The constraints and affordances of co-creation as a teaching strategy within a Project Based Learning Program

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Declaration

I, Nicole Jeanne Candy (0104348A), declare that this research report, titled The constraints and affordances of co-creation as a teaching strategy within a Project Based Learning Program, is my own work. This research report has not been submitted for a degree at any other university. I have acknowledged all quotations and paraphrased ideas by using the APA referencing, (as described & requested by the University). I am aware that the University of Witwatersrand will take disciplinary action against me if my work suggests that I plagiarised and failed to reference.

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Abstract

Co-creation refers to the meaningful collaboration between teachers and learners. This study investigated co-creation as a teaching strategy, by questioning how co-creation influenced grade 8 and 9 learners' motivation to engage in PBL lessons, and whether sustained engagement was achieved through co-creation. Of interest was whether there were any skill gaps that impact on a learner's ability to successfully engage in co-creation. This qualitative, case study involved a complex research design, divided into three stages. The first stage involved the learners completing a traditional PBL project that was designed by their teachers. The process of co-creation was then implemented as a teaching strategy, and learners collaborated with their teachers to design a PBL project that they would like to undertake. Once the co-creation projects were designed, learners had the opportunity to complete their own project or the project of a peer. After choosing, learners had to complete their projects. Questionnaires were used as a means of gathering data at different stages throughout the research process. The first questionnaire was completed by learners and teachers at the end of the traditional PBL project and another was completed by learners and teachers at the end of the project that had been designed through the co-creation process. The key findings of the study were that the characteristics of traditional PBL that enhance learner motivation are present during projects that have been co-created. Additional characteristics of the co-creation process that improve motivation are the increase in learner choice and autonomy. In terms of learner engagement, co-creation achieved higher levels of sustained engagement and engagement towards the end of the project, than were shown in traditional PBL. However, learner engagement in the middle of a co-creation project was noted to be lower than traditional PBL. Learners' skills that require development in order to complete a co-creation project successfully included: research skills, IT skills, time management and reflection. The main finding of the study was that co-creation should be incorporated into a PBL program, but that this process needed to be scaffolded in order to be implemented successfully. This scaffolding process needed to include additional support provided to learners when researching or implementing the use of technology. It is also recommended that teachers introduce co-creation in sections of a project, before allowing learners to co-create an entire project.

Keywords: Project Based Learning; co-creation; motivation; engagement; learners

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Chapter 1: Introduction and Context to the Research

1.1. Introduction

Creativity, entrepreneurship and innovation are recognised by UNESCO as key enablers for sustainable development. In addition to these characteristics the UNESCO 2030 Agenda (adopted in 2015) identifies the need for individuals to access information and utilise information and communication technologies. Furthermore, there is a need for an inclusive education system that fosters creativity, critical thinking and life-long learning in order to meet the challenges of the changing social-economic climate (UNESCO, 2017). The World Economic Forum reports that the top skills for employers in the future will include critical-thinking, problem solving, self-management and flexibility. Employers are also expected to rapidly digitise the work process, thus requiring employees to be digitally literate (World Economic Forum, 2020). There is a need to teach the essential digital skills so that they are integrated into a learner's skill set, as well as a need to teach creative and critical thinking. However, existing secondary school educational institutions do not always offer an environment where creativity, critical thinking and innovation are fostered. In schools that focus on performance and results, fear of failure limits a learner's willingness to try and be innovative and there is a gap between real world needs and existing curriculums. There is also a need to teach the essential digital skills so that they are integrated into a learner's skill set (Androutsos & Brinia, 2019). In addition to equipping learners to meet the demands of an ever-changing world. Schools need to consider the individual interests and preferences of learners in order to foster motivation and engagement towards the educational activities presented. Learners who are interested in a topic are more likely to engage, process

information and achieve within the learning environment (Harackiewicz & Smith, 2016). Thus, challenge for educational institutions is to meet the interest preferences of their learners and assist them in acquiring the skills and competencies to meet the demands of their environment. Institutions who are able to meet this challenge will better enable their learners to manage personal, social, and occupational challenges in an ever changing, technology-based global structure (Chemi & Krogh, 2017).

Project Based Learning (PBL) is a model that organises learning around projects, and I suggest, is an approach to learning that could enable learners to achieve UNESCO's goals. PBL projects are based on complex challenging questions, that require learners to work independently over extended periods of time. PBL projects inherently require learners to carry out research, problem solve and develop an end- product (Thomas, 2020). PBL provides learners with an opportunity to engage in learning scenarios that provide meaningful context to content and allows learners to develop their knowledge and skills within a social context. (Ranjana Tiwari, December, 2017).

1.2. Background and Context of Research Project

The research was conducted at a co-educational private high school in Johannesburg. PBL was introduced at the FET school in 2019, in order to address the need for critical thinking, and IT skills development amongst the learners. In preparation for the implementation of the PBL Program the teachers at the FET school were asked to each design a project that could be used during the PBL Program, these projects were then moderated, by the teachers responsible for implementing the program, and a 'Project Bank' was created. Each term approximately ten

projects were selected from the Project Bank and made available to learners. The projects selected vary depending on the areas of expertise of the teachers that are teaching PBL that term. The FET school changes their timetable and teacher allocation termly, thus project availability varies between terms. Teachers are assigned to facilitate specific projects based on their own areas of expertise; however, they are not always assigned to projects that they have designed.

In the first year of implementation, these projects were carried out by learners in Grade 8 and Grade 9, over a fifteen-day cycle. At the beginning of a cycle, learners would be provided with a list of the ten projects that had been pre-selected and a brief description of each project available. Learners would then select their project of choice. Based on their choice of project, learners would then be assigned a teacher who would facilitate their project over the fifteen-day cycle. Projects followed a general structure of having a research component, an activity component and a feedback component. Learners received both written and oral feedback from their facilitators on their work throughout the project. Parents received information in the form of a written comment on the learner's performance for each project. This feedback was sent via email or on the school's communication platform. The PBL Projects were not allocated marks and were not reported on the summative report provided by the school at the end of each term. At the end of each cycle, the process was repeated with learners selecting a new project. Throughout 2019, teachers who were involved in the implementation of the PBL program added projects to the 'Project Bank' and made adjustments to existing projects.

During the 2019 year it was noted, particularly among the Grade 9 learners, that some learners were not engaged in the projects and were becoming disruptive. As PBL is not for assessment purposes at the school, a poor mark was not a motivator for engagement. Co-creation was implemented ad-hoc with these disengaged learners to encourage them to engage more constructively in the program. Co-creation is a pedagogical approach that focuses on learner empowerment. The co-creation process refers to the meaningful collaboration between learners and teachers within a learning context. This collaboration allows learners to become active participants in the learning process and allows for the construction of content and resources. Co-creation may include, but is not limited to, shared decision making, negotiation around content and teaching methods, development of resources and assessments (Bovill, 2019). Co-creation within a PBL framework is therefore a possible means for educational institutions to develop the skills required of learners in the 21st Century.

It was proposed by the researcher that the use of co-creation within the FET School's PBL framework would provide learners with an opportunity to be in control, provide a more flexible learning environment where the learner had choice, allow for learners to collaborate with their peers and integrate technology as a means to acquire knowledge and present findings. PBL allows for the incorporation of co-creation, as the content for the projects are guided by challenging questions rather than prescribed curriculum. Thus, the program had the potential to allow learners to collaborate with their teachers and participate in the design phase of the projects.

The implementation of co-creation on an ad-hoc basis in 2019 for learners who were disengaged, was found to have varied success. Although some learners were more willing to engage in projects where they had selected a topic of interest and designed the research and project task, others remained disengaged. During the 2019 year it was also noted that some learners thrived in the PBL program as the topics they selected were areas of interest to them, and the projects were completed to an exceptionally high standard. Co-creation was implemented ad-hoc for these learners as they were able continue with the project, they were interested in. For these extension projects, learners were involved in formulating a desired outcome or level of expertise and then worked towards achieving that level.

In 2020, some adjustments were made to the PBL program implemented at the school. In both Grade 8 and 9, the first project was selected by the teachers and completed by every learner. This was done to allow for some formal teaching of skills and classroom management strategies that the teachers had identified as being needed for the successful implementation of the PBL program. These skills included journaling, researching information and digital literacy. In terms of classroom management strategies, learners were taught hand signals so that the teachers were able to manage a large number of learners, as well as techniques to resolve conflict and provide feedback.

In Grade 9, the learners completed the initial project, and were able to proceed onto completing individual projects, following the 2019 structure. In Grade 8, learners continued with the assigned

project for the duration of the first term. The intention for the Grade 8 learners, was that in the second term they would begin their own choice projects.

The Covid-19 pandemic impacted on the Grade 8 and 9 learners as the school was closed due to the National Lockdown. Once the National Lockdown was eased by government, the school management team rotated which grades attended school and which remained online. During the lockdown period a decision was made by the school, not to include PBL in the online schooling timetable. This decision was made so that Grade 8 and 9 learners were able to focus on meeting the demands of their core academic classes. Thus, learners only resumed PBL in the latter part of Term 3, when they completed own choice projects from the project bank. As a result of the Covid-19 pandemic it is noted that the learners who entered Grade 9 in 2021, did not fully consolidate the desired PBL skills and strategies that the teachers intended to cover in their Grade 8 year. The skills that were considered by the PBL teachers to be most necessary, were included in the 2021 co-creation project.

In 2021, the FET School made adjustments to the structure of the timetable and the structure of PBL. The changes were made for reasons independent to the research being conducted for this research report and were made in order to accommodate staffing and curriculum requirements within the school. These changes involved three separate components to PBL being introduced namely: Sports Skills, Technology Skills and Projects. The Grade is split into three distinct groups, and each group completes a component (sport, technology, or project) for three days and this is then rotated throughout the term. This decision was implemented in order to formalise the

teaching of technology skills and to meet the staffing demands at the school. Although this did not directly impact on the learners who were involved in this research project it did have an impact on the involvement of teachers as research participants. The impact of this decision is discussed further in Chapter Three.

The start of the academic school year was delayed in 2021, due to the Covid-19 Pandemic and the FET School made the decision to begin academic teaching for all subjects, including PBL, online. This decision meant that the initial stages of the co-creation project occurred online. The impact of this, is discussed further in Chapter Three and Chapter Five.

1.3. Problem Statement

A Project Based Learning Program was introduced to the FET school to encourage learner engagement and develop 21st Century skills. Although learners within a PBL Program are provided with greater choice than what is offered in traditional schooling, their choices are still limited to projects designed and selected by their teachers. It was my hypothesis that this characteristic of the existing PBL Program impacts on learners' engagement and motivation. Within our school environment, co-creation has emerged as a way to manage and assist learners who have become disengaged, are at risk or require extension. However, these projects have been created ad-hoc, and a more systematic approach to co-creation within a PBL context was required.

1.4. Purpose Statement

The purpose of the study is to better understand the constraints and affordances of co-creation as a teaching strategy within a PBL program at an FET school. In particular, the researcher investigated if the use of co-creation improves the motivation of learners to engage in the PBL program. The PBL program was in its third year of implementation at the FET school, and it was the first time that co-creation was implemented formally as a teaching methodology within PBL. The researcher intended to document the process of implementation of co-creation as well as monitor the motivation and engagement of learners throughout the process of co-creating and carrying out their designed projects.

1.5. Key Research Questions

What is the impact of using learner-teacher co-creation on learners' motivation and engagement within a PBL program?

Sub-Questions

1. How does co-creation influence a learner's motivation to engage in PBL lessons?
2. Is sustained enquiry and engagement achieved through co-creation?
3. Are there skill gaps that impact on a learner's ability to successfully engage in co-creation?

1.6. Importance of the Research

Co-creation within PBL is a relatively new topic in education and initial studies show that there are a number of benefits to the approach. However, the majority of these studies are conducted overseas and not within a South African context. This research is important as it will demonstrate if the findings of the existing studies apply to a South African context. It is also noted that although there are studies conducted on PBL and co-creation, these tend to be based on a University context. Thus, there is a need to determine if the results observed in University students apply to learners within the FET Phase.

1.7. Outline of Research Report

Chapter Two of this research report contains a literature review which provides a summary of the pedagogical framework for constructivism, Project Based Learning (PBL) and co-creation. Contemporary theories around factors that influence learner motivation and engagement are discussed. Chapter Three contains the research methodology which focuses on the procedures followed by the researcher, the design of the questionnaire, ethical considerations and methods used for data analysis. Chapter Four and Five contain the results of the study. Chapter Four contains the results from Phase One of the study which involved the implementation of a traditional PBL Project from the school's project bank. Chapter Five focuses on the results from Phase Two of the study which involved the implementation of the co-creation process. In Phase Two of the study pupils had the opportunity to follow the co-creation process to design a PBL Project which they then completed. Chapter Six contains the discussion of results where the impact of co-creation on learner motivation and engagement is evaluated through the

comparison of results from Chapter Five and Chapter Six. Common themes that emerge within the results chapters are discussed and comparisons made to existing literature. Chapter Seven concludes the dissertation with a summary of the affordances and limitations of co-creation within a PBL context. This is followed by recommendations for implementing co-creation within FET schools. An analysis of the limitations of the research study and recommendations for future research is also included in Chapter 7. A bibliography and appendix of consent letters and questionnaires is included at the end of the research report

Chapter 2: Literature Review

The purpose of this literature review is to outline some of the theories that inform my research. I begin by exploring theories that contribute to the constructivist teaching approach and to provide background on constructivism as a teaching approach. The link between the constructivist teaching approach, PBL and co-creation is then established. The process of co-creation and the role of the teacher and learner within the co-creation process are discussed. Theories of motivation and learner engagement are explored. Lastly, a summary of the known affordances and constraints of PBL and co-creation is provided.

2.1. Constructivism as a Pedagogical Framework for PBL and Co-Creation

Theories that Contributed to a Constructivist Teaching Approach

Piaget's (1936) Theory on Cognitive Development states that children are intrinsically motivated to explore and understand their environment. Children are able to adapt their thinking and behaviour in order to meet the demands of a changing environment. Children pass through four stages of development, namely sensory-motor stage; preoperational stage; concrete operational stage and the formal operational stage (Morris, 1999). As children pass through these stages, they are placed in situations of 'cognitive conflict', where there is a discrepancy between their view of the world and new information that they are acquiring. Through the processes of assimilation and accommodation children are able to alter their internal schemes of knowledge, and thus learning occurs (Fernyhough, 1999). Piaget's work is valuable as it shows that learning is an active process, and that learner's theories and opinions need to be respected if they are to

remain engaged in their learning. During the process of learning, teachers need to be aware of learners' perceptions in order to create opportunities for these perceptions to be challenged as learning occurs through these experiences of cognitive conflict.

Vygotsky's Theory on Cognitive Development emphasises the role of social interactions on children's cognitive development. Vygotsky's Theories state that higher mental processes such as meaning and voluntary attention are created and sustained by social interaction. Vygotsky's Theory describes the 'zone of proximal development' in which he explains how learners perform better when supported by a more experienced person (Fernyhough, 1999). Vygotsky's work is valuable to this study as it emphasises the importance of the social environment in which PBL, and co-creation occurs. The 'zone of proximal development' is of particular importance as co-creation makes use of both the teacher as a facilitator for learning, and the role of peer-teaching in the process of learning.

Van Glasersfeld built on the work of Piaget and Vygotsky by demonstrating that learning occurs not only through experience and action, but also from children reflecting upon their actions (Kieren, 1994). Van Glasersfeld's research is valuable to this study, as the process of reflection and journaling is used as part of the PBL and co-creation processes.

Theories of Constructivisim as a Teaching Approach

Constructivisim is an approach to teaching that considers learners to be active agents within the learning process. Learners are seen as being able to link knowledge gained to prior knowledge

and assign meaning to the new knowledge in order to develop conceptual structures. This learning process requires both self-regulation and reflection as learners are required to assimilate new experiences and make accommodations to their existing knowledge. This allows learners to further develop their understanding and the meaning they assign to knowledge. A constructivist teaching approach is beneficial to learning as it allows for the development of organizational principles that are transferable to a range of learning settings (Lee & Hannafun, 2016).

Problem Based Learning as Form of Constructivist Teaching Methodology

PBL, is rooted in constructivist approaches to teaching, and involves learners working together to solve a specific driving question or problem. This methodology encourages the development of problem-solving, critical thinking and improves academic performance (Almulla, 2020). As the name suggests, projects are central to this approach and drive learner encounters; they involve learners in a constructive investigation and are realistic and relevant within the learner's worldview. Some characteristics of PBL projects include giving learners autonomy in their learning, collaborating with peers and assigning new roles to the learner and teacher alike (Xiaomei Du, 2016).

A constructivist teaching environment is achieved when knowledge and authority is shared between teachers and learners. The success of this process requires tasks to be authentic with specific objectives (Olusegun, 2015). PBL is an example of a constructivist teaching approach within a classroom setting as PBL places learners in realistic, contextualised, problem solving scenarios. This broader view of the subject content better enables learners to assimilate new

information and make accommodations to existing information, thus construction of knowledge can occur.

Social constructivism suggests that through a learner's interactions with both the teacher and their peers, they further construct their knowledge. This process involves the learner receiving feedback on their ideas and actions, as well as being required to articulate their thought processes (Lee & Hannafun, 2016). As PBL occurs within a social context and may include peer teaching or review this process is enhanced.

Tasks created within a PBL Program are problem orientated, thus the point of departure is the subject knowledge required for the problem, this allows for a diverse cross curricular approach to the subject materials. Projects also rely on participant direction meaning that learners define the problem and choose the working methods to solve it. This characteristic of participant-direction, allows for learner to take ownership of their work. This ownership further allows learners to be flexible and creative in their approach to the task. Within this framework there is also a demand for academic skills, analytical skills, problem solving, self-reflection and communication (Chemi & Krogh, 2017).

PBL Programs allow for the accommodative learning process to occur. However, this process is most effective when tasks selected are significant to learners. Tasks that are not viewed as being significant to the learners will be dismissed as irrelevant or assimilated into existing cognitive structures. (Chemi & Krogh, 2017). This research supports the use of co-creation within a PBL

program, as learners have an increased choice over the learning content and activities, they have the ability to select tasks that are significant and relevant within their frame of reference.

PBL projects follow the stages of: selection of the subject and reflection on the driving question, problem formulation of the project, decisions on how to research and solve the problem posed, the actual project work, production of an end product and reflection. The role of the teacher is to facilitate this process. This role of the teacher includes asking critical questions, focusing learners on weak or questionable points and commending progress (Chemi & Krogh, 2017).

Supervision refers to the role the teacher holds within the PBL classroom. Two different supervision styles are identified as playing an important role in the facilitation of PBL projects, namely problem-orientated supervision and disciplinary supervision (Ravn, 2017). Problem-orientated supervision focuses on the PBL process and ensures that the project follows the steps of planning, research, drawing conclusions, presenting and evaluating. In this form of supervision, the teacher encourages learners to reflect on their knowledge and demonstrates how decisions may influence the end product. In disciplinary supervision the teacher emphasises the connection to the knowledge being constructed by the learners and existing knowledge within the field. This type of supervision still enables learners to construct their own knowledge but ensures that they still have knowledge of the particular theories within a particular field (Ravn, 2017). Although disciplinary supervision is acknowledged by the researcher as a supervision style within the PBL environment. The supervision style implemented at the FET school is more problem-orientated in nature. This is due to the fact that the projects on offer do not link specifically to any part of

the prescribed curriculum. The purpose of PBL within the school is to use the projects as a method to teach skills and provide enriched content, rather than the teaching of subject specific theories. The reflection component of the PBL process plays an important role in the development of learner's and their construction of knowledge. In a classroom setting learners receive a large quantity of feedback, however, they do not always have the interest or ability to use it effectively. The PBL approach provides learners with the opportunity for reflection and more effective use of feedback to enhance learning (Almulla, 2020). As PBL occurs within a social context, learners have the opportunity to further develop understanding by learning from the shared reflections from others in their learning environment (Zhou, Ravn, & Du, 2017).

