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The impact of the project-based learning (PBL) on the motivation of first-year students at Universitas Negeri Medan

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ABSTRACT

The goal of this study is to look at the effect of new learning approaches like project based learning (PBL) on the enthusiasm for studying of undergraduates at Universitas Negeri Medan. In the quasi-experimental design, the Times-Series Design with Control Group was used. The one-way ANOVA test was used to evaluate the data. The results demonstrated that the pretest and posttest motivation questionnaires in the control and experimental classes of the PBL paradigm differed. The mean of pretest motivation score for the experiment group was 3.50, by input score that varied from 3.00-3.97 and a standard deviation of 0.58. The mean of posttest motivation score for the experiment group was 3.83, by a score that ranged from 3.03-4.00 and a standard deviation of 0.61.

Keyword : Project Based Learning; **Motivation**; **effect; undergraduates; ANOVA**

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1. INTRODUCTION

Learning is a complex process that involves numerous challenges. Motivation, one of the most significant among such difficulties, can be characterised as an internal condition that arouses, guides, and maintains behaviour. The inner condition is a required component of any form of activity. The global implications of this became clear, particularly with Frederick Taylor's spread of his theory of managerial science at the turn of the 20th century. After that time, awareness of motivation has grown, and more study has been undertaken, with numerous theories providing insight into motivation (Köseoğlu, 2013). About 100,000 full-time and part-time undergraduates do not finish their first year of study, and dropout rates have grown at a number of UK universities (National Audit Office (NAO), 2007). This pattern could be a symptom of a larger motivational issue among a small percentage of students. According to research, students' motivations for attending university differ, and early motivation affects subsequent academic achievement and perseverance (Ratelle et al., 2007). As a result, although students might seem similar at the start of university study, depending on their original motivations for attending, some may be more motivationally dependent and prone to dropout than others.

Improving the quality of human resources is an issue for universities. Education in higher education institutions should ideally enhance both technical and interpersonal abilities in students. However, lectures can sometimes only be used to improve concrete abilities (Azis & Kurniawan, 2019; Robles, 2012; Syakur & Panuju, 2020). Technical skills correlate to lecture topic understanding, while soft skills are largely concerned with hard skill improvement. Among them are soft skills that include solving issues and analytical thinking (Shah et al., 2011; Wats & Wats, 2009). Analytical thinking competence does not develop in unison with physical development. This ability is associated with the ability to

creatively and logically uncover, assess, and solve problems in order to reach the most appropriate choices and conclusion (Shah et al., 2011; Syakur & Panuju, 2020).

Students may employ project-based learning to independently discover practical and technological challenges, develop alternatives, and carry out joint research to solve them (J. W. Lee & Choi, 2015). Learning takes place in a team-based classroom environment while students are solving issues and discussing their findings. In such an environment, teachers and students must take on duties that vary from what they are used to (Choi & Jang, 2010). Because the problem-solving process in project-based learning is centred on collaborative learning, students must accept increased responsibility for developing of their interpersonal capabilities as well as their academic abilities. Students learn to collaborate effectively with others and discover different perspectives and ideas while working on a common topic (Byun et al., 2007). Project-based learning is similar to constructivist learning environments in that it revolves "throughout an issue or question in order to ensure finishing established a set of activities, and upon the completion of those tasks, the development of a final outcome (model) is aimed" (Bluemenfeld et al., 1991). Project-based learning emphasises student initiative and offers students more responsibility in the learning environment, which is a time-consuming process.

Project-based learning (PBL) is a type of learning that is geared for complicated problems and emphasises extended learning activities. Using technology to improve collaborative abilities is one option. Most learners presently are accustomed to utilising computer technology in their academic work. Participants may utilise their knowledge of technology to participate in collaborative learning projects in order to acquire not only language proficiency (Musa et al., 2011), but also how to cooperate and collaborate with others on their team to accomplish specific educational goals. According to Chang and Lee (Chang & Lee, 2010), "students gain fundamental principles during lessons that involve the implementation of contextual understanding through collaborative projects." Projects involving multimedia and technology adapt themselves nicely to collaborative work, which promotes cooperation as well as teamwork. These student tasks are multidisciplinary and product-oriented (Guerra & Kolmos, 2011; Mihardi et al., 2013). PBL is a type of learning that can help learners develop innovative thinking, problem-solving, and communication, in addition to research that leads to true problem solving (Huang et al., 2010; Nucci et al., 2014). By employing real-world challenges relating to a certain subject, PBL can improve motivation, procedure, and student achievement (Syakur, 2021; Syakur & Panuju, 2020).

