Diploma Programme subject outline–Group 4: sciences			
School name	Worthington Kilbourne High School	**School code**	007119
Name of the DP subject *(indicate language)*	IB Biology SL - English		
Level *(indicate with X)*	Higher [ ] Standard completed in two years [ ] Standard completed in one year * [X]		
Name of the teacher who completed this outline	Brianna N. Diehl	**Date of IB training**	Fall 2016
Date when outline was completed	Fall 2018	**Name of workshop** *(indicate name of subject and workshop category)*	IB Category 1

* All Diploma Programme courses are designed as two-year learning experiences. However, up to two standard level subjects, excluding languages ab initio and pilot subjects, can be completed in one year, according to conditions established in the *Handbook of procedures for the Diploma Programme*.

1. Course outline

– Use the following table to organize the topics to be taught in the course. If you need to include topics that cover other requirements you have to teach (for example, national syllabus), make sure that you do so in an integrated way, but also differentiate them using italics. Add as many rows as you need.

– This document should not be a day-by-day accounting of each unit. It is an outline showing how you will distribute the topics and the time to ensure that students are prepared to comply with the requirements of the subject.

– This outline should show how you will develop the teaching of the subject. It should reflect the individual nature of the course in your classroom and should not just be a “copy and paste” from the subject guide.

– If you will teach both higher and standard level, make sure that this is clearly identified in your outline.

	Topic/unit (as identified in the IB subject guide) *State the topics/units in the order you are planning to teach them.*	Contents	Allocated time One class is 50 minutes. In one week there are 5 classes.	Assessment instruments to be used	Resources *List the main resources to be used, including information technology if applicable.*
Year 1	Unit 1: Introduction to IB Bio & "The Stuff of Life"	Introduction to the course Introduction to Practical Work 2.1 Molecules to Metabolism 2.2 Water	6.76 hours	Mastery Assessment over 2.1 & 2.2 (summative) Lab write up, graphs, and chi-squared analysis for introdctory lab. (formative & summative) Water lab analysis (formative & summative) Desk top concept maps and group discussion on 2.1 & 2.2. (formative) In class molecule building, table drawing practice.	*Pearson Baccalaureate SL Biology* 2nd Edition (Damon et al. 2014) Notes & resources adapted from https://www.bioknowledgy.info/ Schoology Animal behavior lab document (observational lab) Discussion centered around animal experimentation policy & ethics Water lab Youtube videos & other visual aids to support learners Concept maps & learning targets

	Cells	1.1 Cell theory, cell specialization, and cell replacement 1.2 The ultrastructure of cells 1.3 Membrane structure 1.4 Membrane transport 1.5 The origin of cells 1.6 Cell division	17.64 hours	Mastery Assessment over 1.1-1.6 (summative) Lab write up, graphs, and statistical analysis for practical work. (formative & summative) Scientific drawing how to (goes along with ultrastructure of cells lab) Learning Target Completion	*Pearson Baccalaureate SL Biology* 2nd Edition (Damon et al. 2014) Notes & resources adapted from https://www.bioknowledgy.info/ Schoology Microscopes & prepared slides Micrograph images of cells Potatoes Rulers

	Molecular Biology	2.3 Carbohydrates & lipids 2.4 Proteins 2.5 Enzymes 2.6 Structure of DNA & RNA 2.7 DNA replication, transcription & translation 2.8 Cell respiration 2.9 Photosynthesis	20.20 hours	Mastery Assessment over 2.3-2.6 (summative) Mastery Assessment over 2.7-2.9 (summative) Lab write up, graphs, and statistical analysis for practical work. (formative & summative)	*Pearson Baccalaureate SL Biology* 2nd Edition (Damon et al. 2014) Notes & resources adapted from https://www.bioknowledgy.info/ Schoology Molecular Modeling Kits Jmol Software Table Markers Enzyme Catalysis Lab Uniprot Database Chromatography

	Genetics	3.1 Genes 3.2 Chromosomes 3.3 Meiosis 3.4 Inheritance 3.5 Genetic modification & biotechnology	14.30 hours	Mastery Assessment over 3.1-3.5 (summative) Lab write up, graphs, and statistical analysis for practical work. (formative & summative)	*Pearson Baccalaureate SL Biology* 2nd Edition (Damon et al. 2014) Notes & resources adapted from https://www.bioknowledgy.info/ Schoology pGlo Lab
	Human Physiology (WWI & the Human	6.1 Digestion & absorption 6.2 The blood system 6.3 Defence against infectious disease 6.4 Gas exchange 6.5 Neurons & Synapses 6.6 Hormones, homeostasis, & reproduction	21.00 hours	Mastery Assessment over 6.1-6.3 (summative) Mastery Assessment over 6.4-6.6 (summative) Lab write up, graphs, and statistical analysis for practical work. (formative & summative)	*Pearson Baccalaureate SL Biology* 2nd Edition (Damon et al. 2014) Notes & resources adapted from https://www.bioknowledgy.info/ Schoology Case Studies POGIL

