

An analysis of interaction patterns in students' research essay guidance to build six main parameters of the Indonesian National Qualification Framework: Covid-19 pandemic period

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ABSTRACT

This study aims to reveal the interaction patterns and inhibiting factors for the final project guidance in the Mathematics and Natural Sciences Education Department, Universitas Lampung, to develop the six main parameters of the Indonesian National Qualifications Framework (INQF). The study employed a mixed method involving 67 students who composed the final project for the 2021/2022 academic year selected from 314 final project students using the cluster random sampling technique. The data in this study were primary and secondary data obtained by questionnaires, interviews, and documents, analyzed qualitatively, quantitatively, and descriptively. The closed-response questionnaire was used regarding the interaction pattern, the INQF parameters achievement, and perceptions of the achievement of students' core competencies. An open-response questionnaire regarding the inhibiting factors for the final project guidance was used to provide the qualitative data. Descriptive analysis was conducted to determine the profile and interaction pattern of the final project guidance, while the qualitative analysis using Miles and Huberman model was to reveal the inhibiting factors of the final project. The results show that: (1) the dominant interaction pattern that occurred was an associative pattern originating from the factors of suggestion, identification, and sympathy; (2) the INQF parameter with the best score is the science parameter with an average parameter achievement of 9.97 from the lowest score 3.00 until the highest score 12.38; and (3) the perception of achieving the highest core competency of students is the aspect of soft skills, both personal and interpersonal, with the highest average perception of achieving core competency being 59.71 out of 80.

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INTRODUCTION

The framework of national qualification has directed the focus of curriculum development from the primary education level into higher education. The emergence of this framework is motivated by the need to classify a person's qualifications based on a set of criteria associated with the level of learning achievement that has been obtained. The existence of a qualification framework is to encourage the development of work skills, facilitate mobility, and increase a person's access to higher levels of education and training throughout his life (Directorate General of Learning and Student Affairs, 2015).

The Indonesian National Qualifications Framework (INQF) is the embodiment of the quality and identity of the Indonesian nation in relation to the national education system, national job training system, and national equality assessment system, owned by Indonesia to produce human resources from learning outcomes, which are owned by every Indonesian worker in cre-

ating quality work and contributions in their respective fields of work (Directorate General of Learning and Student Affairs, 2015). Mixed in various government regulations, the basic principle developed in the INQF is to assess a person's performance in scientific aspects, expertise, and skills in line with learning outcomes obtained through the education, training, or experience process that has been exceeded, that is equivalent to a qualification descriptor for a certain level.

INQF is used as a form of curriculum development as a building block for graduate competencies and study materials according to their qualification level. The results of the developed curriculum are implemented in a series of learning systems at every level of education. The ultimate goal of embedding ideal competency attributes as mandated by the INQF through the choice of methods and approaches in education services certainly needs to be measured. This measurement has been carried out in a portfolio by each educational institution clearly recorded through the final grades, quality letters, and narrative descriptions of graduates' capabilities.

Department of Mathematics and Natural Sciences Education, University of Lampung (Universitas Lampung or Unila) is one of the institutions concerned with providing professional educators for the quality of education who oversee the curriculum with INQF level 6 and level 7. INQF level 6 leads the qualification for technical or analyst positions while INQF level 7 as an expert position. The achievement of these qualifications is facilitated through a series of academic activities in the applicable curriculum. The success of implementing the curriculum is measured through the learning outcomes of graduates which refer to a series of competencies. The operational form of success is reflected in various variables including quantitatively described through the length of the study period. The result of the evaluation of achievement in the study program at the Mathematics and Natural Sciences Education Department regarding the study period is presented in Figure 1.



Figure 1. Average Study Program Period at the Department of Mathematics and Natural Sciences FKIP Unila (in years)

Figure 1 shows that during the two evaluation periods (before and during the pandemic), two study programs experienced an increase in the average study period, while there were other study programs that experienced a decrease in the average study period. It means that the Covid-19 pandemic has an impact on the study programs at the Department of Mathematics and Natural Sciences, University of Lampung. In terms of the type of degree program, the master's degree has a longer term of study period than the national standard when compared to the bachelor programs. It indicates that there are challenges and obstacles in completing studies in master's degree programs. A deeper study is carried out by measuring the length of the final assignment and lead to the finding that: (1) there were three bachelor's degree programs whose average length of time for final project completion before and during the pandemic < 8 months, while the other bachelor' degree programs experienced an increase in the average length of time into > 8 months during the pandemic; and (2) all masters' degree programs average length of time for final project completion before the pandemic and during the pandemic > 8 months, where one program experienced an increase in the average length of time while the others expe-

rience the opposite. It means that the Covid-19 pandemic has an impact on some study programs at the Department of Mathematics and Natural Sciences Education.

This fact indicates that there are problems that need to be followed up immediately. The Chancellor's Regulation of the University of Lampung Number 13 of 2019 concerning the Academic Regulations of the University of Lampung also confirms that the achievements of several study programs in the Mathematics and Natural Sciences Education Department have not met the standards set. The results of research by Rosidin et al. (2020) also show that there are problems related to lectures and online mentoring during the Covid-19 pandemic. This problem is also thought to arise in the process of interaction in the preparation of the final project. Adaptation to the use of information technology is the *prima donna* of changing interaction patterns during the pandemic. Harfiyanto et al. (2015) state that the existence of gadgets can be a new pattern of interaction in relationships. Furthermore, Rosidin et al. (2020) also state that one of the obstacles in the online mentoring process is the interaction and communication factor, whereas the process of guiding the final project is not only a series of activities in compiling and completing a student's scientific framework presented in a scientific paper but also a potential development to achieve the qualifications required by the level of education. For this reason, it is necessary to conduct a study to analyze the clustering of factors and the interaction pattern of the final task guidance at the Department of Mathematics and Natural Sciences, FKIP Unila. This study needs to be carried out to provide a representative map of the evaluative study to formulate the formulation of problem-solving strategies for improving the quality of academic services in order to develop the main parameters of the IQF.

RESEARCH METHOD

The research design used is a mixed method by combining an exploratory quantitative approach and a qualitative approach. This design aims to find and describe the phenomenon of interaction patterns and clustering of the difficulty factors in the preparation of the final project at the Department of Mathematics and Natural Sciences FKIP Unila in order to achieve the six parameters of INQF.

