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Impact of Authentic Learning Environment on Academic Intrinsic Motivation in Studying General Science at Elementary Education Level

Wajeeha Aurangzeb*

Abstract

This study explores impact of authentic learning and academic intrinsic motivation in studying science at elementary education level in the backdrop of theory of Constructivism. Factors of authentic learning included authentic context, expert performance, multiple viewpoints, collaboration, interaction, coaching & scaffolding, reflection and integrated & authentic assessment. Personal relevance, self-efficacy, self-determination, career-motivation and grade-motivation were taken as subscales. Descriptive correlational research design was used to extract data from 300 teachers and Grade 8 students. Data collection instruments included "Science Motivation Questionnaire" by Glynn, Taasoobshirazi & Brickman (2008), used for students and a self-constructed 30 statement questionnaire for assessing authentic learning based on extensive literature review. Pearson correlation revealed that a strong positive correlation exists between the two variables. Intrinsic motivation for studying General Science reflected positive correlation with authentic context and authentic assessment (r=.82) and negative correlation with multiple viewpoints (r= -.81). Highest mean score was manifested by authentic context (m=24.35) grade motivation factor (m=24.66). R^2 value of simple linear regression model is 0.728 showing that 72.8% of the variation in the academic intrinsic motivation can be explained by this model containing only authentic learning. It is concluded that students' intrinsic motivation for studying General Science will enhance by providing them conducive and authentic learning environment. Elementary teachers may be introduced to innovative teaching strategies such as project method, demonstration method, problem solving method and collaborating learning through workshops/ trainings in order to follow true spirit of constructivism in elementary level classrooms.

Keywords: Authentic learning, Academic intrinsic motivation, Authentic context, Grade motivation

*Assistant Professor, Department of Education, National University of Modern Languages, Islamabad

Introduction

"The principal goal of education is to create men and women who are capable of doing new things, not simply of repeating what other generations have done…men and women who are creative, inventive discoverers…The second goal of education is to form minds which can be critical, can verify and not accept everything they are offered." Piaget (as cited in Etuk, 2014).

Piaget's above-mentioned statement clearly reflects educational understanding of this era. Although, educationists have a wide consensus to Piaget's opinion at theoretical level, still full implementation of this concept in educational settings is not fully in vogue. Therefore, one must take into consideration whether our schools are a means of equipping students with newer skills to challenge the traditional system of education or mere a means of transferring culture to upcoming generations (Kohn, 1999). Educators need to rethink about the concept of school and reflect upon the perspective whether the school experiences provided to our students develop skills to cope with real life situations or not. At this point, Piaget's statement may be viewed as a guide to explore our learning environments. This argument makes it inevitable to have a microscopic view of our schools which become learning laboratories to incorporate higher order skills and creativity. Incorporation of these in our teaching learning process becomes associated with adopting constructivist principles (Schoen, 2008).

Constructivism views learning as a social and dynamic process in which social setting/learning environment and prior knowledge of pupils is taken into consideration. Constructivist argues that pupils' come to classrooms and specially science classes with strongly formed concepts. Students are not considered passive receivers of knowledge in this approach rather active participant in knowledge construction. Research has clearly shown that constructivist approach is promising and has positive effects on students' motivation and performance (Appleton, 2002). Constructivist teaching approach motivates students because they find it more pleasant to work in a challenging yet facilitating environment. It is considered a meta-learning strategy as it paves a newer dimension of self-regulated learning for students. Research supports the argument that students of constructivist classrooms have higher learning skills as compared to those sitting in traditional classrooms (Kim, 2005).

Authentic learning concept emphasizes that either learning activities are carried out in a real world situation or have a high transfer ratio to real world context. Activities designed for authentic learning must have cultural and personal relevance. Cultural relevance means that culture of the academic discipline must be focused whereas personal relevance refers to the concept of linking new information to the world outside students' classroom setting (Stein, Isaac & Andrews, 2004). From other perspective, it can be deduced that authentic learning activities teach students how to think creatively like members of their own discipline (Meyers & Nulty, 2009).

Authentic learning activities tend to be pupil-centered, as in this approach teachers are viewed as facilitators and collaborators for students' learning. Instructor need to shift their roles from sage on the stage to guide by the side. Teachers' primary role becomes as a helper and guide to enable students explore their own learning (Mayo, 2010). In this sense, authentic learning is deep rooted in constructivist theory, which states that active engagement with problems is the best way of learning, as Dewey said "Education is not an affair of telling and being told, rather an active and constructive process" (Dewey, as cited by Mayo, 2010).