	Evolution & Biodiversity	5.1 Evidence for evolution 5.2 Natural selection 5.3 Classification of biodiversity 5.4 Cladistics	11.00 hours	Mastery Assessment over 5.1-5.4 (summative) Lab write up, graphs, and statistical analysis for practical work. (formative & summative)	*Pearson Baccalaureate SL Biology* 2nd Edition (Damon et al. 2014) Notes & resources adapted from https://www.bioknowledgy.info/ -Schoology -Resin preserved specimens
	Ecology	4.1 Species, communities & ecosystems 4.2 Energy flow 4.3 Carbon cycling 4.4 Climate change	15.00 hours	Mastery Assessment over 4.1-4.4 (summative) Lab write up, graphs, and statistical analysis for practical work. (formative & summative)	*Pearson Baccalaureate SL Biology* 2nd Edition (Damon et al. 2014) Notes & resources adapted from https://www.bioknowledgy.info/ -Schoology -Ravine Study
	Option C: Ecology & Conservation	C.1 Species & communities C.2 Communities & ecosystems C.3 Impact of humans on ecosystems C.4 Conservation of biodiversity	12.00 hours	Mastery Assessment over C1-C4 (summative) Lab write up, graphs, and statistical analysis for practical work. (formative & summative)	*Pearson Baccalaureate SL Biology* 2nd Edition (Damon et al. 2014) Notes & resources adapted from https://www.bioknowledgy.info/ Schoology

2. The group 4 project

As the IB guides say, “The group 4 project is a collaborative activity where students from different group 4 subjects work together on a scientific or technological topic, allowing for concepts and perceptions from across the disciplines to be shared in line with aim 10—that is, to ‘encourage an understanding of the relationships between scientific disciplines and the overarching nature of the scientific method.’” Describe how you will organize this activity. Indicate the timeline and subjects involved, if applicable.

Students will be required to participate in a group 4 project as outlined in the IB biology syllabus. Students will be broken into small groups and asked to develop their own research question related to the biology core curriculum and other scientific and technological disciplines. Students will be required to include an international component, related to our pack H2O project or another approved international connection. Students will spend approximately 4 hours of in class time planning their projects/experiments, focusing on research, determining their goals, hyothesis, and end product. The remaining 6 hours will be devoted to executing their procedures and communicating their findings to members of the WKHS IB staff, their peers, or other appropriate audience. The planning process will begin late January (4 hours), the final project will be carried out in early spring (6 hours).

3. IB practical work and the internal assessment requirement to be completed during the course

As you know, students should undergo practical work related to the syllabus.

- Physics, chemistry and biology: 40 hours (at standard level) or 60 hours (at higher level)
- Computer science: 40 hours (at standard level) or 40 hours (at higher level)
- Design technology: 60 hours (at standard level) or 96 hours (at higher level)
- Sport, exercise and health science: 40 hours (at standard level) or 60 hours (at higher level)

Use the table below to indicate the name of the experiment you would propose for the different topics in the syllabus.

An example is given. Add as many rows as necessary.

Name of the topic	Experiment	Any ICT used? *Remember you must use all five within your programme.*
Introductory Unit	Isopod Behavior Study	
2.3 Water	Water Properties Lab	
1.2 Ultrastructure of Cells	Microscope Introductory Practical	
1.2 Ultrastructure of Cells	Cell Infrastructure Practical	
1.4 Membrane Transport	Diffusion & Osmosis in Potato Cells	

1.6 Cell Division	Identifying phases of Mitosis in Onion Cells	
2.3 Carbohydrates and Lipids	Jmol introducton	Yes
2.4 Protein Modeling	Use of pipe cleaners and other manipulatives to simulate protein structure	Yes
2.5 Enzymes	Enzyme (Catalase) Energetics	Yes
2.6 Structure of DNA & RNA	DNA Modeling Lab	Yes
2.8 Cell Respiration	Respirometer Lab using germinating peas	
2.9 Photosynthesis	Chromatography of Spinach	
3.1 Genes	GenBank Database Exploration	Yes
3.1 Genes	pGLO Bacterial Transformation	Yes
4.1 Ecology	Ravine study	

4. Laboratory facilities

Describe the laboratory and indicate whether it is presently equipped to facilitate the practical work that you have indicated in the chart above. If it is not, indicate the timeline to achieve this objective and describe the safety measures that are applicable.

