ability that needs to be recognized and developed. Past research has focused on studying the concepts of creativity and project-based instruction separately. However, the review of the current literature indicates the unavailability of studies in which the effects of PBI and creativity is investigated together especially at the university level [27]. The importance of creativity has been recognized and yet found to be lacking in schools [1]; [42]. Therefore, the main purpose of the current study was to investigate the effects of PBI on the creativity level of vocational education students at the Hashemite University (HU).

3. Research Question:

The following research question was addressed in this study:

1. Is there any significant difference between the creativity level of the experimental group students (in which the project-based instruction was used) and the control group students (in which the traditional method of instruction was used)?

4. Significance of the Study:

An intensive literature search including world indexes, databases, and dissertations indicated the unavailability of studies related to the effect of PBI on creativity level of students at the university level. Such studies as there addressed the two areas separately. The results of this study will provide valuable information and expand the body of knowledge in the field of education in general, and vocational education in specific by expanding our understanding of the relationship between PBI and creativity. Furthermore, the researchers hope

that findings from this study can contribute to the development of the educational systems by helping faculty members at the university level to develop curriculums that address PBI and creativity. In addition, policy makers might benefit from the results of this study in their decision-making and planning.

5. Methodology:

5.1 The Study Context:

The present study was conducted at the Hashemite University, one of the most prominent, public universities in Jordan. Specifically, the department of Curriculum and Instruction offers a number of classes in the teacher education program one of which the vocational education course. For the first semester of the academic year 2006/2007, there were two sections of the vocational education course. Both sections of the course were taught by the same instructor (the primary researcher) who decided to teach one of the sections not the traditional approach rather the project-based approach. This was the only class that was taught this way at the Department of Curriculum and Instruction. The class meets three times for 50 minutes long each session a week for a period of three and a half months. The classes started in September 2006 and ended in December 2006. The same content and materials were used for both experimental and control groups. One class was taught with PBI while the other class was taught via the traditional approach. Students in the experimental group were asked to develop projects, discussion forums, seminars, multimedia enhanced lectures, role plays, vocational songs, booklets, and training sessions related to the content of the class. Students were encouraged to work individually and in groups depending on type of projects required. Students were urged to think creatively and critically when in the process of developing their projects. The control group proceeded with regular classroom activities during the treatment period. The curriculum consists of topics in the following areas:

vocational education curriculum in Jordan; teaching vocational education in regional and international countries; barriers facing vocational education implementation; developing lesson plans in vocational education; technology use in teaching vocational education; industrial education, agricultural education, and home economics education.

5.2 Population and Sample:

The population for this study comprised of all undergraduate students with a major in teacher education from the Department of Curriculum and Instruction at the Hashemite University. The sample of the study consisted of undergraduate students with a major in teacher education registered for the vocational education course offered by the Department of Curriculum and Instruction during the first semester of the 2006/2007 academic year. There were two sections of vocational education course with 63 students in the first session (58 female, 5 male) and 62 students in the second session (60 female, 2 male). Session one with 63 students was treated as the experimental group and session two with 62 students was treated as the control group. The students were mostly 20 and 21 years old. With regard to the control group, there were eight students age 20 and 54 students age 21. The experimental group statistics included 13 students age 20 and 50 students age 21. Therefore, the students' gender and age were not considered to be of relevance in this study.

5.3 Instrumentation:

Data for the study were gathered using the Test your Creativity Level Scale (TYCL). This instrument was adopted from Hammadi [19] and Swaidan [38] which has two available versions, one in Arabic which was used in this study and one in English. The instrument consists of 50 items that is rated on a Likert-type scale ranging as follow: 5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, and 1 = strongly disagree. Since