Co-Creation as a Form of Constructivisim

Co-creation further develops the constructivist approach as it requires learners to actively collaborate and negotiate with the teacher on elements of the learning process. Co-creation allows learners and teachers to contribute to curricular, decision making, implementation, investigation and analysis. Although co-creation provides an opportunity for shared decision making, and negotiation. The contributions of the teacher and learners are not necessarily equal or made in the same manner (Bovill, 2019). Co-creation recognises that in order for learning to have meaning, teachers need to be open to the learners' contribution to the learning process and recognise their participation (Chemi & Krogh, 2017).

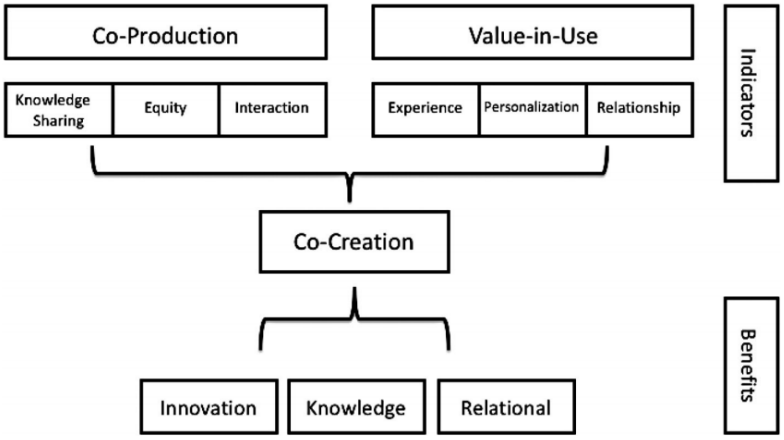
2.2. Co-Creation and the Co-Creation Process

Value co-creation is defined by Dollinger et al (2018) as a process whereby learners' resources are integrated with organisational resources to facilitate a range of activities and experiences that encourage exchange and interaction which can lead to better practice and innovation. By allowing learners to contribute knowledge and resources that are different to that of their teachers, educational institutions create a more inclusive environment that fosters superior educational outcomes. Dollinger et al (2018) propose a conceptual model of value co-creation which can then be subdivided into two distinct, yet interlinked, components namely co-production and value-in-use. Co-production involves learners in the early phases of the design process; thus their knowledge, experiences and opinions may influence the learning content and methodologies created. This sharing of knowledge will provide educational institutions with insight into the experiences of learners and enable them to develop innovative solutions that meet the changing needs of the learners. In order for this process to be effective it is important to ensure that educational institutions provide access to all learner voices, ensuring that all learners have an opportunity to contribute and not only a select few. Value-in-use refers to the value that learners and teachers place on the content designed once the teaching program is implemented. This perceived value is influenced by the learner's overall experience of the educational experience. It may also be influenced by the extent to which the program can be further personalised to meet their individual needs. Value-in-use may also be influenced by learner relationships, amongst their peers, with their teachers or the institution as a whole. The process of co-production enhances relationships thus improving the learner's perception that the educational experience is positive (Dollinger, Coates, & Lodge, 2018).

The figure (figure 2.1.) below provides a summary of the model showing the indicators for successful co-creation to occur as well as the benefits that arise from the process of co-creation.

Figure 2. 1

Indicators for Successful Co-Creation



(Dollinger, Coates, & Lodge, 2018)

This model is applicable to my research project as both co-production and value-in-use co-creation are being implemented during the design and completion of the co-creation project. Co-production is implemented as learners' knowledge is used in the design of the projects, and there is greater sharing of authority (equity) in the decisions regarding how the content and activities of the PBL Project time would be structured. This allows for value-in-use co-creation to take place as the learner's experience of PBL is more personalised.

The process of co-creation can be understood from looking at the word itself. The term 'co' implies a social aspect, in which learners, peers and teachers collaborate. The term 'creation' shows that something is formed as a consequence of this collaboration. Thus, co-creation refers

to the formation of new knowledge, understanding or skills, that form within a social context (Iverson & Pedersen, 2017).

Co-creation is a collaborative reciprocal process which allows both learners and teachers to contribute in different ways. Co-creation may take the form of evaluating course content and learning processes, designing assessment methods and joint evaluation. Co-creation can also take place at varying levels of an institution from individual learning to classroom, course and institutional levels. Bovil et al (2015) states that learner roles in co-creation may include, but are not limited to:

- Consultant- sharing and discussing perspectives and understanding
- Co-researcher- collaborating meaningfully with teachers and peers on the content discussed
- Pedagogical co-designer- sharing, responsibility for the design of learning, teaching and assessment
- Representative- being a learner voice on issues pertaining to the institution.

Although the first three roles identified above involve the learner as an active participant, they are dependent on the teacher to create these opportunities for co-creation to occur (Bovill, Cook-Sather, Felten, & Millard, 2015). The responsibility lies with the teacher to create a space in which learners are able to contribute and co-create. The creation of this space is a conscious and active process for the teacher (Ravn, 2017). However, once these opportunities are created the responsibility for the learning process does not sit with the teacher or learner alone. The social

space of teaching and learning needs to be co-created through the mutual sharing of this control (Iverson & Pedersen, 2017).

In co-creation, the supervision role of the teacher shifts more towards the problem-orientated supervision discussed above, and away from disciplinary supervision. This is because disciplinary supervision encourages the belief that the teacher has the knowledge and answers required to complete the project. According to (Ravn, 2017) this belief limits the willingness of learners to offer ideas and participate in the co-creation dialogue. A supervisor who encourages creativity, joint exploration and constant reflection will facilitate co-creation more effectively. The role of the learners and the supervisor outlined are significant as it provides insight into the environment that will need to be created within the PBL classroom at the FET school, in order for the co-creation process to occur successfully.

A co-creation process is one that incorporates: co-creation of knowledge and peer to peer production, learners providing feedback to each other that is further supplemented by the teacher. (Chemi & Krogh, 2017). This differs from the traditional PBL context in that feedback is given during in the design (creation) phase of the project as well as during the implementation phase of the project.

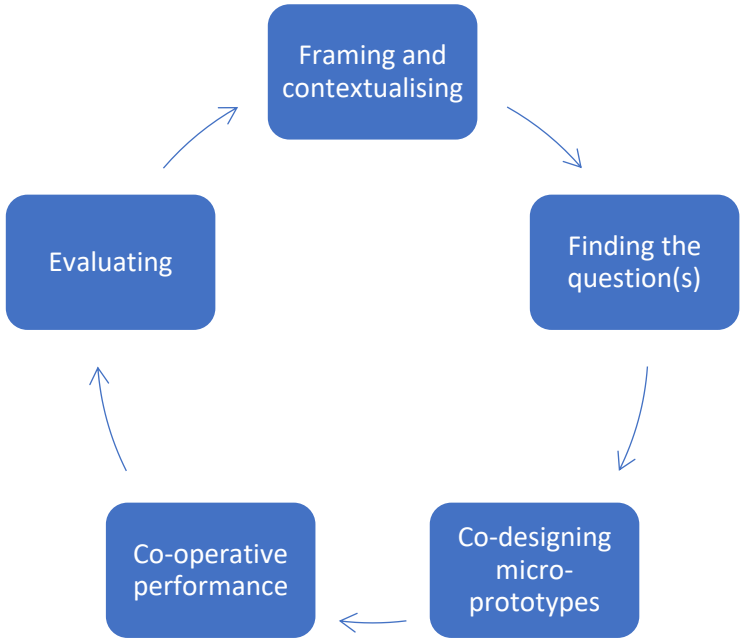
Iversen and Perdersen (2017) suggest that the co-creation process can follow five phases:

1) Framing and Contextualising: this focuses on identifying the context in which learning will be taking place this may include identifying the formal requirements and academic goals to be achieved.

2) Finding the questions: this focuses on identifying the questions and challenges that the learner tries to solve.
3) Co-Designing micro prototypes: this aims to identify possible solutions to the challenges or questions posed in phase two.
4) Co-operative Performance: this involves the actioning of the solutions in phase three and may involve a variety of teaching processes.
5) Evaluation: this process may have two parts, one in which the learners end products are evaluated and another in which the process itself is evaluated.

Figure 2. 2

The Co-Creative Process Wheel



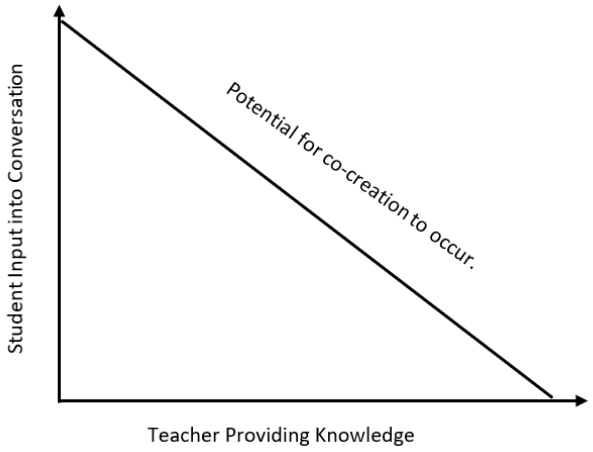
(Iverson & Pedersen, 2017)

The co-creation process outlined in the figure (figure 2.2) above is beneficial to the research as it provides a framework for which co-creation will be implemented at the school.

Communication that encourages engagement and allows learners to express what excites and frustrates them is central to the relationship between learners and teachers in the co-creation process. The dialogue between teachers and learners needs to display a willingness to explore and improvise; thus, ensuring that conversation is not limited to preconceived ideas and the transfer of information; but allows for the co-creation of knowledge (Iverson & Pedersen, 2017). A key characteristic identified in teachers who manage the co-creation process effectively is the ability to communicate and thus manage the anxiety of learners throughout the process. This more open dialogue differs from a traditional teaching model in which the teacher only listens to what learners are saying in so far as it meets their existing mental models of the topic (Iverson & Pedersen, 2017). The importance of the dialogue and the link to co-creation is illustrated through the following matrix:

Figure 2. 3

Communication and Co-Creation Matrix



Adapted from Iversen and Stavnskaer 2016

As can be seen in the matrix (figure 2.3 above), the less knowledge provided by the teacher, the greater the opportunity for learner input into the conversation and the greater the potential for

co-creation to occur. It is noted by the researcher, that this matrix refers to the teacher providing knowledge and answers, and that this particular form of interaction needs to be reduced in order for co-creation to occur. As can be seen on the matrix, co-creation has the greatest potential to occur when the teacher providing knowledge is at a minimum and learners have maximum opportunity to provide input into the conversation (Iverson & Pedersen, 2017). Teacher interaction is still required in order for co-creation to occur, but that the form of this interaction changes for the situation. By the teacher facilitating conversation rather than providing knowledge and answers, learner generated ideas are encouraged, considered and discussed (Almulla, 2020). This enables teachers and learners to engage in a dialogue that is focused on inquiry. This inquiry based dialogue enables learners to acquire knowledge within a new framework and build on their existing knowledge, understanding and skills. The inquiry based dialogue is different from instruction in that it encourages active questioning by the learners, who are required to take ownership for their learning. In order for teachers and learners to enter into an inquiry based dialogue where ideas are discussed involves an element of risk. The nature of the dialogue means that it can be unpredictable, and teachers need to be confident in their communication skills in order to facilitate the conversation. The dialogue also requires the sharing of authority, the teacher needs to ensure that they do not exert too much authority and influence the direction of the dialogue while still meeting the needs of learners who may, due to insecurities or anxieties, be unwilling to take ownership of the dialogue and direct its path. (Iverson & Pedersen, 2017)

Communication skills that are required by a teacher facilitating a co-creation process may include the ability to think aloud, reformulate a learner's perspective and respectfully challenge and evaluate ideas (Ravn, 2017). Furthermore, teachers who effectively manage the PBL and co-creation process must be good at reflection and self-assessment. As the PBL environment requires a shift in the role of the teacher and a change in teaching style, it is important that teachers regularly reflect on their teaching practices in order to improve their teaching (Zhou, Ravn, & Du, 2017). The communication skills outlined above are important to the research as they will need to be developed by the teachers in order to implement the co-creation process successfully. As part of the analysis, the researcher critically assessed the extent to which communication impacted on the co-creation process.

2.3. Factors Impacting on Learner Motivation and Engagement

The following section of the literature review identifies factors that impact on learner motivation and engagement. This is important, as part of the research aims to identify factors within the PBL and co-creation classrooms that enhance learner motivation and engagement, so that these can be accentuated going forward. The research also aims to identify factors within the PBL and co-creation classrooms that decrease learner motivation and engagement, so that these can be reduced going forward.

Motivation is a multi-dimensional concept that refers to the factors that initiate and guide behaviour towards a certain goal or outcome. On a primitive level this motivation is needs-based, however, interests, values and attitudes can also influence motivation. Intrinsic motivation refers

to behaviour that comes from within an individual's own world and is independent of factors within the individual's environment. Extrinsic motivation refers to behaviour that are driven from factors within the individual's environment, such as punishments, rewards or social support. In addition to the classification of motivation into extrinsic and intrinsic, there are other motivational components that impact on a learners' motivation. These factors include the value that a learner places on the task at hand and if the task allows for the attainment of a learner's personal goal. The expectation of the learner around the task also impacts on motivation, this expectation is influenced by a learner's autonomy and belief in their own abilities. Factors such as test anxiety and self-esteem can also influence learner's motivation. (Almulla, 2020).

Academic motivation refers to the driving force behind a learner's desire to learn and excel in academic activities (Gupta & Mili, 2016). In a meta-analysis of 205 studies on learner achievement showed that motivation has positive affect on learner achievement (Orhan-Özen, 2017). High academic motivation correlates to improved concentration in class and better study habits. Academic motivation was higher in learners who achieved academic success. Amongst high academically achieving learners' academic motivation was not influenced by gender. In low academically achieving learners, academic motivation was found to be lower in male learners (Gupta & Mili, 2016).

Investment refers to the commitment of the learner to the goals, practices and identities that constitute the learning process. Investment links closely to academic motivation in that it influences the long-term academic achievement of learners. Investment is greater when the

content or skill is linked to social practice, thus the learning of content or skill will provide the learner with higher social status. Investment has been highlighted in second language learners, where learners are more willing to invest in the learning of a language if it is perceived as being useful within their social and cultural status. Investment from a learner into their learning may vary throughout time, as it is influenced by the particular setting, and the range of social interactions that accompany these settings. The extent to which a teacher identifies that the ideas, knowledge and existing skills of a learner have value can impact on the extent to which a learner invests in the learning process of a given classroom (Darvin, 2019).

Learner engagement refers to a learner's involvement, excitement and persistence with regards to the learning process and incorporates both the learners emotional and intellectual investment in learning. Learner engagement may vary depending on different educational context. Learner engagement is both essential for co-creation and an end-product of the process (Bovill, Cook-Sather, Felten, & Millard, 2015). The impact of motivation on engagement, and if sustained engagement results in greater academic achievement, form an important component of the data analysis.

Social Factors that Influence Motivation and Learning

Social participation within a classroom environment influences the process of learning. Meaning, practice, community, and identity are interconnected social constructs that influence the learning experience. Thus, learning is not limited to the acquisition of knowledge, but includes an emotional component as well as a social and societal component. This social and societal

component includes the interactions between the individual and their environment (Zhou, Ravn, & Du, 2017).

In social learning theory, behaviours are learnt through experience, at a basic level this results in behaviour being driven by consequences in the form of punishment and rewards. These external consequences form incentives for behaviour as well as re-enforcing behaviour. As learners are able to anticipate the outcomes of their behaviours, prior experience influences learner's behaviour within a context. Behaviours and skills can also be learnt either through deliberate observation or inadvertent modeling. Modelled behaviours are learnt more effectively if the model is perceived to have behaviours that give them status or result in rewards. Although influenced by external factors behaviour and actions are self-regulated. Thus, a behaviour or action produces two types of reinforcement, namely the self-evaluation and the outcome. An important aspect in developing self-regulation occurs through socialisation, as individuals are able to evaluate their own behaviour based on the reaction of others in their environment. Social learning theory is relevant to the research as a learner's past experience and relationship with a teacher can impact on their motivation and engagement. Teachers and peers who are perceived highly by a learner will also have a greater impact on their motivation to learn (Bandurra, 1977).

Classroom consensus refers to the extent that individuals within a classroom perceive the classroom environment, it's atmosphere, motivational climate and academic goals, in the same way. Teachers that develop a climate in which mastery of concepts and skills is the classroom goal, rather than out-performing one's peers, develop classrooms that value authentic learning,

perseverance, and individual progress. Learners within these environments show higher levels of motivation and perseverance. Task authority, recognition and evaluation are central to classrooms that have a mastery goal structure. Task authority refers to the extent to which learners are able to take ownership of their own learning, monitor their progress and make decisions on social matters within the classroom. The recognition and evaluation component refers to the teacher's practice of providing feedback to learners so that they can improve. In an ideal situation for PBL and co-creation to occur, all learners would perceive the goal of the learning environment to be mastery orientated. The greater the consensus amongst learners the more learners view the learning goals and norms around behaviour in a similar manner which may lead to higher levels of academic achievement (Bardach, Lüftenegger, Yanagida, Spiel, & Schober, 2019).

Classroom consensus is influenced by the teacher's expectations, behaviours and transparency of their instructions (Bardach, Lüftenegger, Yanagida, Spiel, & Schober, 2019). Classroom consensus is important within the PBL Program as PBL incorporates components of group work, and it requires the teacher to interact more with individuals on a one- on- one basis rather that interacting with the class as a whole. This approach to classroom management requires higher levels of classroom consensus as it relies on learners to meet the expectations of the classroom for work and behaviour rather than have these expectations externally enforced by the teacher. As co-creation requires greater interaction between the teacher and learner, high levels of classroom consensus are needed for success of the project.

2.4. Affordances of PBL and Co-Creation

The following two sections include current studies that identify affordances and constraints of PBL. These are of importance to the researcher as the literature will need to be compared to observations that are made based on the research data. Observations that are supported by the research add to the reliability and credibility of the study. Observations that contradict the existing body of literature or introduce new information, provide insight into areas where further research is required.

PBL is seen to encourage learners to focus on the learning itself and the mastery of content and skill rather than the completion of tasks to an acceptable standard. This shift in learner focus encourages sustained engagement in tasks over an extended time (Thomas, 2020). In a study carried out on 3rd, 5th and 10th Graders who were identified as having low motivation, 82% agreed that PBL motivated them and 93% expressed an interest in the topics presented (Thomas, 2020).

A common characteristic of learners who demonstrate difficulties in both academics and behaviour is a lack of motivation to engage in tasks. Suhr (2018) demonstrated that motivation and willingness to engage amongst middle school learners (equivalent of Grade 8 and 9) was found to increase, when they felt that they belonged within the social setting of the classroom (Suhr, 2018). PBL is a means of engaging learners within a social setting, which leads to increased motivation to engage in lessons as acquiring knowledge enables learners to collaborate. Ranjana et al (2017) found that 73% of learners in the study agreed to being satisfied and motivated with PBL and facilitators reported an increase in interactions within the PBL groups, as the year

progressed (Ranjana Tiwari, December, 2017). Suspensions and disciplinary problems were also found to be lower in schools that implemented PBL programs (Thomas, 2020). While my study does not specifically focus on learners who demonstrate difficulties in academics and behavior, it will be interesting to observe whether co-creation has a positive effect on the motivation of learners who tend to be disengaged during lessons.