Table 1. Number of Research Respondents

| No. | Study Program | Total Students | Number of Respondents |
|--------------|--|----------------|-----------------------|
| 1. | Mathematics Education (PM) | 60 | 8 |
| 2. | Physics Education (PF) | 63 | 11 |
| 3. | Chemistry Education (PK) | 60 | 10 |
| 4. | Biology Education (PB) | 58 | 14 |
| 5. | Information Technology Education (PTI) | 16 | 8 |
| 6. | Master of Mathematics Education (MPM) | 20 | 7 |
| 7. | Master of Physics Education (MPF) | 22 | 4 |
| 8. | Master of Science Teacher Training (MKIPA) | 15 | 5 |
| Total | | 314 | 67 |

This research was conducted at the Department of Mathematics and Natural Sciences, FKIP Unila, with the subject of final project writing being the students of the Department of Mathematics and Natural Sciences, FKIP Unila for the 2021/2022 academic year. The respondents were 67 students from 314 final project students of the Mathematics and Natural Sciences Education Department, FKIP Unila in the 2021/2022 academic year. The proportion of research subjects based on the number of students composing the final project in each study program is presented in Table 1.

The data in this study are in the form of interaction pattern data and a description of the difficulty factor in preparing the final project during the Covid-19 pandemic. The data are primary and secondary data which are obtained using questionnaires and through document analy-

sis. They were collected through a series of activities including observing, taking notes, asking questions, and exploring the source or subject under study. The data obtained from observations and interviews were processed, presented, and analyzed, and conclusions were drawn in the form of descriptive writing. The nature of the data presentation in general is expected to be able to answer the question about the interaction pattern and the difficulty factor in the preparation of the final project. The interaction pattern is focused on associative and dissociative patterns whose sources are explored whether they come from imitation, suggestion, identification, and sympathy factors.

The instruments used in this study consisted of an interaction pattern questionnaire, a questionnaire for the achievement of the INQF parameters, a questionnaire on perceptions of student achievement of core competencies, and also a questionnaire on difficulty factors given to students preparing the final project. The INQF parameters are measured using the main parameters contained in document 001 of the Indonesian national qualification framework ([Directorate General of Learning and Student Affairs, 2015](#)). There are two questionnaires used and an open-response questionnaire. The closed-response questionnaire used a five-point Likert scale and it consisted of statements with positive and negative values, while the open-response questionnaire was used to explore in-depth information regarding the difficulty factors in the preparation of the final project in order to achieve the six main parameters of the INQF. Document analysis sheets were also used in this study to obtain secondary data related to interaction patterns and difficulty factors. In addition, triangulation of sources was also carried out to validate the consistency of research data.

Before being used, the research instruments were tested for validity and reliability. The validity of the instrument used content validity, construct, and item validity. In the process of the content validity of a test, an expert was asked to rate or assess the test items adequately to represent the latent attribute to be measured by the test taker ([Beck, 2020](#)). The validation of the content and construct was carried out by two experts for each instrument using the content and construct validation sheet. After the instruments were declared valid, then data collection was carried out, and item validity and reliability tests were carried out. The result of the validity test is presented in Table 2. The instrument reliability coefficient was 0.87 with a high-reliability category so it can be concluded that the instruments for the social interaction pattern, INQF parameter achievement, and the perception of core competency achievement are of good quality and feasible to use.

Table 2. The Number of Valid Items for Each Research Variable

| Variable | Number of Aspects/Indicators | Number of Valid Items |
|-------------------------------|------------------------------|-----------------------|
| Interaction pattern | 5 | 46 |
| INQF Parameter | 6 | 14 |
| Perception of core competency | 4 | 16 |

Prior to data analysis, the type of data scale was transformed from an ordinal scale (questionnaire results) to an interval scale using the method of successive interval (MSI). After the data scale became an interval, then descriptive analysis was carried out by calculating the average, highest score, lowest score, and standard deviation of each measured variable. Categorization was also carried out to determine the profile of each respondent using ideal criteria whose calculations were based on the ideal mean and ideal standard deviation based on Rakhmat and Solehuddin ([Sudrajat, 2008](#)).

Then, quantitative descriptive analysis was also carried out in the form of percentages to calculate the percentage of achievement indicators for each variable and the percentage of category acquisition for each variable. The main analysis of the data in this study was carried out inductively using the Miles and Huberman model ([Sugiyono, 2012](#)), namely through data reduction, data display (data presentation), and conclusion verification (drawing conclusions).

FINDINGS AND DISCUSSION

After conducting the research stages in the form of analyzing research problems for one month, developing instruments for one month, validating and improving instruments for one month, collecting data for one month, and validating data for one month, the researchers analyzed the data to lead to generalizations so that they could be reported and published. The results of descriptive data analysis are as follows.

Findings

Interaction Pattern

The pattern of interaction was measured using a questionnaire that measured five aspects, namely aspects of cooperation, accommodation, competition, conflict, and competence. The descriptive statistics in the interaction patterns that occurred during the final project guidance process during the Covid-19 pandemic in each study program are presented in Table 3. Meanwhile, the percentage of achievement indicators for each aspect is presented in Table 4.

Table 3. Descriptive Statistics of Interaction Patterns of Students Compiling Final Projects at the Department of Mathematics and Natural Sciences, FKIP Unila

| No. | Study Program | Average | Highest | Lowest |
|-----|--|---------|---------|--------|
| 1. | Mathematics Education (PM) | 125.62 | 151.14 | 98.97 |
| 2. | Physics Education (PF) | 131.84 | 162.89 | 103.24 |
| 3. | Chemistry Education (PK) | 123.81 | 160.27 | 104.08 |
| 4. | Biology Education (PB) | 123.05 | 156.19 | 95.06 |
| 5. | Information Technology Education (PTI) | 121.27 | 155.40 | 101.62 |
| 6. | Master of Mathematics Education (MPM) | 129.13 | 150.76 | 98.96 |
| 7. | Master of Physics Education (MPF) | 127.66 | 137.27 | 117.76 |
| 8. | Master of Science Teacher Training (MKIPA) | 124.35 | 149.44 | 92.07 |

Note: Maximum ideal score = 184

Minimum ideal score = 46

Table 3 shows that the highest average interaction pattern is obtained by the PF study program, while the lowest average interaction pattern is obtained by the PTI study program. The highest score for the interaction pattern is also in PF, while the lowest score for the interaction pattern is in the MKIPA study program. These findings indicate that in general, the most positive interaction pattern for final project guidance is in the PF study program. Moreover, the average score of interaction in all programs was > 91.82 , which is in a high interaction category.

