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Mr. Dibya Prasad Satapathy

NAME: Mr. Dibya Prasad Satapathy

RESEARCH QUESTION: How can the understanding of phenotypic discrimination among people be developed by using concept of gene expression in my class XII students.

	Please check you have completed the following:	Checked
1	Label your assignment file as: 'GTA2015_India_rSarangi.doc', where xxxx is the initial of your first name followed by your second name, for example 'rsingh' for Rahul Singh	√
2	Add your full name in the header so that it appears on every page of your assignment	√
3	Add your institution's name in the footer so that it appears on every page	√
4	Number the pages of your assignment	√
5	Ensure that the combined word count for Part 1 and Part 3 of your assignment is not more than 3000 words. Use Ariel pt 11 font. If you have any appendices they should not exceed 12A4 sides in length	√
6	If you decide to submit your assignment using the writing frame below, please delete pages 1 and 2 of this document and start the first page with your assignment's title	√
7	Ensure that you submit a personal statement with your assignment. A template for the personal statement is provided below	√

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Personal Statement

Name: **Mr. Dibya Prasad Satapathy**

How can the understanding of phenotypic discrimination among people be developed by using concept of gene expression in my class XII students.

School: SAI International School

As a teacher researcher, I feel extremely privileged to participate in this creative venture of professional development through Class room based Action Research. I always felt curious and wanted to explore new ways of thinking in solving the puzzles, which Mother Nature gave us. Starting from DNA to protein coding or changing color of leaves in the fall

I think that if a teacher has a good command on the topic and always thinks about how learning process can be changed for improvisation and make classes more interesting and also make the class extremely student oriented It will develop a sense of curiosity in the students and give a rise in the interest of students.

I always believed in changing the way the course had been taught in the past in order to improve learning opportunities for all students. Historically, biology was taught using books and pictures from the book. The biology laboratories had many specimens which nobody would relate to. When I was learning biology the traditional way, I understood how functional proteins arose from DNA. Having already studied biology for several years I knew about the functions of some proteins, and I knew about transcription and translation as isolated processes, but the fact that proteins folded spontaneously and that they way they folded, and their consequent function, was dependent on their amino acid sequence had never been pointed out to me.

This sort of “top down” teaching is typical in biology, and it’s easy to see why. Traditionally, biology has involved the study of “black box” processes – processes whose fundamental basis was unknown. Early teaching had to be superficial since so little was known about the underlying mechanisms of the processes they described. In covering metabolism for example the names and arrows approach was valid since the chemical basis of the enzyme functions were unknown.

Over the years as our understanding of biological processes has evolved, basic teaching methods have not. Textbook and teachers still tend to take the top-down approach that their predecessors had to, focusing on higher order processes and treating the underlying chemistry almost as an aside. But this is not the best way to do things. Biology is just complicated

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chemistry so, where possible, the teaching of biology should start with the chemical basics and build on them logically to reach an understanding of higher order processes.

I extend my thankfulness to my mentor Mrs. Binati Mishra without whose constant guidance and support this project was not possible alongside thanking each member of the staff teaching as well as others whose valued support helped me go a long way in the constructive completion of the project. I also thank the school management for their constant support and guidance to complete the assignment. My heartfelt thanks goes to the British Council for giving me this platform to explore more and enhance my knowledge Vistas, thereby upgrading my professional skills and also helping my students take interest in the process and help clear their concepts of such a difficult topic.

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Word count and declaration of originality

I hereby declare that, except where explicit attribution is made, the work presented in this assignment is entirely my own.

Word count (excluding Part 2, appendices and references): 2,284 words

Signed : 

Name : Mr. Dibya Prasad Satapathy

Date : 14.5.2015

I will allow my work to be used in case studies or other publicity material.

Signed : 

Name : Mr. Dibya Prasad Satapathy

Date : 14.5.2015

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Declaration of originality provided by the school's Principal or Director/Chairman/Owner

I hereby declare that, except where explicit attribution is made, the work presented in this
assignment is entirely the work of Mr. Dibya Prasad Satapathy

Signed



Name : Mr. Harish Sanduja

Date : 14.5.2015

Declaration by mentor

I declare that I have had an ongoing professional discussion with Mr. Dibya Prasad Satapathy
about this action research.

I have checked the word count and found it to be correct

Signed



NameBinati Mishra.....

Date 25 / 5 / 2015

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Your Research Question..... How can the understanding of phenotypic discrimination among people be developed by using concept of gene expression in my class XII students.

Your name and the name of your institution... Dibyaprasad Satapathy SAI

International School , Bhubaneswar...

The name of your mentor.....Mrs Binati Mishra.....

Date.....27th Feb...2015.....

1.1 Framing your research question.

My research question is-

How can the understanding of phenotypic discrimination among people be developed by using concept of gene expression in my class XII students.

My action research and projects associated with it would have many positive outcomes, starting with the teachers of Biology, who would eventually emerge as efficient teacher leaders-

To teachers of Biology in my school-

- The innovative and practical method of learning will enable them to develop new strategies for different topics.
- It allows for an ongoing process of self evaluation where they can appraise themselves and their own performance.

