ROLE-PLAY: LEARNING EXPERIENCE THROUGH ENACTMENT IN SCIENCE EDUCATION

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ABSTRACT

An enormous shift is made in scientific approach of students by using new methods of teaching and learning. This study encompassed the reinforcement of scientific knowledge and real-life practices with the help of role plays. It was a mixed method research. The quasi control group comprised of 52 students and experimental sample consisted of 52 players (science students) and observers (science students) of 7th grade. The qualitative procedure to collect the data was through observational checklist (pre-defined schedule) and video recording followed by structured interviews of the observers and players. The responses were coded into themes. Findings showed that role plays are effective in strengthening the science concepts which were taught in the real time science classroom teaching. The learning of the students was improved along with the confidence and participation as a group. Moreover, it was found that conducting role plays was a healthy activity with in less time and resulted in enhancing creative abilities of science students. Indeed, science students felt motivated for being part of the role plays. It was also observed that students were excited about the performances and were taking it as a competition between them. The achievement of students was also improved in the final examinations. It is recommended to include role plays for teaching and learning science concepts at elementary level.

KEYWORDS
Role Playing; Science Education; Retention; Learning; Reinforcement, Higher order thinking

INTRODUCTION
To structure learning experience, researches have uncovered important principles that enabled people to practice what they have learned in new settings. Likewise, study of cognitive psychology has increased understanding of the nature of skilled performance and along with principles of knowledge that motivate student's abilities to solve problems in a wide variety of areas, including history, mathematics, science, social studies, and literature. Learning is rooted in cognitivism, stems in behaviorism, traces in constructivism and blooms in connectivism. Since every different interpretation are posed in the way that how people learn.

In active learning, children naturally interact and experiment with the environment during play (Piaget, 1951). They learn to compromise, cooperate, argue and disagree with other children, which characterizes children dialogs as they grow into the 'concrete operational period'. Social interactions teach them how to overcome egocentrism (Piaget, 1972). Therefore, learning is a social process (Vygotsky, 1978). Direct learning experience can occur on an indirect basis through observation. The important roles played by remote, symbolic and self-regulatory processes and observationally witnessing the affective reactions for other actions are missed out features in science learning. Science education fits in to social science discipline. Unlike other social science subjects e.g., language education, Science content was practically not considered to be taught through role-play. Role playing was found to have place in fields like, nursing, management, construction, administration and education. "Role play involves defining the problem, preparing roles, setting and enacting the scene followed by guided discussion and concluding after observations" (Kinasevych, 2009).

In the viewpoint of delivering knowledge of science subjects by any approach either teacher –centred or student-centred, is somehow based on evolving behaviour towards nature. Where students especially start relating their own observation and thinking with the information being imparted. It has a potential to clarify scientific concepts through physical and intellectual activities (McSharry and Jones,2000). As role play involves thinking, feeling and acting the social situations same as the purpose of education giving knowledge, learning skills and changing attitudes before and after a classroom situation.

Furthermore, given new instructional practices, may develop 'skills, knowledge, and attitudes' that would significantly enhance the achievements of learners. Constructivist

perspective of science learning and teaching is diversely influenced by this. Group role play learning benefits in four ways: facilitate understanding, put theory into practice, engage in social learning and informing (Kamerade, 2011). In role-play, peer interaction has a variety of social (Webb, 2010) and motivational benefits (Biggs, 2003). These include: improve communication skills, increases self-awareness and provides opportunities for forming relationships. A variety of learning and cognitive processes can be facilitated by peer interaction (King, 2002) same is applicable in role playing activities. In science education, role play can be combined with games and simulations, where student perform this activity with learning outcomes (Blatner, 2000). Role playing is the best way to develop the skills of initiative, problem solving and working cooperatively in teams, and above all will prepare young people for challenges of the Twenty-First Century. Using this method of teaching, the understanding of difficult concepts become easy by involving students intellectually and physically (Isvoran, 2001).

Students become more interested and involved, not only learning about the material, but learning also to integrate the knowledge in action, by addressing problems, exploring alternatives, and seeking novel and creative solutions (Kase,1995). There are enough problems with its use that it hasn't fully "caught on" (Blatner, 1995). Science learners face many problems in retaining and then consolidating different concepts such as the incapability to master the creative skills, which badly affects learners' achievement in and motivation towards learning general science. Pupils cannot usually participate in Science lecture because they lack the confidence while speaking the science language. There are numerous reasons behind this problem; either related to the learner, teacher, methods of instruction, or the instructional resources might be a reason for this problem. So, it is essential to find a technique to benefit teachers and learners to overcome this problem. Therefore, this study attempted to experience role-playing on students' motivation and achievement in the creative skill, communication skill, thinking skill, retention and understanding of science of seventh grader learners in the "Government Comprehensive Girls Higher Secondary School, Dhoke Kashmirian, Rawalpindi". The study was steered to help overcome the above-mentioned problem.