Table 4 shows that the highest percentage achievement indicator is the Independence and Responsibility indicator in the competency aspect, while the lowest indicator achievement percentage is the Influence of Communication Methods in Interaction indicators in the conflict aspect. When viewed from the percentage of achievement of each indicator in each study program, it is known that for the indicator of Communication in Interaction, the highest percentage of achievement is in the MKIPA study program. It indicates that the students in the study program have a high frequency of communication with their supervisors, and students were able to tell research problems in a straightforward manner in an easy-to-understand way. On the indicator of attitude in working together, the highest percentage gain was obtained by the PB and MKIPA study program, which means that students in those two study programs have good collaboration skills. This phenomenon also shows that students in both study programs also have a willingness to help each other in completing their final assignments. For indicators of the fulfillment of needs, the highest percentage gain is in the MPM study program, which means that the interaction pattern of the final project guidance in the study program has succeeded in building interaction that meets the mutual needs of the student and the supervisory committee.

Table 4. Percentage of Achievement of Social Interaction Indicators in Each Study Program in the Mathematics and Natural Sciences Education Department, FKIP Unila

| Aspect | Indicator | Bachelor | | | | | Master | | |
|-------------------------------|--|----------|-----|-----|-----|-----|--------|-----|-------|
| | | PM | PF | PK | PB | PTI | MPM | MPF | MKIPA |
| Cooperation and Collaboration | Communication in Interaction | 72% | 73% | 74% | 72% | 70% | 74% | 72% | 77% |
| | Attitude in Cooperation | 65% | 86% | 84% | 89% | 75% | 68% | 80% | 89% |
| | Fulfillment | 73% | 83% | 74% | 74% | 77% | 90% | 82% | 81% |
| Accommodation | Language in Interaction | 85% | 89% | 77% | 80% | 77% | 79% | 69% | 77% |
| Competition | Competitive Attitude in Interaction | 83% | 70% | 72% | 72% | 70% | 72% | 73% | 73% |
| | Views on the Impact of Interaction | 75% | 81% | 76% | 75% | 78% | 72% | 87% | 77% |
| | Availability of Supporting Factors | 88% | 85% | 72% | 72% | 76% | 69% | 80% | 66% |
| Conflict | Attitude to Interaction Conflict | 72% | 76% | 73% | 69% | 71% | 86% | 76% | 65% |
| | The Influence of Communication Ways in Interaction | 49% | 61% | 55% | 51% | 60% | 55% | 61% | 53% |
| | Personal Resources in Resolving Conflict | 71% | 68% | 70% | 69% | 65% | 77% | 67% | 74% |
| | Supportive Environment in Interaction | 76% | 80% | 73% | 72% | 73% | 82% | 70% | 75% |
| Competency | Independent and Responsible | 69% | 86% | 84% | 82% | 77% | 84% | 90% | 79% |
| | Applicative and Adaptive | 79% | 85% | 77% | 78% | 72% | 80% | 83% | 78% |
| | Analytical and Solutive | 77% | 81% | 75% | 75% | 77% | 87% | 88% | 78% |

In the indicator of the use of language in interaction, the highest percentage of achievement was obtained by the PF study program. This means that both lecturers and students in the PF study program were able to build communication relationships as storytelling partners with good language quality, both orally and in writing. The highest competitive attitude in interaction is shown by students in the PM study program, which means that PM students can prioritize empathy in dealing with friends who make mistakes, firmly reject plagiarism, and be able to overcome jealousy of friends' achievements in the process of mentoring final assignments. For indicators of the view on the impact of guidance interactions, the highest percentage is owned by the MPF study program. This means that the mentoring process in the MPF study program was able to provide changes in science and mastery of technology, build self-confidence to be able to compete in the world of work, have global insight, build readiness in facing community demands, and provide learning experiences and learning outcomes that continue to increase. While the availability of supporting factors is best owned by PM students, which means that students have the perception that the supervisory commission in the PM study program has reliable and professional academic and non-academic abilities and skills as well as the availability of infrastructure and learning facilities is considered adequate.

In the aspect of conflict, the indicator of Attitude to dealing with conflict in interaction is best shown by students in the MPM study program. For indicators of the influence of how to communicate in interactions, it is best shown by students of PF and MPF, which means that the supervisory commissions in the two study programs are able to build interactions in communication situations that do not depend on self-perception, interpersonal attraction, attitudes, and prejudice regarding mentors. Meanwhile, the personal resource indicator resolving conflicts is best achieved by the MPM study program. That is, MPM students state firmly that they have excellent physical conditions, behavior, interests, intellectual intelligence, spiritual intelligence, and emotional intelligence that are very good to be able to interact in completing the final project guidance process. In addition, MPM students also have the availability of a supportive environment in building interactions.

In the aspect of competence, the MPF study program has the highest percentage of achievement for indicators of independence and individual responsibility as well as analytical and solution, while the applicable and adaptive indicators are shown very well by PF students. This indicates that the interaction pattern of the final project guidance built-in PF and MPF can make students make the right decisions based on information and data analysis, as well as provide guidance in choosing various alternative solutions independently and in groups. Meanwhile, the interaction pattern of final project guidance in PF makes students more able to apply their

field of expertise and utilize science, technology, and/or art in problem-solving, able to adapt to the situation at hand, and formulate problem-solving using theoretical concepts in the field of educational knowledge comprehensively general and theoretical concepts particularly.

In addition, the results of the study also show the profile categories of students who compose the final project. Based on the results of data analysis, there are no students who have an interaction profile in the low or very low category. The highest gain in each study program is in the profile with a very high interaction pattern category. Meanwhile, study programs with interaction pattern profile acquisition in the medium category are PB study programs, MKIPA, and MPF. A complete illustration of the acquisition of the profile percentage in each category for each study program is presented in Figure 2.

