## Original Research Article

# SATISFACTION OF BASIC PSYCHOLOGICAL NEEDS AND TEACHING-LEARNING PROCESS OF PHYSICS IN JUNIOR SECONDARY CLASSES IN JAFFNA DISTRICT, SRI LANKA.


### Abstract

This study investigates Relations of satisfaction of basic psychological needs and teaching-learning process and achievement of physics in junior secondary classes in Jaffna District Sri Lanka;findimpact of basic psychological needs on teaching-learning process.The study was descriptive and a quantitative study of 89 science teachers to explore the relationship between teacher satisfaction of basic psychological needs and their teaching-learning process. The study also included 855 class-wise students to examine the relationship between students' satisfaction of basic psychological needs and their physics achievements. The results show that both relations ships are positively correlated, and teaching learning process can be predicted the level of 31% by the variation of teachers' satisfaction of basic psychological needs. The findings suggest that applying SDT principles in the physics teaching-learning process can enhance teacher satisfaction to lead better classroom practice and student achievement, leading to better academic performance.



*Key words*— Self-Determination Theory, Basic psychological needs, Physics Teaching-Learning Process, junior secondary classes and Physics achievement.


### 1. INTRODUCTION

The application of Self-determination Theory (SDT) in the education sector has gained attention in recent years, particularly in improving student motivation and engagement. SDT proposes that the satisfaction of basic psychological needs, such as autonomy, competence, and relatedness, promotes intrinsic motivation and well-being. In the context of physics education, student motivation, engagement and achievement play a vital role in developing scientific literacy, critical thinking, and problem-solving skills. This study explores the application of SDT in the physics teaching-learning process in junior secondary classes in Jaffna district, Sri Lanka.

### 2. LITERATURE REVIEW

SDT has been widely used in educational contexts to promote intrinsic motivation and well-being. SDT proposes that individuals have basic psychological needs for autonomy, competence, and relatedness that, when satisfied, promote intrinsic motivation and well-being (Ryan & Deci, 2017). Autonomy refers to the need to feel that we are the owner of our own behaviours. Competence refers to the need for mastery and the feeling of being capable of achieving one's goals. Relatedness refers to the need for connection and belonging with others.

Research has shown that the application of SDT in education can enhance students' motivation and engagement, leading to better academic performance and positive attitudes towards learning (Javier et al., 2022). For instance, a study by Hyeon (Hyeon et al., 2020). found that promoting autonomy-supportive teaching practices improved students' motivation and engagement in a mathematics classroom. Similarly, another study by Black and Deci (Black & Deci, 2000) showed that SDT-based interventions increased students' intrinsic motivation and well-being in a college course.

In the context of physics education, several studies have explored the impact of SDT on students' motivation and engagement. For instance, a study by Uwizeyimana(Uwizeyimana et al., 2018) found that promoting autonomy-supportive teaching practices enhanced students' motivation and engagement in a high school physics classroom. Similarly, a study by Alast(Aalst, 2000) showed that

integrating SDT principles into a physics course improved students' intrinsic motivation and learning outcomes.

## 3. OBJECTIVE AND RESEARCH QUESTIONS

### Aim of the Study

The aim of this study is to explore physics teaching and learning based on SDT at the junior secondary level in Jaffna District and make valuable suggestions to enrich meaningful learning.

### Objectives

The objectives of this study are:

1. To determine the achievement levels of students in physics at the junior secondary level.
2. To investigate students and teachers' satisfaction level of competence, autonomy, relatedness, on physics teaching and learning at the junior secondary level.
3. To examine the relationship between relatedness, competence, and autonomy and physics achievement at the junior secondary level.
4. To find the impact of teachers' satisfaction of basic psychological needs on their teaching learning process.

### Research questions

Based on the objectives, the following research questions were developed:

1.1 What are the students' achievement levels in physics components in junior secondary classes?
2.1 What are the levels of satisfaction of Basic Psychological Needs of students in junior secondary classes?
2.2 What are the levels of satisfaction of Basic Psychological Needs of science teachers in junior secondary classes?
3.1 What are the relations of students' satisfaction of competence, relatedness, and autonomy with the achievements of students?
3.2 What are the relations of teachers' satisfaction of competence, relatedness, and autonomy with the achievements of physics in junior secondary classes?
3.3 What are the relations of teachers' satisfaction of competence, relatedness, and autonomy with their teaching-learning process?
4.1 What is the impact of teachers' satisfaction of basic psychological needs on their teaching learning process?

