RESEARCH ARTICLE

Junior Secondary Students' Satisfaction of Basic Psychological Needs and Their Achievement in Physics

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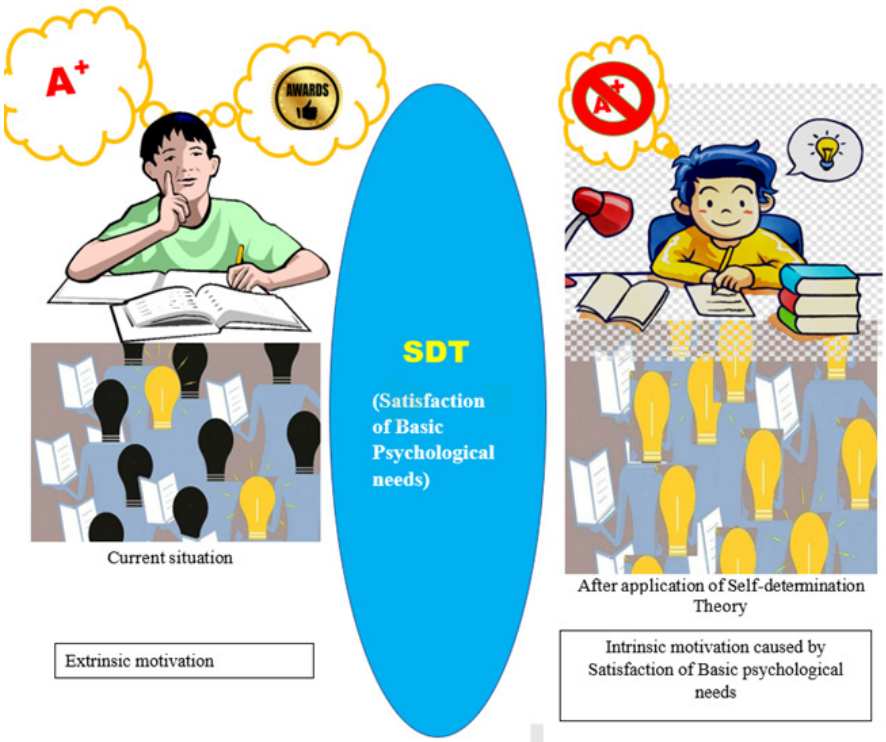

Highlights

- Students' achievement in Physics is at an average level.
- Students' satisfaction of Competence, Autonomy, and Relatedness (CAR) is directly associated with their achievement in Physics.
- The perception on student-teacher dialectical frame is not at satisfactory level thus suggesting a paradigm shift for the best practice.
- Reeve's student-teacher dialectical framework approach is necessary to improve the quality of teaching-learning.

Ceylon Journal of Science 52 (3) 2023: 315-322
DOI: https://doi.org/10.4038/cjs.v52i3.8071

RESEARCH ARTICLE

Junior Secondary Students' Satisfaction of Basic Psychological Needs and Their Achievement in Physics

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Received: 13.01.2023 ; Accepted: 31.03.2023

Abstract: Self-Determination Theory (SDT) is a broad theory of human development and wellness, with strong implications in education. According to SDT, three psychological needs are essential settings for self-growth, integrity and well-being *viz*., competence, autonomy, and relatedness (CAR). This study investigates the relations of junior secondary students' physics achievement with the satisfaction of their Basic Psychological Needs (CAR). A mixed methods approach was used in the study and selected a convenience sample of 855 junior secondary students and 8 principals in all five educational zones in Jaffna District in the North Province, Sri Lanka. The student related quantitative data were collected using standard Korean Basic Psychological Needs Scale (K-BPNS) with four-point Likert scale and assessment test papers for each Grade. Qualitative data were gathered in interviews from eight principals to explore their views on current situation of physics teaching-learning processes according to the framework for comprehending motivation in SDT. Quantitative data were analysed descriptively using SPSS 20.0. Qualitative data were analysed in narrative analysis. The results revealed that students' satisfaction with BPN (CAR) factors were directly correlated with their achievement in physics. Principals' perception on Reeve's student-teacher dialectical frame is not at a satisfactory level. Thus, this study provides essential information for policymakers on enhancing students' physics achievement at the junior secondary school level.

