University of Portsmouth

Active Learning Design

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Declaration

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Abstract

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Dedication

Dedicated to my Grandfather,

Albert William Stanley Humphries.

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Chapter 1

Introduction

1.1 Active Learning Design

This report proposes a new tool, "Active Learning Design", targeted specifically for UoP lecturers. This tool aims to empower lecturers by providing a suite of features that will assist and streamline the design process of new course,module, and lesson plans.

The core functionality of this tool revolves around the creation rich, free-form descriptions of each module. This information will be automatically structured into a Force-Directed graph, highlighting connections within the curriculum.

With future development, this tool can be expanded upon, generating tables and summaries through the information and graphs created.

1.2 Background and Historical Context

The landscape of teaching is undergoing a transformation. Traditional, Knowledge centric methods are being revolutionised with Active Learning, a more interactive and engaging approach proposed by Bonwell and Eison, 1991 and its effectiveness confirmed by Fatmi et al., 2013. The University of Portsmouth (UoP) is using this knowledge to redesign it's entire curricula through a process called enABLe, The University of Portsmouth, 2024.

However, current tools on the market, while important and valuable, can restrict lesson plans to static formats, hindering the flexibility and dynamism of these lessons, restricting the adaptability of teaching to cater for a diverse population of students Vostal et al., 2023.

The lack of tools remains a persistent challenge in educational settings, in contrast to the abundance of Information and Communication Technologies (ICT) resources, Conole and Fill, 2005. This limitation underscores a gap in the usability and effectiveness of existing learning design tools, hindering educators from creating pedagogically effective

activities.

A significant cause of the ineffectiveness of these tools is the confusion caused by the lack of agreed-upon terminology relating to Active Learning, and Learning Design (LD), Walmsley-Smith et al., 2019. This disorientation can hamper the development and evaluation pertaining to furthering Active Learning within educational environments.

1.3   The Future of Teaching

In contrast to the lack of tools specifically suited to Active Learning, it has emerged as a new pedagogical approach that overcomes certain issues relating to static teaching material. Methodologies pertaining to this, prioritse student engagement and participation, straying away from lecture-based learning, towards more active and dynamic strategies, Freeman et al., 2014. Studies have shown this contributes to strengthened performances in STEM fields (Science, Technology, Engineering and Maths), highlighting it's importance in teaching.

1.4   Aim

This project aims to restructure Active Learning at UoP, by creating "Active Learning Design", a new tool that surpasses the limitations discussed in Section 1.2. This tool will facilitate the design of courses and modules within the university curriculum, improving upon the status quo.

The fundamental objective of this project was to expand upon a proof of concept created by a previous student, which highlighted significant potential, but was hindered by time constraints.

The aim was to expand upon this idea, and design a data structure and graphing tool that users would be able to utilise, to construct and visualise connections between courses, modules, topics, etc.

To achieve this, the preliminary phase involved analysing the original design, and focusing on areas that needed to be improved and enhanced upon.

1.5   Project Objectives

To achieve the aims set out in the introduction, see Section 1.4, the following objectives were established to ensure a successful development and implementation:

- Research into existing Learning Design software available on the market.

    - Identify functionalities and the limitations of existing Learning Design tools in the market

- Research into a Suitable Hosting platform.

- Determine the most effective delivery method, whether that is a Web Application, Mobile application, or another form.

• Discovery into Suitable Software Development Methodologies.

- Consider the advantages and disadvantages of selecting specific methodologies, in relation to this project.

• Develop A Learning Design Tool

- Develop a Learning Design artefact with a minimum amount of ten core functionalities, that directly addresses the needs of lecturers, as identified in interviews and project Meetings

• Testing the "Active Learning Design" Tool

- Test the tool using a mixture of automated and manual methods to identify and address any functionality or usability issues.

• Evaluation of the "Active Learning Design" Tool.

- Evaluate the artefact to validate its potential compared to the requirements gathered, as seen in Section 4.2,

1.6 Project Constraints

The project had various constraints that needed consideration to make the development and testing of the artifact easier. The following is a list enumerating the identified constraints for the project.

• Testing the system in a real-world situation was limited to only a few physical devices because of budget constraints. Even though the main goal of the project didn't need many live devices, having at least one device was necessary to make sure the system worked correctly

• Another constraint was the time available to finish the tasks, making sure both the project and report met a good standard. To tackle this challenge, I organised weekly meetings to ensure regular progress, and development of a weekly minimum viable product. Evidenced by Chapter 3 and Appendix D

• Available Literature within the field of User Design / Learning Design constrained the ability to review the literature to a satisfactory extent.

1.7 Legal, Ethical, Professional and Social Issues

During surveys and interviews, no personal data was collected. Only module-related information and artifact data were stored, following the Data Protection Act. These interviews can be seen within Appendix D.

All collected data stayed within the artifact and wasn't used for anything other than what's related to the artifact.

Throughout the project's development, a professional standard was maintained. Interviews were conducted in a professional environment, and a professional demeanor was upheld.

1.8 Summary

This section gave a view of the project's background, the market at that time, and why the artifact was created. It explained the main goal and the objectives set to reach it, listing the important steps for success. It also pointed out possible problems and how they were dealt with.

Chapter 2

Literature Review

2.1 Introduction

In pedagogy, there are numerous terms and definitions that closely relate to one another. Two of these terms are Active Learning (AL), and Learning Design (LD). This chapter reviews the need for both AL and LD by summarising the surrounding literature and outlining the existing tools.

The educational landscape is undergoing a significant shift towards AL approaches, where students are no longer passively learning, instead actively engaging, participating and thinking critically during the learning process, Biesta, 2011. To advance this transition, educators are relying on LD, a structured approach to revise and update learning activities to implement an engaging and effective pedagogical environment, Michos et al., 2017.

2.1.1 Search Methodology

As seen in Appendix C, the need to specify and break down my searches was apparent, due to the sheer amount of results relating to the topic of "Learning Design". EBSCO Host, EBSCO Discovery, and Google Scholar were used to find, examine, and review sources pertaining to LD based literature.

A comprehensive search was performed using Google Search to identify the current market of Learning Design tools. This search helped construct a table of exisiting tools, the benefits and disadvantages behind each one.

2.2 Active Learning and its importance

Active Learning (AL) is a pedagogical approach that strives to engage students within educational environments through activities that inspire critical thinking, problem solving, and heightened participation. Research has shown that AL centred methods have lead to improved performances, in various STEM fields, such as Science, and Maths, Freeman

et al., 2014. Furthermore, in Freeman et al., 2014, underrepresented students were shown to have enhanced outcomes when studying with AL strategies.

Grounded in self-determination theory, and highlighting the importance of social development and well-being of participants, AL has been shown that it can lead to enhanced memory and improved learning outcomes, Markant et al., 2016. Through fostering active engagement, positive and proactive tendencies can be exhibited, through participants in AL practises, Ryan and Deci, 2000.

Active Learning transcends the static and traditional teaching processes currently taught within educational environments, through having students lead interactive, constructive and engaging activities. Such exercises include, problem solving tasks, simulations and interactive discussions, which show the variety of methods to further enhance these new ways of thinking, Menekşe et al., 2013.

2.3 The Role of Learning Design

Learning Design (LD) has gained significant attention in recent years due to its focus on enhancing the learning process through thoughtful and intentional design. The concept of learning design has been around for a long time, but it has recently seen specialised studies that delve into the organisation and optimisation of learning experiences, Repenning and Ioannidou, 2006.

In the realm of LD, the emphasis is on the user's experience and the importance of personal experience in shaping a learner's approach to learning, Leung, 2006. This highlights the shift towards considering learners as users and users as learners, underlining the significance of experiential learning and user-friendly design in educational and technological settings.

2.3.1 Principles of Learning Design

User experience plays a crucial role in learning design, with studies indicating that the usability of e-learning courseware is influenced by users' prior experience with the Internet and the time they spend on the courseware, Koohang, 2004. This underscores the need to consider users' backgrounds and experiences when designing effective learning experiences.

Moreover, the shift from user-centered to learner-sensitive design has been proposed to address the unique needs of users as learners, Granić and Adams, 2010. This approach acknowledges the individual characteristics and requirements of learners, advocating for a more personalised and tailored design process.

2.3.2 Benefits of Learning Design for Educators

Incorporating elements of user-centred design and interaction design, learning designers aim to create engaging and effective learning experiences. By utilising a user-centred design approach, designers can develop interfaces and interactions that cater to users' needs and preferences, ultimately enhancing the overall learning process, Hasani et al., 2022.

Furthermore, the application of design thinking in developing user interfaces for mobile learning applications has shown promise in understanding users' feelings and needs, leading to improved user experiences, Saputra and Kania, 2022. This approach emphasises empathy and user engagement in the design process, resulting in more intuitive and user-friendly interfaces.

2.4 The Need for Effective Active Learning Tools

In the current market, there is a plethora of LD tools available, ranging from digital platforms to physical resources, aimed at enhancing the educational process, Miklošík et al., 2019. These tools play a crucial role in addressing the evolving needs of educators and learners in an increasingly digital world. For example, the adoption of machine learning-based analytical tools in digital marketing has become essential for gaining a competitive edge through data-driven approaches, Miklošík et al., 2019. Additionally, the integration of virtual reality technology in physics education has shown promise in providing immersive learning experiences that enhance student engagement and understanding Budi et al., 2021.

One notable trend in the market is the emphasis on personalised and adaptive learning solutions to cater to individual student needs. Educational technologies, such as educational video games and virtual laboratories, are being leveraged to create tailored learning experiences that promote student engagement and motivation, Yuan et al., 2022. Moreover, the development of e-learning platforms that offer interactive and customisable content reflects a shift towards accommodating diverse learning styles and preferences, Martyniuk et al., 2021. By utilising tools like problem-based learning models and virtual reality technology, educators can create dynamic learning environments that adapt to the unique requirements of each student, Ababkova, 2019.

Experiential learning tools are gaining prominence in the market due to their effectiveness in enhancing student learning outcomes. Simulations and business simulations, for instance, have been shown to increase student engagement and involvement in the learning process ,Laverie et al., 2020. Furthermore, the use of role-playing activities and gamified learning approaches has been found to improve student retention and application of knowledge ,Koul and Jasrotia, 2021. By incorporating these experiential learning tools

into the curriculum, educators can create hands-on learning experiences that foster critical thinking and problem-solving skills, Koul and Jasrotia, 2021.

The market for learning experience tools is also witnessing a surge in the development of innovative instructional media to support effective teaching practices. Tools like Adobe Animate and Wordpress are being utilised to create interactive and engaging learning materials that cater to diverse subject areas, such as physics and mathematics, Prakasiwi and Gusemanto, 2021. Additionally, the use of cloud computing technologies in STEM education is revolutionising the way subjects like physics and biology are taught, offering new opportunities for collaborative and blended learning approaches, Martyniuk et al., 2021. These advancements in instructional media underscore the importance of leveraging technology to enhance the learning experience and promote knowledge retention, Prakasiwi and Gusemanto, 2021.

Moreover, the market for learning experience tools is evolving to meet the demands of modern education systems, especially in the wake of the COVID-19 pandemic. Blended teaching approaches that combine traditional classroom instruction with online resources are becoming increasingly popular to ensure continuity in education, Martyniuk et al., 2021. The development of cloud-based educational platforms and virtual learning environments has enabled seamless collaboration and communication among students and educators, facilitating a more interactive and engaging learning experience, Martyniuk et al., 2021. By embracing these technological advancements, educational institutions can adapt to changing circumstances and provide quality education to students in diverse settings.

2.4.1 Limitations of Existing Learning Design Tools

The landscape of LD is continuously evolving, prompting the need for new tools to meet the demands of modern education. The integration of digital technologies and innovative pedagogical approaches has reshaped the way educators deliver content and engage students in the learning process. Asynchronous learning tools, such as social networking sites and associated digital materials, have emerged as alternative channels for information transfer, enhancing student engagement and interaction, Northey et al., 2015. However, the dynamic nature of education calls for the development of new tools that can adapt to the diverse learning needs and preferences of students, fostering a more personalised and effective learning experience, Northey et al., 2015.

As stated in Section 2.1.1 , a Google Search was enacted to identify existing tools, and applications. Through prior knowledge of some tools, keywords were used, such as "Learning Design tools" and "Active Learning Tools". These keywords proved invaluable to compile a list of multiple tools used currently in education.

Table 2.1: Comparisons of the Current Market

Name	Description	Advantages	Disadvantages	Cost
Articulate360	Course development tool	Drag and Drop, Browser Based authoring	Poor Language support, Limited amounts of Customisation due to Drag and Drop nature	Monthly Subscription
Figma	Cloud-based design tool	Real-time collaborative editing, Easy file sharing	Multiple users can edit and overwrite each other, Internet Only	Free, with paid subscription if required
Figjam	Online whiteboard	Versatile, and Collaborative	Online only, missing some functionalities	Free or Paid
Adobe Photoshop	Photo manipulation tool	Versatile features, Meticulous design	Expensive, and not beginner-friendly	Annually.
Adobe Illustrator	Design tool	Versatile Vector based design	Size, Difficult to learn	Subscription (annually)
Adobe Captivate	Interactive content creation	Easy to use	Poor UI Design Expensive subscription	Subscription.

These tools, see Table 2.1 , are all examples of tools that *can* be used within Learning Design and Active Learning environments. No tools were found that were specifically catered for educators working in AL / LD.

One area where new learning design tools are essential is in the realm of experiential learning. Experiential learning, which focuses on hands-on experiences to promote learning, has gained traction in educational settings. Tools like participatory photo novels and simulations have been used to immerse students in real-world scenarios, enhancing their understanding and retention of course material, Das, 2011, Laverie et al., 2020. However, there is a growing need for more interactive and engaging tools that can simulate complex environments and provide students with practical learning experiences that mirror real-world challenges, Das, 2011, Laverie et al., 2020. By developing new tools that facilitate experiential learning, educators can create dynamic and impactful learning experiences that prepare students for success in their future careers.

The shift towards blended learning approaches has also underscored the importance of new learning design tools that can seamlessly integrate digital resources into traditional classroom settings. Mash-up authoring tools for e-learning, based on pedagogical templates, offer educators a structured framework for creating interactive and engaging learning materials, Capuano et al., 2009. These tools enable educators to design customised

learning experiences that cater to diverse learning styles and preferences, promoting active participation and knowledge retention, Capuano et al., 2009. However, the demand for more versatile and user-friendly tools that support collaborative learning and knowledge sharing remains high, driving the need for continuous innovation in learning design tools, Capuano et al., 2009.

In the context of marketing education, the adoption of new learning design tools is crucial for enhancing student engagement and facilitating skill development. Tools like Canva, a design platform integrated into the marketing classroom, exemplify the potential of innovative tools to foster creativity and collaboration among students, Hinchcliff and Mehmet, 2023. By incorporating dialogic and social learning approaches into the classroom, educators can create a dynamic learning environment that encourages active participation and knowledge co-creation, Hinchcliff and Mehmet, 2023. Moreover, the use of machine learning-based analytical tools in digital marketing education highlights the importance of staying abreast of technological advancements to equip students with relevant skills for the digital age, Miklošík et al., 2019. These tools not only enhance the learning experience but also prepare students for the evolving landscape of marketing practices, Miklošík et al., 2019.

Present learning design tools encompass a wide array of online and digital resources aimed at assisting educators in creating engaging and effective learning experiences. Tools like Padlet, Kahoot, YouTube, and Essaybot have been employed to enhance student interaction, collaboration, and engagement in various educational contexts, Ahmad and Atmazaki, 2022. These tools are developed based on specific conceptions and ideas of learning design, integrating principles of pedagogy and educational theory to facilitate effective knowledge transfer and skill development. The implementation of learning design tools is guided by specifications such as the IMS Learning Design specification, which offers a framework for structuring educational content and activities, Maziriri et al., 2020.

