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### System Dynamics of School Classroom Dynamism: A Complexity Understanding

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#### Abstract

Classroom is a formal systemic unit integrating with conscious teacher and student activities. The rationale of this paper was to present the complexity understanding as an alternative to linear systemic view to classroom context. The objective of this paper was to explore the nature of classroom dynamism under the complex system dynamics. Methodologically, it is based on the comprehensive literature review. It has discussed the influential dynamics which make classroom human subjects act, interact, and change their behaviour. It has explored the micro to macro systems that influence the didactic interaction system of teacher and student. It has analysed the interplay of the proximal and distal systemic dynamics which are to be regarded as inherent forces from complexity paradigm of a study. The core idea flowing in the paper is making meaning of the dynamism and dynamics of classroom interaction that obviously occurs in complex systemic context. It implies to accommodate complexity responding classroom research methodologies and pedagogical approaches that are expected to function in a compatible manner.

**Keywords:** Classroom interaction, complex system, pedagogical transformation, complexity paradigm

#### Introduction

A child, formally enrolled into a school, is usually brought up in an informal setting of family and community. The child entered school system from family context, and becomes student, gets tied up with classroom teacher in the sense of academic relation with a formal system. The interacting behaviour between them deeply influence on their behaviours where an implicit learning occurs without conscious knowledge. The formal relation between teacher and student gradually reduces their spontaneous role and behaviour. There is education in essence of consciousness. Education, in formal sense, is man-constructed and planned. As Rousseau (1979) believed the nature, men, and things are three sources

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of education that widens the meaning of and the interaction for education. As argued by him, everybody is brought up through these three masters (Rousseau, 1979). They are regarded as masters from their own positions; and the interaction among them creates complex systemic context for teacher and student. Then, the classroom becomes the space of a relational context of complexity (Burns & Knox, 2011) where learning from man is focused to cultivate the culture of formal education which has been nurtured by the society. It is the learning space of student within a complex formal school system. The student's academic terrains of knowledge start under the system along with teacher through a formally constructed course for learning where a constant interaction between them is expected to be. The goal of learning unites them as they share this space as a classroom (Carroll & Taylor, 1998). The dyadic relation of the teacher and student is directed and redirected by the classroom system and complex system of the systems that exist as micro, meso, exo, and macro systems (Bronfenbrenner, 1979). Hence, the context of classroom system is in evolving and self-organizing space of complex systemic phenomenon to be conceived.

Throughout the paper, the dynamics and dynamism of the classroom interaction have been dealt as two interactive dimensions. The interactive classroom journey of the teacher and student is interwoven process to the dynamics and dynamism. The dynamism is the concept to understand teacher and student interaction which changes over the time; whereas the dynamics is programmed, symbolic, and indirect, but ultimate elements to the interaction. The first concept informs to understand the classroom interactive behavior is continue and constant process of change. The latter concept refers to the forces exerting the dynamism. Hence, author argues in this paper that the linear causal systemic understanding requires to shift to the complexity understanding to study the classroom behavioral activities which are interwoven into the interplay of classroom systemic dynamics.

This paper is to contribute to the transformation of conceptual understanding of the traditional approach to conceive the classroom context which believes linear causal relationship of systemic phenomenon. It presents the nature of complexity that opposes the assumptions of traditional linear causal system to understand classroom phenomena. The author justifies the relevance of the complexity perspective to understand the holistic classroom system without reducing it into a part and linearity concept. The paper signifies to replace the traditional systemic view in the field of classroom research and evaluation practices. It tends to hint at complexity consciousness in dealing with classroom phenomena, formulating policy for classroom pedagogy, and designing instructional program. It also intends to inform the classroom researcher to plan and develop research methodology with the consciousness of the classroom complexity being a responsive to the unavoidable nature of the complexity.

The concern of this paper is to deal with the understanding of the classroom dynamics and systemic complexity of the school classroom system. The interaction of teacher, student, and systemic forces is not static concept to understand the classroom phenomena. Evolving understanding leads the knowledge community closer to the reality of the classroom

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functioning which is complex to understand. Constructing the alternative understandings is a spontaneous process in the scholarly thinking that opens a new concept to question traditional systemic view. In this ground, the objective of this paper is to explore a nature of classroom complexity and dynamism by critically analysing and synthesising the information obtained from existing scientific literature which is expected to become a new perspective asset to the classroom researchers.