The answers to research questions provide a satisfactory exploration of meaningful learning of physics concepts at the junior secondary level based on SDT. By answering these research questions, the study aims to provide a comprehensive understanding of physics teaching and learning at the junior secondary level and to identify ways to improve students' physics achievement through meaningful and effective teaching and learning practices. The study will contribute to the existing literature on physics education and provide valuable insights for teachers, educators, policymakers, and other stakeholders involved in physics education at the junior secondary level.

## 4. RATIONALE

SDT is a well-established theoretical framework in educational psychology that explains how individuals can be motivated by their own needs and interests rather than external rewards or pressures. The application of SDT in physics teaching and learning can provide a more holistic and student-centered approach, which can lead to improved learning outcomes and engagement in the subject.

The Jaffna district is an important context for this study as it is an area that has experienced significant social and political changes in recent years. The education system has also undergone changes, with a focus on more student-centered approaches to teaching and learning. However, there is limited research on the application of SDT in physics teaching and learning in the Jaffna district.

The findings of this study will contribute to the development of effective physics teaching and learning practices in the Jaffna district, which can be used as a model for other contexts. It will also

provide insights into the application of SDT in physics education and its potential impact on student motivation and engagement. The paper will conclude with recommendations for future research and implications for policy and practice in the field of physics education.

## 5. MATERIALS AND METHOD

### Method

The study used a cross-sectional mixed-method approach, combining quantitative and qualitative data collection methods. The study was conducted in 89 schools in Jaffna district, Sri Lanka, involving 89 science teachers and their 855 class-wise students in grades 6-8 who were studying physics components in science. The study was conducted 2021-22.

### Participants

The participants in this study were 89 science teachers and their 855 class-wise students from junior secondary classes in Jaffna district, Sri Lanka. For the quantitative study, we used a questionnaire to collect data on teachers' satisfaction of Korean basic psychological needs scale and their teaching-learning process, and students' satisfaction of basic psychological needs scale and class wise achievement physics test to their physics achievements.

### Sample locations


Figure 1 sample locations

### Procedure

Ethical approvals were obtained from the director of post graduate institute of science, University of Peradeniya; Northern province director of education; the relevant school principals and the participants.

The qualitative data collection process for this study involved two separate procedures for students and teachers. For the students, the data was collected through surveys completed during their regular school classes in March of 2021. The surveys took approximately one hour to complete and were administered by two research assistants with a master's degree and M.Phil. in education. Prior to distributing the surveys, the class teachers were asked to leave the classroom to encourage honest answers from the students. The purpose of the study was explained to the students, emphasizing that there were no correct or incorrect answers, and their participation was voluntary and confidential. After the completion of the surveys, they were collected by the research assistants.

For the teachers, the data collection procedure was like that used for the students. They were given the survey to complete in their own time and were asked to seal it in the envelope provided. A week later, the envelopes were collected by the researcher.

### Instrumentation

The format for all questionnaire items was a 4-point scale, ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). All items were specific to physics components in science class and written in Tamil. The students survey contained physics unit achievement test in multiple choice response.

### Students' and teacher's Basic Psychological Needs

The tool used in this study was the Korean Basic Psychological Needs Scale (K-BPNS), developed by (Inok Ahn, 2014). The tool was translated to Tamil and each subscale consists of 5 items,

corresponding to the needs for Autonomy, Competence, and Relatedness. The reliability of the K-BPNS has been established in previous studies, with a validated alpha of 0.72 (Hayes, 2017).

**Students' physics achievement**

The achievement tests were prepared and moderated by experience two science teachers and science Inservice advisor for each grade separately. Those were Multiple choice question type for totally hundred scores to minimize the examiner's biasing. Second marking were done for recheck.

