



# Project Report-Class X Biology

## MSCI 651 International Project Management

## Course Instructor- Dr Peter Carr

Team 3 Members

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# 1. EXECUTIVE SUMMARY

Teachers without Frontiers (TWF) is a continuous professional development program that connects teacher with information and knowledge. It aims to provide professional development for teachers through an online resource library which is accessible, contextually relevant, consistent and coherent. As part of an International collaboration on blended learning and capacity development, The University of Waterloo is collaborating with TWF to provide technology-based teaching materials to teachers and students in Pakistan.

The report includes detailed explanation, analysis and methodologies followed during the execution of the project by the students enrolled in the Master of Management Sciences program at the University of Waterloo, Canada. Under the initiative TWF (Teachers without Frontiers), Team 3 has been assigned to source teaching material for Grade IX-X Biology as per G7 curriculum for teachers in Pakistan. The primary objective of the team was to help teachers to provide the best possible education to students in Pakistan. The team achieved this objective by providing the teachers with different types of online resources that were consistent and coherent as per the Student Learning Outcome (SLOs) corresponding to the National Curriculum of Biology Grade 10 Biology G7 curriculum during a period of 12 weeks.

At the onset of the project, the team developed a structure which clearly described the responsibility and allocation of work to each team member. The progress of each team member and their work was managed with the help of the Gantt Chart. The team communicated through various internal and external channels. The changes that were made at any stage and the risk or issues faced at any phase of the project were identified and handled accordingly.

Every week approximately 60-70 links were collected for different sections of the curriculum that went through extensive quality check. The project quality was measured by the "Learnability Matrix," in which each online resource provided was scored on the basis of data quality checks parameters which are discussed in detail later in the report. The team successfully managed to collect almost a total of 454 links in the allocated time.

## 2. INTRODUCTION

A team consisting of 7 students enrolled in International Project Management (MSCI 651) at the University of Waterloo, Canada, were assigned to work on the online repository of Class X Biology subject, under the guidance of Dr Peter Carr and project client Ms Hafsa Alvi, representative of the Pakistan NGO Teachers without Frontiers (TWF) which is a part of Idara-e-Taleem-o-Aagahi (ITA)-Center for Education and Consciousness. The development program aims at empowering teachers, particularly women in remote areas. The initiative is envisioned as a movement for teachers to augment their knowledge, skills and approaches through a wide range of innovative learning opportunities. TWF along with the students of the University of Waterloo has created a website to help teachers provide the best possible education for school students in developing countries.

With the aim of taking this initiative forward, an economical and quality efficient digital platform for learning resources that could reach a wider audience located even in the remote part of Pakistan was formed. Team 3 was assigned to source teaching material for Grade IX-X Biology as per G7 curriculum for teachers in Pakistan as their Winter 2019 International Project Management course work.

A project plan was laid down at the beginning of the course that discussed the approaches and the process that will be used to deliver the project. The team focused on various knowledge area such as determining the project scope, clearly stating project milestones, scheduling various roles and activities within the team. The objectives of the project and its aim to achieve the goals are clearly outlined in the project scope section. The project milestone was set and the target of each project stage and the mechanism to achieve them within the deadline was listed down. This helped the team to successfully cross every milestone within a defined time frame.

The team was well connected and coordinated through a well-built communication network that helped the team to ensure that all stakeholders receive the project deliverables on time. Any changes during the execution of the project were addressed in the change management plan. The main objective of the project was to build quality online repository for teachers of class X biology. It was of utmost priority for the team to ensure different types high quality online resources were researched as per the Class X Biology G7 curriculum. The team members took quality measures to ensure that the experience of online teaching was comprehensive and friendly for both teachers and students. This was ensured by using the “Learnability Score” for all the quality checks that were performed on the online sourcing material.

## 2.1 OBJECTIVES

- The successful completion and development of the reliable resource repository that could be used by the teachers in their classrooms without any cost and can be amended further if required
- To accomplish the predefined goals of the project which is, to impart knowledge to students by optimizing the necessary inputs like tutorials, interactive learning games, presentations and videos.
- To create a complete project report and presentation that meets the client's needs and objectives which is to help the teachers in Pakistan prepare high-quality study material as per the student learning outcomes (SLOs) listed in the Pakistani national curriculum for Biology IX-X. The exposure of students to various branches of biology should be in a comprehensible and friendly manner

## 2.2 ACHIEVEMENTS

- The project objectives were achieved well within the project deadline without compromising on the quality and efficiency of the online resources.
- The quality of all the links collected from the team members was assessed based on the final quality checks. The quality feedback was provided to each of the link providers to ensure that quality is not compromised.
- A "Learnability Matrix" was successfully developed that had a rating based on the scoring given for each quality check and only those links were approved and provided to the client that had met the quality check standards.
- Below table depicts the outcome of implementing the learnability matrix, where the overall learnability score for the online resources was found to be 4.62 on a scale of 5.

