The Effect of Motivation on Increasing Students' Cognitive Ability Through Guided Discovery Learning

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ABSTRACT

Motivation becomes a very important aspect in various activities carried out by everyone, including students while studying in college. Many works of literature and publications have revealed the relationship between motivation and learning outcomes at the school level with traditional methods and this study tries to explore the topic again by using the Guided Discovery Learning (GDL) method which is different from traditional/classical learning methods. To find out differences in achieving learning outcomes through the method are based on the level of achievement motivation of students at the college level of physical education program. This study uses a quasi-experimental method with a sample of 38 college students, and the learning process is 12 offline face-to-face meetings. The level of students' motivation was measured using a motivational questionnaire consisting of 38 questions regarding achievement motivation, and students' cognitive abilities were measured using three lecture material tests conducted at the beginning, middle, and end of the class term. The results of the study were processed quantitatively using statistical software to see the descriptive and inferential analysis in concluding the significance of the difference between low and high-motivated samples in their achievements in sports nutrition lectures. This study reveals a significant difference in the achievement of the sample after going through GDL learning based on the level of motivation. The results of the Student T-test and Wilcoxon's statistical difference test on the Low-Motivated (LM) sample showed an insignificant difference on the 1–2 test, and a significant difference in the achievement of tests 2–3 and 1–3 at the level of $\alpha.05$. The High-Motivated (HM) sample showed the consistency of significant changes in each test carried out (1–2, 2–3, and 1–3) at the level of $\alpha.05$.

Keywords: guided discovery learning, higher education, motivation, physical education, self-determination theory.

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I. INTRODUCTION

One of the teacher's tasks in preparing prospective teachers who are studying in college is their motivation to be able to achieve the best results while in college. One of the toughest challenges for educators in higher education is to be able to stimulate students' intrinsic motivation by giving them opportunities for independent study and self-development. A student must be placed at the center of the learning process which must be understood as an inclusive process that includes various goals and responds to different learning motives also desires and is supported by professional, personal, or social reasons (Pires, 2009). As one of the competencies that must be possessed by a teacher, personality competence is influenced by many motivational factors. The nature and character of a teacher are very important as the main capital of motivation and performance in the classroom. This has implications for teacher recruitment policies, teacher training programs concerning student profiles, and identifying and applying appropriate methodologies for their performance in the classroom (Rao, 2016). The motivation of prospective physical education teachers is as important as the self-confidence they have when attending college lessons or at their preparatory stage in teaching their students in the

classroom (Yudho *et al*., 2022). This is one of the variables that must be prioritized in every teaching mission for prospective teacher education at the tertiary level. This mission of course must respect the context in which the undergraduate study is recognized as appropriate in the public domain: i.e., an inherent bachelor's degree, organized as a unit or module of learning, in which students must meet objectively assessed standards (Savage *et al*., 2011). As previously known, motivation consists of motivation from within (intrinsic) and from outside (extrinsic). Learning motivation is the tendency of students to carry out learning activities that are driven by the desire to achieve the best achievement or learning outcomes (Rafida & Idayani, 2021). Motivated means being moved to do something. A person who feels no drive or inspiration to act is thus characterized as unmotivated, whereas a person who is energized or activated to achieve a goal is considered motivated (Smohai *et al*., 2021). The scheme of division of the motivation types is illustrated in Fig. 1 below.
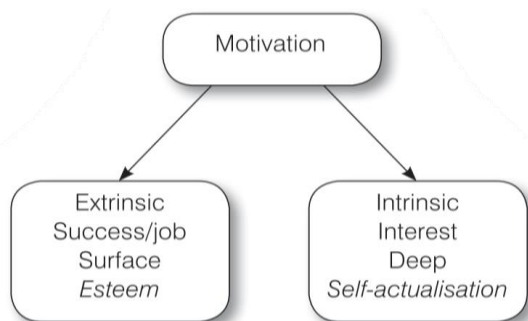

Fig. 1. Motivation Framework (Savage *et al*., 2011).