Comparisons of the current market of learning design tools reveal a diverse landscape with platforms like Moodle, Canvas, Blackboard, and Trello providing unique features and functionalities to support teaching and learning. While these tools have significantly altered the educational landscape, there are limitations that require attention. The necessity for new tools in learning design arises from the evolving demands of modern education and the aspiration to enhance student engagement, collaboration, and critical thinking skills. By creating innovative tools that cater to the diverse needs of educators and learners, the field of learning design can continue to evolve and adapt to the changing educational landscape, Maziriri et al., 2020.

2.5 Conclusion

The development of learning design tools has been influenced by the convergence of pedagogy, educational theory, and technological progress. Learning design emerged to provide structured methods for organising educational content and resources to improve student learning outcomes. The primary goal of learning design is to create effective learning experiences by strategically arranging educational materials in a coherent and engaging manner. Unlike traditional textbooks that structured content into chapters, the introduction of online platforms such as Moodle, Blackboard, and Canvas revolutionised the delivery of educational content, offering interactive and dynamic learning experiences, Maziriri et al., 2020.

The current landscape of learning design encounters various challenges and issues that affect its efficacy. Differing opinions on the best practices in learning design have led to a variety of approaches and methodologies being utilised in educational settings. While some initiatives concentrate on dialogic teaching and learning to reshape socio-cultural contexts and mindsets, García-Carrión et al., 2020, others prioritise experiential learning projects to immerse students in real-world scenarios, Radford et al., 2015. The moderate success of learning design tools can be attributed to the complexity of educational environments and the diverse needs of students, underscoring the significance of continuous innovation and adaptation in learning design practices, Maziriri et al., 2020.

In conclusion, the need for LD tools underscores the importance of integrating pedagogy, educational theory, and technology to develop engaging and effective learning experiences. The evolution of these tools has been driven by the necessity for structured approaches to organising educational content and resources. While existing tools have significantly transformed the educational landscape, there is an ongoing need for innovation and adaptation to tackle the challenges and limitations in the current market. By leveraging new tools and technologies, educators can enhance student learning outcomes and equip learners for success in the digital age.

Chapter 3

Methodology

A software development methodology is "defined as a framework for developing information systems, focusing on planning and organization. It benefits both teams and customers by improving efficiency and adaptability to changes." - Badkar, 2023

Throughout development cycles, various methodologies can be employed to complement individuals, developers, or both. This chapter aims to provide an overview of different methodologies, their respective advantages and disadvantages, and the selected methodology for this particular artefact.

3.1 Scrum

Figure 3.1: Scrum Methodology

The Scrum methodology is a sub-framework of the Agile concept, in which it follows an iterative approach. Scrum can be defined as "a management framework that teams use to self-organise and work towards a common goal...Scrum practices allow teams to self-manage, learn from experience, and adapt to change. Software teams use Scrum to solve

complex problems cost effectively and sustainably. " - Amazon-Web-Services, n.d.

Image sourced from Korkut, 2023.

Advantages

- "Daily Scrums improve communications, identify impediments, promote quick decision-making, and consequently eliminate the need for other meetings" (Scrum Guides, 2023).

- "Sprints enable predictability by ensuring inspection and adaptation of progress toward a Product Goal at least every calendar month" (Scrum Guides, 2023).

- "At the Sprint Review, the Scrum Team presents the results of their work to stakeholders and progress toward the Product Goal is discussed" (Scrum Guides, 2023).

Disadvantages

- "Stakeholders may find the short iterations difficult to adapt to when used to longer development cycles" (Scrum Guides, 2023).

- "Teams may focus too much on process over product due to process overhead" (Scrum Guides, 2023).

- "For larger and more complex projects, adaptations may be needed to the framework" (Scrum Guides, 2023).

After careful analysis and comparisons of different methodologies, the Scrum methodology emerged as the most suitable choice. Its adaptability makes it well-suited for both team-oriented and individual projects, providing the flexibility needed for potential future expansion.

3.2   Methodology in Use

Meetings were scheduled regularly, between my supervisor, and myself, which took place at least once a week, sometimes even happening 5 days a week, with sprints becoming day-long during some iterations of the project.

In total there were 37 pages of meetings, interviews, and requirements that arised from these meetings. In total, there were 18 meetings, 4 meetings, between my supervisor and other lecturers at the University of Portsmouth.

These "Project Meeting Agenda" meetings, were imperative in Iterating upon each new sprint, and without so, the project would have failed.

Due to these regular meetings, a strict deadline was set at every stage, resulting in hit deadlines, with a new update provided to each meeting.

These 37 pages can be seen within the appendix, Appendix D.

Chapter 4

Requirements

This chapter outlines the requirements needed for the system to be functional and considered successful as well as the methods used to gather and prioritise the importance of each.

4.1 Existing Systems

Learning Design Tools are not a new concept, with users having familiarity with existing tools on the market, such as Figma, and Articulate360, and the ADOBE suite of software systems. All of these tools share the purpose of letting the end user design education in the way they see fit.

4.1.1 Figma
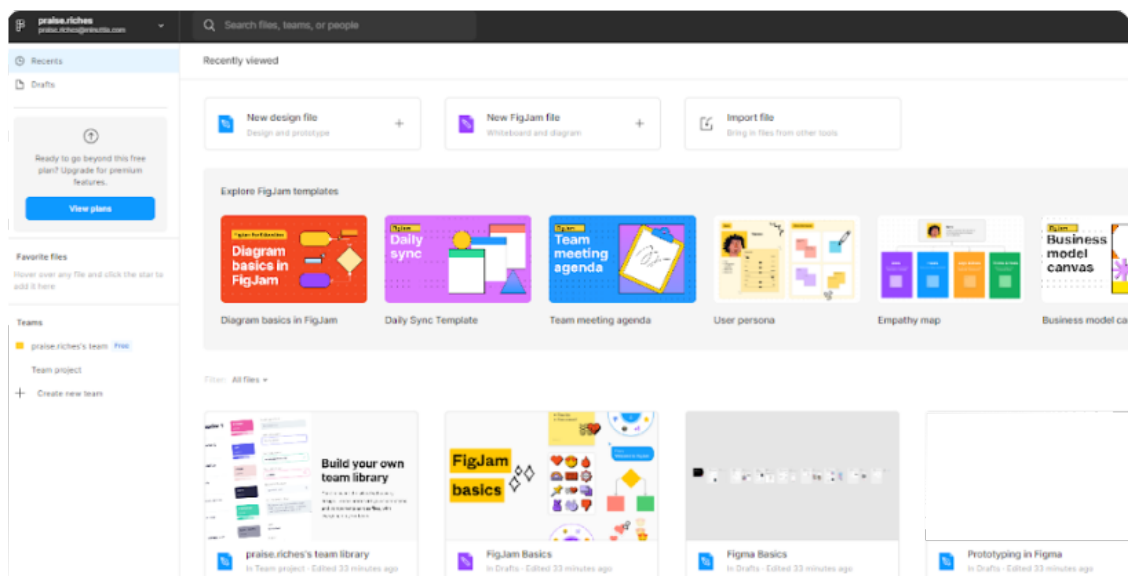
Figure 4.1: Figma's Dashboard

Figma is a cloud-based tool for creating collaborative designs. It is used in field such as application development, web design and education. Figma is now started to be used

significantly within graphic design classes, and graphic design courses within schools and universities, worldwide. Hakim et al., 2022

Advantages

- Real-time collaboration between team members

- Cross-Platform compatability - browser and desktop support

- Version History

Disadvantages

- Steep Learning Curve

- Limited Offline Functionality

- Performance issues with large sized files.

4.1.2 Articulate 360
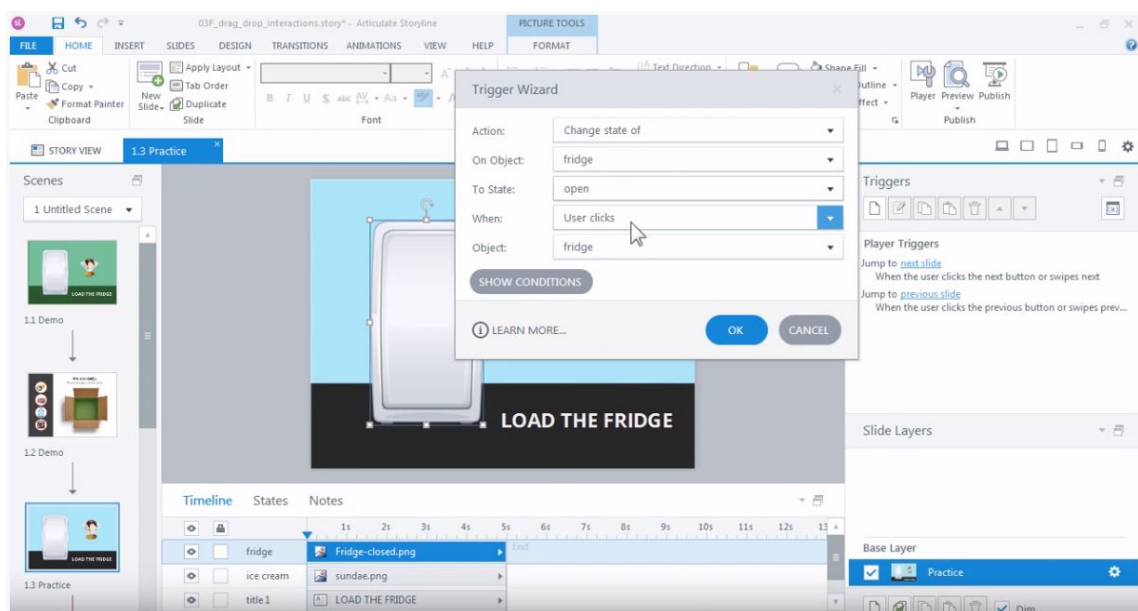
Figure 4.2: An example of a project in Articulate 360

Articulate 360 is an online learning tool used within the creation of digital courses, and educational material. Articulate 360 specifically is a suite of tools developed by Articulate, encapuslating tools such as Storyline360, Rise360, and Review360, for example.

Advantages

- Easy to use design

- Versatile - As it's a suite, a range of tools are available

- Collaborative

Disadvantages

- Subscription based service

- Limited customisation of the tools

- Requires an internet connection

4.1.3   Moodle

Figure 4.3: Moodle's Home Dashboard

Moodle is an open-source learning tool used by staff and students within education, to deliver online courses, supplements to courses, and other educational content. Primarily used by universities, such as the University of Portsmouth, to organise and deliver content to students.

Advantages

- Open source software

- Scalable for both small organisations and large ones

- Large community support network

Disadvantages

- Steep Learning Curve

- High maintenance

- Performance issues during peak usage times.

Target User Groups

- Figma - Primarily used by graphic designers, educators and students within Design-rlated courses.

- Articulate 360 - Primarily used by instructional designers, developers specialising in eLearning tools, and educators.

- Moodle - Used by teachers and students in educational institutions and environments.

4.2   Functional Requirements

Functional Requirements describe how the system is supposed to behave, in the concept of services, tasks, or functions that the system is expected to be able to perform

Prioritisation is essential when eliciting requirements, ensuring that those most important to the stakeholders and users are completed to refer to the project as successful. Hatton, 2008 outlines the MoSCoW method as a commonly used method of prioritising requirements in common groups as defined by the acronym:

- Must Have - Requirements are required, failure to implement should consider the project a failure

- Should Have - Requirements that would be good to have, not necessarily required and shouldn't consider the project a failure if not implemented

- Could Have - lower ranking to "Should Have" requirement, but not critical.

- Won't Have - Requirements not important to the current form.

4.2.1   Requirements

Table 4.1: Requirements

№	Name	MoSCoW	Description	Reason	Successful Indication
MH1	Graphical View	Must Have	A graphical view of the force directed graph.	Imperative to the project, the user will not be able to see the connections and dependencies between each node	A viewable page
MH2	Ability to Add Nodes	Must Have	Functionality to add nodes (otherwise it won't work)	If the user cannot add nodes, then there is no functionality to the project whatsoever.	Adding Node functionality works
MH3	Ability to Delete Nodes	Must Have	Functionality to delete nodes (otherwise it won't work)	If the user cannot add nodes, then there is no functionality to the project whatsoever.	Deleting Node functionality works.
MH4	Importing Files	Must Have	The ability to import a JSON file from local to the web page	This is needed to due to the user otherwise having to redraw the same diagram every time they use it	Importing a JSON file successfully redraws the graph in accordance to the file.

№	Name	MoSCoW	Description	Reason	Successful Indication
MH5	Downloading Files	Must Have	The ability to download a JSON and SVG file consisting of the data needed to draw the graphs	This is needed due to the web page consisting of a template design, and it's imperative to be able to download the edited copy.	
SH1	Adding data and links to each node	Should Have	A graphical view of the force directed graph.	Imperative to the project, the user will not be able to see the connections and dependencies between each node	Viewable links between each node
SH2	Multiple Views	Should Have	Functionality to add nodes (otherwise it won't work)	If the user cannot add nodes, then there is no functionality to the project whatsoever.	Adding Node functionality works
SH3	Representation of different Levels	Should Have	Differentiation between nodes of different types, such as Course, Module, etc	If the user can't easily differentiate, they might not notice the different type of connections between Nodes	Different colours, shapes for each level of type

№	Name	MoSCoW	Description	Reason	Successful Indication
SH4	Multiple Ways to Edit	Should Have	The ability to edit the SVG through either using buttons, or writing JSON in a textbox	This makes it easy for the user to be able to enter data the way they want to and understand how to	At least two ways of editing - Buttons / Information Box
SH5	Multiple ways to create New Nodes	Should Have	Multiple ways to edit for ease of users	This would be perfect for ease of use, and user's accessibility.	
CH1	Tabular View	Could Have	A Tabular view of the force directed graph.	This would be of importance so that the user could create the graphs in other ways if they so pleased	A tabular view of the Force Directed Graph on the SVG.
CH2	Account System	Could Have	Ability to have accounts for each user	Ease of use, having a secure system	Login / Sign Up page
CH3	Tabular Export function	Could Have	An Export function to create a tabular form of the graphical SVG view.	This would help users when creating and saving data.	

№	Name	MoSCoW	Description	Reason	Successful Indication
WH1	Data Store	Won't Have	A data store so that the webapp will remember the user's SVGs	This would be a future consideration, meaning multiple users can save their own SVGs, load up SVGs, and have access to all of them online, without needing a local saved version	N/A
WH2	Importing SVG	Won't Have	Incorporating an SVG import	Gives the user another way to incorporate already made graphs into the webapp basic mode. Future Development	N/a
WH3	Collaborative Editing	Won't Have	Collaborative editing to have multiple users edit the information on the web page	This would be a phenomenal idea for future development, but due to the time frame, not possible to be added	N/a

4.3 Non-Functional Requirements

Non-Functional requirements are essential aspects of software development that focus on "How good" the software performs rather than "what" it does Chung et al., 2000, These requirements define the attributes of the system, and are imperative for ensuring the quality and success of the system being implemented.

Table 4.2: Non Functional Requirements

№	Name	MoSCoW	Description	Reason
NF-MH1	Performance	Must Have	Respond within 2 seconds under normal load.	User satisfaction and productivity.
NF-SH1	Availability	Should Have	Uptime of 99.5%, excluding maintenance.	Minimises downtime and ensures user trust.
NF-SH2	Scalability	Should Have	Handle 30% user increase within a year.	Accommodates potential user base growth.
NF-SH3	Reliability	Should Have	MTBF of at least 1500 hours.	Ensures reliable user experience with minimal disruptions.
NF-SH4	Usability	Should Have	Intuitive and accessible interface for a broad audience.	Enhances user satisfaction and ease of use.
NF-SH5	Maintainability	Should Have	Well-documented code and minimal downtime updates.	Streamlines maintenance tasks and reduces errors.

Chapter 5

Development: Design, Testing and Implementation

This chapter will discuss the design, and the decisions behind each iteration. Within documentation of each update, Testing will be discussed, and results will be shown, on how successful each change was, improvements that can be made, and any outright failures within these iterations.

Further insight will highlight the specific choices behind the implementation of each library, language used, and the reasons behind them.

