La actitud de los estudiantes hacia la biología en las escuelas secundarias de Islamabad, Pakistán

Students' Attitude towards Biology in Secondary Schools in Islamabad, Pakistan

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RESUMEN.
En esta era de la ciencia y la tecnología, el mundo enfrenta desafíos geográficos, mientras que los futuros constructores de naciones están perdiendo su interés incluso en temas de ciencias, especialmente en biología. Existen numerosos factores que contribuyeron al éxito de los estudiantes en un tema en particular, pero el más importante es su actitud hacia ese tema. El objetivo del presente estudio fue investigar la actitud de los estudiantes hacia la biología en las escuelas secundarias de Islamabad. La población de este estudio comprendió a todos los estudiantes de biología de 10º grado en diferentes instituciones en Islamabad. Debido a la escasez de tiempo, el investigador seleccionó a 506 estudiantes (de seis escuelas públicas y cuatro privadas) como muestra de conveniencia para este estudio. Estos estudiantes fueron administrados a través de un instrumento válido y confiable conocido como "Biology Attitude Scale" (BAS) desarrollado por el investigador. El estudio utilizó una escala tipo Likert de 5 puntos para medir la actitud de los estudiantes hacia la biología en siete dimensiones: "Interés en biología", "Carrera en biología", "Importancia de la biología", "Profesor de biología", "Dificultad en biología", "Uso de equipos en biología" y "Metodología de la biología". La actitud de los estudiantes hacia la biología se analizó utilizando el puntaje promedio de una declaración individual. Los resultados del estudio revelaron que los estudiantes en general mostraron una actitud positiva hacia la biología. Las estudiantes exhibieron una actitud positiva en comparación con los estudiantes varones. Del mismo modo, los estudiantes en las escuelas públicas mostraron una actitud positiva hacia los estudiantes de las escuelas privadas.

PALABRAS CLAVE.
Actitud, Escala de actitud de biología, Biología, Educación Secundaria, Pakistán.

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ABSTRACT.
In this age of science and technology, the world is facing geographical challenges, whereas the future nation builders are losing their interest even in science subjects, especially, in biology. There are numerous factors that contributed towards students' success in a particular subject but the most important one is their attitude towards that subject. The focus of the present study was to investigate the attitude of students towards Biology in Secondary Schools in Islamabad. The population of this study comprised all 10th grade Biology students in different institutions in Islamabad. Owing to the shortage of time, the researcher selected 506 students (from six public and four private schools) as a convenience sample for this study. These students were administered through a valid and reliable instrument known as "Biology Attitude Scale" (BAS) developed by the researcher. The study used a 5-point Likert type scale to measure students' attitude towards Biology on seven dimensions: "Interest in Biology", "Career in Biology", "Importance of Biology", "Biology Teacher", "Difficulty in Biology", "Equipment use in Biology" and "Methodology of Biology". Students' attitude toward Biology was analyzed by using the mean score of an individual statement. The findings of the study revealed that overall students showed a positive attitude towards Biology. Female students exhibited a positive attitude as compared to male students. Similarly, students in public schools showed a positive attitude toward students of private schools.

KEY WORDS.
Attitude, Biology Attitude Scale, Biology, Secondary education, Pakistan.

1. Introduction.

In its general perspective, education can be considered a form of learning which includes knowledge, skills, and habits necessary to be shifted from one generation to another through the triangular process of teaching, training, and research. The first and foremost function of education is to aim at prepare one for life and since it is supposed to prepare one for living a better life, one must be sure of what he/she can attain through it and from what discipline he/she can achieve through it. Several principles of education have been derived from psychology, which is the fusion of different theories associated with the teaching-learning process. In addition, the quality of education depends on how a teacher teaches his students in the classroom. In order to prepare today's students to become valuable workers of tomorrow, it is essential to ensure the effectiveness of science teachers' education. Many factors affect students' level of achievement, but the most important is their attitude towards a particular discipline.