### **Methods and Procedures**

This paper is based on the comprehensive literature review (CLR) method that consists of exploring topics/beliefs, initiating the search, storing and organising information, selecting/deselecting information, expanding the search, analysing/synthesising information, and preparing paper (Onwuegbuzie & Frels, 2016). The review method tends to be a pragmatic philosophical stance to deal with the ontology and epistemology. The review contains the concepts, theories, and perspectives on complex dynamic classroom system which helps to understand and make meaning of the classroom dynamism. Hence, relevant literature related to the problem was searched through google scholar and authentic websites using keywords. The themes generated from the explored literature are taken as the bases of this research paper to organise the information meaningfully.

### **Results and Discussion**

Classroom is a formal setting that functions with the ecological systems which consists of proximal and distal layered of the systems (Bronfenbrenner, 1979). The teacher and student are didactic actors within the system. The paper discusses the classroom interaction which is regarded as micro level interaction participating teacher and students. The macro level interactional dynamics, like teacher training, national policy and other, prevailed beyond the classroom setting are also discussed. The behavior of professional teachers is expected to be controlled and monitored by their meta cognition (Flavell, 1979) built through teacher education and University education. The instructional discourse emphasizes the change in classroom interaction from teacher initiated talk to student initiated talk (Flanders, 1974). Classroom systemic context, classroom interaction, and dynamics of the interaction are discussed.

### **Classroom as a Systemic Unit**

Classroom is the systemic unit which has akin relation with the development of school system. Instruction practice in classroom appeared along with the emergence of schooling system as a publicly organised practice (Austin et al., 2003) discarding the informal spaces for teaching and learning. The emergence of the classroom practice implied the new nature of knowledge and new mode of human interaction for knowledge processing. It appeared on the ground of the modernization and specialisation of the human society and activities. This modern practice of knowledge processing led to the development of the philosophy of the formal education which is presently recognised as the main streaming education. The philosophy of formal education is a relative construct which maintains direct influence on

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classroom pedagogical practice. The relative philosophical construct of formal education acts upon the classroom instructional practice within a school that is revealed in classroom setting, knowledge preference, value selection and methodological choice.

Classroom is an integral unit of any school system. The vision and culture of school system of shape the system and activities of classroom. It is a complex context constituted of specified space, human and symbols. The space is purposefully designed where teacher and students act and interact in a formal way and on formal content prescribed by the official curriculum. Hence, classroom is a formal learning space for the students (Bautista & Borges, 2013; Lomas & Oblinger, 2006). The human represents teacher and student with a changed role into a formal position. The student and teacher are the two human dimensions of the classroom with conscious behavior. The symbols being used in the classroom are dealt as the set objects with meaning, and written and expressed words and information on the platform of symbolic interaction (Blumer, 1986) which imply the means of classroom behavioral development. The symbols which are used in the classroom are expected to be within the parameter of formal education system. The content is regarded as a body of knowledge to be taught in specific classroom (Tiberghien & Malkoun, 2009). Hence, in general, the classroom setting and the activities carried out in it are formal, symbolic, abstract and purposeful; and considered them as academic phenomena interacting with the everyday human world which are informal, unstructured and natural occurring.

In conclusion, classroom context is a constructed specific space for the purpose of interacting teacher and student on a specified content. Classroom is not an isolated and absolute independent context. Rather it exists in a constant interacting position of an interrelated and interdependent notion of relationship between classroom-internal and classroom-external worlds, between the individual and the contextual (Cao, 2009). Hence, activities within the classroom are integral systemic processes.

### **Interactive Dynamics in Classroom Systemic Complexity**

The term ‘interaction’ implies an action – reaction or a mutual or reciprocal influence between individuals, teacher-pupil in classroom setting (Amatari, 2015). The interaction between teacher-student in classroom is primarily regarded as verbal interaction, classroom talk, verbal communication and overt behaviour (Amatari, 2015; Baker, 1992; Flanders, 1974). Flanders (1974) has categorized the classroom interaction behaviors into ten categories and four classifications like teacher’s indirect influence (accepts feeling, praise, student idea and ask questions), teacher’s direct influence (lectures, gives directions and criticism), student talk (student response and student initiation) and silence (Amatari, 2015; Baker, 1992). The main concerns in this classification are teacher talk and student talk. Hence, the interaction in classroom, in this study, is the verbal expression between teacher and students which is regarded as the major process in classroom. The verbal interaction is a meaningful and a purposeful face to face action of talking, dialogue, conversation or two-way communications between teacher and student, students as a cohort. It is the core process of any classroom and the foremost concern in teaching. This means the heart of teaching and

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learning lies in classroom interaction (Robinson, 1994). But, within the multidimensional system of classroom interaction, it is unpredictable its exact process and consequences of the categorical activities.

