

High School Students' Perception of Challenges in Physics Learning and Relevance of Field Dependency

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Abstract

The study examines high school Students' Perceptions and challenges in learning Physics regarding Field Dependency. Physics is often represented as being abstract and unrelated to the real-life subject. Field Independent students gain higher than the Field Dependent students as hat independent students' confidence and understanding are higher than dependent students. The study uses a survey with samples of students drawn from both Urdu and English medium from rural and urban higher secondary schools (N = 500). Firstly, a survey questionnaire for perceptions and challenges in Physics learning and second test for Level of Field Dependency of Johnstone experiment test which is also known as group embedded figure test. Field dependency shows high mean value represents the outcome that mostly students are field dependent. Female students' ratio is exceeded than male students because of the current pattern of education.

Key Words

Physics, Perceptions, challenges, Level of Field Dependency, Group embedded figure test, Hidden Figure Test

Introduction

This study investigates the high school students and challenges in learning Physics regarding Field Dependency. Physics in secondary schools is seen as one of the troublesome occupations (Colletti, 2010). The teachers in secondary schools still are no connection of Physics themes to real-life examples (Ramma *et al.*, 2006). Subsequently, the students, over the entire year, comes in the classroom with a similar kind of procedure, arranging, assets, questions, and assessment methods then it ends up exhausting for the students. In such conditions, students are not just incapable to comprehend and apply science ideas.

The study ahead with the idea that the Field Independent learner can focus on important things in doing assignments and leave sideways that is unimportant for that task. Similarly, faced with the Physics problem (laws and numerical problems), the Field Independent learner is able to take information in the question that will assist in getting an answer. Thus, this study seeks the impact of being Field Depended/Independent in student Physics learning.

Review of the Related Literature

The research found that students worldwide are less interested and creative with Physics ideas than other science subjects since progressively dynamic ideas are in physics. Along these lines, the learning of Physics ideas requires more concretization. This investigation additionally looks to investigate a connection between students Physics learning and level of Field Dependency. Witkin and Goodenough (1981), Field Dependency (FD) is represented as an individual: "it's exceptionally hard to separate the things from its system or foundation. It is likewise hard for individuals who readily acknowledge the administering field or setting effectively. Field free (FID) Individuals can do things independently from a deliberate hypothetical field and its unique situation.

It is interesting that Erdemir and Bakirci (2009) depicted that physics mentality is the inclination for people who arrange thoughts, feelings, and practices towards the mental article. Individuals are not

brought into the world with dispositions they adapt a while later. A few frames of mind depend alone understanding, information and aptitudes and some are picked up from different sources. Be that as it may, the frame of mind does not remain the same. It changes over the span of time and bit by bit. Adensina and Kinbobola (2002) portray understudies/people groups always structure new frames of mind and alter old ones when they are presented to new data and new encounters. Material science subject is estimated as the most risk territory inside the field of science. On the contrary, enrolment, and interest in physics at high schools has been increasing every year that has thoroughly changed the trend towards martial sciences. Students who choose to proceed with their investigations in the field of Physics are additionally frustrated by the high drop-out rates inside the control.

Witkin and Goodenough (1981) depicted that field-subordinate is an individual that can't separate a thing from its specific situation. Goodenough (1976) talked about the distinction between field reliance and field freedom as: "The capacity to defeat implanting settings in perceptual working, and it is viewed as the logical part of an enunciated model of field approach as communicated in observation... Interestingly, field reliance alludes to individuals who take the association of the field in perceptual and critical thinking assignments as given, and they experience issues in isolating a thing from its unique situation" (Witkin and Goodenough, 1981). The field-dependence/independence dimension has a huge application to educational problems (Witkin *et al*, 1974; Goodenough, 1976; Witkin *et al*, 1977; Witkin and Goodenough, 1981). Therefore, there is a need to explore the field dependency level, learning experiences and perceptions of Physics students of age between 14-18.

Significance of the Study

The study seeks details on the conceptual challenges that students usually encounter in secondary school Physics generally, and particularly in Pakistan. I anticipate that this study might help students acquire command over subject knowledge at the secondary level in Physics. There seems to be a huge difference between what is required by students and what happens in the classroom and in the laboratories where students learn Physics. This study may suggest ways to understand the numerical problems of Physics, the common challenges encountered by the majority of students in the secondary Physics class. Also, this study may help in exploring the factors that lead to imperfect Physics knowledge of basic Physics concepts; deep-rooted conceptual mistakes being unaware of the processes and procedures required to perform various numerical problems, laws and practically performed experiments needed to be solved and performed in Physics laboratories.

