

Exploring the Science Teachers' and Students' views on the effectiveness of Health Literacy in Raising Awareness about Misuse of Chemicals and their precautions

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Abstract



This research focusses on the use of video in a physics laboratory in higher education in Pakistan. Using video seeks to improve understanding of science procedures. This study explores the perceptions of key stakeholders relating to the use of video, specifically in relation to laboratory procedures. Thus, the main aims of the study are to explore (a) their perceptions about the components for use of video so that experiments can be undertaken appropriately; (b) their perceptions of the role and importance of procedural of physics practical in the laboratory.

The study uses a methodological triangulation to gather data from a science teacher using a questionnaire followed by semi-structured interviews with 10 science teacher, and five focus groups with small groups of science students. Although the researcher's role as an insider helped in collecting robust and extensive data due to personal familiarity with the native setting, it also brought challenges in conducting the use of video interviews. Overall, it became clear that the conceptualization of the role and importance of procedural understanding was rather limited. Nonetheless, the results of this study indicate that most video users saw the role and importance of procedural understanding. Many teachers-educators appreciated their role as facilitators of the learning process using inquiry and reported that they had developed an appreciation of the benefits of performing practical through using videos in the physics practical laboratory. In addition, many of the teachers reported that continued practice in the physics laboratory through videos and/or teaching method courses had contributed to their developing a better understanding of physics practical in the laboratory.

Keywords: Laboratory, Video-based Laboratory, Technology, Experimentation

Introduction

"Health literacy is ironic, as the field of health literacy has expanded in scope and depth (Berkman, *et.al*, 2010). One of the most urgent problems in our healthcare system today is the need to address health literacy, which is the capacity to comprehend and act on health information. Making health information available to everyone, regardless of background, education, or literacy ability, may be one of our biggest difficulties (McCray, 2005). The health literacy scale and tasks are based on the definition of health literacy adopted by the American Institute of Medicine and Healthy People. "The degree to which individuals can obtain, process, and understand basic health information and services needed to make appropriate health decisions (Ratzan & Parker, 2006).

In current society, health literacy (HL) has grown to be an increasingly important skill for people to make decisions that will impact their health. Additionally, people find it increasingly challenging to navigate modern healthcare systems (Eichler, *et.al*, 2009). The issues with health education, the part it plays in one's capacity to comprehend therapeutic and self-care data, and its interface to well-being results have as it were as of late been recognized by analysts. Since the concept of well-being proficiency is still generally modern, it should be carefully characterized to other disciplines start to require note of the issue and include the body of inquiries about and data of the relevant issue encompassing it (Speros, 2005).

There are several methods to generate health literacy. Millions of individuals, both well and ill, do online searches for health-related information. Health-related websites are among the most popular on the internet, although the problems with that a large portion of the content on these sites is too difficult for many individuals to understand. Since revising the entire text to make it more comprehensible is not a viable solution, finding additional types of assistance is important. It is widely truth that low health literacy is associated with worse health outcomes and inferior performance (Leroy & Miller, 2010). Therefore, this study seeks how health literacy help om raising awareness in

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making people literate and helping them to make precautions of the misuse of chemicals and unnecessary plastic in the environment.

The Objective of the Study

There is the following objective of the study.

- To explore teachers' and students' views about the role of health literacy.
- To explore the teachers' and students' perceptions about the implications of health Literacy in awareness of the misuse of chemicals.
- To identify the opinions on the hazards if there is a lack of health literacy.

Research Question of the Study

The research questions of the study are following as:

- What is the role of health literacy for teachers and students?
- What are the harmful effects of chemicals in environment?
- How do the teachers and students' opinions of the awareness of health literacy can affect the harmful effects?
- What are the views on the hazards if there is a lack of health literacy?

Significance of the study

This study will be helpful to explore the role of health literacy needed for common citizen particularly young students. This study will connect literacy to daily, environmental literacy, and health literacy to protect environment from the misuse of chemicals by the public. This study helps to generate awareness about chemicals in environment. This study will be supportive of the scientific knowledge concerning the misuse and precautionary measures for the safety of chemicals. This study is supportive of implicating chemical literacy to solve chemical-based issues in environment to the policy makers and university authorities. This study helped all types of pollution in environment decrease with awareness of chemical literacy.