**Physics teaching-learning process**

Teaching-learning process scale was constructed by the modification of Task evaluation questionnaire from Intrinsic motivation inventory (Description, 1994). It was two sub scale corresponding to Teaching method and Types of evaluation and each subscale have fifteen items with four points Likert's types.

**Statistical analyses**

The software programme SPSS version 20.0 was used for our basic analyses. After checking for normal distribution of the data, linearity of relationships between variables and computing the basic correlations between the different variables, reliability tests for all the scales used to measure the different variables were performed.

**5.10 Data analysis**

Data analysis was done by constructing two conceptual models as shown below.

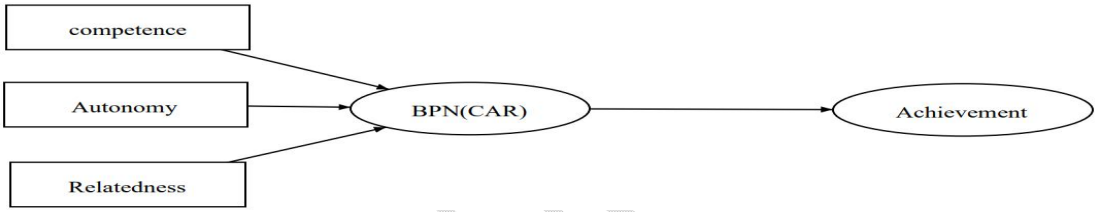


Figure 2 shows students' conceptual model.

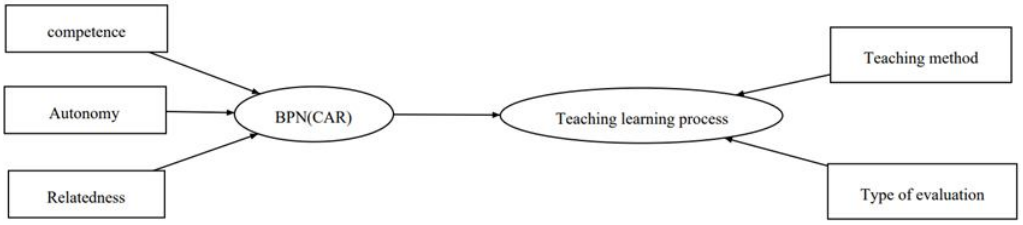


Figure 3 shows Teachers' conceptual model.

## 6. RESUTS AND DISCUSSION

**Cronbach alpha**

As described by Creswell (Creswell, 2012) the coefficient Cronbach's alpha is a reliable and widely used method to test the internal consistency of research instruments, especially when the items are scored as continuous variables.

Table 1. Cronbach's alpha for each subscale

| Participants | Name of subscale | No of items | Cronbach's alpha | df |
|---|---|---|---|---|
| Students | Students BPN | 12 | 0.7 | 853 |
| Teachers | Teachers BPN | 13 | 0.9 | 87 |
| | Method of teaching | 15 | 0.7 | 87 |
| | Types of evaluation | 15 | 0.7 | 87 |

The results indicate that the Teachers' BPN subscale had the highest reliability with a Cronbach's alpha coefficient of 0.9, which is considered to be highly reliable (Sürücü, 2020). This suggests that the

items in the Teachers' BPN subscale are highly interrelated and contribute to a reliable measure of the construct of interest, which is teachers' beliefs about psychological needs in education.

On the other hand, the Students' BPN subscale had a moderate reliability coefficient of 0.7. However, a reliability coefficient of 0.7 is still considered acceptable (Sürücü, 2020) , and researchers can use this subscale with caution when drawing conclusions from the data. Furthermore, the Method of teaching and Types of evaluation subscales also had moderate reliability coefficients of 0.7. Therefore, researchers should be cautious when interpreting the results obtained from these subscales and consider other factors that may influence the validity and reliability of the collected data.

**Results of Research Question 1.1 student's achievement levels in physics components in junior secondary classes.**

Table 2 junior secondary physics achievement

| | |
|---|---|
| Number of students | 801 |
| Mean | 56.85 |
| Median | 57.00 |
| Mode | 55 |
| Std. Deviation | 18.738 |
| Range | 92 |
| Minimum | 8 |
| Maximum | 100 |

The table shows the mean marks for physics components in junior secondary classes. The mean marks range from 55.51 for grade 6 students to 59.00 for grade 8 students, with a junior secondary mean of 56.90. The total number of students represented in the table is 801(after the data cleaning).

