Manatti: Journal of Multi-disciplinary Research
Vol. 2 No. 1 (2026) 25-29

Advancing Physics Education in Junior Secondary Classes: A Self-Determination Theory Analysis of Stakeholder Perspectives in Jaffna District, Sri Lanka

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Abstract:
Establishing academic rigor through a transparent methodological framework is essential for validating the complexities of educational reform. This study investigates the perspectives of key educational stakeholders on improving physics education within junior secondary classes in the Jaffna District, Sri Lanka. Adopting a qualitative research design rooted in Interpretive Phenomenology, the research explores the alignment between instructional practices and the psychological nutriments of the learner. A purposive sample of 25 stakeholders comprising 3 Science In-Service Advisors (ISAs), 8 School Principals, 10 Parents, and 4 out of 5 Zonal Directors of Education (ZEs) provided a comprehensive view of the regional educational landscape. Data were collected via semi-structured interviews and focus group discussion utilizing the Autonomy supportive instructional practices as a guiding protocol and analyzed through Reflexive Thematic Analysis at a semantic level. The findings reveal a pervasive "controlling" environment driven by systemic exam-oriented pressures, which thwarts students' basic psychological needs for autonomy and competence. The study highlights an urgent need for professional development in autonomy-supportive pedagogy to transition from a culture of compliance to one of scientific curiosity.

Keywords: Physics education, junior secondary level, intrinsic motivation, autonomy-supportive teaching, stakeholder perspectives

Received 25 December 2025, Accepted 05 March 2026

DOI: https://doi.org/10.4038/manatri.v2i1.4

1. INTRODUCTION AND PROBLEM STATEMENT

Physics education serves as a foundational pillar of the secondary curriculum, equipping students with the analytical tools necessary for scientific inquiry and critical thinking. In the 21st-century educational landscape, the strategic cultivation of student motivation is paramount; modern curricula must move beyond rote memorization to empower learners who are capable of innovation and self-directed problem-solving.

Every school has a formal discipline policy. Schools want to create an environment in which effective teaching and learning can take place. If we flip through the pages of any school's discipline policy, we can find a socially engineered framework designed to (a) communicate values and priorities, (b) establish rules and norms, (c) foster learning, (d) identify inappropriate behaviour and its consequences, and (e) recognize and celebrate appropriate behaviour. A discipline policy typically originates with a list of core values, such as those for safety (physical, social, emotional), tolerance (acceptance of diversity), respect (treat others as you would like them to treat you), and excellence (work to fulfil one's potential). It continues with a list of rules designed to discriminate appropriate from inappropriate behaviour. As students walk down the hallway of almost any school, they will likely see posters that identify both what these appropriate behaviours are (and their rewards) and what these inappropriate behaviours are (and their punishments) (Reeve et, al., 2022).

Like the school, the teacher wants to create an environment in which effective teaching and learning can take place, and, like the school, the teacher wants all students to experience security, acceptance, support, and multiple opportunities for wellness and achievement. Thus, teachers follow the school's lead to establish and communicate rules, norms, values, and appropriate ways of behaving (i.e., a discipline policy for the classroom) ((Reeve et, al., 2022).
Teachers are in a daily struggle to energize and direct students to engage in learning, using techniques and strategies that clearly vary in their effectiveness. So far compared to the efforts focused on developing curricula and developing tests to assess student competencies, much less emphasis has been given to research in motivation (Liu et, al., 2016). Thoughtful

the role of motivation in human behaviour is especially important as we educate our children and prepare them to be the self-directed and lifelong learners of the twenty-first century. Yet, there are still gaps in our understanding of how to catalyse motivation in our schools, classrooms. Especially, it can be done to translate research findings into real-life applications (Earl, 2019).

The primary challenge in the Jaffna District lies in the tension between "socially engineered" discipline frameworks and the psychological necessity of internal motivation. While current school policies are designed to regulate behavior through rules, rewards, and punishments, these external structures often prioritize compliance over the development of an internal "fire." As Liu et, al. (2016) suggests, if "education is the lighting of a fire," then motivation is the torch that must sustain it. Current educational efforts in Sri Lanka have focused heavily on curriculum and standardized testing, yet they often neglect the psychological drivers of the learner. This inquiry employs Self-Determination Theory (SDT) to evaluate the "So What?" factor: how the current shift toward high-stakes testing may be extinguishing the very curiosity the curriculum seeks to foster.