Review of the Related Literature

Health literacy is defined as the degree to which individuals can obtain, process, and understand basic health information and services needed to make appropriate health decisions (Freedman *et al.*, 2009). Health literacy also taken as a collection of theoretical knowledge, applied knowledge, and critical thinking skills that relate to declarative knowledge, procedural knowledge, and decision-making skills (Liu *et al.*, 2020). Therefore, public health outcomes can improve because of population-level health literacy initiatives that have a great potential to increase peoples' health knowledge, skills, and behaviors. The reading and speaking skills of persons in clinical settings are the focus of evaluations of health literacy, nevertheless. Thus ideas and practices related to health promotion may be used to create a framework for assessing the critical health literacy of various demographic groups (Guzys *et al.*, 2015).

The literature suggests that the expanding amount of evidence demonstrating correlations of low literacy with the safe environment indicate encouraging a culture that values health literacy (Paasche *et al.*, 2005). Due to a load of associated chronic conditions such as diabetes, coronary artery disease, and hypertension as well as the numerous drugs that must be controlled, patients with heart failure are particularly at risk. Their inadequate social and financial resources severely hampered our research participants. (Murray *et al.*, 2009). Moreover, by looking on the literature on the environment air pollution, frequently contains a combination of many toxicants. The specific pollutants found in indoor and outdoor air vary depending on the chemicals in the environment of the origin, but toxicants like polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs), as well as other heavy metals, like lead, are usually present (Koester, *et Al.*, 2021).

Most literature suggests health literacy is significant to safe the environment. Weiss (2003) focus may be seen in studies that examine how health-related literacy is measured, how poor literacy affects a variety of health issues, and how strategies to lessen the consequences of low literacy through enhanced service delivery and changed communications are tested over time. It is noticed that mustard gas and nerve gases are the two main chemical weapon classes. They are viscous liquids, not gases. They don't have a lot of volatility. The fact that these agents were created is extraordinary to damage humans through any exposure method and to work well at modest dosages. Notable is the fact that these main agent kinds have not altered in more than 50 years. When it comes to the environment, most CWAs, including mustard (HD), hydrolyze after being solvated and create degradable

byproducts including thiodiglycol (TDG), 1,4-dioxane, and 1, 4-Dithiane, 1,3-Dithiolane, and thyroxine. Besides, some earlier studies have demonstrated the durability of these compounds for up to 60 years (Vaezihi *et al.*, 2022).

Noticeably, current paradigm change that affect where and how healthcare is delivered during the COVID-19 epidemic and beyond. Therefore, it is crucial to spot any delays brought on by patients' low eHealth literacy. If patients are unable to properly use the many tools and technology required to get treatment, then eHealth resources are of little use to them. Older age, poor health literacy, and low socioeconomic position are hindrances to decreased eHealth utilization in cardiology (Brørs, *et.al*, 2020). Decision-making impacted by and affecting health literacy has transformed the way that family relationships, organizational activities, state policy, national mortality figures, and the global economy have all been affected during the past several weeks. (Sentell *et.al.*, 2020).

In the present era, there were several health-related implications, and the pandemic in particular generated issues with mental health and health communications that hurt the general public's mental health. The control measures, which included social isolation, school closure or reduced physical activity, fewer places visited, and increased smartphone use, appeared to have an immediate negative impact on university students' emotional well-being, as evidenced by an increase in anxiety and depression (Nguyen *et al.*, 2021). Through these points highlighted from the literature, it is encouraged to look at what factors can increase health literacy and how literate youngsters in the university can protect environment from the misuse of chemicals that generate air pollution.

Research Methods

An interview and a questionnaire provide complementary perspectives on the opinions of the science students and science teachers at university level. Overall, a mixed method design in this study has been chosen. A high response rate was obtained because of the questionnaire those were conducted. The questionnaire was created as the research tool, considering all the points. I carefully thought up the questionnaire's wording and conducted a detailed analysis of how the questions should be interpreted. The researcher created a questionnaire for health literacy instructors. Each question included a closed response option and a 5-Likert scale. The questions were written so that the respondents thought they were simple to swiftly respond to. Additionally, the closed questions survey investigates the value of health literacy in raising teachers' awareness. To examine these issues and objectives, questions were created in a way that would allow instructors to use them to address the spic health literacy and changes.