Motivation itself is one of the main determining factors to being able to follow the learning process well. A teacher sometimes neglects to take this into account. Motivation has been defined as the level of effort that a person is willing to expend to achieve certain goals (Pew, 2007). Self-determined motivation in the classroom leads to adaptive beliefs about classroom assessment, which promote a variety of self-regulatory learning strategies, including superficial and metacognitive strategies (Cho *et al*., 2021). The way to effectively motivate students can be done by selecting and trying new possibilities to enrich student motivation. Or, more importantly, educators can look at themselves and their behavior to become aware of a new understanding of motivation, which can have a positive effect on increasing the motivation of their students (Kaylene & Williams, 2011). Of the eight motivational factors assessed in the master's program on educational leadership (Sogunro, 2017), namely; teaching quality, curriculum quality, relevance and pragmatism, interactive classrooms and effective management practices, progressive assessment, timely feedback, self-direction, conducive learning environment, and effective academic advising practices; teaching quality emerged as the most valuable motivating factor in their higher education studies. The theory of SDT (Self-Determination Theory) is a theory that underlies the importance of motivation in every learning process in the classroom. The application of SDT to the classroom approach lies in its emphasis on the level of student motivation to produce their learning environment that can encourage or hinder the fulfillment of their basic cognitive needs (Abeysekera &

Dawson, 2015). SDT provides an understanding of motivation that "requires consideration of the innate psychological needs for competence, autonomy, and relatedness" (Alamri *et al*., 2020). Teaching practice in physical education is heavily influenced by Mosston's outstanding teaching style framework (Arjunan, 2012). The spectrum of teaching styles from Musca Mosston consists of a collection of eight approaches or teaching styles consisting of (1) Teaching by command; (2) Teaching with assignments; (3) Reciprocal teaching; (4) Small groups; (5) Individual programs; (6) Guided discovery; (7) Problem solving, and (8) Creativity (next step) (Sicilia-Camacho & Brown, 2008). GDL (Guided Discovery Learning) as one of the effective learning methods at the tertiary level is used in this study as an appropriate method for increasing the cognitive capacity of students related to their motivation. Guided discovery learning strategies provide students with problems and opportunities for exploration to provide solutions to any given problem while teachers guide students to develop problem-solving skills and the ability to be creative in thinking (Ayodele & Nasiru, 2021). Students must have good cognitive, psychomotor, and affective abilities to learn independently. The provision of Guided Discovery Learning worksheets can help cognitive and psychomotor students in independent learning, where this worksheet can guide students in independent learning as a substitute for lecturer guidance. In general, the steps of learning activities in the GDL model are (1) Stimulation (providing information stimulation); (2) A statement of the problem (problem identification); (3) Data collection; (4) Data processing; (5) Verification (check again); and (6) Generalization (making conclusions) (Imawan & Ismail, 2022).

II. METHODS

Before holding 12 meetings in the discussion of the sports nutrition class material, an initial cognitive test was carried out on 38 samples who were also students of the whole class. The initial test contains 38 questions to determine the level of motivation of each sample with a value of .895, based on standardized item .904, then the sample is divided into two levels based on the motivation score obtained. The Table I below shows the level of reliability of the questioners used in this study.

TABLE I: QUESTIONNAIRE RELIABILITY STATISTICS

Cronbach's Alpha (CA)	CA Based on Standardized Items	N
0.895	0.904	38

These two samples then follow the learning process through the GDL method. The second test was carried out at the 8th meeting and the third final test was carried out after the learning process was completed at the 12th meeting. The results of the scores of each test were then processed using Jamovi 22 software, to find out the description of the data as well as to test the hypothesis of this study in investigating differences in the ability of the samples after going through the GDL learning process based on their level of motivation. The statistics of the motivation questionnaire used in this study are shown in the following Table II.

TABLE II: QUESTIONNAIRE RELIABILITY STATISTICS

Cronbach's Alpha (CA)	CA Based on Standardized Items	N
0.895	0.904	38

* Normally Distributed.

III. RESULTS

The data that has been obtained from the carried-out research is then processed using the Jamovi statistical device 2.3.18.0 to determine the degree of significance of the differences in test results from each test that has been carried out by the samples. These results are attached to Table III below.