It purposively explored the consequence of role play on students' motivation and achievement in learning science for seventh graders in a government school in Rawalpindi tehsil. Further, the study aimed to determine how the method of reinforcement interacts with enthusiasm, competence and cooperation of the learner in determining students' achievement and motivation in science conceptual learning. This mixed research study explored role play phenomenon and further utilized while developing and testing a new instrument to check the results of that phenomenon. In Pakistan, curriculum planners may benefit from the study in different ways; to adjust

with the curriculum changes, to meet the different and changing learning styles of the students and they may revise the curriculum to make sure it contains the role-play technique. Lots of methods and strategies have been applied to science classrooms; the majority highlighted the role of teachers not of learners. Hence, learners can be benefitted from this study becoming an active player, instead of being passive learners, who sit on benches and only receive information from their instructors.

This study has some limitations: First, seventh class students in the governmental school of Rawalpindi Tehsil in Pakistan. Second, the study was limited to one teacher, teaching through role play. Third, this study was restricted to the use of role play in reinforcing General science concepts.

LITERATURE REVIEW

It is stated that teachers use the term "role-play" for simple dialogues or more complex simulations. A role-play has been claimed as a fluency activity, if it is performed in pairs or groups in the classroom. It encourages participation of maximum students. Just like real life situations, it is a useful rehearsal for transactional and interpersonal roles. Students do not face the cognitive challenge of finding original and intelligent things in role play. They enjoy the opportunity to act and to assume other roles. A role-play usually gives a purpose and a direction to the learning during discussion. It is interesting when role-play involves both competitive and co-operative elements. Moreover, students practice language according to the setting, the formality of the situation, and the function required for the role.

It is claimed that "pair work increases the amount of learners' practice, encourages cooperation, which is important for the atmosphere of the class and for the motivation it gives to learning with others, and enables learners to help each other to use and learn the language. In addition, the teacher is able to act as an assessor, prompter or resource." as believes. During pair work problem of noise and indiscipline arise, depends on the task set by the teacher and teacher´s attitude during the activity. It is agreed that group work offers courage and confidence to some learners: "students, who are shy of saying something in front of the whole class, or to the teacher, often find it much easier to express themselves in front of a small group of their peers". Methodologists expressed concerns about the number of participants and co-operation among them in groups. Science teachers may find role play helpful in developing the enjoyable experiential side of their lessons for the children (Jones, 2000). Problem based learning if embraced with role playing for analysing real life cases allows students to improve critical thinking and logical reasoning skills (Bhattacharjee, 2014). Role playing activities help students to develop their instincts of abstract phenomena, increase the learning motivation, control temper, improves the personal evaluation, cultivate 21st century skills that can be challenging to develop using traditional

teaching techniques (Craciun, 2010).Group role-play can follow a discourse also paying attention to time management and the motivation of students to get them involved (Kamerāde, 2011).

Role-playing is an effective practical tool for the teaching-learning process in science related fields. To cope with anxiety, fear and doubts before facing future real-life situations. The use of video as a support tool in simulations is appreciated (Riera, Cibanal, & Mora, 2010). The role-play positively influenced comprehension of environmental science topics (Phillips, 2013). Role-playing is a promising pedagogy; however, teachers feel some trouble in its use (Belova, Eilks & Feierabend, 2013). Role play concluded as flexible methodology, made of a multiplicity of voices. Role-performance can be used as an "indicator" of a complex process: "reality-practice, which provides a learning environment to deal with conflict, developing teacher's role as promoters of new interpretive models (Gray, 2004). Recently, science-based mimes and role plays are recorded and proved useful. These activities developed visualizing skills of students through different modes. Drama may promote dialogic, imaginative, interactive and cognitive learning of non-human phenomena (Dorion, 2009). Role play is significantly enhancing cognitive skills, promoting high levels of learner participation, educating for sustainability, so that critical thinking and logical reasoning powers are boosted (Lyle, 2010). Depicting scientist's life stories through drama can be used as one of the informative and exciting ways of increasing understanding of the Nature of science (Cakici, 2012). Role play classes are quantitatively as effective and may serve as didactic tools, giving students the chance to learn actively and potentially retain the acquired knowledge more efficiently (Randi, 2013).