The overall junior secondary mean of 56.90 falls within the range of a passing grade, but it is not a particularly high mean score. This may indicate that students need additional support and resources to improve their performance in physics components, particularly if they are struggling to achieve passing grades.

It is also worth considering that the data presented in the table only provides a snapshot of student achievement in physics components at a given point in time. To gain a more complete understanding of student learning and performance in physics, additional data should be collected and analysed, such as student scores on individual physics assessments or standardized tests.

Overall, the data presented in the table suggest that there is room for improvement in student performance in physics components at the junior secondary level. Teachers and administrators should consider implementing strategies to support students who are struggling to understand and apply physics concepts, such as small group instruction, peer tutoring, or additional resources and materials. By providing additional support and resources, educators can help ensure that all students have the opportunity to succeed in their physics education.

Table 3 level of physics achievements Level statistics

| Level of achievement | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Low achievement (1st quartiles) | 201 | 25.1 | 25.1 | 25.1 |
| Moderate achievement | 379 | 47.3 | 47.3 | 72.4 |
| High achievement (3rd quartiles) | 221 | 27.6 | 27.6 | 100.0 |
| Total | 801 | 100.0 | 100.0 | |

Which indicated a significant difference in the level of physics achievement among the students. The results suggest that there is a need for further investigation into the factors that contribute to the varying levels of achievement. It is possible that differences in teaching methods, teaching experience, teacher-student ratios, and student characteristics may have played a role in the observed differences in achievement levels.

One possible explanation for the higher proportion of students with moderate levels of achievement is that the teaching methods used may not be challenging enough to push students to excel. Teachers may need to implement more rigorous and engaging teaching methods that will help students to develop a better understanding of the subject matter. Additionally, there may be a need for extra support and resources for students who are struggling with the subject, such as after-school tutoring or personalized attention from teachers.

Furthermore, it is important to note that the level of achievement in physics can have a significant impact on a student's future academic and career prospects. A strong foundation in physics can lead to opportunities in fields such as engineering, computer science, and research. On the other hand, a weak foundation can limit a student's options and potential for success. Therefore, it is essential for teachers and policymakers to prioritize the improvement of physics education and the promotion of high achievement levels among junior secondary students.

In conclusion, the results indicate that there is a significant difference in the level of physics achievement among junior secondary students. Further research is needed to identify the factors contributing to the observed differences in achievement levels and to develop strategies to promote higher achievement levels. Ultimately, improving physics education at the junior secondary level can have a profound impact on the future success of students and the society.

**Results of Research Question 2.1 the levels of satisfaction of Basic Psychological Needs of students in junior secondary classes.**

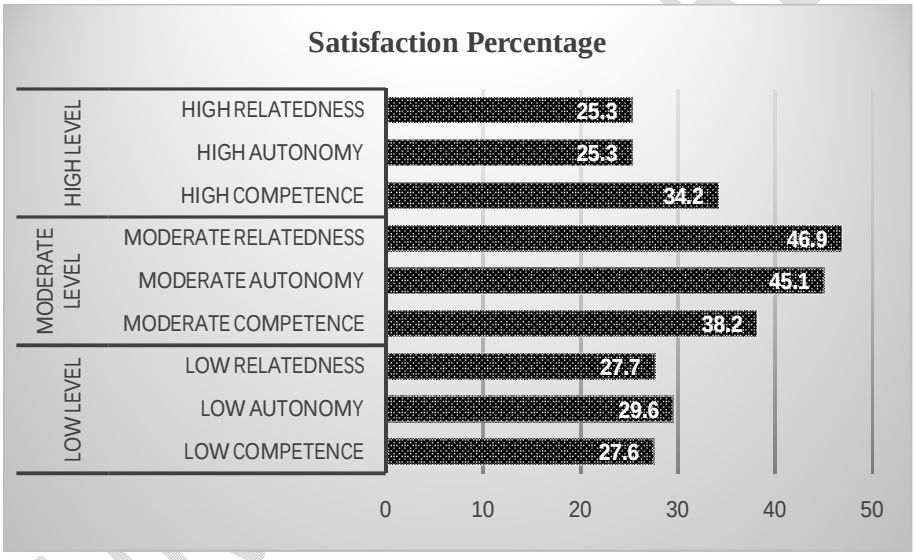


Figure 4shows students' satisfaction level of BPN.