5.1   Website

Due to experience and familiarity with HTML, CSS, and Javascript, it was decided that this artefact will be designed within these languages, for web browsing usage. This gave the ability to create an artefact that works on all internet connected devices that supports a browser.

This decision was also made to cater to the Non-Functional requirements made in Table 4.2, such as portability and maintainability. This provided an easy way to create the artefact to those standards.

HTML - HyperText Markup Language

HTML is the foundational language used to structure content within the World Wide Web (WWW). It was paramount to the conception of this project, due to the want of it to be a web-browser based application.

By incorporating HTML, Non-Functional Requirements were achieved nearly automatically due to the portable nature of the WWW.

HTML was used to define the basic framework, placement of headers, and integration of

the Javascript and CSS files.

Javascript

Javascript was used in conjunction with HTML, to provide the dynamic functionality of the webpage, such as creating the SVG and infobox elements on the page.

Javascript managed the dynamic behaviour of the application, updating the SVG elements, based on "GraphData" - quite literally, the JSON data that structures the graph. This manipulated the DOM (Document Object Model), updating the graph with new data, smoothly, as to not interrupt the user's experience.

D3

D3.js is a javascript library, that was imperative to the project, providing the basis for the Force-Directed Graph, created within the SVG container. Without this library, there wouldn't be a clean, and easy to use force-directed graph.

Due to a steep learning curve with D3.js, in part due regular updates and maintenance to the library, the project stalled for the opening month, due to spending time understanding the key aspects to D3

However, there were many difficulties with this library. A lot of the examples, and libraries pertaining to Force-Directed graphs were made in D3 Version 3. D3 V3 was released in December 2012, and at the time of implementing and designing the project, the latest version of D3 is now D3. V7.9.0.

Due to this almost twelve year difference between the two versions, there were a lot of outdated library names, such as d3.force, which in the latest version has now been renamed into d3.forceSimulation() with more specific naming conventions, such as d3.forceSimulation().force(). As small as this difference seems, the library had been completely uprooted, with most functions not working anymore.

CSS - Cascading Style Sheets

CSS was key in styling the page to both be minimalist, clean and to fit with the colour scheming of the University of Portsmouth's Logo.

CSS was used to edit the styling attributes of the buttons and the nodes within the SVG container.

JSON - JavaScript Object Notation

JSON is a lightweight data-interchange format used to exchange data. The GraphData was structured in a JSON specific format, as this was the required structure to work with the aforementioned D3 libraries.

5.2 Iterations

5.2.1 Iteration One
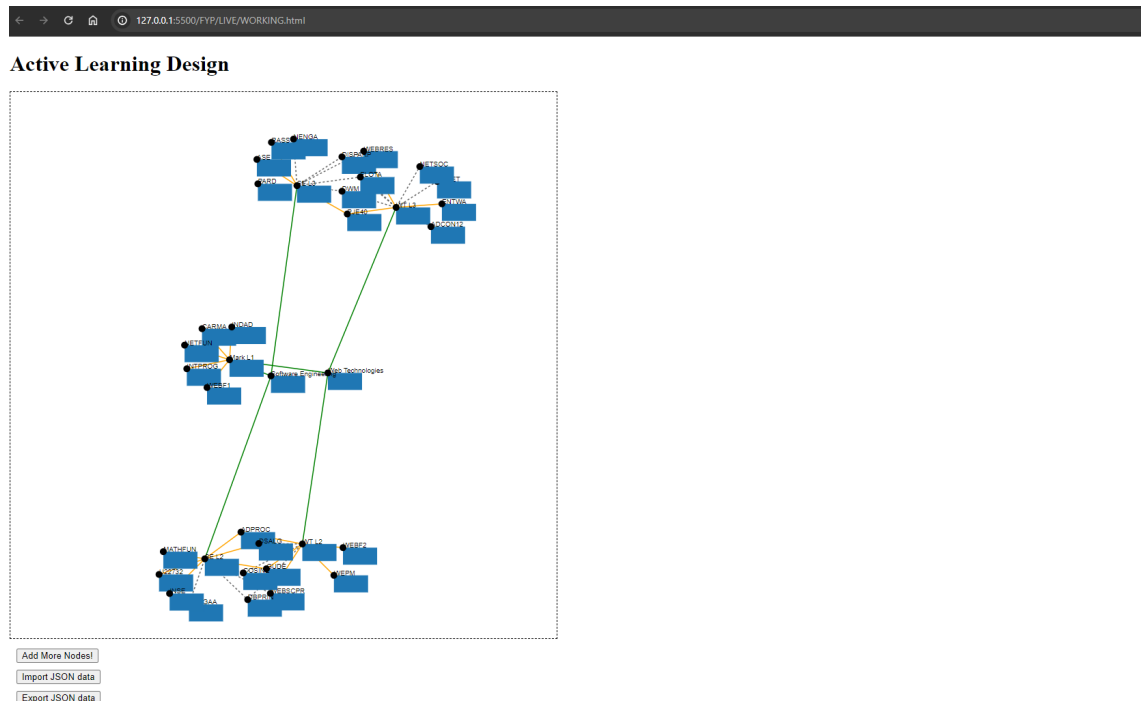
Figure 5.1: Iteration One

The first iteration was just a simple web page which consisted of a SVG container, with a dashed border, inside of which had the Relationship Force Diagram, constructed using JSON within the App.js file. This graph was hardcoded into the page, as a proof of concept, showing what the graph could look like, on the webpage.

Underneath the SVG container were three buttons, "Add More Nodes!", "Import JSON data", and "Export JSON data", These three buttons didn't work, and were merely there for visualising what the page might look like.

The SVG consisted of Blue rectangles, with Black circles in the top left of the rectangles, to represent the Nodes of the graph. These nodes also contained the text of each node name, above the rectangles. Connecting the nodes together were a total of three lines. These lines were coloured as follows:

- Green

- Orange

- Grey-Dashed

These colours served no purpose within this iteration, but merely as a visualisation tool to show that the connecting "links" could be edited to have certain values, which within this implementation were just colours.

With this first iteration, the proof of concept turned out to be more difficult than originally planned. The example Force-Directed Graph , within the D3.JS webpage, was written in D3.js V3, and at the time of coding , the latest version of D3.JS was V7.9.0.

The differences between the two versions were stark, as certain D3 functions were renamed between the multiple years, and some were rendered useless. An example of one of these was the D3.force function which has now been updated to D3.forcesimulation.force().

Testing

With this first iteration, the buttons were purely visual aids to demonstrate a render of what the page could become. Within this iteration, the testing process was simple, due to the non-working buttons on the page.

Because of the simplicity of this first iteration, the only test scenario that would provide and supply any results, whether expected or not, was to see whether the user had the ability to move the nodes within the SVG border. These nodes, as seen in Figure 5.1, are blue rectangles. with a black circle in the top left corner, and the name appearing above.

Table 5.1: Iteration One Tests

№	Test Scenario	Expected Outcome	Actual Outcome	Result
One	Movement of Nodes in SVG	Ability to move nodes within the border of the SVG	Nodes were able to be moved.	PASS
2	"Add More Nodes" button	This button holds no functionality - so NOTHING	NOTHING	N/A
3	"Import JSON data"	This button holds no functionality - so NOTHING	NOTHING	N/A
4	"Export JSON data"	This button holds no functionality - so NOTHING	NOTHING	N/A

5.2.2   Iteration Two
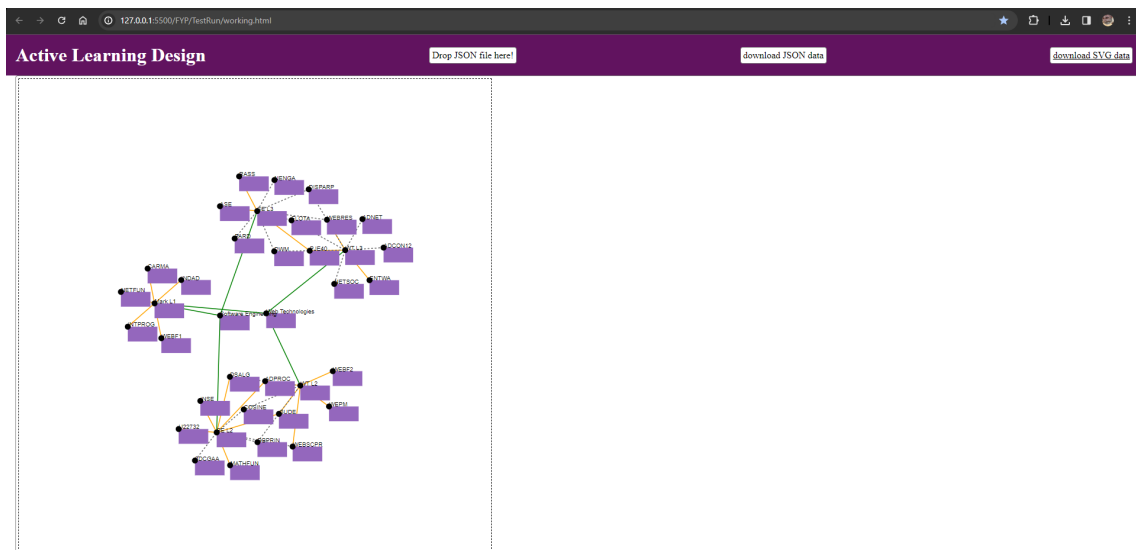
Figure 5.2: Iteration Two

The second iteration developed upon the styling of the webpage, incorporating a border at the top of the page, containing the Header of "Active Learning Design", and now three buttons, consisting of "Drop JSON here!", "download JSON data", and "download SVG data".

These three buttons were originally placed underneath the SVG container in the first implementation, and for viewing pleasure and ease of access, had now been moved within the header. The buttons had some functionality, with the user being able to press both the "download..." buttons to download either the JSON/ SVG data of the file.

The border had a purple background, using the same Purple Hex valuation from the University of Portsmouth's logo.

The Nodes within the SVG had now been updated to use a purple colour scheme, instead of the original dark blue from the first iteration.

Testing

Testing for this second iteration, focused on the buttons that were in the header, "DROP JSON here!", "download JSON data", and "download SVG data". There was no need to retest the movement of the nodes, as no functionality had changed between iterations.

Table 5.2: Iteration Two Tests

№	Test Scenario	Expected Outcome	Actual Outcome	Result
One	Movement of Nodes in SVG	Ability to move nodes within the border of the SVG	Nodes were able to be moved.	PASS
2	"Drop JSON here!"	Dragging and Dropping JSON will update the graph, with the attributes of the new JSON.	Updated Graph	PASS
3	"download JSON data"	Starts a download of the Graph in it's JSON structure	A downloaded JSON file called graphDATA.JSON	PASS
4	"download SVG data"	Starts a download of an svg image of the graph	A downloaded svg file called graph_with_links, depicting the graph.	PASS

As can be seen by Figure 5.3, the downloaded SVG file produced an image of the graph, however, focusing on the picture, it shows that the colour formatting was somewhat different to the one appearing on the webpage, and the Text within the names wasn't formatted correctly, either. The downloading function PASSED, although, it was wrong in the colour scheme.

An issue that was faced throughout this iteration was when downloading the SVG file of the graph. When successfully downloading an SVG of the graph, the CSS colour schemes were starkly different to the ones on the actual webpage. This is shown in Figure 5.3, with the links between each node, being red and blue, instead of the green and orange, for example. As also can be seen, the text is boldened , and a different size to the webpage view.
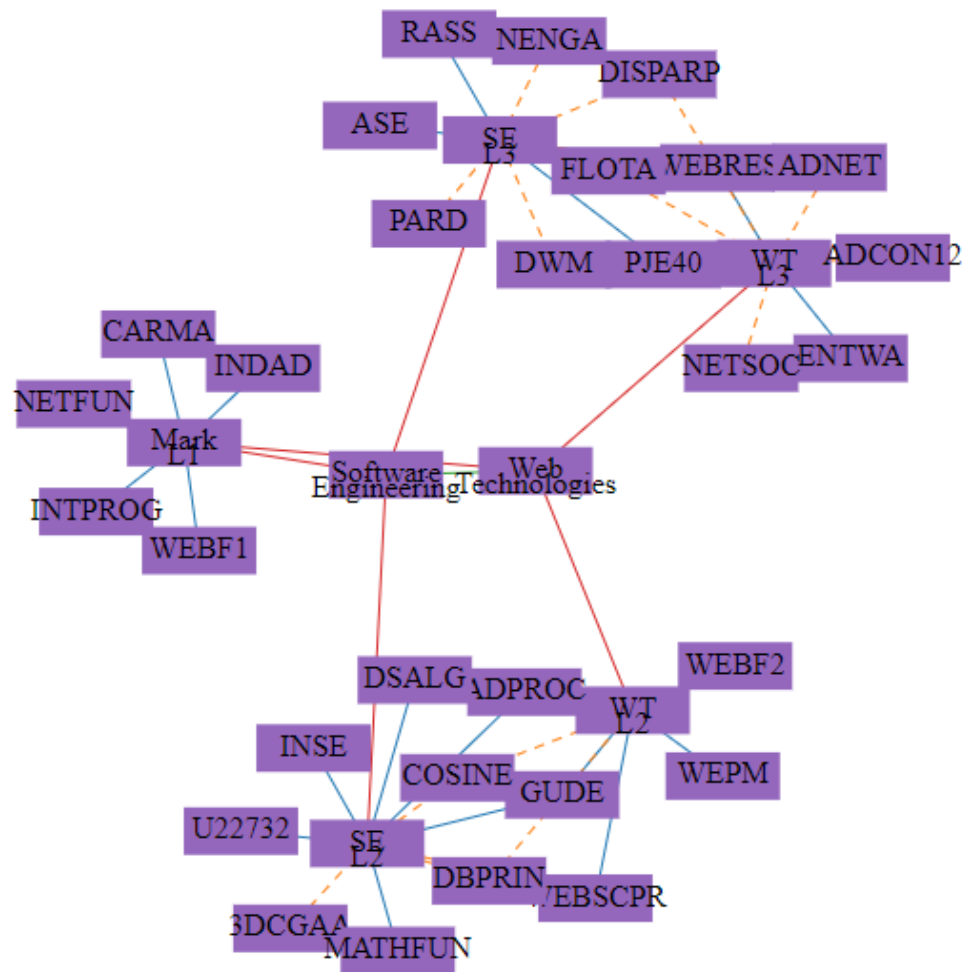
Figure 5.3: Iteration Two-graph_with_links.svg

5.2.3   Iteration Three

Figure 5.4: Iteration Three

The third iteration developed upon the styling of the SVG, updating the purple rectangles to now include the text of the node inside the boundary of the rectangle, instead of being placed above it. The black circles in the top left of each of the nodes was removed, as it made the design too clustered, and didn't serve any purpose.

Two new buttons were added underneath the SVG container, "Add Node", and "Delete Node". These two buttons were fully working, adding and deleting nodes when clicked. These buttons created a prompt for the user to type in the specifics of the node to be created "Node Name, Source Node, Link Type", and "Node to be deleted".

With the addition of these two buttons, the first five functional requirements, as seen in Section 4.2, were achieved to their full extent.

Testing

Testing for this third iteration, focused on these new buttons, "Add Node", and "Delete Node", due to the previous testing, the remaining functionality of the page was confirmed, and rendered pointless to be retested, as no changes were made to it.