Tobin (1993) remarked that due to increasing popularity of constructivist view of teaching-learning, a paradigm change in science education is also observed. Constructivism has taken into account pedagogy, curriculum development, research and teacher education. Constructivism emphasizes that students don't come to science classrooms empty headed but arrive with many strongly formed concepts about real world situations. According to this view, students are active creators of knowledge and teachers serve as facilitators in this process.

Constructivist approach is required in teaching science at all level of school to enhance authentic learning. Conventional pedagogies produce rote learners whereas this approach makes knowledge creators and lifelong learners. Elementary level of schooling is one of the most important levels as students are shifting towards higher education/tertiary education and need to have authentic knowledge base. Learning at elementary education level through constructivist approach contributes towards social, intellectual, psychological and cultural development of students whereas traditional teaching lacks this (Cakir 2008; Dogra, 2010). It is an admitted fact now that constructivist approach becomes a mean to reach authentic learning as end destination. Pakistani learners at elementary level studying the subject of General Science require to be motivated intrinsically as constructivist approach emphasizes on constructing knowledge through one's own experiences. Authentic learning can take place only if a learner is intrinsically motivated towards studying a subject.

Literature Review

Extensive research indicates that constructivist approach to teaching science at elementary education level has been widely used. Miheso (2002), Becker & Maunsaiyat (2004) and Obiekwe (2008) have stated that those elementary level students who have been taught science through constructivist approach scored higher than those who had been taught with conventional methods. Qarareh (2016) has concluded that low achieving students at elementary education level who were taught through constructivist approaches achieved significantly higher as compared to their counterparts who learnt general science concepts through traditional teaching.

Adak (2017) found that constructivist teaching approach paves a way towards effective learning. If the authentic learning is embedded in teaching-learning environment, science students move towards intrinsic motivation and become active learners. This approach not only helps achieving pre-determined learning targets but also caters positively towards academic achievement in science subject among all psychological groups of students studying the subject at elementary level.

Herrington and Oliver, (2000) emphasized that authentic learning is the combination of the learning activities which incorporate and inculcate the knowledge and skills in the learner in a real-life setting. Authentic learning also allows the learners to connect the learning gained in the school with the demanding situation of the community. The list of Authentic learning experiences provided by Herrington and Oliver, (2000) includes experiences as:

- Provision of such contexts that provide a reflection of the ways in which knowledge learnt in school will be useful in real life.
- Provision of exploratory opportunities that will allow students to explore complex and vague definitions of real-life situations.
- Provision of the opportunities to access and observe the performance by experts and creation of models for themselves.
- Provision of performing diverse roles and understanding the multiple perspectives guiding these roles.
- Supporting the environment in which students can construct their knowledge in collaborative experiences.
- Promotion of the reflective behaviour to facilitate abstraction of authentic behaviour.
- Promotion of articulation to explore the tacit knowledge present inside the mind of the student.
- Provision of coaching to the student by teachers in critical times and provision of the opportunities of scaffolding to fading out the need for support from teachers.
- Provision of an authentic assessment system that deals with an integrated assessment of learning tasks and provides a holistic view rather than a partial one

Ayla (2016) reflected upon the principles of authentic learning saying that it facilitates teachers by providing a framework to analyse the planning done by themselves and arrange activities of classroom in such a way that facilitate the inculcation and development of knowledge that is rooted deeply in the personality of students and is flexible at the same to adjustment of new knowledge and skills. This flexible and deep knowledge is helpful to improve social practices in a community setting. Further advantages of this frame include provision of lenses that enable learner to examine practices of teachers in making sense and translating the complex Jargon required by their professional practices.