TABLE III: DATA DESCRIPTIVE

Test results	Mot-Cat	N	SD	Min	Max	Shapiro-Wilk W	Shapiro-Wilk P
Test1	Low	20	12.6	13	53	0.945	0.301 *
	Tall	18	8.47	10	43	0.975	0.882 *
Test2	Low	20	7.18	17	43	0.936	0.205 *
	Tall	18	12.02	17	60	0.963	0.658 *
Test3	Low	20	13.46	20	73	0.964	0.635 *
	Tall	18	18.43	20	100	0.908	0.080 *

The description of the data above explains several things that can be taken as the result of research data, where the results of tests 1, 2, and 3 which are divided into two categories of motivation possessed by the samples are described in succession as follows. Average test results on the sample of low motivation N=20 was 32.7, 28.4, and 45, with minimum scores of 13, 17, and 20, maximum scores of 53, 43, and 73, and SD of 12.6, 7.18, and 13.46. The highly motivated sample N=18 had a mean result of 26.8, 35, and 47.2, with a minimum score of 10, 17, and 20, a maximum score of 43, 60, and 100, and an SD of 8.47, 12.02, and 18.43. All data are normally distributed based on the results of the Saphiro-Wilk test. Fig. 2 below shows the results of data visualization on each test carried out by the sample divided into the categories of their motivation.
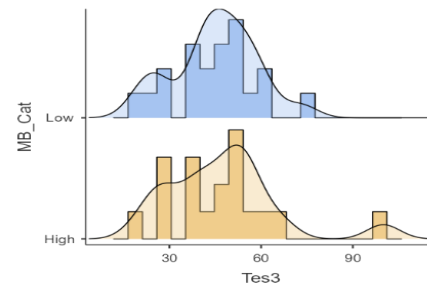

Fig. 2. Test results are based on the sample's motivation.

The results of the T-test of research samples with low motivation are shown in Table IV below.

The results of the Paired Sample T-test on the sample data with low motivation resulted in a significant difference in test 2-3 (<0.001 and statistical difference -5.679) and test 1-3 (p<0.001 and statistical difference -6.296), while the test results There was no significant difference in the 1–2 test results in the two test results (p=0.493) at the 95% confidence interval (α=0.05). The difference in the results of tests 1, 2, and 3 can be seen visually in the descriptive Fig. 3. of the T-test below.
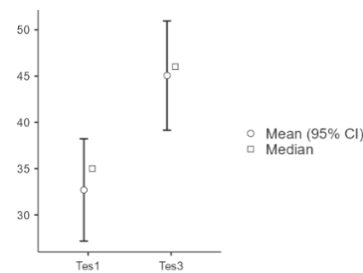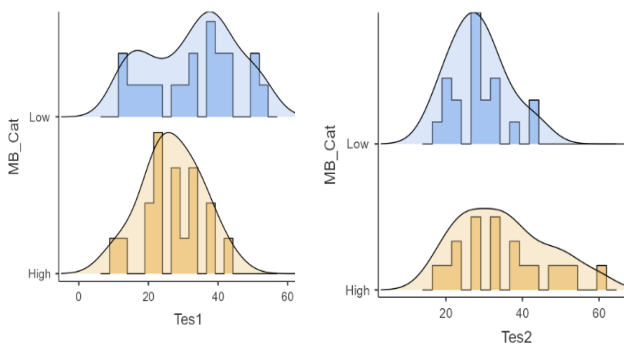
TABLE IV: PAIRED SAMPLE T-TEST

			Statistics	Df	P
Test1	Test2	Student	-0.692	37	0.493
		Wilcoxon W	273	a	0.681
Test2	Test3	Student	-5,679	37	<0.001*
		Wilcoxon W	77		<0.001*
Test1	Test3	Student	-6,296	37	<0.001*
		Wilcoxon W	36	b	<0.001*

*Significantly different.
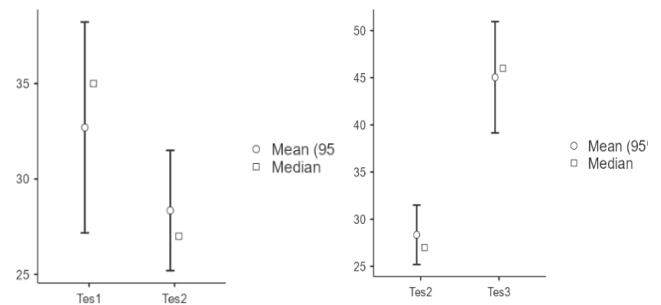
T-Test difference results of Test 1 and test 2 with LM sample