The students of my school would be able to-

- Break the monotony and will be able to study difficult process in an innovative method.
- Most of the students of class 12 would be able to have a detailed idea regarding the gene expression.
- The students will have a detailed idea about the phenotypic discrimination found around different corners of the world.
- They will be able to exchange their findings, reports and other information in the form of articles, photographs, etc and can also share it with our partner School students.

1.2 Briefly describe your working context

Sai International School affiliated to the Central Board of Secondary Education is located in Bhubaneswar which is known as the temple city of India or the Swarna Tribhuj. This is one of the most visited places of Eastern India. Recognising the need for extra ordinary passion for learning among students of Eastern zone the school has a constant effort to provide facility not

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only in terms of infrastructure but also to develop a broad range of skills for life and to shape their carrier and to take responsibility of an adult and citizen.

My profile and work:

I have completed my M.S.C and MPhil in Zoology from Ravenshaw college and currently pursuing my carrier as Curriculum instructional leader of Class XI & XII and the HOD of the Dept. of Biology . I have always dreamt to create enthusiasm and tremendous interest in Biology among Class XII students I have 16 years of teaching experience..Being a C.I.L I am also keeping a track of various subjects like English, Physics Chemistry, Math, Computer science Biology etc..

Year after year I am always actively involved in various CBSE oriented biology projects and I was also involved in our school ISA project on finding ph of different water samples and correlating with the organisms growing initiated through a field study .

In the year 2014 I got the Certificate of appreciation for outstanding performance from Ministry of Human Resource Department.

1.3 Analyse your starting point

The project mainly consists of field experiment, Lab experiment and various case studies regarding phenotypic discrimination.

Observation-

Students of class XII biology have an inherent interest in genetics but their knowledge is restricted to particular areas given on the textbook only. Teaching in the class room and making them aware about certain phenotypic discrimination. is impossible only in the class room. I thought going out of the box would help my students to clearly understand the difficult concepts of genetic expression. With innovative activities and use of ICT in real practice would help them to correlate with this concept and how it is relevant in their day to day life. Misconception regarding structure of DNA ,isolation invitro, through innovative lab experiment can give a clear cut idea about genotypic expression responsible for phenotypic discrimination.

Based on a survey conducted in my school during the execution phase of the ISA Projects & Pre-Research Survey conducted for GTA on 17 February 2015 I found out that

- My students have a keen interest to know more about gene expression
- Most of them are aware of the term gene expression but only 10% are able to explain them.
- .Students are unaware of the process of inheritance and expression of Regulatory genes.
- With the help of Action Research i am intending to clarify their myths and superstitions regarding expression of genes, by various case studies and ICT.
- My students will get to know more about recent research on this topic done by scientists in the other parts of the world

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- They will also share their learning with the sixth form students of our partner School through Skype and the findings of the research will be shared with the teachers of that school through emails

1.4 Working with your mentor and other advisors

My Primary mentor is Mrs. Binati Misra. For the successful execution of the action research for the GTA Programme in my school, I would need the support and guidance of the Principal of the school, Mr Harish Saduja and Vice principal Mr Nilakantha Panigrahi who are Science teachers as well.

Mrs Mishra is very cooperative and initially guided me in framing my research Question. Since she belongs to the same school our mode of communication will be one to one basis though it will also continue through e -mail and phone.

1.5 What ethical issues do you need to take into account?

The potential participants of my action research mainly include students of class XII. The students will be initially taken into confidence and make them clear about the action research and how it is going to benefit them. A letter of consent with the detail of action research will be sent to the parents of the class which will be part of my project. The students would have the liberty to withdraw at any time of the action research, however as this topic is part of their curriculum I hope and presume that all the students will be enthusiastically ready and also the parents will give their consent for the proposed research.

1.6 What diversity / equal opportunities issues have you identified?

SAI International school provides equal opportunity to each and every child in terms of guidance, tools and chemicals and lab requirements. Opportunities will be given to all the students of the target class with no discrimination of gender or deprive any one belonging to different cultural or. social background.

Students of the other sections of class XII will also have equal opportunity to learn and participate in the activities as I will train my co teachers of the Biology department who in turn will organize all the activities and experiments in their respective classes.

The Lab will be free for the students to use under my guidance, if they want to enhance their learning on this topic with further experiments.

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Action plan for the GTA Programme

Title of your assignment: How can the understanding of phenotypic discrimination among people be developed by using concept of gene expression in my class XII students.