Attitude is a hypothetical construct that specifies someone's liking or disliking towards an attitudinal object. Attitude may be viewed as positive, negative or neutral. Attitude is the way of viewing things (Muellelcile, 2005). The intended outcomes of science education at the secondary level are attitude like academic achievement. According to Oskamp and Schultz (2005), social psychologists proposed three theoretical viewpoints concerning the important nature of attitudes: the tri-component point of view, the separate entities' point of view, and the latent process perspective (as cited by Khan & Ali, 2012).

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Keeping in view these theoretical viewpoints, attitude comprised three components: Cognitive, affective and behavioral. The thinking or beliefs of an individual towards an attitudinal object referred to the cognitive component of attitude, the feelings, and emotions that someone has towards an attitudinal object are referred to as an affective point of view and the individual's overt actions and responses to the attitudinal object is referred to the behavioral component of attitude.

The tri-component point of view considered that cognition, affect and behavior are unique rather than separate entities. The proponents of the second theoretical viewpoint considered attitude is something that carries only affective component and mentioned the other two components as its determinants (Thurstone, 1931; Bem, 1970 and Fishbein & Aizen, 1975). Oskamp and Schultz (2005), considered the latent process viewpoint comparatively better than the tri-component viewpoint and the separate entities' viewpoint in the sense that it is more consistent with the conclusions of current research studies on attitude. Attitude is a tendency of an individual to react positively or negatively to a particular attitudinal object (Oskamp and Schultz, 2005). This definition of attitude is based on the latent process viewpoint and followed by the researcher in the present study.

2. Rationale of the Study.

There are a lot of research studies in the field of science education dedicated to the purpose of improving the ways of quality science education and for increasing enrolment in science-related courses. There are numerous factors affecting students' learning in science, one of the key factors is their attitudes and development of positive attitudes safeguard their interest in learning science education and science-related careers (George, 2006).

The most important goal of almost every country's national curriculum is to work for developing a positive attitude towards science (Koballa & Crawley, 1985; Laforgia, 1988). Now a day, there is a large amount of literature concerning students' attitude towards science in general (Barmby, Kind, & Jones, 2008; MD Zain, Samsudin, Rohandi, & Juosh, 2008; Osborne, Simon, & Collins, 2003), an adequate amount indicating attitude towards Physics and Chemistry (Angell et al., 2004; Cheung, 2009; Salta & Tzougraki, 2004) and a lesser amount of studies relating students' attitude towards Biology (Prokop, Prokop, & Tunnicliffe, 2007a; Prokop, Tuncer, Chuda, 2007b; Spall, Stanisstreet, Dickson, & Boyes, 2004). This can somewhat disguise students' attitudes because Science is not viewed as a homogeneous subject (Spall, Barrett, Stanisstreet, Dickson, & Boyes, 2003). Therefore, the identification and impact of attitudes came to be an important part of research in education.

The present study mainly focused on "Students' Attitude towards Biology in Secondary Schools in Islamabad, Pakistan".

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3. Research Objectives.

The present study focuses on the following research objectives:

1. To study the attitude of the students towards Biology at Secondary level.
2. To study the significance of variation with respect to attitude towards Biology, if any between:
    a. Male and Female students.
    b. Public and private students.
3. To study the significance of variation with respect to seven construct of Biology attitude scale, if any between.
    a. Male and Female students.
    b. Public and private students.

4. Research Questions.

The objectives of the study were supported by following research questions:

i. Is there any significant variation between the mean attitude scores of male and female students towards Biology?
ii. Is there any significant variation between the mean attitude scores of public and private students towards Biology?
iii. Is there any significant variation between the mean scores of male and female students on the seven dimensions of Biology attitude scale?
iv. Is there any significant variation between the mean scores of public and private students on the seven dimensions of Biology attitude scale?

5. Research Hypothesis.

The research questions of the study were further supported by the following research hypothesis:

H_{01}: Male and female students would significantly differ in attitude towards Biology (total score of BAS) and on seven dimensions of BAS.

H_{02}: Public and private students would significantly differ in attitude towards Biology (total score of BAS) and on seven dimensions of BAS.