Table 5.3: Iteration Three Tests

№	Test Scenario	Expected Outcome	Actual Outcome	Result
One	"Add Node"	A new node will be added to the graph, connecting to a previously made node	Nodes could be added, after entering the new name, and the name of the node it was connecting to	PASS
2	"Delete Node"	A node of the users choice will be deleted and removed from the Graph	Nodes could be deleted, after entering the required name of the node,	PASS

5.2.4   Iteration Four
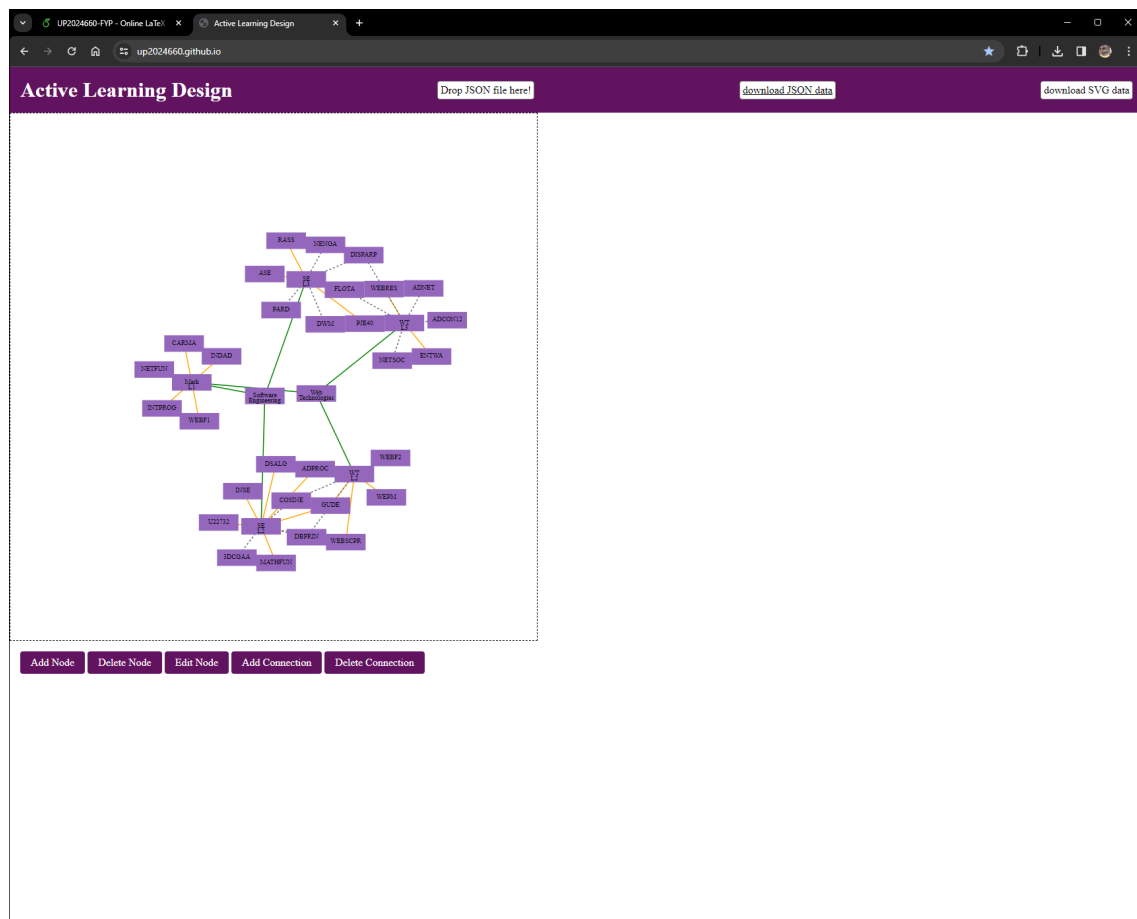
Figure 5.5: Iteration Four

The fourth iteration developed upon the functionality of the graph, by adding new buttons: "Edit Node", "Add Connection", "Delete Connection". These buttons were functionally working, and like the previous implementation, it prompted the user to specify the node to edit, or the two specific nodes to "Add Connection" and "Delete Connection" between.

These buttons had been styled in the inverse to the buttons in the header, with the purple colour of the header being the background for each of these.

The border surrounding the buttons, as seen previously in Figure 5.4, had also been removed, due to it being unnecessary, and being ugly, and eye catching, and not in the good way.s

Testing

Testing for this fourth iteration, focused on the newly added buttons under the border containing the graph, these being "Edit Node", "Add Connection", and "Delete Connection".

Table 5.4: Iteration Four Tests

| №	Test Scenario	Expected Outcome	Actual Outcome	Result
One	"Edit Node" button functionality	Ability to edit the names of the specified node	Nodes were able to be edited	PASS
2	"Add Connection" button functionality	Ability to add new "links" (lines) between two specified nodes.	Newly created lines show between two specified nodes	PASS
3	"Delete Connection" button functionality	Ability to delete "links" (lines) between two specified nodes.	Specified links have been deleted	PASS

5.2.5   Iteration Five
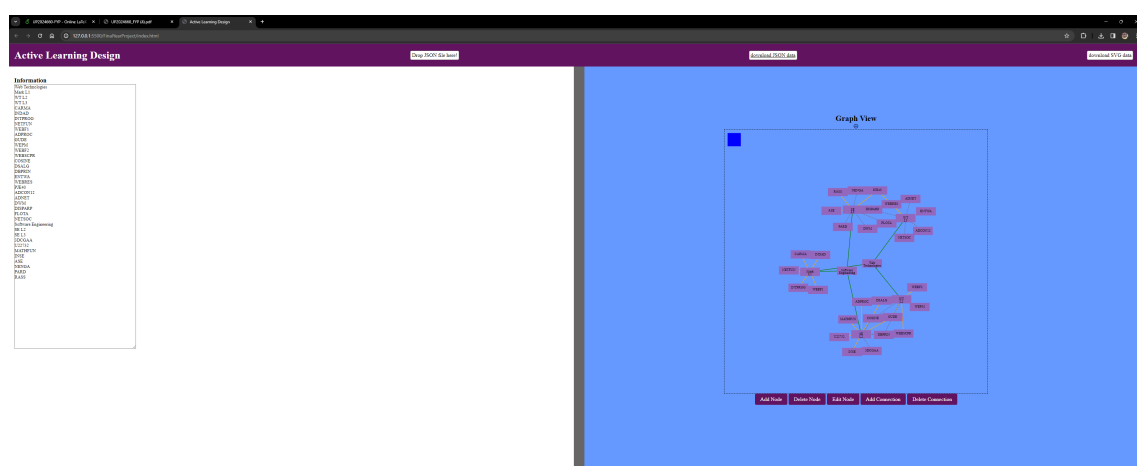
Figure 5.6: Iteration Five

The fifth iteration redesigned the entire page, splitting the page into two sections, Left and Right, with a grey divider in the middle. The SVG and container, moved to the right hand

side of the screen, which now has a blue background, the blue being the same hex value as the blue in the UoP Logo.

A blue square was constructed in the top left of the SVG, so that the user would be able to drag from it, and create a new node.

In the middle of the page, a grey divider was created, which was able to change the width of both the left and right sides accordingly, based on where the divider was.

On the left hand side of the page was a textbox, which contained all the names of the Nodes - This was designed for future functionality, so that one would be able to write JSON in this text box, and be able to update the SVG graph on the RHS, and vice versa.

If the user double-clicked anywhere a new node would be created, following the same function process as the "Add Node" button

Testing

Testing for this fifth iteration, was quite short, due to this iteration mainly focusing on redesigning the page, retaining the functionality of all buttons, with the only difference between stylistic choices made.

The only difference was the addition to the "info box" on the left hand side, the blue square within the top left corner of the graph container, and the double-click functionality

Table 5.5: Iteration Five Tests

№	Test Scenario	Expected Outcome	Actual Outcome	Result
One	"Info Box" showing list of all nodes	N/A	A list of nodes appeared within this info box, ordering them in the same way they were created.	PASS
2	Blue Square Addition	Dragging from the Blue square, to anywhere on the graph container, would create a new node	This didn't work, the nodes being created were permanently forced underneath the blue square	FAIL
3	Double-Click add node function	After a double-click, a new node will be created on the graph	A new Node was created after double-clicking anywhere within the border of the graph container.	PASS
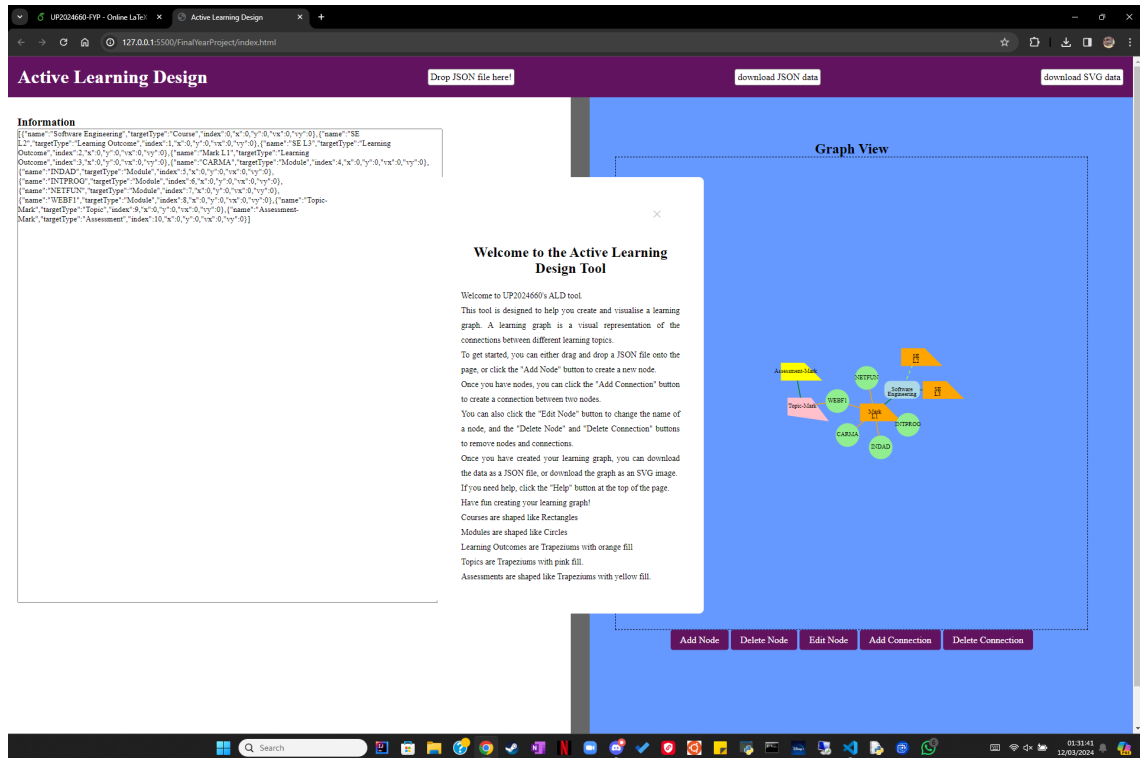
Figure 5.7: Iteration Six

5.2.6 Iteration Six

The sixth iteration added a new popup when the page loads, explaining what the tool is, how to use, and what the shapes mean on the SVG.

This was just a placeholder, demonstrating the need for an explanation of the tool itself.

The Infobox had an update to it, overhauling it to now show the JSON structure for the nodes, instead of just a list of each of the names. This was done to implement a future consideration of being able to update and edit nodes. Within this iteration, there were no functionality to this, as this was just a proof of concept.
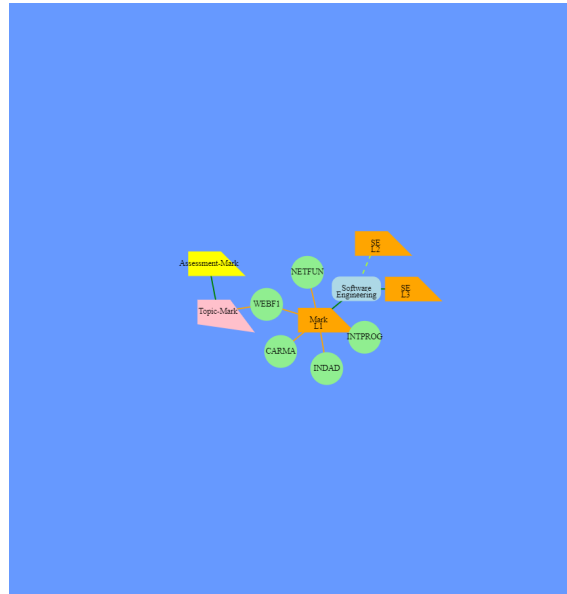
Figure 5.8: Iteration Six SVG style

The SVG was adapted to use a multitude of shapes and colours, showing how each node can be a different level of structure, such as COURSE, MODULE, LEARNING OUT-COME, TOPIC, ASSESSMENT,

Testing

With this iteration, the only two updates for testing purposes were the update to the infobox, now showing the list of JSON structure, and the Popup that appears within the page.

Table 5.6: Iteration Two Tests

№	Test Scenario	Expected Outcome	Actual Outcome	Result
One	"Info Box" showing list of all nodes' JSON structure	N/A	A list of nodes appeared within this info box, ordering them in the same way they were created.	PASS
2	Close Pop Up	Clicking the "x" will close the pop-up displayed	The popup successfully closed when the user clicked the exit button	PASS

5.2.7 Iteration Seven

Figure 5.9: Iteration Seven

The seventh iteration does away with the blue background of the SVG, reverting it back to just the background of the white page. The border surrounding the SVG was removed too, streamlining the page, to declutter it.

Above the Info-box, and the SVG previously were "Information" and "Graph" headers, and they both have been removed, minimising the look of the page.

Testing

There was no need for testing for this iteration, as the only update was purely stylistic choices.
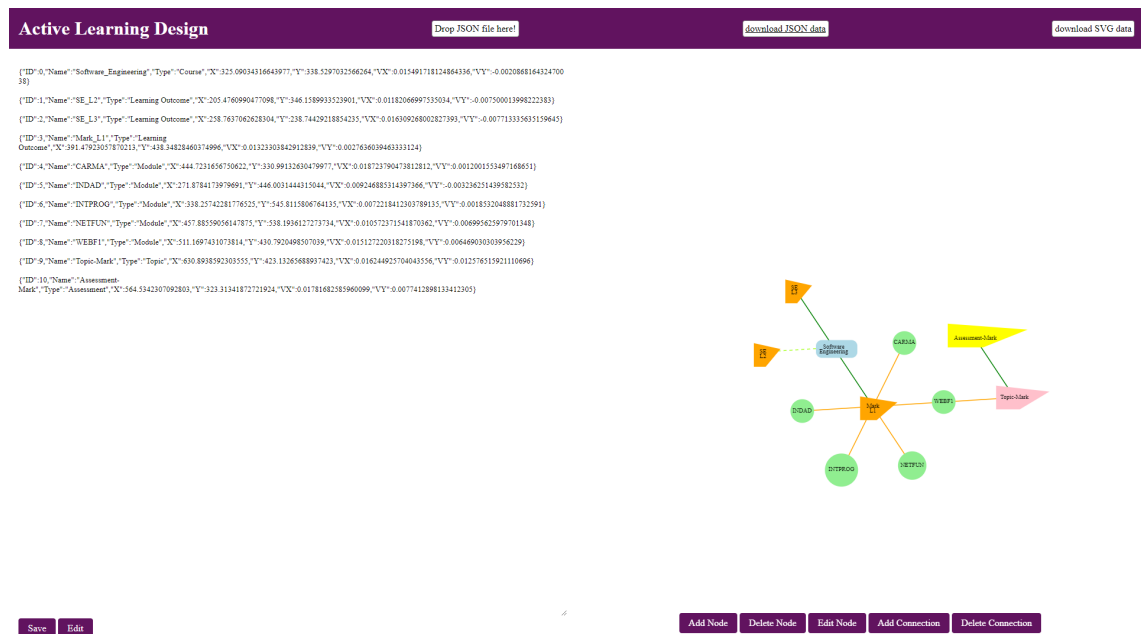
5.2.8 Iteration Eight - The Final Iteration

Figure 5.10: Iteration Eight

The Final iteration of the project added two buttons underneath the Information box, and removed the old border of the box itself.

With these two new buttons, you can edit the JSON file on the left of the page (within the info-box), and Save it, which in turn updates the text within the info box, and updates the graph on the right hand side.

While the Edit button hasn't been pressed, the info-box updates itself every 1000 milliseconds, and is uneditable, due to the refreshing nature of the text.

Once the 'EDIT' button has been pressed, the text stops updating, and changes the contenteditable nature to 'TRUE' from 'FALSE', this is so that the user can change and alter the text, if they so wish.