2. LITERATURE REVIEW

Students collaborate with one another to address hard and authentic problems in project-based learning. As a result, project-based learning requires participants to not only put their understanding to their training, but also to collaborate in groups to solve challenges (Solomon, 2003). Small group activities are essential in project-based learning for members of the team to make cooperative decisions and solve problems. Individual project suggestions tend to be quite simple for students to develop, but it is critical to establish the best alternative by collaborative discussion and negotiation. Teachers will always face challenges in this area. The problem of an independent rider, that is an organisation member who is dependant on the performance of the remaining members of the group and receives an evaluation of work by everyone on the group without completing their own tasks, can arise during team project training. However, learning to interact is vital, and collaborative learning projects can help students build real-world skills (Kim & Lee, 2012; H.-J. Lee & Lim, 2012; Mulvey & Klein, 1998).

Humans are programmed to find out novel and difficult circumstances, in addition to chances to learn and enhance their talents, according to the concept of self-determination. This is known as intrinsic motivation. Fundamentally motivated activities are those undertaken for the sake of the positive experiences they provide, such as passion, satisfaction, or challenge. They happen organically and do not require external stimuli. An infant's exploration conduct is an example of truly organically motivated behaviour (Ryan & Deci, 1985) (Ryan & Deci, 2000). Extrinsically motivated actions are those that are performed in order to achieve a certain goal (i.e. instrumental behaviour). There are four types of extrinsic motivation that have become increasingly recognised as autonomous, according to self-determination theory. Activities performed for incentives or to prevent penalties are examples of external regulation. Activities carried out for feelings of pride or to avoid feelings of guilt are examples of unauthorised regulation. Identified regulation includes actions performed for their significance, worth, or utility. While specified standards are incorporated into one's personality (that is, when they

are harmonised with an individual's preferences, hobbies, and needs), integrated regulation occurs (Liu, 2003; Ryan & Deci, 1985, 2000).

Extrinsic motivation, on the other hand, refers to behaviours that are implemented not for the sake of gaining individual satisfaction or enjoyment from discovering or investigating an educational activity, but for the sake of achieving a result that includes gaining an excellent grade or avoiding teacher discipline (Ryan & Deci, 2000). Individuals that are extrinsically driven pursue activities that generate benefits that are outside to the action itself. An athlete, for example, would compete in the Olympics in order to win a medal of gold and the fame and money that come with it. Deci and Ryan postulated three categories of extrinsic motivation in their study Intrinsic Motivation and Self-Determination in Human Behaviour (Ryan & Deci, 1985). External regulation, identifiable regulation, and introjected regulation are listed in ascending order.

Although the fact that classes are necessary in the faculty, students despise them. This is due to the fact that a university course is supposed to be difficult to learn, possess; and complete the exam. According to several experts, attitudes (Dalgety et al., 2003), motivation (Covington, 2000), and an intense curiosity in the topic being presented each have an effect on learning success. Apart from instructional effectiveness, which influences student achievement, students' perspectives are thought to have an impact on their performance (Centra & Gaubatz, 2000). A study discovered that motivation effects a student's attitude, with the motivated student changing to an optimistic mindset and the less driven student changing to a negative attitude (Berg, 2005). Positive attitudes include working hard in class and not giving up even when you fail. Students become more motivated and focused when they obtain intrinsic benefits such as positive feedback instead of external advantages such as high grades (Ryan & Deci, 2000). This is due to the fact that intrinsic incentives provide more satisfaction than extrinsic rewards.

3. METHOD

The study was using quasi experimental approach, by applying a pretest and posttest design. This study participants were 145 students from Universitas Negeri Medan's Engineering Department in their first semester of the academic year 2022/2023. The design of this research is shown in Table 1.