Your name and the name of your institution: **Mr Dibyaprasad Satapathy , SAI International School BBSR**

The name of your mentor: **Mrs. Binati Misra**

Action Details	Outcome	Actions	Timescales / Key dates	Resources / People including sources of support and challenge	Success Criteria	Comments / amendments to plan
	<i>What outcome are you intending to achieve? Can you break it down into one or two smaller achievable outcomes?</i>	<i>What are you going to do? What actions are necessary? When will you review your work? When will you contact your mentor? Plan when and how you will disseminate your work.</i>	<i>When will you start it? When will it be completed?</i>	<i>Who will you involve? What resources do you need? What difficulties do you need to include so you can plan for them?</i>	<i>How will you know when you have achieved this action?</i>	<i>Indicate when you have achieved your intended outcome. Make a note of any changes you have had to make to the plan. Reflect on the relevance of your project to other teachers both locally and globally.</i>
Gain your head teacher's/principal's approval for your action research and your action plan:					Yes	
Date the approval was given:10.02.2015.....						
Action 01: GTA Preparation- Pre-research						

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1.1	Analysis of the concerns and knowledge of the students	Distribution of Questionnaires to the Students and consent letters to parents.	10 th Feb 2015	20 Students of Class – XII B Students Dibyaprasad Satapathy Debasis Bal	The Questionnaires were based on some of the common facts for introducing the concept of gene expression and later it can be shared with local and global links	
1.2	Reviewing previous knowledge of students and also collecting consent forms from parents	Collection of filled-in questionnaires from the Students, Teachers & and consent form from Parents.	16 th Feb 2015	Dibyaprasad Satapathy 20 Students of class XII B	Analysis and review of the knowledge of the students on the topic	-
1.3	Pre Research Stage & preparing for Implementation.	Finding out the ICTS available for the better study of gene expression and online survey Finding out various methods of extraction of gene and the tools and techniques available locally for the same.	18 th to 20 th February 2015	Dibyaprasad Satapathy Resources from the school library, Internet, and my professor Dr Shiba Prasad Mohanty who will provide real guidance for the same.	Getting a clear cut idea regarding the execution of action research in class. Compile and enlist techniques and activities for the research.	-

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1.4	Agreement/Approval from the Head teacher and subject teacher of the partner school regarding sharing of information and content.	Sharing of letter of interest and intimation about the GTA Programme inviting the partner school to engage into information sharing.	21 st February 2015	Dibyaprasad Satapathy	Statement of approval and interest from the partner school.	-
1.5	Initiation of the Project Synopsis	Based on the information obtained preparation of Synopsis.	23 rd February 2015	Dibyaprasad Satapathy	Drafting of Synopsis and Action Plan-	-
1.6	Complete writing synopsis and Action Plan	1 st Submission of the Synopsis to the Mentor Final submission after getting feedback from the mentor	27 th Feb 2015 28 th Feb 2015	Dibyaprasad Satapathy	Feedback from the Mentor and edit if necessary and send it back again for final submission	-
1.7	Providing information regarding GTA Programme to the Students and Teachers involved.	Preliminary sessions with students and distribution of the Research Questionnaire and consent forms to the students. Session-2 Explaining the Students about the	5 th March 2015 10 th March 2015	Dibya prasad Satapathy Students of Class XII B	Receiving parents consent form The participants will be aware about the GTA program and the various research methods associated with it.	

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		objective of GTA programme: How can the understanding of phenotypic discrimination among people be developed by using concept of gene expression in biology				
1.8	Getting a clear idea regarding the existence of DNA in different organisms.	Activity: Analysis of different cells at least a plant and an animal for each small group through Biochemical experimentation in the Biology lab.	16 th and 17 th March 2015	Dibyaprasad Satapathy 20 Students of class XII B	generate knowledge about existence of DNA in plant and animal cells	
1.9	Learning of different classroom practices of the topic	Class room Activity: PPT presentation of classroom methods on this topic in Schools of other countries.	18 th March 2015	Dibyaprasad Satapathy 20 Students of class XII B	The students will be well aware about the details of this topic and the varied activities used in classes of other country.	
1.10	Virtual class with Our Partner School sixth form students to	Students of both the schools discuss over skype about their	19 th March 2015	Dibyaprasad Satapathy 20 Students of class	Sharing of knowledge and learning with partner school students.	

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	discuss about Gene expression.	knowledge of gene expression		XII B Devjani Mohapatra Teachers and students of Partner School Jessica Patnaik		
1.11	To have a detailed idea regarding the decoding of information from DNA to protein in three class room sessions	Activity using ICT: Online demonstration of DNA replication using Youtube in the class	15 th - 19 th April 2015	Dibyaprasad Satapathy 20 Students of class XII B	The students will have a detailed idea about the decoding of information from DNA to protein.	
1.12	Making the concept more interesting for the students by giving some live examples.	Activity: PPT & Audio Visual Presentation on Phenotypic variations found in different parts of India.	21 st - 25 th March 2015	Dibyaprasad Satapathy 20 Students of class XII B	Students will develop a wide vision regarding the Phenotypic variation found in different corners of India.	
1.13	Finding out the level of understanding the students have achieved during the ongoing process.	Activity: PPT The students will do research and Present (Group wise) their findings regarding phenotypic variation found in different corners of world.	2 nd -10 th April 2015	Dibyaprasad Satapathy 20 Students of class XII B	The students will be able to develop and gather information regarding expression of genotype in different corners of the world.	
1.14	Getting idea whether students are able to correlate the	Activity: The students will share their	29 th April 2015	Dibyaprasad Satapathy	Students will have self learning experience of	

