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A Gender-Wise Comparison of Student's Attitude Towards Biology at Secondary School Level

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Abstract

Purpose of the study was to get an insight of students (boys and girls) attitude towards Biology. It was a cross-sectional survey based study. Population of the study was all boys and girls enrolled as science students in public Schools of Kahuta Rawalpindi and randomly selected sample was 120 students. The researcher employed a self-constructed Biology Attitude Test. Attitude was further subdivided into six indicators which were interest toward biology, career in biology field, importance of biology, biology teacher, difficulties faced in biology and laboratory equipment. Tool was validated and reliability coefficient was 0.81. To compare the mean difference of boys and girls attitude towards biology independent sample t-test was applied and found that interest towards biology, importance of biology and difficulty in biology got significant values upon 0.05 significance level. Girls shown significantly high attitude over these indicators as compared to boys. While other indicators like future career in biology, biology teacher and equipment got non-significant values. It is concluded that attitude of boys and girls towards biology is different at some indicators but almost indifferent at other indicators. Advancement in biological field is only possible by positive attitude towards biology, teachers and parents should play their role in enhancing children attitude by adopting latest interactive and practical mechanisms of teaching and providing them with enriched experiences in biology relevant areas.

Keywords: Attitude, Biology, equipment, career

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Introduction

The issue of attitudes to science remains one of enduring focus. In an analysis of the trends in research in science education using a citation analysis, Lee et al. (2009) argue that research on the attitude dimensions of learning has been one of the principal attentions of the published body of work in the leading journals in the field of teaching and learning (Lederman, et al., 2023). To fulfill the dream of getting scientifically learned individuals it is necessary to educate them scientifically knowing their base knowledge and attitude or interest towards science learning (Lederman et al., 2023). Attitude is the main deriving or discouraging force for learning any subject. It effects students' academic performance and their input in scientific fields during their professional lives (Hussaini, Foong & Kamar, 2015). Awareness of students attitude towards science is critical to both recognizing and changing their attitudes and approaches not only in science learning but approaches in scientific projects and pursuing science based careers (Zia, Anwer & Butt, 2023).

It is consequently in the interest of society, and the charge of teachers, to improve youngster's attitude towards science, and to prepare them to live in a highly scientifically and technologically intellectual and learned society (Akinbadewa & Sofowora, 2020). It would help improve their accomplishment and optimistic attitudes as well (Rabgay, 2018). The future of society is determined by citizens who are talented to understand and help shape the complex influences of science and technology on our world. Keeping in view the importance science learning generally and biology learning specifically in development and standings of nation and individuals this study aimed to describe the attitude of students both girls and boys in learning biology at secondary level.

Literature Review

Faaz & Khan, (2017) stated science education is receiving ultimate importance globally due to its wider scope and development of integrated critical thinking and life relevant problem solving skills among students (Jamphel & Kinley, 2022). Scientific and technological advancement guides nation to enter into the race of developed nations (Caradus, Goldson, Moot, Rowarth, & Stewart, 2023). Biology helps us to identify and provides with the most suitable alternatives to survive in ever changing dynamic society (Das, 2020). Biological studies are of vital importance for advancement of various fields (Niclou & Sarma, 2023) like health and medicine, environmental awareness, agriculture and food production, biotechnology (Pepe, Hesami, de la Cerda, Perreault, Hsiang

& Jones, 2023) and industrial fields moreover its applications are extended up to various social and personal fields by addressing the techniques of genetic engineering, cloning and potential risks of inheritable traits or diseases (Wale, Freimark, Ramirez, Kafri, Dziuba, Bilich & Duffy, 2023). Medical fields totally rely on biological studies hence it's impossible to be a doctor, surgeon, pharmacist or nurse (Krell, 2023) without studying biology. It is not wrong to conclude from above discussion that technological, scientific, social, personal and environmental advancement is based on true scientific knowledge of learners (Fan, Aghabalayev & Ahmad, 2023; Vickram et al., 2023).