Table 1. Experiment Design

Group	Initial State	Treatment	Final State
A1 (Treatment)	Q_1	X	Q_2
A2 (Control Group)	Q_3	-	Q_4

Description:
A1 = Treatment group
A2 = Control group
Q1 = The pretest motivation outcomes of the experimental group of students
Q2 = The posttest motivation outcomes of the experimental group of students
Q3 = The outcomes of the pretest motivation of the control group of students
Q4 = The outcomes of the posttest motivation of the control group of students
X = The PBL learning paradigm was used to treat the experimental group of students.

A. Data Collection

Data was collected using scores from a students' motivation pretest and one posttest in the use of project based learning model for students from the Engineering Department of Universitas Negeri Medan during the first semester. The results of motivation tests were analysed using statistical approaches, that is the one-way ANOVA test. To evaluate the association between project-based learning approaches and student learning motivation, questionnaire data was collected. The structural equation modelling statistical method was used to analyse the respondent's answer score.

B. Test

To collect data on learning outcomes, the motivation test was administered both before and after the learning procedure.

- Motivation Pretest

After it was determined that the two classes had the similar learning motivation based on data (H_0 accepted if count t table), the motivation pretest was administered in both situations of groups of first semester students in the 2022/2023 year.

- Pretest Motivation Outcomes
  Pretest results are given to Engineering Department students at Universitas Negeri Medan to ensure that each class has the same initial interest.
- Research Treatment
  Researchers in the experimental and control groups administered the therapy 14 times. The treatment makes use of the same material, lecturers, class circumstances, and time. PBL is used in experimental classes to teach.
- Motivation Posttest
  After 14 times of therapy, students in both classes are given a post-test utilising motivation test as an acceptable and acceptable, dependable, and pragmatic test instrument. The questions in the assessment instrument were identical to those in the pretest.

C. Instrument

- Questionnaire
  Standard assessment (for every student) and the Project-Based Learning (PBL) model questionnaire (for Exploratory class students).
- Motivation Test
  To assess students' motivation for the instructional materials (treatments) used in this study, the Instructional Materials Motivational Survey (IMMS) was implemented. (Keller, 2010) created the survey to analyse the motivational quality of educational experiences applying the ARCS concepts of Attention, Relevance, Confidence, and Satisfaction. IMMS is widely utilised in numerous languages all over the world, according to research, demonstrating its validity and reliability. It has a wide range of applications (researchers, students, and educators) (Kutu & Sozbilir, 2011; Wang et al., 2020). Cronbach's alpha for attention is 0.89, for relevance it is 0.80, for confidence it is 0.86, and for satisfaction it is 0.89 (Wang et al., 2020). This study's Cronbach's alpha internal consistency reliability coefficient is more than 0.8. This study's motivation questionnaire has 20 items. Each statement has four potential responses from which students must select one. The five possible replies are not true, slightly true, moderately true, mostly true, and very true. The score of motivation instrument is presented in Table 2.

Table 2. Score of Motivation Instrument

Description	Score
Not true	1
Slightly true	2
Moderately true	3
Mostly true	4
Very True	5

D. Data Analysis

The one-way ANOVA test was implemented to investigate the intervention effect, in which a variety of treatments were applied to deal with the problem formulation linked student motivation test scores. To evaluate the connection between the PBL-based learning process and the learning motivation attained by students at Universitas Negeri Medan's Engineering Department using Partial Least Squares (PLS) methodology. PLS is a multivariate statistical method that compares a large number of variables that are dependent and independent factors. PLS is a variant-based Structural Equation Modelling (SEM) statistical technique used to complete multiple regressions when data difficulties such as limited experiment dimensions, missing scores, and multicollinearity exist.

4. RESULTS AND DISCUSSION

The one-way ANOVA test had a significant result of 0,00 in the group under investigation. Because the significant value result of experiment group is 0.05 < (0,000) < 0,05, so it was decided that H_2 was approved, meaning that the intervention impacts of the motivation assessments, specifically the pretest and posttest, were either different or significant. According to the test results, the sig for the PBL model

control group was 0.031. Since the significant score is 0.05 < (0.031) < 0.05, so it is possible to conclude that H_2 was accepted, implying that the course of action impacts of the motivation tests, notably pretest and posttest, were different, or significant modifications happened.