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	knowledge gained with the information available in their group.	knowledge gained from the activities already done and Group wise will share data and find out variation from the examples available in their respective group.		20 Students of class XII B	phenotypic variations found in different groups.	
1.15	Sharing of Final research findings and learning outcome with partner School of UK	Send a ppt via email to our partner School with the final research outcome	30 th April 2015	Dibyaprasad Satapathy	shared learning with UK partner School via skype	
1.16	Sharing of teaching techniques with colleagues of the department	Conduct a workshop for colleagues of the department so that Sharing of teaching techniques can be done	20 th March 2015	Dibyaprasad Satapathy Devjani Mohapatra 05 Teachers of the Biology department	Co teachers gain knowledge about the innovative activities to be introduced in class XII B which they will execute in the other sections	Sharing of learning done with co teachers
1.17	Analysis of the knowledge gained from the research and learning impact on target students and co teachers about the topic and preparation of comparative charts and statistical data.	Collection of all data and Preparation of Evaluation charts	2 nd May 2015	Dibyaprasad Satapathy Devjani Mohapatra Debasis Bal	Evaluation documents ready	

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1.18	Final submission to be sent to Mentor along with evidences for analysis and feedback	Submission to Mentor	10 th May 2015	Dibyaprasad Satapathy Mrs Binati Mishra		
1.19	Submission of final presentation.	Sending the final presentation to the Mentor after making due changes to the presentation, as per feedback received.	14 th May 2015	Dibyaprasad Satapathy Mrs Binati Mishra	Final GTA Presentation including all sections 1-3 and evidences compiled in the form of survey reports, PPT photographs, statistical data, links to uploads, etc.	

Section 3: Developing your enquiry.

At this point you refer back to your plan with its key dates and actions and consider your progress.

3.1 What were the key learning outcomes?

As a biology teacher the main intended learning outcome is to give emphasis on development diverse teaching methods, stimulating learning motivation and interest and enhancing the effect of learning through relevant practical skill.

The learning outcomes of the students who were part of my research program is

- (i) They had a clear cut idea about the structure of DNA
- (ii) Practical knowledge about its isolation.
- (iii) The students also had a detailed idea regarding the concept of gene expression and correlated it with the phenotypic variation found at different corners of the world.

Previously I was giving more emphasis on direct teaching method also known as factory approach for teaching concept of gene expression and found lack of interest in the students' curiosity, questioning and feedback.

This method was just to gain mechanical knowledge aiming at scoring high marks and passing exam. After going through the 6 week practical and activity oriented teaching I got learning satisfaction which is one of the major items to measure learning centre and collecting information helped me to emphasize on those points of gene expression that was difficult for students and teachers to understand. Due to innovation of course design it motivated the students to integrate knowledge with a practical, flexible innovative ability that would enable them to make a more substantial contribution to relevant areas.

3.2 How did you evaluate your intended learning outcomes?

A Pre research test and a post evaluation (after completion of the action research) the achievements were recorded and plotted on bar graph to reflect on the improvement in their conceptual learning .

When feedback was collected from students and colleagues it was found that they were keenly interested and liked the interactive teaching methods rather than the prevalent direct teaching method.

Appendix A.1 shows Table I, pre – test and Post –test results.

Appendix A. 2 reflects the qualitative analysis of a pre – test and Post –test results.

Appendix B.1 Pre- research program (ppt presentation)

Appendix B.2 Research activity (isolation of DNA from plant cell)

Appendix B.3 Research activity ((isolation of DNA from animal cell))

Appendix B.4 PPT presentation (DNA traits from other countries)

Appendix B.5 Virtual class with partner school students

Appendix B.6 PPT presentation (student presentation)

Appendix B.7 Extended activity (sharing finding with co teachers)

Appendix C.1 Parental permission on the research.

Appendix D.1 Questionnaire for Students' Pre Concept Test

Appendix D.2 Questionnaire – pre research

Appendix D.3 Questionnaire –post research

3.3 What has been the influence of engaging with the knowledge base?

During the research I used many sources to gain knowledge. The websites and the books that I have used have been presented in the reference column at the end of this section.

I had few discussions with subject teachers, classroom teacher, and science coordinator about the research. I have also attended an in-service training to explore new issues about teachers learning and teacher education and got a wide vision regarding activity oriented learning. I brushed through the books I had read during my post graduation course which refreshed my knowledge base and gave me new ideas. I researched about the different ways teachers are teaching this concept in the other parts of the world. Our partner school in UK was of great support.

3.4 How did the advice and guidance influence the way you learned and / or the outcomes of your learning?

My mentor Mrs. Binati Misra has been extremely kind and generous in giving me not only her time but her most valuable feedback and suggestions during the course of the research.

Originally the sessions were designed to have a specific time slot for the PowerPoint presentation, but then depending upon the student's ability, the time slot was modified. The students needed explanation during the session and the PowerPoint presentation was paused several times in between for an explanation. The duration for couple of session was extended as the students needed more time to understand and respond. The chairman of our school, is very encouraging at each and every step of my teaching, learning process,.

The principal of our school had also been a source of knowledge to me. I am able to learn a lot under his supervision and guidance to use the strategies of the research in the right manner.

