

INFLUENCE OF PROBLEM BASED LEARNING MODEL AND STUDENTS' CHARACTER ON MATHEMATICAL CONCEPTUAL UNDERSTANDING

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ABSTRACT

This research is motivated by students' low understanding of mathematical concepts in the learning process. The purpose of this research is to find out whether there is an influence of the Problem Based Learning model on students' understanding of mathematical concepts and to find out whether there is an influence of students' character and abilities on students' understanding of mathematical concepts at MAN 1 Padang Pariaman. This type of research is posttest-only control group design. The data analysis technique in this research is the ANOVA and Correlation Test. From the results of the ANOVA test calculations, the results showed that there was a significant influence of the Problem Based Learning model on students' understanding of mathematical concepts at MAN 1 Padang Pariaman. Moreover, students who have a high category of mathematics learning record also have better concept understanding abilities than students with a medium and low category of mathematics learning record. On the other hand, RIASEC major also influences concept understanding, while DISC personality, intelligence and learning style do not influence concept understanding. Recommendations based on this research are that we need to consider students' character and abilities in mathematics learning so that they can fulfill the mathematical abilities expected from learning.

Keywords: Problem Based Learning, Conceptual Understanding, RIASEC Major, DISC Personality, Intelligence, Learning Style

INTRODUCTION

Steps taken by the government within the instruction segment incorporate making changes to the educational modules. The educational modules comprises of a set of rules for teachers to create learning programs for understudies, with the point of planning understudies to confront various types of issues which will happen in their environment (Ramadoni & Cesaria, 2023). The Serve of Instruction and Culture of the Republic of Indonesia proposed the thought of changing the educational programs: an autonomous learning educational program (Manal, 2022).

One exertion to encourage create the concept of self-directed learning which is as of now being created within the national instruction framework is separated

learning. Separated learning is learning that adjusts students' learning needs through autonomous learning action techniques (Marlina, 2019). Concurring to Amrilizia & Dewi (2023), the separation methodology utilized incorporates separating forms, substance and items concurring to learning fashion groupings (visual, sound-related and kinesthetic).

An independent educational program gives teachers the flexibility to form high-quality learning that meets the wants of understudies and the learning environment. Autonomous Educational modules Learning points to pay consideration to understudy advancement and execution in such a way as to meet the need for quality instructors who can give dynamic and pleasant learning all through the lesson, particularly in mathematics learning (Dewi, 2022).

Mathematics could be an all-inclusive science that underlies the advancement of cutting edge innovation and contributes to the improvement of human considering and reasoning abilities (Rahmadian, 2019). Mathematics learning may be a handle of interaction between instructors and understudies, and instructors deliberately utilize different strategies to guarantee that science learning programs develop and create ideally and understudies proceed to ponder and learn. Carrying out exercises successfully and effectively (Nabillah & Abadi, 2019).

In truth, science is frequently seen as a subject that's troublesome to get it, since understudies see it as a subject that's troublesome, uninteresting, boring, indeed frightening, hence contributing to students' understanding of numerical concepts (Martini, 2015). Understanding scientific concepts is one of the establishments of the science learning handle and one of the destinations of the fabric displayed by the educator (Silalahi, 2023).

Understudies who have a good understanding of the concepts of the learning process will be more likely to be included in learning so as to realize tall learning results, whereas understudies who don't get it the concepts will be less likely to be included in learning (Indriani, 2022). Understanding concepts is very critical since deciding issue tackling methodologies requires dominance of the concepts that underlie issue understanding and permits understudies to illuminate more troublesome issues that are basic in nature. Separated from that, understudies are able to get it concepts within the field of arithmetic, get it the connections between

concepts, create concepts and strategies, and clarify the reasons (Ramadoni & Mista, 2023).

Based on the comes about of perceptions, a picture of the learning handle within the classroom was gotten. The learning prepare tends to be teacher-centered, and instructors still utilize clarification strategies. It can be seen that in learning exercises, particularly science, understudies tend to be detached and less basic in reacting to the teacher's clarifications. Understudies can as it were unravel questions that are comparative to the case questions instructed by the educator. Understudies cannot total the works out freely, but tend to lean toward to mimic their friends' work. Organize F IPA MAN 1 Based on the comes about of interviews with science subject instructors in Padang Pariaman, with respect to understanding of numerical concepts, there are a few components that might impact the moo capacity to get it numerical concepts. Students' science learning is exceptionally troublesome and less amazing so understudies pay less consideration to the material given by the instructor. This is often since the learning strategy utilized is still a conventional strategy utilizing an clarification methodology. Understudies can as it were memorize concepts and are incapable to apply them when they experience issues related to the numerical concepts they have learned. They are indeed less able to assess and define issues, making it troublesome for them to fathom numerical issues (Paradina, 2019).