Keywords: Basic Psychological Needs, Intrinsic Motivation, Physics Achievement, and Self-Determination Theory.

INTRODUCTION

The Self-Determination Theory (SDT) is a new theory of human growth and wellness, with solid implications for education (Ryan & Deci, 2017). It highlights three psychological needs that are essential for self-growth, integrity, and well-being. They are needs for Competence, Autonomy, and Relatedness (CAR). The need for competence is defined as the need to feel good of oneself or not in an activity to produce the desired outcome. The need for autonomy relates to the need to feel one is the owner of her/his behaviour. The need for relatedness refers to the need to feel connected with the rest of the society. The satisfaction of the three needs forms intrinsic motivation. When intrinsically motivated, people are engaging in activities of their interests. They work with a full sense of volition without external rewards or constraints. On the other hand, if the three needs are not satisfied, intrinsic motivation will be weakened.

The motivation is the driving force to actions, desires and needs. Thus, the enhancement of student motivation is important. According to Deci and Ryan (2000), motivation is twofold; that is intrinsic and extrinsic. The simplest distinction between extrinsic and intrinsic motivation is the type of reasons or goals that lead to an action. While intrinsic motivation refers to accomplishment of something as it is inherently interesting or enjoyable, while extrinsic motivation refers to conducting something since it leads to a separable outcome based on external influence. Thus, the extrinsic motivation contrasts with intrinsic motivation, which is performing an activity simply for the enjoyment of the activity itself, instead of for its instrumental value.

While motivation arises from many different sources (e.g., needs, cognitions, emotions, environmental events), it is viewed from a needs-based perspective within the SDT framework; hence, motivation is equated with students' psychological need satisfaction. Hence, students who perceive themselves to be acting with a sense of autonomy, competence, and relatedness during the learning activity experience high-quality motivation, while those who have these three needs neglected or frustrated during the instruction, experience low-quality motivation. The distinction between the two concepts is that motivation is a private, unobservable psychological, neural, and biological process that serves as an antecedent cause to the observable behaviour that is engagement. While motivation and engagement are inherently linked (each influences the other), those who study with motivation are interested in engagement mostly as an outcome of motivational processes, whereas those who study with engagement are interested mostly in motivation as a source of engagement. Hence, motivation is the relatively more private, subjectively experienced cause, while engagement is the relatively more public, objectively observed effect.

Past studies showed that science education in junior secondary level in Sri Lanka is not at an adequate level (NIE, 2017). Teachers play an important role of developing students' passion for learning. SDT has been widely

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adopted in understanding and predicting motivation. However, there is a dearth of studies on key psychological drivers to investigate the relations between such drivers and engagement in physics in Sri Lanka. On the other hand, a comprehensive study has not been conducted to identify key psychological drivers that influence the curiosity of physics education. Thus, the main aim of the present study was to address this gap in the literature by investigating the relations of junior secondary students' satisfaction of Basic Psychological Needs with achievement in physics.

Despite the united efforts of researchers, teachers, and stakeholders to promote motivation in students, there is still a research gap in the relationship between satisfaction of basic psychological needs and students' achievement for physics components in the Sri Lankan context, in particular the junior secondary classes. Thus, this paper sought to understand the learners' Basic psychological need satisfaction and achievement in physics in junior secondary classes. This study looked into individual satisfaction of basic psychological needs in physics learning from the SDT perspective.