6. Literature Review.

Biology is science and open to new development and also natural. It is obvious that with this discipline people can get to know one another both anatomically and physiologically, improve their way of thinking about the surrounding world and think scientifically, to grasp the underlying idea of nature so that a living culture is created (Sulun, Gurbuz & Kandemir, 2004). Another important factor in the education of subject experts is the interaction and attitude of students towards a particular lesson. In order to check how much behavior is learned by students, it is essential to measure the attitudes that are believed to be materialized. Students' success in a particular subject is closely associated with their attitudes about that subject. As a field, Biology is the most related science and subject to others (Cilenti & Ozcelik, 1991). As subject matter, it comprised of Medicine, Ecology, Genetics, Cell Biology and Biology of Nature.

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It is highlighted through researches that attitude is an important component of science education (Gardner, 1975; Joyce & Farenga, 2000; Osborne et al., 2003; Schibeci & Riley, 1986) not only concerning students' involvement and interest (Greenfield, 1996; Koballa, Crawley, & Shrigley, 1990; Simpson & Oliver, 1990; Weinburgh, 1995) but also their performance in science (Linn, 1992). Moreover, Wilson (1983), Oliver & Simpson (1988), Rana (2002), and Papanastasiou & Zembylas (2004) reported a positive correlation between students' positive attitude towards science and their achievement in science.

A study conducted by Usak, Prokop, Ozden, Ozel, Bilen, & Erdogan, (2009), reported that students' attitudes towards Biology are neutral, he further suggested that students' interest in learning Biology will lead to better achievement in Biology. But unlike this, the gender difference was found between students' attitudes towards learning science. Boys show more positive results than girls' students. According to Osborne et al., 2003 and Nasr & Soltani, 2011, reported that there is no significant difference between the attitudes of male and female students towards Biology. In another study, conducted by Prokop, & Prokop, (2007), found that girls have more interest towards Biology than boys.

In general, students' attitude towards science decline with increase in grade level (Ramsden, 1998; Osborne et al., 2003), boys show more positive attitude towards science than girls (Simpson & Oliver, 1985; Schibeci & Riley, 1986; O'Brien & Porter, 1994; Francis & Greer, 1999) and more negative attitudes are linked with physical sciences than biological sciences (e.g. Spall et al., 2003; Spall et al., 2004).

Keeves and Kotte (1992) and Jones, Howe and Rua (2000) reported that, girls show more positive attitudes towards Biology than boys unlike Chemistry and Physics. Dawson (2000) while comparing changes in interests and attitudes of Australian Students' over 20 years, reported that, girls show more performance in human Biology and general Biology, but boys were intensely interested in earth sciences. Unlike gender differences, research on attitudes of UK students of age level 11-16, reported that attitudes towards Biology show different age-related patterns than attitudes toward physics (Spall et al., 2004). According to Spall et al., (2004), Students' attitude towards Physics becoming more negative with increase in age, relative to more positive attitudes towards Biology.

There are lot of studies indicate that students' attitudes towards science decline with increase in grade levels (Francis & Greer, 1999; Pell & Jarvis, 2001) and it is considerably rich at elementary and secondary level of schooling (Rani, 2000; Weinburgh, 1995).

7. Methodology

In the present study, the researcher adopted 'Descriptive Survey' or 'Normative Survey' for answering the above said objectives. Normative survey study describes and explains what actually exists at present. The procedure was carried on students' learning Biology at secondary level both in public and private schools in Islamabad.

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7.1. Population and Sample.

The population of the study was all students learning Biology as an elective subject at the secondary level both in public and private schools in Islamabad. A total of 506 students were randomly selected from 10 different institutions, the detail of which is given below:

Table 2
Sample in detail

Type of School	Male	Female	Total
Public	109	194	303
Private	117	86	203
Total	226	280	506

7.2. Research Instrument.

The investigation of students' attitudes towards science is important for secondary school educators (Osborne, Simon & Collin, 2003). The present study involves the use of the Biology Attitude Scale (BAS), initially developed and validated by the researcher himself. Reliability of BAS was found 0.86 using Cronbach alpha. The questionnaire comprised statements related to seven underlying constructs like students' interest in biology; students' career in Biology; the importance of Biology; Biology teacher; difficulties in Biology; use of equipment in Biology and methodology of Biology. Students' attitude consists of three components: cognitive, affective and psychomotor (Oskamps & Schultz, 2005). The major 5-point Likert scale has 25 items includes the following seven subscales:

Table 1
Subscales of the Biology Attitude Scales

Sr. No.	Title of the subscale	Statements	Nature
1	Student's interest in Biology	1, 14	Positive: 1, 14
2	Student's career in Biology	3, 9, 19, 21	Positive: 3, 9, 19 Negative: 21
3	Importance of Biology	8, 13, 17	Positive: 13, 17 Negative: 8
4	Biology Teacher	4, 7, 11, 16, 23	Positive: 4, 11, 23 Negative: 7, 16
5	Difficulties in Biology	2, 5, 24	Positive: 5 Negative: 2, 24
6	Use of equipment in Biology	12, 22, 25	Positive: 22 Negative: 12, 25
7	Methodology of Biology	6, 10, 15, 18, 20	Positive: 10, 15, 18 Negative: 6, 20

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7.3. Data Collection and Analysis.

Data were collected from male and female students enrolled in different public and private schools in Islamabad. Biology Attitude Scale (BAS) was personally administered by the researcher. Initially, the researcher informed all the stakeholders like headteachers, teachers, and students about the terms and conditions of BAS including the purpose of the study. The data collected on students' responses were analyzed by descriptive statistics and independent sample t-tests using SPSS version 23.0.

8. Results.

Table 1

Students' attitude towards Biology at Secondary Level

Sr.No.	Statements	Mean	Remarks
1	Biology is my favorite subject.	3.8	Positive
2	The concepts and theories of Biology are too difficult to understand comparatively other science subjects.	3.4	Neutral
3	I would like to make a career in Biological sciences.	3.6	Positive
4	My Biology teacher is favorite one.	3.9	Positive
5	Biology is the easiest subject for me.	3.4	Neutral
6	Biology class is somewhat boring to me.	3.8	Positive
7	My Biology teacher is strict in his/ her dealing.	3.5	Neutral
8	Biology is less important as compared to other science subjects.	4.1	Positive
9	Biological knowledge is essential for my future career.	4.0	Positive
10	It is easy to raise question during biology class.	3.7	Positive
11	I prefer the teaching style of my Biology teacher.	3.8	Positive
12	We do not make use of Biology equipment.	3.1	Neutral
13	Biological knowledge supports us in understanding other courses and phenomenon.	3.8	Positive
14	I am inspired by my Biology teacher.	3.7	Positive
15	I am satisfied with the method of teaching Biology in our school.	3.8	Positive
16	I am not satisfied with teaching style of my Biology teacher.	3.9	Positive
17	The awareness of Biology is necessary for improving our lives.	4.1	Positive
18	I easily understand Biological concepts during class time.	3.7	Positive
19	I would like to be a Biologist.	3.1	Neutral
20	I find it difficult to share my views in Biology class.	3.2	Neutral
21	There is no place for Biology in my future plans.	3.6	Positive
22	I realize the importance of equipment when I prepare Biology lesson.	3.6	Positive
23	I have an easy access to my Biology teacher when I have any problem in Biology.	3.8	Positive
24	I often face difficulties in understanding concepts in Biology.	3.1	Neutral
25	I dislike performing Biology experiment.	3.9	Positive

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Table 2
Differences of Male and Female Students' Attitude towards Biology

Sub Scales	Male Students (N=260)		Female Students (N=280)		t-value	Sig.
	Mean	S.D.	Mean	S.D.		
Students' Interest in Biology	7.14	2.02	7.8	1.55	−4.363	.000
Students' Career in Biology	13.30	3.75	15.08	3.96	−5.144	.000
Importance of Biology	11.55	2.11	12.41	1.93	−4.793	.000
Biology Teacher	18.74	4.18	18.86	3.89	−.323	.746
Difficulty in Biology	9.30	2.48	10.45	2.37	−5.314	.000
Use of equipment in Biology	10.19	2.26	11.07	1.96	−4.639	.000
Methodology of Biology	17.87	3.50	18.62	3.20	−2.492	.013
Overall	88.12	14.07	94.48	12.66	−5.348	.000