Table 3. Experiment Result

Group	Initial State		Final State		Sig.
	Mean	*Std*	*Mean*	*Std*	
A1 (Treatment)	3.50	0.58	3.83	0.61	0.031
A2 (Control Group)	3.45	0.59	3.60	0.60	0.000

Individual paired-samples T-tests are applied to examine if there may be significant variations in the levels of association between the PBL-based learning process and learning motivation. Table 3 showed the mean scores and standard deviations of each group's motivation score as well as their learning model. It demonstrates that all of the variables have significant disparities. The significance level is lower than 0.05. As a result, H_2 is acceptable. The PBL class had the biggest positive mean difference, indicating that the learning paradigm has a greater impact on the students' motivation.

5. CONCLUSION

Derived from the outcomes of the investigation mentioned above, that is possible to infer that the usage of PBL can assist students in developing abilities to think critically. Students must practise analytical thinking abilities in order to be equipped to deal with current and future difficulties and problems. Implementing PBL as one of the approaches and tactics for dealing with students' motivation has a significant impact, resulting in better motivation for first-year university students in learning and collaborating.

REFERENCES

Azis, R., & Kurniawan, D. (2019). Strategi Peningkatan Kemampuan Peternak Itik Melalui Pelatihan Manajemen Pakan Itik Terhadap Kelompok Peternak Itik Hibrida Super di Desa Slorok Kecamatan Doko Kabupaten Blitar. *Jurnal Pengabdian Dan Pemberdayaan Nusantara (JPPNu)*, 25–31.

Berg, C. A. R. (2005). *Factors related to observed attitude change toward learning chemistry among university students*. *6*(1), 1–18.

Bluemenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palincsar, A. (1991). Motivating Project-based learning: sustaining the doing, supporting the learning. *Educational Psychologist*, *26*(3), 369–398.

Byun, Y. K., Kim, Y. H., & Son, M. (2007). *Educational methods and educational engineering*. Hagjisa.

Centra, J. A., & Gaubatz, N. B. (2000). *Student perceptions of learning and instructional effectiveness in college course*.

Chang, L. C., & Lee, G. C. (2010). A team-teaching model for practicing project-based learning in high school: Collaboration between computer and subject teachers. *Computers and Education*, *55*(3), 961–969. https://doi.org/10.1016/j.compedu.2010.04.007

Choi, J. I., & Jang, K. W. (2010). *Teaching with PBL*. Hagjisa.

Covington, M. V. (2000). Goal Theory, Motivation, and School Achievement: An Integrative Review. In *Annu. Rev. Psychol* (Vol. 51). www.annualreviews.org

Dalgety, J., Coll, R. K., & Jones, A. (2003). Development of chemistry attitudes and experiences questionnaire (CAEQ). *Journal of Research in Science Teaching*, *40*(7), 649–668. https://doi.org/10.1002/tea.10103

Guerra, A., & Kolmos, A. (2011). Comparing problem based learning models: suggestions for their implementation. *PBL Across the Disciplines: Research into Best Practice 3rd International Research Symposium on PBL 2011*, 3–14.

Huang, H. M., Rauch, U., & Liaw, S. S. (2010). Investigating learners' attitudes toward virtual reality learning environments: Based on a constructivist approach. *Computers and Education*, *55*(3), 1171–1182. https://doi.org/10.1016/j.compedu.2010.05.014

Keller, J. M. (2010). Motivational Design for Learning and Performance. In *Motivational Design for Learning and Performance*. https://doi.org/10.1007/978-1-4419-1250-3

Kim, H. S., & Lee, J. H. (2012). A study on the moderating role of participatory safety climate in the relationship between task and relationship conflicts in the team. *Journal of Korean Society Business Administration*, *19*(6), 115–132.

Köseoğlu, Y. (2013). *Educational Research and Reviews Academic motivation of the first-year university students and the self-determination theory*. *8*(8), 418–424. https://doi.org/10.5897/ERR12.124

Kutu, H., & Sozbilir, M. (2011). Adaptation of Instructional Materials Motivation Survey to Turkish: A Validity and Reliability Study. In *Necatibey Faculty of Education Electronic Journal of Science and Mathematics Education* (Vol. 5, Issue 1).