Haste (2004) sampled 11-21 years old UK individuals and conducted a survey to get insight of their beliefs and values about science and technological innovations. She identified four groups of believers; a group of under 16 years old girls were grouped under the label of 'green', they were uncertain about science and its relationship with nature, they were also having ethical concerns regarding science and technology; 'techno-investors' comprised of males who were trusting science and government, they were also enthusiastic about science and technology; the 'science oriented' was also o a group of males, they believe in applications of science and technology and interested in scientific thinking; last group was 'alienated from science' they were not interested in science and technology and were even bored of its potentials, this group constituted females. She found although girls were equally interested in science and science oriented careers but their focus was quite different than boys. They related to 'green' values associated with science (socially responsible and people-oriented aspects of science) as compared to the 'space and hardware' that dominate communication regarding science. She argued that the science curriculum needs to characterize both of these dimensions of, and to acknowledge value aspects along ethical concerns adjoining sciences and their applications. It's our accountability to encourage students for science learning (Kışoğlu, 2018) and counsel about scientific future careers (Uitto, 2014). Interactive activity based learning and student interest centered activities can help developing and retaining student's interest in learning science (Prokop, Prokop & Tunnicliffe, 2007).

Etkina and Mestre (2004) suggest that instructors of introductory science classes try to motivate their students by asking them to consider the preconceptions about science related topics that they bring to the class (Nasir, Arifin & Damopolii, 2023). Studies show that students who attend all or most classes perform better academically (Sharpe & Abrahams, 2020), and good attendance is associated with high motivation. In other words, the most successful students are usually the most highly motivated;

they are most likely to come to class, do extra-credit work, and attend help sessions (Moore, 2006) their punctuality is related to their positive attitude towards science learning. A highly motivated student is usually one with a positive attitude toward the subject s/he is learning. Therefore, in order to improve students' attitudes toward science, faculty must motivate students, which they can do through their teaching styles and by showing them the relevance of the learning topics to their everyday lives (Acarli & Acarli, 2020). In addition, they must create the learning environment (Ahmad, Sultana & Jamil, 2022) that helps motivate students not only to come to classes but also want to learn and enjoy and apply learning in their day to day lives (Movahedzadeh, 2011).

Students' increasing reluctance to choose science courses, and physical science courses in particular, in their final years of secondary education has important implications not only for the continuity of scientific endeavor but also for the scientific literacy of future generations. As a result, development of positive attitudes towards science, scientists, and learning science, which has always been a constituent of science education, is increasingly a subject of concern. Students' learning interests and attitudes toward science have both been studied for decades. However, the connection between attitude and students' life experiences about science and technology has not been addressed much (Usak et al., 2009).

Ogawa and Shimode (2008), in their study on 560 Japanese students (268 female and 292 male) with average of 15 years old, examined their views about the various components of ROSE project. Results showed that there was not meaningful difference between girls and boys in attitude toward science. They considered school science important and easy to learn but were opposite to increasing the science content and integration of technology in science teaching (Chebotib & Kering, 2021).

Statement of Problem

Student's attitude dimensions determines the future of biological implications at various levels. It determines the magnitude of personnel which would be able to put their share in up gradation of medical and health services, play their role in prevention of environmental degradation, advancement id agricultural products. Determination of student's scientific attitude in turn provides teachers with student's perspective regarding science teaching and learning. This will not only provide an overview of student's attitude but an information or baseline to encourage them and bring positive changes in their attitude towards science for national advancement.

Objectives

Researcher tried to achieve following objectives through this effort;

1. To explore the attitude of secondary level students towards learning of biology.
2. To examine the difference between boys and girls attitude towards biology learning.

Following research questions are addressed to achieve the desired objectives

1. What is the description of student's general interest toward biology?
2. Do secondary level students are interested to get career in biology field?
3. What is the importance of biology in student's point of view?
4. What is the student's point of view for their biology teacher?
5. What kind of difficulties students are facing in biology learning and handling laboratory equipment?

Methodology

Study followed cross sectional survey design and was conducted in public schools of tehsil Kahuta. Population of the study was all the science students studying in public schools of Kahuta. Total number of Public High Schools was 33, and Science students studying in those schools were 600. 20% of the population was taken as sample. 120 boys' and girls' studying at secondary level were randomly selected for data collection. Researcher made attitude test was distributed in students to record their attitude towards biology.