I have a prep room outfitted with a sink, shelving units, an incubator, first aid kit, and chemical storage. My room has lab benches, three sinks, an eyewash, fire blanket, and fire extinguisher. We do not have an autoclave, so when we work with non-pathogenic bacteria I use a bleach solution to soak and disinfect equipment. Students have access to goggles, gloves, and aprons that are property of the school. I do not have a safety shower but the room across the hallway does. Our chemistry rooms have goggle disinfectant stations, showers, fume hoods and all the safety features listed above. We had a safety audit that was completed last year, each science room has an SDS binder for any/all chemicals found in that specific room.

5. Other resources

Indicate what other resources the school has to support the implementation of the subject and what plans there are to improve them, if needed.

We have access to lab areas equiped with safety features. Our students have access to a natural habitat to observe. Our school is built on a ravine, which facilitates enormous opportunities for periodic stream studies & water quality analyses. We have a very collaborative science department that shares materials and lab ideas. Students have access to science academic assistants that are available during all school hours. We have science magazines that are sent to the school, periodicals and texts in the library, and computer labs/carts that are available for research using Infohio database. My biggest plans to improve biology and how it is implemented is to aquire 1 to 1 chromebooks that I can keep in my classroom at all times.

6. Links to TOK

You are expected to explore links between the topics of your subject and TOK. As an example of how you would do this, choose one topic from your course outline that would allow your students to make links with TOK. Describe how you would plan the lesson.

Topic	Link with TOK (including description of lesson plan)
02 Molecular Biology	In this unit we talk a lot about models because students have difficulty visualizing the 3D structure of molecules. This is the first time I introduce students to the connection between science and the theory of knowledge. We talk about why we use models in science and how that contributes to our knowledge of complex ideas & phenomena.
05 Evolution & Biodiversity	The early part of the TOK course focuses on the validity of knowledge using the theory of evolution as an illustrative example. The instructor talks wih the students about what has led to our current understanding of our species and everything that exists. The discussion leads the sudents to the understanding that our knowledge is based on logic and reasoning, but it is constantly evolving as we add to the current body of research and study. I discuss the scientific method, the experiments that have led us to our current knowledge of evolution, and we discuss validity of research & the reasoning that puts evidence together.

7. Approaches to learning

Every IB course should contribute to the development of students' approaches to learning skills. As an example of how you would do this, choose one topic from your outline that would allow your students to specifically develop one or more of these skill categories (thinking, communication, social, self-management or research).

Topic	Contribution to the development of students' approaches to learning skills (including one or more skill category)
Practical Work	Students are consistantly refining their communication and social skills as part of their lab practical work in IB Biology SL. I change seating arrangements in the course approximately 8 times which shuffles the people they work with, and the lab groups that work together.

8. International mindedness

Every IB course should contribute to the development of international-mindedness in students. As an example of how you would do this, choose one topic from your outline that would allow your students to analyse it from different cultural perspectives. Briefly explain the reason for your choice and what resources you will use to achieve this goal.

Topic	Contribution to the development of international mindedness (including resources you will use)
4.4 Climate Change	We will discuss how the concentration of gases in the atmosphere affect climates experienced at Earth's surface. Within this topic we will discuss how our climate in land-locked Ohio is different than coastal regions and island nations throughout the world. We will discuss how climate change affects the agricultural industry in Ohio, and compare that to other forms of agriculture globally. I chose this topic because it is a local and global issue, and we can connect with other IB Biology classes in other parts of the world to gain different perspectives.

9. Development of the IB learner profile

Through the course it is also expected that students will develop the attributes of the IB learner profile. As an example of how you would do this, choose one topic from your course outline and explain how the contents and related skills would pursue the development of any attribute(s) of the IB learner profile that you will identify.

Topic	Contribution to the development of the attribute(s) of the IB learner profile

Internal Assessment	The practical lab work throughout the duration of the course, internal assessment, and group 4 project will collectively be used as an instructional tool to facilitate all aspects of the IB learner profile. I will discuss the IA as the topic that is used to develop the attributes of the profile. We begin the IA in the first quarter of the school year. In IB Biology SL at WKHS, the IA is treated as an individual research asseessment that requires the student to be completely immersed in the scientific method and discovery through inquiry. The students must choose a biological topic of their choice, this promotes the reflection attribute as they begin to think about how biology relates to their own lives and what interests them in the core content. They develop the risk-taking attribute as they commit to a topic, and begin their experiment to which they are not certain of the outcome. They must be communicators as they collaborate with the teacher and their peers. During lab hours they communicate their schedules and plans to carry out their experiments successfully. They must be principled as they evaluate the ethics and safety considerations of their proposed work.