Objectives of the Study

This study involves exploring students' perceptions, experiences, and the challenges which they face in learning Physics and the probable causes and reasons for the challenges.

This study has the following objectives:

1. To explore the high school students perceptions about Physics learning
2. To seek out the high school students perceived challenges in their Physics learning
3. To find the Field Dependency correlated with gender and age of high school students in Physics

Research Questions (RQs)

This study answer the following questions:

RQ1. How do high school students think of physics learning?

RQ2. How do high school students perceive the challenges in Physics?

RQ3. What is the correlation between Field Dependency on gender and age of students in Physics?

Research Methodology

The research design includes a tool for data collection. Firstly a questionnaire was used in this study with higher secondary school students to seek their perceptions and challenges in learning Physics. Secondly, the Johnston experiment test was used to find the level of Field Dependency. The questionnaire contained the statements on the students' perceptions of physics and challenges in learning school Physics. This study contains the quantitative research method to enlighten why those methods were applicable and how the research tool like questionnaire was developed and administered. Also, the tool like Group embedded figure test is known Johnston experiment test were conducted in schools.

The researcher developed a questionnaire in the light of current themes from the literature such as Physics school learning their perceptions and challenges students' faces. The measurement of the extent/level of Field Dependency was measured by Witkin *et al*. also known as the Group Embedded Figures Test. The tools of data collection are questionnaire and the Johnstone experiment is administered in this study.

The goal of this study is to explore the students’ perceptions towards Physics learning in the classes the 9th-12th from the ages between (14-18) years from both public and private area schools. This includes learners’ reflection of their perceptions, challenges and the nature of the problems which the students face and the expected cause of these problems. The sample consists of 500 male and female students from public and private schools. The schools are selected from the public and private sectors from each of the districts. The schools are selected on an equal basis from the rural and urban areas.

Table 1. Sample Selected from Schools

Number of Schools	No. of Boys schools	No. of Girls schools	Total No of Schools
Public high schools	51	40	91
Private high schools	12	10	22
Total	63	50	113

Findings of the Study

A sample of 500 male and female students from public and private schools took part in this study. The demographic make-up of the sample is précised/summarized in the table.

Table 2. Demographic Make-up of sample (N=500)

Age		Gender		School locality		School type		Which class		Parent status	
Years	%	Are you	%	Locality	%	School	%	Class	%	status	%
14	16	Male	48	Rural	46	Public	48	9th	25	Poor	5
15	26	Female	52	Urban	54	Private	52	10th	26	middle	90
16	15							11th	23	Rich	5
17	24							12th	26		

The above table 1 displays that female students from the private higher secondary schools belong to the urban areas are quite higher than the male students because of the patterns in science and education. Mostly, the students fell into the youngest age group of fifteenth which is higher in number than the other ages from 14th to 18th. The majority, of higher secondary 10th class and 12th class students, participated equally and the ratio is slightly higher than the 9th class and 11th class students. The majority, of the student, belongs to mediocre families of society with lesser earnings because their parent income is moderate and judicious.

Data from the Questionnaires Items

The questionnaire is divided into four sections in the Likert form to gain the overall opinions of the respondents. The overall scenario is presented section by section:

Section 1. Think of your school Physics classes

No	Statements	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
		%	%	%	%	%
<i>N=500</i>						
1	I understand my Physics lesson completely	39	57	4	0	0
2	I like the way my teachers presents the topics in Physics	24	66	10	0	0
3	I understand the procedures in the Physics class	23	49	24	4	0
4	I like doing practical work and experiments in the Physics laboratory	61	20	11	4	4
5	I dislike home task because I cannot do it on my own	45	20	9	13	13
6	I think tuition is necessary to get good marks in Physics	25	23	10	23	19
7	I feel anxiety near the Physics examination	27	32	16	20	5
8	I find I have sufficient time of revision at school before examinations	18	65	12	4	1

9	I find that it's difficult to revise the year's syllabus for the final exams	21	28	25	18	8
10	I do not like short questions because I cannot express all that I know	32	21	6	26	15
11	I like multiple choice questions in Physics exams	43	32	8	12	5
12	I think permitted time limit is very short in Physics paper	21	19	4	46	10
13	If I face difficulty in understanding, I seek out help from my teachers.	30	60	4	5	1
14	Teachers questioning in the classroom helps me to understand	22	67	10	1	0