Biology Attitude Test

An instrument developed by researcher was used to get insight of the boys and girls attitude towards biology. After extensive reading of literature common sub-constructs of student's attitude was focused for recording their attitude. Finally Student's attitude was further subdivided into 6 indicators which were interest toward biology, career in biology field, importance of biology, biology teacher, difficulties faced in biology and laboratory equipment. Each indicator was then tried to be measured through relevant items on 5 point Likert scale. The respondents were asked to select any extent on five point Likert scale.

Validity and reliability of BAT

Instrument was validated by 5 experts of the field and amended in accordance with their comments. It was pilot tested on 24 biology studying

secondary level students which were not part of the sample. Statements were amended in light of the students ambiguities highlighted during testing. Reliability coefficient of overall biology attitude test was calculated as 0.81. Items with reliability coefficient less than 0.3 were discarded and others were retained. Instrument was finalized after validation and pilot testing.

Data Analysis

Data collected through biology attitude test was analyzed in terms of percentage to know the number of respondents marking any extent, whereas to find the difference of the responses of male and female attitude t-test was used.

Results

Biology Attitude Test was a researcher constructed instrument to explore attitude of secondary school students towards biology. Responses collected were analyzed and described in terms of mean scores.

Interest toward Biology

Selection of any course to be learnt is just because of the students or parent's interest specifically keeping in mind the economic stability in terms of profession likely to be adopted in future. Most of the times biology is selected as a subject, when there is any ones interest in medical profession (doctor, nursing, pharmacy etc). Keeping in mind every possible option different questions are asked from the respondents, in order to grasp every reason of interest towards biology.

Table 1. ***Interest toward Biology***

Interest toward	SA		A		UD		DA		SDA		M
Biology	N	%	N	%	N	%	N	%	N	%	
I like biology	63	52.5	53	44.2	3	2.5	1	.8	0	0	1.52
I like BL* often	28	23.3	83	69.2	2	1.7	6	5.0	1	.8	1.91
The work with LO* is very interesting	63	52.2	49	40.8	8	6.7	0	0	0	0	1.54
B is strange for me	29	24.2	23	19.2	13	10.8	44	36.7	11	9.2	2.88
I face difficulties in biology lessons	16	13.3	12	10.0	9	7.5	42	35.0	41	34.2	3.67

***** BL= Biology lessons, LO = living organisms

Data in table 1 demonstrating facts collected for interest towards biology, where 69.2% of respondents marked agree for statement would you like to have biology lessons more often, while 23.3% marked strongly agree. 52.5% and 44.2% marked strongly agree and agree before the statement, do you like biology more than other subjects. More than half (52.2%) selected strongly agree for they liked working with living organisms whereas 40.8% showed their agreement. A mixed tendency had come in front in response to nature and biology is strange for you as 24.2, 19.2, 10.8, 36.7 and 9.2% marked strongly agree, agree undecided, disagree and strongly disagree respectively. Almost 70% (35.0 and 34.2%) marked disagree and strongly disagree for statement, do you face difficulty in biology.

Future Career in Biology

Learning of biology open the windows of number of professions among which any one can be selected after specialization like doctor, dentistry, horticulture, nursing etc. To get insight to the student's attitude towards biology due to any specific reason this parameter was added to the instrument.

Table 2. ***Future career in Biology***

Future career in Biology	SA		A		UD		DA		SDA		Mean
	N	%	N	%	N	%	N	%	N	%	
Do you like watching natural history films	67	55.8	30	25	5	4.2	11	9.2	7	5.8	1.84
Do you like to make a career in B field	40	33.3	70	58.3	2	1.7	5	4.2	3	2.5	1.84
BK* is necessary	48	40.0	69	57.5	1	.8	1	.8	1	.8	1.65
My future career is independent from B	39	32.5	53	44.2	3	2.5	16	13.3	9	7.5	2.19
My BT* is my model	52	43.3	65	54.2	0	0	0	0	3	2.5	1.64
Do you like to work like your BT*	54	45.0	57	47.5	2	1.7	5	4.2	2	1.7	1.70
Would you like to be a biologist in future	23	19.2	41	34.2	14	11.7	24	20.0	18	15.0	2.78