T-Test difference results of Test 2 and test 3 with LM sample

T-Test difference results of Test 1 and test 3 with LM sample

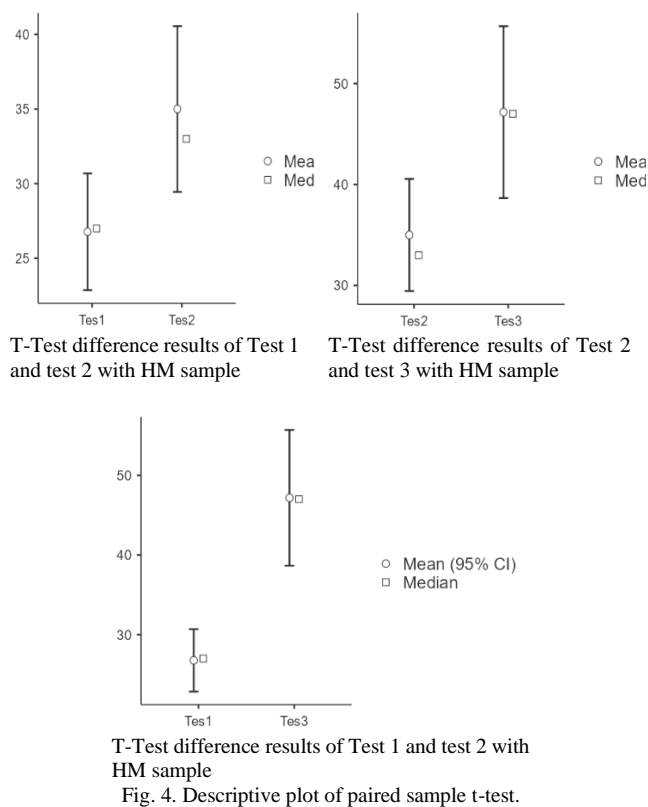Fig. 3. Descriptive plot of paired sample t-test.

The results of the T-test of research samples with high motivation are shown in Table V below.

TABLE V: PAIRED SAMPLE T-TEST HM

			Stat	Df	P
Test1	Test2	Student	-2.66	17	0.008*
		Wilcoxon W	26	a	0.016*
Test2	Test3	Student	-2.94	17	0.005*
		Wilcoxon W	30		0.008*
Test1	Test3	Student	-5.11	17	<0.001*
		Wilcoxon W	4	b	<0.001*

*Significantly different

The results of the T-test differences in tests 1–2, 2–3, and 1–3 with a highly motivated sample of statistical differences, with p-values on the results of test 1 and test 2, respectively (p.008 with a statistical difference of -2.66) on test results 2 and test 3 (p.005 with a statistical difference of -2.94), and the results of tests 1 and 3 (p.001 with a statistical difference of -5.11) at the 95% confidence interval (α=.05). The difference in the results of tests 1, 2, and 3 can be seen visually in the descriptive Fig. 4. of the T-test below.

T-Test difference results of Test 1 and test 2 with HM sample

T-Test difference results of Test 2 and test 3 with HM sample

T-Test difference results of Test 1 and test 2 with HM sample

Fig. 4. Descriptive plot of paired sample t-test.

IV. DISCUSSION

Several things can be discussed above in the results of statistical calculations and data visualization, where in general there are different things in the achievement of motivated and highly motivated samples, where the average comparison of tests 1,2, and 3 is 32,7, 28, 4, and 45, mean 26.8, 35, and 47.2 as illustrated in the following graph.
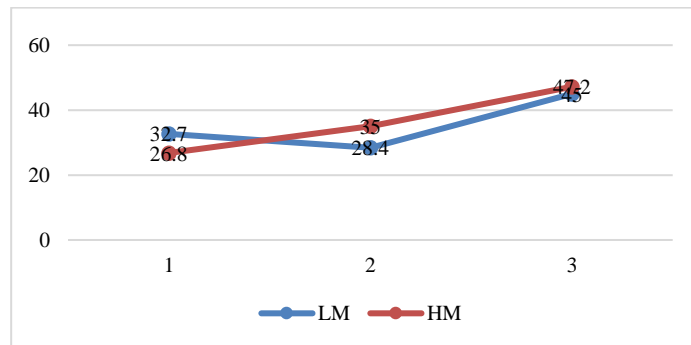

Fig. 5. Test average performance changes on different samples.