Co-creation involves a shared responsibility for the learning process between learners and teachers. The shared responsibility requires a greater level of engagement from the learner. In addition to the increased engagement, co-creation enhances teaching and classroom experiences and improves learner- teacher relationships (Bovill, Cook-Sather, Felten, & Millard, 2015). The learner- teacher relationship is developed as the co-creation process requires an increase in interactions. This increase in interactions allows for the formation of positive relationships. These positive relationships are key predictors of positive learner engagement, enhanced motivation and academic achievement. (Bovill, 2019). Positive teacher-learner relationships are key indicators for learners placing a high overall value on their educational experience. Co-creation allows for frequent and in-depth interactions which foster mutual understanding and respect. Learners who experience quality teacher-learner relationships experience higher levels of learning and higher levels of satisfaction with their learning experience (Dollinger, Coates, & Lodge, 2018).

Individual autonomy enhances motivation and engagement, which in turn leads to improvement in performance and determination to persevere (Lee & Hannafun, 2016). As PBL focuses on the

process of finding solutions, it creates a dynamic learning environment which is more conducive to the sharing of control between teachers and learners (Almulla, 2020). Thus, PBL and co-creation provide learners with opportunities to increase their level of autonomy and they become more motivated to engage in their learning (Lee & Hannafun, 2016). PBL was also found to provide learners with an opportunity to formulate their own learning objectives, which encouraged learner autonomy and engagement (Almulla, 2020). Co-creation provides learners with an increase in variety and autonomy. An increase in variety, autonomy and learner choice are all factors which positively enhance learner motivation and engagement (Thomas, 2020). Learners also gain confidence and capacity due to their more active voice and autonomy in their learning experiences (Bovill, Cook-Sather, Felten, & Millard, 2015).

Learner satisfaction is subjective in nature and refers to a short-term positive attitude which arises from how learners perceive the educational experience. The increased level of autonomy experienced by learners during the co-creation process is shown to increase the level of learner satisfaction and increase their involvement in the learning experience. As the co-creation process allows for learners to express their needs, and for the educational institution to better meet these needs, learners experience a higher level of satisfaction as they perceive the learning experience to be valuable (Ribes-Ginera, Perello-Marín, & Díaz, 2016).

'Graduate capabilities' refers to the skills that learners acquire that can be transferred to future learning experiences as well as their future careers. Learners who participate in co-creation activities are shown to have greater agency and developed leadership skills, thus enhancing their

graduate capabilities (Dollinger, Coates, & Lodge, 2018). In a study conducted amongst University students and their teachers, the PBL methodology was shown to encourage the development of information technology skills and to integrate them into their academic skills (Almulla, 2020). Digital tools are used throughout the co-creative process to research, implement, design and present. Thus, knowledge is created alongside the required digital skill set (Androutsos & Brinia, 2019).

An advantage to the co-creation process, is that it provides an opportunity for learners to become involved earlier and contribute to the curriculum design process. This allows for an academic curriculum that is more adaptable and flexible as it incorporates the views of the learner involved. Learners' involvement in curriculum design has also been shown to improve learner's positivity towards the curriculum content and an overall improvement in knowledge and skill acquisition (Ribes-Ginera, Perello-Marín, & Díaz, 2016).

2.5. Constraints of PBL and Co-Creation

One of the identified constraints of PBL is that although learners may begin a project engaged, sustaining this level of inquiry for an extended period of time is challenging. Other limitations to PBL included learners not having the technology skills to access the information or tools required for the inquiry (Thomas, 2020). The complex nature of learning through PBL and co-creation requires learners to be supported and scaffolded through the process. Teachers are required to experience a shift in their role to one with decrease control and increased support (Lee & Hannafun, 2016).

Timetabling and scheduling is a recognised limit on the co-creation process as decisions often have to be made prior to learners starting school. Although learners desire control and wish to be active participants collaborating with their peers, when placed in the actual learning environment, established behaviours such as reliance on the teacher limits this process. If the teacher does not fulfill this role, but rather encourages problem solving and active participation, it may lead to frustration on the part of the learner (Chemi & Krogh, 2017).

Overcoming resistance to change in learning institutions is acknowledged as factor that can limit co-creation. This characteristic amongst teachers can be influenced by inherent practices of the organisation, teacher's individual knowledge and experience and perceived risks associated with innovation. Teachers may also question if learners are able to add academic value to the discussion, if they lack the pedagogical background, and disagree on whether learners should be allowed to engage in conversations on assessment practices. Learners may also be reluctant to change from their comfortable role and move into one that requires greater levels of effort and engagement. This overall resistance to change is shown to be reduced when the benefits of co-creation and the process is clearly explained. This communication is shown to be effective in reducing anxiety which is often the underlying cause of the resistance to change. (Bovill, Cook-Sather, Felten, & Millard, 2015).

Institutional structures may also create a barrier to the co-creation process, as it does not fall into the high-priority roles associated with traditional teacher and pupil roles. Co-creational within smaller contexts, for example within an individual classroom setting, is seen to be more

manageable than on a larger scale. Allowing learners to contribute on a micro-scale often allows for learner voices to be heard while still meeting the prescribed needs of the institution. Effective communication with regards to what co-creation means, the process, expectations around roles as well as outlining the benefits and complexities is critical for successful implementation of the process (Bovill, Cook-Sather, Felten, & Millard, 2015).

Lack of active involvement on behalf of the teachers in their supervisory role may also limit the co-creative process. In order for co-creation to occur teachers as well as learners need to take ownership of the process and involve oneself in the dialogue. For some teachers this is a shift in the traditional model of involvement in the PBL process where teachers could remain detached and remain in control of the supervision process rather than being actively involved in the project. This shift in focus is particularly challenging if projects or the knowledge acquired is later used for formal assessment purposes, as the dynamic between learners and teachers shifts again during the assessment process. However, if the focus of the learning environment is co-creation and not assessment, the teacher needs to be an active participant in the project process, involved in decisions and modelling expected behaviours (Ravn, 2017).

Chapter Two has provided a summary of the literature that was used to inform this research. This literature included some of the theories that contributed to a constructivist teaching approach. It was then established that PBL and co-creation can be considered a form of constructivist teaching. An outline of the co-creation process was provided, this included the roles of teachers and learners within this process. Theories on motivation and learner engagement were

discussed. Lastly, some of the constraints and affordances of co-creation were discussed. A limitation of the literature reviewed is that the majority of the studies were conducted overseas and not within a South African context. It is also noted that a number of the studies conducted on PBL, and co-creation were based within a University context, rather than a high school context. Thus, as discussed in Chapter One, the limitations of the existing literature contributed to the importance of this study. Chapter Three outlines the methodology for this research report. This is then followed by the results for the study in Chapters Four and Five. The literature review is then incorporated into the discussion of results in Chapter Six and the recommendations in Chapter Seven.

Chapter 3: Methodology

Chapter Three provides an overview of the methodology that guided this research project. An overview of the theory that guided the methodology is provided and context to the study is established. This is followed by an outline of the phases of the study and the data collection methods. A link between the research questions and the questions on the questionnaire are also established. This is followed by an outline of how participants were selected to participate in the study. A description of the data analysis that was used to generate the results in Chapter Four and Chapter 5 is provided. Lastly, a description of the ethical considerations for the study are described.

3.1. Overview

The research was conducted within an interpretivist, social sciences paradigm. The interpretivist social sciences paradigm emphasises meaningful social interaction, socially constructed meaning and value relativism (Neuman, 2006). The research conducted was a qualitative case study as the project examined a wide variety of aspects relating to the participants within the setting of the PBL classroom, across grade 8 and 9 in one school. Qualitative research places an emphasis on time and observes a sequence of events as it unfolds (Neuman, 2006). Case studies are a form of qualitative research in which a naturally occurring situation, where variables are not or cannot be controlled is studied (Morrison, 2006). The research conducted was a case study as naturally occurring events within the PBL classroom at the FET school were investigated over time.

The researcher employed an action research methodology. Action research is a research strategy which sets out to change the situation being researched. This is done by a process of enquiry that aims to improve the practices of the researcher conducting the research. During this process of critical enquiry, the researcher includes in the investigation their own practices with the intention of improving these practices (Morrison, 2006). The research conducted was an example of action research, as the researcher was a PBL teacher at the school, thus any knowledge gained from the study improved their own practice. During action based researcher the researcher plays a dual role of being a participant in the project and the person conducting the research (Neuman, 2006). In this study, the observations of the researcher were taken into account and included alongside those of the participants. During the data collection phase of a case study emphasis is placed on providing participants with a 'voice' so that insight into the situation may be gained (Morrison, 2006). In this study, this voice was provided for through the use of direct quotes in the results chapter.

The research was conducted over the period of 2020-2021, and as a result was impacted on by the Covid-19 pandemic and associated school closures. The research was conducted at an Independent School within South Africa, which was impacted on by the school closures implemented by the Department of Education, as well as voluntary closures by the school's management team. For the purpose of this report, the intended methodology as well as the adjustments made have been included.

A Linear Research Path research design was employed. A linear research path proceeds in a clear, logical path and follows certain and specific steps (Neuman, 2006). As is shown in the methodology below, it was the researcher's intent to follow a clear path when implementing the project. However, due to the dynamic and ever-changing nature of the school environment, adjustments did need to be made and these have been included alongside the proposed methodology.

3.2. Phases of Research

Within the research design, the research was divided into two phases which are discussed in detail below. Phase One of the study involved, the researcher collecting data on the engagement of learners within the existing PBL program. For the purpose of this study this is referred to as the traditional PBL Project. Phase Two of the project involved the implementation of the co-creation process to design a project. The project designed by the learners through the co-creation process was then carried out by the learners. For the purpose of this study, this project is referred to as the co-created or designed project.

Phase One of the research involved understanding and evaluating the practices within the PBL classroom. Phase Two then aimed to implement the strategy of co-creation and evaluate its effectiveness in improving motivation and engagement within the PBL classroom. The structure of lessons for the co-creation process and the manner in which it was delivered to the learners, was designed by the researcher. Thus, the researcher included an element of their own practice, the co-creation project designed by the researcher into the study. This had been done with the intention to improve the teaching practice within PBL.

Phase One

Once ethical clearance was granted, the researcher presented the research to the learners, teachers and parents. All learners and teachers who volunteered were included in the study and the necessary consent forms completed. Once consent had been attained, the research project commenced.

1. **Phase One:** Learners selected a project from the existing school bank[1] of PBL Projects. Once these projects were selected, learners were assigned to a teacher who facilitated the project process. Upon completion of this project the first set of questionnaires was carried out by both the learners and teachers. The learner's questionnaire can be found in Appendix 2 and the teacher's questionnaire can be found in Appendix 3. The results for this phase of the project can be found in Chapter Four.

2. **Phase Two:** The proposed plan for the project was that learners were to learn about co-creation and collaborate with their teachers to design their own PBL Projects. Learners would then have the opportunity to present their designed projects to their peers and teachers and receive feedback. Due to the school closures[2], the amount of time allocated to this section of the project was reduced, and components of the task were completed online. This limited collaboration between the teachers and learners as well as amongst learners themselves.

[1] The project bank is described in Chapter 1, it is a collection of PBL projects designed by the teachers at the FET school.
[2] Schools were closed in January of 2021 due to the second wave of the Covid-19 pandemic.

Once the learners' projects had been designed through the co-creation process, learners had the opportunity to complete the project they designed or to choose a project that was designed by one of their peers. Once learners had completed the designed project, they were asked to complete a questionnaire on the co-creation process and the implementation of their designed projects. The learner questionnaire can be found in appendix 4. The teachers completed two questionnaires for Phase Two of the project. The first questionnaire focused on the co-creation process and the second questionnaire focused on the implementation of the designed projects. The teacher questionnaires can be found in appendix 5 and appendix 6. The results for phase two of the project can be found in Chapter 5.

For the teacher questionnaires it was the intention of the researcher to have the same teaches complete questionnaires at the end of each phase. This would have allowed for comparison between the two phases. However, due to staff and timetable restructuring within the school, apart from the researcher none of the staff involved in Phase One continued with Phase Two of the project. The questionnaires for the teachers were still completed at the end of each phase. Phase One was completed by one sample of teachers. This sample has been identified as Teacher 1, 2, 3 or 4. Phase Two of the project was then completed by a different sample of teachers. This sample has been identified as Teacher A and Teacher B.

3.3. Data Collection and Design of Questionnaire

Research questionnaires are used to gather information on participants' behaviour and opinions on a situation. This method of data collection is useful as it allows for a large quantity of data to be collected from participants in a short period of time (Neuman, 2006). The electronic questionnaire was selected as the tool is familiar to the learners and teachers as they are used within the FET school to collect information and feedback on a regular basis.

The questionnaire in Phase One was aimed at establishing the current levels of engagement and motivation in the PBL program. The questionnaire used at the end of Phase Two provided feedback on the co-creation process used to design the project as well as the effectiveness of the co-creation process when the project was implemented.

Types of Questions

Alignment is a way of combining both qualitative and quantitative methods within the same research design. The purpose of alignment is to ensure that the benefits of both approaches are gained. Closed ended questions provide quantitative data allowing for statistical comparisons. Open ended questions provide depth and insight into the answers of participants (Morrison, 2006). Alignment is achieved in the design of the questionnaire as the closed ended questions provide quantitative data which allows the researcher to identify common themes, calculate percentages and allow for easy comparison between participants. The inclusion of open ended questions provides participants with an opportunity to elaborate on responses and provide their

own insight. The inclusion of open ended questions thus provides research participants with a 'voice' in the study.

The use of open ended questions in the teachers' and learners' questionnaires adds to the authenticity of the study as it gives participants a voice and allows them to share their insights. Direct quotes have been incorporated into the results, to further allow for the participant's voice. This provides the researcher with fair, balanced and honest view-points on the experience of co-creation in PBL, thus enhancing the authenticity of the study.

Structure of the Questionnaire

The questionnaires used during the research have been designed so that a specific question on the questionnaire links to one of the specific research questions. The links between the research questions and the specific questions on the questionnaire are discussed under questionnaire design. The use of multiple indicators for a specific construct improves the reliability of the study. (Neuman, 2006). Multiple indicators have been used in this study as the perspectives of the teachers, learners and researcher are considered.

The use of multiple indicators as well as multiple data collection points also serves to improve the validity of the study. Multiple data collection points are evident as data was collected at the

end of the completion of the traditional PBL project [3] and at the end of the completion of the project that was designed through the co-creation process[4].

Convergent validity is a measurement of validity for multiple indicators based on the idea that indicators will act alike or converge (Neuman, 2006). If in analysis the data produces trends that are consistent across all data collection points for a test subject convergent validity would be achieved. Convergent validity was ensured during the data analysis as the researcher compared the learners' and teachers' answers in the open ended questions with their answers in the closed ended questions. The learners' and teachers' answers were also compared to ensure convergent validity.

The questionnaire was developed to ensure that questions avoid ambiguity and do not lead participants in a specific direction. The questionnaires were completed at the end of each project, so that the impact of participants' memories on their responses was limited. The surveys were completed during class time, in order to ensure maximum return of the questionnaires.

Links between the research questions and the questionnaires

The following section will show the link between different questions on the questionnaires as well as the link between the research questions and the questions on the questionnaires. In order to ensure that this section is easy for the reader to follow, the researcher has paraphrased some

[3] The completion of the traditional PBL project formed phase one of the research study.
[4] The co-creation process and completion of the designed project formed phase two of the research study.

of the questions on the questionnaires. The exact wording of the questions can be found in Appendix 2- 6[5].

Research Question 1: How does co-creation influence a learner's motivation to engage in PBL lessons?

Questions were asked around when learners felt motivated to engage and the factors that influenced their motivation. To allow for comparison many of the questions were repeated on the learner and teacher questionnaires, with a change in wording from 'you' on the learner's questionnaire to 'learners' on the teacher's questionnaire.

For Phase One of the project when learners completed the traditional PBL Project, the following closed ended questions were asked. Which statement for you is most correct? Possible responses included I feel motivated at the start of the project because it is something new and exciting or the middle of the project as I understand the project and am making progress or the end of a project as I can see my goal is about to be achieved. This question was then followed by two questions asking learners/teachers to identify factors that positively influenced motivation and factors that negatively influenced motivation. The list of factors given was written so that they mirrored each other for example on the positive list 'interest in a topic' was mirrored by 'being assigned a topic I'm not interested in', this was done to allow for ease of comparison.

[5] The term student is used on the questionnaires instead of learner, as the word learner is not used at the FET school.

The questionnaire contained three open-ended questions that asked learners to identify how motivated they felt at the start/middle/end of the project and to comment on any factors that influenced the way they were feeling. These questions were asked to identify how motivation changed throughout the course of a project, and possible reasons that these changes occurred. Learners were then asked to identify their likes and dislikes; these questions are discussed under general trends later in the chapter. Teachers were asked to identify characteristics of the project that encouraged or discouraged learner motivation and engagement. The researcher aimed to gain insight into learner motivation, however, felt that a less direct question would be more appropriate for learners taking into consideration their age, hence the question around likes and dislikes. Given the teacher's ages and qualifications a more direct question was considered appropriate.

As with the traditional PBL project, the questions on the learner and teacher questionnaire had some similarities in order to allow for comparisons between participants to be made. In addition to this, the co-creation questionnaire had questions that were similar to the traditional PBL project, to allow for comparisons between the two projects to be made.

For Phase Two of the project, participants completed questionnaires on the co-creation process and the completion of the designed project. The questions on questionnaire for Phase Two were similar to questionnaire for Phase One. Three closed ended questions and three open ended questions about when learners felt motivated in the co-creation project were asked. These were

asked in order to gain insight into how motivation changed throughout the course of the co-creation process.

The teachers' questionnaire had additional questions designed to provide teachers with an opportunity to elaborate on their responses. These included the open ended questions asking teachers to identify the characteristics of the co-creation project that encouraged/discouraged learner motivation.

Research Question 2: Is sustained enquiry and engagement achieved through co-creation?

For Phase One and Phase Two of the project, both learners and teachers were asked an open ended question. This was phrased as follows: Did you feel you worked at the same level throughout the project? If not, why? Try identifying a day in which you worked at your best and worst? Comment on what happened that made these days different. As with the questions above, the wording of 'you' to 'learners' was made for the teachers' questionnaire. This question was designed to gain insight into learners' levels of engagement throughout the processes. The question also allowed for the researcher to see if there was a correlation between motivation and engagement over the duration of the project.

For both questionnaires teachers were then asked an open ended question around which teaching strategies they utilised to engage and motivate learners. The intention of the researcher was to gain insight into effective strategies that could potentially guide future practice.

An open ended question around how being online impacted on engagement in the co-creation process was asked to both learners and teachers. Although online learning was not the focus of this study, the research did take place within the context of the Covid-19 pandemic and the school closures did impact on learning.

Research Question 3: Are there skill gaps that impact on a learner's ability to successfully engage in co-creation?