2. THEORETICAL FRAMEWORK: SELF-DETERMINATION THEORY (SDT)

Self-Determination Theory (SDT) offers a superior lens for analyzing educational engagement because it focusses on the innate psychological needs that facilitate human growth. SDT posits that optimal learning occurs when the environment supports three Basic Psychological Needs (BPNs) and Satisfaction of these needs enhances intrinsic motivation and engagement in learning (Ryan & Deci, 2000):

1. **Autonomy:** The need to experience volition and feel like the origin of one's actions.
2. **Competence:** The ambition to feel effective and capable within a learning task.
3. **Relatedness:** The desire for meaningful social connection and a sense of belonging.

Research has shown that classrooms that support students' psychological needs for autonomy, competence, and relatedness are associated with higher levels of intrinsic motivation, engagement, and academic performance (Niemiec & Ryan, 2009) and Junior secondary physics achievement directly correlated with their satisfaction of basic psychological needs (Vijayakumaran et, al., 2023).

SDT has been used to predict the beneficial versus harmful downstream motivational effects of rewards (Deci et, al., 1999), praise (Henderlong & Lepper, 2002; Ryan, 1982), rules (Koestner et, al., 1984), feedback (Vallerand & Reid, 1984), and competition (Reeve & Deci, 1996). Teachers introduce many different "social and environmental events" to effect a change in their students' motivation and engagement. Because teachers often focus their instruction on a goal of sparking and maintaining students' engagement (rather than motivation per se). Engagement refers to the extent of a student's active involvement in a learning activity (Christenson et, al., 2012).

The main contribution of the theory is to point out that it is not the instructional event itself (e.g., reward, praise, and rule) that motivates or demotivates. The classroom application of SDT centers on the distinction between "informational" and "controlling" events (Niemiec & Ryan, 2009). Instructional events like feedback, praise, or rules are not inherently demotivating; rather, it is the student's *perception* of these events that determines their impact. When an event is perceived as informational, it catalyzes motivation by providing the data needed to master a task. Conversely, when it is perceived as a "controlling" pressure to think or behave in a specific way, it thwarts the student's BPNs. In Jaffna, stakeholders from Zonal Directors to parents play critical roles in determining whether the physics classroom functions as an informational catalyst or a controlling barrier.

However, the effectiveness of physics teaching and learning significantly depends on the collaboration and insights of various stakeholders such as in-service advisors, parents, zonal education directors, and school principals. Understanding their perceptions can provide valuable insights into challenges and opportunities within the learning environment, which can lead to targeted and effective interventions.

Role of In-Service Advisors

In-service advisors are pivotal in identifying gaps in teaching strategies and providing professional development to teachers. Their perception regarding teaching challenges can help tailor teacher training programs to address specific difficulties in delivering physics concepts effectively (Darling-Hammond et al., 2017).

Involvement of Parents

Parents' attitudes toward their children's physics education significantly impact student motivation and engagement. Parental perceptions can shed light on how home environments support or hinder learning, enabling schools to bridge gaps between classroom instruction and parental support (Fan & Chen, 2001).

Contribution of Zonal Education Directors

Zonal education directors play a critical role in resource allocation and policy implementation. Their perceptions about systemic challenges, such as resource shortages and curriculum misalignments, can guide strategic decisions to enhance the physics learning process (Fullan, 2016).

Leadership of School Principals

School principals influence the overall teaching and learning environment. Their insights into school culture, teacher competency, and student performance can help implement school-level initiatives to improve physics education outcomes (Leithwood & Jantzi, 2005).

Engaging all these stakeholders ensures a holistic approach to addressing challenges in physics education. By integrating their perceptions, schools can foster a supportive ecosystem that enhances teaching quality and student achievement. By identifying the barriers and opportunities in physics education, this study aims to provide evidence-based

recommendations for addressing systemic issues and enhancing teaching and learning practices.