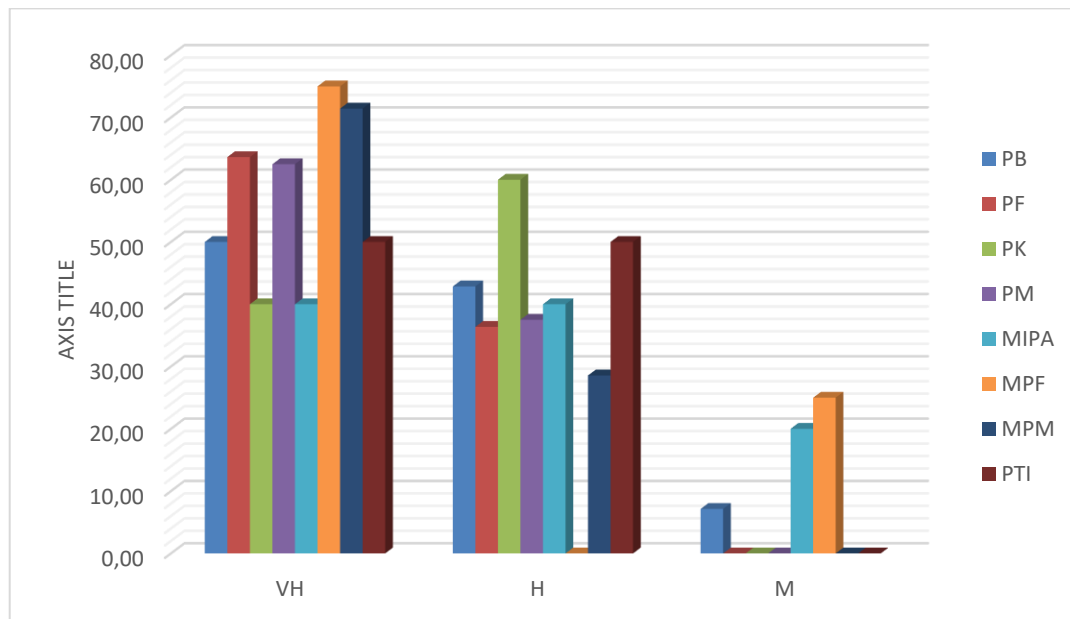


Figure 2. Profile of Categorization of Interaction Patterns for Final Project Guidance in the Mathematics and Natural Sciences Education Department, FKIP Unila

INQF Parameter Achievement

The achievement of INQF parameters is measured using a questionnaire on six INQF parameters, which are: science, knowledge, know-how, skill, affection, and competency. The descriptive statistics in the achievement of INQF parameters in the final project guidance process during the Covid-19 pandemic for each study program are presented in Table 5. Meanwhile, the percentage gain for each parameter is presented in Table 6.

Table 5. Descriptive Statistics of Achievement of INQF Parameters for Final Project Compiling Students at the Department of Mathematics and Natural Sciences, FKIP Unila

| No. | Study Program | Average | Highest | Lowest |
|-----|--|---------|---------|--------|
| 1. | Mathematics Education (PM) | 44.69 | 55.68 | 36.61 |
| 2. | Physics Education (PF) | 49.27 | 59.62 | 32.65 |
| 3. | Chemistry Education (PK) | 45.62 | 59.62 | 32.13 |
| 4. | Biology Education (PB) | 46.58 | 59.62 | 32.13 |
| 5. | Information Technology Education (PTI) | 43.27 | 57.07 | 33.88 |
| 6. | Master of Mathematics Education (MPM) | 47.83 | 59.62 | 30.29 |
| 7. | Master of Physics Education (MPF) | 53.20 | 59.62 | 45.95 |
| 8. | Master of Science Teacher Training (MKIPA) | 47.09 | 59.62 | 31.78 |

Note: Maximum ideal score = 70

Minimum ideal score = 14

Table 5 shows that the MPF study program has the highest average achievement of the INQF parameters among other study programs. While the percentage of achievement of the lowest INQF parameters was obtained by the PTI study program. The highest score of the achievement of the INQF parameter, which is 59.62, is in almost all study programs except the PM and PTI study programs. Meanwhile, the lowest score for the achievement of the INQF parameter of 30.29 is in the MPM study program.

Table 6. Percentage of Achievement of Indicators on Achievement of INQF Parameters

| No. | Study Program | Science | Knowledge | Know-how | Skill | Affection | Competency |
|-----|--|---------|-----------|----------|-------|-----------|------------|
| 1. | Mathematics Education (PM) | 77% | 80% | 73% | 77% | 71% | 72% |
| 2. | Physics Education (PF) | 83% | 88% | 82% | 89% | 80% | 76% |
| 3. | Chemistry Education (PK) | 80% | 73% | 74% | 76% | 80% | 75% |
| 4. | Biology Education (PB) | 77% | 76% | 80% | 80% | 84% | 75% |
| 5. | Information Technology Education (PTI) | 75% | 70% | 76% | 69% | 70% | 74% |
| 6. | Master of Mathematics Education (MPM) | 84% | 80% | 80% | 78% | 76% | 81% |
| 7. | Master of Physics Education (MPF) | 92% | 94% | 88% | 84% | 83% | 92% |
| 8. | Master of Science Teacher Training (MKIPA) | 86% | 79% | 78% | 86% | 78% | 70% |

Based on Table 6, the general achievement of the INQF Parameters for each indicator in each study program at the Department of Mathematics and Natural Sciences FKIP Unila is high. The study program with the highest achievement is the MPF and the lowest achievement is PTI. The parameter with the highest achievement is science while the lowest is competency.

The MPF study program excels in the parameters of science, knowledge, know-how, and competency. This further strengthens that the final task guidance process that takes place in the MPF study program was able to provide the most complete provision in achieving the INQF parameters. The PF study program excels in skill parameters, which means that the interaction in the final project guidance makes students have psychomotor abilities achieved through measurable training based on knowledge or understanding (know-how) to produce products or performance that can be assessed both qualitatively and quantitatively. PB study program excels in affection parameters which means that the interaction in the final project guidance in the PB study program was able to make students have a sensitive attitude towards aspects around their lives. The achievement of the lowest parameters of science, knowledge, and affection was experienced by the PTI study program. Meanwhile, the lowest acquisition of know-how, skill, and competence parameters was achieved by the students of PM. However, a percentage of achievement greater than or equal to 65% indicates that INQF is well-established in all study programs. This finding is also reinforced by the percentage of categorization of INQF achievement parameters as presented in Figure 3.