Five of his interviews from universities were selected for the pilot study. We collected data from both male and female teachers and were asked interview questions. Interview questions were designed to explore the role and importance of health literacy in developing awareness and precautions about the misuse of chemicals and their hazards in the environment. To this end, a pilot study was carried out as an important part of my research work. Participants interview variables varied by gender, qualifications, and age. The data collected helped us gather feedback. Participants responded positively and the results were encouraging. Participants' responses and feedback to interview questions provided valuable information. I recorded his voice with the participant permission. All participants were satisfied with the content of the interview questions. The interview was conducted in person, transcribed after listening carefully. Data collection of questionnaires with 300 students and interviews with 10 teachers were conducted personally by researchers throughout the university. The participants are asked to complete an informed consent form to indicate their willingness. Ultimately, the data collection process was completed in six weeks. For ethical considerations, I made the contact with the participants and informed them about my research. We both agreed on the time. I met the participants according to the time given to them. They signed the consent form. The Participants agreed to give me data. I assured the participants that their information would be kept private from others.

Data Analysis

Table 1: Demographic Data of the Participants

Group		%
Gender	Female	66.0
	Male	34.0
Age	18-20	57.3
	20-22	31.0

Time Program	More then 22	11.7
	Evening	20.7
Area	Morning	79.3
	Science	78.0
	Life Science	12.0
	Social Sciences	10.0

Looking at Table 1, it is evident that the number of male participants is more than female participants. Data collected in Central Punjab shows that male teachers. The trend towards education is comparatively better than that of women. Hence the number of men is more. The number of teachers is more than women. As far as qualification is concerned most of the participants have it. Master's degree while graduates are second and there are many participants with MPhil degree. At the very least, this reflects the growing trend of studying at the bachelor's and master's levels. And interest in higher education is also growing. Less than a third of the total participants are 2 over 30 years of age and the same is the case with participants aged 31-40 years. One-fourth of the total teachers are aged 41-50 while the number of participants of age above 50 is minimum.

Table 2: This section asks your opinions about your learning by Role of Health Literacy

Sr.	Statement	S. A	A	N	Dis	SD
1.	Health literacy is the ability to access health information and services.	45.3	42.0	7.0	3.7	2.0
2.	Health literacy is influenced by h characteristics and the environment.	28.3	51.7	17.0	1.7	1.3
3.	A person's reading and speaking skills are central to health literacy assessment.	31.7	47.7	18.0	2.7	0
4.	Cannot explain to complex human skills necessary to become a health-literate citizen	16.0	35.3	25.7	19.3	3.7
5.	Health literacy is closely related to general literacy or literacy.	26.7	30.7	26.7	14.0	2.0
6.	Those who know about health literacy have a lower rate of illness.	31.7	31.0	17.7	11.7	8.0
7.	Healthcare costs are lower for people with low literacy.	26.3	43.0	16.7	11.7	2.3
8.	Health literacy means different things to different people.	18.7	48.7	19.0	11.0	2.7
9.	The goal is to encourage educators and other professionals to adopt a common language of health literacy.	35.3	33.0	26.0	3.3	2.3
10.	Lifelong learning strongly predicts health literacy	33.0	39.7	20.0	5.0	2.3
11.	Health perception is easier to conceptualize than to measure directly.	20.7	41.7	21.3	13.0	3.3
12.	Health literacy can measure a person 's reading comprehension and health knowledge.	35.7	34.0	17.7	10.0	2.7
13.	Health literacy rates affect people at different levels.	28.3	43.3	18.0	4.0	6.3
14.	It is important to take care of health prevent diseases and maintain standards during daily life.	43.3	27.3	23.0	4.3	2.0
15.	Understanding appropriate health interventions are subject to time constraints.	30.0	46.0	12.3	7.3	4.3

By looking at table 2: In general, today's students are very active in health literacy regarding their chemical hazards. They believe that new technologies will not only enrich the hands-on learning process but also bring education to life on a global scale, providing access to sources of knowledge that previous generations never dreamed of recognizing the power of practical work in the environment to grow our knowledge we also understand the power of health literacy. They recognize that the awareness of health literacy has changed some areas of competence that extensive use of chemicals has potentially diminished the importance of writing, and we recognize that chemical hazards impact.