Specific objectives of the study are to: (i) find out students' achievement in physics components of junior secondary levels; (ii) measure Competence, Autonomy and Relatedness (CAR) in physics learning in junior secondary Level using Korean Basic Psychological Needs scale; (iii) investigate the relations of Competence, Autonomy and Relatedness (CAR) in physics achievement of Junior Secondary Level; (iv) investigate the relations of Basic Psychological Needs in physics achievement of Junior Secondary Level; (v) explore the perceptions of school principals on junior secondary physics teaching and learning; and (vi) make suggestions to enhance students' meaningful physics learning in Junior Secondary Level.

MATERIALS AND METHOD

A mixed methods approach was utilized, incorporating both qualitative and quantitative data collection and analysis methods. The sample consisted of 89 schools from all five educational zones in the Jaffna District, using a convenience sampling technique. The participants were Tamil-speaking students, as shown in Table 1.

Table 1: The details of the study population.

Student's Grade		Frequency	Percent
6	Female	159	55.0
	Male	130	45.0
	Total	289	100.0
7	Female	150	54.7
	Male	124	45.3
	Total	274	100.0
8	Female	176	60.3
	Male	116	39.7
	Total	292	100.0
	Female	485	56.7
Junior secondary	Male	370	43.3
	Total	855	100

Eight school principals in Jaffna District were selected representing all five educational zones at Northern Province in Sri Lanka. All students were Tamil, and the age range was between 11 and 13 years.

The study was conducted in accordance with ethical guidelines for research involving human participants. Informed consent was obtained from all participants, and their anonymity and confidentiality were maintained throughout the study. They were briefed that their participation was voluntary. Interviews were conducted among the eight principals separately. Students completed the surveys during their regular school hours in March 2021. Before administering the surveys, class teachers were asked to leave the classroom to encourage students to state their honest answers.

The standard Korean Basic Psychological Needs Scale (KBPNS) was administered to measure the students' satisfaction with Basic Psychological Needs. Fifteen items of this instrument were used to measure student autonomy, competence, and relatedness (Deci and Ryan, 2000). For self-report measures, 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. Each subscale consisted of 5 items, corresponding to the needs for Autonomy, Competence, and Relatedness. The student survey contained a physics unit achievement test in multiple-choice responses.

The conceptual framework was constructed as shown below.

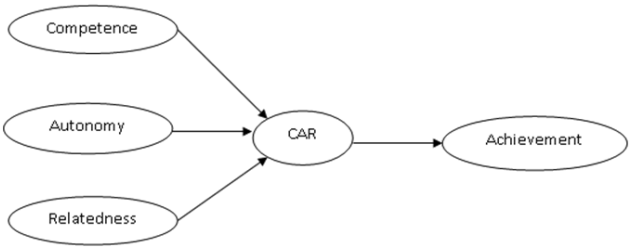

Figure 2: Independent variables and the dependent variable of the study

Quantitative data were analysed using SPSS.20.0. Descriptive analyses were carried out on the data for students' satisfaction with Basic Psychological Needs followed by a reliability test. The correlation between Basic Psychological Needs and Achievement was measured by linear regression (r^2). Narrative analysis was used to analyse qualitative data.

RESULTS AND DICUSSION

Cronbach's alpha is a measure of internal consistency and reliability which is how closely related a set of items are as a group. Alpha coefficients ranged between 0.74 and 0.93 of three factors of the multidimensional questionnaire as shown in Table 2. Therefore, the internal consistency or reliability of those items is excellent (≥0.5) in the questionnaire, and it can be used as a standard instrument of data collection.

Table 2: Internal consistency (Cronbach's α) of the sub-scales of the instrument

Sub scales	Cronbach's Alpha	No. of Items
Competency	0.763	5
Autonomy	0.749	5
Relatedness	0.796	4
Student's CAR	0.929	14

The above Cronbach's alpha values show a high notch of reliability of the instruments used. Based on the specific objectives, the results are presented under each research question. The data cleaning resulted 801 student sample size.

Students' achievement levels in physics in junior secondary classes

Descriptive statistics were computed to measure the mean values of students' achievement in physics. The mean statistics of students' achievement in physics were represented in Table3. The quartile values (first quartile is low level <25%, moderate level 25%-75%, high level >75%) were used to find the low, moderate and high levels of achievements.