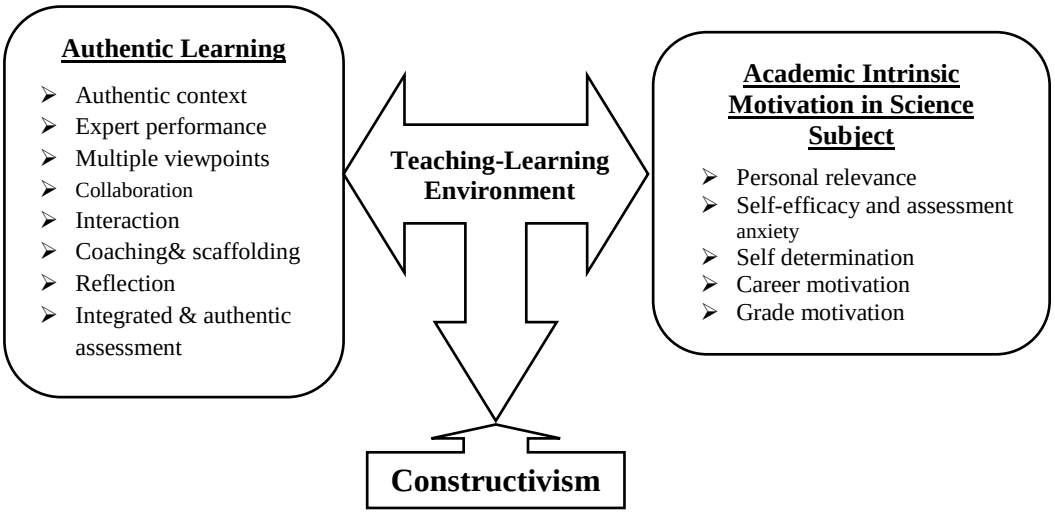
Numerous researchers (Avraamidou, 2012; De Kock, A., Sleegers, P. and Voeen, M. J. M, 2014) have concluded that if students are exposed to open-inquiry method by providing appropriate environment such as provision of open access to the science laboratories with some scientific problems allowing them to explore methods and finding out solutions of the problems in an open way can help them and stimulate their instinct to learn autonomously through the investigative learning technique. Gibson and Chase, (2002) highlighted the fact that middle school students showed more interest in learning when involved in an open laboratory task, or were allowed to ask any questions related to their investigation, and were free in finding the solutions of the problems they were presented and explored the worth of different inquiry methods in finding out solutions of their problems. Bennett & Gadlin (2012) also reported that middle school learners can gain and develop the ability of posing quality research questions and also connect these questions with knowledge and evidences as they are exposed to expert and multiple viewpoints. This approach also helps them to reflect upon their scientific research questions and develop viable solutions (Suttakun, Yutakom & Vajarasathira, 2011; Su, H. 2020; Vo, Ullrich-French and French, 2020).

Theoretical framework

Present study is guided by constructivism which refers to those conditions in which knowledge is acquired through the process of active learning. Active learning means teachers and students become co-constructers of knowledge in teaching learning situation. Constructivist learning theory has derived its strength from Dewey's, Piaget's and Vygotsky's work (Dewey, 1938; Piaget, 1964; Vygotsky & Cambridge, 1978). Dewey emphasized that learners must be provided learning opportunities which enable them to think and use sensory inputs in order to arrive at new level of knowledge by themselves. According to Piaget (1964) this knowledge may be constructed individually or through a comprehensive process of social interactions (Vygotsky, 1978). Students learn in a better way through interactions with peers, family members, teachers and their environment as compared to learning in isolation.

Authentic learning is a means of learning which happens through actual participation in real world situations/problems. It engages the students by providing them opportunities of solving complex real-world problems in authentic context. The teaching learning environment of authentic learning has some dominant features which includes providing authentic/ real world context for learning to students, interactions and collaborations with each other, teachers' scaffolding and providing multiple viewpoints by expert to facilitate diverse learners, reflection for improvement and authentic/integrated assessment based on problem provision in real world scenario. This variable was considered as predictor variable of the study as it is solidly grounded by the theory of constructivism (Carlson, 2002; Rule, 2006& Lombardi, 2007).