1999, the instrument was tested with more than 5000 subjects in a number of countries including United Arab Emirates, Saudi Arabia, Kuwait, Qatar, Bahrain, Syria, and Lebanon. This instrument was developed to measure the creativity level among adults ages 18 or older. This instrument is easy to use and can be scored by the administrator. It uses a simple total score that can be weighed against a seven-level creativity scale that ranges from substantially creative (4.5-5), to very creative (4-4.49), creative (3.5-3.99), moderate creative (3-3.49), weakly creative (2.5-2.99), noncreative (2-2.49), and resist creativity (1-1.99). This test can be administered periodically in order to allow a person keep track of his/her creativity level and creative development. The TYCL test is reported to have a strong reliability and validity [19]; [38]. Based on their studies, a test-retest of the scale on 199 subjects provided a strong reliability of an alpha of .61 and higher. The standards for instrument reliability for Cronbach's alpha by Robinson, Shavor, and Wrightsman [33] were used to judge the quality of the TYCL scale: .80-1.00 – exemplary reliability, .70-.79 – extensive reliability, .60-.69 – moderate reliability, and < .60 – minimal reliability. Factor structure was conducted by the above researchers on the instrument to determine its construct validity and factor structure. The results indicated a four factor model with 32 items as follow: (1) intuitive awareness (11 items), (2) external locus of control (9 items), (3) self-confidence (7 items), and (4) originality (5 items).

5.4 Data Collection:

In an effort to review the impact of PBI on the creativity level of students, this study compared two sections of students enrolled in a first-semester vocational education course at the Hashemite University for the academic year 2006/2007. There were two sections of the same course with approximately equal number of students. One section was randomly assigned to the experimental group (students received PBI in late morning) and the other to the control group (students received

traditional instruction in early afternoon). The same instructor taught both the control and the experimental group's course.

The process of data collection was as follows: first, the TYCL test was given by the instructor during the first week of September 2006/2007 as the pretest for all students in both the experimental and control groups before the implementation of the intervention. The instructor collected students' surveys and stored them in SPSS database. The survey length was 30 minutes. After the intervention (PBI for the experimental group and traditional instruction for the control group), the same test was administered during the last week of December 2006/2007 for both groups to determine students' creativity levels. Usable data were collected from 63 students in the experimental group and 62 subjects in the control group. Finally, since both the experimental and control groups took the same pre-and posttest, and the experiment occupies the same time period for all subjects, and the same instructor teaches both classes, testing, instrumentation, maturation, mortality, history, selection, and sensitization are not an internal validity threats.

5.5 Data Analysis:

A quasi-experimental, pretest-posttest control group design using a sample of intact groups was used in this study [6]. Quasi-experimental design is used when intact classrooms are used as the experimental and control groups. This design is most appropriate when the researcher is not able to randomly assign subjects to groups but able to randomly assign groups to the levels of the treatment. Researchers use them to compare groups "that are defined by a naturally occurring, non-manipulated variable that is usually a subject variable or a time variable" [18]. Moreover, this design is used to control or reduce threats to internal validity [14].

The main purpose of this study was to determine the effect of PBI on the creativity level of vocational students at the Hashemite University. The independent variable is the method of instruction which has two levels (PBI and traditional), the dependent variable of the study is the creativity posttest scores for each dimension and for the total TYCL score, and the pretest is the covariate. Analysis of covariance (ANCOVA) is most suitable to be used when dealing with intact groups or subjects. ANCOVA on the post-semester TYCL scores with pre-semester TYCL scores as a covariate was used to determine whether there are differences in creativity level between the experimental and control group before and after the intervention. Data analysis was handled by using Statistical Package for Social Science (SPSS 11.5) and a significance level of .05 was adopted [14]. Finally, using ANCOVA has the benefits of adjusting for preexisting differences that may exist among the intact groups prior to the research, increase in the precision of the research by reducing the error variance, and it increases statistical power [17].

6. Results:

The data collected from all participants were coded, entered to the SPSS spreadsheets, and analyzed using software package SPSS version 11.5. Descriptive statistics for all variables in this study were examined using SPSS frequencies. The minimum and maximum values for each variable were examined for the accuracy of data entry by inspecting out of range values. An examination of these values showed that no out of range values were detected. Missing subjects were not detected either. Reliabilities for the TYCL scale was .80 and for each of the subscales as follow: intuitive awareness ($\alpha = .82$), external locus of control ($\alpha = .77$), self-confidence ($\alpha = .81$), and originality ($\alpha = .82$). These results indicate that the TYCL scale is a reliable measure for this study. Results of the study are addressed by the research question addressed in this study.