I have learned a lot from my school staff, who had been very supportive and always gave me clear idea about, how to conduct an activity and what would be the students reaction to it.

3.5 What changes were made along the way? What impact did the review have on your plan?

As my work progressed, I found that some more students are interested in the particular topic. As suggested by the Assessor Prof. K. Pushpanadham I made few changes in my action plan to ensure that more students are coming with their own ideas in the form of PowerPoint presentation and to explain them in front of others. This enabled them to prepare well and to become thorough with the subject rather than merely remembering the concept.

Also as suggested in the review I involved the other Biology teachers of my school in the project. I did a session for them to orient about the new method of teaching Gene expression in the classroom and Lab.

This reveals that as a result of this Meta analysis the performance of experimented students are better than traditional courses in terms of general achievement analytical skills process and related skills.

3.6 Has your awareness and / or understanding of ethical issues changed in any way as a result of your action research?

The research area included all students of my classroom, the ones who are part of the research and the ones who are not part of the research. Parent consent was taken before the initiation of the research. The parents were briefed about the research and their child's role in the research. I took care to give equal opportunity to everyone and also knowledge was shared with the students of other sections of Class XII who were not part of the research .

3.7 Has your awareness and / or understanding of diversity / equal opportunities changed as a result of your action research?

Equal opportunity was given to each member of the group. Group discussions after the concept taught ensured that all students are equal participants irrespective of any difference in the socio economic or cultural differences and also there was no gender bias. Both girls and boys got the same opportunity to participate. Other teachers and students were also part of the research as the findings were shared so that no one is deprived of the new and effective learning method.

3.8 . How did you share the learning with other?

In the beginning of my research program, I shared my action research with my colleague Debjani Mohapatra and valuable feedback was obtained. I had even kept some of the photos of

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isolation and phenotypic variation in my lab, So that the other co- teachers can also go through it. I also shared it with class IX & X students and teachers to create interest among them while going through related chapters.

REFERENCES

	Author	Date of publication	Title of book/article etc.	Publication or website detail URL and date the website was last accessed
1.	Hait ghosh James D. watson, Tania A Boher,	2012	A text book of Botany	Central Bool agency
2.	Stephan, P. Bell	2011	Molecular Biology the Gene	Pearson
3.	Sanjaya Sharma	2011	A new approach to Biology Genetics	Arihant
4.	Ajoy paul	2007	Text book of Genetics from gene to genome	Arunava public
5.	Gardner Simon	2010	Principle of Genetics	Wileay edu
6.	CB power	2014	Cell Biology	Himalaya
7.	Veer Bala Rastogi	2001	Genetics	Meerut
8.	Gardens & T. Davies	2010	Human genetics	Bristol
9.	Lehninger. Nelson, clox	2010	Principle of Biochemistry	Freeman
10.	Lehlinger	2010	Fundamental of Biochemistry	Kalyani
11.	Pearson	2014	Essential of Genetics	Pearson
12.	(K Bhatia)	2015	Elementary Biology	True man
13.	Ghosh, Manna	2011	Fundamental of Botany	Kalyani
14.	Ghosh, Nanda	2012	Text book of fundamental & Zoology	Central Book
15.	Smiths snith	2012	Human Molecular Genetics	Pearson
16.	J.T. Hancock	2011	Molecular genetics	Viva Book publication

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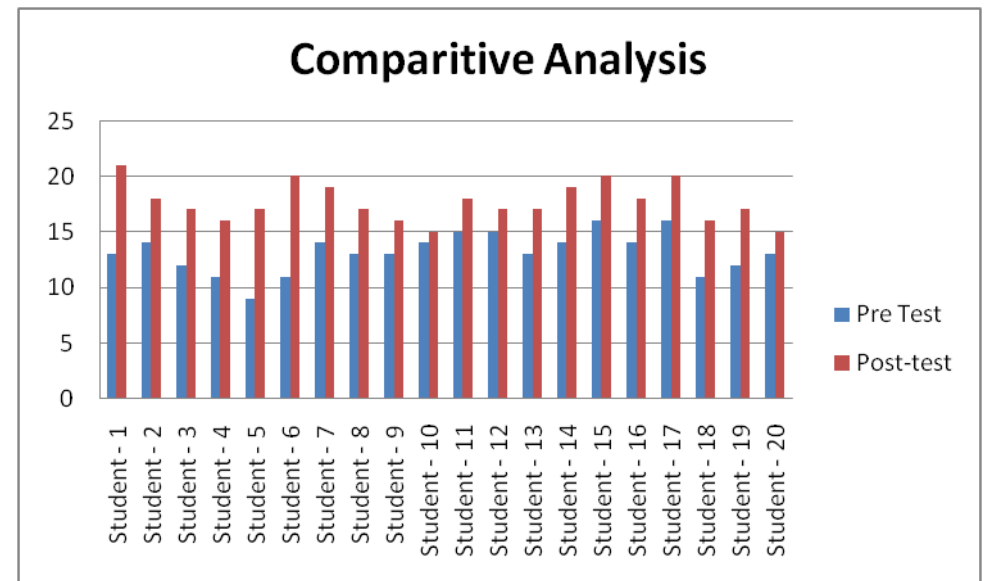
Appendix A.1

Table I, Pre test and Post test results.