Based on percentage, 27.6% and 27.7% of students have low levels of satisfaction with Competence and Relatedness and low-level satisfaction with Autonomy showed 29.6% higher than others. The lowest percentage of moderate level (38.2%) belongs to satisfaction of competence and the highest percentage of moderate level belongs (46.9%) to satisfaction of Relatedness. There were 25.3% of students have a high level of satisfaction with both Autonomy and Relatedness and high-level satisfaction with competence showed 34.2% higher than others. The majority of students' satisfaction showed in moderate level for all factors of CAR.

Table 4 Students' Competence, Autonomy, and Relatedness.

| | Mean | Std. Deviation | Median | Mode |
|---|---|---|---|---|
| Autonomy | 3.01 | .661 | 3.00 | 3.00 |
| Competence | 3.07 | .664 | 3.20 | 3.60 |
| Relatedness | 3.03 | .731 | 3.00 | 3.50 |

In the satisfaction of basic psychological scale, the highest satisfaction was found in the sub-scale competence (3.07) and the lowest satisfaction was in the sub-dimension of Autonomy (3.01). The median of competence of 3.20 indicates the majority of satisfaction of competence inclined toward a high level.

**Results of Research Question 2.2 the levels of satisfaction of Basic Psychological Needs of science teachers in junior secondary classes.**

Table 5 shows teacher' BPN means.

| Overall BPN factors | Mean |
|---|---|
| Teachers Relatedness mean | 3.2462 |
| Teachers BPN mean | 3.1984 |
| Teachers Autonomy mean | 3.1864 |
| Teachers Competence mean | 3.1841 |

The table shows the mean values of science teachers' satisfaction levels for the factors of Competence, Relatedness, Autonomy, and Basic Psychological Needs (BPN) in the junior secondary.

The mean value for the teachers' Relatedness is the highest at 3.2462, which indicates that the teachers have a higher level of satisfaction with the relationships they have with their colleagues and students. This is an important finding because positive relationships can lead to better student outcomes and higher teacher job satisfaction.

The mean value for Teachers' BPN is 3.1984, indicating that teachers feel moderately satisfied with their basic psychological needs being met. This means that teachers feel a sense of competence, autonomy, and relatedness in their work environment, which can lead to higher motivation and job satisfaction.

The mean value for Teachers' Autonomy is 3.1864, indicating that teachers have a moderate level of satisfaction with the degree of independence they have in their work. This finding is significant because autonomy is one of the basic psychological needs, and meeting this need can lead to higher job satisfaction and motivation.

The mean value for Teachers' Competence is 3.1841, indicating that teachers feel moderately satisfied with their level of competence in their teaching field. This finding is important because competence is one of the basic psychological needs, and meeting this need can lead to higher motivation and job satisfaction.

Overall, the results suggest that science teachers in junior secondary have a moderate level of satisfaction with their basic psychological needs being met, and with their level of competence, autonomy, and relatedness in their work environment. However, there is room for improvement in some areas, such as autonomy and competence, which may impact job satisfaction and motivation.

It is important for schools and education policymakers to consider the satisfaction levels of teachers in these basic psychological needs to improve teacher job satisfaction, motivation, and ultimately, student outcomes. This information can be used to identify areas of improvement in the school environment to meet the needs of teachers and improve the quality of education for students.

**Results of Research Question 3.1 the relations of students' satisfaction of competence, relatedness, and autonomy with the achievements of students.**

Table 6. Correlation among achievement and autonomy, competence, and relatedness

| | Achievement | Autonomy | Competence |
|---|---|---|---|
| Autonomy | .188** | | |
| Competence | .222** | .936** | |
| Relatedness | .178** | .959** | 0.965** |

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

The correlation coefficient between Achievement of physics and students' satisfaction of competence is 0.222 which indicates ($0.222^2$ =0.049) a 4.9(5%) percentage positive relationship between Achievement of physics and students' satisfaction of competence and is significant at a 1% confidence level. And since the correlation coefficient is much greater than 0, it can be mentioned that there is a positive and meaningful relationship between academic achievement scores and satisfaction with autonomy, competency, and relatedness.