Once pressing 'SAVE', the info-box contenteditable becomes 'FALSE' again, so that it is not able to altered, while also still refreshing every 1000 milliseconds.

Testing

Testing for this final iteration, focused on the buttons displayed below the info-box. These buttons, "Edit", and "Save", were added so that the user can utilise multiple ways to edit the graph fulfilling the requirement laid out in Table 4.1. These went through vigorous testing so that they would be perfect, due to the necessity of having user friendly services.

Table 5.7: Iteration Eight Tests

№	Test Scenario	Expected Outcome	Actual Outcome	Result
One	Ability to Edit Info - EDIT = FALSE	The user should not be able to edit the info, while the contenteditable is still FALSE.	Nodes were able to be edited, but reset every 1000 milliseconds, for intents and purposes, this is successful.	PASS
2	Ability to Edit Info - EDIT = TRUE	The user should be able to edit the info, while the contenteditable is still TRUE.	Nodes were able to be edited	PASS
3	Infobox text content updates every 1000 milliseconds	Updates the X,Y,VX, and VY, coordinates every second	When dragging nodes, the X,Y,VX,VY all updated every second	PASS
4	Ability to Save edited info	Updates the graph with the new edits (such, as Name being changed, X,Y,VX,and/or VY)	Graph updated with these new changes	PASS

5.3 Discovery Process

Because of these hurdles to the development and implementation of the project, such as struggling with the Infobox functionality, and updating D3.js, a valuable experience of discovery was encountered.

This discovery process, while frustrating going through at the time, actually benefited the artefact, with valuable new findings relating to both the technical and methodological aspects of this project.

- Unforeseen Dependencies and Learning:

    Updating this revealed dependencies that forced extra time to be spent ensuring

compatibility. Due to this, improvements were made to the quality and maintain-ability of the code, by requiring more thorough reviews of the supplied library.

• Trade-Offs and Re-evaluations:

The significant amount of time allocated to update this highlighted trade-offs be-tween the functional requirements, ideas that were developed throughout, and the base functional needs of this artefact.

Functional Requirements were reorganised due to updated priority standings of each, which in turn, led to a greater allocation of time towards the basic functional-ity of this artefact.

5.4   Summary

In summary, the design stage for this project has been constructed with both functional and non-functional requirements having been considered. As can be seen through the designs, see Chapter 5, the main design of the webpage was settled upon within Iteration Five, Section 5.2.5, with the SVG on the right hand side, and the Infobox taking place on the left hand side.

From this iteration onwards, the changes made to each new iteration were small incre-ments, doing away from having a blue background, borders around the SVGs, and the draggable div within the middle.

These iterations added more basic functionality to the page, and sometimes reinstated changes due to some of them not working in previous iterations.

Testing each iteration was imperative before finishing a sprint and moving onto a new iteration. If the functionality wasn't there, it was worked upon until it was sufficient enough.

Throughout all iterations from Iteration Five, Section 5.2.5, there was a challenge in trying to get functionality working from the left hand side of the page, the Info Box. The Info Box was supposed to add the ability to write , update , and delete the nodes in addition to the buttons on the right hand side.

This ability to edit, proved more difficult then thought to be at the start, due to the im-plementation and coding choices behind creating the force directed graph. In order to add the total functionality of the left hand side, the problems had to be broken down significantly.

Iteration Five, Figure 5.6, added a simple text box on the left hand side of the page, which just showed the list of all created Nodes. This did update with deletions, and additions of the nodes through the buttons on the right, but that was it for the base functionality.

Iteration Six, Figure 5.7, updated the text in the text box, to now show the full JSON of each Node. Moving from showing just the name, to now showing name,targetType,index,x,y,vx,vy. These coordinates, updated with each drag of the nodes, and each addition and deletion to the graph.

The next update to the infobox came with Iteration Eight, see Figure 5.10. Within this iteration, the text was updated to now include newlines between each node for visual accessibility purposes, and made sure that each node was clearly visibile and readable.

The structure of the text changed once again, moving from name,targetType,index,x,y,vx,vy to being finalised with ID,Name,Type,X,Y,VX,VY . This change dramatically improved the readbility, and was necessary due to coding choices , further stated in Section 5.2.8.

The only test that failed, see Section 5.2.5 was the "Blue Rectangle Create Node ability", the functionality behind this test was there and apparent, however multiple issues in rendering prompted it to be unsuccessful. These challenges arised due to the positioning of the nodes when created, as no matter where the user dragged from the blue rectangle, as long as it was within the graph border, were always fixed to appear behind this rectangle, sometimes even being blocked entirely by it.

Chapter 6

Testing

This chapter of the report details the approach that has been taken in regard to the testing of the application and its features. It defines several additional testing requirements which have been defined throughout the development, based on the errors and issues encountered. In addition, it details how the artefact delivered on the defined functional and non-functional requirements

It is important to note that all the testing has been conducted on the Windows 11 operating system. Testing on other platforms was not completed because of time constraints but is considered one of the areas for further improvement.

In the Design and Testing Chapter - each iteration went through a dedicated testing phase, focusing only on the newly added functions, buttons, among others.

6.1   Testing

Table 6.1: Concatenated Table of all Tests

№	Test Scenario	Result
Iteration1-1	Movement of Nodes in SVG	PASS
Iteration1-2	"Add More Nodes" button	PASS
Iteration1-3	"Import JSON data"	PASS
Iteration1-4	"Export JSON data"	PASS
Iteration2-1	Movement of Nodes in SVG	PASS
Iteration2-2	"Drop JSON here!"	PASS
Iteration2-3	"download JSON data"	PASS
Iteration2-4	"download SVG data"	PASS
Iteration3-1	"Add Node"	PASS
Iteration3-2	"Delete Node"	PASS
Iteration4-1	"Edit Node" button functionality	PASS

№	Test Scenario	Result
Iteration4-2	"Add Connection" button functionality	PASS
Iteration4-3	"Delete Connection" button functionality	PASS
Iteration5-1	"Info Box" showing list of all nodes	PASS
Iteration5-2	Blue Square Addition	FAIL
Iteration5-3	Double-Click add node function	PASS
Iteration6-1	"Info Box" showing list of all nodes' JSON structure	PASS
Iteration6-2	Close Pop Up	PASS
Iteration8-1	Ability to Edit Info - EDIT = FALSE	PASS
Iteration8-2	Ability to Edit Info - EDIT = TRUE	PASS
Iteration8-3	Infobox text content updates every 1000 milliseconds	PASS
Iteration8-4	Ability to Save edited info	PASS

As shown in Table 6.1, of the accumulated 22 tests, 21 passed, achieving each expected result, as seen in Chapter 5, successfully. The singular test that failed, Iteration5-2 Table 5.5, was ultimately discarded, after consideration with my project supervisor, Dr. Rich Boakes.

The total amount of iterative tests, produced a 95.45% Pass rate, indicating that the testing process was ultimately successful, in producing optimum performance.

This progress showed an effective Development process between each update of the artefact, achieving all requirements needed to be successful.

Chapter 7

Evaluation

The purpose of this chapter is to evaluate the project against the requirements and objectives, while also looking at the project management of this artefact. All of these considerations will determine whether the artefact was successful.

7.1 Functional Requirement Evaluation

This section evaluates the functional requirements and determines if they were successful or not. As shown below, each requirement is laid out with a MET / NOT MET, and highlighted in respect colours GREEN/white

Table 7.1: Requirements

ID	Name	Status	Evidence
MH1	Graphical View	MET	Section 5.2.8
MH2	Ability to Add Nodes	MET	Table 5.3
MH3	Ability to Delete Nodes	MET	Table 5.3
MH4	Importing Files	MET	Table 5.2
MH5	Downloading Files	MET	Table 5.2
SH1	Adding data and links to each node	MET	Table 5.4
SH2	Multiple Views	MET	Section 5.2.8
SH3	Representation of different Levels	MET	Table 5.7
SH4	Multiple Ways to Edit	MET	Section 5.2.8
SH5	Multiple ways to create New Nodes	MET	Section 5.2.8
CH1	Tabular View	NOT MET	N/A
CH2	Account System	NOT MET	N/A
CH3	Tabular Export function	NOT MET	N/A
WH1	Data Store	NOT MET	N/A
WH2	Importing SVG	NOT MET	N/A
WH3	Collaborative Editing	NOT MET	N/A

7.2 Non-Functional Requirement Evaluation

Table 7.2: Non-Functional Requirements

ID	Name	Status	Evidence
NF-MH1	Performance	N/A	N/A
NF-SH1	Availability	N/A	N/A
NF-SH2	Scalability	N/A	N/A
NF-SH3	Reliability	N/A	N/A
NF-SH4	Usability	N/A	N/A
NF-SH5	Maintainability	N/A	N/A

The Non-Functional Requirements were not able to be tested, due to BLAH BLAH BLAH BLAH

7.3 Summary

In summary, the project was successful in reaching the goals it was set out to. It fulfilled 10/16 of the total "Functional Requirements" - with all 10 of those classified under "Must Have" or "Should Have" in the MoSCoW ranking.

The remaining six functional requirements consisted of three "Could Have" and three "Won't Have" conditions. These were always low priority, and time that could have been utilised to try and get some of the "Could Have"s working was used to polish the "Must Have" and "Should Have" requirements.

These remaining requirements are documented in a backlog, which is on the project Github page, under Issues. This backlog highlights the iterative nature of the project and the Scrum methodology that was used throughout. This backlog board proved useful, in graphically representing how far along the development stage had progressed.
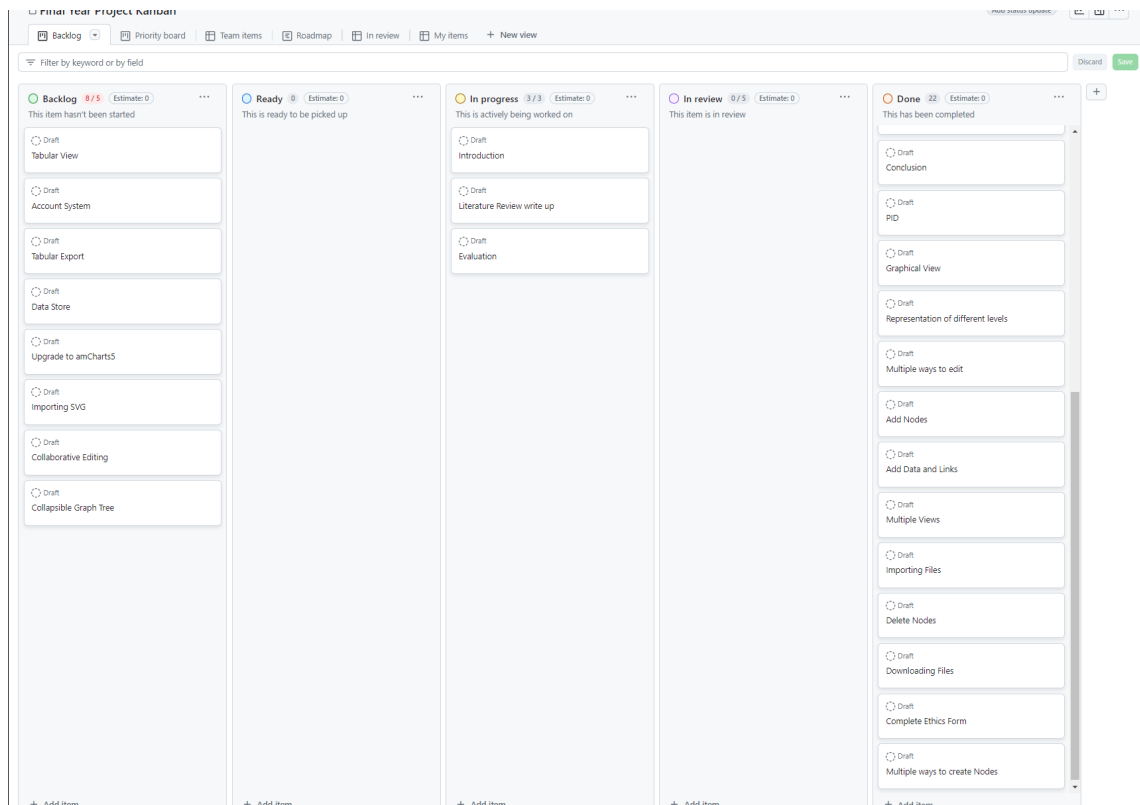
Figure 7.1: Backlog Board

It's clear that the project was a success in reaching it's Requirements, both Functional and Non-Functional, yet still has areas that can be improved, which will be discussed in Section 8.2.

Chapter 8

Conclusion

8.1 Project Aim

The aim was to build an educational tool that would help users design active learning experiences. These experiences would be designed for classes, modules, and others.

Upon this creation of the singular modules, the user would then be able to combine multiple to design a fully active course.

8.2 Future Development

Throughout the development of this artefact, multiple decisions, ideas and requirements were placed lower down on the priority scale, due to a multitude of reasons, such as Time Availability, Costs, and Complexity of the idea itself.

8.2.1 amCharts 5 Library

One area of improvement that could be considered for Future consideration would be replacing the D3.js library, with amCharts 5.

amCharts 5 is, like D3.js, a Javascript library, that specialises in constructing Charts, Graphs and Concepts.

Due to the need to update D3.js manually (from V3, to V7.9.0), and the time constraint to learn the library, the file size expanded rapidly, for it to work.

amCharts 5 however, is regularly updated, pushed, and specialises in Force-Directed Graphs, and diagrams.

As shown below, the difference between my interpolation of the D3.js library, and the amCharts5 library, is quite stark. amCharts5 provides stylistic choices, and collapsible trees built in, and collision detection.

Figure 8.1: D3.js VS amCharts5

8.2.2   Tabular View and Export

Tabular View

As mentioned in the Functional Requirements, see Table 4.1, a key functionality not implemented, was the ability to view the graphData as a table within the webpage, akin to the InfoBox on the left hand side of Section 5.2.8, This would offer multiple benefits to the user such as:

- Accessibility:

  A tabular view would greatly improve the accessibility for users who found the graph difficult to interact with and use.

- Improvements to Readability:

  For graphs which have been developed upon, that have a complex structure due to the amount of nodes, a clear overview would be useful to have, making it easier to understand through quick scanning.

- Filtering

  Utilising a table, the user would be able to quickly sort through data, finding specific aspects of the graphData.

Tabular Export

The ability to export the graphData as a table, see Table 4.1 would greatly benefit users.

- Version Control

Through the exportation of the graphData, the user would be able to have multiple local stages of each graph, allowing the user to keep a controlled history of the development of their graphs

- Collaboration

Users would be able to send this tabular format to other users, who would then be able to utilise this table, to expand upon it in their own time.

- Offline Functionality

The graphData would be downloaded, available to be used offline, rendering the data completely portable, without requiring an internet connection at all times, which it currently relies upon.

Implementation Considerations

To be successful in implementing this tabular format, future considerations would have to be taken, in ensuring optimal results.

- Exporting Formats:

Formats such as CSV (Comma-Seperated Values), and Excel (XLSX), would be two formats that would need to be further researched, due to the accessibility of tools, such as Microsoft Excel, and Google Sheets, that can interpret these values.

- Updates to GraphData source.

Currently the data that makes graphData is in JSON format, that provides the structure of the specific force-directed tree, that the user had created.

In order to export this data, the source formatting may have to be changed from JSON, to something more suitable for exporting.

- Interface Integration

Another Future Consideration that would have to be developed upon, would be the way to integrate the tabular view into the current webpage. Currently on the page, see Figure 5.10, the page is split into two, the left hand side, being an info box containing all JSON data, and the right hand side containing the graphical representation of the data.

Whether there is a toggle function that replaces the infobox with this table, in a carousel function, or the info box would be removed entirely, is purely based on the developer's decision.

8.3 Reflection

Throughout this development process, limitations were encountered due to factors such as time complexity and learning difficulties with libraries, such as D3, for example. The process of updating D3, highlighted the need for maintaining evolving technologies, amplifying the sustainability of this project.