7. Results Pertaining the Research Question:

Research question one was to determine whether there are significant differences between the creativity level of the experimental group students (in which the PBI was used) and the control group students (in which the traditional method of instruction was used)? Analysis of covariance (ANCOVA) was utilized to answer this question. In this case, the post-TYCL total score and the score for each subscale were used as the dependant variable, the group (experimental vs. control) was used as the independent variable, and the respective pre-TYCL total score and the score for each subscale was used as a covariate (in order to control for any differences between the groups

at pretest). Based on the analysis, significant differences were found among the treatment groups (experimental vs. control) based on the total score for the TYCL scale. The results indicated that there was a statistically significant difference in the creativity level between the experimental and control groups for the favor of the experimental group $F(1, 122) = 1406.49, p < .001$. (see Tables 1 and 2). The pretest (covariate) was not found to be a significant predictor of the post-test score ($p = .301$) indicating the equivalence of the treatment groups on the pretest. The Effect size and power of test were also reported to provide more detailed data.

Table - 1
Means and Standard Deviations for the TYCL Scale on the Posttest

Group	Mean	Std. Deviation	N
Control	2.21	.12	62
Experimental	3.65	.27	63

Table - 2
Summary of ANCOVA for the TYCL Scale with Pretest as Covariate

Source	SS	df	MS	F	Sig.	Effect Size	Observed Power
Corrected Model	65.933	2	32.967	735.253	.000	.923	1.00
Intercept	3.366	1	3.366	75.072	.000	.381	1.00
Covariate (Pre)	.048	1	.048	1.077	.301	.009	.177
Group	63.063	1	63.063	1406.494	.000	.920	1.00
Error	5.470	122	.045				
Total	1151.854	125					
Corrected Total	71.404	124					

Note. R Squared = .923 (Adjusted R Squared = .922).

The study also investigated whether significant differences exist in creativity level between the treatment groups (experimental and control) for each TYCL subscale. With regard to the intuitive awareness subscale, ANCOVA analysis indicated significant differences between the treatment groups for the favor of the experimental group $F(1, 122) = 1074.578, p < .001$. Moreover, significant differences were not found between the treatment groups on the pretest ($p = .819$) indicating that the groups were equivalent prior to the intervention (see Tables 3 and 4).

Table 3**Means and Standard Deviations for the TYCL Awareness Subscale on the Posttest**

Group	Mean	Std. Deviation	N
Control	2.32	.20	62
Experimental	3.90	.32	63

Table 4**Summary of ANCOVA for the TYCL Awareness Subscale with Pretest as Covariate**

Source	SS	df	MS	F	Sig.	Effect Size	Observed Power
Corrected Model	78.089	2	39.044	540.459	.000	.899	1.00
Intercept	10.504	1	10.504	145.402	.000	.544	1.00
Covariate (Pre)	.004	1	.004	.053	.819	.000	.056
Group	77.631	1	77.631	1074.578	.000	.898	1.00
Error	8.814	122	.072				
Total	1300.868	125					
Corrected Total	86.902	124					

Note. R Squared = .899 (Adjusted R Squared = .897).

The ANCOVA statistic also showed significant differences between the treatment groups on the external locus of control subscale for the favor of the experimental group $F(1, 122) = 639.127, p < .001$. The analysis also indicated that the treatment groups were equivalent on their creativity scores on the pretest ($p = .96$) (see Tables 5 and 6).

Table 5**Means and Standard Deviations for the TYCL External Locus of Control Subscale on the Posttest**

Group	Mean	Std. Deviation	N
Control	2.13	.20	62
Experimental	3.64	.42	63

Table 6**Summary of ANCOVA for the TYCL Locus of Control Subscale with Pretest as Covariate**

Source	SS	df	MS	F	Sig.	Effect Size	Observed Power
Corrected Model	71.180	2	35.590	319.606	.000	.840	1.00
Intercept	18.930	1	18.930	169.997	.000	.580	1.00
Covariate (Pre)	.000	1	.000	.003	.956	.000	.050
Group	71.171	1	71.171	639.127	.000	.840	1.00
Error	13.585	122	.111				
Total	1135.049	125					
Corrected Total	84.766	124					

Note. R Squared = .840 (Adjusted R Squared = .840).