Learners were asked two closed ended questions asking them to identify the characteristics of the co-creation process that they enjoyed the most or least. The possible responses included: designing my own topic; designing my own research questions; designing my own activity; designing my own end product; peer feedback; teacher feedback; opportunity for self reflection; managing my own time and being able to use my IT skills. The rationale behind this question was that areas of confidence and ability would be shown in the learner's preference and enjoyment. The opposite would be true, in those areas where skills still needed to be developed would be indicated by learner's dislikes. A similar question was asked on the teacher's questionnaire, teachers were asked to identify the characteristics of co-creation that the learner's engaged in most and least. The response options to this questionnaire were the same as for the learners. The rationale for this question was that learners would be more engaged when they felt confident that they had skills to complete the task. Thus, areas identified as having low learner engagement would also indicate areas where skill development needed to occur.

This was then followed by an open ended question asking learners to explain any parts of the co-creation process that they found difficult. This was a more direct question than the closed ended question asked. This question provided the researcher with the opportunity to look for correlations between areas of enjoyment, or lack there-of, and areas that learners experienced difficulty. It also provided learners with an opportunity to provide further explanations on their answers. The teachers' questionnaire had a more direct question asking teachers to identify any skills that the learners required to complete the co-creation process.

General trends

For both the questionnaires given to learners there were questions included to establish learners' preferences in order to see if there were specific trends or patterns that may link to motivation. The intention of the researcher was to see whether questions that were linked to motivation, but that did not directly ask about motivation directly, would provide further insight[6].

For Phase One there was a closed ended question which was: 'how do you decide which project you would like to complete in PBL?' Possible responses to this question included: something that interests me; something that my friends are completing; something that will help with Grade 10 – 12; something that I think will be easy and I will do well in; something that is being run by a teacher I like. The following open ended questions were asked: Identify something you liked about the project and identify something you didn't like about the project that you would like

[6] The inclusion of questions that linked to motivation, but did not ask learners about motivation directly contributed to the convergent validity of the study.

taken out of the project. The rational for these questions has been discussed under research question one above. Two questions were then asked on both the teachers' and learners' questionnaires. The first question, 'how would you improve the project?' was asked by the researcher in order to gain insight into how the project, and thus the teaching within the classroom could be improved. As discussed above, one of the purposes of action based research is to improve the practices of the researcher (Morrison, 2006). The second question, 'do you have anything you would like to add about the first (traditional PBL) project. This provided all participants with an opportunity to elaborate on any of their responses, which added to the depth of the data collected.

For Phase Two there was one closed ended question that asked how learners had decided on the topic for the co-creation project. Possible responses included something that interests me; something that my friends are completing; something that will help in Grade 10 – 12; something that I think will be easy and I'll do well in or something I thought would challenge me. This question was similar to the question 'how do you decide which project you would like to complete for PBL' these similarities in the design of the questionnaire were intentional to allow for ease of comparison. Later on, in the questionnaire this question was followed by asking learners to identify if they selected their own or somebody else's project and asked them to explain their decision. This question was included to see if any trends or patterns emerged in the learners' choices and explanations. The trend that did emerge, is that what drove project selection in a traditional project, was different as to when learners had the opportunity to co-create a project. This finding is discussed in more detail in Chapter 6.

This question was followed by a close-ended question asking learners to identify which statement best described how they felt when co-creation was explained to them, possible options included: excited, as I can choose what I complete my project on; nervous, as I prefer to know exactly what is going to happen or indifferent, I didn't feel this project would be any different to the previous projects. This question was included as the anxiety of learners throughout the co-creation process is identified in the literature as something that needs to be managed when implementing co-creation as a teaching strategy (Iverson & Pedersen, 2017). This question was also asked to teachers, to establish if anxiety was also a concern within the teachers as the process was new to them as well as the learners.

In Phase Two the teachers' questionnaire had some additional questions, designed to provide the teachers with an opportunity to further explain their answers and provide further insight into the process for the researcher. These questions included asking teachers if they felt co-creation benefitted any group of learners in particular. This question was included as the co-creation process had initially been included in the PBL program at the school ad-hoc, to try and encourage engagement from learners who were not engaging in lessons. Teachers were asked to identify and explain any advantages and disadvantages to allowing learners to complete projects that they co-created. They were also asked if they felt co-creation should be incorporated into the PBL program at the FET school.

As with the questionnaire for Phase One, both teachers and learners were asked if they had any suggestions to improve the co-creation process. As discussed above, this was asked with the

intention of improving the teaching practices of the researcher. There was then a question asked if participants had anything further to add about the second project. This was asked with the intention of providing participants with an opportunity to elaborate on their responses.

3.4. Research Participants

Prior to the research being introduced to potential participants, ethical clearance had been attained from the Human Research Ethics Committee (non-medical) at the University of the Witwatersrand[7]. Written permission[8] was also attained from the Headmaster of the FET school prior to the commencement of the study. As the study took place within an ISASA school, permission from the Headmaster was sufficient to conduct research within the school. Permission from the Department of Education or ISASA is not required.

Once the necessary permission and ethical clearance had been obtained, the research was presented to the Grade 8 learners and PBL teachers. Both teachers and learners were then invited to participate in the study. Information letters and consent letters were then provided to all interested participants. These letters can be found in appendices 6-12. All teachers and learners who completed and returned the consent forms were included in the study.

[7] Ethical Clearance Certificate Protocol Number H20/02/05

[8] The letter requesting permission that was sent to the Headmaster can be found in appendix one. Information identifying the school has been removed.

Researcher as a Participant:

Qualitative research provides in-depth knowledge of the research setting and uses personal insight, feelings and human perspectives to understand the social context fully (Neuman, 2006). The researcher is a member of staff at the school, so had a dual role of being a participant and a researcher. This allowed for an immersion in process and the opportunity to use self-reflection when carrying out the study. The role of participant was also necessary, as the researcher had knowledge and experience in the use of co-creation, that was not held by all the members of the PBL teaching team. The researcher recorded any observations (such as discussions with staff and learners) that link specifically to the project in a research journal, which became a data source.

However, this methodology does run a higher risk of researcher bias. In order to minimise the researcher bias, the data collected from learner and teacher participants provided a parallel check to the observations recorded by the researcher, allowing the researcher to confirm evidence and look for internal consistency, thus limiting researcher bias and improving the credibility of the research. The use of multiple data collection points in the form of the learners' questionnaires and teachers' questionnaires was incorporated into the study in order to provide multiple perspectives on the process and limit researcher bias.

In terms of ethical considerations, any observations recorded by the researcher were recorded on a document stored on a password protected laptop. The observations recorded were around general trends and observations relating to learners' motivation and engagement throughout the research project. Observations regarding specific participants were recorded against the

participant's code. No identifying characteristics or personal details was recorded when making observations. Neither the researcher nor the school stand to gain financially from the research conducted.

3.5. Data Analysis

The data analysis completed for the research project was separated into the questionnaire responses for the traditional PBL project and the questionnaire responses for the co-creation project. The results for the traditional PBL project are described in Chapter Four and the results for the co-creation project are described in Chapter Five of the research report. Chapter Four and Chapter Five have been further sub-divided into the responses from the learners and teachers. In Chapter Six the researcher discusses the results from Chapter Four and Chapter Five. The analysis of the learners' and teacher questionnaires were separated into the analysis of closed ended questions and the open ended questions. The responses to the closed ended questions were analysed using percentages of participants who selected a particular response and by identifying the most common (mode) and least common responses.

For the initial phase of analysis for the open ended questions open coding was used. Open coding involves a preliminary analysis of the data in order to identify themes, this assists the researcher in condensing and categorising the raw data (Neuman, 2006). This initial phase was followed by axial coding. Axial coding involves the process of establishing connections among themes and elaborating on concepts (Neuman, 2006). In this phase of the analysis, the researcher focused on comparing the themes between the group of learner participants and teacher participants. The

second phase of data analysis involved the review of the observations recorded by the researcher in their own journal. The final phase of the data analysis involved selective coding where the researcher identified select data that supported the themes and concepts that have been identified. The results of the final coding can be seen in the results and discussion chapters as direct quotes from the data are used to substantiate the themes outlined by the researcher.

3.6. Ethical Considerations

As mentioned above, the research project only commenced once approval was received from the Human Research Ethics Committee (non-medical) at the University of the Witwatersrand. In addition to this, permission for the study was granted by the Headmaster of the FET school. As the research was conducted at an independent school, no further permission was required. The project required a number of ethical considerations to be taken into account as the learners who participated in the study were in Grade 8 and 9, thus the average age for participants was between 13-15 years.

Learners as Participants

The principle of voluntary consent was followed throughout the study. Participants were only involved in the study if they explicitly and freely agreed to participate in the study (Neuman, 2006). All learners were invited to participate in the study at the beginning of the study. This request was made verbally, and learners were then provided with a written Participant Information letter (Appendix 7) and Informed Assent Letter (Appendix 8). These letters outlined

the purpose and procedures of the study. Learners were made aware, that their participation was voluntary and would not impact either their sporting involvement or academics at the school. As the researcher is a teacher at the FET school, it was important for learners to understand that participation was voluntary, as the researcher does teach some learners academic subjects and coach sport to some of the learners. The risk of coercion was also mitigated as work completed during PBL at the school is not for marks and does not impact on the learner's aggregate. During the study, not all learners who formed part of the sample population took part in the study, this indicates that coercion did not take place.

The participation in the project on co-creation as well as the tasks being used to collect data formed part of the PBL curriculum at the school, thus participants were not advantaged or disadvantaged by their participation. The survey questionnaires are familiar to the learners as surveys completed on Microsoft Forms are common practice at the school and are used to collect learner feedback and information. As this format of collecting information from the learners was familiar and was completed during class time, it should have caused minimal stress and inconvenience for the participants.

As the learner participants are legal minors a Parent Information Letter (Appendix 9) and Informed Consent Letter (Appendix 10) completed by each of the learner participant's legal guardians.

Teachers as Participants

The teachers who teach PBL were invited to participate in the study at the beginning of the study. This request was made verbally, and teachers were then provided with a written Participant Information letter (Appendix 11) and Informed Consent Letter (Appendix 12). These letters outlined the purpose and procedures of the study. Teachers were made aware, that their participation was voluntary and that they will not receive any financial or professional advancement for their participation. As the researcher does not form part of the line management for any of the teacher participants, participation in the study did not impact on teacher appraisals, increases or promotions.

Confidentiality of Participants

Confidentiality is the ethical protection for those who are studied by holding research data in confidence or keeping them secret from the public; not releasing information in a way that permits linking specific individuals to specific responses (Neuman, 2006). In order to maintain confidentiality in the study, all participants were assigned a number of either 'Learner Number' or 'Teacher Number'. The researcher was the only person who was able to link these numbers to the participant details. This information will not be published or made available to anyone and was stored on a password protected laptop. No photographs of participants were taken during the study. All sources of data will be destroyed three years after the completion of the project.

Chapter Three has outlined the research methodology that was implemented to conduct the research. Chapter Three has included a description of how the project was divided into Phase

One and Phase Two of the project and the data collection that occurred during each of these phases. The method of data analysis that was used to analyse the questionnaires has been explained, and these results are shown in Chapter Four and Chapter Five. The links between the research questions and the questionnaire have been outlined, these links will form the basis of Chapter Six.

Chapter 4: Results Phase One Traditional PBL Project

4.1. Overview

Phase One of the research project involved learners selecting and completing a traditional PBL project. Initially, when PBL was introduced at the school, the teachers were required to each submit a project and these projects formed a project bank. The projects made available to the learners are pre-selected based on the expertise of the teachers teaching PBL during that Term. Although some teachers teach PBL for the entire year, others rotate in termly based on their other academic demands. The teachers were allocated a specific project to facilitate based on their area of expertise. The researcher was the only person who facilitated a project of their own design. The remainder of the teachers involved, were not involved in the design of these specific projects.

The projects that learners could choose from were as follows:

1. Minecraft Build Challenge: In this project learners participated in a competition being run by Microsoft. Learners were required to research the United Nations sustainable development goals and design a sustainable future. Learners were required to submit a two-minute video where they explained their worlds. These videos were then entered into the competition being run by Microsoft. The driving question for the project was 'How do we create a more sustainable planet?
2. Beatles: In this project learners researched The Beatles Band. This research included researching the biographies of the different band members. It also involved looking at the song lyrics and their meaning within the context of the society. Learners then completed a presentation on their findings. The driving question for the project was 'Are The Beatles lyrics and songs still relevant?'

3. Plague: In this project learners researched aspects of the Covid-19 pandemic. They then used the computer (cellphone) game plague to manipulate an outbreak. This manipulation involved changing the starting point of the outbreak, the characteristics of the disease as well as the symptoms and then seeing how a change in these variables impacted on the outcome of the disease. Learners then completed a presentation of what they had learnt. The driving question for this project was 'Does the computer game "Plague" accurately reflect a possibility of global extinction?'
4. Fake News: In this project learners researched the various aspects of misinformation and how it spreads over a viral platform. They then used an adaption of the game Plague to create and manipulate a news story. The manipulation involved changing where the misinformation originated, the type of misinformation e.g. political versus scientific misinformation, who starts the misinformation e.g. politicians vs celebrities and the motivation behind the misinformation. These different variables then impacted on the outcome of the spread of the misinformation. Learners then completed a presentation of what they had learnt. The driving question for this project was 'In the age of social media, news channels and technology, we have access to all the information we could possibly need. The question is who and what do we believe?'
5. How do I: In this project the driving question was 'How do I'. Learners needed to create an explanatory video for future learners on how to use one of the existing technologies within the College's resource center for example the 3D printers. Individual learners also adapted this project and requested to make demonstration videos of some of the software that they had, had to master in their Grade 8 Year, for example MS Outlook.

Two out of the twenty-three participants selected the Beatles Project, five selected the Fake News Project, four selected the How do I Project and six learners selected the Plague and MineCraft Projects respectively. Learners selected the projects independently, however, once the project was selected, they were given the option of working independently or on their own. Learners were allocated to a teacher to complete the project. The teachers were allocated projects based on their own expertise. Upon completion of the projects the learners who agreed to participate in the study were asked to complete the questionnaire in appendix 2.

The questions were designed to elicit reposes from learners on what influenced their selection of projects, what influenced their motivation in the course of a project and the factors that impact on engagement over the course of a project. Learners likes, dislikes and suggestions for improvement with regards to the projects were also considered. The questionnaire consisted of both closed and open ended questions.

In what follows, learners' responses to the questionnaire are presented, this is then followed by the response of teachers to the questionnaire. When the researcher has observations that corroborate, contradict or elaborate on a point raised by a participant these have been included.

4.2. Learner Responses to Questionnaire

The initial questions on the questionnaire focused on factors that influence project choice and motivation. The results are shown in the table (table 4.1) and graph (figure 4.2).

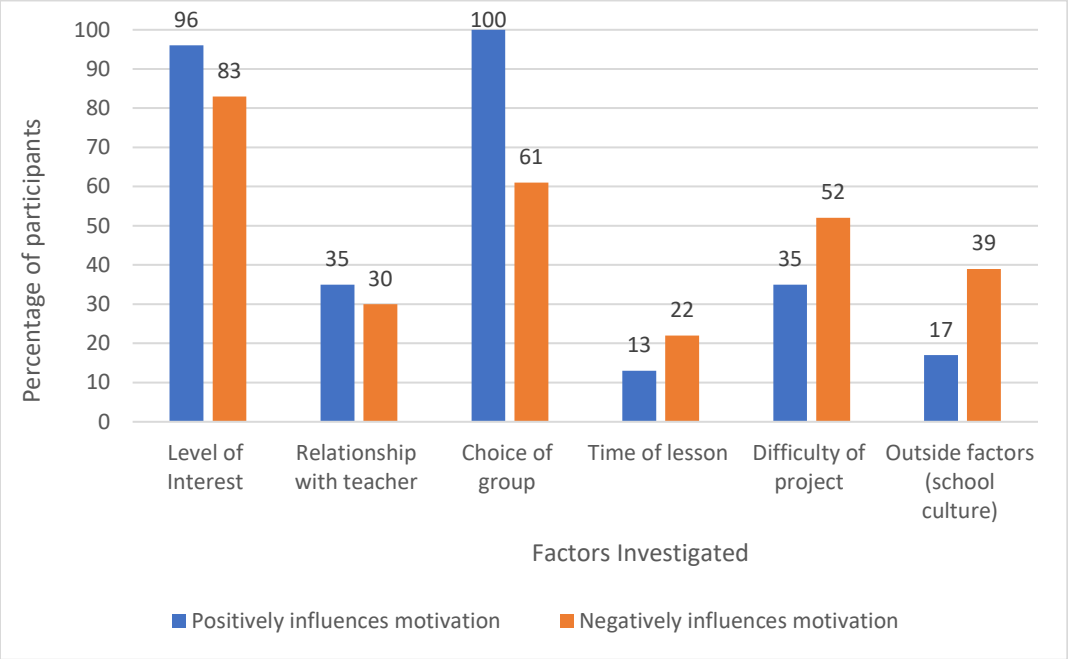
Table 4. 1

Table showing learner's responses on factors that impact on project selection and motivation.

Question	*How do you decide which project you would like to complete in PBL? I pick…*					
Possible participant responses	Something that interests me	Something that my friends are completing	Something that will help in Grade 10-12	Something that I think will be easy, and I'll do well in	Something that is being run by a teacher I like	
Percentage of learner's who selected option	96	22	17	17	4	
Question	*Select the three factors that positively influence your motivation to engage in a topic*					
Possible participant responses	interest in the topic	my relationship with the teacher running the project	being allowed to pick my group or work on my own	the time of day that the lesson is taking place	if the project has enough to challenge me but does not make me feel overwhelmed.	Outside factors, that affect how I feel e.g. being tired from sports practice, or having a good because I saw a friend
Percentage of learner's who selected option	96	35	100	13	35	17
*Note: two learners selected more than three factors, in this case their first three responses were used.						
Question	*Select the THREE factors that NEGATIVELY influence your motivation to engage in a project...*					
Possible participant responses	being assigned a topic that I am not interested in	my relationship with the teacher running the project	being assigned group members or being forced to work on my own	the time of day the lesson is taking place	if the project is too difficult or too easy	Outside factors, that affect how I feel e.g. being tired from sports practice, or having a good because I saw a friend
Percentage of learner's who selected option	83	30	61	22	52	39
*Note: one learner selected more than three factors, in this case their first three responses were used.						

Figure 4. 2

Bar Graph showing Influences of different factors on learner's motivation.



As can be seen in Figure 4.2. the ability to choose one's group members or to work on one's own, was the mode for the data set on what positively influences motivation. Level of interest was the mode for the data set on what negatively influences motivation.

The next questions on the questionnaire focused on motivation and engagement over time. The results are shown in the table (table 4.3) and graph (figure 4.4.)