Based on the above results mean value of achievement is 56.85, the median is 57 and most students reached 55 marks. However, the mean values were less than the median. Hence, students' achievement was low in physics in the sample. The result shows 72.4% of students remain at low or moderate levels.

Satisfaction levels of students' Competence, Autonomy, and Relatedness

Based on the above results, 27.6%, 27.7% and 29.6% of students show low levels of satisfaction with Competence, Relatedness and Autonomy respectively. 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 with a high level of satisfaction in both Autonomy and Relatedness while showing a high level (34.2 %) of satisfaction with competence. The majority of students' satisfaction showed in moderate level for all factors of CAR.

Table 5: 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 towards a high level.

Table 3: Mean statistics of achievement of physics

	Minimum	Maximum	Mean	Std. Deviation	Median	Mode
Achievement	8	100	56.85	18.738	57	55

Table 4: Cumulative percent achievement of physics

Achievement Level	Frequency	Percent	Cumulative Percent
Low achievement	201	25.1	25.1
Moderate achievement	379	47.3	72.4
High achievement	221	27.6	100.0
Total	801	100.0	

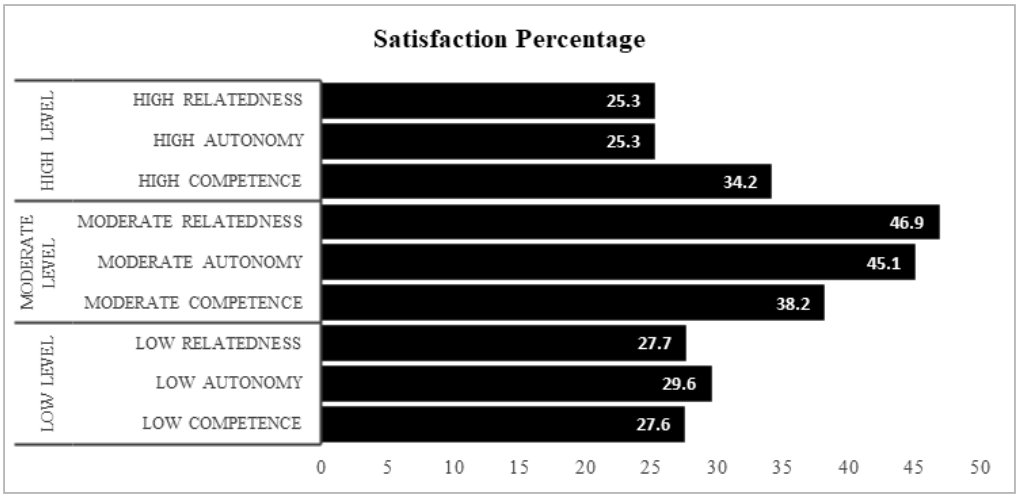

Figure 2: Student satisfaction levels of Basic Psychological Needs (BPN)

The relations of students' competence, relatedness, and autonomy with the achievement of physics students

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

	Achievement	Autonomy	Competence
Autonomy	0.188**		
Competence	0.222**	00.936**	
Relatedness	0.178**	0.959**	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 99% confidence level. Since the correlation coefficient is much greater than 0, it can be concluded that there is a positive and meaningful relationship between academic achievement and satisfaction in autonomy, competency, and relatedness.

Satisfaction levels of students' satisfaction with Basic Psychological Needs, Competency, Autonomy and Relatedness (CAR)

Table 7: Level of satisfaction of Competency, Autonomy and Relatedness (CAR).

Level of satisfaction with CAR	Frequency	Percent	Cumulative Percent
Low CAR	225	28.1	28.1
Moderate CAR	347	43.3	71.4
High CAR	229	28.6	100.0
Total	801	100.0	

Based on the above results, 28.1% of students show a low level of satisfaction with CAR, and 28.6% of students have a high level of satisfaction with CAR. The majority of students' satisfaction shows a moderate level of CAR (43.3%).