Moreover, the data indicate that training issue is important. It is relatively easy to provide training on the technical aspects of health literacy by using chemical access. It is much more difficult to provide awareness and educational support, showing the new and exciting ways by which new technologies can be harnessed in the environment. In this, the best way forward might be to send some key personnel to a country where there are good developments. These people should be practicing teachers, with an established record of excellent technical teaching and who also possess basic skills in the use of chemicals. When they come back, they can be future coaches.

Table 3: This section asks your opinions about how you found it difficult in developing literacy.

Sr.	Statement	S.A	A	N	Dis	SD
1	Lack of knowledge affects literacy problems.	47.3	33.3	12.7	4.0	2.7
2	Illiteracy has less ability to read writing and number skills.	19.3	47.3	24.7	5.7	3.0
3	Communities are key settings for health literacy.	31.7	34.3	29.0	4.7	.3
4	Daily choices for consumers are made difficult	23.7	37.7	30.7	6.7	1.3
5	Does not Provide a source of health information.	31.0	30.3	16.7	17.3	4.7
6	Older patients have limited education and lower income, and those are non-native English speakers.	36.3	30.0	15.0	12.0	6.7
7	People need information they can understand and use to make the best decision for their health.	30.0	37.0	23.7	6.3	3.0
8	Medication errors are common, dangerous, and preventable.	26.7	38.7	17.3	14.0	3.3
9	The health outcomes for people with diabetes who have limited literacy can be improved significantly	25.0	41.7	25.3	6.7	1.3
10	Genetic makeup lifestyle behavior to up stance or other reason.	28.0	42.0	20.3	8.3	1.3

By looking at the table 3, most of the replies discuss utilizing chemicals in the environment in generic terms. Health literacy also often provides learners with more autonomy. Students may now better seek information outside of the environment about the usage of chemicals. Participants avoid using outdated materials. Instead, they want to be able to use the latest teaching awareness to enhance student learning to meet the latest educational needs. Also, the environment should be made more user-friendly to improve health literacy. In developing countries like Pakistan, teachers need to stay in touch with social media to make it environmentally friendly.

Table 4: Gender Difference between health literacy awareness about chemicals hazards

Sr.	Statement	Gender	S. A	A	Net	Dis	S. D	Total		X2	Df	P
1.	Health literacy is the ability to access health information and services.	Female	89	88	7	11	3	198	300	17.185	4	P<0.005
		Male	47	38	14	0	3	102				
2.	Health literacy means different things to different people.	Female	41	102	35	20	0	198	300	18.764	4	P<0.005
		Male	15	44	22	13	8	102				
3.	The goal is to encourage educators and other professionals to adopt a common language of health literacy.	Female	71	70	48	8	1	198	300	10.931	4	P<0.005
		Male	35	29	30	2	6	102				

By looking at table 4, some statements show gender differences in response patterns. In general, these real differences are what might be expected. The female student tends to be more person-orientated while the male student is more disposed to the more mechanical aspects of life. Another feature is that the proportion choosing the 'neutral' option tends to be low, indicating that views are tending to be polarized. Most hold more positive than negative views, rarely neutral. In many questions, female students hold more positive views. However, of particular importance about assessment, female students fear highly about students memorizing and being aware of health literacy. Perhaps, a female student is more alert to the limitations of using chemicals. Interestingly, a male student is less likely willing to see limited use of chemicals than a female student. Again, this perhaps reflects the tendency of females to be highly enthusiastic about the use of chemical hazards.