Additionally, through discussions and Project Meetings with my supervisor, functionalities like tabular export and view were explored, deeming them valuable, but due to time constraints unlikely to implement in the required time frame.

Taking everything into account from the start to the finish of this project, the outcome can be viewed as successful, with a functional and no-cost artefact being implemented. The list of Functional Requirements were ultimately, too ambitious to be fully achieved within this time constraint, however, due to 10 of the 16 requirements being achieved, this project can be seen as somewhat accomplished in the artefacts aims and objectives.

Unforeseen circumstances, including a brief hospitalisation, challenged my confidence throughout the project, which led to varying levels of happiness. Towards the end of the project life cycle, the development process had gained a sense of growing assurance, due to ongoing feedback and support received in each Project Meeting.

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Chapter 9

Appendices

Appendix A

Ethics Certificate

Certificate of Ethics Review

Project title: Active Learning Design Tool

Name:	Mark Voss	**User ID**:	UP2024660	**Application date**:	22/11/2023 14:38:26	**ER Number**:	TETHIC-2023-106905

You must download your referral certificate, print a copy and keep it as a record of this review.

The FEC representative(s) for the **School of Computing** is/are **Elisavet Andrikopoulou, Kirsten Smith**

It is your responsibility to follow the University Code of Practice on Ethical Standards and any Department/School or professional guidelines in the conduct of your study including relevant guidelines regarding health and safety of researchers including the following:

- University Policy
- Safety on Geological Fieldwork

It is also your responsibility to follow University guidance on Data Protection Policy:

- General guidance for all data protection issues
- University Data Protection Policy

Which school/department do you belong to?: **School of Computing**

What is your primary role at the University?: **Undergraduate Student**

What is the name of the member of staff who is responsible for supervising your project?: **Dr Rich Boakes**

Will you gather data about people (e.g. socio-economic, clinical, psychological, biological)?: No

Will you gather data from people about some artefact or research question (e.g. opinions, feedback)?: Yes

Confirm whether and explain how you will use participant information sheets and apply informed consent.: I will supply each interviewee with the participation infoirmation sheet, which will outline that the interview will be recorded, for my data collection, and it'll just be opinions and feedback.

Confirm whether and explain how you will maintain participant anonymity and confidentiality of data collected: Anonyminity is not needed, as it is opinions that will be only relayed to me, generalised, and not shared with anyone else.

Will the study involve National Health Service patients or staff?: No

Do human participants/subjects take part in studies without their knowledge/consent at the time, or will deception of any sort be involved? (e.g. covert observation of people, especially if in a non-public place): No

Will you collect or analyse personally identifiable information about anyone or monitor their communications or on-line activities without their explicit consent?: No

Does the study involve participants who are unable to give informed consent or are in a dependent position (e.g. children, people with learning disabilities, unconscious patients, Portsmouth University students)?: No

Are drugs, placebos or other substances (e.g. food substances, vitamins) to be administered to the study participants?: No

Will blood or tissue samples be obtained from participants?: No

Is pain or more than mild discomfort likely to result from the study?: No

Could the study induce psychological stress or anxiety in participants or third parties?: No

Will the study involve prolonged or repetitive testing?: No

Will financial inducements (other than reasonable expenses and compensation for time) be offered to participants?: No

Are there risks of significant damage to physical and/or ecological environmental features?: No

Are there risks of significant damage to features of historical or cultural heritage (e.g. impacts of study techniques, taking of samples)?: No

Does the project involve animals in any way?: No

Could the research outputs potentially be harmful to third parties?: No

Could your research/artefact be adapted and be misused?: No

Will your project or project deliverables be relevant to defence, the military, police or other security organisations

Appendix B

Project Initiation Document

B.1 Basic Details

Student Name:	Mark Leslie Voss
Draft Project:	Active-Learning Design Tool
Course/Year:	BSc Computer Science 2023-2024
Project Supervisor:	Dr. Rich Boakes
Client Organisation:	University of Portsmouth
Client Contact:	Dr. Rich Boakes

B.2 Degree Suitability

The deliverable of this project will be a Web application, which will be used by lecturers. This web application will entail the use of data storage and management, which will help plan modules better. My experience with Web programming stems from my second year of university module, with the same name. The skills I have gained and knowledge learned, through the creation and development of my coursework will greatly benefit my understanding of this project.

In order to successfully complete this deliverable, I will be applying the knowledge gained throughout my university education, especially relying on my understanding of creating a project and multiple deliverables directly stemming from my Software Engineering Theory and Practice module, which taught me these skills.

B.3 The Project Environment and Problem to be solved

When designing a module lecturers must choose the skills and knowledge that must be conveyed to students as well as designing precisely how they will be learned. The University favours Active Learning over more traditional didactic lectures, and through the enABLe process the usefulness of the module storyboard has become apparent, as it forms a single and succinct point of contact where staff can plan what will be done when, by

whom, and why.

Creating a storyboard is a complex process and managing all the thoughts, the information, the possibilities, the resources (etc!) is challenging. A tool is needed that can support lecturers as they create the un-structured braindump of ideas; apply structure to those ideas, construct the storyboard, and publish a version of it to a particular cohort. Currently modules and their resources are inconsistent and difficult to find when going through all the content available, whether it is on moodle, or other websites. Modules that are planned and communicated differently, contribute to a confusing 'maze' of resources. A standardised way of building and sharing module plans using a common storyboard system would help alleviate this issue.

This tool will create a homogeneous structure for each module coordinator and lecturer to use when designing and sharing their modules.

B.4   Project Aim and Objectives

Aim: A web based tool for module coordinators and lecturers to use, which will help plan, create and design their modules.

Objectives:

- Understand what happens when a module is designed (and what problems MCs have to overcome).

- Identify what information will need to be stored by the system in order to plan, design and publish module storyboards.

- Identify suitable hosting and data storage services.

- Build & evaluate MVP (including Usability reviews with MCs).

B.5   The Project Constraints

A constraint will be the time available to complete the deliverables, making sure both the project and report are completed to a sufficient standard. With the constant support of my supervisor, this constraint should be suitable enough to overcome. This will be done through thorough planning of the project, using self created deadlines and by having constant communication with my supervisor.

Another constraint will be the availability of lecturers when conducting my interviews. Due to the nature of this project, I'm relying heavily on the information and feedback from my interviewees, so that I can take on board any criticisms, or feedback of my prototypes.

B.6   Facilities and Resources

The main deliverable will be a web application, which will be created using visual studio code, and the Node.JS framework. These are both free, and are easily accessible, having them on both of my devices that I will be using. I have a domain name purchased that will be able to host the artefact in its completed state, so that anyone can view it at any time, relying only on the Name.Com domain servers to be functional and running. This is so that if anyone, myself included, or my supervisor wants to view the project at any given time, I won't have to set it up manually on one of my local devices, such as my laptop or PC.

For my research, I expect to use books in the University Library, and research journals that will be found through Google Scholar & EBSCO Discovery.

If these listed resources come into difficulties and constraints arise, I will inform my supervisor and schedule meetings to mitigate these circumstances to the best of my ability.

B.7   Log Of Risks

Table B.1: Log Of Risks

№	Description	Likelihood	Impact	Mitigation/Avoidance
1	Computer failure and Laptop Failure	Extremely Low	Cause delays to the project timeline and data loss	Loan a device from the University loaning scheme, and use the computers in the library. Work will be backed up onto a shared drive between my at home devices, and university devices.
2	Loss of Data	Medium	Missing files, missing updated work, causes delays in having to restart certain documents.	Constant back ups to both separate hard drives, GITHUB, and google drive.
3	Illness	Medium	Deadlines not being reached, Meetings not being attended.	Constant communication with Dr Rich, informing him of any illness, and to take steps from there.

№	Description	Likelihood	Impact	Mitigation/Avoidance
4	Unfinished Artefact	Medium	As most of the project will rely on testing, measuring and comparing this artefact, any delay will cause a major delay in completing other parts of the project.	Each development cycle will have a Minimum Viable Product (MVP), which will in-turn give me set deadlines to start, work on and hopefully finish each MVP. This will compartmentalise each area, so that I don't spend too much time on the unimportant ends of my prototype, and focus on building the necessary products.
5	Low Participation in interviews	Medium	This would not allow me to collect enough data about the needs of the module coordinators and lecturers, meaning features might not be present	Arrange meetings with staff as soon as feasible and possible. This will ensure I have enough responses before proceeding with the design of the artefact.

B.8 Project Deliverables

Throughout the project development cycle the MVP will change, focusing on one specific area. Through the creation and developments of these MVPs a fully functional web application prototype will be implemented.

A github repository will be created storing all of the code and documentation of each separate file.

A final report will be produced containing a detailed description of the project, entailing research process, technologies used, implementation of the artefact and a retrospective and evaluation of the entire project development cycle.

B.9 Project Approach

Throughout the project timeline, I will be adhering to the Scrum agile development cycle, which will involve in creating and developing each new specific feature within a two week timeframe. This will ensure that what's important and urgent will be worked on instantly, and have enough time given to it, to create a suitable solution to each problem.

I will be using a Github repository to store my code, which will allow me to have a secure virtual backup of my project, and version history, which will show the entire process of

each separate stage of development.

Through the use of Google Scholar, I will be researching data management techniques, module planning, and resource management frameworks. I will also be conducting interviews, with both my client, and other members of the Portsmouth University School of Computing staff.

B.10   Project Tasks and Timescales
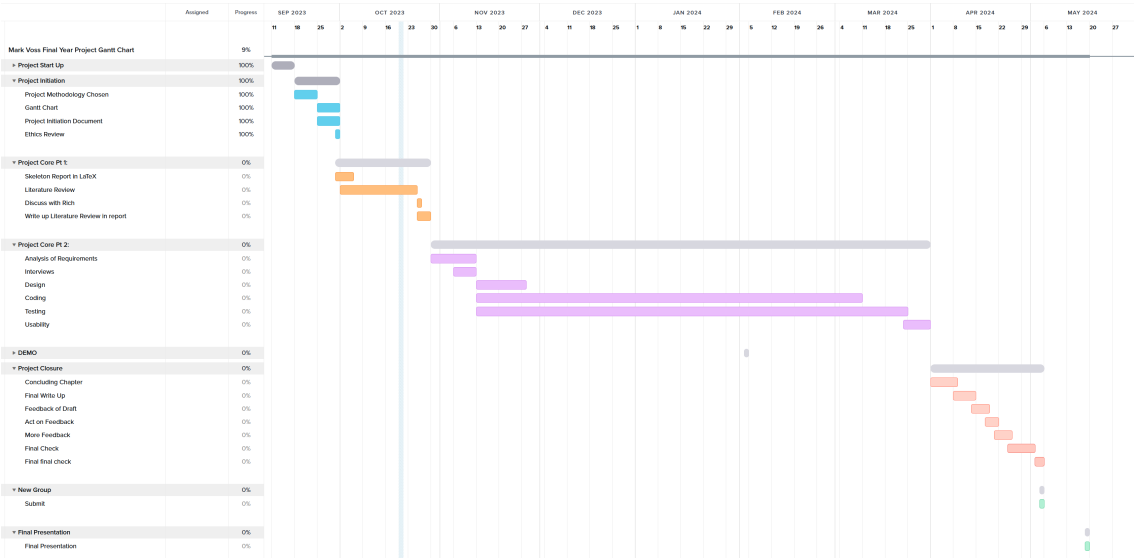
UP2024660's Gantt Chart at the start of the year

B.11   Supervisor Meetings

A meeting will be scheduled every Wednesday at 2:30 with my supervisor, Dr Rich Boakes, which will entail all changes made weekly to my project, with discussions surrounding - any decisions made, and the chance to receive feedback regarding revisions needed. These weekly meetings will ensure that project scope evolution is within manageable bounds and that each feature reaches an agreeable standard, before proceeding with a separate feature.

By scheduling weekly meetings, this will be useful in creating weekly progress reports, keeping records and identifying issues within each increment.

These meetings will be face to face, permitting availability of my supervisor and any extenuating circumstances. If these meetings cannot be orchestrated to be in person, these will be scheduled onto Google Meet. Any annual leave scheduled will be properly communicated, and actions will be taken to minimise these delays. If my supervisor has to, at any time, go on a leave of absence, I will communicate with the module coordinator and ask another staff member to take on the previous supervisor's duties.

B.12 Legal, Ethical, Professional,Social Issues

I am not collecting any personal data when taking out my surveys and interviews, however I will be storing module related information and data on the artefact. This will be in accordance with the Data Protection Act.

The data collected will stay within the artefact, and won't be collected or repurposed for any other purposes excluding the artefact.

Throughout the development of my project, I will maintain a professional standard, conducting myself in a professional manner, while conducting interviews in a professional environment.

B.13 Gantt Chart
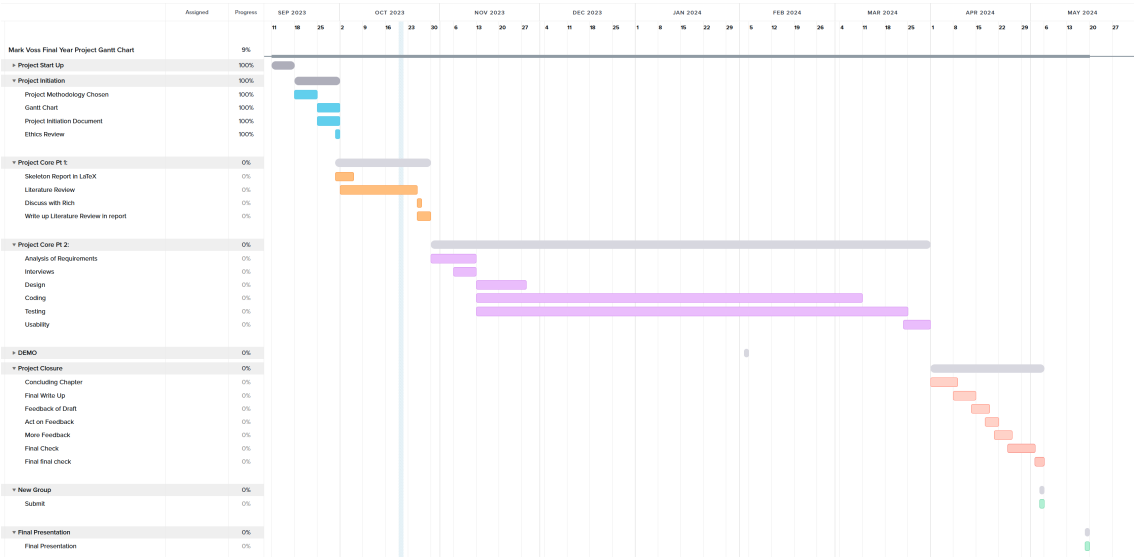
UP2024660's Gantt Chart at the start of the year

Appendix C

Search Methodology

Table C.1: Search terms used and the corresponding resulting number of articles using EBSCO Host and EBSCO Discovery.

Searches made	Results
Learning Design	5,593,861
"Learning Design"	57,245
"Learning Design" AND Technology	29,296
("Learning Design" AND Technology)	37,935
("Learning Design" AND "Technology" AND "Higher Education")	30,373
("Learning Design Technology")	266
("Learning Design Technology" AND 2019-2023)	154
("Learning Design Technology" AND 2019-2023 AND Full Text online Only AND Peer Review Journal Articles ONLY)	115
("Learning Design Technology" AND "Blended Learning" AND 2019-2023 AND Full Text online Only AND Peer Review Journal Articles ONLY)	11
("Learning Design Technology" NOT "Analytics" AND 2019-2023 AND Full Text online Only AND Peer Review Journal Articles ONLY)	66[1]

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[1]Upon Further inspection, the search result that led to 66 results, only resulted in 37 non duplicate search results.

Appendix D

Project Meetings

Project Name - UNDECIDED

Project Meeting 1

27/09/23
14:30 to 15:00
BK 1.13

Prerequisites:
- N/A first meeting

Items to Discuss:

1. **How in depth does this PID have to be?**
   Some past example projects either list a lot of risks , while others list 1/2/3 , which all seem very few considering how lengthy this project lasts for.

