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| **Objective A: Investigating** |

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| **Goal and Global Context**  a). Choose a Global Context  b). Define a goal which is both clear and highly challenging.  **RQ: How can I build an Astronomical clock?** | GC: Scientific and technical innovation  Goal: Build an astronomical clock. This clock is highly challenging for me personally because I’ve never dealt with the creation of machinery before, and I generally am uneducated on how clocks work, let alone know how to build one. This project will open up a whole new sector for me in terms of interests and in terms of knowledge. I chose this goal because I’m interested in astronomy I believe it is the future because Humans have already explored earth, but what can help us answer big, important questions like is there life beyond earth? Can we time travel? |

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| b). Define a goal which is both clear and highly challenging.  **SMART Goals** | **Specific:**  1).**Who** will be involved, besides you?  2). **What** do you plan to achieve?  **3). When** and **where** do you plan to complete your project?  4). **Why** this particular goal? What is your personal motivation? | My goal is to create an astronomical clock. My supervisor will guide me through it and I will have help actually creating it, primarily because there are safety precautions dealing with electrical circuits and some of the equipment I will be using. The clock will most probably be built in a warehouse or a garage, where there is room for noise and wood chippings etc. This goal is important to me because it will help me develop new skills that are incredibly interesting, such as designing machinery and building it. It will be important to my audience in terms of education, especially because it will be placed school, it will be very informative to the students. |

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| **SMART Goals** | **Measurable:**  **Your goal must be measurable-** Include precise amounts, dates, and so on in your goals so you can measure your degree of success. ... | I will know when it is accomplished when it can accurately display time in the same way as an analog clock (using angles). Also I created a Summer plan that can help me organize my time in steps, and that can help me measure what I’ve completed and what I have yet to complete. Currently, I am at the planning stage of my project, I plan to start building my clock in November, since I’ve never built a clock and need as much time as possible for physical errors in the process of building it. |

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| **SMART Goals** | **Achievable:**  Your goal should be achievable within the time frame you have, whilst still presenting the appropriate level of challenge. By setting realistic yet **challenging** goals, you hit the balance you need. | My goal is achievable if I put in the right amount of effort into the research, the concept of gears and working machinery is not too complex to understand but the process of physically building the clock will probably be difficult considering I’ve never built one before and I’m not close to any horologists or people that specialize in clocks, although, my father is an engineer so he should be able to guide me through some concepts and help me understand them to the fullest of my ability. |

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| **SMART Goals** | **Relevant:**  Your goal should be relevant-to the project objectives, to your own interests and to your chosen global context. | Although I am inexperienced with machinery, I think I am the right person to create this product because I am passionate about astronomy, I am also fairly good at mathematics and very good at art, therefore I will able to design the clocks outside nicely. The goal is relevant to the global context of scientific and technical innovation because this global context explores the way humans use their knowledge of scientific principles to develop the world. People from different eras used their knowledge of machinery and astronomy to build astronomical clocks that develop the natural world by informing it’s audience of where we are in the universe, which could in turn expand the knowledge of humans about astronomy. |

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| **SMART Goals** | **Timely:**  Your goal should have a clear time limit. This will help you in terms of time management.  **Deadlines.** | My product is due in December, and I personally plan to start building it in November because I need as much time as possible to plan it so I can leave space for errors in the process of building it. |

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| c) Describe what makes their project personal. | I have a personal interest in astronomy because I believe it is the future, the field of astronomy is mostly unexplored and there is still so much we, as a society are unaware of in terms of what’s beyond Earth. I’m also interested in the concept of mechanics and engineering because my father is an engineer and he wants me to go into engineering, I’ve never done anything that’s directly related to engineering like this clock, so I think it’s a good opportunity to explore my options in a way that still keeping me engaged and interested in what I’m doing. |

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| **Prior learning and subject-specific knowledge**  The prior learning and subject knowledge referenced by the student must be consistently highly relevant. | Something that I learnt previously that also encouraged me to create this product was Islamic, since we talk about how god created space and the universe and how we will never know all of the scientific principles that exist. It was a reminder that there’s still so many things in the universe that are unknown that could probably change all of science as we know it.  In Mathematics- measurement we explored different metric units , this is useful to me because it can help me design my product with accurate measurements, especially since I am dealing with a complex piece of machinery. Also, I know about ratios and fractions and I will need those to calculate the gear ratios of my clock. Mathematics is the basis of building a clock, and it motivated me to choose this goal because it is interesting how mathematics caused the whole clock to work together perfectly, with all the bits and pieces fitting together to tell time. |