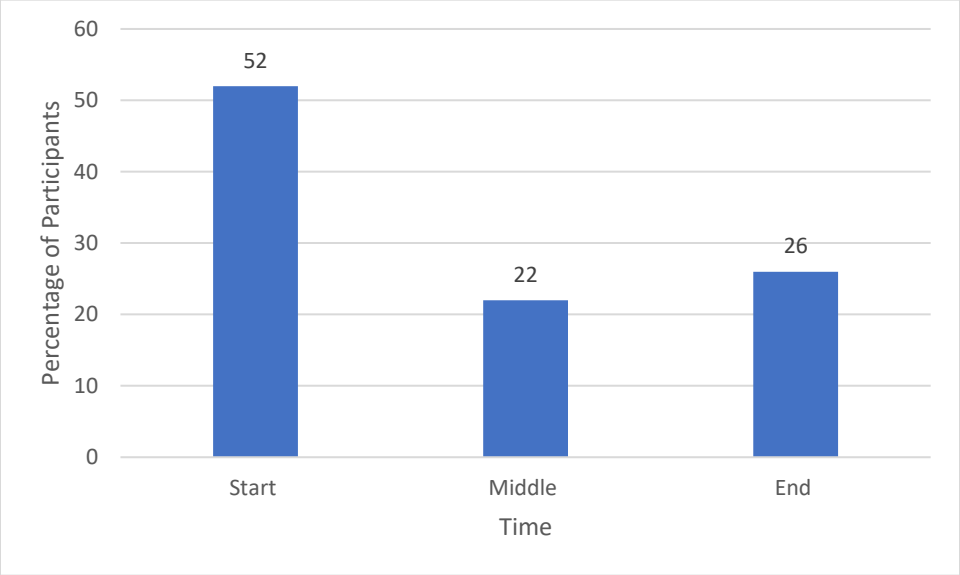
Table 4. 3

Table showing learners' responses regarding motivation and time

Question	*Select the most correct response:* *I feel motivated…*		
Possible participant responses	at the start of a project, as it is something new and exciting.	In the middle of a project, as I understand the project and am beginning to see results.	Towards the end of a project, as I can see my goal is about to be achieved.
Percentage of learner's who selected option	52	22	26

Figure 4. 4

Bar graph showing at which point in the project learners felt they were most motivated



As can be seen in the graph (figure 4.4), learners were most motivated at the start of the project.

Motivation then dropped towards the middle of the project and increased towards the end.

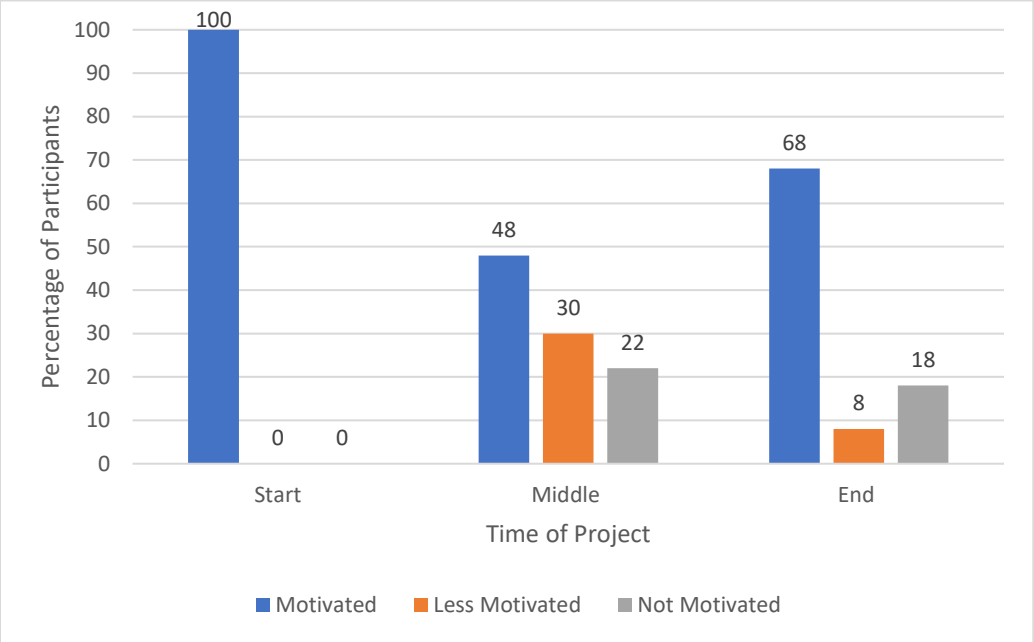
The questionnaire then asked three open-ended questions regarding motivation to engage in the project at beginning, middle and end. These three questions were worded as follows:

1) How motivated did you feel to engage in this project, when you started?
2) How motivated did you feel towards the middle of the project?
3) How motivated did you feel towards the end of the project?

In response to the first question, all of the participants identified themselves as being motivated to complete the project. In response to the second question, 48% of participants identified as being as or more motivated to engage in the project, 30 % of participants identified as still being motivated, but less than they were at the start and 22 % identified as being demotivated. In response to the third question 68 % of respondents identified as being motivated to engage, 8 % identified as still being motivated, but less than they were at the start and 18 % of participants were demotivated at the end of the project. Responses from three of the participants were not considered for these questions as they did not explicitly answer the question, and the researcher was unable to infer motivation from the context of their answers. The responses for the three questions on learner motivation at different stages of the project are shown in the graph (figure 4.5).

Figure 4. 5

Bar graph showing at which point in the project learners felt they were most motivated



There are common themes that emerge in the participants' written responses to the three questions above. These common themes are: personal interest in the topic, group dynamics, newness, characteristics of computer games, technology, relationship with the teacher, time management, sense of achievement and school culture.

Personal Interest

At the start of the project, 29 % of participants expressed that their motivation to complete the project was linked to their level of interest in the topic. This is shown by the statement from Participant 17 who expressed that "Science is something I've always been interested in, and the project excited me". Topics that were perceived to be relevant to the learner's lives increased their level of interest, this is shown in the statement by Participant 22 who expressed that

“learning about the fake news also applied to small things like rumours spread within a grade”. As the project progressed personal interest influenced motivation, Participant 10 identified that “I was very motivated as it got more and more interesting as time went on”. 8 % of participants indicated that a drop in personal interest did result in a decrease in level of motivation. This can be seen from Participant 2 who identified that the “Coronavirus timeline did not intrigue me” and as a result their level of motivation decreased.

Choice of Group

At the start of the project, 22 % identified being able to select their group members or work on their own as a motivating factor. Participant 17 expressed that “members in my group helped make me feel motivated to do this project - not only because they are my friends, but they are also hard workers.” Although Participant 12 decided to work on their own, the sentiment expressed in their statement “(I) knew I was going to have fun because I was working on my own” confirms that group make up, or the option to work individually, does influence learners’ motivation.

Group dynamics continued to influence motivation throughout the project, with 13 % of participants identifying group dynamics as a factor that influenced motivation at the middle and the end of the project. In the middle part of the project 8 % of participants identified a positive group dynamic as contributing positively to a willingness to engage. This was evident in groups where the learners had good working relationships. This is shown in Participant 17’s statement where they express that “Each group member chose a specific section of the project which helped

me focus only on my section." Participant 18 had a similar experience where the group dynamic enabled the sharing of work, and this contributed positively towards motivation. They expressed this as follows: "we all had special talent that we contributed, which was fun." In the middle of the project and at the end of the project 4 % of participants identified group dynamics as negatively impacting on motivation. This group dynamic included disagreements on how decisions were made, or an unfair distribution of work. This is evident for Participant 8 who stated that: "I feel I did the most work and felt the most stressed."

Newness

At the start of the project, the idea of beginning something new was a motivating factor for 22 % of participants. Interest in the novelty of a new project was evident in the learners' comments, particularly for those who engaged in the projects that involved computer games. This factor was evident for Participant 18 in particular who wrote that "despite the fact the none of my friends did not pick the project…it was my chance to start something new and see what I like." Towards the middle of the project, this factor had the reverse impact where Participant 4 identified that there was a "recurring theme (which) became very tedious and quite boring"

Characteristics of Computer Games

Three of the projects included an aspect of computer or cellphone games. In the Minecraft Project, the program Minecraft was used to create a virtual world that demonstrated the learners understanding of a sustainable environment. Thus the game was used to present the learners knowledge. In the Plague and Fake News Project, the game Plague and Plague- Fake News

Addition, were used to create simulations under which a Plague or Fake News would spread. Learners were able to change the variables of the game and in doing so, alter the outcome. The characteristics around the computer games that influenced learner motivation included the novelty of being allowed to play a game for school work, the learner's skill in the game, the difficulty of the game and if it held the learner's interest, and the relevance of the game to the learner.

30 % of participants identified being allowed to play a computer game as a motivating factor at the start of the project. The majority of these participants expressed that they found the games fun, and there was an aspect of novelty around being allowed to game in class. This motivation was also linked to competency within the game as expressed by Participant 15 who stated that, "being good at Minecraft really motivated me to do this project." Participant 20 was skeptical of the use of gaming stating that "when we started playing games, I thought that this was kind of childish." However, as the project progressed, they stated that "it was a new way of approaching the project. In the end I liked it very much." The positive impact of including computer games on the learners' motivation did continue for 8 % of the participants, with Participant 20 noting that by the middle of the project "I felt even more motivated than at the beginning because I was focused on finding a strategy to win the Plague game." However, this feeling was not sustained through to the end of the project where they (Participant 20) felt, "Possibly a bit less focus on the game, and more on focus on practicalities such as research, and more real-world thought." Overall, 18 % of participants noted that the game did not remain a motivating factor past the

initial stages. In the middle of the project Participant 2 noted that “Frankly, I felt bored. The novelty of playing a game had worn off.”

It is noted by the researcher, that in the Plague and Fake news project, the link between the game and the academic content of the project required facilitation. This is significant in terms of the development of projects as these links need to be clear. When games are used to develop learners’ understanding of content, the purpose of the game needs to be understood by the learner and where necessary application of the game to the theory needs to be facilitated. It is important, that unless the sole intention of the game is to spark interest in a topic, that learners do not view playing the game as a fun activity within a project, but rather as a means of constructing knowledge.

Technology

12 % of participants identified problems with technology as a factor that impacted negatively on their motivation. Two of these learners completed the project with the 3D printers which had a blockage that required a technician, and one learner accidently deleted their world in Minecraft. Participant 3 and Participant 12, both note their frustration with the 3D printers in the middle of the project. The impact of this factor though on their motivation varies between the Participants by the end of the project Participant 3 is not motivated, and expresses that they are, “Even more annoyed and a bit mad because every time someone tried to print it got blocked and we had to fix it again.” Where Participant 12 has taken a different approach and worked on other components of the project, they state that “I was a lot more motivated compared to how I was

feeling in the middle of the project. I decided to just start working on my guide. I enjoyed working on my guide and I enjoyed presenting it. I was a little upset at the fact that I wasn't able to actually print my design, as the printers weren't fully operational."

The responses of Participants 3 and 12 demonstrate that the overall impact that a problem with technology has on the learners is influenced by their own personal response to the problem. Participant 3 allows the problem with the technology to influence their motivation negatively thus the problem with the technology influences other aspects of the project. Participant 12 focused less on the problem with the technology, and although they acknowledged the problem, they did not allow it to impact the entire project. Thus, the ability to respond to challenges, and refocus one's energies plays a role in the ability of participants to overcome challenges with technology.

Relationship with the Teacher

8 % of participants identified their relationship with the teacher as a motivating factor. This is best illustrated by the statement from Participant 12 who expressed that: "I was happy to have had the opportunity to work with Mr… as he is quite approachable, and I was able to ask him any question".

Time Management

Time is indicated as a factor that impacts both positively and negatively on learners' motivation. At the beginning of the project 8 % of learners respond positively to being allowed to work at

their own pace. Participant 19 expresses that, “I liked working at my own pace and this let me explore the endless limits to the project.” In contrast to this Participant 20 expressed that, “I also felt that the questions that we were given to answer were daunting, because they had a deadline and we had to complete it before that deadline.” In the middle of the project 8 % of learners continued to identify time as a factor that impacted on motivation, Participant 13 expresses that, “I was quite anxious in the middle of the project because I wasn't sure I would finish in time” whereas Participant 19 felt that “there was still lots of time to complete the project and this made me feel unmotivated.”

At the end of the project 22 % of candidates identify time as a factor that impacted on motivation, again though, their experiences differ between learners. 8 % expressed a focused approach to the project as they needed to finish, where as 12 % identified that they finished early and had nothing to do. This is shown in Participant 21’s statement that, “the only issue was that I finished early, and didn't really have PBL work to do.” Participant 15 identifies being rushed as a factor that demotivates him, as expressed in his statement, “I was also a bit demotivated as I really do enjoy taking my time building or accomplishing something in Minecraft and not feeling rushed is something I enjoy.” Participant 8 statement about the end of the project, illustrates the extent to which some of the learners, struggled to manage their time through the course of the project, “because I knew I wasn't previously doing work at the pace I was supposed to which meant I had much more work to do at the end than the rest of the project.”

Sense of Achievement

A sense of achievement was identified as a motivating factor by 26 % of learners in the middle of the project and 56 % of participants at the end of the project. This sense of accomplishment incorporated the acquisition of knowledge as expressed by Participant 10 who said that in the middle of the project they were, “starting to learn a lot about the different viruses.” Mastering the content and skills required created a sense of accomplishment, as Participant 7 expresses in the middle of the project that, “I was more motivated due to the fact that I was getting the hang of the project and what we were doing.” Learners were motivated when they viewed the content as being relevant and were able to apply what was learnt to their current reality, this is shown by Participant 22 who expressed that, “I was able to apply the knowledge I had learnt about political fake news to what was happening in the USA election.”

The presentation of their work to their peers had either a positive or negative impact on learners’ motivation and sense of achievement or lack thereof. At the end of the project Participant 9 expresses that they were, “nearly done and it was looking good” they go onto explain that, “We worked the best the two days before we had to present as we were motivated to not make a complete fool of ourselves.” Participant 13 expresses that their project was, “looking exactly how I wanted it” This is in contrast to Participant 4 who expresses that they were “feeling ashamed of my project because it was boring.”

External Factors and School Culture

On the questionnaire learners were asked to identify any external factors that impacted on their motivation. The researcher had intended to name this category ‘external factors’ to account for a variety of factors that were specific and unique to an individual participant. However, in the written responses a similar theme of school culture emerges, across the participants. School culture refers to the beliefs, perceptions, relationships and attitudes that influence and shape how a school functions (The Glossary of Education Reform , 2021). The busy and pressurised environment of the school that contributes to stress and learner fatigue impacted negatively on motivation. Stress around the upcoming examinations emerged as a factor for one participant that impacted negatively on motivation in PBL.

The next question on the questionnaire considered sustained enquiry, but it was phrased differently to the questions above. The question asked: “Did you feel you worked at the same level throughout the project? If not, why? Try identify a day in which you worked at your best and worst? Comment on what happened that made these days different”. The results from these questions are shown in the table (table 4.6) and graph (figure 4.7).

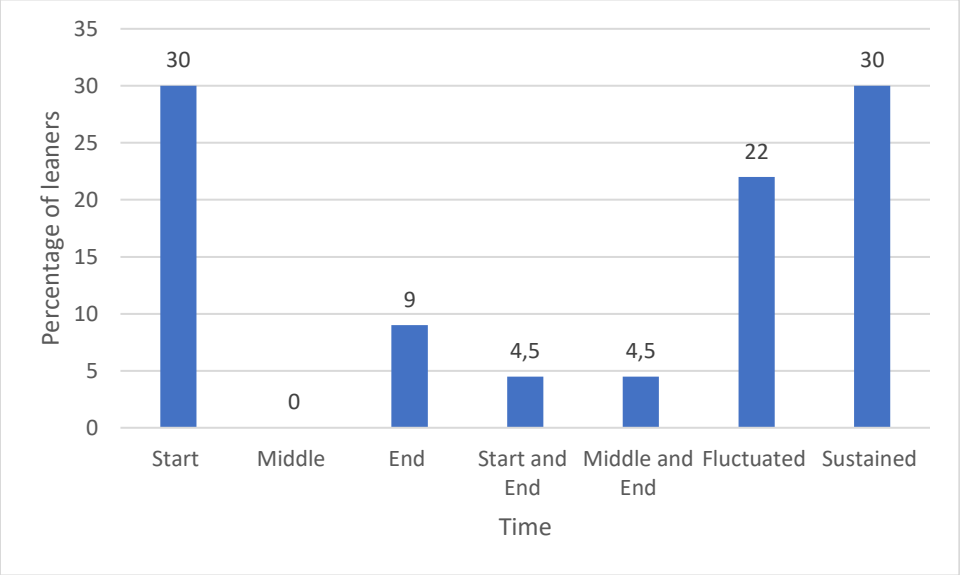
Table 4. 6

Table showing times during a project that learners identify as being engaged

Time of Project	Percentage of learners
Start	30
Middle	0
End	9
Start and end	4.5
Middle and end	4.5
Engagement fluctuated	22
Consistently Engaged	30

Figure 4. 7

Bar graph showing the times during a project that learners identify as being engaged



Figures 4.6 and 4.7 correlates with figures 4.4 (page 63) and 4.5 (page 65) showing that motivation and engagement are highest at the beginning and end of the project. The themes that emerged were correlated with the themes from the previous questions. These included level of interest, group dynamic, relationship with the teacher and school culture. One new theme emerged from this question, namely, the structure of the project.

The impact of level of interest on learner's engagement is illustrated by the comment made by Participant 13, "I was more motivated to do the things that I was interested in and found more enjoyable. I didn't like taking the printers apart to try and fix them-so I didn't work as hard then. I really enjoyed doing my guide and presenting it, so I worked really hard on this."

The importance of being able to select one's group and the relationship between the learners and teacher is highlighted in the statement from Participant 8 who wrote, "The days where I worked the worst were the few days where we weren't allowed to talk which means we had to try and do group work without communicating with my team". This further emphasised by Participant 16 and 19 who identified the week online as the week where they were least engaged. Participant 19 says, "I found that I worked the least when I was online, as I wasn't with my partners, and I wasn't under the pressure from my peers to work in class."

The impact of school culture on learner's motivation is shown by 18 % of participants identifying fatigue as a factor that impacted negatively on motivation. Participant 5 states that, "I didn't do any work as I was very tired", Participant 7 who stated, "I worked better when I was not tired", Participant 11 who said, "I think I was just really tired" and Participant 19 who said, "I worked the best when PBL was one of my early lessons and I didn't have a cultural at the beginning of the day, I think was because I wasn't tired and could focus on the tasks at hand".

It is noted at this point, that fatigue is identified by both the researcher and in a conversation with one of the teacher participants, as being caused by the high-pressured nature of private

schools within the South African context. The FET School where the research was conducted forms part of the Independent Schools Association of South Africa (ISASA). The school has a reputation for producing high academic results and offers a variety of co-curricular activities. Although enjoyed by many learners, there is pressure on learners to make the most of the opportunities afforded, particularly given the expense of attending the school. This does contribute to learner fatigue, when learners engage in too many co-curricular activities. Fatigue is also noted in a number of staff members, who try to balance both their academic and co-curricular demands. As PBL is not a subject that appears on learner's academic report cards, it is often perceived as being less important. For some learners, this adds to the appeal of PBL in that they are able to enjoy learning without the additional pressure of marks and averages. For other learners, it is the subject where they disengage and relax. The same trend is noted amongst the teaching staff. As teaching PBL does not form the core responsibility of many academic teaching staff and is not considered in teachers' performance reviews it is considered less important than other academic commitments. When under pressure teaching staff will often allow their learners to continue working on their PBL projects and use the time to catch up on their academic work for example marking.

The need for the projects to be structured in a manner that facilitates engagement begun to emerge and is expressed by Participant 20: "I worked my best when I had a set plan for what I wanted to achieve in this specific lesson." It is noted by the researcher, that teachers who presented a project they had designed or familiarised themselves with, were best equipped to provide the external structure required to support the learners. One of the areas, that requires

review is that the researcher was the person responsible for the overseeing of all of the projects and would often rotate into classes to provide assistance. Where some teachers took ownership of their classes, others were reliant on the researcher to answer questions of learners and provide guidance on how far the learners should have completed, and where they needed to progress to in the following lesson.

The correlation between figure 4.4 (page 63), figure 4.5 (page 65) and figures 4.6 and 4.7 (page 74) shows that motivation does impact on engagement. This trend is expressed by Participant 19 who states, “If you can choose something that you are interested in, you are more likely to put more effort into the project.” However, the researcher does recognise that this is a general trend and there are exceptions. This is shown by Participant 21 who expressed, “I do feel as though I worked the same throughout the project, even though my motivation wasn't the same my work quality did not decrease.”