*BK = Biology knowledge *BT = Biology Teacher

The data in table 2 represent the responses of respondent toward future career in biology, where the fair majority (58.3%) of the respondents respond that they wanted to make a career in biology field, the one-third (33.3%) of them showed strong agreement, whereas, hardly 7% reported disagreement and merely 1.7% remain undecided. Second most repeatedly marked statement is that biology knowledge is necessary for respondents' future against which most to fair majority (40.0 and 57.5%) reported agreement and strong agreement; only 3% went to report disagreement and strong disagreement. At third my biology teacher is my personal model is marked strongly agreed and agreed (43.3% and 54.2%) which constitute 98% of the respondent's response. More than 50% i.e. (55.8%) strongly agreed with they like watching natural history films as same one-fourth (25%) accept that as agree, whereas 5.8% argued that they strongly disagree and the fewer (4.2%) respondents said that they are undecided about watching natural history films. About 93% (47.5% and 45.0%) illustrated that they want to work like their biology teacher, minors went against. About one-fourth (44.2%) reported agreement with statement that their future career is independent from biology while one-third (32.5%) marked agreed, then 25 like 13.3, 7.5 and 2.5% went from undecided to strongly agreed extent. Equally distributed like 34.2, 20, 19.2, 15 and 11.7% marked agreed, disagreed, strongly agreed, strongly disagreed and undecided against the statement would you like to be a biologist in the future.

The respondent's data presented that the students like biology as subject so as they love to watch natural history films and they are grasping the importance of biology for life; their experience with their biology teacher was also good so they idealize themselves as teacher like their own or to become a biologist in future. They are also accepting the fact that their future career could be independent from biology.

Importance of Biology

Importance of biology was taken as an indicator of attitude; it was taken in consideration to get an idea about the student's point of view about biology as a subject. To check whether they think of it as important for life and organisms or unimportant from different angels a group of items were added under this heading. Collected responses descriptive are given below in Table 4.3.

Table 3. ***Descriptive of importance of Biology***

Importance of Biology	**SA**		**A**		**UD**		**DA**		**SDA**		**M**
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	
Its helps in	56	46.6	60	50.0	0	0	2	1.7	1	.8	1.59

conceptual skills											
Its improves our lives	52	43.3	66	55.0	2	1.7	0	0	0	0	1.58
It's essential for life	66	55.0	50	41.7	1	.8	1	.8	2	1.7	1.53
Bio is not important as compere other courses	7	5.8	5	4.2	3	2.5	57	47.5	48	40.0	4.12
Nobody needs BK	4	3.3	2	1.7	6	5.0	41	34.2	67	55.8	4.38

* BK= Biology knowledge

The table 3 illustrates the student's responses for importance of biology. Majority (55.0% and 43.3%)of the students went to agreement with the statement that biology progress improves the quality of life; same is the case with the statement "Biology is essential for other courses and for life" as 55.0% and 41.7% are strongly agreed and agreed respectively. A fewer less number like (50.0% and 46.6%) marked agreed and strongly agreed with biology helps in development of conceptual skills. In contrast to the first three statements respondents showed a high rate of disagreement (55.8% and 34.2%) with nobody needs biology knowledge and only 2.5% marked undecided, biology is not important in comparison with other courses is rated disagreed mostly i.e. 47.5% and 40.0% marked disagree and strongly disagree and only 1.7 marked agreed.

The data reveals that students are well aware of the role of biology in development of conceptual skills and in improvement of the quality of life. They also know its superiority over other courses.

Biology Teacher

Biology teacher was dealt as separate indicator of attitude to get an idea of the student's views about their biology teacher. As we know behavior and methodology of any subject's teacher affects the student's attitude towards that subject. Responses mean scores are being given here in the table.

Table 4. ***Descriptive of Biology teacher***

Biology teacher (BT)	**SA**		**A**		**UD**		**DA**		**SDA**		**M**
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	
I like him/her	57	47.5	61	50.8	1	.8	0	0	1	.8	1.56
BT use audible voice	45	37.5	74	61.5	0	0	0	0	1	.8	1.65
BT manage the class	54	45.0	65	54.2	0	0	0	0	1	.8	1.58
BT use innovative	53	44.2	67	55.8	0	0	0	0	0	0	1.56

ideas											
I have MU* with BT	59	49.2	57	47.5	3	2.5	1	.8	0	0	1.55
BT*makes you do active work	52	43.3	54	45.0	7	5.8	5	4.2	2	1.7	1.76
BT*disregard aspiration of students	13	10.8	5	4.2	9	7.5	48	40.	45	37.5	3.89