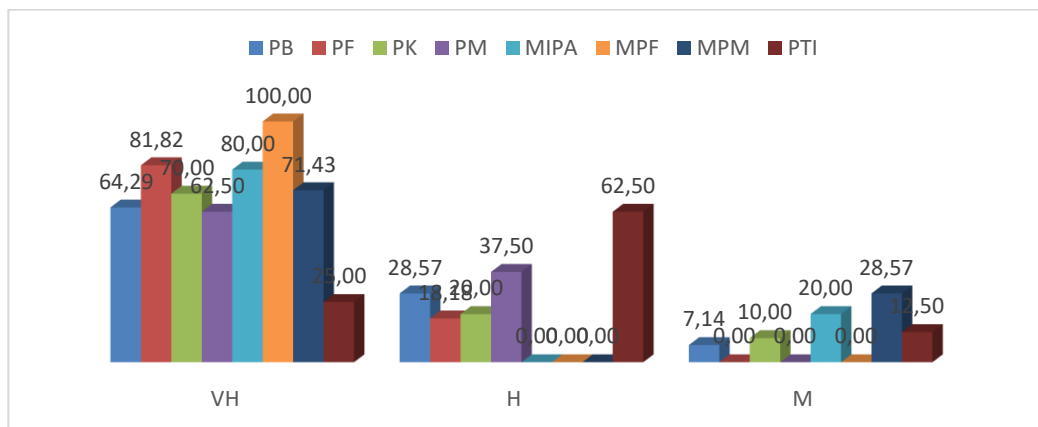


Figure 3. Profile of Categorization of INQF Parameter Achievements in the Mathematics and Natural Sciences Education Department, FKIP Unila

Based on Figure 3, there are no study programs that are in the category of achieving low and very low INQF parameters, and a slight percentage of achievement is in the moderate category. The most achieved categorization profile of INQF parameters is in the very high category for all study programs but PTI. Nevertheless, the acquisition of PTI is dominant in the high category. Those mean that the final project mentoring process in the Mathematics and Natural Sciences Department of FKIP Unila has facilitated the competency development of prospective-teacher students in achieving the six INQF level parameters.

Perceptions of Achievement of Students' Core Competencies

Students' perceptions of core competency achievement were measured using a questionnaire on four aspects, namely: personal soft skills, interpersonal soft skills, technical hard skills, and knowledge hard skills. The descriptive statistics obtained in the perception of students' core competency achievements that occurred during the final project guidance process during the Covid-19 pandemic for each study program are presented in Table 7. Meanwhile, the percentage of achievement indicators for each aspect is presented in Table 8.

Table 7. Descriptive Statistics of Perception of Achievement of Core Competencies of Students Compiling Final Projects at the Department of Mathematics and Natural Sciences, FKIP Unila

| No. | Study Program | Average | Highest | Lowest |
|-----|--|---------|---------|--------|
| 1. | Mathematics Education (PM) | 47.95 | 57.45 | 35.85 |
| 2. | Physics Education (PF) | 52.59 | 65.39 | 28.46 |
| 3. | Chemistry Education (PK) | 52.89 | 66.07 | 37.12 |
| 4. | Biology Education (PB) | 51.76 | 66.80 | 35.74 |
| 5. | Information Technology Education (PTI) | 51.42 | 66.80 | 38.73 |
| 6. | Master of Mathematics Education (MPM) | 54.27 | 65.39 | 37.12 |
| 7. | Master of Physics Education (MPF) | 59.71 | 66.07 | 52.53 |
| 8. | Master of Science Teacher Training (MKIPA) | 52.43 | 66.80 | 38.46 |

Note: Maximum ideal score = 80
Minimum ideal score = 16

Table 7 shows that the MPF study program obtained the highest average in terms of perceptions of student achievement of core competency while the lowest average acquisition was in the PM study program. This shows that the process of guiding the final project with best practices in growing student perceptions regarding its core competencies is owned by the MPF study program. Even so, the average score > 44.5 indicates that all study programs have a high category perception of core competencies. The description of the percentage of achievement of each indicator of the perception variable of the achievement of core competency is presented in Table 8.

Table 8. Percentage of Achievement Indicators on Perceived Core Competency Achievements

| No. | Study Program | Personal Softskill | Interpersonal Softskill | Technical Hardskill | Knowledge Hardskill |
|-----|--|--------------------|-------------------------|---------------------|---------------------|
| 1. | Mathematics Education (PM) | 73% | 73% | 66% | 73% |
| 2. | Physics Education (PF) | 78% | 81% | 77% | 77% |
| 3. | Chemistry Education (PK) | 78% | 82% | 77% | 75% |
| 4. | Biology Education (PB) | 79% | 81% | 74% | 73% |
| 5. | Information Technology Education (PTI) | 78% | 80% | 72% | 75% |
| 6. | Master of Mathematics Education (MPM) | 83% | 84% | 74% | 81% |
| 7. | Master of Physics Education (MPF) | 96% | 86% | 87% | 94% |
| 8. | Master of Science Teacher Training (MKIPA) | 83% | 81% | 78% | 68% |

Table 8 shows that the highest percentage in terms of achievement of perceived indicators of core competency achievement is in the aspect of soft skills, both personal and interpersonal. That is, the process of supervising the final project that occurs facilitates interactions that build well perceptions of the soft skills possessed by students. The study program with the highest percentage of achievement indicators is the MPF which dominates in every aspect of the perception of students' core competency achievement. The study program with the lowest perceived core competency achievement is the PM study program in total, personal soft skills, interpersonal and technical hard skills while in the aspect of hard skills knowledge, the lowest achievement occurs at the MKIPA study program. The categorization of the perception profile of students' core competency achievement is presented in Figure 4.