Interaction is carried out with all the activities that take place in classroom. The interactive activities happen between the teacher, student, and content in the teaching and learning process. As being formal and purposeful interaction process; a student can demonstrate that learning consequence at the end of the process. The interaction within a classroom takes place on the content prescribed by planned curriculum, also known as official curriculum. The interaction between teacher and students enacts the content of the planned curriculum facilitating with the classroom instructional process (Marsh & Wills, 1999). Hence, the classroom interaction is mainly triadic interaction among the content derived from curriculum, teacher developed through professional orientations and student under construction.

As argued by Robinson (1994), the teacher-student interaction in the classrooms is complex. Moreover, the classroom context is also complex in setting. The nature, pattern and degree of the interaction between teacher and student are shaped by the classroom complexity. The interaction is a two-way human communication and influence process occurring in a complex context of any classroom. It reveals interplay of various systemic factors. The influencing role of the factors in the interplay is difficult to predict. The unpredictable interactive role of the factors forms a complex system of classroom instruction. Therefore, the teacher and student interaction in a classroom is a complex interplay of the micro and macro system dynamics derived from the explicitly controlled or directed classroom and implicitly occurring everyday systemic world.

The understandings of interaction are in a process of evolving which provides ingredients to discourse from different value perspectives. From systemic perspective, the classroom interaction is a micro level pedagogical practice where regulative and instructional discourses interplay practically (Bernstein, 1990; Morais, 2002). Interaction is practical side of the discourse. It is behaviorally enactment of discourse as fundamental requirement of discourse process. Schwarz et al. (2009) categorically summed up the perspectives of understanding the classroom interaction that process –product perspective correlates teacher’s action and student’s outcomes; ethnographic perspective explains how classroom practices enact and build culture; and discourse analysis perspective focuses on how classroom practices and discourses shape each other. Obviously, it is argued that discourse gives meaningful change in the classroom interaction practice. The classroom interaction is recognized as an academic verbalization, scaffolding, and quality meaning within pedagogical discourse.

### *Academic Verbal Interaction*

The interaction of student with teacher is an academic interaction (MacPherson, 1984; Robinson, 1994). Academic verbal interaction is the foremost means to academizing the

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teacher and student who are engaged in interaction in the school premise. The academic interaction is the conversation, discussion and talk about academic topics which is not same as listening to academic lecture or giving an academic speech; conversation as the fifth language skill (Zwiers et al., 2014).

The verbal interaction in classroom enhances academic language of the students along with academic contents. In vice-verse, the development of academic language of the students promotes teacher-student interaction. Academic interaction is the process occurring in classroom for formal language learning. Hence, obviously the school and classroom promote the academic language which is more or less distant language from the everyday language of students. The oral academic language is an explicit instrument for the students to learn in their classroom through teacher and student talk. The talk is expected to be more and better advantageous from five dimensions i.e. language and literacy, thinking skills, content learning, social advantages and psychological advantages (Zwiers, 2011). Hence, the students' formal and academic learning dimension is constructed in the context of interaction between teacher and student. But the interaction between teacher and student is likely weakened by the knowledge and skill on academic language possessed by student.

### ***Interactional Scaffolding***

The teacher's role in the classroom interaction is a scaffolding process to enable student to solve problem, to carry out learning tasks beyond his initial capacity and to proceed to a successful (Wood et al., 1976) which is recognized as a service format, model or monitor to be used by a teacher facilitating students acquiring mastery (Bruner, 1983). The knowledge construction of student within the Zone of Proximal Development (ZPD) occurs through the interaction between teacher (adult) and student (child) (Vygotsky, 1930). The scaffolding within a ZPD located at macro level and micro levels. The micro level scaffolding takes pace in classroom interaction in the form of curriculum enactment. The teacher and student talk on curriculum content relying on the students prior knowledge to enter a new knowledge is an interactional scaffolding (Hammond & Gibbons, 2005). Hence, the interaction between teacher and student is a process of scaffolding.

### ***Quality Meaning of the Interaction***

The quality of classroom instruction depends upon the quality of interaction between teacher and students. The interaction in classroom is an innate quality of student learning (Zhao, 2016). Classroom talk or oracy sets up foundation of literacy, academic discourse, language proficiency, content learning and critical learner (Fisher et al., 2008). But in the history of classroom interaction, talking by students was not norm of classroom; students were punished for talking, even if the talking was academic (Fisher et al., 2008). Four decades back from today, Flanders argued that the interaction norms in the schools were 80% teacher talk and 20% students talk. Pfau (1977) stated that the classrooms are dominated by the teacher's instructional behaviors like teacher talking, lecturing, and teachers questioning with predictable student response. This, of course, tends to reducing the students'

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interactional behavior to practice Amatari (2015) makes reiteration that this is indeed, the prevalent scenario in our present educational system across the three levels of the primary, secondary and tertiary. In a sum up, the dynamism of the classroom interaction over the course of time is a critical concern, as the pedagogical transformation is a mainstreaming discourse in the academic arena since a long year.