The relations between students' satisfaction with Basic Psychological Needs (CAR) and achievement of physics

The results reveal that the achievement of physics is linearly associated (r=.218) with students' satisfaction with CAR and is significant at 99% confidence level. Below table 8 shows the statistics of r^2.

The linear correlation coefficient of 0.218 measures the degree of relationship between the satisfaction of CAR and the predicted value achievement of the student. The Coefficient of Determination R-square measures the goodness-of-fit of the estimated Sample Regression Plane (SRP) in terms of the proportion of the variation in the dependent variables explained by the fitted sample regression equation. Thus, the value of R square is 0.048 simply means that about 4.8% of the variation in student achievement in physics is explained by student satisfaction with Basic Psychological Needs and the R square value is significant at the 99% level.

This finding shows association with the SDT's assumption that situational school context influences satisfaction of the needs wellbeing (Ryan & Deci, 2017) where wellbeing means flourishing or fully functioning. They also explained that full functioning of students is determined by mainly two factors such as development factors temperament, intellectual abilities, etc. or social situation factors motivational style of teachers, parenting styles, etc. Some other studies showed that need satisfaction is related to states of feelings of vitality (Carmignola *et al*., 2021), general life satisfaction, hope, and internal locus of control (Huebner & Gilman, 2006) gratitude and positive mood (Tian *et al*., 2014) lower stress (Li *et al*., 2019).

Christenson (2012) showed the association of satisfaction of psychological needs in the classroom is academic engagement. However, the contribution of each need to student achievement is unclear as the results of various studies are contradictory. Some researchers showed that satisfaction of the need for autonomy and competence is associated with higher academic engagement and achievement (Jang *et al*., 2009). Some studies showed that the satisfaction of the three basic psychological needs do not affect academic achievement (Olivier *et al*., 2020). Therefore, following the SDT postulate, a student with higher need satisfaction in the classroom may have a greater sense of academic achievement (Richard M Ryan & Deci, 2017). Motivation, well-being, engagement, or academic achievement during the junior secondary school period is crucial to students' success in their later educational experiences.

Qualitative results

The researcher concentrates on a narrative analysis method for interviews and focuses on group interviews. Following Start's model (Start, n.d.), narrative analysis was used for

Table 8: The values of r^2 in satisfaction of BPN (CAR) and achievement

Independent variable	Dependent variable	r^2 (effect size)
Students' CAR	achievement	0.047

Variables	Unstandardized coefficient (B)	SE of B	Standardized coefficient (Beta)	t-value	p-value
Constant	40.083	2.998		13.372	0.000
Students' CAR	5.514	0.962	0.199	5.729	0.000

interview data. Thus, the following two tables were formed. The arrangement of the data in a manageable format was constructed as the first step to facilitate the process of assigning codes and themes to sections of the transcript. Accordingly following grid was constructed. The five acts (Reeve, 2002) as the codes of the focus group interview and interviews. Moreover, an observation schedule as a standard Rating Sheet Score Autonomy-Supportive Instructional Behaviours (Reeve, 2016) was used to Score Autonomy-Supportive Instructional Behaviours of prospective teachers.

Perceptions of Principals regarding physics learning in junior secondary classes

According to the proposed student-teacher dialectical framework embedded within SDT, the codes were formulated as each act shown below in the table 8.

According to the above grid following table 9 indicates the narrative summary of the perception of principal interviews.

Principals' interview analysis

The aforementioned five acts were analysed as codes and summarized narratives as given in the table 9.