| Week | Tutorial | Worksheet | Video | Games | Chart | Quizzes | Slideshow | Total Weekly Link Count | Bad Links Learnability Score | Good Links Learnability Score | Overall Learnability Score |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Week 1 | 27 | 1 | 23 | 0 | 2 | 4 | 1 | 58 | 2.33 | 4.65 | 4.62 |
| Week 2 | 61 | 12 | 16 | 3 | 7 | 6 | 2 | 107 | 2.57 | 4.7 | |
| Week 3 | 122 | 10 | 34 | 2 | 6 | 12 | 5 | 191 | 2.66 | 4.73 | |
| Week 4 | 29 | 2 | 7 | 0 | 0 | 2 | 0 | 40 | 2.58 | 4.66 | |
| Week 5 | 16 | 2 | 7 | 0 | 0 | 2 | 0 | 27 | 2.71 | 4.57 | |
| Week 6 | 19 | 1 | 6 | 1 | 0 | 4 | 0 | 31 | 2.66 | 4.42 | |

**TABLE 1: LEARNABILITY MATRIX**

# 3. PROJECT PLAN

## 3.1 THE APPROACH

The team has adopted and implemented an agile approach towards this project. It involved iterative assessment of the work by team including making any change plan during the period of 4 months. The team has conducted weekly submission of reports to the client on the subject with 154 SLOs.

## 3.2 THE SCRUM TEAM

Our Scrum team consisted of a Project Client, the project team, and a Scrum Master. Scrum team was self-organized and cross functional. The team has chosen how best to accomplish the work, rather than being directed by others outside the team. Scrum team has delivered resources iteratively and incrementally, maximizing opportunities for feedback from the client. Incremental deliveries of weekly report ensured that a potentially useful version of working resources was always available.


**FIGURE 1 SCRUM TEAM**

## 3.3 THE PROJECT CLIENT

The Project client was responsible for maximizing the value of the resources and the work of the project team. Resource management includes:

- Clearly expressing SLOs in the curriculum.
- Optimizing the value of work the project team performs.
- Ensuring the project team understands the objectives to the level needed.

## 3.4 THE SPRINT REVIEW AND PLANNING

Each sprint had a time-box of one week during which a complete, workable resource directory was created. Overall, a total of six sprints were planned and delivered. The Sprint Team usually started by developing the master quality data sheet. A set of good and bad links were stored for assessing the quality of links by the quality manager. Finally, a resource mapping sheet was compiled along with the weekly status reports. This report summarizes the work that has been submitted and the work projected for the upcoming sprint

A Sprint Review was held at the end of the Sprint to inspect the Increment and adapt any changes if needed. The team members worked on the things that could be done to optimize quality.

This was an informal meeting, not a status meeting, and the presentation of the Increment was intended to elicit feedback and foster collaboration. This was an hour time-boxed meeting for weekly Sprints. The Scrum Master ensured that the event took place and that the participants understand its purpose.

## 3.5 PROJECT LIFE CYCLE PROCESS

The Project life cycle consisted of four stages:

- **Project Start**: The Project was assigned by Professor to team consisting of 7 members and topic was given. As soon as project was assigned, team conducted a meeting to assign roles and responsibilities based on the work. The group started with requirements gathering from client.
- **Project Plan**: The Project Plan was prepared by the team. Project Scope and objectives were defined, and the schedule management, change management, and risk management plans were made. The team proceeded with project after approval from the client and professor.
- **Project Execution:** It included identifying weekly topics, finding resource links, creating resource mapping sheet, quality data sheet, weekly meeting with client and weekly status report submission.

➢ **Project Delivery:** Final Report and Video presentation summarized the project. The project will be delivered after approval from professor and client.