To change the scenario, the transformation of the teacher-dominated classroom interaction is a present discourse to ensure quality achievement of the students. Amatari (2015) has stressed that there is an earnest need to reverse the prevailing classroom interaction scenario. The type and amount of interaction can be a determinant of the success of a class. Few decades ago, Flanders (1970) reported that teachers of high-achieving students spent about 50 percent of the class time talking, compared with 80 percent for teachers of low achieving students (as cited in Fisher et al., 2008). This informs that the quality of classroom learning is directly related to students' participation in the classroom interaction and taking time.

### **Classroom System Dynamics to Dynamism**

Classroom instructional dynamics is a complex and multifaceted phenomenon having to do with classroom climate and the behavior of teachers and students (Montague & Rinaldi, 2001). Mulcahy et al. (2015) stated the classroom dynamics into three categories which encompasses the discursive, material and social dynamics. The classroom learning space is understood as the product of complex interactive process of the three dynamics. The discursive dynamic is the vision dealing for student centered learning, personalized learning etc. The material dynamic is the design which tells about traditional or innovative classroom. The social dynamic is the shared structure set up by a school organizational system (Mulcahy et al., 2015). Burns and Knox also state four types of factors as dynamics that influence classroom instructional practice. They are institutional, pedagogical, personal and physical factors (Burns & Knox, 2005, 2011). These function with a restless interface and interaction in classroom practice.

Dynamism is a complex consequence of the dynamics which opposes to mechanism. It is relational and interdependent quality of classroom interaction phenomenon. It depicts progressive change characterizing interrelatedness, fluidity and unpredictability that captures ever changing process holistically rather than partly (Burns & Knox, 2011). They elaborate further that dynamism is a typical feature of classrooms in which there is inherent potential for instability and unpredictability. In conclusion, dynamism of classroom interaction is a live and relational process of constant caused by dynamics that are within control or beyond control. The classroom learning space establishes an interactive relation of the dynamics causing relational and transformational dynamism.

### ***Micro-Macro Interaction System***

The groundwork for classroom interaction is laid outside classroom, and outside the school (Vanderstraenten, 2001). The classroom interaction and its dynamism are the

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constant action and interaction process with integral dynamics set beyond the classroom. The factors involved in the interaction are conceived as dynamics of the interaction. Such classroom interaction reveals a micro complex system created by discursive, material, and social dynamics (Mulcahy et al., 2015). Hence, the interaction between the two systems is an inherent process of complexity understanding with the hologrammatic relation.

Classroom is a micro system of interacting, interrelated, or interdependent group of elements forming a complex whole within which a child's evolving construction of reality emerges. The evolving construction of a child is expressed in verbal and non-verbal behavior (Bronfenbrenner, 1979). The elements of the micro system are activities, interpersonal relations and roles in a setting (Bronfenbrenner, 1979; Shelton, 2019). The activities of human beings are the active actions and interaction with environment which are regarded as the sources, the processes and the outcomes of human development (Shelton, 2019). The interpersonal relation is obtaining attention to participating in activities of one and another's activities forming a unique joint activity as a dyad (Bronfenbrenner, 1979; Shelton, 2019). The role is a set of activities. The relations are expectations of a person occupying a particular position, and of others in relation to that person (Bronfenbrenner, 1979). In my study, micro system of interaction is the verbal communication between teacher and students in a classroom.