Table 8: Reeve's five acts

Code number	Act	Purpose
1	Vitalise inner motivational resources	• Foster intrinsic motivation, self-endorsed goals & values • Preference for optimal challenge • Foster a sense of curiosity
2	Use of informational, non-pressurizing language	• Non-evaluative, flexible & informational
3	Provide explanatory rationales	Importance, personal significance & value
4	Display patience	• Display patience in monitoring students' work • Display patience & change problem-solving
5	Acknowledge & accept negative affect	• Appreciate student's perspective • Create opportunities to restructure an unappealing lesson

Table 9: Narrative summary of perception opening code of principals

Reeve's acts	**Principal 1**		**Principal 2**		**Principal 3**		**Principal 4**		**Principal 5**		**Principal 6**		**Principal 7**		**Principal 8**		**Total**		**Conclusion**
	Strength	Barrier	Strength	Barrier	Strength	Barrier	Strength	Barrier	Strength	Barrier	Strength	Barrier	Strength	Barrier	Strength	Barrier	Strength	Barrier	
Vitalise inner motivational resources		X		X	X			X		X	X			X	X		3	5	Barrier
Use of informational, non-pressurizing language	X			X	X			X	X		X		X		X		6	2	Strength
Provide explanatory rationales		X		X	X			X		X		X		X		X	1	7	Barrier
Display patience		X		X	X			X		X	X		X		X		4	4	Not decided
Acknowledge & accept negative affect		X		X		X		X		X		X		X		X	-	8	Barrier

Principals' opinion regarding physics teaching and learning in junior secondary classes has barriers. However, the second act such as the use of informational, non-pressurizing language showed strength and the fourth act display of patience is neutral. Most respondents satisfied only one act among five acts. Thus, qualitative results are closely associated with quantitative results.

The qualitative and quantitative results presented in the study offer valuable insights into the learning and teaching of physics in junior secondary classes in Jaffna district. The quantitative data shows that the majority of students achieved only moderate levels of achievement in physics components. On the other hand, the qualitative data obtained from the focus group interviews with school principals provides a deeper understanding of the factors that contribute to student learning and achievement in physics.

The Reeve's acts grid in the qualitative data provides a snapshot of the perceptions of school principals regarding the different strategies used in teaching physics. For instance, principals 1, 2, 4, 5, and 7 identified the need to vitalize students' inner motivational resources as a key strength in teaching physics. This aligns with the self-determination theory, which highlights the importance of providing opportunities for students to develop intrinsic motivation to learn.

The following Interview questions and responses supported to the above theme from the principal responses.

What would be the opinion regarding students vitalise inner motivational resources in teaching and learning physics components of science in our junior secondary schools?

Nice questions, I really expected but teachers do not do it.

(PRIN/Focus group interviews/16/01/22/ques1/P2)

Mm. I propose that in our every staff meeting.

(PRIN/Focus group interviews/16/01/22/ques1/P4)

I think it is not in satisfactory level.

(PRIN/Focus group interviews/16/01/22/ques1/P5)

Yeah, it is not happening because of our larger size of class.

(PRIN/Focus group interviews/16/01/22/ques3/P1)

I think not enough.

(PRIN/Focus group interviews/16/01/22/ques3/P7)

In contrast, principals 1, 2, 4, 5, 6, 7, and 8 identified the use of explanatory rationales as a potential barrier to learning physics. This suggests that the way explanations are provided to students may need to be revised to improve learning outcomes. The following Interview questions and responses supported to the above theme from the principal responses.

Do you believe that your science teachers provide explanatory rationale? (Consider Importance, personal significance & value of students.)

Yeah, it is not happening because of our larger size of class. (PRIN/Focus group interviews/16/01/22/ques3/P1)

Wow, I really expected but teachers do not do it. (PRIN/Focus group interviews/16/01/22/ques3/P2)

Mm. I propose but it is not happening. (PRIN/Focus group interviews/16/01/22/ ques3/P4)

I think it is not in adequate level. (PRIN/Focus group interviews/16/01/22/ ques3/P5)

Our teachers do it but not in well. (PRIN/Focus group interviews/16/01/22/ ques3/P6)

I think not enough. (PRIN/Focus group interviews/16/01/22/ques3/P7)

Fairly happening in our schools. (PRIN/Focus group interviews/16/01/22/ ques3/P8)

There is a clear link between the quantitative and qualitative data obtained in the study. For example, the need to vitalize students' inner motivational resources is an important factor identified in both the quantitative and qualitative data. The self-determination theory suggests that providing students with opportunities for autonomy, relatedness, and competence can enhance intrinsic motivation and promote meaningful learning. The quantitative data indicates that autonomy, relatedness, and competence are important factors associated with student achievement in physics. The qualitative data provides insights into how school principals perceive the implementation of strategies that promote autonomy, relatedness, and competence.