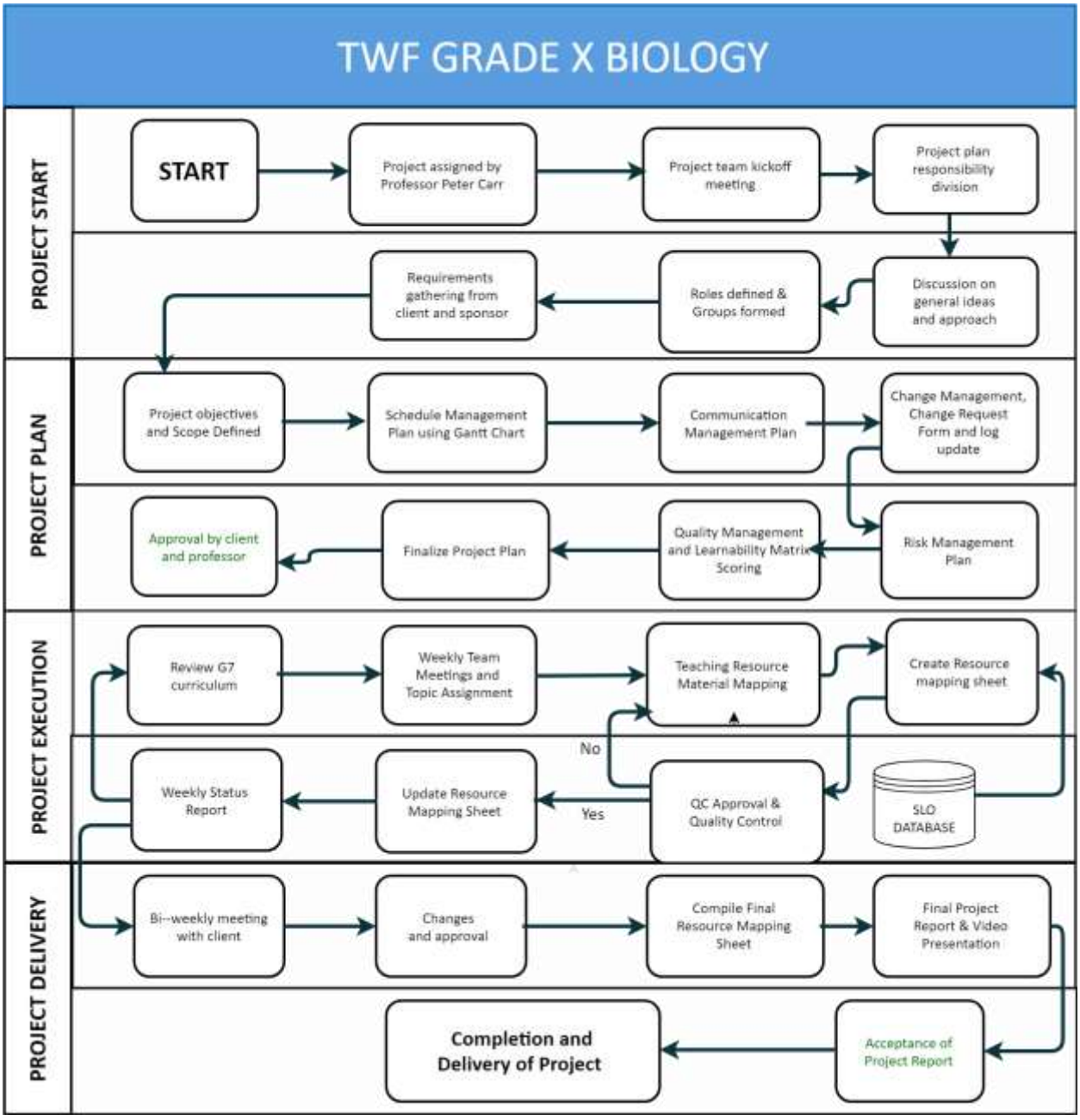



**TABLE 2: PROJECT LIFE CYCLE PROCESS**

## 3.6 PROJECT DESIGN

The project design can be structured typically into six steps as shown in the figure.

The first step is Goal Setting. Goals were defined adequately by discussing them with Project supervisor Prof. Peter Carr, Project Sponsor Ms. Hafsa Alvi, and management science team from the University of Waterloo. Next, the team assigned resources to the group according to the National grade IX- X curriculum. Student learning outcomes were clearly specified for each subtopic. Then the team looked out for resources in compliance with the student learning outcomes. A comprehensive search was conducted to capture resources with Maximum data relevancy. The collected resources were then submitted to the Quality manager for quality data analysis. As part of the Quality Management plan, the resources were scrutinized for various quality parameters that ensure the highest quality standards. Regular feedbacks were provided by the quality manager to team members and accordingly further changes were made by team members to achieve the highest quality. Thereby quality score was obtained for each subtopic. All the data resources were maintained in a master quality data sheet file that helped in tracking all the information related to the project. Finally, weekly status report and weekly deliverable were provided to the project sponsor and project supervisor.


**FIGURE 2 PROJECT DESIGN**

## 3.7 PROJECT IN SCOPE

- To render a resource mapping sheet comprising URLs of resource material accessible through the web.
- To make available learning resources conforming to the student learning outcomes (SLOs) mentioned in the Pakistan National Curriculum for Grades IX-X.
- Setting up appropriate learning resources that can draw outcomes in the development of behavior/attitudes.
- Providing high-quality learning resource material with the view for maintaining standards and benchmarks.
- Incorporating the resource material accessibility on all platforms and operating system.
- Showing progress through weekly project reports and submitting the final report.
- Preparation of documentation to be delivered as part of a project management plan.

## 3.8 PROJECT OUT OF SCOPE

- The project team will not give learning resources for subjects other than Grade X biology.
- The project team is not responsible for developing any learning resource.
- Any software and lab experiment kits would not be provided.

# 4. IMPLEMENTATION OF PROJECT PLAN

After creating the project plan, it was important to abide by the project plan. The aim to build an online repository for Teachers Without Frontiers-Class X Biology was successfully implemented by the team. The team worked day and night to build a rigorous online library for the teachers in Pakistan to provide them with quality resources. Throughout the project, the team focused on quality of links rather than the quantity. Despite that, the team was able to search more than 450 links which contributed to the project completion. The project was divided into many phases and the tasks were allocated to each and every person based on the expertise in their skill.

As a team, we mainly focused on the following points

- Providing online resources that are easily accessible
- Make sure that online resources abide by the Student Learning Outcomes (SLO)
- Providing resources in form of games, quiz, flashcards, worksheets, tutorials and videos.
- Make sure that whosoever access the provided links gets the detailed information and knowledge about the course topic
- To create enjoyable experience for the teachers as they get detailed knowledge about the course while playing games or flash cards or quiz.