Individual differences based on the RIASEC model can influence student learning. Holland's RIASEC model as an integrative framework for individual differences (Armstrong, 2008). On the other hand, the DISC model can also influence student learning processes (Beddu, 2021). Other characters that influence student learning outcomes are the learning style and level of students' academic abilities (Mustofa, 2022; Ramadoni & Chien, 2023).

Based on the comes about of interviews with MAN 1 Padang Pariaman understudies, understudies consider learning arithmetic to be troublesome and boring since arithmetic has numerous equations and is troublesome to memorize. In expansion, understudies detailed that they regularly felt confounded when replying instructor questions. There's investigate which states that understanding concepts may be a exceptionally imperative premise for tackling issues since

actualizing issue tackling methodologies requires authority of the concepts that underlie issue fathoming (Ramadoni & Mista, 2023).

This problem-based learning is anticipated to prepare each individual's capacity to illuminate the issues they confront. Understanding concepts gives a establishment for shaping modern information and makes a difference understudies unravel more troublesome issues. Hence, it points to overcome students' challenges in understanding numerical concepts. We require an fitting and compelling learning demonstrate. One learning demonstrate that progresses students' understanding of scientific concepts is problem based learning (Silalahi, 2023).

Problem based learning requires students' mental action to get it learning concepts through circumstances and issues displayed at the starting of learning, with the point of preparing understudies in fathoming issues employing a problem-solving approach. Typically a learning demonstrate that must be carried out (Agustina, 2018). Separated from that, problem based learning can cultivate the improvement of basic considering abilities, issue tackling abilities, and communication aptitudes (Lestari, 2022). In this manner, this problem based learning demonstrate can progress students' scientific issue solving abilities by beginning by displaying problems to understudies and through the method of looking for data within the understudy center (Putri & Suryani, 2019).

Consistent with the opinion above, the PBL model is characterized by students studying real world problems as something they must learn. Through problem-based learning, students are expected to acquire skills that are more than just memorized knowledge. Problem-based learning is designed to help students solve real-world problems with the aim of acquiring concepts and knowledge.

Based on these problems, the aim of this research is to find out whether problem based learning, the level of academic and student character influence students' conceptual understanding.

This inquire about was carried out at MAN 1 Padang Pariaman. In this inquire about there are two test classes, specifically the exploratory lesson which learns utilizing the Issue Based Learning demonstrate and the control lesson which learns utilizing the customary learning demonstrate. The inquire about plan utilized was a posttest-only control gather plan. The free factors in this investigate are the Issue

Based Learning demonstrate and the Customary Learning show. In the meantime, the subordinate variable in this inquire about is understanding numerical concepts. The populace in this think about were understudies of Stage F IPA MAN 1 Padang. The inspecting method for this inquire about was decided employing a basic irregular testing procedure, specifically a examining method from individuals of the populace which is carried out haphazardly without paying attention to the strata within the populace, so that each part of the populace has the same opportunity to be gifted or chosen (Sugiyono, 2014).

The instrument used in this inquire about was a posttest within the shape of an paper with pointers of concept understanding. This points to degree students' understanding of numerical concepts and is balanced to the subject matter and pointers of concept understanding. As a result of the examination of the test things, it is known that the unwavering quality of the test things as measured with the assistance of SPSS based on Kartyas (2019), appears that the Cronbach's Alpha esteem is > 0.6 , to be specific $0.676 > 0.6$, so it can be concluded that all the things that the analyst will utilize as rebellious are pronounced dependable. The information examination method utilized in this investigate is the Correlations and Anova test.

DISCUSSION

In this study, a correlation test was carried out to see the relationship between variables. Data obtained from SPSS can be seen in Table 1.