Objective of the study is to explore stakeholder perceptions of the current challenges and opportunities in teaching and learning physics at the junior secondary level in the Jaffna District. To achieve the objectives this study investigates stakeholder perspectives on physics education through the following research questions:

1. **RQ1**: What are the perceived barriers to intrinsic motivation and curiosity in physics education?
2. **RQ2**: How do stakeholders view the application of autonomy-supportive instructional behaviours in teaching?
3. **RQ3**: What strategies can enhance autonomy, competence, and relatedness in junior secondary physics education?

3. METHODOLOGY

This study utilizes a qualitative approach to capture the nuanced, lived experiences of stakeholders within the specific regional context of the Jaffna District. Qualitative inquiry is essential here, as it reveals the systemic pressures and human perceptions that quantitative metrics frequently overlook.

3.1 Research Design and Data Transformation

To ensure transparency in the data transformation process, the study employs an Interpretive Phenomenological Analysis (IPA) design to capture the lived experiences of the participants. The analytic method utilized was Reflexive Thematic Analysis. The coding process was strictly inductive, allowing themes to emerge directly from the data without being forced into pre-existing categories. Analysis was conducted at the semantic level, prioritizing the explicit meanings of the participants' words to maintain the integrity of their authentic voices.

3.2 Participant Profile

The following Table 1 summarizes the stakeholder groups involved in the study:

Table 1. Participants and Strategic Contribution to Study

Participant Group	Strategic Contribution to Study
Science In-Service Advisors (ISA) (properly appointed)	Expertise in teacher guidance and identifying professional practice gaps.
School Principals	Insights into administrative leadership and instructional culture.
Parents	Perspectives on home-school alignment and student engagement levels.
Zonal Directors of Education (ZE)	Policy-level understanding of systemic resource allocation and district pressures.

Samples were selected using purposive sampling, ensuring representation from key administrative and instructional stakeholders across all five educational zones of the Jaffna District (Island, Jaffna, Thenmarachi, Vadamarachi, and Valikamam) (Table 2). The rationale for selecting participants from multiple zones was to capture contextual diversity within the district, including variations in school resources, student demographics, and instructional practices. The sample composition is presented in Table 2.

Table 2. Samples

Zone	Zonal Director	In-Service Advisor	Principal	Parent
Island	1	Nill	1	2
Jaffna	1	1	3	2
Thenmarachi	1	Nill	1	2
Vadamarachi	1	Nill	1	2
Valikamam	–	2	2	2
Total	**4**	**3**	**8**	**10**

Principal sample was selected proportional to the number of schools because principals play a central role in instructional leadership and school-level implementation of pedagogical practices. The inclusion of parents provided an additional perspective on student motivation and learning behaviours outside the classroom. All zonal directors in the district were invited to participate to ensure policy-level representation. Although all initially agreed, one zonal director was unable to participate due to administrative constraints. Only three science In-Service Advisors were properly appointed in Jaffna district, and they cover their duty to other Zones too.

3.3 Data Collection Procedures

All interviews and focus group discussions were conducted by the researcher using pre-validated semi-structured protocols. Prior to data collection, participants were informed about the purpose of Study, confidentiality assurances, and voluntary participation. Written or verbal consent was obtained.

- Individual interviews with zonal directors were conducted at mutually convenient times and lasted approximately 45–60 minutes and audio-recorded with permission.
- Focus group discussions with principals and ISAs lasted approximately 60–90 minutes and were facilitated to ensure balanced participation and audio-recorded with permission.
- Parent interviews were conducted via Zoom and audio-recorded with permission.

All sessions were audio-recorded and later transcribed verbatim.

3.4 Data Analysis

Qualitative data were analysed using thematic analysis, following the six-phase framework proposed by Braun and Clarke (2006). This approach was selected due to its flexibility

and suitability for identifying patterns of meaning across diverse participant groups.

The analysis follows these steps:

1. Familiarisation with the data through repeated reading of transcripts.
2. Generation of initial codes by identifying meaningful units related to SDT constructs and instructional practices.
3. Development of a coding framework, recorded systematically in a qualitative codebook.
4. Searching for themes by clustering related codes.
5. Reviewing and refining themes to ensure coherence and relevance.
6. Defining and naming themes and integrating them into a coherent analytical narrative.