**Results of Research Question 3.2 the relations of teachers' satisfaction of competence, relatedness, and autonomy with the students' achievements of physics in junior secondary classes.**

Table 7 shows the Relationship between Teachers' CAR and Students' achievements.

**Correlations**

| **Factors of Teacher's BPN (teacher's CAR)** | **Students' physics achievement means (class)** | **Teacher Autonomy mean** | **Teacher Competency mean** | **Teacher Relatedness mean** |
|---|---|---|---|---|
| Teacher Autonomy mean | -.188 | | | |
| Teacher Competency mean | -.175 | .995** | | |
| Teacher Relatedness mean | -.037 | .637** | .634** | |
| Teacher BPN mean | -.153 | .975** | .975** | .788** |

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

The table presents the correlation coefficients between the factors of teacher's CAR and the achievement of physics in junior secondary classes. The correlations were computed using Pearson's correlation coefficient. The results indicate that there is no correlation between teacher competence and student achievement in physics (r=-.175, P<.01). The no correlation was found between teacher BPN and student achievement in physics (r=-.153, P<.01).

The results suggest that teacher competence is an important factor in determining student achievement in physics. This finding is consistent with previous research that has shown that teacher knowledge and expertise are important predictors of student achievement (Hattie, n.d.). The results also suggest that teacher BPN is an important factor in determining both teacher competence and student achievement. This finding is consistent with self-determination theory, which suggests that teachers who feel competent, related, and autonomous are more likely to provide high-quality instruction that supports student learning (Reeve & Jang, 2006) .

**Results of Research Question 3.3 relations of teachers' satisfaction of competence, relatedness, and autonomy with their teaching-learning process.**

Table 8 correlations among teachers' variables

| | **Teaching Learning Process** | **Teaching Method** | **Type of Evaluation** | **Teacher Autonomy** | **Teacher Competence** | **Teacher Relatedness** |
|---|---|---|---|---|---|---|
| Teaching Method | .870** | | | | | |
| Type of Evaluation | .915** | .597** | | | | |
| Teacher Autonomy | .559** | .516** | .488** | | | |
| Teacher Competence | .554** | .506** | .488** | .995** | | |
| Teacher Relatedness | .396** | .360** | .350** | .637** | .634** | |
| Teacher BPN (teacher's CAR) | .555** | .508** | .488** | .975** | .975** | .788** |
| **. Correlation is significant at the 0.01 level (2 tailed). | | | | | | |

The table 8 presents the correlation between teacher BPN (teacher's CAR) and different aspects of the teaching-learning process, including teaching method, type of evaluation, teacher autonomy, teacher competence, and teacher relatedness. All correlations were found to be significant at the 0.01 level (2-tailed).

The results show a strong positive correlation between teaching method and teacher BPN, indicating that teachers who have higher levels of autonomy, competence, and relatedness tend to use more effective teaching methods in the physics classroom. This finding is consistent with research that suggests that teachers who feel more autonomous, competent, and related to their work are more likely to engage in innovative and effective teaching practices.

Similarly, a strong positive correlation was found between type of evaluation and teacher BPN, indicating that teachers who feel more autonomous, competent, and related to their work tend to use more effective types of evaluation in the physics classroom. This finding suggests that teachers who are more satisfied with their work are more likely to implement appropriate and effective methods of assessing their students' learning.

The results also show a positive strong correlation between teacher autonomy, competence, and relatedness and the teaching-learning process(Arkkelin, 2014). This suggests that teachers who feel more autonomous, competent, and related to their work tend to create a more conducive learning environment for their students. The findings are consistent with self-determination theory, which posits that individuals who feel autonomous, competent, and related are more likely to be engaged, motivated, and successful in their work.