## 4.1 TASK SCHEDULING

The tasks were allocated to each and every team member as defined in the project plan. During the allocation of the task, different roles were decided among the teammates. This activity was significant in terms of project perspective as we channelized the strengths of each and every team member. The table below shows the task name, its owner, how many days it took to complete the task and the status of the task

| S no | Task Name | Duration (Days) | Task owner | Status |
|---|---|---|---|---|
| **1.** | Section 1: Study of life and biodiversity<br>Section 2: Cell Biology | 6 | Aarchit,Susahnt,Janhavi, Manasa Vineeth, Veda | Completed |
| **2.** | Quality Check for Section 1 | 3 | Venkat | Completed |
| **3.** | Preparation of Weekly Status Report-Week 1,2 | 1 | Vineeth | Completed |
| **4.** | Section 3: Life Processes | 3 | Aarchit,Sushant,Janhavi, Manasa Vineeth, Veda | Completed |
| **5.** | Quality Check for Section 3 | 2 | Venkat | Completed |
| **6.** | Preparation of Weekly Status Report-Week 3 | 1 | Aarchit | Completed |
| **7.** | Section 4:Continuity in Life | 3 | Aarchit,Sushant,Janhavi, Manasa Vineeth, Veda | Completed |
| **8.** | Quality Check for Section 4 | 2 | Venkat | Completed |
| **9.** | Preparation of Weekly Status Report-Week 4 | 1 | Janhavi | Completed |
| **10.** | Section 5: Ecology | 3 | Aarchit,Sushant,Janhavi, Manasa Vineeth, Veda | Completed |
| **11.** | Quality Check for Section 5 | 2 | Venkat | Completed |
| **12.** | Preparation of Weekly Status Report-Week 5 | 1 | Sushant | Completed |
| **13.** | Section 6: Application of Biology | 3 | Aarchit,Sushant,Janhavi, Manasa Vineeth, Veda | Completed |
| **14.** | Quality Check for Section 6 | 2 | Venkat | Completed |
| **15.** | Preparation of Weekly Status Report-Week 6 | 1 | Manasa | Completed |
| **16.** | Final Report Preparation | 8 | Sushant,Veda,Vineeth, Aarchit | Completed |
| **17.** | Final Video Presentation | 5 | Janhavi,Manasa,Venkat | Completed |

**TABLE 3: TASK SCHEDULING**

## 4.2 ONLINE RESOURCE BUILDING AND QUALITY MANAGEMENT PROCESS

A team of 7 people was given a target to collect approximately 60- 70 links each week. The quality analyst had tested the links on the below-mentioned parameters.

- **Data Relevance Check** - It measures the relevancy of the online resources given to the quality analyst in terms of subject and content.
- **Student Learning Outcome meeting check** - The quality analyst makes sure that all links provided are as per the SLO's given in the National Curriculum of Biology Grade IX-X. If any of the links didn't matched the SLO's given in the curriculum, then the team members were asked to provide new links that met the requirements of the SLO's
- **Data Authenticity** – It measures whether the content in the link is authentic and users are not asked to make paid accounts to access those links.
- **Data Accessibility** – The team made sure that; the resources are easily accessible to all the users. The focus point was that the links can be accessed quickly and should have less load time.
- **Data Redundancy**- There were no repeated links with the same content.
- **Link Functionality**- The team made sure that the links were functional in Pakistan. This was achieved by using VPN functionality: where the IP address of the local system was changed to the IP address of Pakistan so that the links functionality could be checked easily. This test was important as the client wants seamless accessibility of the links provided for the curriculum

The figure below describes the quality management process and all the procedures followed at each quality parameter