Table 5: Gender difference between male and female it difficult in developing literacy

Sr.	Statement	Gender	S.A	A	N	Dis	SD	Total	X2	DF	P	
1	Does not Provide a source of health information.	Female	61	62	32	40	3	198	300	15.439	4	P<0.005
		Male	32	29	18	12	11	102				
2	Medication errors are common,	Female	51	89	29	27	2	198	300	18.036	4	P<0.005
		Male	29	27	23	15	8	102				

	dangerous, and preventable.													
3	The health outcomes for people with diabetes who have limited literacy can be improved significantly	Female	41	94	53	10	0	198						
		Male	34	31	23	10	4	102	300	19.527	4	P<0.001		

By looking at table 5, in general, females tend to be a high health outcome for people with diabetes who have limited literacy can be improved significantly than males. In all questions regarding their older patients having limited education and lower income, and those who are non-native, female student shows a higher than male student. This indicates that female is getting more willing to be not provided a source of health information. Again, this perhaps reflects the tendency of a female student to be highly enthusiastic about the Lack of knowledge that affects literacy problems. Moreover, there were the data revealed the following themes:

Theme 1: Understanding of Health Literacy

Health literacy was a knowledge that we all have the right to acquire because every human being should maintain good health. And we should also get more information related to our health and tell more people about health.

Health literacy may assist us in preserving our health, preventing health issues, and managing existing issues more effectively. Because we people don't know what we are using in our daily life. As we use processed food, or we use processed juice we know about health literacy then we can take better care of our health.

It indicates a fundamental understanding of the elements of health literacy as well as a thorough understanding of its physical and chemical properties and often used practical applications (T3).

This data shows that it denotes a full awareness of its physical and chemical characteristics, as well as frequent practical uses, as well as a fundamental understanding of the components of health literacy. For example, a few Participants, Noted that.

I think we should get information about our health as we who consume daily food don't know what was good for us or not. For example, some people do not eat milk products, some people do not eat wheat products, and they have allergies, if they know about health, then only they will be able to avoid these products and we should always use the same products. We should eat foods that are good for our health and that benefit (G3.S4).

The data indicate that since we eat food regularly and are unaware of what is healthy for us, I believe that we should learn more about our health. For instance, some people cannot consume dairy or wheat goods due to allergies; if they are aware of health issues, they will be the only ones able to avoid these items, and we should always use the same ones. We should consume foods that are beneficial to our health.

In my opinion, we should get up early in the morning to keep our health good we should go for a walk Firstly five times prayer Reading was one of our best exercises because we need a lot of exercises to maintain good health. We need fresh air more (G4.S2).

This data indicates that I believe that to maintain excellent health, we should wake up early and take a walk. Beginning with five prayers because we require a lot of activity to keep excellent health, reading is one of our finest activities. We require more clean air.

Theme 2: Awareness of misuse of chemicals in their environment

I think we can give awareness about the misuse of chemicals through workshops, and seminars, and we can play TV programs. And factories that manufacture chemicals should be aware of the dangers of chemicals in chemical products. Few Participants, Show that.

Health literacy may assist us in preserving our health, preventing health issues, and managing existing issues more effectively. Chemicals were used in our daily life which the common people do not know like processed food and fast food, most chemicals were used in them (and most children are addicted to fast food, the children of the people before today were more powerful, they had more power to do everything (T12).

Environmentalists about their harm to the environment, and agricultural specialists about their harm to the plants (T15).

I think children should know about chemicals and we should conduct activities in our schools and colleges to inform children about the use of chemicals we were using daily. It is not known how much and how to use these chemicals (G2.S3).

The above data indicate that there is a need to educate farmers to minimize the use of chemicals that were harmful to their environment or crops and to use less harmful chemicals. The participants also agree to agricultural experts concerning their harm to the plants, and environmentalists about their harm to the environment.

Theme 3: Hazards of chemicals

Chemicals should be used sparingly and when you buy chemicals from the store, you must read its label. And educated people can easily understand this thing and they can avoid the harms of chemicals; the harms of chemicals are very dangerous for their health.

All chemical manufacturing factories should dispose of the waste material of the factory, or its chemical water properly and not put it in the same crops. Crops may also be damaged animals may also be damaged and humans may also be damaged.

Another participant stated that.

The most significant of these problems were laboratories using chemicals and discharging them directly into the environment without any pre-treatment, industries discharging effluents into the environment untreated, and indirect chemical types such as traffic smoke that are released into the environment unchecked(T4).

This data show that the most major of these issues includes laboratories employing chemicals and releasing them into the environment without any pretreatment, businesses releasing waste into the environment, and indirect chemicals kinds like traffic smoke that were discharged into the environment uncontrolled.