* MU= mutual understanding, *BT= Biology Teacher

Table 5 demonstrates data collected regarding students views about their biology teachers. A huge number i.e. 61.5% students described that their teachers voice is audible, same as 37.5% exhibited agreement, More than 50% like 55.8%, 54.2% and 50.8% agreed with teacher provides innovative ideas, manage class properly and they like their biology teacher respectively, as far as the statement about mutual understanding is concerned overwhelming majority 97% of students marked agree and strongly agree merely 2.5% stood undecided and 1% marked disagree. Almost same results are collected about active work made by teacher, In response to the statement biology teacher disregard aspiration of students 40.0%, 37.5%, 10.8%, 7.5% and 4.2% reported disagreement, strong disagreement, strong agreement, undecided and agree respectively.

Majority of the respondents reported through their responses that they like their biology teacher, voice is audible, teacher manages the class properly, and teacher provides innovative ideas and have mutual understanding with students. They also agree with that teacher makes them to do active work. Our biology teacher disregards aspirations of students, is disagreed by a large number of respondents, so students are comfortable with their biology teachers.

Difficulties Faced by Students in Biology Learning

Infrastructure, Human resource and pedagogical issues come in front as difficulties faced by students.

Table 6. ***Difficulties faced by students in biology learning***

Face difficulty in Biology	**SA**		**A**		**UD**		**DA**		**SDA**		**Mean**
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	
We don't have BT*	3	2.5	4	3.3	3	2.5	51	42.5	59	49.2	4.33
Our BT* are less experienced	4	3.3	7	5.8	4	3.3	46	38.3	59	49.2	4.24
The BT* method less understandable	4	3.3	3	2.5	1	.8	45	37.5	67	55.8	4.40
The voice of	5	4.2	4	3.3	2	1.	5	45.	5	45.	4.25

BT* very low						7	4	0	5	8	
The BLE are not available in school	3	2.5	1 3	10. 8	7	5. 8	4 8	40. 0	4 9	40. 8	4.06
I am allergic from experimentation on living things	1 6	13. 3	9	7.5	2	1. 7	5 1	42. 5	4 2	35. 0	3.78
I never understand my BT* accent	5	4.2	6	5.0	4	3. 3	4 3	35. 8	6 2	51. 7	4.26
Biology is one of the difficult courses for me	9	7.5	3	2.5	1	.8	6 2	51. 7	4 5	37. 5	4.09
I don't like the method of BT	8	6.7	5	4.2	2	1. 7	4 8	40. 0	5 7	47. 5	4.18

* BT*= Biology teacher

Table 7 is showing results of data collected against face difficulty in biology, where most frequently marked statement (55.8%) as strongly disagrees was teacher method less understandable and 38.3% responses were collected as disagree. Almost equal number (87-89%) of students marked I never understand teacher's pronunciation (51.7% and 35.8) and biology is one of difficult courses as (51.7% and 37.5%), Half (49.2) of them marked we don't have teacher of biology and they are less experienced whereas 42.5% and 38.3% respectively marked disagree. Fair majority marked strongly disagree and agree for all remaining items, which clearly depicts students are very much satisfied with biology course its respective teacher her/his way of teaching and they were also having their subject teacher. Responses depicts that students were not facing any difficulties with respect to teacher, methodology being employed.

Table 8. ***Descriptive biology laboratory equipment (BLE)***

Biology laboratory equipment (BLE)	**SA**		**A**		**UD**		**DA**		**SDA**		**M**
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	
BLE* is available	51	42.5	44	36.7	14	11.7	6	5.0	5	4.2	1.92
Teacher explains BLE	44	36.7	36	30.0	5	4.2	21	17.5	14	11.7	2.38
Teacher allow you to use the BLE	26	21.7	40	33.3	21	17.5	23	19.2	10	8.3	2.59
I right use of BLE	18	15.0	24	20.0	17	14.2	41	34.2	20	16.7	16.7
I enjoy using of BLE	44	36.7	57	47.5	10	8.3	3	2.5	6	5.0	1.92
I practice on BLE	16	13.3	29	24.2	12	10.0	47	39.2	16	13.3	3.15
I have knowledge of BLE	28	23.3	27	22.5	9	7.5	44	36.7	12	10.0	2.88
I like to practice	44	36.7	62	51.7	7	5.8	4	3.3	3	2.5	1.83