Name of the student	Pre Test	Post-test
Student - 1	13	21
Student - 2	14	18
Student - 3	12	17
Student - 4	11	16
Student - 5	9	17
Student - 6	11	20
Student - 7	14	19
Student - 8	13	17
Student - 9	13	16
Student - 10	14	15
Student - 11	15	18
Student - 12	15	17
Student - 13	13	17
Student - 14	14	19
Student - 15	16	20
Student - 16	14	18
Student - 17	16	20
Student - 18	11	16
Student - 19	12	20
Student - 20	13	15

Appendix A.2

The qualitative analysis of a Pre – test and Post –test results.



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Appendix B.2

Appendix B.1

Pre –Research Activity: The students were presented with the PowerPoint on the topic related to concept .



During one of the biology classroom activity, 34 students of my class were presented on the topic related to the DNA. The topic that were covered during the presentation were

“Gene Expression” included a vast array of information on the central dogma of biology: gene expression. **“RNA Structure and Function”** reviewed the diversity of structure and function of various types of RNA during the gene expression process.

“Transcription” helped students visualize the process of transcription as well as understand the use of RNA expression– level analysis to complete genetic research.

“RNA Processing (Post-transcription)” helped explain how, once transcription is complete, eukaryotic cells undergo a process called RNA processing in order to prepare the RNA to leave the nucleus.

“Proteasome (Post-translation)” explored what happens to proteins once they are used by the cell. The proteasome is a large molecular machine that plays an important role in recycling and regulating cellular proteins. At the end of the class, in a discussion all the doubts and queries were answered.

Research Activity:

Activity to isolate DNA from the plant cell through Biochemical experimentation in the Biology lab.



Activity Description: The target Group Students were divided in groups and each student was asked to isolate DNA from the cells of plants. The Performance of Students gave me the indication of the prior knowledge and the areas that needed strengthening. The groups were made and the students were guided to begin the work in a systematic manner.

The students participated very actively and were very amazed about their findings. The hands on activity gave them a clear picture of the content taught.

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Appendix B.3

Research Activity:

Activity to isolate at DNA from the cells of animal through Biochemical experimentation in the Biology lab.



Activity Description: The target Group Students were divided in groups and each student was asked to isolate DNA from the cells of animal. The students were asked to isolate DNA from the liver cells of a frog. Initially the students were hesitant to hold the frog and do the dissection, but when I modelled it in front of them, they gained confidence and were able to finish the task.

Appendix B.4

Class room Activity: Power Point presentation in the classroom on this topic related to DNA in Schools of other countries.



Activity Description: The students were presented with a PowerPoint showing how a DNA is related to the physical features of humans of different countries. The countries that were selected for the DNA analysis are Nigeria, China, Scotland, and India.

The students were provided with the detail understanding of how the human beings from Nigeria would carry a DNA trait that would be different from a DNA analysis of a human being from Scotland. Likewise how the DNA traits of a person from china would be different from that of India.

Thus the students gained a clear understanding of the DNA traits. At end of the presentation all the questions were addressed and answered.

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Appendix B.5

Activity: Virtual class with Our Partner School (Chosen Hill School , UK) students to discuss about Gene expression.



Activity Description: During an interactive session with the partner school students, the target group students were able to discuss about the 'Gene expression'. The partner school students shared their understanding on the said topic. They explained how the topic was introduced to them, they talked about their personal experience biochemical experimentation. The same was shared by the target group students as well. The students also shared some laughter moments and enjoyed the interactive session with the partner schools students. At the end both the groups were able to expand their knowledge on the related topic.

Appendix B.6

Activity: The students did research and Presented (Group wise) their findings regarding phenotypic variation found in different corners of the world.



Activity Description: The students were able to develop and gather information regarding expression of genotype in different corners of the world. The student shared their subtopics among themselves and assigned topics for their presentation. After initial hiccups, the students gained confidence and were able to present their findings. The students were hesitant to clear some of the doubts of their group mates but after little hint given my me the students were able to explain their findings.

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Appendix B.7

Extended Activity: Conduct a workshop for colleagues of the department so that sharing of teaching techniques can be done.



After completion of the research program and after receiving feedback from my mentor , I was asking to share my finding with my colleagues . My colleagues liked my innovative way of teaching and are looking forward to implement in their teaching as well. My research finding were also sent to the teachers of our partner school, Chosen Hill School, UK, they also congratulated me on my finding and were encouraged to implement. I also shared my finding with my school principal and he had announced to implement such things in our school curriculum and expand it further to other departments of education.

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Appendix C.1

Parent permission Letter

Parental permission for participation of student in a Research Study

Dear Parents,

This is to seek permission to allow your child to participate in a research study conducted by Mr. Dibya Prasad Satapathy, Biology teacher, SAI International School, Bhubaneswar. The purpose of this research is to find out 'How can the understanding of phenotypic discrimination among people be developed by using concept of gene expression in my class XII students'.