RESEARCH OBJECTIVES
1. To find the effect of role play on higher level knowledge and skills with increase in achievement.
2. To explore the perception of students about role play technique in motivating students towards General Science learning

RESEARCH QUESTIONS
1. Is "Role-playing" helpful in bringing motivation in 7th graders towards higher level science learning?
2. Is there an effect of using "role-playing" on 7th graders' achievement in higher level Science learning?

RESEARCH METHODOLOGY
The study followed the exploratory sequential mixed method design which involved first collecting qualitative data followed by quantitative data. The first phase included

data collection about their science conceptual understanding, through observation and interviews from randomly selected students in two groups, during and at the end of the role play further followed by developing and taking written evaluation from all the seventh graders taught with and without role plays.

Population and Sample
The major focus was on Seventh Graders (male/female) in public sector schools under school education department Punjab enrollment statistic in the academic year 2017-2018.The whole population was approximately 736719 of class 7 students documented according to the school summary report at the Online School Information System - Government of Punjab.

The experimental group and control group consisted of 52 each, in 7th grade, which were learning general science at 'Government Comprehensive Girls Higher Secondary School, Dhoke kashmirian, Rawalpindi. Students were distributed between in two groups which were given the revision and reinforcement of science concepts through role play by one trained teacher. However, control group students were taught by another teacher without role play. The following table (1) shows the distribution of sample throughout the method:

Table 1: *Distribution of sample*
Table 1 shows selected number of participants in experimental groups and control group.

No of students	Groups
52	Control group
52	Experiment group

Design and Variables of the Study
 In this study the learners were given an experience, where science concepts were revised through playing the roles to observe their participation and confidence over previous knowledge while revising the concepts in front of class by using their knowledge and creativity. Their performances were recorded for the later analysis through coding and identifying the themes. After four weeks later, then they were tested to explain and refine outcomes and measure achievement developed from the qualitative findings. Notation system for this mixed methods study is: qualitative quantitative

Instruments of the Study
The study used the tools as follows:

1. Observation checklist and Semi-structured interview.
2. Test of100 marks.

Table 2: *Detail of Checklist*

Motivation Checklist	**Excellent (A)**	**Acceptable (B)**	**Could improve (C)**	**Not observed (D)**
Scientific				
Student				
Student talk				
Student grouping				
Student creativity				
Student Self-assessment				
Environment				
Competition				

As shown in the Table 2, observations recorded and graded for above mentioned nine specifications accordingly.

Interview Questions
Students were asked almost 10 questions about their likeliness and interest up to creativity in science role plays particularly the kind of difference noted in them after engaging in active learning.

Figure 1. Students performing role of on body, atria and blood cells.

Figure 2. Students performing play parts of a flower.

Table 3: *Role Plays*

No.	TOPICS	UNIT	UNIT NAME	DURATION
1	Blood circulatory system	2	transport in humans and plants	1 minute 35 sec
2	Diarrhoea	1	Human organ systems	4 minutes 10 sec
3	Constipation	1	Human organ systems	2 mins and 47 sec
4	Common cold	1	Human organ systems	3 mins and 34 seconds
5	Transport system in plants	2	Transport in humans and plants	3 minutes and 50 seconds
6	Sources of water	5	Water	2 mins and 47 sec
7	Structure of flower	3	Reproduction in plants	4 mins and 17 sec
8	Digestive system	1	Human organ systems	4 minutes and 32 seconds
9	Life cycle of flower	3	Reproduction in plants	4 minutes and 39 seconds
10	Modes of transfer of heat	8	Transmission of heat	6 minutes and 47 seconds
11	Big bang theory	12	Investigating the space	4 minutes 10 seconds
12	Stars	12	Investigating the space	3minutes and 49 seconds

As shown in the Table 3, duration of each role play varies according to the demand of the topic.