The questionnaire then asked three questions around likes, dislikes and suggested improvements. These were phrased as follows:

1) Identify something you liked about the project.
2) Identify something you didn’t like about the project.
3) Suggest a way to improve the project.

The common themes in the participants’ responses to these questions echoed the one’s above. These were: personal interest in the topic, choice of group, novelty of gaming, technology,

relationship with the teacher, time management and structure of the project. Themes that did not correlate with the themes for the previous three topics were newness and sense of achievement. One new theme emerged from these questions, and this was learner choice.

In response to the question: identify something you liked about the project, 26 % of the learners selected the gaming component. Participant 15 expressed that, “I really enjoyed using my knowledge of Minecraft to do something useful with it. It made me happy as when it was a PBL lesson I felt that PBL was something that took my mind off of school stress and made me play a game I enjoyed.” 43 % of participants identified an interest in the topic content or skills developed. 22 % identified being able to select their own group or having the choice to work on their own. Participant 19 expressed that, “I liked that I could work with who I wanted to. This is an important skill for the future as you have to make the right choice in terms of how productive you would be.” 4 % of the learners identified the flexible timetable as an area of the project that they liked. 17 % of learners identified having greater choice, as an aspect of the project that they liked. This is expressed by Participant 13 who responded, “I really loved the freedom to both, present the project in whatever way I wanted to and to be able to have the option to work by myself.’

In response to the question: identify something you didn’t like about the project. 43 % of learners identified frustrations with the structure of the project. These frustrations included too much research and a need for more practical activities. A need for clearer instructions was identified, as expressed by Participant 13 who commented that the outline of the project timeline provided

“added pressure as it was vague and didn't give me dates, which I personally would prefer because I like diarising things.” Another aspect of the project that learners did not like was limited choice. This was expressed as learners were frustrated with teachers who specified the required presentation format. The need for choice was emphasised by Participant 17 who stated, “I would find it better to have a conversation with the class about our project instead of making us present on PowerPoint (or) Sway” This was echoed by Participant 19 who expressed that, “I would have taken out the rules as to how we needed to present. By limiting us to only presenting in a particular way, you are limiting our creativity.” Participant 21 noted that he had been able to select his style of presenting, but stated that, “If I had chosen a different project, I would not have liked the fact that we were forced to present in a certain way. The freedom of choice is a large portion of the enjoyment of PBL.” Difficulties with technology were identified by 17 % of the learners as an aspect of the project that they had not liked. These difficulties included a delay in software licenses, difficulties with the 3D printer and an inability to download on their own computer devices. Too little time was identified as a problem by 9 % of the learners. 9 % of learners also identified teachers being disengaged as an aspect of the projects that they did not enjoy. This is expressed by Participant 4, “The teacher chosen for the project, Mrs … was an appropriate teacher for the topic as she teaches science, however, I felt that she was more focused on doing her own work and was not engaged with the class at all. This made the lessons feel like a waste of time or an opportunity to do something else. Participant 16 expresses a similar sentiment, “I didn’t like how we were just left to just do whatever and how it presented so many opportunities to slack-off.” As noted by the researcher above, this observation by the learner

speaks to the overall culture of the school, with teachers viewing PBL as being of lower priority than their traditional academic subjects.

The suggestions to improve the projects, mirrored the points expressed by the learners in the question on aspects of the projects they had not liked. The responses varied between the learners with the most common suggestion being the need for more practical tasks or discussions and the need for clearer instructions. This was best expressed by Participant 15, “I also strongly recommend that there is more communication between learners and teachers.” The theme of choice was also evident with Participant 4 requesting the opportunity to select the teacher to take the project. Participant 19 expressed that, “I think if you create more projects to choose from, more people will find something that they are really interested in. If you can choose something that you are interested in, you are more likely to put more effort into the project.”

Prevalence of Emergent Themes

Once the themes described above had been identified the researcher considered the percentage of candidates who identified a theme. As this particular analysis focused on the prevalence of the theme within the sample rather than the impact of the theme on motivation, the researcher did not consider if a theme was identified as either positively or negatively impacting on motivation. For example, if a candidate identified having an interest in the subject as a motivating factor and another candidate identified a lack of interest in the subject as being demotivating, both candidates were considered to have identified interest as a factor that impacted motivation overall. The results for this analysis are shown in the table (table 4.8) and graph (figure 4.9).

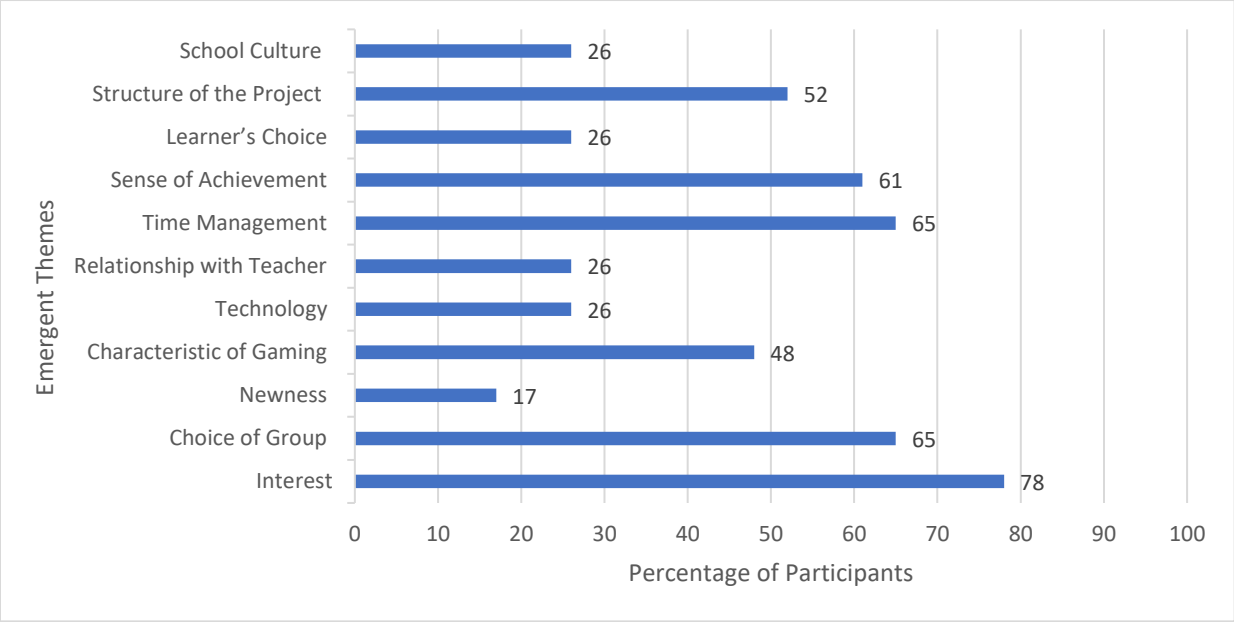
Table 4. 8

Table showing the percentage of participants who identified a theme as influencing motivation

Theme	Percentage of participants who identified factor as influencing motivation and engagement
Interest	78
Choice of Group	65
Newness	17
Characteristic of Gaming	48
Technology	26
Relationship with Teacher	26
Time Management	65
Sense of Achievement	61
Learner's Choice	26
Structure of the Project	52
School Culture	26

Figure 4. 9

Graph showing the percentage of participants who identified a theme as impacting on motivation



As can be seen in figure 4.8 and figure 4.9, a learner's level of interest, followed by their ability to choose a group and manage their time are the factors that are identified the most by learners as having an impact on motivation.

The researcher then looked at the extent to which a theme impacted on motivation. This was done by counting the number of times a theme was mentioned by all of the participants. Thus a theme that was mentioned many times by a participant, was taken to have a higher impact on motivation, than a theme that was mentioned less. As with the previous question, if a theme was identified either positively or negatively it was counted towards the tally. The results of this analysis can be seen in the table (table 4.10) and graph (figure 4.11)

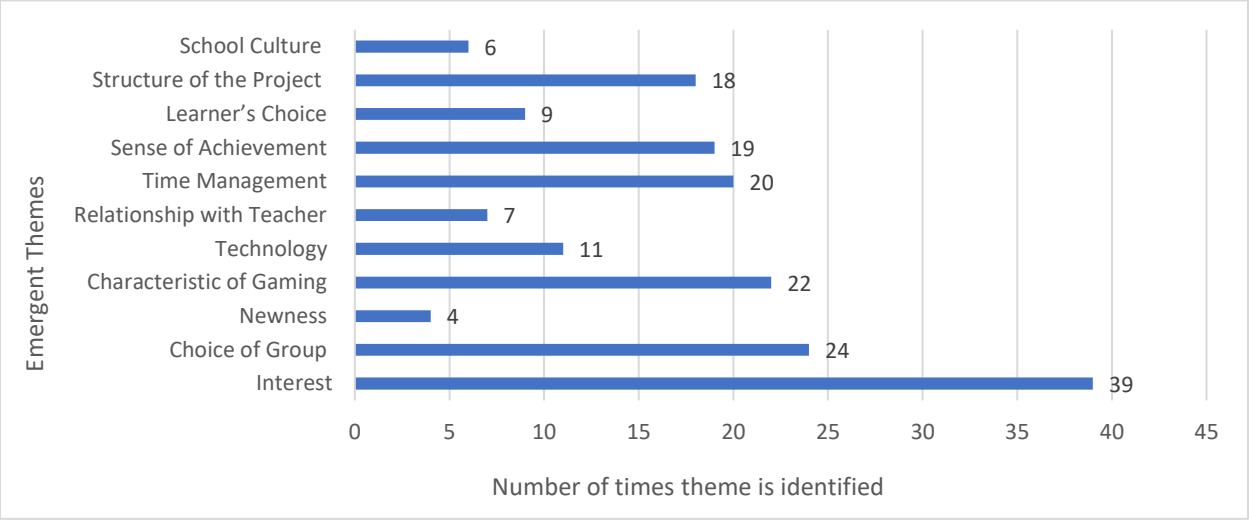
Table 4. 10

Table showing total number of times a theme is identified as impacting on motivation

Theme	Total number of times identified
Interest	39
Choice of Group	24
Newness	4
Characteristic of Gaming	22
Technology	11
Relationship with Teacher	7
Time Management	20
Sense of Achievement	19
Learner's Choice	9
Structure of the Project	18
School Culture	6

Figure 4. 11

Graph showing the number of times a theme is identified as impacting on motivation

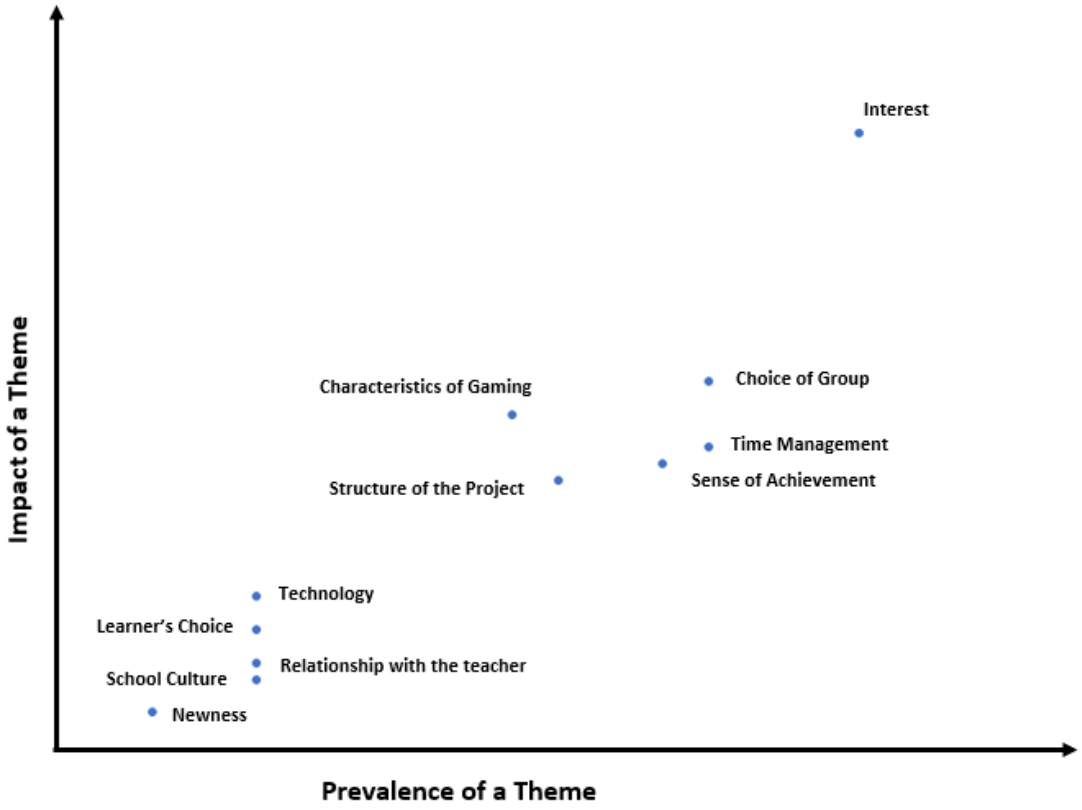


As can be seen in figure 4.11, interest in a project, choice of group and characteristics of gaming are identified most frequently by participants as influencing motivation. Newness of a project and the culture of the school are mentioned the least frequently.

The information from figure 4.9 (page 81) and figure 4.11 (page 83) was then combined to provide the researcher with a comparison of the themes if one considered both prevalence and impact. This information is shown in the graph (figure 4.12).

Figure 4. 12

Graph showing the prevalence and impact of themes on learners' motivation



As can be seen in figure 4.12, a learner's level of interest is the most important theme as it impacts the highest number of learners and has the greatest impact on motivation and engagement. The newness characteristic of projects, emerges as less important as it impacts the lowest number of learners and has the least impact on motivation and engagement. The remaining themes can then be assessed relative to each other depending on their placement within the graph.

Although the analysis of considering themes both in terms of their prevalence and impact was useful as it allowed for comparison. It was evident that some themes were only mentioned in

either a positive or negative context for example, the use of technology was not identified by any of the participants as influencing motivation positively, however, when problems with the technology arose, it is evident that it has a negative impact on motivation. Thus, the number of times a factor was identified as either positively or negatively influencing motivation was considered. As with the previous analysis, the number of times a theme was mentioned, was considered to be an indicator of the extent to which the theme had impacted on motivation. The information regarding how many times a factor is identified as either positively or negatively influencing motivation, is shown in the table (table 4.13) and graph (figure 4.14) below.

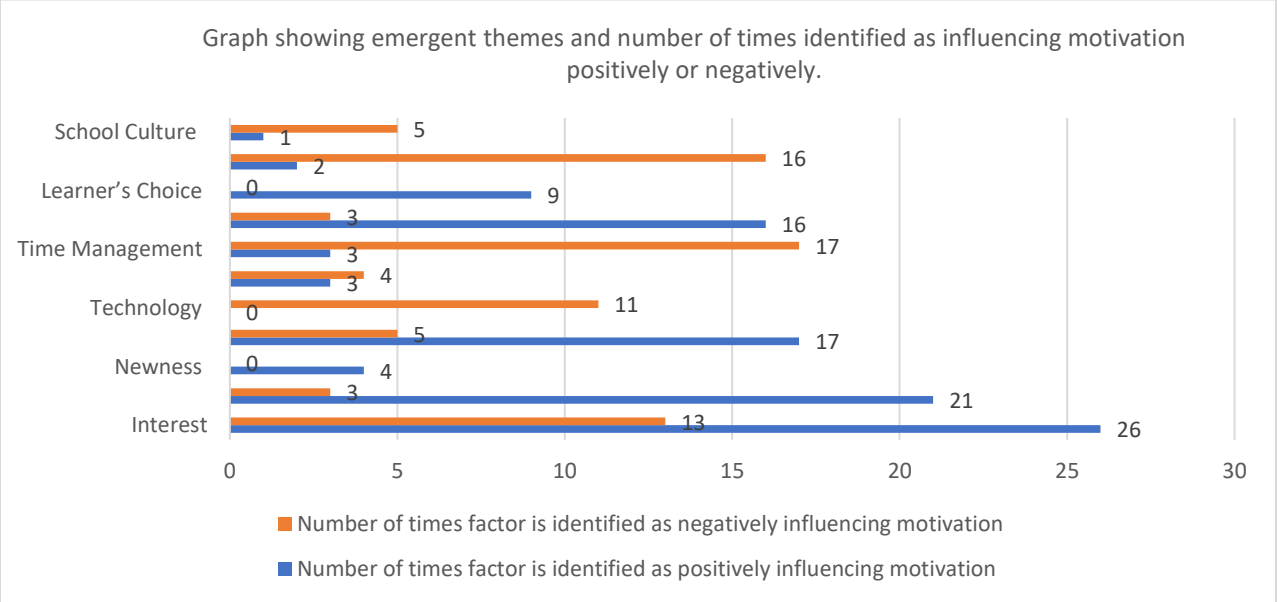
Table 4. 13

Table showing the number of times a theme was identified by participants as influencing motivation positively or negatively

Theme	Number of times factor is identified as positively influencing motivation	Number of times factor is identified as negatively influencing motivation
Interest	26	13
Choice of Group	21	3
Newness	4	0
Characteristic of Gaming	17	5
Technology	0	11
Relationship with Teacher	3	4
Time Management	3	17
Sense of Achievement	16	3
Learner's Choice	9	0
Structure of the Project	2	16
School Culture	1	5

Figure 4. 14

Graph showing the number of times a theme is identified by participants as impacting either positively or negatively on motivation



As can be seen from Figure 4.14, learners' choice is only identified as enhancing motivation and technology is identified as impacting negatively on motivation. This finding correlates with the learners' statements quoted in the discussion above. The themes that are seen to influence motivation positively the most are interest in the project, the ability to select one's group and characteristics of gaming. The themes that are seen to influence motivation negatively the most are an inability to manage one's time, the structure of the project and learner's level of interest.

4.3. Teachers Responses to the Questionnaires

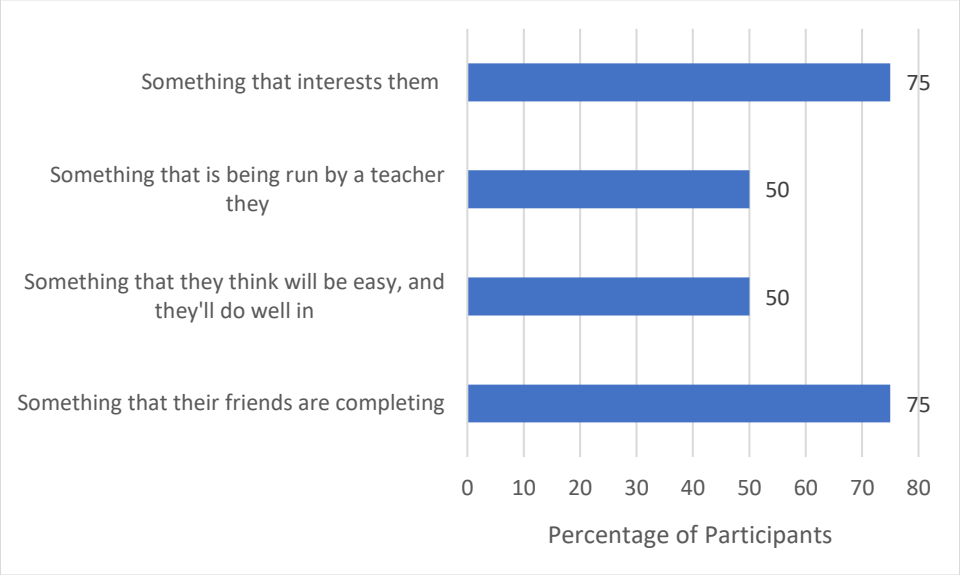
In Phase One of the project four of the six teachers who facilitated projects agreed to participate in the study. Of these four participants, three completed the questionnaire in hard copy and one participant completed the questionnaire online. Each of the teachers who completed the questionnaire were involved in the facilitation of a different project. The only project not

represented by the research sample is the Plague Project, however, observations on this project are recorded by the researcher themselves. Although the researcher did rotate into the other teachers' classes, to provide assistance when needed, each of the individual teachers were responsible for providing facilitation to a specific group of leaners. In addition to providing support to all the learners, when necessary, the researcher was responsible for a specific group of learners. This group of learners had selected a mixture of all the projects. In terms of the physical structure of the school, the classrooms used for PBL are relatively close together and have inter-leading doors, allowing for ease of movement between venues.