Your child's participation will involve him/her to participate in a biology laboratory work and also interact over Skype with other students of partner school, Chosen Hill School, UK. The students will also present a PowerPoint on their learning to their fellow mates from other sections. I will be taking all the necessary precautions to ensure your child's safety during all the laboratory works. I will make sure that all the students are aware with the safety guidelines during every laboratory procedure; however my laboratory assistants will also be present to assist your child.

Participation in this research is voluntary. You may refuse to allow your child to participate or withdraw your child from the research at any time. Your child will not be penalized in any way should you decide not to allow your child to participate or to withdraw your child from this study.

If you have any questions or concerns about this study or about your child's rights as a research participant, please feel free to contact Mr. Dibya Prasad Satapathy at SAI International School.

Consent

I have read the parental permission form and have been given the opportunity to ask questions. I give/do not give my permission for my child to participate in this study.

Parent's signature  Date: 12/2/2015
Student's name: 

A copy of this parental permission form should be given to you.

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Appendix D.1

Students' Pre Concept Test Questionnaire

SAI International School

Duration: 25min

F.M-10

Name- Jyoti Swalok Juyipatty

03
10

- Transmission of genetic character from parent to offspring is known as.
(a) variation (b) Heredity (c) Blending (d) Somatoplasm
- Who coined the term allele?
 (a) Saunders (b) Bateson (c) Johanssen (d) Mendel
- Which of the following bond is not associated with a deoxyribonucleotide?
(a) Phospoester bond
 (b) Glycosidic bond
(c) Phospodlester bond
(d) More than one option correct
- Which of the following DNA form has maximum number of base pair per turn.
 (a) A-DNA (b) B-DNA (c) C-DNA (d) Z-DNA
- Who proposed the central dogma concept.
 (a) Crick (b) Watson (c) Griffith (d) Mendel
- The copying of information form DNA to mena is known as
 (a) Translation (b) Replication (c) Transcription (d) None of these
- What is the site of DNA replication
 (a) Nucleoplasm (b) cytoplasm (c) Mitochondria (d) None of these
- In which phase chromosome is clearly visible
 (a) Prophase-I (b) Anaphase-I (c) Telophase-I (d) Metaphase-I
- Which enzyme is mainly responsible for chain elongation during transcription.
 (a) RNA polymerase (b) DNA ligase (c) DNA helicase (d) primase
- Which protein is associated with DNA in eukaryotes
 (a) Histone (b) NHCs (c) trypsin (d) Myoglobin

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Appendix D.2

Students' Pre Concept Test Questionnaire

SAI International School

Duration: 25min

F.M-10

Name- Biswajeet Padhy

07
10

- Transmission of genetic character from parent to offspring is known as.
(a) variation (b) ~~Heredity~~ (c) Blending (d) Somatoplasm
- Who coined the term allele?
(a) ~~Saunders~~ (b) Bateson (c) Johanssen (d) Mendel
- Which of the following bond is not associated with a deoxyribonucleotide?
(a) Phospoester bond
(b) ~~Glycosidic bond~~
(c) Phospodiester bond
(d) More than one option correct
- Which of the following DNA form has maximum number of base pair per turn.
(a) A-DNA (b) B-DNA (c) ~~C-DNA~~ (d) Z-DNA
- Who proposed the central dogma concept.
(a) ~~Crick~~ (b) Watson (c) Griffith (d) Mendel
- The copying of information form DNA to ~~mRNA~~ is known as
(a) Translation (b) Replication (c) ~~Transcription~~ (d) None of these
- What is the site of DNA replication
(a) ~~Nucleoplasm~~ (b) cytoplasm (c) Mitochondria (d) None of these
- In which phase chromosome is clearly visible
(a) Prophase-I (b) Anaphase-I (c) Telophase-I (d) Metaphase-I
- Which enzyme is mainly responsible for chain elongation during transcription.
(a) ~~DNA polymerase~~ (b) DNA ligase (c) DNA helicase (d) primase
- Which protein is associated with DNA in eukaryotes
(a) ~~Histone~~ (b) NHCs (c) trypsin (d) Myoglobin

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Pre Test Questionnaire

SAI International School

Name: Adarsh Agarwal

12
25

F. M. - 25
Time : 1 Hr

- In *E. coli*, according to the operon theory combines with
(A) regulator protein to switch on structural genes transcrion
(B) regulatory protein to switch off structural genes transcrion
(C) inducer gene to switch on structural genes transcription
(D) structural genes to switch on structural genes transcription
- Translation of mRNA takes place in
(A) 5' to 3' direction
(B) E to A site
(C) P to Q site
(D) any direction
- There are 64 codons in genetic code dictionary because
(A) there are 64 type of tRNAs found in cell.
(B) there are 44 meaningless and 20 codons for amino acids.
(C) there are 64 amino acids to be coded.
(D) genetic code is triplet.
- RNA primer is used in
(A) RNA repair.
(B) replication.
(C) translation.
(D) transcription.
- The enzyme necessary for the break down of lactose into glucose and galactose when the lactose is added to the medium of the *E. coli* are
(A) β -galactosidase
(B) transcetylase
(C) permease
(D) lactase
- In operon systems, the synthesis of proteins is controlled by
(A) operator gene through regulator gene
(B) regulator gene through operator gene
(C) promoter gene through regulator gene
(D) operator gene through promoter gene
- During DNA replication, the strands are separated by
(A) DNA polymerase. ~~(B) ligase.~~
(C) helicase. (D) primase
- DNA replication is
(A) conservative and discontinuous
(B) semiconservative and semidiscontinuous
(C) semiconservative and discontinuous
(D) conservative and semidiscontinuous