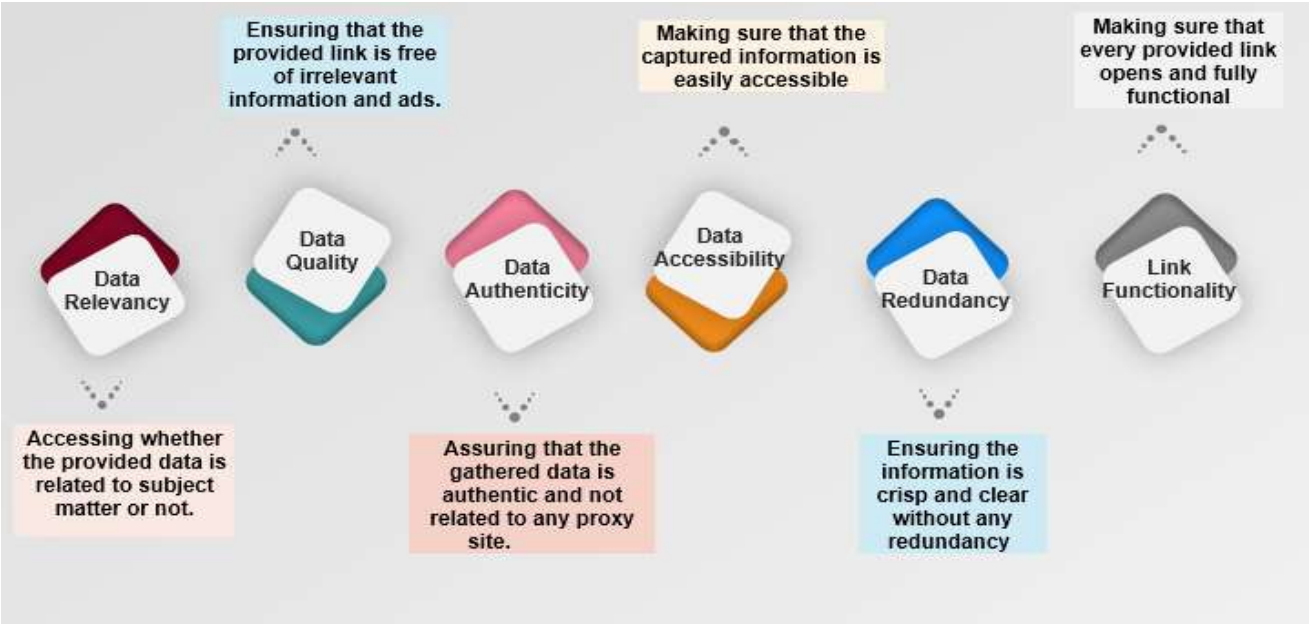



**FIGURE 3 QUALITY MANAGEMENT PROCESS**

## 4.3 REPORTING

The formal reporting to customer was done via emails. For each week, a Weekly Status Report was sent to Customer as well as to Professor. The Tech Resource Mapping Sheet was used to gather all the links pertaining to Class X biology subject. The templates for a weekly status report and tech resource mapping sheet were pre-defined and given to the team by professor and we had to implement our own ideas into that templates.

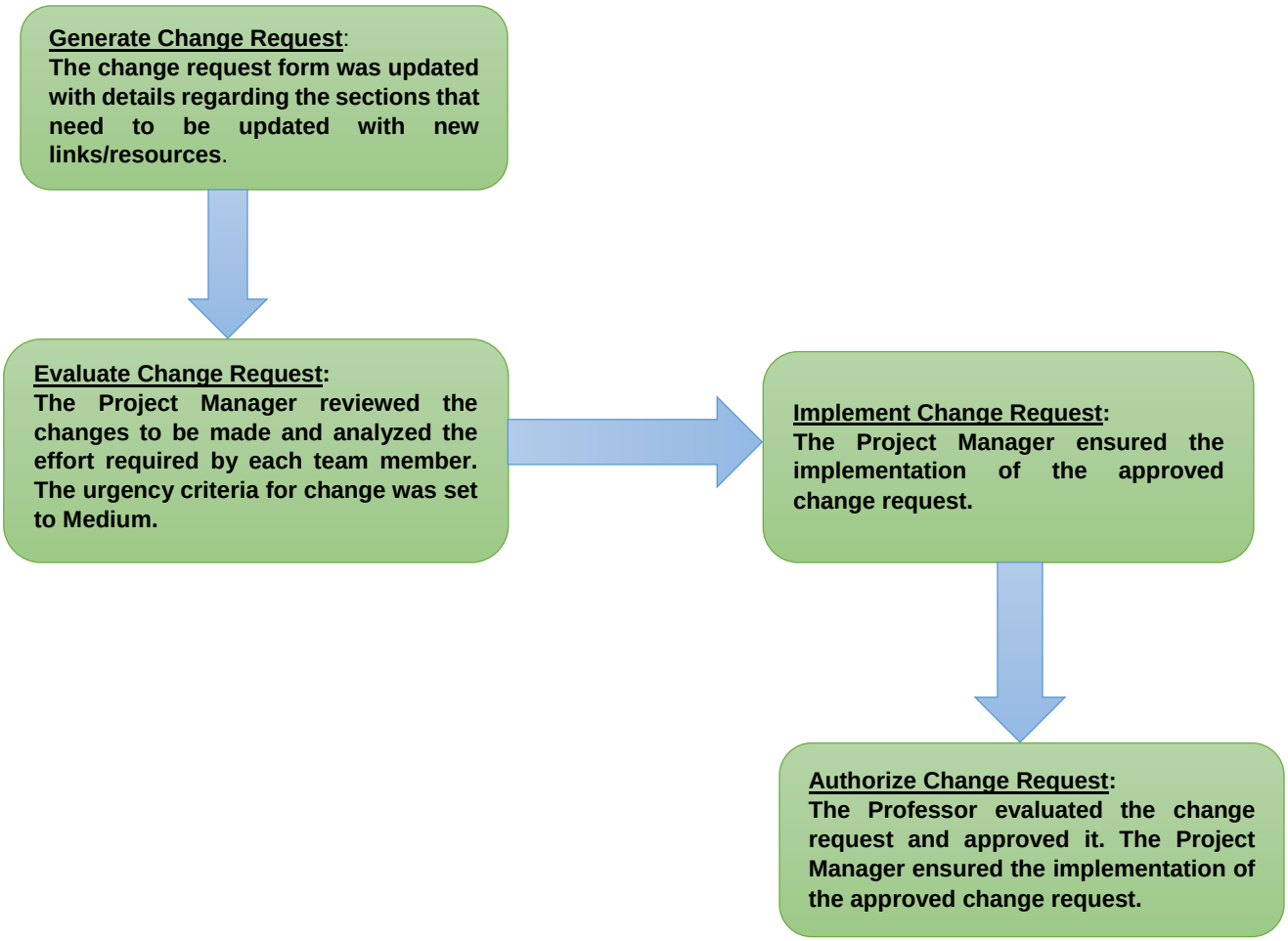
Internally, the team used a drop box to upload and download the tech resource mapping sheet. This helped the team to coordinate and communicate with each other. The team followed a new approach for the quality check; segregating the links into the categories of good links and bad links based on the analysis done by the quality manager.