Table 1. Correlations

| Pearson Correlation | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----------------------------|---|---------|---------|---------|-------|---------|-------|
| 1. Conceptual_Understanding | - | -.414** | -.797** | -.353** | -.230 | -.115 | .113 |
| 2. Group | | .000 | .000 | .020 | .052 | .334 | .346 |
| 3. Level of Academic | | | 1.000 | .001 | .233 | .018 | 1.000 |
| 4. RIASEC Major | | | | -.202 | .221 | .029 | -.153 |
| 5. DISC Personality | | | | .089 | .063 | .808 | .200 |
| 6. Intelligence | | | | | - | .067 | .077 |
| | | | | | .988 | .577 | .519 |
| | | | | | | -.326** | -.055 |
| | | | | | | .005 | .647 |
| | | | | | | | .040 |
| | | | | | | | .736 |
| | | | | | | | - |

7.Learning
Style

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Based on the table data above, it can be seen that conceptual understanding has a correlation with group ($r=.414^{**}$), level of academic ($r=.797^{**}$), RIASEC major ($r=.353^{**}$). Meanwhile, group is correlated with RIASEC major ($r=.390^{**}$) and group is also correlated with intelligence ($r=.279^*$). And DISC personality is correlated with intelligence ($r=.326^{**}$). To make the relationship between variables more clearly visible, it can be seen in Figure 1 below:

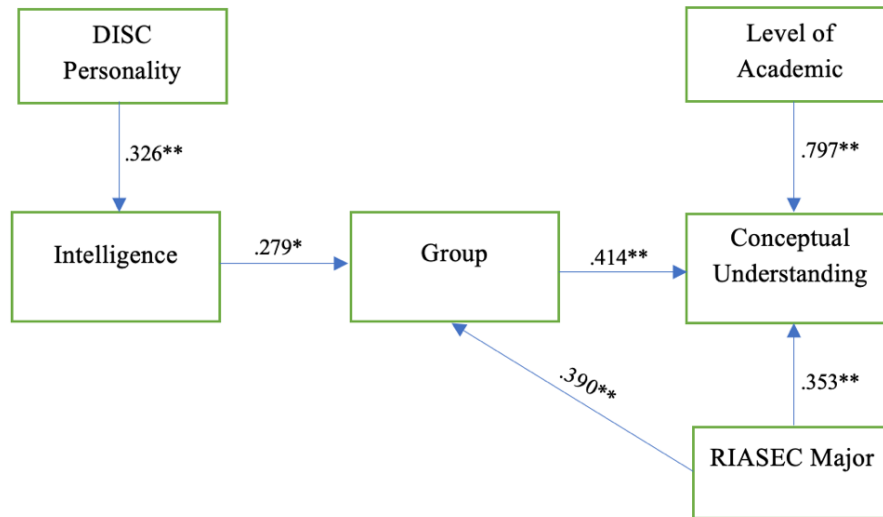


Figure 1. Model of the Influence of Students' Character and Conceptual Understanding

Based on Figure 1 above, it can be seen that conceptual understanding is influenced by group, level of academic and RIASEC major. Meanwhile, the group is influenced by RIASEC major and intelligence. And DISC personality is influenced by intelligence.

Table 2. Comparison of Conceptual Understanding in Term of Learning Groups

| Group | \bar{x} | N | SD | Percent | MS | F | <i>p</i> |
|--------------|-----------|----|-------|---------|---------|-------|----------|
| PBL | 71.05 | 36 | 18.16 | 50 | 3773.05 | 14.49 | .000 |
| Conventional | 56.57 | 36 | 13.82 | 50 | 260.40 | | |
| Total | 63.81 | 72 | 17.6 | 100 | | | |

In table 2 above, it can be seen that students who study with the problem-based learning model ($\bar{x} = 71.05$) have significantly better concept understanding abilities than students studying with the conventional model ($\bar{x} = 56.57$).

Table 3. Comparison of Conceptual Understanding in Term of Level of Academic

| Level of Academic | \bar{x} | N | SD | Percent | MS | F | <i>p</i> |
|-------------------|-----------|----|-------|---------|---------|-------|----------|
| High | 89.28 | 13 | 10.02 | 18.06 | 7104.43 | 62.91 | .000 |
| Medium | 62.95 | 44 | 11.94 | 61.11 | 112.93 | | |
| Low | 44.24 | 15 | 5.70 | 20.83 | | | |
| Total | 63.81 | 72 | 17.6 | 100 | | | |

In table 3 above, it can be seen that students who have a high category mathematics learning record ($\bar{x} = 89.28$) have better concept understanding abilities than students with a medium category mathematics learning record ($\bar{x} = 62.95$). Students who have a medium category mathematics learning record ($\bar{x} = 62.95$) have a better understanding of concepts than students with a low category mathematics learning record ($\bar{x} = 44.24$).