In response to the question 'How do you think learners decide how to complete a project?' Teachers identified learner's interests and the ability to work with friends as the two main factors driving project selection. The learner's relationship with the teacher and a learner's belief that something will be easy are also identified as factors that impact on project choice. These results are shown in the graph (figure 4.15).

Figure 4. 15

Bar graph showing teachers' perceptions of which factors influence a learner's choice of project.



In response to the question regarding at which point in a project learners felt most motivated, 75 % of the teachers identified the beginning of the project as the point where learners were most motivated. 25 % of the teachers felt that learners felt most motivated towards the end of a project, as they can see the goal is about to be achieved. Teachers were then asked to identify the factors that they believed influenced a learner's motivation to engage in a project. The results of this question are shown in the table (table 4.16) and graph (figure 4.17).

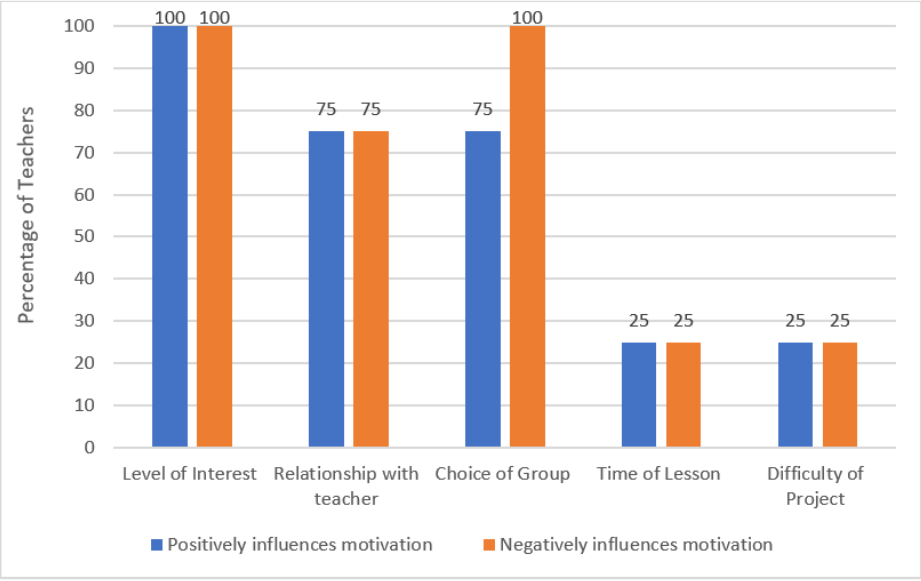
Table 4. 16

Table showing which factors teachers think influence learner's motivation to engage in a topic either positively or negatively.

Question	*Select the three factors that you think positively influence learner's motivation to engage in a topic*				
Possible participant responses	interest in the topic	their relationship with the teacher running the project	being allowed to pick their group or work on their own	the time of day that the lesson is taking place	if the project has enough to challenge them but does not make them feel overwhelmed.
Percentage of teachers who selected option	100	75	75	25	25
*Note: None of the teachers selected outside factors, for this reason the option is not reflected in the table.					
Question	*Select the THREE factors that NEGATIVELY influence your motivation to engage in a project...*				
Possible participant responses	being assigned a topic that they are not interested in	Their relationship with the teacher running the project	being assigned group members or being forced to work on their own	the time of day the lesson is taking place	if the project is too difficult or too easy
Percentage of teachers who selected option	100	75	100	25	25
*Note: None of the teachers selected outside factors, for this reason the option is not reflected in the table.					

Figure 4. 17

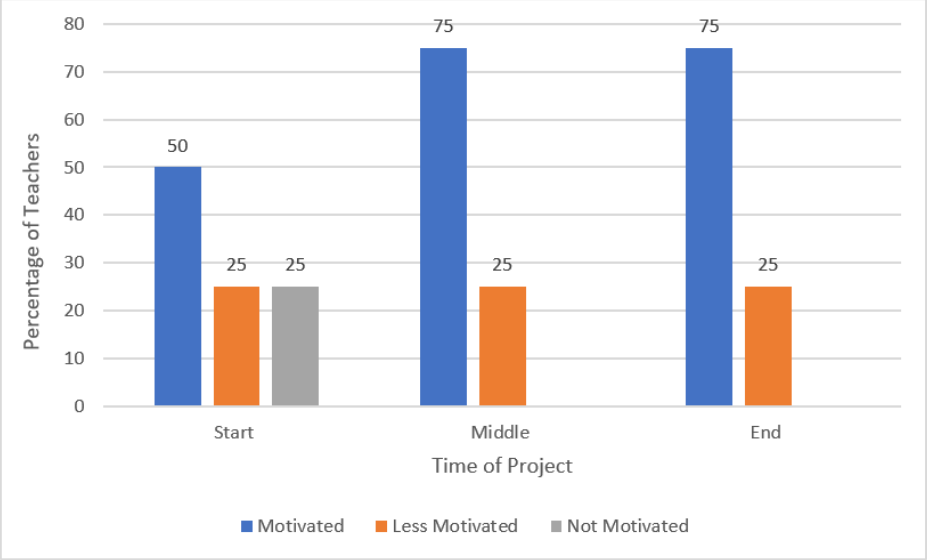
Graph showing which factors teachers think influence learners' motivation to engage in a topic either positively or negatively.



Teachers were then asked to comment on learners' motivation at the beginning, middle and end of the project, the results are shown in the graph (figure 4.18).

Figure 4. 18

Bar graph showing teachers perceptions in changes in levels of learners' motivation at the start, middle and end of the projects



Teachers were asked to elaborate on their responses, and to try and identify factors that influenced the way the learners were feeling. Gaming emerges as a common theme that influences learner motivation and engagement. This is evident in Teacher 4 who comments that learners were motivated throughout the project, they state that, 'The game was new and interesting…trying out different manifestos made the learners remain engaged'. This is echoed by Teacher 3 who states that, 'once the building of the actual project started, they were very keen and looked forward to using the technology'.

The pressure to present is identified as a motivating factor by Teacher 4 who writes, 'The presentation planning also kept them motivated.' Teacher 4 elaborates further and identifies that allowing learners to collaborate on the presentations improved motivation, they state that, "They (learners) were motivated because they got to collaborate" Although less positive, Teacher 2 notes that, '(learners) felt the pressure and so tried to rush to get things done'. Teacher 1 notes that a sense of achievement positively influenced motivation and writes that, "The learners saw the value in the process, saw the value in having the choice of project and found interesting avenues that they had not been exposed to so far this year."

Although no common themes emerged as factors that negatively impact on motivation, different teachers did identify factors that were unique to their groups of learners. Teacher 1 expresses the negative impact of Covid-19 on the learner and states that, "They were not motivated. Their experience of the first project was interrupted by COVID and (they) did not understand the value of completing the process of that project on their return." Teacher 4 observes that learners did not willingly engage in the research component of the project. It is noted by the researcher, that the importance of research and research skills, would have been covered in more depth, had school not been interrupted by Covid-19.

Teacher 2 identifies gender as a factor that influenced engagement as the project progresses, they identified that, "Girls were very engaged. Majority of the boys started to lose interest." At the end of the questionnaire Teacher 2 expresses that "some students not mature/responsible enough to do group work"

Teacher 3 facilitated the Minecraft Project, which was unique in that learners' projects were entered into a competition being run by Microsoft. This competition meant that certain aspects of the project had strict rules and requirements. Teacher 3 expresses how the lack of choice caused by these rules impacted negatively on learners' motivation. Teacher 3 expresses that, '(learners became) less motivated when they realised that strict rules needed to be followed… they seemed less enthusiastic about putting together the PowerPoint as again, it had to be done in a specific way."

Teachers were then asked to identify factors that they felt encouraged or discouraged learner motivation and engagement. They were then asked to make suggestions on how to improve the project in order to encourage learner motivation and engagement. Learner's choice emerges as a common theme that encourages motivation and engagement, with Teacher 1 identifying "self-direction" as a characteristic of a project that encourages learner motivation and engagement. Teacher 3 emphasises the importance of learner choice when they identify the competition rules as being a characteristic of the project that discouraged learner engagement. Teacher 3 states, "They (the learners) wanted the freedom to build and present it in their own way" Teacher 2 identifies the "ability to complete work in different formats' as a characteristic that encouraged learner engagement. This characteristic is an example of learner choice within a project. Teacher 2 continues to emphasise the need for learner choice suggesting in her improvement for The Beetles Project that learners should be allowed to "choose from a variety of choices of a band or group." Learner's interest in a topic is also identified by Teacher 3, who comments that the

relevance of the project encouraged motivation and engagement. Teacher 3 writes that learners "engage with issues, as environmental impact is something they feel strongly about". Teacher 4 also comments on relevance being important to learner motivation and suggests that the Fake News game could have been expanded on, they state that, "(Learners) can choose which current issues in society promote Fake News." Teacher 4 also identifies the use of the game and collaborating with peers as encouraging motivation and engagement.

Teacher 4 identifies that the repetitive nature of some of the tasks discouraged motivation and engagement. Teacher 2 also identifies the need for projects to not be repetitive stating that their project was "not exciting for boys" and needed more "action".

In response to the question "Did you feel your learners worked at the same level throughout the project? If not comment why?" All the teachers felt, that although most of the learners worked consistently there were fluctuations. Identified causes for these changes included the temperature and the time of day. The impact of technology is identified by Teachers 1 and 3 who identify problems with technical equipment and WiFi as negatively impacting on engagement.

Teachers identified their own involvement in the projects as being an important influence on learner motivation. This is expressed by Teacher 1 who states that, "Learners thrived when I was involved in their processes and showed interest in their explorations. It was important for me to get to as many projects as possible in a lesson." Strategies included asking open ended questions around the project such as these asked by Teacher 3 "Why did you… How do you think… What

possible problems might". Teacher 2 had a similar approach stating that they "answered questions or made improvement suggestions." Teacher 2 also showed their own interest in the project, by playing songs from The Beatles in the background. Teacher 4 encouraged engagement by providing structure and assistance with time management. Teacher 4 also facilitated class discussions "about how students who played had strategised" to encourage engagement.

Chapter Four describes the results from Phase One of the project. Phase One of the project involved the completion of the traditional PBL project. The researcher aimed to establish the levels of motivation and engagement of learners during the traditional PBL project. This would then allow for a comparison to be made to determine if learners' motivation and engagement changed if co-creation was implemented as a teaching strategy within the PBL context. The results for Phase Two of the project can be found in Chapter Five. A discussion of the results from Chapter Four and Chapter Five takes place in Chapter Six.

Chapter 5: Results of Phase Two Co-Creation Project

5.1. Overview

Phase two of the research process involved the implementation of the co-creation process. In this phase the learners designed their projects with the assistance of the teachers. Once these projects were designed, they were then completed by the participants. As discussed in the methodology, the process of co-creation was interrupted by online schooling and some of the participants were off campus for the presentations due to Covid-19 concerns.

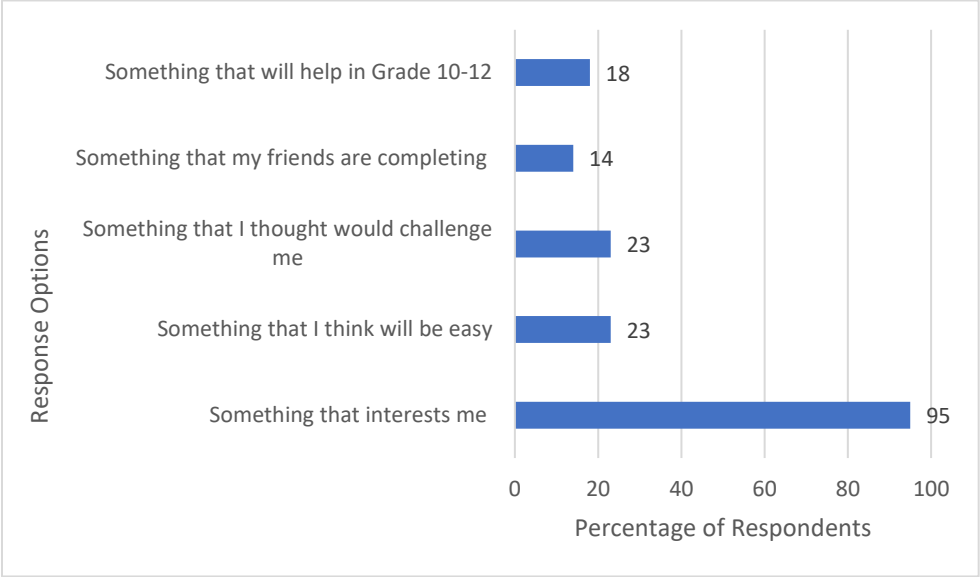
The second questionnaire was completed by the participants after the completion of the co-creation process and completion of the designed projects. The first part of the questionnaire focused on the co-creation process itself, and the second part of the questionnaire focused on the completion of the co-created projects. Twenty two out of the twenty three original participants completed the questionnaire. A possible explanation for Participant 23 not completing the questionnaire, was the school going into a period of online schooling, due to Covid-19 and the researcher being unable to contact Participant 23.

5.2. Learner Responses to Questionnaire

In response to the first question, 'How did you decide on the topic for your co-creation project', participants were able to select from a variety of closed responses, and they were not limited to only one response. The responses are shown in Figure 5.1.

Figure 5. 1

Bar graph showing responses to what influenced learner's topic for the co-creation project.

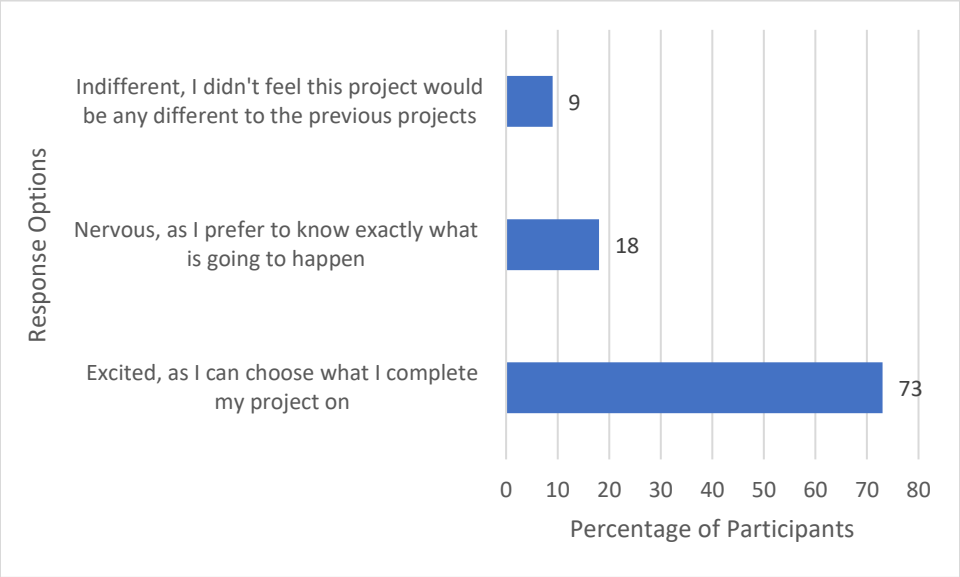


As can be seen from the graph (figure 5.1), the interest level of participants was the driving factor in determining topics for their own project. Although something that would be easy, and something that would be challenging are the next most prevalent option, it is noted that Participant 2 and Participant 18, selected both of these options which is contradictory and indicates a misunderstanding of the question and response options. If one, does not consider the responses of these two candidates, the response to these two options is lowered to 14 %.

In response to the question, 'Which statement best describes how you felt when co-creation was explained to you…" The most prevalent response selected was, 'Excited, as I can choose what I complete my project on." The responses to this question are shown in the graph (figure 5.2)

Figure 5. 2

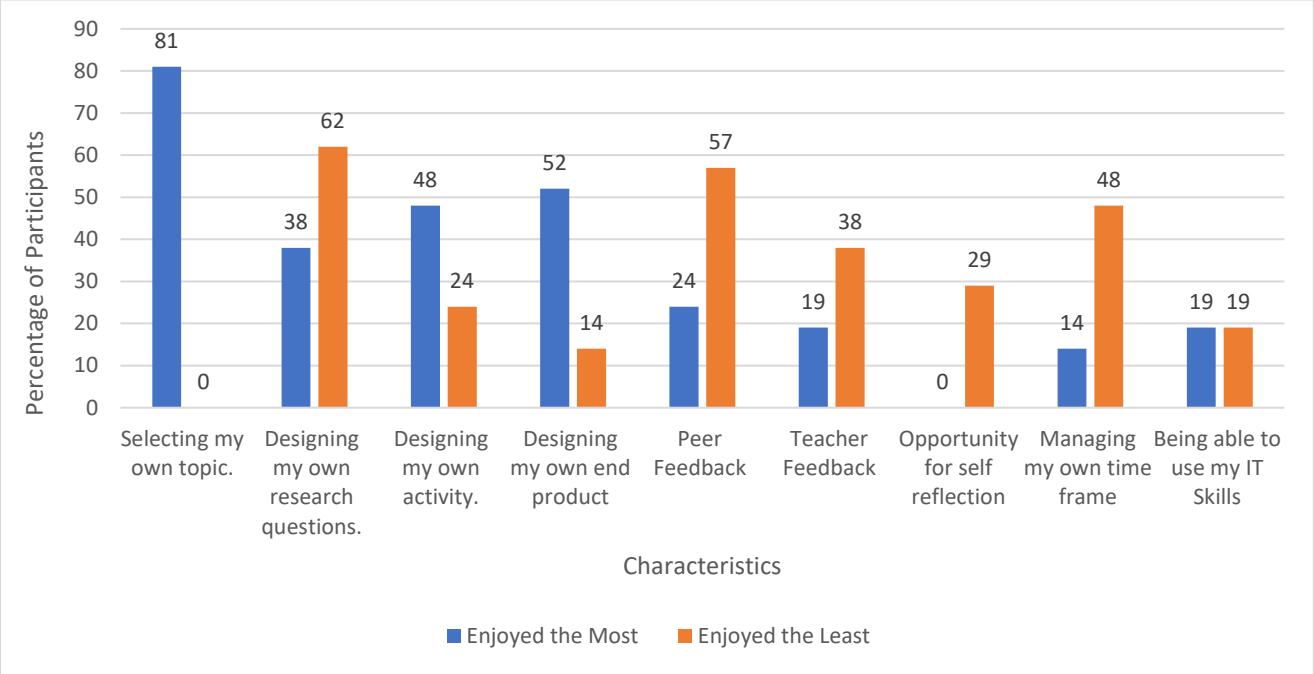
Bar graph showing learners' responses as to how they felt when co-creation was explained to them.