## 4.4 CLIENT AND INTERNAL MEETINGS

The team met with the customer every two weeks and every week with the professor. The meeting aimed to present the weekly status report as well as share the progress on the project. The weekly meetings helped in resolving various queries that arise during the progression of the project. The meeting with customer and professor helped and motivated the team to progress in the right direction. The team met internally every week to discuss the status of the project and any issues if any team member was facing. Also, the team was connected via group chat messaging service that enabled everybody to resolve the queries instantly.

## 4.5 CHANGE MANAGEMENT

The change management process as shown below was followed to incorporate the change of revisiting the links to achieve the average count of links. During the project execution, the team found out that the links were falling short of average links required for the course. So, the team clarified the same with the professor and started working towards the suggestions provided by him.



## 4.6 PROJECT SCHEDULE-GANTT CHART

The attached Project schedule provides the information for the task allocation, days taken to complete the task, task owner and percentage of task completed. This chart was followed rigorously to track the project timelines, project deliverables and owner of the task. The Gantt chart is attached as Appendix 1

## 4.7 ISSUES

No issues were faced during the project implementation. All the deadlines were met. The weekly status report and tech resource mapping sheet were submitted to customer and professor on time.

# 5. PROJECT RESULTS

Through fruitful collaboration, within three months, 454 links were produced, reflecting on the objectives stated in the Project plan. The Project was facilitated by Professor Peter Carr.

The project group worked in a structured manner to source relevant links for the course to ensure that students understood the ideas and concepts of Biology and articulate it as per the expectations of the course curriculum. The 454 links sourced in the project belong to 17 sections of the course curriculum encompassing wide range of topics in Biology. Starting from the basics, it is safe to say that the Project has been successful. Project members kept the Program Manager and other members informed about their activities. As a result, it was easy to realize the progress in the Project. This kind of systematic communication between the Project members, Client and the Professor was integral to the content development and success of the Project.

## 5.1 MEASURE

We juxtaposed expected and effective results and discovered the subsequent findings. The below figure illustrates the types of resources and their percentages for all topics in Biology Grade 10 course and the related quality metrics. Such measures were being reviewed regularly.