Furthermore, there was a strong positive correlation between teacher competence and teacher BPN, indicating that teachers who feel more competent in their subject matter tend to be more satisfied with their work. This finding is consistent with previous research that has shown a strong relationship between teacher competence and job satisfaction.

**Result of Research question 4.1 the impact of teachers' satisfaction of basic psychological needs on their teaching learning process?**

Table 9 model regression statistics

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .555[a] | .309 | .300 | 5.917 |

a. Predictors: (Constant), Teacher's CAR

**ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 1343.446 | 1 | 1343.446 | 38.373 | .000[b] |
| | Residual | 3010.872 | 86 | 35.010 | | |
| | Total | 4354.318 | 87 | | | |

a. Dependent Variable: Teaching learning process

b. Predictors: (Constant), Teacher's CAR

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. |
| 1 | (Constant) | 43.067 | 4.346 | | 9.910 | .000 |
| | Teacher BPN mean | 8.328 | 1.344 | .555 | 6.195 | .000 |

a. Dependent Variable: Teaching Learning process

The regression analysis further confirms the relationship between teacher BPN and the teaching and learning process. The regression model, which includes teacher's CAR (BPN) as a predictor, significantly predicts the quality of the teaching and learning process ($F(1, 86) = 38.373$, $P < .01$, $R^2 = .309$). The coefficient of determination ($R^2$) shows that approximately 30.9% of the variance in the teaching and learning process can be explained by the predictor variable, teacher's CAR.

The standardized beta coefficient of teacher's CAR is 0.555, which indicates that there is a moderate positive effect of teacher's CAR on the teaching and learning process. The regression equation shows that for every one-unit increase in teacher's CAR, the teaching and learning process will increase by 8.328 units, holding all other factors constant.

These findings are consistent with the self-determination theory, which suggests that when teachers feel satisfied with their BPN, they are more likely to be motivated to engage in teaching activities that promote students' motivation and learning. The autonomy-supportive teaching behaviours, such as providing choices, rationale, and opportunities for collaboration, are crucial for fostering students' intrinsic motivation and engagement in the learning process. When teachers feel competent and

related to their students, they are more likely to create a positive learning environment that promotes students' self-esteem, sense of belongingness, and positive social interactions.

In conclusion, the results suggest that teacher's satisfaction with their BPN has a significant impact on the quality of the physics teaching and learning process in junior secondary classes. The findings highlight the importance of supporting teachers' needs for autonomy, competence, and relatedness in promoting students' motivation and engagement in the learning process. The results suggest that teacher training programs and school policies should prioritize creating a supportive and collaborative teaching environment that fosters teachers' satisfaction with their BPN. Future research could explore the causal relationships between teacher BPN and the teaching and learning process using longitudinal or experimental designs.

## 7. CONCLUSION, SUGGESTIONS AND LIMITATIONS

Students' satisfaction with all three factors of Basics psychological needs and achievement of physics were measured, showing a positive correlation in junior secondary classes. Among them, competence shows a highly positive relationship with achievement. Hence, Each and all science teachers try to make the classroom environment such that satisfaction of students' BPN becomes at a higher level. teachers' satisfaction with all three factors of Basics psychological needs and physics teaching-learning process were measured, showing a positive correlation in junior secondary classes. Furthermore, the coefficient of determination ($R^2$) shows that approximately 30.9% of the variance in the teaching and learning process can be explained by the predictor variable, teacher's satisfaction of BPN.

Moreover, it may be necessary to improve teachers' pedagogical shifts. Instead of asking the question, how can I motivate my students? we should ask how we can create the conditions within which my students can motivate themselves? Pedagogical practices may be possible through improved teacher education and school-based teacher development programs. Finally, we suggest providing all schools with at least a standard set of student-teacher dialectical frameworks and self-learning materials in physics and digital infrastructure to promote active learning and self-regulated learning.

This study was conducted in Grades 6, 7, and 8 within Jaffna District in Sri Lanka. Thus, the findings of the research couldn't be generalized nationally and internationally. In this feature, the researcher proposed to do the study in depth and with more content in the secondary physics components with a large sample size to generalize results.

### Consent

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

### Ethical Approval:

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

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