2. **LaTeX**
   Is it wise to do my PID in LaTeX as well as my actual report?

3. **How in depth does each section of the PID have to be?**
   For me to achieve the best grades for my write up, would it be wise to write a lot of information regarding each section in my PID, or should I leave it as concise as possible?

Any other items / Actions before next meeting:

1. **Set Clear Target for PID draft**
   When would the wisest time be to hand in a revision of my PID?

2. **Would it be wise to look at some literature in the meantime?**
   See above.

3. **The deadline for the PID is the 20th /10 , is it wise to use this long creasing out the wrinkles?**
   See above

Project Name - UNDECIDED

Project Meeting 2

29/09/23
10:30 to 11:00
BK 1.13

Prerequisites:

- Complete PID
- Listen to Feedback

Items to Discuss:

4. **How do I save this Gantt chart?**
   It's corrupting every time I do it on my home PC

5. **LaTeX**
   Any good tutorials I can use?

6. **When should I have completed my ethics review?**
   i don't have a working title yet, so can't really submit

7. Check my PID?

Any other items / Actions before next meeting:

4. **Anything necessary for the next meeting on Wednesday?**

5. **Anything I can do to really get a good grade?**

Project Name - Active-Learning Design Tool

Project Meeting 3

04/10/23
14:30 to 15:00
BK 1.13

Prerequisites:

- Start Reading
- Fill in Ethics Review
- Gantt chart Completion

Items to Discuss:

8. **PID Completed - Please check over**
9. **Look over the Gantt chart, is this too specific?**

10. **What would be a good next step?**

Any other items / Actions before next meeting:
1. Start interviews
   5 or so

   1.) Taiwo - used enable
   2.) Ioannis
   3.) Val
   4.) Penny lives with Ronel
   5.) Haythem - DB stuff
   6.) Thanos
   7.) David Williams
   8.) Xia
   9.) Sohail
   10.) Dalin
11.

12. **Read**

Soc.port.ac.uk/staff

Nadim - discussion

2.) latex play now

3.) Nadim will have great discussions about module designing
4.) Amanda too

Talk to them, get a feel for questions about their module design / redesign process , what software could support.

Start conversation before next Wednesday

Be open to change / discovery

This will discover the problem that I'm trying to solve

5.) Formulate questions talk to rich via discord record this for project management

Project Name - Active-Learning Design Tool

Project Meeting 4

11/10/23
14:30 to 15:00
BK 1.13

Prerequisites:
- Conversate with Amanda / Nad
- Fill in Ethics Review
- Correct mistakes on PID

Items to Discuss:
1. PID edited - Please check *

2. Nad hasn't got back to me yet, have emailed again, but I will be off campus until Monday now

3. List of Lecturers who have been ENABLED
   Alaa Mohasseb, Farzad Arabikhan, Janka Chlebikova, Taiwo Adedeji, Soraya Harding, Bruce Valler, Julian Murphy, Shelley Usher, David Williams, Gail Ollis

4. What problems do YOU have? - This way i can add to what amanda said, and start formulating Interview questions

5. Have we received feedback on Ethics Review yet?

6. What would be a good next step?

7. What are the problems when designing and creating modules? I've never done this, so don't know how to proceed with answering the question on the PID.

Any other items / Actions before next meeting:
- Literally just bumped into Nadim - planning on having a meeting next thursday - 19th
- Submit ER
- Submit PID
- Formulate Qs

Interview With Dr Rich Boakes

Interview with Dr Rich Boakes
15/10/23
09:00 to 10:00
BK 1.13

Good Morning Rich,

I hope you are well

What is a Learning Designer?

It's not what he thought it was

Thought it was going to be following a process - learn to do it

Learned all techniques, it's really about None of that, understanding what the aim and destination is, and facilitating other lecturers to get there

It's a influencing role , good deal with psychology involved

Lecturers who've been ENABLED have been somewhat resistant to agree

Begin by establishing a common ground, almost a therapeutic session

Establish norms, common stuff, and trust that rich is a lecturer first and not a bureaucrat

Discussions about why active learning is better, give examples of what they already do , shows where they use active learning.

This leads to an agreement in how good they're active learning is, and can position them to influence them into "what is the ideal module " why don't you do that?

Wouldn't know how to get there, let's storyboard through the facilitation meeting often not 1-1

World best when rich , MCs and Lecturers for that module

They give ideas, and build from there.

So learning to be a designer is all about…. Consulting

It's about being honest and authentic

Help lecturers who do a good job, make a better job

Challenge lecturers who do bare minimum teaching , convince them to bare minimum but better.

Sometimes it's harder , some lecturers half do the storyboard,

What does lecture ⅓ mean? Go show on Moodle.

I don't have time to link it , they can look themselves

Time wasting, don't have time for that etc

Not all lecturers are as focused on great experiences for the student , so we have to cope with those.

That's what a LD is, but fundamentally it's about a "breath of fresh air, rather than stifling handcuffs" - said Dr Ali.

Help communicate their enthusiasm for their subject in new ways.

How would you best describe your role as a Learning Designer?

What currently is your biggest obstacle when trying to help lecturers get enABLed?

2 for 1 go me

What is the main obstacle?

It's not the bit in the room, the facilitation

It is what they do next.

Templates have evolved since 18 months ago

People who have been enabled 8 months ago, have used V1. Horizontal Google doc,

Template V2 is evolved due to problems, Google sheets , and vertical

Didn't want to convert to V2 template, due to liking the old template.

Lecturers get set in the ways, give them a new way, and then they get set in those ways as well.

Big problem is getting lecturers to create a common stable, similar across all modules .

Another part to this is we do our session, we leave them and then they go do some storyboarding, and then they go do something else, come back to the storyboard and the ADMIN of doing LD is you do a session, minimum 4 weeks later, review of what they've done , etc ,

Reality is they haven't had time to do things, keep pushing and pushing , sometimes review sessions should be done soon, but ended up in October.

Issue with that, one lecture resigned module, one did in excel, and one did it "strangely" , not having easy overview ability.

Mechanism to flag , or ask questions would make Rich's life easier "would be nice to have an easier way to manage" , we have a bunch of Google forms, that lead to a spreadsheet, to a dashboard which higher ups see.

Would be better to see a live system , showing the nuances.

When planning an enable session, what is your main focus?

Design needs analysis, before an ENABLE 30 minute DNA meeting, ask a bunch of questions about what they think they need , so we can tailor it to them.

If they don't know how to do it , they ask other Learning designers.

When it was designed it was a 2 day process -> 1 day process -> half day and now it's about 2 hours.

Document before hand to facilitate help and do DNA.

A therapy session is the DNA session , not often done beforehand, but very helpful to have done beforehand.

Go look at the module code on Moodle, and see how they're being delivered , Moodle doesn't make everything the same, each module is different.

See how readable and understandable it is, if you have a pre recorded video, you can see how engaging / dull the lecturer is .

Really understand the circumstances , get feedback on the lecturer and character view them.

Some lecturers are not liking how cookie cutter some of the other approaches are , and feel as if they hate it.

Rich converses with the lecturer to try and get them on side , talk off topic, on topic, talk about what they want to push. Back on.

Prep is good because of friends and not enemies.

How do you manage the differences between each LD? cookie cutter approach and your approach?

You don't. Manage the differences , everyone has their own experiences. Might be because the lecturer was in a bad mood, not likely, but possible .

You can't manage them, you have to cope, turn up on the day and see what happens.

How do you keep lecturers on track , when converting to this new learning style?

You don't, you don't like manage them, and it's a problem

Remind them about the meeting, sometimes some lecturers "forget" because everyone is busy, 'i'll ask about that, and never get around to it"

About 1/10 don't engage them not Rich's problem, so much other things, 1 person not engaging is not the end of the world

Enable needs to encourage people through the gravitational field, not push the lecturer who wants to throw his toys out the pram.

This lecturer is the outlier whose course is decrepit and old and shows.

How do you convince lecturers that this is a positive way forward, when it's currently unproven within the context of the University of Portsmouth?

Convince them by showing plenty of evidence that when active learning is used, students remember more, which helps with module feedback results.

Designed by professors of learning design , and we are here to help them do it,

There are references for it, but nobody has ever asked for it.

We have anecdotes , two years in CCC a non enabled web , 20 people in drop in

Last year with storyboard and clear what to do , well over 100 people in the drop in sessions, because it was clear up front, and seeing the drop in sessions as not optional and more "oh I can ask questions"

Students coming earlier and earlier , filling up earlier and earlier.

How do you check whether enabled has worked in the review session?

Look at the storyboard , read it though, what language , "by the end of the week you WILL" good active verbs , appropriate for the level they're teaching, short sentences with links in pre and post for each different session , have they linked it into the learning outcomes.

Have they shown how each lecture links to assessments , all fairly self-evident.

Have to look at. Storyboard that students will actively learn self or scaffolding, and come into the quality time with the lecture so they have useful time , so to check the knowledge.

If this is happening every week, then the lecturer has got it, otherwise it's obvious.

Inspire them into knowing what they're dream format is, highlight that their dream IS active learning.

All magically happens if they've mentally dreamt it.

Project Name - Active-Learning Design Tool

Project Meeting 5

18/10/23
14:30 to 15:00
BK 1.13

Prerequisites:
- Submit Ethics Review ☑
- Submit PID☑
- Interview Rich - As a MC☑
- Formulate Questions for Alaa Mohasseb, Farzad Arabikhan, Janka Chlebikova, Taiwo Adedeji, Soraya Harding, Bruce Valler, Julian Murphy, Shelley Usher, David Williams, Gail Ollis

Items to Discuss:
1. I need help formulating questions. I will wait until after Nad's interview, but where do I start?

2. **Formatted PID into LaTeX ☑**

3. Is there anything you think I should improve upon from our interview, when interviewing Nad?

4. Can I borrow a Final year first class project? Is that allowed?

5. Can we use a slack channel? Or Notion? Something where I can collaboratively show you what needs to be done, e.g. , 20 Minute challenges.

6. **I need a reality check. I need to go about things very differently, evidently, I want to the do the best possible FYP , and , so in turn, can we come up with a set of steps so that it is manageable and doable, to the best of my ability, (and better)**

Any other items / Actions before next meeting:
- Nadim Meeting 2pm - Thursday
- Formulate Qs
- When will the next meeting be?
- D3 - force graph (e.g.).

Interview With Nadim Bakhshov

Interview with Nadim Bakhshov
19/10/23
13:45 to 14:15
BK 1.05

Good Afternoon Nad,

I hope you are well

What is a Learning Designer?

A very good question.

His view is , I used to build degrees at college , with uni of Sussex , Surrey and portsmouth

Stuck by simple concepts, one of which is how you design, what's the relationship between one piece of module and the next

Always think of it as dependency relationship, bit abstract idea , why are you teaching this, is it dependant on before, is it thought through

Where can you test this?

LD is really understanding about what a course is , and what learning is

4 elements for him, the simple elements to help

Do you know the context, how much is your material , used etc ,

Lambda 8s knowledge is a social practice to do with speaking, how to speak, how to talk when learning.

a is what you're able to do , parking programming , most people think it's one thing , bring C and lambda in , justify it , situationally what a good response is to each context.

U Is look at the world through the lens of your knowledge

Looking through his knowledge , he can see python code as code and not jumbled. The best example is a doctor who can see a X-ray and see a broken rib.

Build dependency relationships through each [] -> []

How you develop your material ,

start base position , ability to code

Ability to see others code , applying it to different situation,

Apply new concepts and new words , languages new situation and new behaviours ,

20 years spent seeing, brings it into play when LD-ing.

Tell me how various concepts are linked , is there a relationship , or can I study this without needing

Sees it as a dependency and not a linear thing.

Some lecturers have no connection before , no obvious connection until a long long later.

Test whether you really have learned it , and know it's

He can see you can't teach real world stuff, but can simulate as best I can

Looks for how a lecturer is assessing, because we know how the real world works ,

LD has two things , so many different ways you can model a curriculum , spiral ones , more sophisticated structure, all stem structures.

All about graph theory, and graphs , nodes say that's a topic and how it branches , and links to others ,

.
Take the graph concept, each node is a topic , concept

Whether it's directly assessed there or then is another issue.

Makes you spot dependencies and the module style very easily.

Mind mapping might show other services.

But this might show direction in the relation and dependencies , arrow linking concepts

Every topic, should have the question with how to assess it

Not every concept might have an assessment , but ¾ etc, dotted lines to assess a , assess the clusters of the information.

Lecturer to see when they want to give the piece the assessment ,

With the dependencies , it shows the assessment is the hierarchical things and show which is linking , to this

We get useless lecturers , who throw stuff at the wall and learn everything , and it isn't great.

Regular sessions with Nadim, really like to see it succeed.

Interview With Dr Rich Boakes

Interview with Dr Rich Boakes
14/10/23
11:30 to 12:45
BK 1.13

Requirements he personally needs

I want to be able to

I want to work with this multiple ways

Create a text file , a plaintext file of essentially one row per concept , upload that through the magical drag and drop, and have all of those concepts appear randomly spaced out on the screen, not related to each other.

Would like to be able to create a relationship between those randomly spaced items , by if I'm on a mouse and click and drag across , or on touch screen and dragging across, and then somehow making an association. These associations you'll be able to define what is the meaning of this.

Add new words directly to any place on the screen

Make associations between those words, exactly the same way as the ones from the text file

I would like to be add more text files, and merge more text files, maybe he has a meeting, and new words and concepts are created , show if he has duplicates , or assume they're the same ,

Create new words and association's with those old words

Text files to be able to have indents , so if he has in column 1 , fruit , and in the next row , of a tab or 2 spaces bananas,

Would then like both fruit and bananas to be added to the page , with an association already made between fruit and bananas.

Can't say what kind of association that'd be , in brackets maybe? Fruit (is a) banana ,

Gotta be separate syntax for doing so

Technically oriented , I would like this to work on a desktop with a mouse , likely to be quite complicated , to be able to have the space to move things around and think, would be useful.

Would like this to work on 80 inch touch screen devices ,

Also be useful to have multiple collaborating users as well ,

Perhaps not In the same interface , but if a couple keyboards and laptop that would be able to create the words , and then the words magically appear on screen.

Laptops would have a text based interface , these would then appear in a stack of words that aren't sorted yet.

Associations need to be defined somehow , same way banana is a fruit , we might have concepts called "lecture" and "workshop" and workshop might have a couple of things associated with it , worksheets , durations , hardware requirements

Not necessary to define all these upfront , but it is necessary for a requirement to define them in the future

Also set formats that there is a structure that would need to be easily added to each of these things. For example , weeks
Week 1 - 12 , week 13-24

Let's say a Teaching Block is 12 weeks, we could very quickly add in 12 nodes , then associate another node with that week somehow

Say we have a node of type topic , node will have a name of "how the web works" , thinking of RDF

Non functional requirement will be a tool that will help organise and view parts of a soup of data , with multiple different views of the date, some graph based , some table based , some fed into AI spewed out text.

I want the tool to be able to create data and association's between data , visualising these , and be extensible for new ways of creating, visualising and manipulating data.

I would like that to work for multiple people simultaneously, somebody using laptops , and the big screen.

Would like to save the big screen as a view of the data , create a view that is a table, a view that is a graph, edit , possibly edit the data using all different kinds of views.

Maybe read only views?

Look through the data as a graph that filters out most things but only a student would find interesting.

Given a current date, what's the next worksheet, prep I need to do.

Then would need to associate a start date with a cohort, infinite potential,

The thing that potentially makes it so flexible is the graph based model,

Big ugly database -> expect it to become unmanageable.

However database have schemas , and so do RDF, and RDF schemas might be interesting

Show me all lectures that I haven't put slides for , haven't created worksheets etc

Helps a lecturer understand what they need to do to deliver the next lecture.

Exist as a standalone and as a service. Anybody could come along and git clone it, npm install, npm start.

Get a data store working -> table it -> graph it , and that's the barebones.

What would be a suitable data store for a project where the underlying data structure is a graph.

Lit review starts now and ends on the 17th May.

Lit review as a verb,
Lit review as a noun hand in on 17th.