Table 4: *Role players and Observers*

Role play	Players	Characters	Observers
Blood circulatory system	10	Body, atria, ventricles, lungs, blood	42
Diarrhoea	2	Doctor, patient	50
Constipation	2	Doctor, patient	50
Common cold	2	Doctor, patient	50
Transport system in plants	10	Sun, seed, root, stem, leaf, xylem, phloem, mesophyll, stomata, tree	42

Sources of water	9	Ocean, soft water, hard water, fresh water, land, water, earth, pure water, salt water	43
Structure of flower	9	Flower, petal, sepal, stamen, cerpel, filament, anther, stigma, style	43
Digestive system	11	'Mouth, teeth, tongue, oesophagus, stomach, small intestine, large intestine, liver, pancreas, gall bladder, salivary gland'	41
Life cycle of flower	13	Petals, sepals, stamen, carpel, bee, water, wind, fruit	39
Modes of transfer of heat	18	Conduction, convection, radiation, heat, conductor, insulators, iron, copper, mercury, aluminum, air, plastic, glass, wood, thermos flask, silver.	34
Big bang theory	2	George Lemaitre ,universe	50
Stars	6	beta, sun, Vega, Algol, Betelgeuse, Arcturus,	46

As shown in the Table 4, the duty of each player and observer was defined during role playing.

Teacher guided and student guided role plays were presented to the students. In student guided approach the teacher intervened as facilitator in different phases of role plays activity.

Data collection and Statistical Analysis
At the time of data analysis, the information from the student's interviews and observations was used to identify different aspects of student's knowledge, skills and attitude. This study also used the student's expressions from the videos to assist in coding and constructing scales for the follow-up feedback form to determine change in attitude. Thus, the second phase of this study analysed tests given by all 104 students and the results were used to assess the student's science comprehension, evaluation, creativity and the variations that existed among the group without role play by comparing their achievement scores in second phase.

FINDINGS

This study aimed at exploring and investigating the effect of role-playing on students' achievement and attitude in the seventh graders in the governmental schools in Rawalpindi. Therefore, it explored the effect of the proposed way of teaching and revision (role-playing) and the ordinary way of teaching. The findings of the study were presented in this section according to the research questions.

Results Linked motivational change in 7th graders towards higher level science learning after "Role-playing".

From 12 Classroom observations which were carried out during each role play to check for the following 10 characteristics, the results are listed in Table(4).The 10 characteristics were noted during each science drama, which were recorded under four groupings i.e., could improve(A), acceptable(B), excellent(C) and not observed(D).

Table 5: *Grading of Observations*

Observation Checklist Role plays	1	2	3	4	5	6	7	8	9	10	11	12
Scientific	A	A	A	A	A	A	B	B	A	B	A	A
Student	A	A	A	A	A	A	C	A	A	A	A	A
Student talk	A	A	A	A	A	A	A	A	C	A	A	A
Student grouping	B	A	A	A	A	A	A	A	A	A	A	A
Student creativity	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
Student Self - assessment	A	A	A	A	A	A	B	A	A	B	A	A
Environment	B	A	A	A	A	A	A	A	A	A	A	A
Motivation	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
Competition	A	D	D	D	A	A	B	B	A	A	A	A

As shown in the Table 5, student creativity and motivation were graded higher as compared to the other observations.

Later on, these were further coded into four skills as:

a) Cooperative skills b) Creative skills c) Communications skills   d) Problem-Solving skills

Above mentioned skills were stemmed to develop attitude of learners towards science and motivated them to study science subjects with more interest and enthusiasm. The outcome from the randomly interviewed students both players and audience are given in the form of list. At maximum 10 questions were asked from the students by the

teacher. The comments of the students towards these questions are listed below:

- In reply to the first interview question, all players and viewers answered with "YES" reasoning provided is mostly they were very happy, enjoyed a lot, felt like easy to learn and remember the science knowledge easily. Some of the players commented that we shared the information and everyone wanted to be a part of this play.
- Students while playing drama on disorders said that we wanted to play Roles on Heart attack, Hypertension, Asthma and diabetes.
- (Question 2) Students also preferred to practice role plays from the start of their next grade8th.As different topics were covered by different students, so each role play was liked by the students in which it was performed. Furthermore, teacher also motivated the students by showing them the performances done by the other students that is how each student shared their opinions about the other role plays. Everyone appreciated the role of common cold patient because of the confidence and creativity of the doer. Some said the best performance was of the leaf for transport in plants. Role of stomach played by one of the student was very enjoyable. Few roles were quite difficult for the students to play and talk about like stomata, oesophagus and thermos flask these were least liked.
- Students completely started learning science with more interest and with relaxed mind.
- Players in student guided role plays said that time varies according to the topic and the number of the characters while designing the science drama.
- Long and complex role plays require teacher guidance to control the behaviours of the students to resolve the conflicts. Many students were difficult to manage, because everyone wanted to show her talent and creativity.
- At each phase/syntax of role play, wherever discussion and re-enactment required, trained teacher controlled them easily. So, students replied by saying mixed answers.
- The entire role plays were chosen according to the interest of the student and were discussed before enactment. They found them valuable, manageable and quite productive to be adapted.