Lee, H.-J., & Lim, C. (2012). Peer Evaluation in Blended Team Project-Based Learning: What Do Students Find Important? *Educational Technology & Society*, *15*(4), 214–224.

Lee, J. W., & Choi, E. S. (2015). An analysis of structural relationships between variables of university students' self-leadership, social support, career motivation, career decision-making self- efficacy, and career maturity. *Interdisciplinary Journal of Adult & Continuing Education*, *18*(1), 33–54.

Liu, M. (2003). Enhancing Learners' Cognitive Skills Through Multimedia Design. *Interactive Learning Environments*, *11*(1), 23–39. https://doi.org/10.1076/ilee.11.1.23.13686

Mihardi, S., Harahap, M. B., & Sani, R. A. (2013). The Effect of Project Based Learning Model with KWL Worksheet on Student Creative Thinking Process in Physics Problems. *Journal of Education and Practice*, *4*(25). www.iiste.org

Mulvey, P. W., & Klein, H. J. (1998). The Impact of Perceived Loafing and Collective Efficacy on Group Goal Processes and Group Performance. In *ORGANIZATIONAL BEHAVIOR AND HUMAN DECISION PROCESSES* (Vol. 74, Issue 1).

Musa, F., Mufti, N., Latiff, R. A., & Amin, M. M. (2011). Project-based learning: Promoting meaningful language learning for workplace skills. *Procedia - Social and Behavioral Sciences*, *18*, 187–195. https://doi.org/10.1016/j.sbspro.2011.05.027

National Audit Office (NAO). (2007). *Staying the course: The retention of students in higher education*.

Nucci, L., Krettenauer, T., & Narvaez, D. (2014). *Handbook of Moral and Character Education Second Edition*. Routledge.

Ratelle, C. F., Guay, F., Vallerand, R. J., Larose, S., & Senécal, C. (2007). Autonomous, Controlled, and Amotivated Types of Academic Motivation: A Person-Oriented Analysis. *Journal of Educational Psychology*, *99*(4), 734–746. https://doi.org/10.1037/0022-0663.99.4.734

Robles, M. M. (2012). Executive Perceptions of the Top 10 Soft Skills Needed in Today's Workplace. *Business Communication Quarterly*, *75*(4), 453–465. https://doi.org/10.1177/1080569912460400

Ryan, R. M., & Deci, E. L. (1985). *Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being Self-Determination Theory*. Ryan.

Ryan, R. M., & Deci, E. L. (2000). *Intrinsic and Extrinsic Motivations : Classic Definitions and New Directions*. *67*, 54–67. https://doi.org/10.1006/ceps.1999.1020

Shah, M., Lewis, I., & Fitzgerald, R. (2011). The renewal of quality assurance in Australian higher education: The challenge of balancing academic rigour, equity and quality outcomes. In *Quality in Higher Education* (Vol. 17, Issue 3, pp. 265–278). https://doi.org/10.1080/13538322.2011.614474

Solomon, G. (2003). *Project-Based Learning: a Primer*. http://www.techlearning.com/db_area/archives/TL/2003/01/project.php

Syakur, A. (2021). *Efficacy of Collaborative Strategic for Reading (CSR) To Improve Students' Reading Comprehension* (Vol. 4).

Syakur, A., & Panuju, R. (2020). Peran Strategis Public Relation dalam Pengembangan Reputasi Pendidikan Tinggi: Studi Kasus Promosi di Akademi Farmasi Surabaya. *BRILIANT: Jurnal Riset Dan Konseptual*, *5*(1). https://doi.org/10.28926/briliant

Wang, S., Christensen, C., Xu, Y., Cui, W., Tong, R., & Shear, L. (2020). Measuring Chinese Middle School Students' Motivation Using the Reduced Instructional Materials Motivation Survey (RIMMS): A Validation Study in the Adaptive Learning Setting. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.01803

Wats, M., & Wats, R. K. (2009). Developing soft skills in students. *International Journal of Learning*, *15*(12), 1–10. https://doi.org/10.18848/1447-9494/CGP/v15i12/46032