Table 4. Comparison of Conceptual Understanding in Term of RIASEC Major

| RIASEC Major | \bar{x} | N | SD | Percent | MS | F | <i>p</i> |
|---|-----------|----|-------|---------|--------|------|----------|
| Artistic & enterprising | 93.94 | 1 | . | 1.39 | 462.98 | 1.82 | 0.045 |
| Realistic, investigative & conventional | 87.88 | 1 | . | 1.39 | 253.94 | | |
| Realistic, artistic & social | 83.34 | 4 | 16.87 | 5.56 | | | |
| Enterprising | 81.82 | 1 | . | 1.39 | | | |
| Realistic | 78.79 | 2 | 29.99 | 2.78 | | | |
| Investigative & social | 72.73 | 7 | 13.99 | 9.72 | | | |
| Investigative, social & conventional | 72.30 | 7 | 19.59 | 9.72 | | | |
| Realistic, investigative & social | 71.22 | 2 | 6.43 | 2.78 | | | |
| Realistic & social | 69.70 | 4 | 18.18 | 5.56 | | | |
| Artistic, social & conventional | 69.70 | 2 | 8.57 | 2.78 | | | |
| Investigative & conventional | 63.64 | 1 | . | 1.39 | | | |
| Social & conventional | 59.74 | 7 | 14.71 | 9.72 | | | |
| Realistic & enterprising | 58.59 | 3 | 4.63 | 4.17 | | | |
| Realistic & social | 55.35 | 15 | 16.54 | 20.83 | | | |
| Artistic & social | 54.55 | 1 | . | 1.39 | | | |

| | | | | |
|----------------------------------|-------|----|-------|-------|
| Social & enterprising | 52.65 | 8 | 10.98 | 11.11 |
| Social | 52.52 | 3 | 20.63 | 4.17 |
| Investigative & enterprising | 51.52 | 1 | . | 1.39 |
| Realistic, social & enterprising | 51.52 | 1 | . | 1.39 |
| Conventional | 39.40 | 1 | . | 1.39 |
| Total | 63.81 | 72 | 17.6 | 100 |

In table 4 above, it can be seen that when viewed from the RIASEC major, the students' conceptual understanding ability is the highest is Artistic & Enterprising ($\bar{x} = 93.94$) and the lowest is Conventional ($\bar{x} = 39.40$). Also, the major type with Artistic & Enterprising significance has the ability to understand concepts than other RIASEC types.

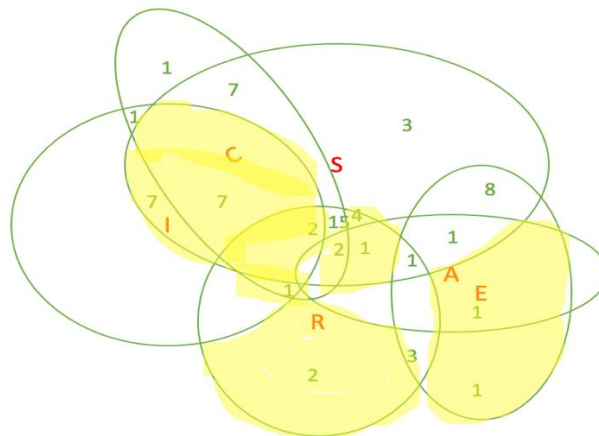


Figure 2. Venn Diagram of Students' Conceptual Understanding Based on RIASEC Major

Based on Figure 2 above, it can be seen that based on RIASEC the majors that most dominantly influence the ability to understand mathematical concepts are Realistic and Enterprising. Meanwhile, IASC can influence the ability to understand mathematical concepts if it collaborates with other RIASEC majors.

Table 5. Comparison of Conceptual Understanding in Term of DISC Personality

| DISC Personality | \bar{x} | N | SD | Percent | MS | F | <i>p</i> |
|------------------------------------|-----------|----|-------|---------|--------|------|----------|
| Steadiness & compliance | 77.38 | 15 | 18.60 | 20.83 | 407.95 | 1.40 | 0.198 |
| Influence, steadiness & compliance | 75.76 | 1 | . | 1.39 | 291.90 | | |
| Dominance, steadiness & compliance | 66.67 | 1 | . | 1.39 | | | |

| | | | | |
|-----------------------------------|-------|----|-------|-------|
| Dominance, influence & steadiness | 63.64 | 1 | . | 1.39 |
| Dominance & compliance | 63.64 | 1 | . | 1.39 |
| Influence & compliance | 62.63 | 6 | 16.34 | 8.33 |
| Dominance & Influence | 62.12 | 6 | 25.63 | 8.33 |
| Influence | 61.62 | 6 | 15.77 | 8.33 |
| Influence & steadiness | 60.61 | 15 | 15.83 | 20.83 |
| Steadiness | 60.00 | 5 | 5.83 | 6.94 |
| Dominance & steadiness | 57.58 | 13 | 16.23 | 18.06 |
| Dominance | 43.94 | 2 | 2.14 | 2.78 |
| Total | 63.81 | 72 | 17.6 | 100 |