with BLE											
Use of BLE make BL easy (understandable)	49	40.8	53	44.2	6	5.0	6	5.0	6	5.0	1.89
I love using BLE	58	48.3	47	39.2	3	2.5	3	2.5	9	7.5	1.82
i feel scared while using BLE	24	20.0	17	14.2	5	4.2	40	33.3	34	28.3	3.36
I feel shamed during using of BLE	22	18.3	17	14.2	7	5.8	43	35.8	31	25.8	3.37
I familiar with BLE	22	18.3	17	14.2	15	12.5	35	29.2	31	25.8	3.30
I don't have understanding of BLE	36	30.0	21	17.5	8	6.7	28	23.3	27	22.5	2.91
Names of BLE are difficult	18	15.0	25	20.8	31	25.8	23	19.2	23	19.2	3.07
BLE are expensive	29	24.2	22	18.3	27	22.5	16	13.3	26	21.7	2.90
BLE out of access	14	11.7	26	21.7	30	25.0	26	21.7	23	19.2	3.15

*BLE = Biology laboratory equipment

Most of the students reported that Biology laboratory equipment (**Table 4.8**) is available in their schools and teacher explains that, while a mixed tendency is observed in responses to teacher allow you to use the laboratory equipment and you know the appropriate use of laboratory equipment. A maximum number of respondents reported that they enjoy the use of laboratory equipment in class and again a mixed approach is observed in response to you have appropriate knowledge of it and can practice on it. More than half of the respondents reported that they like practice with LE, its use makes lessons understandable and they love using LE. All of the other items of the parameter got almost equal marking of all extents from SA to SDA by the respondents.

Overall Attitude Statistics

Table 9. ***Indicators of attitude toward Biology***

Indicators	**Male**		**Female**		**t-test**	**F value**	**Sig.**
	Mean	**SD**	**Mean**	**SD**			
Interest	11.683	1.873	11.333	2.703	.824	8.668	.004*
Future career	12.183	3.259	15.100	2.885	5.189	1.938	.166^{NS}
Importance	13.016	1.599	13.339	2.819	.769	16.34	.000**
Biology teacher	13.150	2.556	13.933	2.550	1.680	.097	.756^{NS}
Difficulty	39.583	2.657	35.583	7.658	3.822	35.84	.000**
Equipment	44.016	9.173	46.866	8.401	1.768	.387	.535^{NS}
Over all attitude	133.389	15.109	135.779	16.377	.824	.004	.948^{NS}

Table 9 demonstrating over all data collected against all the attitude

indicators and finally the overall attitude, where interest toward biology (.004*) got significant value while importance of biology (.000**) and difficulty in biology (.000**) got highly significant values, which indicates attitude of girls and boys are significantly different for these indicators, whereas Future career in biology, biology teacher and equipment got non-significant values i.e. .166, .756 and .535. Overall results calculated shown that there are no significant difference among girls and boys attitude toward biology.

Discussion

Study was conducted to explore the general attitude of secondary level students towards biology and secondly to identify gender wise difference towards learning biology. It is found that both girls and boys are almost indifferently interested in learning biology, however girls shown a bit significant attitude towards biology learning as compared to boys at secondary level. These results are consistent with the findings of (Jamphel & Kinley, 2022; Zangmo et al. 2016). However these are inconsistent with the findings of (Atik et al. 2015; Usak et al. 2009; & Kısoglu, 2018), that secondary level students towards biology is neutral. Finding girls inclined attitude towards biology is in contrast with the findings of Osborne et al. (2003), however corroborates the results of (Nasir & Soltani, 2011; Chung & Son, 2003).

Conclusion

During identification of boys and girls attitude towards biology using Biology Attitude Test it was found that interest towards biology, importance of biology and difficulty in biology got values significant upon 0.05 while other indicators like future career in biology, biology teacher and equipment got non-significant values. So attitude of boys and girls towards biology is different at some indicators but almost indifferent at other indicators. Overall value got against attitude found to be non-significant.