Outcome variable is considered to be students' intrinsic motivation for learning if they are provided authentic learning environment in the backdrop of constructivism. Personal relevance is a leading factor towards intrinsic motivation as it refers to learning experiences that are directly related to personal interests and aspirations of student. Self-efficacy describes a student's confidence to accept and solve challenges. Assessment anxiety decreases if the self-efficacy is high (McGrath & Ferns, 2015). Providing students autonomy and freedom to learn in authentic context leads towards self-determination and they become intrinsically motivated. The result is in the form of self-directed learners (Ryan & Deci, 2000). Theoretical framework is diagrammatically described as:



Objectives

1. To explore factors of authentic learning at elementary education level in the backdrop of constructivism.
2. To explore factors of academic intrinsic motivation in studying science at elementary education level in the backdrop of constructivism.
3. To investigate relationship of authentic learning with academic intrinsic motivation in studying science at elementary education level in the back drop of constructivism
4. To assess the impact of authentic learning on academic intrinsic motivation in studying science at elementary education level in the back drop of constructivism

Null Hypothesis of the research study

H_o There is statistically no significant relationship between authentic learning and academic intrinsic motivation in studying science at elementary education level in the backdrop of constructivism

Methodology

Descriptive correlational research design was used for this study. Population included all the elementary teachers and Grade 8 students of private sector schools of Islamabad. Due to less time, 300 teachers and 300 Grade students of 3 private sector schools were randomly selected as sample of the study.

Data collection tools

Data from students was collected by a standardized scale titled "Science Motivation Questionnaire" by Glynn, Taasoobshirazi & Brickman (2008). They had developed its construct validation and given open access for use of research purposes. This questionnaire has 30 statements on a 5-point likert scale namely strongly agree, agree, undecided, disagree and strongly disagree. This scale was already tested on 500 respondents and after administering exploratory factor analysis, 5 factors were confirmed on factor loading. Glyn et al (2008) have reported Cronbach coefficient alpha as 0.91 which indicates that 91% variance of the total scores can be attributed towards systematic variance. Prior permission through email was also taken from the developers of this instrument for use in this research study.

Data from teachers was collected through a self-constructed questionnaire having 30 items on a 5-point likert scale namely strongly agree, agree, undecided, disagree and strongly disagree. This questionnaire was developed after extensive review of the related literature and existent theories in the field of authentic learning. Exploratory factor analysis was carried out to identify any underlying dimensions conceptualized by teachers in the domain of authentic learning. There was no prior knowledge that the items of Authentic Learning Scale did measure the components discussed in the literature that was used extensively to develop items of the questionnaire. Exploratory factor analysis helped to examine minutely the relationship among items and identification of a set of factors related to authentic learning. Main purpose was to assess the constructs measured by the items and obtain statistical information that was useful in refinement of the questionnaire. Cronbach coefficient alpha was computed to obtain internal consistency of the scale and it was 0.89, considered as excellent. It indicated that 89% of the variance of the total score on this scale can be attributed towards systematic variance.

Results

Table 1

EFA Factor loadings of Authentic Learning Scale (n=50)

Item #	Item	Factor Loading
Factor 1 : Authentic Context		
30	I usually provide real world context for learning to my students.	0.76
18	I share my personal examples and work stories with my students.	0.75
9	I introduce real world scenarios and examples in the lesson I teach.	0.69
6	I teach underpinning knowledge while frequently asking this question, "how and where would you apply this concept in real life"?	0.62
Factor 2 : Expert Performance		
7	I arrange talks of experts for my students.	0.81
11	I provide sample of accomplished work and examples of completed tasks so that students can see what is expected of them.	0.73
19	Students must see a work done by experts before doing it by themselves.	0.69
24	I help the students' access expert performance from many sources.	0.68
Factor 3 : Multiple Viewpoints		
26	I make arrangement to expose students to multiple sources of information such as videos, experts, internet etc.	0.82
5	I make arrangement to expose my students to multiple sides of the problem.	0.69
15	I allow my students to freely navigate around all type of learning resources.	0.59
29	I encourage students to discuss contrasting viewpoints with each other.	0.71
Factor 4 : Collaboration		
1	I provide incentives to students for contributing effectively in team work.	0.79
10	I design such activities which help students to do group work.	0.73
22	I encourage students to collaborate independently.	0.67
16	I guide students to form effective teams.	0.68
Factor 5 : Interaction		
3	I simulate conversations with my students.	0.65
21	I provide meaningful opportunities for my students to talk about their projects.	0.68
12	I ensure that all students take part in conversations and discussions.	0.71
Factor 6 : Coaching & Scaffolding		
2	I encourage students to break down larger tasks into smaller and attainable tasks.	0.74
14	I provide suggestions, hints and ask reflective questions at appropriate time during task accomplishment.	0.69
23	I provide a clear pathway wherever students need help.	0.72
Factor 7: Reflection		
4	I prompt students to think and consolidate their learning.	0.81
17	I facilitate regular review sessions where students talk about their learning accomplishments.	0.78
25	I guide students to link their learning to realities.	0.73
27	My students are enabled to reflect upon their learning to improve.	