Results Related to achievement of students in higher level Science learning after "role- playing"

This study was mainly focused to see the change in the achievement of the students in the final exam after using role play in a month before exam to revise the concepts of general science which were taught previously throughout the year. A final exam was taken of 100 marks in which 20 marks were allotted to the MCQS and 80 marks for the subjective part including short answer questions (marks:45) and long answer questions (marks:35).

Table 6: *Achievement marks of students*

Total students	Passed/ Percentage		Failed (below 33)	Between (33-40)	Between (40-60)	Between (60-80)	Between (80-100)
52	37	71%	15	16	13	05	03
52	51	98%	01	20	16	10	05

As shown in the Table 6, the marks secured by students among different classes out of 100 was laying almost at each cluster group that shows the difference of their learning levels.

As the final paper of general science was constructed on the concepts built during the role plays. While formulating the paper it was considered that the level of understanding of abstract concepts might have changed after the performances done. Students were also asked about their personal opinion while attempting test. The above collected data was based on the result of the first research question, although the achievement score was compared later. The comparison was made between control group without role play to the experimental group in which revision was done using role playing. As the responses were marked according to the rubrics. The number of failures was high in control group as compared to experimental group.

DISCUSSION

On the basis of the findings from data collected after observations students were able to be scientifically aware and developed the new concepts related to the blood circulatory system, diarrhoea, constipation, common cold, transport system in plants etc, even in student- guided role plays information was gathered by the students from internet. As Richard (2005) stated that students seemed more engaged and excited in completing their tasks through role playing activities.

The creativity and motivation were found in all the role play at the excellent level. As Jeffries (2007) and Mooradian (2008) reported that role play strategy indeed facilitate the students to enhance their motivation and learning. All the students seemed energetic to give their idea and infuse their imagination. The revision was done in a more joyful environment as maximum topics were taken from the syllabus taught in first semester. This was quite helpful activity to reduce boredom and to enhance retention in less time using role play. As studied by Crosling, Heagney, and Thomas (2009); Kennedy (2007) that Role playing is a mechanism to increase student retention rates.

The role play activities were proved to be an easy way in encouraging the students to participate and bring confidence. The highly evident feature of the interview was students were able to recall the sequences of the organs in the system. Some students

could easily give reasons of the scientific phenomenon like, fruit formation from ovary, heat absorption by black surfaces and digestion in stomach by acid. As Miyata (2001) argues that in role play students convey a message through expressions and their expressions show their confidence, stance and gestures.

The number of failures was more in control group with 71% marks as compared to treatment group with 98%. They showed the high achievement scores in the final exam based on the higher-level thinking while answering the questions. The knowledge became the part of their understanding and students started to relate and classify the terminologies and phenomenon of science easily. As Hawes (2008) investigated use of some higher order thinking skills by students in science classroom for the development of both complex reasoning and scientific process.

It was replied by the students that they kept the role plays in mind while attempting question on, stomach, soft water and hard water, sequence of the organs of digestive system and drawing the flow chart of heart. It was also found that role play can be a good technique at the time of revision to increase their achievement in the annual exam along with keeping the record of their other abilities like cooperation, creativity and problem solving. As Elliott (2010) indicated that role play is preferable a reinforcement technique for learning gains, although the order does not matter if both lecture and role play are utilized to convey information.

Although the role plays are considered quite hectic and unmanageable at certain times when the number of students is big here in this study it was controlled because students and teacher were quite familiar to one another and classroom management skill of the teacher was valuable. As Mcilvried et al. (2008) found role-play is a method that usually works best in pre-planned and structured situations that are kept as realistic as possible.

RECOMMENDATIONS
Role playing can bring the students and teacher at one level of conceptual understanding. As such these activities do not require any resources and materials; it is the matter of creativity and execution. Television, radio, mobile, computer etc., all these technological devices are enhancing the learning and making the students active to interact socially and globally. But as these are not available to every child, if available then without connectivity the videos and animation cannot function. So live enactment can bring the entire natural phenomenon from outside into the classroom. Where students are the entities to sense the life actively and energetically. In this way the shared information will retain for longer time and can be reproduced.

So, it is recommended that teaching and learning can be improved among the science

learners using role play. Students are given some freedom to interact with one another through dialogues. This should be added in the curriculum of science education along with other activities, so that students from the primary level may develop of self-creativity and self-confidence to speak especially in the public-sector schools. It is said to implement role-play as an alternative method of learning requires that the method is a part of the institutional learning space.

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