Attitude of students (boys and girls) was tested through Biology Attitude Test showed insignificant result as attitude of girls and boys towards biology was seemed to be indifferent. However girls' attitude is more inclined towards biology then boys studying at secondary level.

Recommendations

1. Student's attitude toward Biology defined the interest of both genders where the interest of boy's seen in downward direction to some extent,

for increasing student's interest in biology the teachers need to follow the modern technology for better explanation of biology subject concepts in students.

2. The teacher must understand to get the individual differences due to the students IQ level and treat them accordingly, for boys the teacher also concentrate to create interest in biology for bright future in biological field.
3. Advancement in biological field is only possible by positive attitude towards biology, teachers and parents should play their role in enhancing children attitude by adopting latest interactive and practical mechanisms of teaching and providing them with enriched experiences in biology relevant areas.

References

Acarli, D. S., & Acarli, H. A. (2020). Examination of students' attitudes towards biology and biology course in terms of gender, grade level and pet-keeping. *Problems of Education in the 21st Century*, *78*(3), 328-341.

Ahmad, S., Sultana, N., & Jamil, S. (2022). Students' attitude towards biology in secondary schools in Islamabad, Pakistan. *IJERI: International Journal of Educational Research and Innovation*, (17), 243-256.

Akinbadewa, B. O., & Sofowora, O. A. (2020). The effectiveness of multimedia instructional learning packages in enhancing secondary school students' attitudes toward biology. *International Journal on Studies in Education*, *2*(2), 119-133.

Atik, A.D., Kayabaşı, Y., Yağcı, E. and Ünlü Erkoç, F. (2015). The secondary school students' biology science and course attitude scale: Analysis of reliability and validity. *Journal of Mehmet Akif Ersoy University Education Faculty,* 36*:* 1-18.

Caradus, J. R., Goldson, S. L., Moot, D. J., Rowarth, J. S., & Stewart, A. V. (2023). Pastoral agriculture, a significant driver of New Zealand's economy, based on an introduced grassland ecology and technological advances. *Journal of the Royal Society of New Zealand*, *53*(3), 259-303.

Chebotib, N., & Kering, V. K. (2021). Students' Attitudes towards computer-assisted learning in Biology subject in a selected secondary school in Uasin Gishu County, Kenya. *IOSR Journal of Research & Method in Education (IOSR-JRME)*, *11*(2), 55-63.

Das, S. K. (2020). Attitude towards biology education and academic achievement in biology of higher secondary students. *Editorial Board,* 9(4), 204.

Chung, Y. L., & Son, D. H. (2003). Effects of cooperative learning strategy on achievement and science learning attitudes in middle school biology. *Journal of the Korean Association for Science Education*, *20*(4), 611-623.

Etkina, E., & Mestre, J. P. (2004). Implications of learning research for teaching science to non-science majors. *SENCER Backgrounder*, 1-25.

Faaz, M. and Khan, Z. N. (2017). A study of the relationship between attitude towards science and academic achievement of upper primary school students. *North Asian International Research Journal of Social Science & Humanities,* 3(8), 38-45.

Fan, W., Aghabalayev, F., & Ahmad, M. (2023). The role of global collaboration in environmental technology development, natural resources, and marine energy generation technologies toward carbon neutrality in knowledge-based economies. *Environmental Science and Pollution Research*. 1(16).

Haste, H. (2004). Science in my future: A study of the values and beliefs in relation to science and technology amongst 11-21 year olds: *Nestlé Social Research Programme.*

Hussaini I, Foong LM, and Kamar Y. (2015). Attitudes of secondary school students towards biology as a school subject in Birninkebbi metropolis, Nigeria. *Int J Res Rev*. 2(10), 596-600.

Jamphel, K. and Kinley. (2022). Secondary science students' attitude towards biology in a higher secondary school in Punakha Dzongkhag. *Educational Quest: An Int. J. Edu. Appl. Soc. Sci.,* 13(02), 111-118.

Krell, M. (2023). Preservice biology teachers' generic and subject-specific career choice motives. *Journal of Science Teacher Education*, 1-19.

Kışoğlu, M. (2018). An examination of science high school students' motivation towards learning biology and their attitude towards biology lessons. *International Journal of Higher Education*, *7*(1), 151-151.