Factor 8 : Integrated & Authentic Assessment		
20	I assess students on the realistic learning tasks.	0.70
8	I assess students by assigned projects.	0.66
13	I make student assessments on the unit of competency mentioned in students' learning outcomes.	0.69
28	I introduce formative assessments also early in the academic year.	0.74

The factor leadings of eight subscales of Authentic Learning Scale extracted from principal component analysis with the varimax solution are mentioned in Table 1. All of the items of these eight factors met the criteria of loading at least 0.40 on their required factors (Tabachnick & Fidell, 2000). This treatment of factors indicated that they were closely related to eight components of authentic learning.

Table 2

Factors, Eigenvalues, % of variance, Cumulative % and Cronbach alpha of Authentic learning scale

Factor	Eigenvalue	% of variance	Cumulative %	Cronbach alpha
Factor 1	7.04	30.07	16.47	0.90
Factor 2	4.65	23.65	19.39	0.88
Factor 3	4.58	18.23	21.86	0.87
Factor 4	4.40	12.34	43.21	0.85
Factor 5	3.93	8.79	49.85	0.75
Factor 6	3.41	6.62	52.39	0.73
Factor 7	3.38	5.89	56.84	0.71
Factor 8	2.23	4.56	60.33	0.69

Factor 1 is authentic context, factor 2 is expert performance, factor 3 is multiple viewpoints, factor 4 is collaboration, factor 5 is interaction, factor 6 is coaching, factor 7 is reflection and factor 8 is integrated and authentic assessment.

Table 3

Correlation between authentic learning and academic intrinsic motivation (n=300)

		Authentic Learning	Academic Intrinsic Motivation
Authentic Learning	Pearson Correlation	1	.79*
	Sig (2-tailed)		.000
	N	200	300
Academic Intrinsic Motivation	Pearson Correlation	.79*	1
	Sig (2-tailed)	.000	
	N	300	

**correlation is significant at the 0.05 levels (2 tailed)*

Table 3 reveals that authentic learning and academic intrinsic motivation have a statistically significant linear relationship (p<.05). The direction of relationship is positive i.e; both variables are correlated positively (greater authentic learning is related to higher intrinsic motivation). The magnitude of strength among two variables is high as r= .79 at p< .05 level.

Table 4

Correlation between sub scales of Authentic Learning with Intrinsic Motivation Scale (n=300)

	Academic Intrinsic Motivation	Authentic context	Expert performance	Multiple viewpoints	Collaboration	Interaction	Coaching/scaffolding	Reflection	Integrated /Authentic assessment
Academic Intrinsic motivation	1								
Authentic context	.82*	1							
Expert performance	-.71*	-.69*	1						
Multiple viewpoints	-.81*	-.66*	-.68*	1					
Collaboration	.69*	.67*	-.69*	-.53*	1				
Interaction	.68*	.88*	-.66*	-.63*	.64*	1			
Coaching /scaffolding	.57*	.86*	-.63*	-.65*	.79*	.73*	1		
Reflection	-.68*	-.68*	-.56	-.69*	-.57*	-.62*	-.61*	1	
Integrated Assessment	.82*	.69*	-.70*	-.64*	.68*	.79*	.77*	-.62*	1

*Correlation is significant at the 0.05 level (2-tailed).

Correlations matrix of academic intrinsic motivation and authentic learning subscales reveal that academic intrinsic motivation has highest positive correlation with authentic context and integrated/authentic assessment (r=.82*) and lowest positive correlation with coaching/scaffolding subscale (r= .57*). Academic intrinsic motivation is negatively correlated with multiple viewpoints subscale (r=-.81). Whereas highest negative correlation of academic intrinsic motivation was found with multiple viewpoints (r=-.81), and lowest negative correlation with reflection (r=-.68). All these correlation values are significant at 0.05 (2-tailed). This 2-tailed correlation has rejected the null hypothesis of the research study that there is statistically no significant relationship between authentic learning and academic intrinsic motivation in studying science subject at elementary education level. Furthermore, this analysis is related to findings of objective 3 of the study that a relationship exists between the two variables with different magnitudes.