Based on the data in Table 5 above, it can be seen that the student who has the highest ability to understand mathematical concepts is Steadiness & compliance ($\bar{x} = 77.38$) and the lowest is Dominance ($\bar{x} = 43.94$). Looking more deeply, it can be seen that the only students who have the ability to understand concepts above average are students with ISC Personality. Meanwhile, students who have Dominance Personality have below average ability to understand mathematical concepts. For more details, see the following diagram:

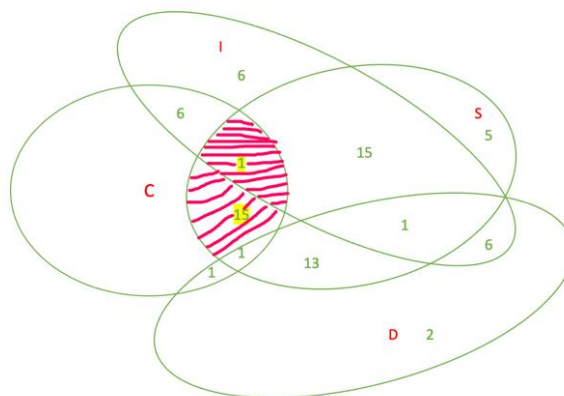


Figure 3. Venn Diagram of Students' Conceptual Understanding Based on DISC Personality

Based on Figure 3 above, the shaded image is a DISC Personality type who has above average ability to conceptual understanding.

Tabel 6. Comparison of Conceptual Understanding in Term of Intelligence

| Intelligence | \bar{x} | N | SD | Percent MS | F | <i>p</i> | |
|---------------------------------|-----------|---|----|------------|--------|----------|-------|
| Logis-matematis & interpersonal | 100 | 1 | . | 1.39 | 347.89 | 1.16 | 0.325 |

| | | | | | |
|-------------------------------------|-------|----|-------|-------|--------|
| Verbal-linguistic & naturalis | 81.82 | 2 | 8.57 | 2.78 | 298.82 |
| Verbal-linguistic | 75.76 | 3 | 16.03 | 4.17 | |
| Logis-matematis, kinestetik & Inter | 75.76 | 1 | . | 1.39 | |
| Musical | 70.71 | 3 | 45.00 | 4.17 | |
| Visual-spasial & intrapersonal | 69.70 | 2 | 21.43 | 2.78 | |
| Logis-matematis | 68.02 | 9 | 18.06 | 12.5 | |
| Logis-matematis & Intrapersonal | 65.91 | 4 | 7.58 | 5.56 | |
| Logis-matematis & verbal linguistic | 63.64 | 1 | . | 1.39 | |
| Naturalis & Intrapersonal | 63.64 | 1 | . | 1.39 | |
| Intrapersonal | 62.43 | 25 | 19.05 | 34.72 | |
| Naturalis | 62.43 | 10 | 12.22 | 13.89 | |
| Visual-spasial & Interpersonal | 59.09 | 2 | 19.29 | 2.78 | |
| Kinestetik & Intrapersonal | 48.48 | 1 | . | 1.39 | |
| Interpersonal | 46.47 | 6 | 5.64 | 8.33 | |
| Verbal-linguistic & Interpersonal | 42.42 | 1 | . | 1.39 | |
| Total | 63.81 | 72 | 17.6 | 100 | |

Based on 9 types of intelligence, namely logical-mathematical intelligence, verbal linguistic intelligence, visual-spatial intelligence, kinesthetic intelligence, existential intelligence, interpersonal intelligence, musical intelligence, naturalist intelligence, intrapersonal intelligence. It was analyzed that the students who had the highest ability to understand mathematical concepts were Logical-Mathematical & Interpersonal ($\bar{x} = 100$) and the lowest were Verbal-Linguistic & Interpersonal ($\bar{x} = 42.42$). This is very interesting to review in the future, that students who have logical-mathematical intelligence have the highest ability to understand mathematical concepts and students who have verbal linguistic intelligence have the lowest ability to understand mathematical concepts. Looking more deeply, it can be seen that students who have above the average score are included in all types of intelligence, while students who are below the average score for musical intelligence are not included. This means that students with musical intelligence all fall into the category of ability to conceptual understanding above average.