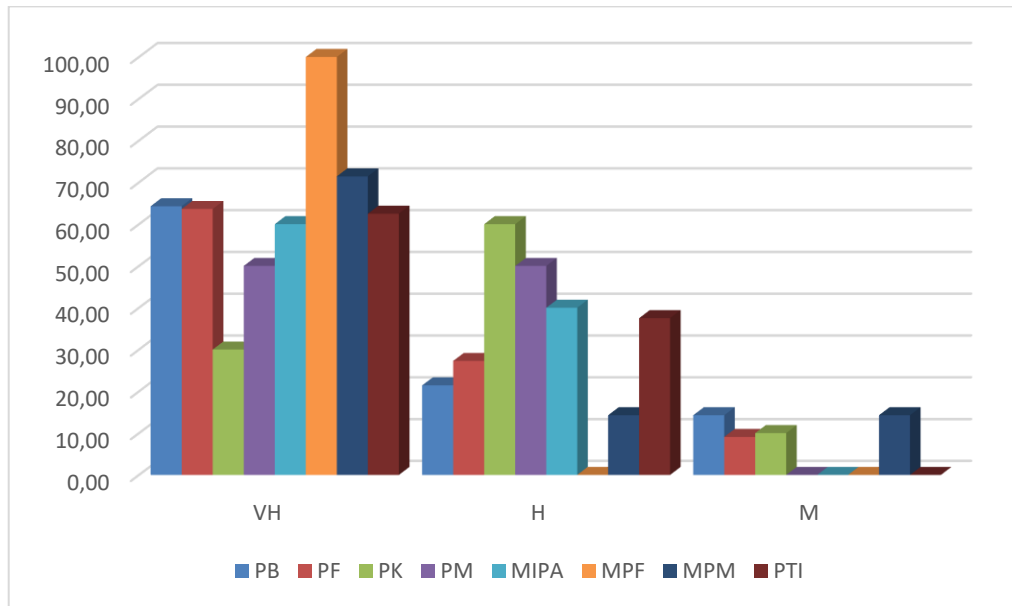


Figure 4. Profile of Perceived Categorization of Core Competency Achievements of at the Department of Mathematics and Natural Sciences, FKIP Unila

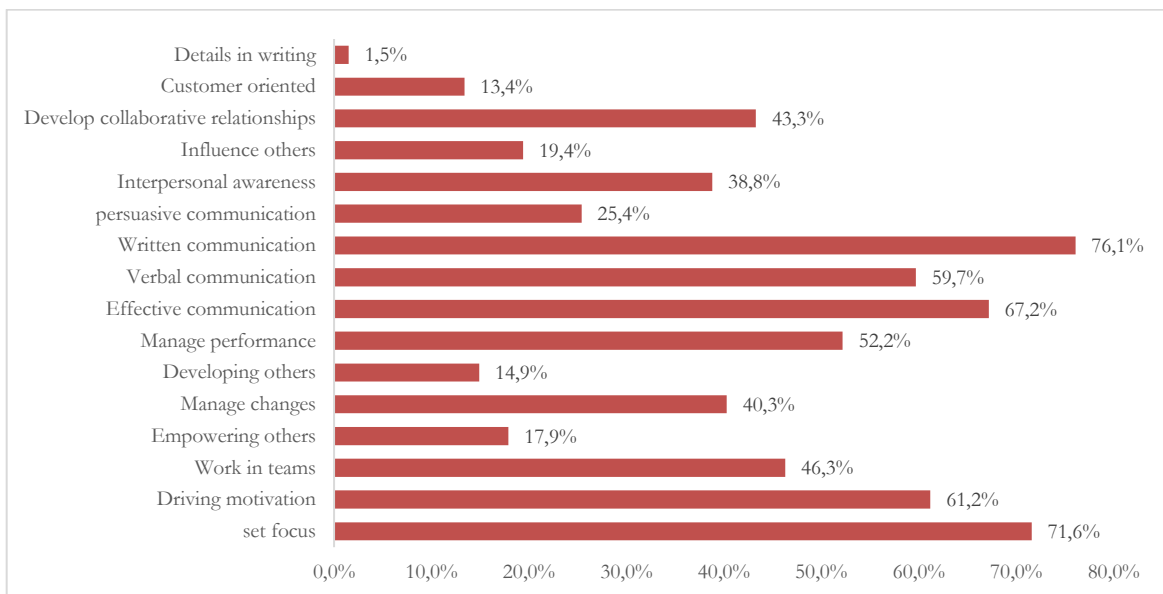


Figure 5. Responses of Students Compiling the Final Project at the Department of Mathematics and Natural Sciences, FKIP Unila on the Impact of Interaction

Based on Figure 4, there are no students with low and very low perception profile categorization. The very high category dominates every study program except for the PK and PM study programs. Data showing the absence of low and very low categories indicate that all students in each study program have a positive perception of their core competencies as the result of the interaction in the process of mentoring the completion of the final project. The description of student responses regarding the impact of interactions is presented in Figure 5.

Based on Figure 5, the most dominant responses given by students indicate that the final assignment guidance interaction was considered able to improve students' abilities in written communication, establishing focus, effective communication, verbal communication, and managing performance. Meanwhile, the competencies that are considered the lowest are customer-oriented, influencing others, developing others, and empowering others. The responses related to competency development are presented in Figure 6.

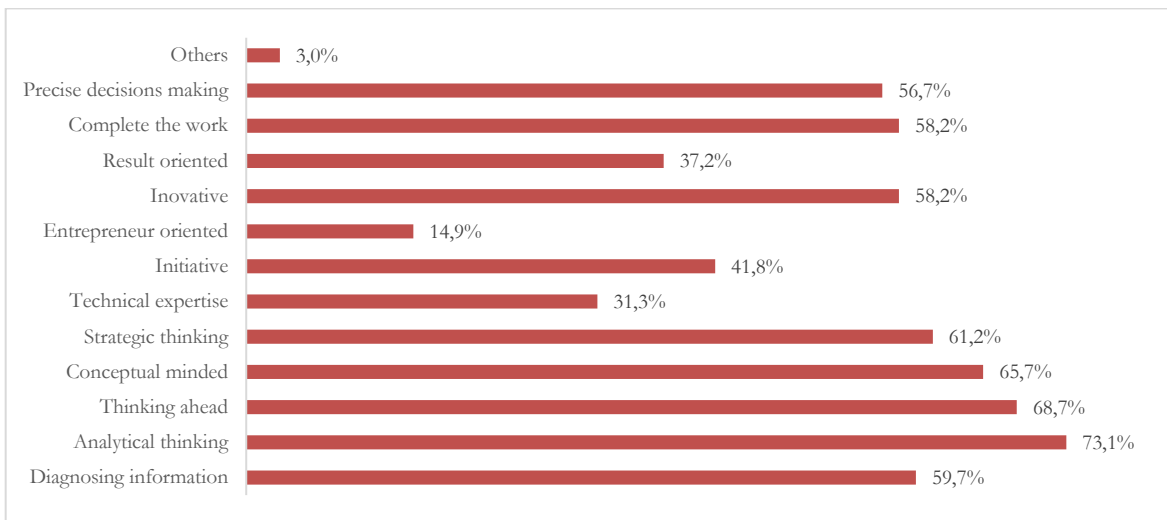


Figure 6. Responses of Students Compiling the Final Project at the Department of Mathematics and Natural Sciences, FKIP Unila towards Competency Development