Table 5
Descriptive Statistics of Authentic Learning scores (n=300)

Subscales of Authentic Learning Questionnaire	Mean	Std. Deviation
Authentic context	24.35	6.290
Expert performance	19.66	3.072
Multiple viewpoints	18.56	3.043
Collaboration	22.63	5.522
Interaction	21.37	5.625
Coaching & scaffolding	21.32	5.610
Reflection	19.45	3.044
Integrated & authentic assessment	23.45	6.180
Total	21.727	5.514

Descriptive statistics on mean scores of Authentic learning scale revealed that highest mean score is yielded by authentic context (m=24.35, SD=6.290). Whereas lowest mean score is that of multiple viewpoints subscale (m=18.56, SD=3.043). Mean of means is 21.727, SD=5.514, illustrating that respondents mostly showed their inclination towards agreeing to the items of this scale.

Table 6
Descriptive Statistics of Academic Intrinsic Motivation scores (n=300)

Subscales of Academic Intrinsic Motivation Questionnaire	Mean	Std. Deviation
Personal relevance	22.29	5.718
Self-efficacy and assessment anxiety	20.61	4.151
Self determination	23.32	6.179
Career motivation	19.37	3.625
Grade motivation	24.66	6.389
Total	22.05	5.662

Mean scores of Intrinsic Motivation Questionnaire reveals that highest mean score is manifested by grade motivation (m=24.66, SD=6.389). Whereas lowest mean score is yielded by career motivation subscale (m=19.37, SD=3.625). Mean of means is 22.05, SD=6.389, depicting that elementary level students mostly showed their inclination towards agreeing to the items of this questionnaire.

Table 7
Coefficients table showing regression equation and test of significance

Model 1(constant)	*B*	*SE B*	β	*t-value*	*p*
Authentic context	1.59	0.23	.63	3.39	.020
Expert performance	-1.36	0.17	-.58	0.56	.060
Multiple viewpoints	-1.45	0.19	-.44	0.58	.070
Collaboration	1.42	0.21	.26	2.75	.000
Interaction	1.49	0.23	.22	2.88	.002

Coaching & scaffolding	1.58	0.24	.47	2.97	.003
Reflection	-1.62	0.16	-.62	0.79	.060
Integrated & authentic assessment	1.48	0.22	.33	2.65	.000

**p<.05* IV= Authentic learning DV= Academic intrinsic motivation

Table above shows simple linear regression equation along with tests of significance. This analysis was carried out to explore the relationship between authentic learning and academic intrinsic motivation of studying science at elementary level. Simple linear regression of the model showed a significant positive linear relationship between authentic context, collaboration, interaction, coaching/scaffolding, integrated and authentic assessment with the dependent variable. It means that for every one unit increase in authentic context, academic intrinsic motivation increases by 1.59 units (*B=1.59, p=0.020).* This can be interpreted for collaboration, interaction, coaching/scaffolding, integrated and authentic assessment in the same manner also.

Whereas a significant negative linear relationship was existent between expert performance, multiple viewpoints and reflection with the dependent variable. It means that for every one unit increase in expert performance is decreasing the dependent variable by 1.36 units (*B= -1.36, p= 0.060).* This can be interpreted for multiple viewpoints and reflection in the same pattern keeping in focus *Beta value* and levels of significance.

Table 8

R Square value of predictor and dependent variable

Model Summary [b]				
Model	R	R Square	Adjusted R Square	Std.Error of the Estimate
1	.806[a]	.728	.701	.9850

a. Predictor (Constant), Authentic learning
b. Dependent Variable: Academic intrinsic motivation

The key information derived from the above table is that R^2 value of this model is 0.728. This indicates that 72.8% of the variation in the academic intrinsic motivation can be explained by this model containing only authentic learning. This value is quite high so the predictions from simple linear regression equation is fairly reliable. It also means that 27.2% of the variation still remains unexplained so adding other independent variables may be considered.