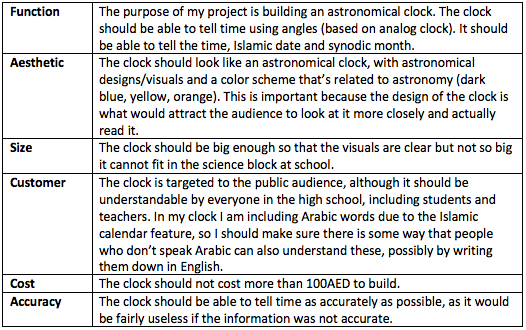
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| **Research Skills ATL**  a). Have conducted research which is systematic and effective to the project and shows insightful understanding of perspectives.  b) Document information fully and correctly using a recognized referencing convention.  c) Will use a minimum of 10 sources, ideally a minimum of 20. | OPVL-Create a chart to evaluate sources. See **Resource 3**  You can choose your own format.   |  |  | | --- | --- | | Source 1: https://www.explainthatstuff.com/quartzclockwatch.html | | | Currency | Last updated on April 29th 2018, - almost 3 months before information was obtained. This makes it very recent and reliable in terms of currency. | | Purpose | The URL of the site indicates it is a non-profit organization meaning the information is more than likely to be unbiased and genuine. | | Accuracy | The information is comparable to other online sources that are about the same topic. Follows the basic rules of grammar, spelling, punctuation and also composition. | | Authority | Text is copyrighted © Chris Woodford. Chris Woodford is a British science writer with an MA in natural sciences from Cambridge University. He also specializes in Physics. This makes this source reliable in terms of authority | | Objectivity | This website does not show any bias in the subjects. Rather it is informative and educational |  |  |  | | --- | --- | | Source 2: www.newworldencyclopedia.org/entry/clock#Analog\_clocks | | | Currency | This website was last modified on the 6th of March 2017, around a year before the information was obtained, meaning it is fairly recent and reliable in terms of currency. | | Purpose | The URL of the site indicates that it is a non-profitable organization so it is more than likely reliable information. |  | | Accuracy | The information is easily comparable to other sources that center around the same topic. Follows basic rules of grammar, spelling, punctuation and composition. This means it is reliable in the sense of accuracy. | | Authority | Not specified exactly who created it other than New World encyclopedia Writers and editors who wrote it in accordance with New World encyclopedia standards. Realistically, since the website is an official encyclopedia we can assume that it is more than likely reliable in terms of authority. | | Objectivity | This page does not present any bias towards the subject. |  |  |  | | --- | --- | | Source 3: <https://geology.com/minerals/quartz.shtml> | | | Currency | The website has been made in 2005 and has been maintained and updated until 2018. There is no information on when the specific article was posted and/or maintained. | | Purpose | The domain/URL suggests it is a commercial site and someone is paying money to make sure that the audience sees their site, this suggests the information is not that reliable in terms of purpose and could include bias since it is driven by money and not educational purposes. | | Accuracy | Many other websites share the same information therefore it is a reliable source in terms of accuracy. | | Authority | Geology.com is operated y a staff of 4 people. The author of the specific article I was looking into is Hobart M. King (PhD), he is also the one that writes most of the articles and news stories. He has a PhD in geology. | | Objectivity | Geology.com is not sponsored by any companies, special interest groups or contributions. Meaning there is little to no chance of any bias in the site. | |

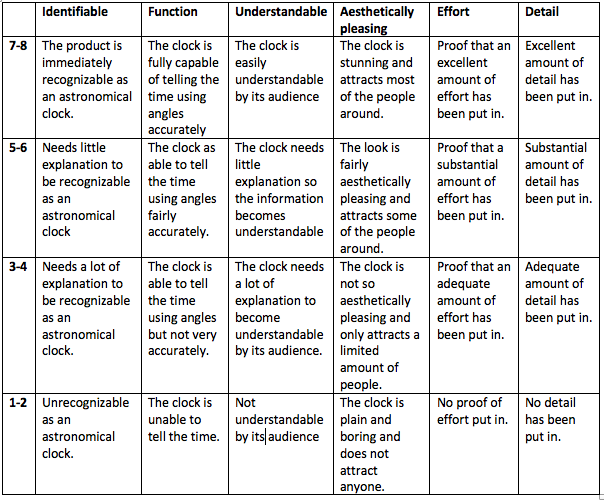
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| * **Collect and record data/sources- Lower Challenge Level** * **Identify primary and secondary sources- Lower Challenge Level**   **Low** | * **Locate, organise, analyse, evaluate and ethically use information from a variety of sources and media- Higher Challenge Level** * **Use critical literacy skills to analyse and interpret information-Higher Challenge Level** |

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| **Completed -Date 17/10/2018** | **Supervisor signed:**  **J.L Swartz** |

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| **Objective B: Planning** |

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| **Develop criteria for the product/outcome**  a).**Develop rigorous criteria** for the product/outcome which can be easily evaluated by someone unfamiliar with the product.  b) Refer to the criteria they designed to evaluate the project product/outcome.  c) Explain any changes made and why they made them.  **Resource 4** | **Create a specification chart (see example below) align it with the assessment criteria**  **See the chart -exemplar Uptown** |