In order to enhance meaningful learning in physics, it is important to consider the findings of both quantitative and qualitative data. One way of achieving this is by promoting self-determination in the classroom by providing opportunities for autonomy, relatedness, and competence. Teachers can use informational, non-pressurizing language to explain concepts and offer students the opportunity to ask questions and engage in discussions. Additionally, teachers can provide clear and detailed explanations that align with students' learning needs and backgrounds. Patience, positive feedback, and acknowledgment of negative emotions can also create a positive learning environment that fosters intrinsic motivation.

In conclusion, combining quantitative and qualitative data provides a more comprehensive understanding of the factors that affect student learning and achievement in physics. By integrating the insights from both types of data, teachers and educational policymakers can design more effective strategies to enhance meaningful learning in physics.

Constructive suggestions to enhance meaningful learning in physics in junior secondary in Sri Lanka

The quantitative part of the study examined the relationship between students' satisfaction of basic psychological needs and physics achievement. On the other hand, the qualitative part of the study explored the perceptions of school principals regarding the implementation of

effective teaching-learning processes in physics. Based on these results, several suggestions can be made to enhance students' meaningful learning in physics. The positive relationship between students' satisfaction of basic psychological needs and physics achievement suggests that students who feel that their basic psychological needs are met tend to achieve better in physics. This finding suggests that if students' basic psychological needs are met in the physics classroom, they are more likely to perform well in the subject. When these needs are met, students feel motivated to learn and achieve. Therefore, teachers should strive to create a learning environment that fosters students' autonomy, competence, and relatedness.

To enhance students' autonomy, teachers can offer students choices in their learning. For example, teachers can offer multiple ways for students to demonstrate their understanding of a concept, such as through written assignments, presentations, or experiments. Students can also be involved in setting their learning goals and selecting topics to study. By giving students control over their learning, teachers can help them feel more engaged and motivated. Professional development programmes for physics teachers should be organized to improve their teaching skills and to keep them updated with the SDT based teaching techniques.

To foster students' competence, teachers can provide opportunities for students to experience success. This can be accomplished by setting achievable goals, providing feedback, and offering support when needed. Teachers can also provide challenging tasks that allow students to stretch their abilities and develop new skills. By helping students feel capable, teachers can increase their motivation to learn and achieve.

In order to enhance students' relatedness, teachers can create a sense of community in the classroom. This can be achieved by encouraging collaboration and teamwork among students. Teachers can also provide opportunities for students to connect with others who share their interests in physics. By fostering positive relationships among students, teachers can help them feel connected and supported in their learning.

The findings of the qualitative study revealed that school principals perceived insufficient implementation of effective teaching-learning processes in physics. It suggests that there is a need for professional development programmes for teachers to improve their teaching skills according to conduct Reeve's five acts to enhance motivation among students in physics.

In conclusion, the findings of this study suggest that enhancing the quality of teaching and learning process in physics education requires a multi-level approach. At the institutional level, schools should establish policies and procedures to ensure effective implementation of teaching-learning process. Moreover, schools should provide teachers with professional development opportunities to enhance their content knowledge, teaching skills, and pedagogical practices based on the SDT. At the classroom level, teachers should strive to create a classroom environment that supports students' autonomy, competence, and relatedness.