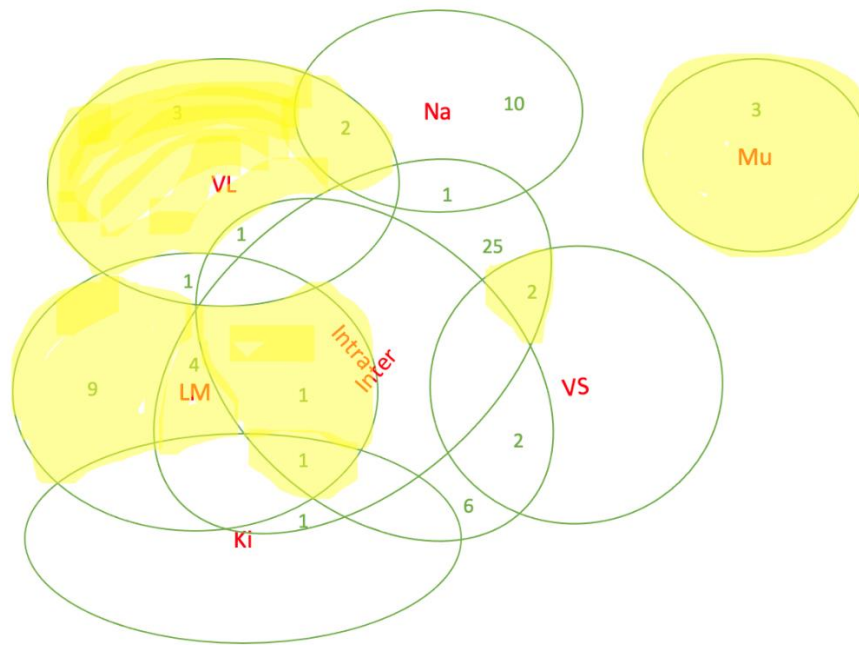


Figure 4. Venn Diagram of Students' Conceptual Understanding Based on Intelligence

Based on the Venn diagram above, it can be seen that the majority of students' mathematical concept abilities are above average and belong to the logical-mathematical, musical and verbal linguistic types of intelligence.

Table 7. Comparison of Conceptual Understanding in Term of Learning Style

| Learning Style | \bar{x} | N | SD | Percent | MS | F | <i>p</i> |
|----------------|-----------|----|-------|---------|--------|------|----------|
| Kinesthetic | 65.99 | 45 | 18.09 | 62.50 | 420.67 | 1.37 | 0.26 |
| Visual | 62.57 | 17 | 17.21 | 23.60 | 306.67 | | |
| Auditory | 56.06 | 10 | 15.00 | 13.90 | | | |
| Total | 63.81 | 72 | 17.6 | 100 | | | |

In table 7 above, it can be seen that there is no significant difference between students' learning styles and students' understanding of mathematical concepts. Even if we look further, students who have a kinesthetic learning style ($\bar{x} = 65.99$) are higher than students who have a visual learning style ($\bar{x} = 62.57$) and students who have an auditory learning style ($\bar{x} = 56.06$). And if we examine again, with the three learning styles above, the learning style of students who have scores above the average is the kinesthetic type learning style.

CONCLUSION

Based on the results of the analysis and discussion of research regarding the influence of the Problem Based Learning model on students' conceptual understanding in Phase F IPA MAN 1 Padang Pariaman, it can be concluded that:

1. There is an influence of the Problem Based Learning model on students' conceptual understanding in Phase F IPA MAN 1 Padang Pariaman.
2. The conceptual understanding has a correlation with group, level of academic, RIASEC major. Meanwhile, group correlates with RIASEC major and group also correlates with intelligence. Furthermore, DISC personality correlates with intelligence.
3. Students who have a high category mathematics learning record have better conceptual understanding than students with a medium and low category mathematics learning record.
4. The student's conceptual understanding when viewed from the RIASEC major, the highest is Artistic & Enterprising and the lowest is Conventional.
- 5 The student's conceptual understanding when viewed from the DISC major, the highest ability to understand mathematical concepts is Steadiness & Compliance and the lowest is Dominance.

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