Lederman, J. S., Bartels, S., Jimenez, J., Lederman, N. G., Acosta, K., Adbo, K, & Zhu, Q. (2023). Completing the progression establishing an international baseline of primary, middle and secondary students' views of scientific inquiry. *International Journal of Science Education*, 1(17).

Lee, M.H, Wub, Y.T., & Tsaic, C.C, (2009). Research Trends in Science Education from 2003 to 2007: A content analysis of publications in selected journals. *International Journal of Science Education*.

Moore, R. (2006). "Class attendance: how students' attitudes about attendance relate to their academic performance in introductory science classes." *Research and Teaching in Developmental Education,* 23 (1). 19–33.

Movahedzadeh, F. (2011). improving students' attitude toward science through blended learning. *science education and civic engagement* ,3(2).

Nasir, N. I. R. F., Arifin, S., & Damopolii, I. (2023). The analysis of primary school student's motivation toward science learning. *Journal of Research in Instructional*, *3*(2), 258-270.

Nasir, A. R., & Soltani, A. K. (2011). Attitude towards biology and its effects on student's achievement. *International Journal of Biology*, *3*(4). https://doi.org/10.5539/ijb.v3n4p100

Niclou, A., & Sarma, M. S. (2023). The now and future of human biology at the extremes: An introduction to the special issue. *American Journal of Human Biology*, 24006.

Ogawa, M., & Shimode, S. (2004). Three distinctive groups among Japanese students in terms of their school science preference: From preliminary analysis of Japanese data of an international survey'the Relevance of Science Education'(ROSE). *Journal of Science Education in Japan*, *28*(4), 279-291.

Osborne, J., Simon, S., & Collins, S. (2003). Attitudes towards science: A review of the literature and it implications. *International Journal of Science Education*, *25*(9), 1049–1079. https://doi. org/ 10.1080/ 0950069032000032199

Pepe, M., Hesami, M., de la Cerda, K. A., Perreault, M. L., Hsiang, T., & Jones, A. M. P. (2023). A journey with psychedelic mushrooms: from historical relevance to biology, cultivation, medicinal uses, biotechnology, and beyond. *Biotechnology Advances*, 108247.

Prokop, P., Prokop, M., & Tunnicliffe, S. D. (2007). Is biology boring? Student attitudes toward biology. *Journal of biological education*, *42*(1), 36-39.

Rabgay, T. (2018). The Effect of Using Cooperative Learning Method on Tenth Grade Students' Learning Achievement and Attitude towards Biology. *International Journal of Instruction*, *11*(2), 265-280.

Sharpe, R., & Abrahams, I. (2020). Secondary school students' attitudes to practical work in biology, chemistry and physics in England. *Research in Science & Technological Education*, *38*(1), 84-104.

Uitto, A. (2014). Interest, attitudes and self-efficacy beliefs explaining upper-secondary school students' orientation towards biology-related careers. *International Journal of Science and Mathematics Education*, *12*(1), 1425-1444.

Usak, M., Prokop, P., Ozden, M., Ozel, M., Bilen, K. and Erdogan, M. (2009). Turkish University students' attitudes toward Biology: The effects of gender and enrolment in Biology classes. *Journal of Baltic Science Education*, **8**(2).

Vickram, S., Manikandan, S., Deena, S. R., Mundike, J., Subbaiya, R., Karmegam, N, & Awasthi, M. K. (2023). Advanced biofuel production, policy and technological implementation of nano-additives for sustainable environmental management–A critical review. *Bioresource Technology*, *387*, 129660.

Wale, N., Freimark, C. B., Ramirez, J., Kafri, A., Dziuba, M. K., Bilich, R., & Duffy, M. A. (2023). Virulence and transmission biology of the widespread, ecologically important pathogen of zooplankton, Spirobacillus cienkowskii. *bioRxiv*, 2023-09.

Zangmo, S., Churngchow, C., Kanin, T. and Mophan, N. 2016. Grade 10 and 12 Bhutanese students' attitudes toward science in the Thimphu District of Bhutan. *Journal of Turkish Science Education (TUSED),* 13(3): 199-213.

Zia, M., Anwer, M., & Butt, M. (2023). How does students' attitude towards biology affect their academic achievement at secondary level. *Global Educational Studies Review,* VIII(I), 462-472. https://doi.org/10.31703/gesr.2023(VIII-I).40

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