The average consistent increase shown by the high-motivated sample compared to the low-motivated sample decreased in the second test. This is to the results of the T-test which was not significant (p. 493) on the comparison test of tests 1 and 2 and then proved significant on tests 2 and 3 (p<0.001) and the T-test on tests 1 and 3 (p<0.001). the. This is different from the results of the T-test in the sample with high motivation which tested a significant and consistent increase at each stage of the test (p. 008, p. 005, and p<0.001). The increase is also clearly seen in the graph of the mean difference between the low-motivated sample and the high-motivated sample, where the HM sample has an average value below the LM (-5.66) in the initial test to then show a significant increase in test 2 (6.6) and test 3 (6.2). These statistical results support the hypothesis that there is an influence of the motivation of the samples on improving the learning outcomes in GDL, as has been stated by (Yudho, 2022) and (Huang & Hsu, 2019) at the higher education level. There are differences in understanding the concepts taught by the guided inquiry learning model and direct learning both for students who have high learning motivation and students who have low learning motivation (Arafah *et al*., 2020). Nurse learner is more motivated to learn with some challenges during the implementation of SDL (Jooste, 2016). GDL is also considered more suitable for students with moderate or high intelligence and less suitable for students with less intelligence, where the growth mindset affects a person's success in various things in life (Imawan & Ismail, 2022). MRS (motivational regulation strategies) can also be an alternative to increase not only student involvement in learning but also students' effort and consistency in pursuing learning and, ultimately, better learning outcomes as well. Ideally, school leaders, educators, or instructional designers might be responsible for designing such a learning environment in which students independently initiate their efforts of motivation and persistence to experience successful learning (Yun & Park, 2020). The reverse classroom model can provide opportunities for students to engage in student-centered active learning experiences, increasing student motivation, higher-order thinking skills, and problem-solving skills (Long *et al*., 2017). Educators should be able to integrate theory into students' life experiences through online teaching forums, which also increases student engagement and motivation (Kang & Zhang, 2020). However, student motivation alone cannot represent the aspect of independence to improve learning and achieve success, but the motivation must be combined with a wider variety of approaches, methods, techniques, and other tools based on active teaching methods, which are inherited from cognitive and

constructivist learning theories (Pelaccia & Viau, 2017). It has been found that the use of a pervasive gaming experience built in a higher education environment could result in increasing student motivation. In addition, it has been detected that the increase in motivation has a positive impact on the learning process, this has been shown through previous and subsequent diagnoses on the development of the gaming experience with students (Arango-López *et al.*, 2019). Game-Based Learning (GBL) can also be applied as one of the cutting-edge methods centered on the educational potential of games as a tool that allows for learning in a motivational, creative, and participatory form, including through the Escape Room game as a learning strategy that is increasingly being used, which is increasingly being used. increase students' motivation and commitment to the learning process (Macías-Guillén *et al.*, 2021). Teachers should also be more involved in designing LET tools for education. It also shows that gamified LET tools can hold promise for increasing intrinsic motivation for teaching and learning (Schulz *et al.*, 2015). In the field of sports, the results of this study reinforce previous studies such as the activities of long-distance runners participating in LDR are largely driven by a desire to improve their health and achieve personal goals (Hongwei & Resza, 2021), high-level of motivation in basketball training (Yudho & Nugroho, 2021), and (Andronikos *et al.*, 2021) which states that environmental factors also affect the level of motivation and success of talent development.

V. Conclusion

The increase in students' cognitive abilities after going through the GDL learning process is proven to be strongly influenced by the motivational conditions of the students. The selection of the right method of learning based on various psychological aspects absolutely must be done by teachers to get maximum learning outcomes. Teachers are also required to always make a positive contribution to the extrinsic and intrinsic motivation of students so that they are always motivated in following the learning process that is being carried out. The psychological aspect of teachers and students must be a priority factor in achieving learning objectives in higher education, associated with appropriate learning methods according to the level of cognitive abilities and thinking maturity of the students.

Acknowledgement

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