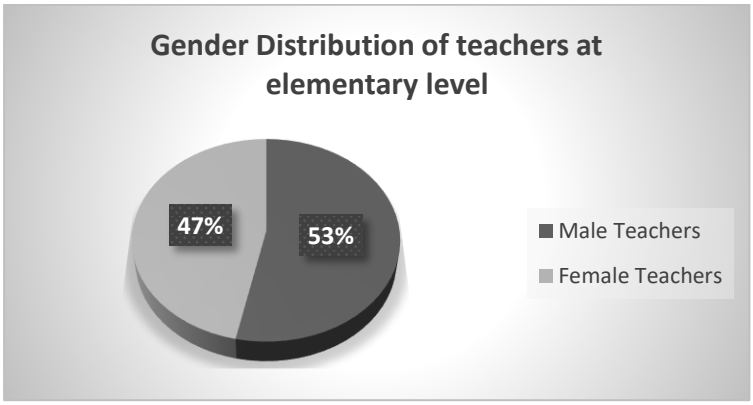


Figure 1. *Gender wise distribution of respondents for Authentic Learning Scale*

Graph 1 shows that 53% male teachers and 47% female teachers teaching at elementary education level responded to the Authentic Learning Scale.

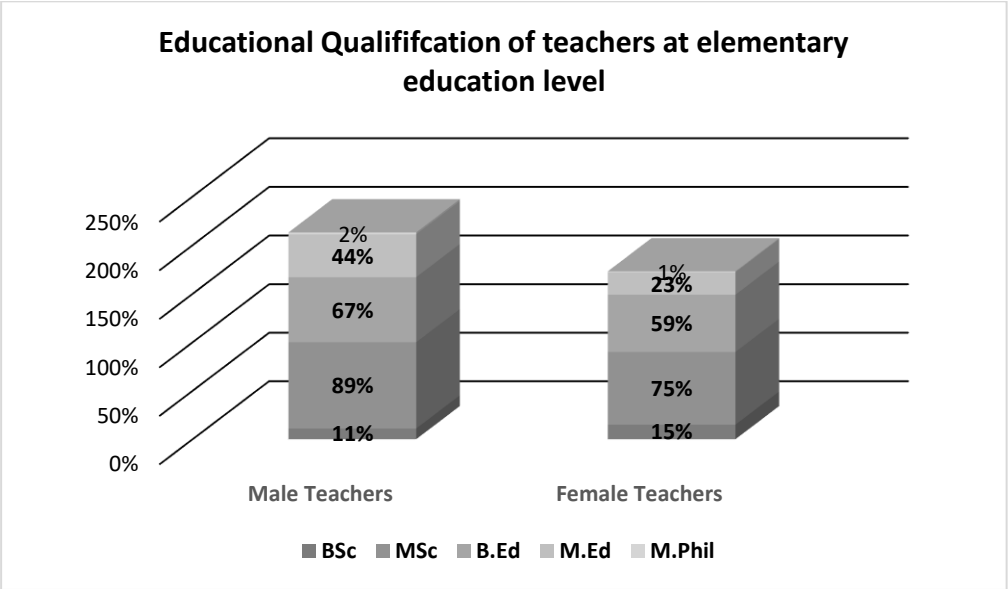


Figure 2. *Educational qualification of respondents for Authentic Learning Scale*

Educational qualification of respondents (teachers) for Authentic learning scale ranged from Bachelors till MPhil level. 11% (male) and 15% (female) teachers hold bachelor's degree, 89%(male and 75%(female) elementary teachers were having Masters in Science degree, whereas percentage for professional degrees (B.Ed & M.Ed.) was 67% (male), 59% (female) held B.Ed degree, 44% (male) and 23%(female) held M.Ed. degree. 2% male teachers and 1% female teachers at elementary level were holding MPhil (post-graduate) degree.

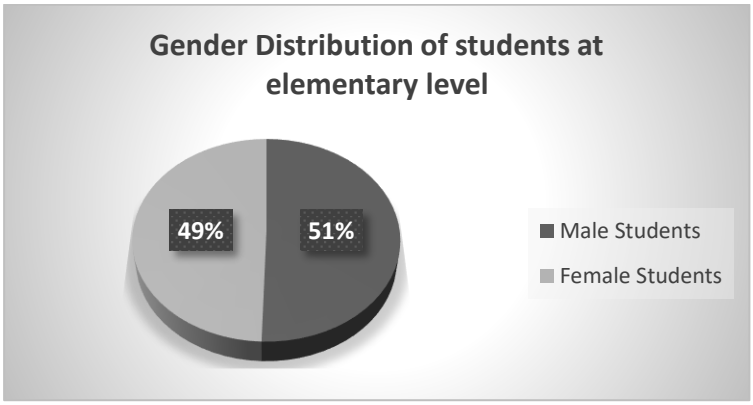


Figure 3. *Gender wise distribution of respondents for Academic Intrinsic Motivation in Science Scale*