As well, the ANCOVA analyses showed that the treatment groups differed significantly on the self-confidence subscale for the favor of the experimental group $F(1, 122) = 345.276, p < .001$ (see Tables 7 and 8) and for the originality subscale for the favor of the experimental group $F(1, 122) = 346.412, p < .001$ (see Tables 9 and 10). Finally, it was shown in the above mentioned tables that the treatment groups creativity scores were equivalent on the pretest for the self-confidence subscale ($p = .219$) and for the originality subscale ($p = .157$).

Table 7

Means and Standard Deviations for the TYCL Confidence Subscale on the Posttest

Group	Mean	Std. Deviation	N
Control	2.21	.20	62
Experimental	3.41	.46	63

Table 8

Summary of ANCOVA for the TYCL Confidence Subscale with Pretest as Covariate

Source	SS	df	MS	F	Sig.	Effect Size	Observed Power
Corrected Model	46.282	2	23.141	180.737	.000	.748	1.00
Intercept	8.480	1	8.480	66.235	.000	.352	1.00
Covariate (Pre)	.196	1	.196	1.529	.219	.012	.232
Group	44.208	1	44.208	345.276	.000	.739	1.00
Error	15.620	122	.128				
Total	1053.9	125					
Corrected Total	39	124					
Total	61.902						

Note. R Squared = .748 (Adjusted R Squared = .744).

Table 9

Means and Standard Deviations for the TYCL Originality Subscale on the Posttest

Group	Mean	Std. Deviation	N
Control	2.09	.13	62
Experimental	3.49	.50	63

Table 10
Summary of ANCOVA for the TYCL Originality Subscale with Pretest as Covariate

Source	SS	df	MS	F	Sig.	Effect Size	Observed Power
Corrected Model	61.397	2	30.699	221.845	.000	.784	1.00
Intercept	17.297	1	17.297	124.994	.000	.506	1.00
Covariate (Pre)	.281	1	.281	2.032	.157	.016	.293
Group	47.936	1	47.936	346.412	.000	.740	1.00
Error	16.882	122	.138				
Total	1057.16	125					
Corrected Total	0	124					
	78.280						

Note. R Squared = .784 (Adjusted R Squared = .782).

9. Discussion and Conclusions:

The purpose of this study was to determine the effect of project-based (PBI) instruction on the creativity level of vocational education students at the Hashemite University in Jordan. To achieve this purpose, a quasi-experimental design with intact classes was employed in this study. One vocational class with two sections was selected for this study. The first section with 63 students was used as the experimental group and the other section with 62 students was used as the control group. The Test your Creativity Level Scale (TYCL) was utilized as the instrument to measure creativity level of students before and after the intervention. The research study took place during the first semester of the academic year of 2006/2007. Data were analyzed using descriptive statistics and ANCOVA. In what follows, we discuss the research question in light of the results presented in the previous section.

10. The Major Findings of the Study:

Students in both sections of the vocational education class were asked to respond to 32 items that measured their creativity level before and after the intervention. These 32 items were grouped to

four dimensions representing creativity. Results of the analysis indicated the following:

1. Vocational education students experienced significant increase in their overall creativity score between the pre-and-posttest as a result of participation in the PBI. The posttest mean values were 2.21 for the control group and 3.65 for the experimental group. Moreover, ANCOVA analysis indicated that there are no significant differences between the control and experimental groups prior to the intervention ($p = .30$). This major finding can be looked at as an evidence of the effectiveness of the PBI in improving students' creativity compared to traditional method of instruction which did not lead to any change in students' creativity level. We can simply describe students taught by PBI as creative while students taught by traditional instruction as noncreative.
2. The students' overall creativity score for the awareness dimension has improved between the pre-and-posttest as a result of participation in the PBI. The posttest mean value was 2.32 for the control group and