From the above table, it is evident that the majority of participant students easily understand Physics lessons. The majority, of the students, responded higher that they entirely comprehend the Physics lessons as they think that their teachers present the Physics topics in a quite better way as they like the skills and techniques of presenting the topics in Physics class. Mostly, the student like working in the Physics laboratory because they like the practical and experimental manual work. In a large number, students dislike the home task as they cannot do it by themselves. Thus, the majority of students think that tuition is compulsory to get good marks in Physics subject. The majority, of students, agreed that they have sufficient time for revision in school but they feel hard to revise the yearly syllabus that's why they feel nervousness close to the Physics examination. Thus, the majority of student participants liked the multiple-choice questions as they think that they are easy to respond as they are not time tanked. However, the above data in the table shows that most students consider they feel difficulty they consult with their teacher to seek out help and the majority think that teacher questioning benefits them to simply understand the Physics lectures.

Section 2. Think of Physics as a subject

No	Statements	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	<i>N=500</i>	%	%	%	%	%
1	I like Physics	24	59	16	1	0
2	I find Physics useful in my daily life	35	23	24	16	2
3	I want to learn Physics because I enjoy it	30	47	12	11	0
4	I find Physics as a boring subject	6	30	15	35	14
5	I feel Physics easy to remember	23	59	11	2	5
6	Knowing Physics will help me in my career	25	63	6	6	0
7	I think Physics is the most difficult subject	11	18	15	37	19
8	Understanding Physics is very much important to me	44	51	1	3	1
9	Physics allows me to generate new concepts and ideas	62	26	2	1	9

From the responses of students, the directly above table shows that the majority of male and female students agreed that they like Physics as a subject. They want to study Physics and enjoyed it as they think that Physics is helpful in their daily life. It is evident from the responses of the above table that the majority of school students disagreed that Physics is a boring subject as they consider Physics an interesting as well as thought-provoking and easy to recall subject. Thus, the majority of students expressed that Physics is a demanding and challenging subject and will help in their career buildings. However, a large number of students consider that Physics is too much important and valuable subject because the study of Physics allows students to generate new ideas, concepts, and philosophies.

Section 3. Think of the topics you have studied in Physics for the 9th class - 10th classes

Easy I understand the topic at the initial stage

Moderate I did not understand it the first time, but now I understand it now

Difficult. I still do not understand the topic

No	Statements	Easy	Moderate	Difficult	Not Studied
	<i>N=500</i>	%	%	%	%
1	Introduction to Physics	51	47	2	0
2	Physical Quantities and Measurement	44	32	24	0
3	Kinematics	76	22	2	0
4	Dynamics	63	31	6	0
5	Turning effect of Force	24	70	6	0
6	Gravitation	56	39	5	0
7	Work and Energy	77	20	3	0
8	Properties of Matter	72	21	6	1
9	Thermal properties of matter	56	31	13	0
10	Transfer of Heat	43	54	3	0
11	Simple Harmonic Motion and Waves	57	16	2	25
12	Sound	54	21	0	25
13	Geometrical Optics	10	57	8	25
14	Electrostatics	14	57	3	26
15	Current Electricity	23	42	10	25
16	Electromagnetism	29	44	1	26
17	Introductory Electronics	10	48	12	30
18	Information and Communication Technology	61	10	3	26

On the whole, the above table displays that it is not probable to interpret the students' responses in an absolute manner. It is not easy for any student to consider a topic as difficult and tough. It is quite evident from the majority of student responses that they take all Physics chapters and topics easily and modestly. Some of the responses show they somehow consider the Physics topics difficult as they are in a very small number. However, the majority take their topics easy as some chapters like Kinematics, work and energy are considers the easiest topics.

Section 4. Think of the topics you have studied in Physics for the 11thclass – 12thclass

Easy. I understand the topic at the initial stage

Moderate. I did not understand it the first time, but now I understand it now

Difficult. I still do not understand the topic

No	Statements	Easy	Moderate	Difficult	Not Taught
	N=500	%	%	%	%
1	Electromagnetic Induction	12	20	17	51
2	Alternating Current	9	21	19	51
3	Physics of Solids	17	29	3	51
4	Electronics	10	20	1	69
5	Dawn of Modern Physics	22	4	1	73
6	Atomic Spectra	1	10	16	73
7	Nuclear Physics	15	10	2	73

On the whole, from the responses of the above table, it is evident that the percentages show that the majority of students consider the topics in Physics are easy and moderate. They think that topics are not difficult they only demand more attention and devotion. However, alternating current is taking as a most difficult topic.