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| **The planning and recording of the development process of the project.**  a) Present **a detailed and accurate plan** and record of the development process of the project from start to finish.  b) Provide evidence of planning through **timelines, milestones or other tools/strategies** (in the appendices).  **Resources 5** | **Summer Plan:**    **General Timeline for Project** |

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| **Self-management skills. ATL**  a) Outline the self-management skills they had when they started the project.  For example a **Gantt Chart, Scrum board/ -Resource 1 folder examplesm**    b) Have demonstrated to you that they have outstanding organization and time management skills.  c) Show how self-awareness of strengths and limitations guides effective planning and helped them complete their project.  d) Discuss the self-management skills they developed through the project. **For example a compass point visible thinking chart-See Resource 2 examples** |  |

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| * Keep a basic log or timeline planning for the project **Lower Challenge Level** * Keep an organised and logical system of information **Lower Challenge Level**   **Low** | * Make plans that are logically sequential and efficient **Higher Challenge Level** * Demonstrate persistence and perseverance **Higher Challenge Level** * Practise ‘bouncing back’ after adversity (struggling, difficulties), mistakes and failures **Higher Challenge Level** |

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| **Completed -Date**  **28/10/2018** | **Supervisor signed:**  **J.L Swartz** |

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| **Objective C: Taking**  **Action** |  |

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| **Creation of product/outcome in response to the goal, global context and criteria.**    a) Discuss the product/outcome as the result of the process undertaken during the project. How is my product/outcome reflecting the global context chosen?  Ask others:   * Is the chosen **global context** evident in my product/outcome? * From viewing my work, can you (another person, looking at it) develop a different or deeper understanding of the **global context** chosen? * Document in journal   b) Have included evidence of the product in the report. |  |

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| **Thinking skills ATL**  a) Demonstrate how their conceptual understanding and contextual learning have influenced the development of the project.  b) Outline the thinking skills they had when they started the project.  c) Discuss the thinking skills they developed through the project.  d) Explain how they may have shared thinking skills to help peers who needed more practice. | 1). What obstacles have you encountered?  2). How have you overcome problems through problem solving?  3). How have you generated novel ideas and considered new perspectives?  4). How have you made connections between what you already knew to what you are learning in the process of taking action?  How have you taken feedback on board and added this into the creation of your product/outcome?  5). How have you developed flexible thinking strategies surrounding the ethical impact of your product outcome?  How have you employed your prior learning in the creation of your product outcome?  6). How have you used your subject specific knowledge and skills in multiple contexts?  What new insight do you have into your chosen global context? ***I used to think...but now I think...and this is why…*** |

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| * Identify problems **Lower Challenge Level** * Present one perspective   **Lower Challenge Level**   * Draw simple conclusions **Lower Challenge Level** | * Consider multiple alternatives, including those that might be unlikely or impossible **Higher Challenge Level** * Make guesses, ask ‘what if?’ questions **Higher Challenge Level** * Create novel solutions to complex problems * **Higher Challenge Level** * Combine knowledge, understanding and skills to create products or solutions **Higher Challenge Level** |

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| **.Communication and social skills** **ATL**  a) Outline the communication and social skills they had when they started the project.  b) Demonstrate how their interactions with others, through clear and consistent communication, builds a sense of community in the development of the project.  c) Demonstrate understanding of perspective, interpretation and empathy, and effectively transfers this knowledge to his or her own communication strategies.  d) Discuss the communication and social skills that developed through the project | 1). How have you managed to resolve conflict and work collaboratively with others?  2). How have you encouraged others to contribute to your personal project?  3). How have you worked effectively with your supervisor and taken their ideas and advice on board?  **Could this be turned into a chart?**  Visible thinking -What makes you think that? **Create a chart**  **Ladder of feedback chart** |

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| Organise information **Lower Challenge Level**  Structure report following advice **Lower Challenge Level** | Work effectively with the supervisor, act meaningfully on feedback received **Higher Challenge Level**  Share ideas, collaborate and build relationships with peers and experts using a variety of digital environments and media **Higher Challenge Level** |

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| **Completed -Date** | **Supervisor signed:** |

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| **Objective D: Reflecting** |

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| **Evaluation of the quality of the product/outcome against their criteria.**  a) Evaluate the product/outcome against the criteria they designed.  b) Identify the strengths, weaknesses and possible improvements of the product/outcome.  c) Have made use of primary data collected for the purpose of objectively evaluating the quality of the product, where relevant. |  |

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| **Reflection on how completing the project has extended their knowledge and understanding of the topic and the Global Context.**  a) identify challenges and the solutions developed to meet them.  b) Demonstrate a deeper knowledge and understanding of the topic and the identified **global context.**  c) Base reflections on evidence, including references to specific process journal entries. |  |

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| **Reflection on their development as IB learners through the project.**  a) Present a reflection on how completing the project has extended his or her knowledge and understanding of the topic and the **Global Context.**  b) Make reference to several **IB Learner Profile traits** and how they feel these have developed through completing the project. |  |

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| **Completed -Date** | **Supervisor signed:** |