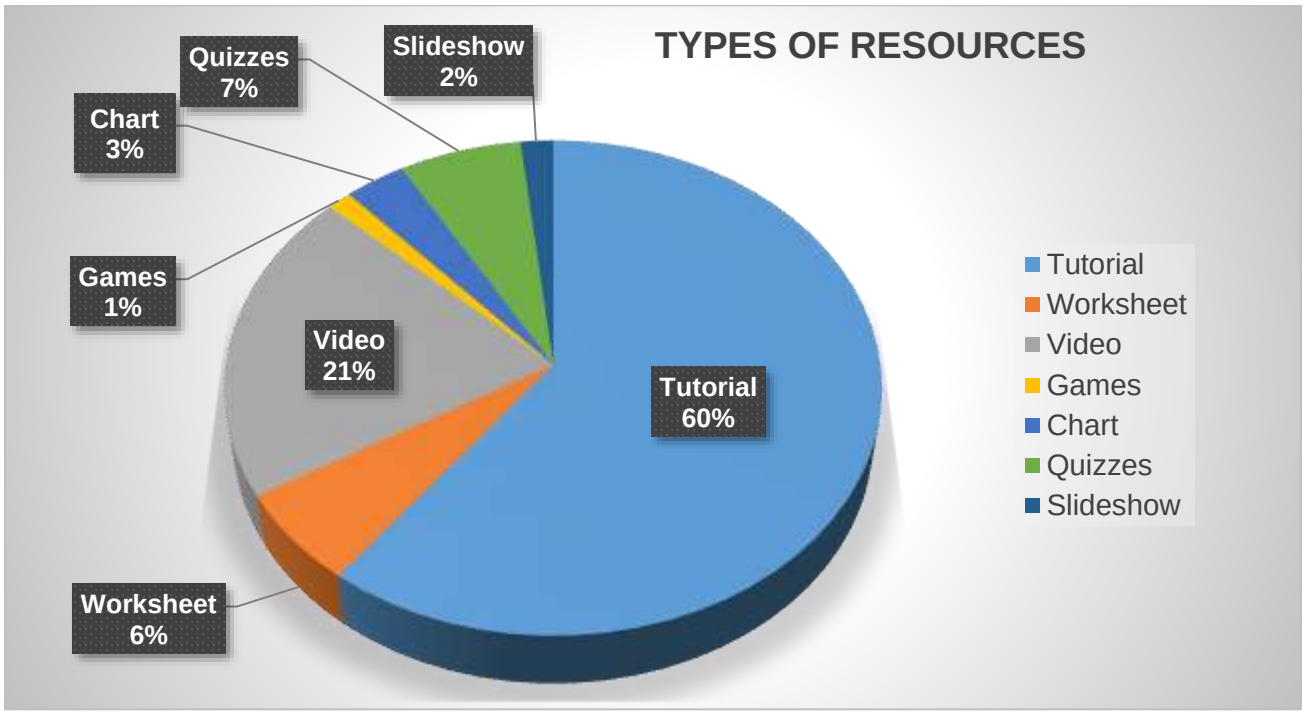



**FIGURE 4 RESOURCE TYPES**

A Learnability Matrix was successfully developed that had a rating based on the scoring given for each quality check and only those links were approved and provided to the client that had met the quality standard.

The forward-backward tracking method was used to check the relevance of all links researched. The Quality manager was responsible for checking the legitimacy and relevance of the links submitted by the team members on a weekly basis. Upon reviewing, any changes required was mentioned directly to the team member.

Exclusion of weekly bad links from weekly analysis played a crucial role in increasing the weekly and overall Learnability score.

Below is the graphical representation of the scores obtained using the learnability matrix.

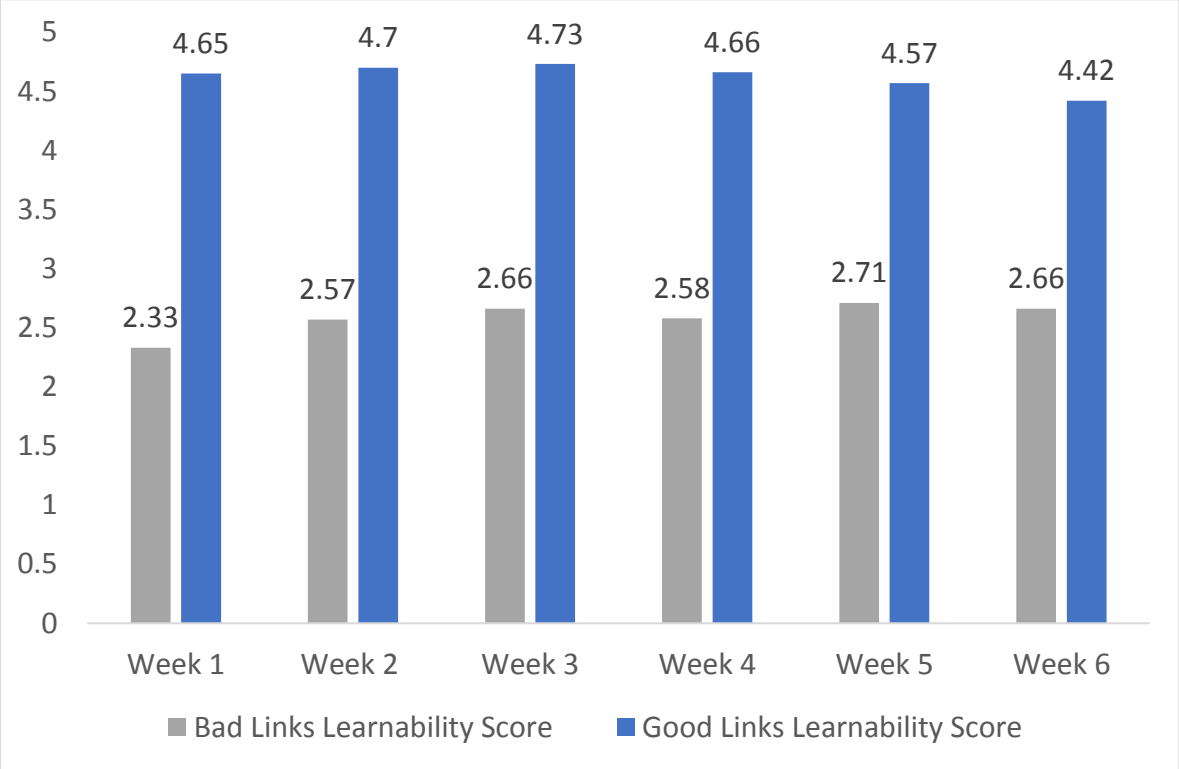



**FIGURE 5 LEARNABILITY SCORE**

## 5.2 RESOURCE DATA ANALYSIS

All the captured resources data were classified into tutorials, videos, quizzes, worksheets, chart, slideshows, and games. The below figure shows a detailed analysis of each resource type. In the overview of the submitted resources, the maximum percentage among all kind of resources is that of tutorials as the team felt that since biology is a technical subject detailed explanation of the topic's charts must be provided for better knowledge as well for understanding. The weekly analysis section demonstrates the number of resource and type of resource team found every week.