Theme 4: Precautions from hazards of chemicals

Participant gave the potential pinion about precautions against the dangers of chemicals in such a way that when people come to buy chemicals from shops, we should tell them how to use the chemicals and how much to use them. They agreed that the use of chemicals should keep them away from our little children so that they cannot touch them, and when we use chemicals, we should wear gloves on our hands so that no one can touch them. Do not touch the eyes or nose with chemicals.

Keep chemical containers closed. Dust and vapor may escape from an open container, while gases and suspended material may penetrate this, causing the nature of the chemical to change (T4).

This data indicates that the Keep the environment clean for your good health. Keep your streets and neighborhoods clean. Cleanliness is half of faith keep the environment clean for your good health. Keep your streets and neighborhoods clean. Cleanliness is half of faith.

Another participant stated that.

I think chemicals should not be used that were not read and used for a year or two and have passed their expiry date (T5).

This data shows that Chemicals that have been stored for a long time and have passed their expiry date should not be used. Because such chemicals were harmful to health and people have been dying.

Discussions

Health literacy may assist us in preserving our health, preventing health issues, and managing existing issues more effectively. Because we people don't know what we are using in our daily life. The literature suggests about processed food and juice have chemicals, therefore public should know better care of our health. Schulz and Nakamoto define health literacy as a collection of theoretical knowledge, applied knowledge, and critical thinking skills that relate to declarative knowledge, procedural knowledge, and decision-making skills (C. Liu *et al.*, 2020) is similar to the findings in this study. I think health literacy is information that every human being should know about because when we have information about our health, what is good for us and what is bad for us, we will be able to take care of our health in a better way, so every person should know about their health and all the information related to it so that they can live a good and healthy life.

Public health outcomes will improve because of population-level health literacy initiatives that have a great potential to increase peoples' health knowledge, skills, and behaviors. We conclude that ideas and practices related to health promotion may be used to create a framework for assessing the critical health literacy of various demographic groups. We understand that managing the intricacy of several concepts to do this may be difficult. (Guzys, *et.al*, 2015). I believe that to preserve excellent health, we should teach our schoolchildren about health literacy and provide them with educational opportunities in the classroom. Kids should understand first aid and how to provide it.

Academics and other professionals to suggest a common language of "health literacy" which was also advised by the Institute of Medicine has been accomplished (Berkman *et.al*, 2010). If the teachers will get good information about the misuse of chemicals so that they can not only take care of their health but also take care of the health of others or teachers should use different social media like Facebook. TV in talks about chemical hazard awareness, which is how they can educate students and public as well about what chemicals to use and how to use them. There is a matter to about how long do we have to use it? Teachers' ought to get detailed information on how to avoid misusing chemicals. Campaigns and effective information sharing on social media can raise awareness of chemical addiction among all age groups.

If the teachers will get good information about the misuse of chemicals so that they can not only take care of their health but also take care of the health of others or teachers should use different social media like Facebook. How long do we have to use it? Teachers' ought to get detailed information on how to avoid abusing chemicals. Campaigns and effective information sharing on social media can raise awareness of chemical addiction among all age groups. Particularly for oil refineries and petrochemical sectors that deal with a variety of chemical chemicals, inherent occupational health techniques are very necessary. In contrast to the others (Hassim, 2016)., however, the study also seeks the similar approaches to enhance health literacy as it is necessary to build up an c. health and protective environment from the misuse of chemicals to save the public

Conclusions and Recommendations

Most of the participants well-acknowledged about the misuse of chemicals in our society. The science students found disadvantages of chemicals in terms of learning and understanding the process of health literacy. It was found that lack of resources and facilities affected our environment, but more important factors are the misuse of chemicals, but we cannot prevent it if we are using a chemical, it is benefiting us but it is causing harm to others. Our environment is getting damaged and other people are also affected by it. Damage is happening so we should take care of such things. Awareness must be generated on the chemicals that have been stored for a long time and have passed their expiry date should not be used. Because such chemicals are harmful to health and people have been dying. Also, awareness seminar and workshops along with tutorial about safe environment and precaution from the hazards of chemicals should be arranged regularly.

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