Table 3 reflects significant gender difference on overall scores of BAS $t(506) = -5.348$, $p < .05$ indicating females *(Mean = 94.48, S.D. = 12.66)* to have more positive attitude towards Biology as compare to males *(Mean = 88.12, S.D. = 14.07).* In case of subscales results are significant for Students' Interest in Biology, $t(506) = -4.363$, $p < .05$, showing female students to score high *(Mean = 7.80, S.D. = 1.55)* than male students *(Mean = 7.14, S.D. = 2.02),* Students' Career in Biology, $t(506) = -5.144$, $p < .0\,5$, showing female students to score high *(Mean = 15.08, S.D. = 3.96)* than male students *(Mean = 13.30, S.D. = 3.75),* Importance of Biology, $t(506) = -4.793$, $p < .05$, showing female students to score high *(Mean = 12.41, S.D. = 1.93)* than male students *(Mean = 11.55, S.D. = 2.11),* Difficulty in Biology, $t(506) = -5.314$, $p < .05$, showing female students to score high *(Mean = 10.45, S.D. = 2.37)* than male students *(Mean = 9.30, S.D. = 2.48),* Use of equipment in Biology, $t(506) = -4.639$, $p < .05$, showing female students to score high *(Mean = 11.07, S.D. = 1.93)* than male students *(Mean = 10.19, S.D. = 2.26), and* Methodology of Biology, $t(506) = -2.492$, $p < .05$, showing female students to score high *(Mean = 18.62, S.D. = 3.20)* than male students *(Mean = 17.87, S.D. = 3.50),* except Biology Teacher, $t(506) = -0.323$, $p < .05$, showing female students to score high *(Mean = 18.86, S.D. = 3.89)* than male students *(Mean = 18.74, S.D. = 4.18)*.

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Table 3
Differences of Public and Private Students' Attitude towards Biology

Sub Scales	Public Students (N=303)		Private Students (N=203)		t-value	Sig.
	Mean	S.D.	Mean	S.D.		
Students' Interest in Biology	8.07	1.49	6.73	1.94	8.293	.000
Students' Career in Biology	14.90	3.98	13.36	3.76	4.328	.000
Importance of Biology	12.48	1.82	11.35	2.21	5.994	.000
Biology Teacher	19.80	3.89	17.33	3.75	7.081	.000
Difficulty in Biology	10.07	2.52	9.73	2.42	1.510	.132
Use of equipment in Biology	10.94	2.12	10.29	2.12	3.363	.001
Methodology of Biology	19.03	3.21	17.16	3.27	6.377	.000
Overall	95.38	12.20	86.06	13.86	7.767	.000

Table 4 shows a significant difference between public and private students on overall BAS, t (506) = 7.767, $p < .05$, indicating public respondents *(Mean = 95.38, S.D. = 12.20)* to show more positive attitude towards Biology as compared to private respondents *(Mean = 86.06, S.D. = 13.86).* In terms of subscales, results are significant for Students' Interest in Biology, t(506)= 8.293, $p < .05$, showing public students to score high *(Mean = 8.07, S.D. = 1.49)* as compared to private students *(Mean = 6.73, S.D. = 1.94),* for Students' Career in Biology, *t(506)= 4.328, p < .05,* showing public students to score high *(Mean = 14.90, S.D. = 3.98)* as compared to private students *(Mean = 13.36, S.D. = 3.76),* for Importance of Biology, *t(506)= 5.994, p < .05,* indicating public students to score high *(Mean = 12.48, S.D. = 1.82)* as compared to private students *(Mean = 11.35, S.D. = 2.21)*, for Biology Teacher *t (506)= 7.081, p < .05,*showing public students to score high *(Mean = 19.80, S.D. = 3.89)* as compared to private students *(Mean = 17.33, S.D. = 3.75),* for Use of equipment in Biology *t (506)= 3.363, p < .05,* showing public students to score high *(Mean = 10.94, S.D. = 2.12)* as compared to private students *(Mean = 10.29, S.D. = 2.12)* and for Methodology of Biology *t (506)= 6.377, p < .05,* indicating public students to score high *(Mean = 19.03, S.D. = 3.21)* as compared to private students *(Mean = 17.16, S.D. = 3.27)*. In case of subscale results are not significant for Difficulty in Biology *t (506) = 1.510, p < .05.*