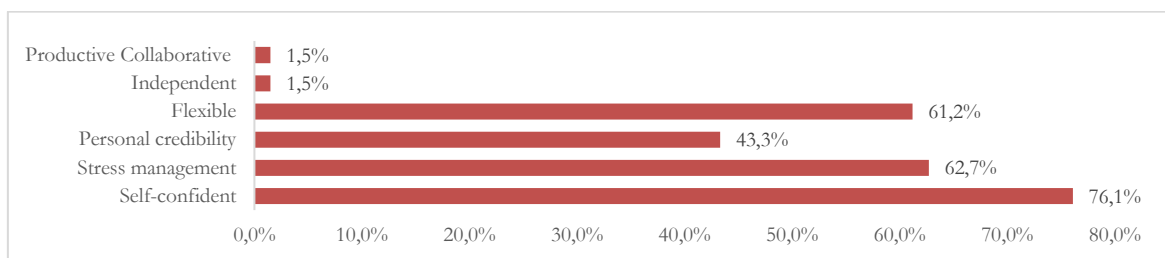


Figure 7. Responses of Students Compiling Final Projects at the Department of Mathematics and Natural Sciences, FKIP Unila towards Self-Management Development

Figure 6 shows that the final project mentoring process is assessed by students as being able to increase competencies in analytical, futuristic, conceptual, and strategic thinking; competencies in diagnosing information, being innovative, and working thoroughly, accurately, and quickly to make decisions. The competencies considered underdeveloped are entrepreneurial-oriented abilities and patience. Interaction in the guidance of the final project is also considered capable of building competencies related to the self-management of students. The self-management competencies considered the best developed are self-confidence, stress management, and flexibility. Meanwhile, the least self-management potential that appears is competence in working independently and joint productivity. The recapitulation of student responses is presented in Figure 7.

Interaction Inhibiting Factors

In addition to studying interaction patterns, achievement of INQF parameters, and perceptions of core competency achievement, information related to interaction-inhibiting factors was also obtained in the process of guiding the preparation of the final project. The result of the analysis of student responses is presented in Figure 8.

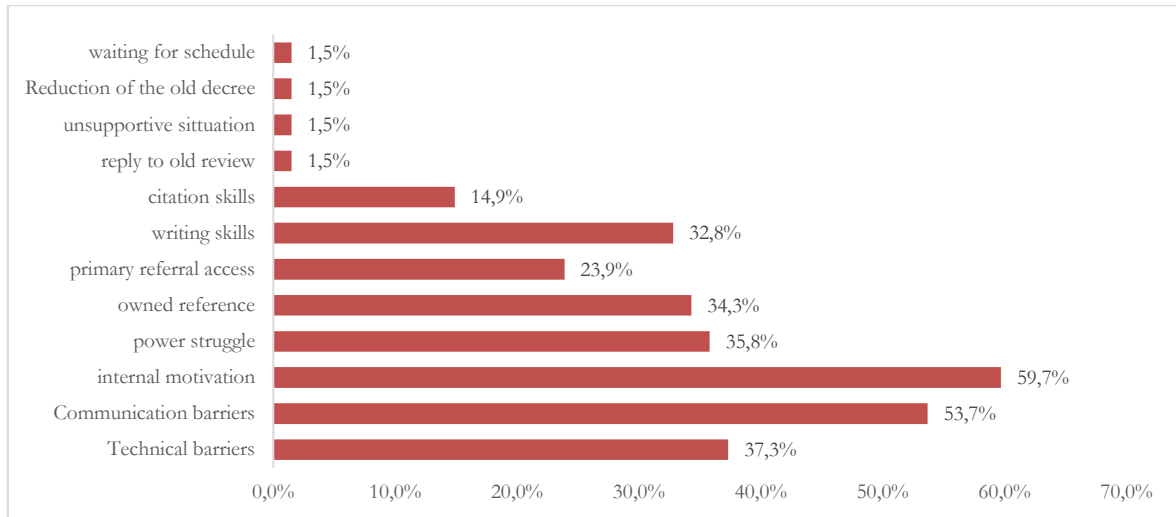


Figure 8. Responses of Students Compiling Final Projects at the Department of Mathematics and Natural Sciences, FKIP Unila to Obstacles

Figure 8 shows the fact that the biggest inhibiting factor experienced by students who compose the final project is the internal motivation factor which often declines during the Covid-19 pandemic. Other inhibiting factors that are considered to greatly affect the pattern of student interactions are barriers to communication and technical barriers to online tutoring. Students also stated that slow replies, difficult communication, unsupportive supervisors, and administrative obstacles such as the determination of SK and inconsistent guidance schedules were also considered to be factors that hindered interaction patterns in the guidance of the final project at the Department of Mathematics and Natural Sciences, FKIP Unila.

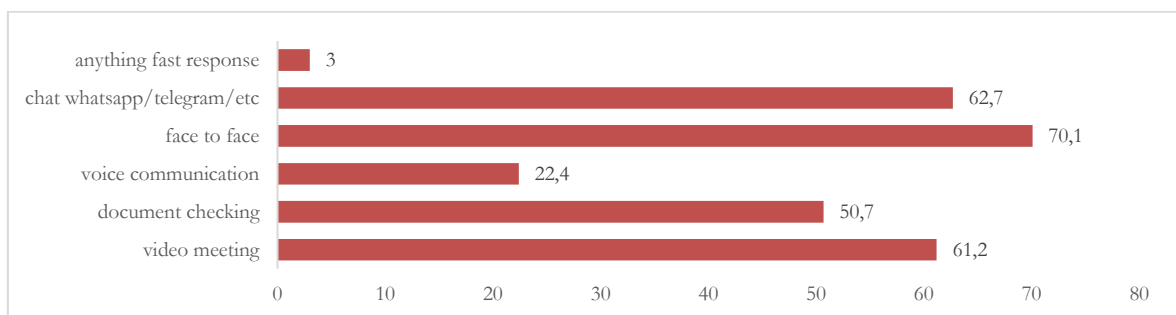


Figure 9. Responses of Students Compiling the Final Project at the Department of Mathematics and Natural Sciences, FKIP Unila towards the Form of Preferred Service Option

Responding to the inhibiting factors experienced by students who compose the final project at the Department of Mathematics and Natural Sciences, FKIP Unila, students were facilitated to get guidance services they were interested in. The guidance service that is most in demand by students majoring in MIPA at FKIP Unila was face-to-face by conforming to the

health protocols. Other services that are highly desired by students are interactive chat using chat applications and social media as well as optimizing the document-checking process. The complete presentation of the response recapitulation of the final project students of the Mathematics and Natural Sciences Department of FKIP Unila is presented in Figure 9.