Project Name - Active-Learning Design Tool

Project Meeting 6

1/11/23
15:00 to 15:30
BK 1.13

Prerequisites:
- Finish Ethics Review templates - Send to Rich
- Update Gantt chart to reflect the month of October
- Close some issues with GitHub, extend information on those issues.
- Start Literature Review

Items to Discuss:
1. Feedback on Ethics Review templates - can we officially submit now?

2. Feedback on Github issues

3. Look into Data Stores

4. Create Milestones that accurately reflect each MVP

Any other items / Actions before next meeting:
-
-
-
-

Project Name - Active-Learning Design Tool

Project Meeting 7

15/11/23
15:00 to 15:30
BK 1.13

Prerequisites:
- Look into D3.JS

Items to Discuss:
1. Is there any official terms other than "Learning Designer" - for lit review ("why designing curriculum is beneficial etc etc) - Learning Designer

2. D3.JS - interesting

3. Look into Data Stores - Just start

4. Create Milestones that accurately reflect each MVP

5. Consent Form, Topic Guide, Participation Information sheet, need to make sure these are 100% before submitting to Kirsten - Done

Any other items / Actions before next meeting:
-
-
-
-

Project Name - Active-Learning Design Tool

Project Meeting 8

22/11/23
15:00 to 15:30
BK 1.13

Prerequisites:
- Look into D3.JS
- Create Milestones
- Start gathering Literature

Items to Discuss:
1. How often should I update GANTT, permitting the fact i was ill - Weekly
2. Another Interview with Nad is planned - tomorrow 2pm
3. While waiting for ethics to be confirmed, can i interview *anyone*?
4. I've finally started literature review woo!! -Sidenote about this,

Any other items / Actions before next meeting:
- Nad Interview 23/11
-
- LD has come about since 2003 (20 years) , technology has improved with it, so what technologies have been proposed/developed that support the process of LD?
- about to help Learning design improve and be used.
- Watch lit review video: https://youtu.be/dafSOc_5a7k

Normal DB or a triple Store database - blogs / webthings, read into etc

Look into Firebase as a poor person's simple lookup data store.

Database might be the way to enable users to collaborate live. - if we pulled locally, only one person would be able to edit, unless a server pulled it.

Project Name - Active-Learning Design Tool

Requirements Interview - Nadim

24/11/23
12:30 to 13:00
BK 1.05

Requirement Design and Requirements with Nadim

Requirements

Collaborative

Opportunity of a tool that will facilitate the dependency between courses and assessments ,

Visualise this easily , then can use the skeleton to build the courses.

Nad's using ChatGPT

This tool.with AI could speed up lecturing and course leaders making it.

Flaw in the first programming in year 1 , 1-4 is basic, week 5 is functions , and that changes everything.

Dependence relationship is all wrong , and

Tool like this will help show the branches ,

Example

Go back through TB1 , go through on pen and paper ,

Tools like mine would show dependencies and change teaching styles.

Pick apart teaching, drop them in as nodes , connect them to assessments colour code them, and see if it's right , if it misses anything ,

Let's you move around the nodes and see what's better , what's worse , see the patterns ,

When you teach well, you create a narrative of concepts , you can't construct proper narratives without these views.

All they have is sticky notes and whiteboards , not fluid and not effective.

Basic node has potentially 5 models , concept , language , (problem to be analysed) , activity , and perception of what you see and how you've learned , these band together through the context and concepts ,

~ — negation, rebuild and rework and learn through things.

Can you demonstrate you can do this , etc ,

Org-roam

Firebase

Github related Version control -
Org-ui

Roam Research
Emacs

Project Name - Active-Learning Design Tool

Project Meeting 9

29/11/23
15:30 to 16:00
BK 1.13

Prerequisites:
- Look into D3.JS ✅
- Create Milestones ✅
- Start gathering Literature ✅
- Watch Literature Review video ✅
- Look into Firebase ✅
- Update GANTT Chart to reflect the last week

Items to Discuss:
5. Is there any way I could get my Literature Review marked according to the scheme when completed? —-NO
6. Did you look into org-ui and roam research that i was told about last week? - NO
7. Will re-interview Nadim
8. Any update on Ethic Review? *Check with Kirsten* —- *OK*
9. When is a good deadline for the Literature Review? - 31st December ?- (set by myself) -8th/12
10.

Any other items / Actions before next meeting:
- Start Writing Literature Review
- Compile sources according to the documentation as seen in the video

Project Name - Active-Learning Design Tool

Project Meeting 10

05/12/23
10:30 to 12:00
BK 1.13

Prerequisites:
Start Literature Review
Submitted Ethics Review
Start Writing literature review in LaTeX
Update GANTT
Submit Moderator Form - 1.) and 2.) Matt 3.) Ronel

Items to Discuss:

11. Any tips on how to just break writer's block?

12. You said that someone should carry on with LR throughout , is it okay , if I haven't written the full 3000-4000 by Friday? And just tinker away? —- 3 pages roughly ,

13. Need to re-interview Nad - will email during this session to make sure I've done it

14. How do I document my designing / coding / everything process ? - as in , take regular screenshots of what I'm doing, showing my codes and designs etc etc?

    - so talk about what I've used , when, why , etc, challenges , nobody especially rich wants to see screenshots about function x , instead create it as a mathematical formula.
    Screenshots of this , this , this is a red / beige flag

15. Would it be wise to include the 2003 IMS Learning Design Specification in the lit review - as an introduction / definition to the topic of LD , before I go into the tools?

    There has been research in this, but this has halted and been rendered obsolete. Talk about how these specifications have been abandoned , and why its a pain in the arse

    Wikipedia is supposed to be a literature review , but no cite , find these projects , look at the cites and actually review it myself and show how these projects have done nothing.

Any other items / Actions before next meeting:
Start Writing Literature Review
Compile sources according to the documentation as seen in the video

Uni Https://www.tandfonline.com/doi/full/10.1080/10494820.2014.994220

Project Name - Active-Learning Design Tool

Project Meeting 11

12/12/23
13:00 to 14:00
BK 1.13

Prerequisites:
Update GANTT
Start Literature Review
Get LR finished to an extent, 3 pages roughly.

Items to Discuss:
1. Should I build up the program from scratch - or carry on with what previously has been done?
   How would I cite that if I do?

2. How do i motivate myself to carry on over XMAS, - this time of year is making me VERY VERY low

3. Need to re-interview Nad - Haven't sorted this out yet. Will sort out accordingly.

4. How do I go about documenting these Project Agendas?

5. I still haven't received my ethics certificate yet. Emailed, no response as of yet.

Any other items / Actions before next meeting:
- Update milestones and stick to them
- Caution against going too much against entering data, without rendering it
- Talk about how Emacs uses d3.js

Project Name - Active-Learning Design Tool

Interview with Mary Watkins

13/12/23

10:30 to 11:00

Online

Learning Design —--

More in Amanda's camp, but has a background in the technology side, i.e. Moodle.

The Learning Design version of my project is more storyboard.

Her storyboard is specifically linked to Learning Outcomes,

Technology Storyboards are extremely stripped back.

She wants more towards the Student view, how can a student use this.

Richard Crabtree - Learning Outcomes - Background with Further Education

Ali - dean of technology.

Project Name - Active-Learning Design Tool

Project Meeting 12

20/12/23
15:00 to 16:00
BK 1.13

Prerequisites:
Update GANTT
Start Coding - Have a basic website with the D3.js visual showing.

Items to Discuss:
1. Have Received Ethics Certificate!

2. Mary was very insightful, but more a student oriented view. Future perhaps.

3. Nad interview will take place in January

4. Viable goal for next meeting?

Any other items / Actions before next meeting:
- ☐ Click on backdrop, create a new rectangle in space with carat inside so you can type.
- ☐ Little indication on top right corner of node so you can drag and connect to others.
- ☐ Always start with a Node , maybe drag from it , and create it in the space you've used.
- ☐ If brave click on node should select a node, shift click multiple nodes , delete , would delete all of them
- ☐ Add export, drag / drop import
- ☐ Could have a URL for a thing, cookie monster , colour blue , name cookie monster , favourite thing , cookies.

- ☑ ~~DragACat github~~
- ☑ ~~Timeline - add takes , keys etc etc~~
- ☑ ~~Portsoc/timeline~~
- ☑ ~~Get into V7, then be happy it's done with the latest stuff.~~

Project Name - Active-Learning Design Tool

Project Meeting 13 (LUCKY NUMBER 13)

8/01/24
14:30 to 16:00
BK 1.13

Prerequisites:
- Update GANTT ✅
- Update it to V7 ✅
- Split it between HTML, CSS, JS ✅
- Check out Drag a Cat / Timeline ✅
- Add export / Import / Drag / Drop ❌

Items to Discuss:
5. The checklist didn't go very well. I tried to go through it constantly, but , I just, I don't know. I don't feel like I'm capable anymore.

6. However, I've gone through the Project, and using past project examples as guides, formed a table of contents that should set the target for each chapter.
   a. - Is this a good structure? I looked at the 3 projects you gave me, and multiple ones listed in the drive.

7. Coincidentally, I have written:
   a. Chapter 1 - Introduction
   b. ~~Chapter 2 - Literature Review~~
   c. Chapter 3 - Methodologies
   d. And have started writing - Chapter 4 - Requirements.

8. As you can see , through the checklist on the previous page, and outlined by 1Things didn't go well, nor as planned, and I'm hitting brick wall after brick wall. I just, eurgh. Impostor Syndrome, Much?

Any other items / Actions before next meeting:
- Put table into landscape page on overleaf
- Write for sun newspaper readers
- Once you can download SVG / JSON, upload JSON , you can then test it and save stuff, restart it and drag back in , try adding to it, otherwise clicking everything

Project Name - Active-Learning Design Tool
Project Meeting 14

17/01/24
16:00 to 16:30
BK 1.13

Prerequisites:
- Update GANTT✅
- Add Export SVG ✅
- Add Export JSON ✅
- Add Drag ✅
- Add Drop ✅
- Add Import ❌
- Made the table landscape in the overleaf project

Items to Discuss:
9. Rewrote the Project to be easy to read, and for sun readers

10. Drag and Drop works, as in i can drag it and drop it , the SVG updates, but i can't get it fully working just yet, they stay in the corner,(Obviously Xs and Ys not working properly yet, but i'm tinkering still)

11. I can successfully download my JSON and SVGs, they both work, and it's how i'm testing the drag and drop function

12. However, I realised I don't have an ADD Node function, or Delete Node function. Very important, but i'm going to get this done after the drag and drop (because i'm using a clear function to wipe the svg when dropping, so i;ll just re-incorporate this into it)
    a. I have plans about how to go about these.

Any other items / Actions before next meeting:
- Add Nodes,✅
- Delete Nodes✅
- Drop function fully working!
- Delete circles, put them into middle, like Banjo Banjos✅
- My customers are learning coordinators in a university and my job is to help come up with designs for active teaching and learning , and the output of a well designed / start point for a well designed module for the students is a storyboard for their learning journey, there are no good tools for learning designers, that are useful enough to take their mind thinking and turn it into a storyboard and then publish it for student's use.

Project Name - Active-Learning Design Tool

Project Meeting 15

24/01/24
16:00 to 16:30
BK 1.13

Prerequisites:
- Update GANTT✅
- ADD NODES
- DELETE NODES
- DOWNLOAD JSON
- DOWNLOAD SVG

Items to Discuss:
1. You can Now add/ delete nodes !!! (FINALLY!)

2. Drag and Drop still doesn't work - STAGE 1

3. I can successfully download my JSON and SVGs, they both work, and it's how i'm testing the drag and drop function

4. Double click to add - - simultaneously downloads SVG and NewNode

Any other items / Actions before next meeting:
- Add properties to one of the nodes,
  - Two ways of displaying property, through Arc
    - Cookie Monster
      - Colour "Blue"
      - Configurable
        - Anything that is "Colour"
  - Create both as draggy droopy thing, or colour template
    - We can then have a template and module,
      - Or use show module title , MC, shorthand , templating within SVG
- Hover over Node, Hold Shift,
  - Shows MC - Rich Boakes,
    - Connection between Rich Boakes
    - See drawing

- ANYTHING ELSE, RICH?,

NADIM REQUIREMENTS - MODERATING SESSION

Colours - different colours between each Node (for example Learning Outcome , Modules, courses)

Random Shapes

Clustering of nodes difficult to see and read

DRAG CLUSTER over and have it stay for ease of Supervisor to see 🙂

When adding to nodes or deleting nodes, have a drop down view of them all, and not just randomly enter them in.

VERY HAPPY WITH WHERE IT'S AT, EXCITED TO SEE WHERE IT GOES FROM HERE.

Project Name - Active-Learning Design Tool
Project Meeting 16

31/01/24
16:00 to 16:30
BK 1.13

Prerequisites:
- Update GANTT✅
- ADD NODES
- DELETE NODES
- DOWNLOAD JSON
- DOWNLOAD SVG

Items to Discuss:
5. Have we completed stage 1??

Any other items / Actions before next meeting:
- Finish off stage 1 view - drag drop / editing etc
- Discuss more on friday

Preliminary

Double click back drop to create single node, no connections with a cursor to edit the text / etc etc etc

Within the SVG

Got a foreign object

Which is a div

Get rid of alerts and query boxes

Not part of the language so don't use them

Double click

Ctrl click and drag, to create new connections , doesn't have a type by default

Triple might be type, pull down for type of all the connections (all the types, add new ones)

NEXT THING SHIFT CLICK + DRAG TO CREATE CONNECTION

DOT LIKE BENJYS

PLUS IN THE TOP LEFT CORNER CLICK ON IT CREATES A NEW NODE RECTANGLE
WITH AN EDITABLE TEXT WITH A CIRCLE ON IT

AS CLICK, GIVES KEYBOARD IF NEEDED

CLOSES BACK TO PLUS

EDIT

Populate it with the content on the right ,

Project Name - Active-Learning Design Tool

Project Meeting 16

07/02/24
14:00 to 14:30
BK 1.13

Prerequisites:
- Finish off final steps for Stage 1, dragging dropping ect
-

Items to Discuss:
1. Converting JSON into an RDF triple store, to be able to do stage 0 views

2. How do I go about creating a webpage like Overleaf, it;s extremely advanced web design, but I feel as if with time, we can get it done.

3. Excited to go about this.

Any other items / Actions before next meeting:
- Need help going about the RDF store, which we discussed
- Highlight the drag / drop (plus in the top left corner)
  -
- Update JSON (don't worry about this for now)

Project Name - Active-Learning Design Tool
Project Meeting 17

14/02/24

14:00 to 14:30

BK 1.13

Prerequisites:
- Finish off final steps for Stage 1, dragging dropping ect
-

Items to Discuss:
1. Grey bar on bottom and top for buttons and graph view
2. Make the SVG full screen (or as full as it can be)
3. Take the updateSVGElement code and go line by line to decide, when the user changes on the left, work out which thing it's altered .
4. Make three unrelated triples that put stuff into the page,
   a. Do this where two of the triples are the same
      i. Where the name is the same, change this name
      ii. Change it from an ellipse to a square box
   b.

Any other items / Actions before next meeting:

Project Name - Active-Learning Design Tool

Project Meeting 18

21/02/24

14:00 to 14:30

BK 1.13

Prerequisites:
-
-

Items to Discuss:

- Had a really bad week, need this as a kick up, to get back on track
- Worked a bit on the report instead, wrote quote a lot for the Design chapter, highlighting every iteration i've had so far
- Just recently, things haven't been great mentally!
- I think I know of a way to be able to update the SVG with the info box on the left hand side, but it will still be in the JSON format.
- I'm thinking more and more that this RDF triple store will be the biggest challenge for the project. I really really can't figure out how to go about it, and I feel quite stupid about not knowing how to do it. I'm sorry.
-

Any other items / Actions before next meeting:
- Write up Lit review and Evaluation, get a first draft now
- Delete the introduction , leave out the conclusion
- Move intro to a new document (leave it out)
- Do it before Easter
- Make it so I can do two sprints (one week, one week off)
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