The analysis is structured according to the framework for qualitative analysis outlined in the *Data Analysis Handbook* (Academy for Educational Development, 2006), The complete coding framework, sample coded transcripts, and theme development tables are provided, ensuring transparency and auditability of the qualitative analysis.

4. RESULTS AND THEMATIC ANALYSIS

The validity of qualitative research is grounded in the direct voices of its participants. In this study, stakeholders provide a stark look at the barriers currently facing physics education.

Research Question Findings

- **RQ1: Barriers to Intrinsic Motivation:** Stakeholders identified a pervasive focus on exams as the primary inhibitor of curiosity. Principals and Zonal Directors explicitly stated that "learning is decided by exam orientation," noting that societal expectations redirect curiosity away from inquiry and toward test results.
- **RQ2: Autonomy-Supportive Behaviors:** Findings revealed a significant lack of student agency. A parent remarked, "Teachers make all decisions during lessons because of the large curriculum," illustrating how time pressure forces teachers into "controlling" instructional styles that restrict student choice.
- **RQ3: Strategies for Enhancement:** Stakeholders advocated for a shift toward diversified, performance-based assessments. One parent observed that student "self-confidence in completing physics tasks is low" because the current system fails to value practical, hands-on competence over written exams.

4.1 Thematic Map: The Hierarchy of Motivation in Jaffna

The following map illustrates the interconnectedness between systemic barriers and psychological outcomes:

- Main Theme 1: Barriers to Intrinsic Motivation
  - Sub-theme: Exam-oriented Pressure
    - First-order code: Priority on results over creative exploration.
    - First-order code: Societal expectations for high marks.
  - Sub-theme: Pedagogical Stagnation
    - First-order code: Underutilization of practical methods.
    - First-order code: Failure to provide explanatory rationales.
- Main Theme 2: Thwarted Basic Psychological Needs
  - Sub-theme: Controlled Autonomy
    - First-order code: Teacher-dominated decision making due to curriculum size.
  - Sub-theme: Deficit in Competence Perception
    - First-order code: Reliance on written tests over performance tasks.

Connection Analysis: The map demonstrates that the barriers identified in Theme 1 directly lead to the thwarted needs in Theme 2. Specifically, the systemic focus on exam results (Barrier) creates a classroom environment where teachers prioritize curriculum coverage over student agency, thereby frustrating the student's need for Autonomy and Competence.

4.2 Discussion and Synthesis

The findings from the Jaffna District reflect a microcosm of the broader Sri Lankan educational landscape. The "So What?" of this research is clear: the lack of autonomy-supportive behavior is not merely a pedagogical choice but a systemic failure. Zonal Directors and Principals act as the systemic gatekeepers of this culture. When Zonal Directors prioritize district-wide test scores, they create a "controlling" environment that trickles down. Principals, under pressure to show results, then prioritize curriculum coverage over curiosity, which forces teachers to adopt controlling behaviors that frustrate the BPNs of the students.

While this study offers deep insights from those who manage the system, it is limited by the absence of direct student voices. Furthermore, the reliance on stakeholder interviews introduces the potential for response bias, where participants may provide socially desirable answers regarding their own practices (Podsakoff et al., 2003).

5. CONCLUSION AND STRATEGIC RECOMMENDATIONS

Advancing physics education in the Jaffna District necessitates a move toward systemic reform over isolated classroom changes. The current exam-oriented culture acts as a structural barrier that prevents the "lighting of the fire" required for 21st-century scientific excellence.

5.1 Strategic Recommendations:

- **Professional Development:** Launch district-wide initiatives to train teachers in autonomy-supportive instructional behaviors, emphasizing "informational" rather than "controlling" language.
- **Assessment Reform:** Shift toward a balanced model that includes performance-based evaluations, allowing

students to demonstrate competence through practical application.

- **Curriculum Adaptation:** Empower teachers to restructure unappealing lessons to align with student interests, fostering a sense of relatedness and volition.

By fulfilling the innate needs for autonomy, competence, and relatedness (Ryan & Deci, 2017, 2020), the Jaffna District can transform physics from a subject of memorization into a journey of discovery.

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