Discussion

The findings show that the study program with the superior final task guidance interaction pattern is Physics Education and followed by MPF. Meanwhile, the study program with the interaction pattern that needs attention is the PTI study program. Similar results are also shown in the acquisition of the INQF parameters achievement variable and the perception of students' core competency achievement that the MPF study program has good practices which can be adopted and adapted by other study programs at the Mathematics and Natural Sciences Education Department, FKIP Unila, especially by the PTI study program. The quality of human resources owned by the MPF study program was estimated as the main factor supporting the success of good interaction and communication patterns that are developed during the final project guidance process.

The dominant pattern of interaction that appears in each study program at the Department of Mathematics and Natural Sciences FKIP Unila is an associative pattern related to cooperation by forming groups, sharing information, and making mutual agreements. These social interactions promote behavioral sequences to simulate complex group activities (Newcomb et al., 2015; Duncan & Fiske, 2015), while the dissociative process is related to conflict/dispute as a social process in which individuals or groups try to fulfill their goals very minimally. The pattern of associative interactions that occurred during the process of guiding the final project at the Mathematics and Natural Sciences Department of FKIP Unila came from the factors of suggestion, identification, and sympathy.

Interaction in the final project guidance is stated to be able to accumulate students' abilities in carrying out a measurable job description and using a structured assessment but with a level that is not higher than other parameters. The highest percentage achievement indicator in interaction was the Independence and Responsibility indicators in the competency aspect, showing success in the development of aspects of student competency. The lowest indicator achievement was the Influence of Communication Methods in Interaction indicators in conflict. These results indicate the need for communication skills development. Anderson and Martin (1995) state that communication motives affect interaction involvement, so it is necessary to understand individual motives in interacting to communicate responsively.

The process of guiding the final project during the Covid-19 Pandemic was successful in developing the competence of independence and responsibility, both individually and in the group. This is inseparable from the dominance of the use of technology in the guidance process. The students who understand the need to be responsible in using technology provide opportunities for themselves to learn independently (Kemmer, 2011; You & Kang, 2014). Scaffolded instruction, targeted-effective guidance, and interactive learning are crucial to support students' need in constructing independence (Larkin, 2001; Bowen et al., 2014; Gilbert, 2015). The final project guidance process experienced by students was able to build knowledge through research results in a body of knowledge and stimulates the desire to conduct sustainable research that can be used to build knowledge by data recording, observation, and measurable analysis to improve understanding of natural and social phenomena.

The lowest gain on the effect of the way of communication in the interaction indicates that the way students communicate with the final project supervisor still depends on self-perception, interpersonal attraction, attitudes, and prejudices about the supervisor. This refers to the supervisor's cognitive style that characterizes the student-supervisor relationship which is a significant predictor of success and failure in research projects (Armstrong et al., 2004).

The results also showed that 86.57% of students stated that the final project guidance process at the Department of Mathematics and Natural Sciences FKIP Unila was able to facilitate increasing self-competence, especially in scientific fields that had never been obtained by students. The mentoring process experienced also facilitates the formation of discipline from all aspects, including consistency in task preparation, good use of time, strategy for achieving plans, and fostering mental and physical endurance. Other responses of 2.99% of students stated that they were neutral and 8.96% of students stated that they had not been fully able to improve competence. Some of the competencies that are assessed as increasing as the impact of the final task guidance process are the ability to process information, think ahead, think effectively, and think analytically, while the rest, 1.49% of students, stated that the guidance process they experienced was not able to facilitate competency improvement because the long mentoring process had an impact on increasing frustration. The student firmly stated, "Initially I wanted to work, but in the end, as long as I graduated, I was happy because the tuition fees had to be considered so that there would be no more perfect works".

In addition, students also stated that the important things obtained during the final project guidance process were mastery of technology, directed new knowledge, better quality of research products, mastery of all aspects of problem-solving, and critical thinking, which was built through criticism, ideas, or constructive input from the supervisor. Most of these abilities are developed through technology-assisted learning. Learning processes using digital technology can be better understood and managed with connectivity, and the active involvement of educators in online learning networks (Goldie, 2016). Besides, in relation to the affective aspect, students stated that the mentoring process experienced trained the character of being patient, diligent, creative, responsible, scientific, honest, respecting time, priority management, self-confident, fighting power, disciplined, persistent, consistent, maximizing effort, and not giving up easily. The good habit of reading many reputable educational journals during the preparation of the final project provides benefits in improving literacy, increasing knowledge, increasing references, expanding horizons, and gaining new knowledge that is not yet known related to oneself and the surrounding environment. Soft skills that are well developed even in a pandemic are communication skills, flexibility, adaptation, insight to be more advanced, and awareness in developing the world of education with various reviews of learning conditions and situations in order to lead to better educational goals.

Suggestions for improving the implementation of final project guidance include: (1) implementation of face-to-face guidance with a time duration that suits student needs, (2) improving response speed, (3) scheduling routine guidance, (4) providing clear and unambiguous directions, (5) using an integrated and parallel guidance system to carry out group guidance for the face-to-face process in case of time efficiency, (6) using video conferencing to make it easier for students to ask questions related to the final project more clearly and interactively, (7) evaluate the implementation of guidance regularly and in an organized manner, (8) fair distributing supervisors' workloads, (9) students have the right to vote/advice commissions are in demand, and (10) availability of easily accessible references given the very long queues to access reference collections in the online library.

CONCLUSION

Based on research results, it can be concluded that: (1) the dominant interaction pattern that occurred was an associative pattern originating from the factors of suggestion, identification, and sympathy; (2) the INQF parameter with the best score is the Science parameter with an average parameter achievement of 9.97 from the lowest score 3.00 until the highest score of 12.38; and (3) the perception of achieving the highest core competency of students is the aspect of soft skills, both personal and interpersonal, with the highest average perception of achieving core competency, which is 59.71 out of 80.

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