- 3.90 for the experimental group. Further analysis with ANCOVA indicated that there are significant differences between the treatment groups ($p < .001$) for the favor of the experimental group. Moreover, both treatment groups were equal on the pretest ($p = .82$). During the intervention, students in the experimental group followed a logical, gradual, and step-by-step approach in solving problems; believed that they should make a contribution to their world that is satisfactory to them regardless of benefits expected; generated ideas inside and outside the classroom about the projects they are working on which has an element of appreciation for beauty; changed their mode of thinking to find solutions to problems related to their work; thought about secrets and riddles involved in their work; and believed that hard work is the best pathway to success. Overall, students who received PBI were described as creative whereas students receiving traditional instruction were described as noncreative.
3. Students experienced a significant increase in their creativity level on the external locus of control dimension as a result of participation in the PBI. On the posttest, the mean values were 2.13 for the control group and 3.64 for the experimental group. Further analysis with ANCOVA indicated that there are significant differences between the treatment groups ($p < .001$) for the favor of the experimental group. Moreover, both treatment groups were equal on the pretest ($p = .96$). During the intervention, students in the experimental group valued work over pleasure; liked jobs that affected others; preferred to get things done in the right way and the right time; searched for knowledge related to their future work; and were an accepted team member. Based on that, students in the experimental group were described as creative whereas students in the control group were described as noncreative.
 4. Students who received PBI experienced a significant increase in their creativity level between the pre-and-posttest on the self-confidence dimension. On the posttest, the mean values were 2.21 for the control group and 3.41 for the experimental group. Further analysis with ANCOVA indicated that there are significant differences between the treatment groups ($p < .001$) for the favor of the experimental group. Moreover, both treatment groups were equal on the pretest ($p = .22$). During the intervention, students in the experimental group considered themselves practical and wise; responsible and dependable; liked to adopt strange ideas; and believed in hard work as an element of success. Overall, students who received PBI were described as moderately creative whereas students who received traditional instruction were described as noncreative.
 5. Students who participated in the PBI experienced a significant increase in their creativity level on the originality dimension. On the posttest, the mean values were 2.09 for the control group and 3.49 for the experimental group. Further analysis with ANCOVA indicated that there are significant differences between the treatment groups ($p < .001$) for the favor of the experimental group. Moreover, both treatment groups were equal on the pretest ($p = .16$). During the intervention, students had original ideas that are expressed freely and individually; excited about generating ideas; relied on inner feelings to solve problems; daydream when thinking about an important project; and are encouraged to present new ideas. Based on that, students who participated in the PBI were described as creative whereas students who received traditional instruction were described as noncreative.

11. Conclusions:

The major findings of this study showed that the PBI is an effective tool for improving vocational student' creativity level when compared to the traditional method of instruction. Students in the experimental group did experience a significant increase in their posttest creativity scores when compared to students in the control group. Experimental group students were classified as creative whereas students in the control group were classified as noncreative. These findings lends support to the argument that the PBI should be applied to all university courses in whole or mixed with traditional methods of instruction [34] because of its profound effect in improving students' creativity. It is well documented in the literature the major benefits of PBI as an effective teaching tool in improving students' academic success, critical thinking skills, and research skills compared to traditional instruction which is boring to students [3]; [20]. Moreover, creativity must be instilled in our education system and society to better meets the needs of the competitive world [12]. However, to the researchers' best knowledge, no research studies locally or internationally exist which directly investigated the effect of PBI on the creativity level of students at the university level. Therefore, this study is considered to be the first of its kind, thus becoming a major contribution to the literature.

Finally, the present research provides a number of practical and theoretical suggestions for the field of study. From the theoretical standpoint, the present study should be (a) replicated with other undergraduate and graduate courses and in other universities in Jordan (b) the instrument (TYCL) should be validated by establishing its criterion and concurrent validity with relation to other related variables such as self-concept, self-regulation, and intelligence (c) utilize advanced statistical techniques such as MANCOVA to test the impact of demographic variables such as gender, age, educational level, and socioeconomic background

on the construct of creativity, (d) analyze the impact of PBI alone and a mix of PBI and traditional instructional on the creativity level of students, and (e) incorporate a qualitative element into the investigation to provide more in depth data.

From the practical standpoint, university administrators should encourage faculty members to (a) incorporate PBI into their teaching/learning process in an environment that is safe where learning is active and hands-on, (b) plan curriculums around projects to advance the knowledge and creativity of students, (c) facilitate cooperation among students to work on individual and team projects, and (d) hold seminars on the university campus to provide information about the benefits of project based instruction and creativity in today's competitive world.

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