9. Discussion.

Findings of the present study indicated that students overall show a positive attitude towards Biology at the secondary level in Islamabad. These findings are consistent with the results of the studies of Asiri (2018); Sakariyau, Taiwo & Ajagbe, (2016); Jebson, & Hena, (2015) and Yunus, & Ali, (2013) which show that secondary school students exhibited positive attitudes towards science. But the findings of the current study are inconsistent with the results of the studies conducted by Al-shargi (1988), and White & Harrison (2012) who found out that secondary school students in Saudi Arabia and the UK showed negative attitudes towards science.

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It is evident from the results of the present study that female students show a more positive attitude towards Biology than male students. In other words, gender seems to affect students' overall attitude towards Biology which is not in accordance with the findings of Iranian secondary school students (Soltani & Nasr, 2010); elementary students in Najran district (Saif & Aseri, 2017); BirninKebbi metropolis secondary school students (Hussaini, Foong, & Kamar, 2015) and Greek secondary school students (Mavrikaki, Koumparou, Kyriakoudi, Papacharalampous, & Trimandili, 2012). This finding of the current study is corroborated with the studies conducted by Osborne, Simon, & Collins, (2003) and Jebson, & Hena, (2015), who found out that gender has an effect on the attitude of students toward science subjects but contradicts in the sense that boys have a more positive attitude towards science subjects than girls have. In another study conducted by Sitotaw & Tadele, (2016), who found out that female students have positive feelings toward physics in 7 and 8 grades. A growing body of research studies suggested that Biology as an elective science subject is more popular among girls than boys, this fully supports the findings of this study (Keeves & Kotte, 1992; Jones et al. 2000; Prokop et al. 2007b and Usak et al. 2009). Female students found to have a more negative attitude towards science subjects and career than male students (Cannon & Simpson, 1985; Weinburgh, 1995) this is not in accordance with the findings of this study. According to Trumper (2006), in general, students' interest in science is neutral (neither positive nor negative), however, he showed that male students were more interested in science than female students. In the present study, there is a significant variation between the mean attitude scores of male and female students in terms of interest in Biology and female students showed more interest in Biology than male students. This finding is not in accordance with Chang, Yeung & Cheng (2009) who indicated in their study that boys have a higher interest in learning scientific topics than girls have.

The findings of this study show that there was significant variation between the attitude of public and private students towards Biology, students in public schools have more positive attitude than students in private schools. This result does not support by Hussaini, Foong, & Kamar (2015) and Yousuf, & Bhutta, (2012) who found out that private school students have more positive attitude towards Biology as compared to public school students. A positive attitude toward a particular subject may be congruent with higher achievement in that subject (Brown, White, Sharma, Wakeling, Naiker, Chandra, Gopalan & Bilimoria, 2015).

10. Conclusions.

Learning attitude in Biology is an important component to study Biology which has been considered as being a complicated subject for most students at secondary level. To increase students' positive attitude towards teaching and learning of Biology, cooperation from everyone is needed especially from Biology teacher who can use various approaches in making Biology conceptually understandable by minimizing misconceptions associated with students' cognitive structures regarding Biology.

Students having a positive attitude towards science in general and Biology, in particular, can practically acquire scientific information and support them to understand different scientific concepts and principles. It is students' positive attitude that makes them conceptually strong enough to value the role played by science in solving various problems and at the same time

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making them realize to understand the efforts of scientists in studying different issues and problems relating to our lives. The findings of the study revealed that overall students showed a positive attitude towards Biology. Female students exhibited a positive attitude as compared to male students. Similarly, students in public schools showed a positive attitude toward students of private schools.

Due to shortage of time and resources researcher confined himself to 506 students as convenience sample for this study. Further, this study was only focusing on the affective component of attitude i.e. students' liking or disliking about the attitudinal object (biology). The researcher recommended that further research studies are required to explore students' positive attitudes towards Biology in Islamabad and further utilize to improve their academic achievement in Biology at the secondary level.

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