CONCLUSION

This study found a positive correlation between students' satisfaction with their basic psychological needs and their achievement in physics in junior secondary classes. To improve students' intrinsic motivation, teachers should focus on creating a positive classroom environment and using a student-teacher dialectical framework embedded within SDT. This can be achieved through improved teacher education and school-based teacher development programmes, as well as providing schools with standard sets of frameworks and self-learning materials in physics and digital infrastructure. As the study was limited to Jaffna District in Sri Lanka findings cannot be generalized nationally or internationally. Hence, future research with larger sample sizes and longitudinal studies can provide more insights into effective teaching practices in physics.

ACKNOWLEDGEMENT

This study was self-funded. Our special thanks offer to the Northern Provincial Director of Education for permitting us to conduct the study. Our sincere thanks are also to all principals, students who consented to participate in this study and to the anonymous reviewers for their constructive comments.

DECLARATION OF CONFLICT OF INTEREST

The authors declare that there are no conflicts of interests.

REFERENCES

Carmignola, M., Eckes, A., Gromann, N., Martinek, D., Wilde, M. & Bieg, S. (2021). *University Students 'Basic Psychological Needs , Motivation , and Vitality Before and During COVID-19 : A Self-Determination Theory Approach*. ***12***(November). https://doi.org/10.3389/fpsyg.2021.775804

Christenson, S. L., Wylie, C. & Reschly, A. L. (2012). Handbook of Research on Student Engagement. In *Handbook of Research on Student Engagement*. https://doi.org/10.1007/978-1-4614-2018-7

Huebner, E. S. & Gilman, R. (2006). Students Who Like and Dislike School. *Applied Research in Quality of Life*, ***1***(2), 139–150. https://doi.org/10.1007/s11482-006-9001-3

Jang, H., Reeve, J., Ryan, R. M. & Kim, A. (2009). Can self-determination theory explain what underlies the productive, satisfying learning experiences of collectivistically oriented Korean students? *Journal of Educational Psychology*, ***101***(3), 644.

Li, C., Ivarsson, A., Lam, L. T. & Sun, J. (2019). *Basic Psychological Needs Satisfaction and Frustration , Stress , and Sports Injury Among University Athletes : A Four-Wave Prospective Survey*. ***10***(March). https://doi.org/10.3389/fpsyg.2019.00665

National Report, National Assessment of Achievement of Students Completing Grade 8 in Year 2016 in Sri Lanka (Ministry o, Issue May). (2017). Ministry of Education, Sri Lanka and National Education Research and Evaluation Centre (NEREC) Faculty of Education,

University of Colombo, Sri Lanka.

Olivier, E., Archambault, I. & Dupéré, V. (2020). Do needs for competence and relatedness mediate the risk of low engagement of students with behavior and social problem profiles? *Learning and Individual Differences*, ***78***, 101842.

Reeve, J. (2002). Self-determination theory applied to educational settings. *Handbook of Self-Determination Research*, ***2***, 183–204.

Reeve, J. (2016). Autonomy-supportive teaching: What it is, how to do it. In *Building autonomous learners* (pp. 129–152). Springer.

Ryan, R. M. & Deci, E. L. (2017). School as contexts for learning and social development. In *Self-determination theory: Basic psychological needs in motivation, development, and wellness* (pp. 351–381). Guilford Publications New York, NY.

Ryan, Richard M. & Deci, E. L. (2017). *Self-Determination Theory* (Richard M. Ryan Edward L. Deci (Ed.)). The Guilford Press,A Division of Guilford Publications, Inc.

Ryan, Richard M. & Deci, E. L. (2017). Relationships motivation theory: The self in close relationships. In *Self-determination theory: Basic psychological needs in motivation, development, and wellness* (pp. 293–318). Guilford Publishing.

Start, S. H. (n.d.). *Introduction to Data Analysis Handbook*.

Tian, L., Chen, H. & Huebner, E. S. (2014). The Longitudinal Relationships Between Basic Psychological Needs Satisfaction at School and School-Related Subjective Well-Being in Adolescents. *Social Indicators Research*, ***119***(1), 353–372. https://doi.org/10.1007/s11205-013-0495-4