The results showed that there is a significant correlation value ($r = .22$, $p < 0.05$) was found between age and Field Dependency score. This value shows that there is a positive but low correlation between age and Field Dependency from the participants. For the results for the measured Field, Dependency was correlated with age, a significant and positive correlation was run. The correlation value obtained was; positive and significant. In another study, there was a marked development of independency with age 12-16 (Onwumere and Reid, 2014). Indeed, there is considerable circumstantial evidence that the extent of field independence can grow with age but this seems to depend on experiences and this has cultural implications (Witkin *et al.*, 1977; Gurley, 1984). The outcome here may well reflect the fact that there are limited opportunities to develop increased field independence in the educational culture in Pakistan.

Discussions

This research study was envisioned to explore the students' perceptions of Physics learning and their challenges. Initially, the first research question queried about the students' understandings and their perceptions towards Physics learning. This is the trending pattern of Pakistani education, particularly in the public area schools. Mostly, the students belong to the lower or middle class of the society, with lower incomes generally in the Public school of Pakistan. They have to teach and learn with old traditional methods like the lecture method and with limited resources as they do not have enough modern facilities.

This research study shows that the majority of male and female participants show a positive perception regarding Physics learning. The majority of the students' participants expressed positive views regarding the subject of Physics; with most expressing that they understand and like Physics and they feel happy to study Physics. The students well perceived their book learning and knowledge in Physics. The students commonly find Physics a boring, difficult and uninteresting course and this finding is little conflicting to (Osborne *et al.*, 2000; Angell *et al.*, 2004). Moreover, the results show that Physics is understandable subject as Physics learning was able to provide guidance and further helped them in their future career opportunities which are not consistent with the previous finding of different research studies held world widely (Lavonen *et al.*, 2007).

The study described that the students' level of satisfaction is enormously high towards Physics learning in the classrooms. In every question, this is by the results of many items. Students show more interest and positive perceptions towards the liking and understanding of Physics. Students like to learn with their interests. The majority of the students stated that teachers should be trained in planning, designing, organizing the curriculum, with the modern use of assessment methods and with the use of information technology as well in Physics is consistent with the ideas of (Ornek *et al.*, 2008). However, Physics teacher pedagogical expertise is most important in the teaching of Physics.

Onwumere (2009) using the correlation examined the relationships between the performance and extent of the level of field dependency in sciences like Physics and other science subjects. Onwumere (2009) showed the extent of the level of field dependency which was highly correlated with Physics performance relatively for every single age group. The Physics test data were obtained from 500 male and female students. For the reason, that approximately the data was normally distributed, therefore, Pearson correlation was used. The overall correlation values between Physics marks (standardized) and the extent of the level of field dependence is moderate. These results outcomes were consistent with the results of (Al-Enezi, 2006) and (Onwumere, 2009). However, the standardized Physics examination scores reveal several kinds of general abilities in Physics learning's, and then this general ability correlates with the extent of the level of field dependency measured.

This study found that females are greater in number than male students and show more willingness towards Physics. The results from the data analysis also represent that the majority of male participants were highly agreed that they like Physics and take more interest in the aspects of Physics subject than the female participants. The male students are more motivated towards Physics than the female students. This finding is similar to (Angell *et al.*, 2008). This is because male students have more career opportunities in the field of Physics than female students.

Conclusions

By looking at the results obtained in this study, their learning in Physics, their perceptions and challenges were explored. Moreover, concerning their age and field dependency was also explored and it is concluded that in common, the students have a relatively high motivation for learning Physics, the majority of students show that almost all students perceive physics well regarding learning, taste, interest, and understanding of Physics. Also, no significant difference was found between the opinions of male and female students in their learn Physics in schools.

However, a significant difference was noted that urban students more encouraged and interested than rural students. The schools in cities are richer in resources and opportunities therefore students get enthusiastic about their learning of Physics in the urban. Moreover, the correlation values between the field dependency and the age of the students show that field dependency raises the performance of the learners as well as the achievement by increasing age.

Recommendations

This study recommended the following to the students the teachers, and the Physics curriculum developers as

- Physics should be conceptually taught to the students through modern teaching methods than the traditional methods especially before teaching formulas, numerical problems, Physics equations
- Various teaching methods should be used to make students more field independent.
- Importance should be given to developing the students' knowledge, conceptual thinking, and understanding in the students rather than memorized learning.

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