This graph shows that 49% female and 51% male students studying at elementary level responded to the Academic Intrinsic Motivation in Science Scale

Discussion

Educationists and teachers have realized the importance of constructivist approach in teaching learning environment. Due to this notion, it has become inevitable to consider students as active creators of knowledge. For this purpose, authentic learning environment is required to keep students motivated. Science teaching at elementary level has a significant importance as students are getting prepared for tertiary education which provides a base for selection of profession. This research study has tried to illuminate the need and relationship of authentic learning with students' intrinsic motivation at elementary education level. Major finding of the study revealed that a strong positive correlation exists between authentic learning environment and students' intrinsic motivation towards studying science subject. Hellgren and Lindberg (2017) have also reflected that authentic leaning experiences in science teaching have the greatest potential to arrest the declining intrinsic motivation among science students. Another major finding of the study included highest correlation among students' intrinsic motivation and authentic context as well as authentic assessment among elementary level students. These results are in consistency with the work done by Marko and Danijela (2015) who have also suggested that students develop intrinsic, goal-oriented motivation in learning science if given authentic context of learning. Authentic assessment also motivates students towards achievement of learning goals as it uses tasks that reflect normal classroom activities (Rae & Cochrane, 2008), imbues assessment effectively in the classroom context (Vatterott, 2015) and involves the teacher and student collaboratively in determining assessment as a major characteristic of constructivist classroom environment (Mayo, 2010). Scaffolding and coaching are temporary supports till the

students become enabled to perform independently. This research study has reflected that this element has a very low correlation which needs to be increased in order to motivate students intrinsically (Monica & Olatubosun, 2013). A negative impact of expert performance and multiple viewpoints was reflected towards students' intrinsic motivation in studying science at elementary education level. Sometimes, students get confused with multiple instructors for the same course, less freedom may be experienced and the teacher can also have the problem of communication and time management (Jones & Harris, 2012). Grade motivation factor shows high mean score for the research instrument, indicating that students consider this factor as most importantly related to their intrinsic motivation. Other researchers have also indicated grade motivation as an imperative factor towards enhancing intrinsic motivation level of students (Steven, Haynes & Stofer, 2015). Lastly, it was observed that the factor of reflection scored negative low correlation with academic intrinsic motivation for studying science. Hence teachers need to enhance reflection skills as it is inevitable in authentic learning environment in the backdrop of constructivism.

Conclusion

General Science is one of the compulsory subjects at elementary education level throughout the world. Majority of the students start lacking motivation in studying this subject due to non-conducive learning environment and the resultant is low academic achievement. Majority of the teachers follow traditional pedagogy whereas, 21st century learners demand more hands-on experiences in an authentic learning environment. Constructivist classrooms advocate authentic context of learning leading towards authentic and integrated assessment. The most appreciable characteristic of any research study is that it must contribute towards something novel to the current phenomena under study. The present study has tried to explore characteristics of authentic learning and academic intrinsic motivation for studying science at elementary level. In addition to this, impact of authentic learning on academic intrinsic motivation was also a major concern of this study. Findings are useful for teachers, students, curriculum planners, educators, school principals and text book writers as they may consider these variables in the back drop of constructivism and achieve better academic achievements. Most importantly, school administration can use the results of this study while planning trainings and workshops for teachers teaching at elementary level to enhance their pedagogical skills and make them skill full in creating authentic learning environment in a better manner for students.

Recommendations

Following practical recommendations may be considered for implication:

i. Elementary teachers may be introduced to innovative teaching strategies such as project method, demonstration method, problem solving method and collaborating learning through workshops/ trainings in order to follow true spirit of constructivism in elementary level classrooms.
ii. Teachers may be provided incentives to promote authentic learning environment in classrooms.
iii. Teachers may set measurable learning objectives and design learning assessments accordingly.
iv. These learning objectives may be conveyed to students so that they know the criteria for assessing them academically.
v. Grade motivation shows highest correlation, so students scoring higher grades in Science subject may be appreciated to set example for others also.
vi. Collaboration and interaction among students may be increased by providing them opportunities to work in small group projects.

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