9. The process of transfer of genetic information from DNA to RNA is called
- (A) transversion.
(B) transcription.
(C) translation.
(D) translocation.
10. The genetic code is degenerate because
- (A) one amino acids is represented by only one codon.
(B) one amino acid is specified by the three mRNA's codon.
(C) one amino acids can be represented by more than one codon.
(D) one codon can code for many amino acid.
11. In Escherichia coli, lac operon is induced by
- (A) lactose
(B) promoter gene
(C) β - galactosidase
(D) i-gene
12. In split genes, the coding sequences are called
- (A) introns
(B) operons
(C) exons
(D) distrans
13. The eukaryotes differs from prokaryotes in their genome because
- (A) prokaryotic genes are not organized into operons.
(B) both introns and exons are present in prokaryotes.
(C) eukaryotic genes are polycistronic and prokaryotic genes are monocistronic.
(D) repetitive sequences are present in eukaryotic genome but not in prokaryotes.
14. Each codon corresponds to only one amino acid. This means that the genetic code is
- (A) unambiguous.
(B) degenerate.
(C) universal.
(D) non-overlapping.
15. Each base along the mRNA is a part of only one codon. This means that the genetic code is
- (A) degenerate.
(B) commaless.
(C) non-overlapping.
(D) universal.
16. Splicing of mRNA takes place in
- (A) cytoplasm.
(B) ribosomes.
(C) spliceosomes.
(D) nucleus.

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17. In recombinant DNA technology, DNA is cut by
(A) DNA polymerases.
(B) restriction endonucleases.
(C) DNA ligases.
(D) helicases
18. During transcription, holoenzyme RNA polymerase binds to a DNA sequence and the DNA assumes a saddle like structure at that point. That sequence is called as
(A) AAAT box.
(B) TATA box.
(C) GGTT box.
(D) CAAT box.
19. The mutation not involving a multiple of three base pairs is
(A) nonsense mutation.
(B) frameshift mutation.
(C) suppressor mutation.
(D) inversion mutation.
20. Incomplete proteins are mostly
(A) animal proteins.
(B) plant proteins.
(C) cyanobacterial protein.
(D) fungal protein.
21. The central dogma of molecular biology is
(A) DNA RNA Proteins.
(B) Proteins RNA DNA.
(C) DNA mRNA tRNA.
(D) DNA mRNA rRNA tRNA.
22. Satellite DNA shows
(A) repetitive sequences.
(B) same sequences in prokaryotes and eukaryotes.
(C) same density as that of bulk DNA.
(D) intervening and overlapping sequence.
23. DNA ligase helps in all except
(A) unwinding of DNA during replication.
(B) sealing nick in the DNA.
(C) joining Okazaki fragments.
(D) DNA cloning.
24. Left-handed double helical DNA is
(A) Z-DNA.
(B) s-DNA.
(C) B-DNA.
(D) A-DNA.
25. A gene which synthesizes a repressor protein is
(A) operator gene.
(B) structural gene.
(C) promoter gene.
(D) regulator gene.

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Mr. . Dibya Prasad Satapathy

Post-test Questionnaire

SAI International School

Name: Adarsh Agarwal

20/25

F. M. - 25
Time : 1 Hr

1. In *E. coli*, according to the operon theory combines with
(A) regulator protein to switch on structural genes transcrion
(B) regulatory protein to switch off structural genes transcrion
(C) inducer gene to switch on structural genes transcription
(D) structural genes to switch on structural genes transcription
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(B) E to A site
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(D) any direction
3. There are 64 codons in genetic code dictionary because
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(B) there are 44 meaningless and 20 codons for amino acids.
(C) there are 64 amino acids to be coded.
(D) genetic code is triplet.
4. RNA primer is used in
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(B) replication.
(C) translation.
(D) transcription.
5. The enzyme necessary for the break down of lactose into glucose and galactose when the lactose is added to the medium of the *E. coli* are
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(B) transcetylase
(C) permease
(D) lactase
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(B) regulator gene through operator gene
(C) promoter gene through regulator gene
(D) operator gene through promoter gene
7. During DNA replication, the strands are separated by
(A) DNA polymerase. (B) ligase.
(C) helicase. (D) primase
8. DNA replication is
(A) conservative and discontinuous
(B) semiconservative and semidiscontinuous
(C) semiconservative and discontinuous
(D) conservative and semidiscontinuous

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9. The process of transfer of genetic information from DNA to RNA is called
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(B) transcription.
(C) translation.
(D) translocation.
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(B) ribosomes.
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(D) nucleus.

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