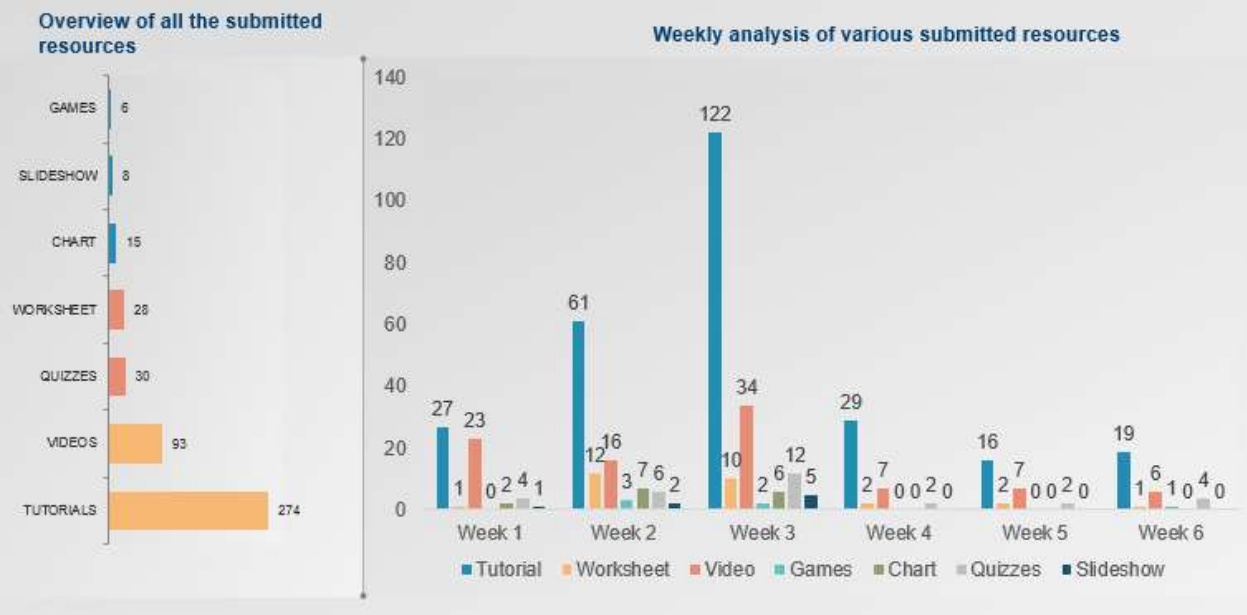



**FIGURE 6 RESOURCE ANALYSIS**

## 5.3 OUTCOMES

- Prepared high-quality study material as per the student learning outcomes (SLOs) listed in the Pakistan national curriculum for Biology IX-X.
- The sourced links contain interactive learning games, presentations, videos, tutorials.
- The relevant informational links give exposure to students on the various branches of biology in a more comprehensible and friendly manner.
- Met the learning requirements, standards, benchmark, and the SLOs to help bring clarity to teachers about what education is seeking to achieve for each student.
- Developed a reliable resource repository for teachers to access for free and one that can be amended further if required.

# 6. DISCUSSION AND RECOMMENDATIONS

## 6.1 SUCCESS FACTOR

- Project goals and deliverables were specific, measurable, attainable, relevant and time-bound (SMART).
- Planning is what kept us organized. A good project plan was the first step in successfully executing the project.
- We allotted accurate time for each section of the curriculum and there was clear documentation of milestones and deliverables.
- There was an agreed upon process for the quick identification and resolution of conflicts.
- Best practices were applied at every phase of the project.
- We decided on the metrics for measuring the progress of the critical goals and how they would be monitored.
- Critical success factors were recorded and documented so they could be referred to in subsequent similar projects.
- The entire team was informed entirely and involved which led to a successful outcome. Thus, communication within the team was also one of the major contributing factors in the success of the project.

## 6.2 LESSONS LEARNT & RECOMMENDATION

- The links submitted had to be retested thoroughly with the Pakistan VPN to ensure that the links are running successfully and are easily accessible by the client
- Allowing the Project team to provide support for a few months for the links provided would ensure the transition of the project from development to production stage is smooth.
- A database to manage all the resources could be provided as it would be easier to maintain and access the resources as compared to master spreadsheet. There were instances when the master spreadsheet got corrupted.
- User Acceptance Test for some links could have been an insightful feedback for the team especially in Quality Control related activities. This would have helped in improving the quality of the resource.
- When the team performed an extensive research for few of the previous sections of the curriculum, the team realized that it would be better to include more links in certain previous sections. Therefore, if additional buffer is built into the schedule at the start, it would allow for more time to review the resources and links that have been researched
- Use relevant technical tools to accurately measure technical aspects such as response-time of the web-pages of the educational resources could be used.

- Measuring the impact of the learning resources after the project deployment in production website would help to realize the value added from the project.
- Kitchener-Waterloo region is a hub of non-profit organizations. Reaching out to some relevant non-profit in the region will provide an opportunity to collaborate with other non-profits and help to market the novel idea of Teachers Without Frontiers.

## 7. RERERENCES


1. Learn Punjab, *[General Science Grade 7 online textbook, supporting reference for SLOs clarifications]*, August 5, 2016, Retrieved from: https://elearn.gov.pk/chapters.php?g=10&s=Biology
2. *Teachers Without Frontiers (TWF),* Feb. 2018, Retrieved from http://itacec.org/twf/