In the ecological concept, there are meso, exo, and macro systems to influence teacher and student interaction activities, relation and role at micro level. The macro complex system of psych-socio-political-economic world system is interconnected to classroom. The macro system may be thought of as a societal blueprint for a particular culture or subculture with having consistencies or similarities of belief system, bodies of knowledge, material resources, customs, lifestyle, opportunity structures, hazards and life course options within a broader systems (Bronfenbrenner, 1994). Hence, the macrosystem involves ideology, institutional structure, science and social policy, and public policy; as theoretical model of environment. Pedagogically, the discursive dynamics, material dynamics and social dynamics are the akin external dynamics to the classroom interaction (Mulcahy et al., 2015) which constantly keeps interaction with the macro complex system. The role nature of the dynamic elements in the classroom interaction remains as an immediate and distant, obvious and hidden, direct and indirect role (Burns & Knox, 2011) and again formal and informal. As the penetration made by Fleischer (2001) to the micro and macro levels, a new shift and alignment has been found as third paradigm eliminating the either or perspective from macro into micro level or from micro to macro level. The interactional talk taking place in classroom is the micro scaffolding consisting of recapping, questioning, conformation, rejection, elaboration and reformulation about content knowledge. The macro level scaffolding, on the other hand, comprises the teacher training approach, curriculum development, educational program and goals. The micro scaffolding maintains the contingent relation with macro scaffolding (Engin, 2014; Hammond & Gibbons, 2005). Such micro and macro contexts and their interaction generate teacher's metacognition which functions to control, regulate and monitor own behavior. Hence, a teacher's act in classroom is teaching



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metacognitively which involves teaching with and for metacognition (Hartman, 2001). Flavell who developed the concept of metacognition has stated its important role playing in oral communication of information, oral persuasion, oral comprehension, self-control and self-instruction and cognitive behavior modification (Flavell, 1979). In conclusion, the micro- to macro ecological systems has interactive relation which have also interactive influence to the teacher and student and their dyadic relation and behaviors in classroom.

### ***Student at the Center of the System***

‘Teach students rather than teach subject’ is core idea of classroom teaching. Student is the foremost element of classroom system, then comes the content and knowledge to be offered to the student. The interaction of student with teacher and the prevailing system dynamics is for the development of the student. Thus, interaction between teacher and student builds up the foundation of student’s academic development explicitly and teacher’s professional development implicitly. The interaction is an essential means to develop attributes of students in a classroom context. Interaction between teacher and student is the pivotal to the student to develop academic being. Knowledge construction of the student remains at the center of classroom process. Interaction implies co-construction. The taught knowledge, unlike the perspective of knowledge to be taught, in a classroom is largely enacted through oral and gestural productions, making it mainly interactional (Tiberghien & Malkoun, 2009). The knowledge development through interaction promotes student’s metacognitive system. Hence, the quality and quantity of teacher-student interaction is a critical dimension of an effective classroom teaching (Amatari, 2015) for the sake of student’s learning.

The classroom system under formal education policy generally emphasizes academic development of a student. There is no doubt teacher’s interaction with student obviously turns to an academic interaction. The focus of the academic interactions is to foster the students’ academic communication skill, disciplinary thinking skill, and content understanding (Zwiers et al., 2014) and academic concept development (Mahn, 2015). Hence, the classroom verbal interaction is intertwined process to the development content and academic knowledge and skills, empowerment, co-construction, and behavioral shaping which is complex in nature.

### **Conclusion**

As the evolved understanding from critical review of the diverse concepts on classroom interaction and its nature, the classroom interaction is an academic interaction in which teacher and student talk in the academic arena. The verbal interaction between teacher and student is not an isolated process. Rather, it is a dynamic classroom phenomenon interwoven with the system dynamics existed within and beyond the classroom. The dynamics of the classroom interaction are categorized as discourse dynamics, material dynamics and social dynamics which are the implicit or covert dynamic elements. Hence, the interaction pattern and transformation of the interaction rely on the interaction between classroom setting and

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external setting, and micro classroom system and macro system constituting the dynamics related to the classroom activities. The behavior of the student and teacher in the classroom are the immediate responses in the conscious and formal setting and within institutional legislative provisions and systems.

In conclusion, the classroom dynamics can be categorized into two levels on the basis of their nature and scope. They are immediate level and ultimate level. At the immediate level, teacher and student interact relying on the authentic curriculum which is micro, specific, practical, direct and speedy in nature; and at the ultimate level, the interactions take place within and inter-institutions, social groups, policy makers, researchers and academician resulting explicit vision, policy, program, social structure and mechanism which is macro, deep, distant, indirect and slow in nature. The immediate and ultimate dynamics remain a constant interaction. Hence, the role of the ultimate dynamics behind the teacher and student interaction may appear as a vital determinant in the transformation of classroom interaction. These have ultimately contributed to the formation systemic complexity.

The conclusion of this review implies researching or investigating classroom process from a new paradigm that is complexity paradigm. The complexity dynamics interface the multivariatenature of human behavior and the contextual conditions (Montague & Rinaldi, 2001). This tells adaptive process of teacher and student behavior in classroom situated system is based on where linear approach may not work in absolute manner in a complex context. The interaction occurred in the complex context lets develop out a new practice which determines nature of dynamism evolving over the course of classroom life.

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