The questions asking learners to identify the characteristics of co-creation that they most and least enjoyed have been presented as one graph (figure 5.3), to allow for comparisons. Learners were asked to select three characteristics, in the event of a learner selecting more than three, the first three responses are considered. Participant 5 selected the response, 'managing my own time frame' as both something she liked the most and least, as this contradicts the response on managing time frame has been disregarded. Participant 14 selected five characteristics that she enjoyed, and two of her responses matched her responses in the enjoying least question, this indicates that she has misunderstood the questions, as a result her responses were excluded from the data set on this question.

Figure 5. 3

Bar graph showing the components of the co-creation process that the learners enjoyed the most and least



Participants were provided with the opportunity to elaborate on what they enjoyed or didn't enjoy about the co-creation process. They were asked to identify aspects they found difficult and asked for suggestions on how to improve the co-creation process. These responses were reviewed thematically, and the prominent themes were similar to those that emerged in questionnaire one, these are discussed below.

Learner Choice and Independence

The desire for own choice and learner independence emerged as a prominent theme, this is best expressed by Participant 13 who wrote, "I personally tend to enjoy projects that allow for more personalisation, and it makes me feel like I'm being treated like I'm older when teachers give me more room to do my own thing. It shows me that they trust me to manage myself well enough

to qualify for good marks" Participant 22 wrote, "I think the whole idea behind the co-creation project is amazing and really provides us with the feeling of independence that we long for when entering high school" and Participant 21 who wrote, "Let us do it again. Let us choose a project (not necessarily the same one) and create it ourselves many times over; allow us to fail and improve." The desire for own choice was also expressed by Participant 11 who expressed that, "I liked choosing my project." Participants 19, 20 and 21 all expressed that they enjoyed the freedom afforded to them by this project, with participant 19 writing, "I enjoyed having the freedom to decide what to do and how to do it. This project made me feel responsible for my own work. This meant that I could focus on my own problems and try to overcome them with my team." Although a similar sentiment, this was expressed differently by Participant 2 who wrote, "I really liked the independence given to us, and I think we should do more independent tasks in the future." The desire for projects that suit individual learning styles, and project goals is expressed by Participant 3 who wrote, "I like doing things in the way that best suits me because I'm a free going person, and restrictions hinder my performance to do my own thing." Participant 17's statement, does emphasise the link between learner's choice and enjoyment impacting on their level of engagement and motivation, they write, "Being able to work on a project I enjoyed actually made me excited to come to the lesson and motivated to complete my work to the best of my capabilities." It is evident from the learners' responses that an increase in choice is a motivational factor. This correlates with statements that show that a lack of choice impacts on motivation negatively. This is expressed by Participant 7 who expresses that they were not motivated to present, as presentations were done verbally to the group and they "get nervous in front of people", thus there is room for even greater choice in the structure of the project.

Structure of the Project

Although learners express a clear desire for increased choice, and greater independence, there is a clear need for this to be balanced with greater structure. 40 % of participants expressed that they found completing aspects of the project independently challenging or that they would have preferred greater guidance. Participant 6 wrote, “I liked being able to design my own end product, but I found it hard to choose what to do in the first place.” This is echoed by Participant 9 who wrote, “I found it difficult to decide our end product when there was no specific end product that we had to design.” Participant 9 goes onto explain that “there were not as many boundaries”. The exact area of difficulty varies between participants with Participant 13 identifying designing research questions, Participant 14 and 17 identifying selecting the project and Participant 15 identifying designing the end-product. The desire for structure carries through into the learners’ suggestions on how to improve the process with learners suggesting past projects or ideas as examples. This is best illustrated by Participant 5 who wrote, “It would be nice to have a list with project ideas for inspiration and showing old projects.” Participants 6 and 14 express a similar sentiment by suggesting that clearer steps would assist in the generation of ideas.

In the feedback, it does become evident that the context with which the learners engaged in this project impacted on their ability to carry out the co-creation process as some of the skills that should have been covered in their Grade 8 year, but weren’t[9], are identified as areas of difficulty. This is best expressed by Participant 2 who wrote, “I found the journaling a bit confusing at times

[9] The participants Grade 8 year was interrupted by the school closures that resulted from the Covid-19 Pandemic

because I was not too sure about what to journal" and Participant 3 who identified the research questions as an area of difficulty because, "I normally don't do any research I just build what I want or do what I want." A difficulty with the research questions was also identified by Participant 13. Information technology skills were also identified as an area where there were gaps from Grade 8, with Participant 11 writing, "I found using my IT skills hard because I wasn't too good at them" The need for journaling, researching and developing IT skills should have been covered in more detail in the Grade 8 year, but this was impacted on by school closures. Although some measures had been implemented by the teachers to address these skill gaps it is evident that greater assistance was needed.

Time Management

Time management was mentioned by 50 % of participants in their written responses. Participant 22 wrote, "I think I would have preferred to have a bit more guidance in the time management aspect of the process as I feel that the main focus was to assist children in creating the best possible project. I found this part (creating the project) very easy and struggled with the time management. Having good time management skills is a very important skill and can help us in every other aspect of our lives." This statement correlated with Participant 21 who also identified time management as a necessary life skill, they wrote, "Managing our own time and developing the projects independently of the teachers. Although it was difficult, it was very instructive for future life skills." The inability to manage one's time as expressed by Participant 22, is also expressed by Participant 20, who wrote, "I found it difficult to realistically plan out my lessons, because I often under-estimated the amount of time it would take to complete a certain task"

and Participant 16 who wrote, “I found the concept of setting my own timestamps difficult because I had no direction in truth and felt a bit lost throughout the duration of the project.” Participant 4’s comment, indicates that an inability to manage one’s time impacted on a number of learners, they wrote, “I feel that people used the time ineffectively and did not come out with a 10 lesson project for the most part.” Participants 10 and 11, both expressed a need for more time, while Participants 15 and 19, suggested that an improvement would be to allow the project selected to determine the time allocated. Participant 19 writes, “What might help is if you let the learners pick the time needed to complete their project so that some groups might complete multiple projects.” It is noted by the researcher that the implementation of this suggestion may not be feasible within the school context. However, it does illustrate a need for assisting learners with designing their projects so that the time available is utilised efficiently.

Group dynamics was another common theme for learner’s questionnaire on the co-creation project. Participant 2 and 16 identified being able to select one’s own group as a positive in the co-creation process. Participant 16 wrote that, “I liked that we were given the option to join other groups or others could join you.” The comments from participants indicate a greater need for interaction either between groups or between learners and their teachers. Participant 9 wrote, “Have more peer discussions as we go along the process so that we can get more feedback on each step of the project, so that we can have more of a clear idea of what we need to change and fix.” The need for more check-ins throughout the process is echoed by Participant 16 who wrote that there was a need for “More check-ins through the project with students individually (are needed), because what you'd see is that many other students were struggling, trying to find

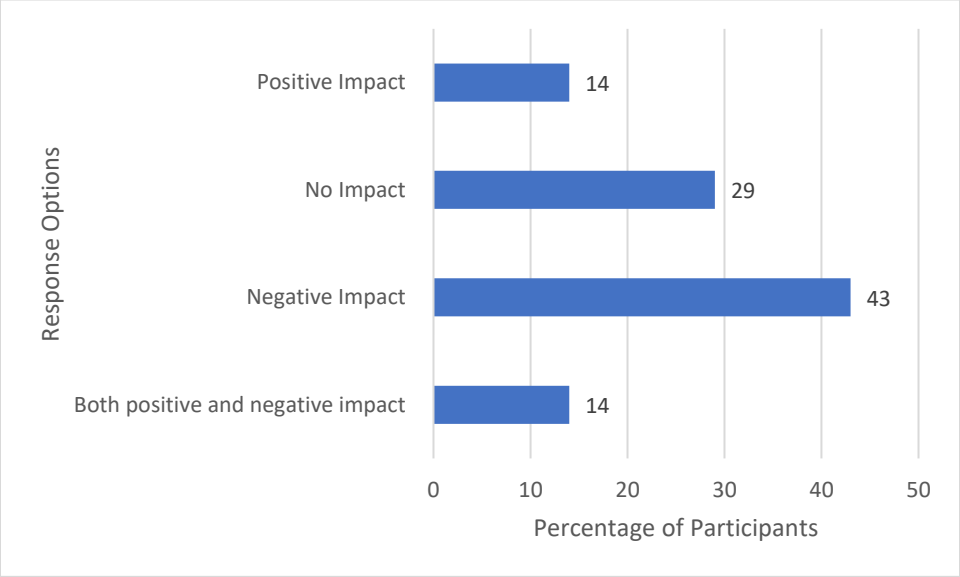
direction and where to take the projects" and Participant 17 who wrote, "A way to improve the co-creation process is by having weekly check-ins with a teacher. That way they are able to see you are doing work and you are able to make sure you are on the right track."

Although 29 % of Participants identified an opportunity for self-reflection as an aspect of the co-creation process that they did not find enjoyable. The written responses of the learners do indicate that they are capable of reflecting on the process and themselves. Participant 13 commented that she found the research questions difficult as she didn't fully understand the process, however, she goes on to comment that, "But that's on me for not asking my teachers." Participant 20, also demonstrates a degree of self-reflection in response to the question "What would you improve?" they wrote, "I do not think that there is anything to change, because lots of what I struggled with had to do with me."

The responses to the question, 'How did being online, impact how you engaged in the co-creation process?' are shown in the graph 9figure 5.4). It is noted that Participant 12 did not answer this question.

Figure 5. 4

Bar graph showing how learners perceived the impact of online learning on the co-creation process.



Reasons given for online schooling negatively impacting on the co-creation process included a decrease in enjoyment, being more easily distracted and an inability to interact with one's peers. Reasons given for online schooling positively impacting on co-creation included home being more comfortable than school and increased time to work on the project. Participant 13's comment links to a need for greater learner-teacher interaction as she writes, "It's made no difference because I was still able to engage with the teacher online as I did face to face. Because PBL teachers have to handle such massive group of children, they hardly ever micro-manage, so I wasn't talking to my teacher or asking questions more than when absolutely necessary."

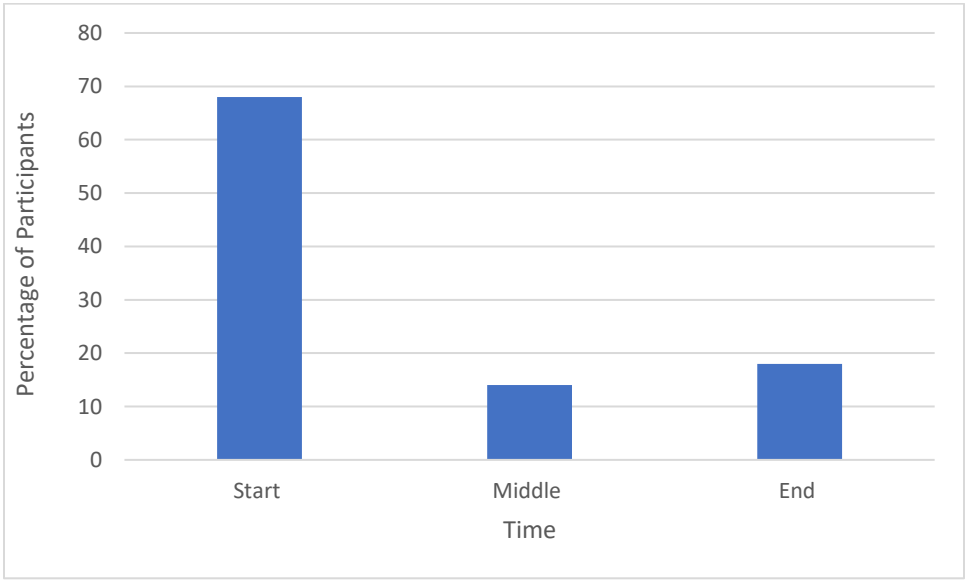
At the end of the co-creation process 81 % of participants elected to do their own project, while 19 % of participants elected to join a friend's project. Project choice was most influenced by

personal interest, with 50 % of participants expressing that an area of interest impacts on project selection. Learners then completed the project they had designed through the co-creation process. The remaining questions on the questionnaire referred to the implementation and completion of the designed project.

Learners were asked to identify if they were most motivated to complete the project, they had designed at the start middle or end of the project. The results for this question are shown in the graph (figure 5.5).

Figure 5. 5

Bar graph showing response from learners as to when they are most motivated to complete a project.



As can be seen in the graph (figure 5.5), learners were most motivated at the start of the project. Motivation then dropped towards the middle of the project and increased towards the end.

The questionnaire then asked three open-ended questions regarding motivation to engage in the project the learners had co-created at beginning, middle and end of the project.

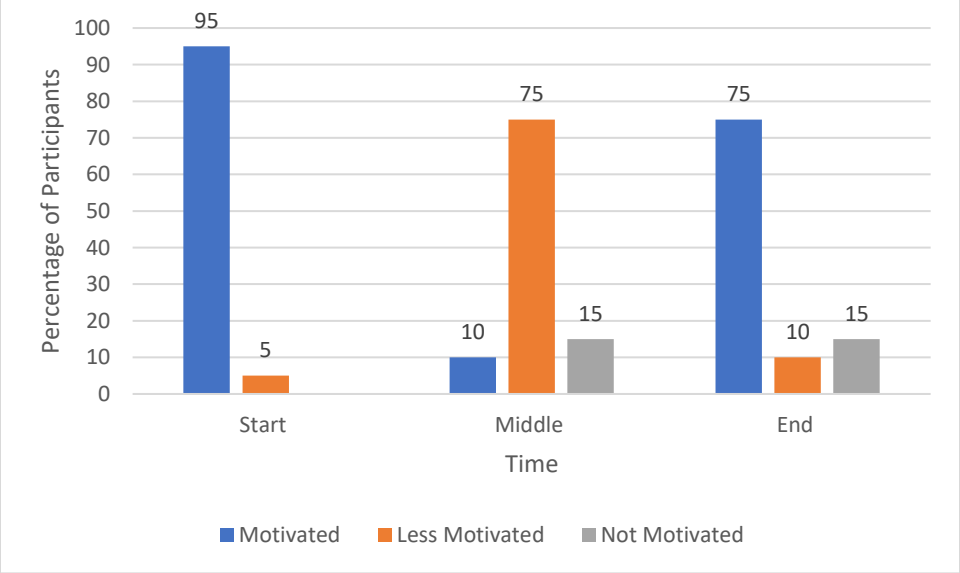
These three questions were worded as follows:

1) How motivated did you feel to engage in this project, when you started?
2) How motivated did you feel towards the middle of the project?
3) How motivated did you feel towards the end of the project?

The graph (figure 5.6) below shows the results from the three questions and shows how learners' levels of motivation change over time.

Figure 5. 6

Bar graph showing learners responses regarding their motivation over time



In response to the first question, 95 % of participants identified themselves as being motivated to start the project. In the written responses, many learners identify anxiety as being an

accompanying emotion, with 14 % of participants stating that they felt either nervous or anxious. A contributing factor to the anxiety at the start of the project, was the participants' perceptions around the project's lack of structure. Participant 9 writes, "I felt very excited but, I was still nervous because of how broad the project was, the fact that I was working in a group made the range of the project even wider." Areas of concern for learners varied and included the requirements of the journaling, the time frame and the research questions. Participants who perceived the project to be well structured were less anxious, this is shown by Participant 2 who writes, "I felt quite motivated at the beginning of the project, as I knew exactly what I was doing." This statement is echoed by Participant 19 who wrote, "I saw a clear vision of what I wanted to be done. This motivated me to keep working"

The themes that emerged in the participants responses to the first question, "how motivated were you at the start of the project?" were similar to the first questionnaire with the newness of the project being identified as a common motivating factor for 50 % of the participants, this is shown in Participant 16's comment, "(I) found the concept intriguing and wanted to learn more about the topic I chose." A high level of interest was identified by 36 % of the participants, the link between motivation and level of interest is demonstrated by Participant 10's statement, "I was very motivated as I was doing a project that interested me and I could not wait to start." The factor of own choice was identified by 24 % of participants as being a motivating factor, this is expressed by Participant 13 who writes, "I was excited to start this project because it was the first school assignment with this much creative license. I was excited to research something I would have never thought would contribute to my education." Group dynamics was identified

by Participant 19 who writes, “At the start of the project, I was very excited to start, and I couldn't wait to work with my friends.”

In the middle of the project, 10 % of participants stated that they were still motivated to complete the project, 75 % of participants identified that they were less motivated and 15 % of participants stated that they were not motivated towards the middle of the project. The reason that emerged for learners feeling motivated was a sense of achievement this is shown by Participant 2 who states, “I felt confident, as I knew what I was doing.” Participant 20, states that they were still motivated, but identifies that, “I was just more aware of how difficult it was actually going to be.”

The themes that negatively impacted on learner motivation towards the middle of the project included newness, sense of achievement, own choice, group members, school culture, the structure of the project and time management. In terms of newness, the lack of novelty and something new, emerges as a factor that impacts negatively on learner motivation and is identified by 23 % of Participants. This is shown by statements from Participant 4, “project became a bit of a drag”, Participant 6 who states, “I was slightly less motivated, because I had gotten past the fun part” and Participant 11 who states, “I was losing focus and it wasn’t as fun anymore, because we had been doing it for a while.”.

A lack of own choice is a factor that impacts negatively on motivation and is identified by 10 % of participants, this is expressed by Participant 8 who was “feeling forced to do the project”. Participant 8 does not elaborate who was forcing them to complete the project. However, it is

noted, that in an earlier question Participant 8 had identified that they had selected their topic based on what their friends were completing and not in an area of interest. It is noted that peer pressure could have influenced their response. Challenges within the group are also identified as a factor that impacts negatively on motivation by 5 % of participants with Participant 12 stating, “I was working with a partner during this part of the project, and it was frustrating.”

A lack of achievement impacted on motivation with 5 % of participants, this is shown by Participant 5 stating, “I didn't feel motivated as I felt like we weren't making any progress” School culture, and the pressure within the school of work to be correct, is also shown by 5 % of participants with Participant 14 stating, “the nervous and stress set in of wanting the project to be done on point.”

The structure of the project emerges as the dominant theme that impacted negatively towards motivation in the middle of the project and is identified by 32 % of the Participants. Participant 16 states, “This was also the point when I started feeling lost”. This feeling was echoed by Participant 17 who expresses, “In the middle of this project, I felt a bit lost. I think I needed some guidance from teachers a bit more,” Participant 19 elaborates that, “During this time, I was not very motivated as I was in a kind of lull. I was tired and wanted to move on. This is when problems started to arise, and I was just trying to overcome them and move onto the next step.” This sentiment is shared by Participant 21 who states, “There was also a lack of direction, a lack of a set plan” Participant 21, does suggest though that the process could be used for learning and

states that, “we should be allowed to do this again, so we can plan better next time and improve on our failures.”

Time management is identified by 14 % of the participants as a factor that impacted on motivation. This is shown by Participant 9 who writes, “I felt a bit unmotivated because we had an idea of what to do but we were struggling to do it, there was a lot to do, and it seemed like we weren't going to finish in time.” Participant 13 does elaborate on their response, and in doing so expresses how time can be both a motivating and demotivating factor, “I was a little unmotivated because of how long it was taking and how badly I actually managed my time. I got a bit nervous when I saw the due date, and then looked at how little I have actually done. But that fear sort of forced me to start working very intensely and consistently.”

At the end of the project, 75 % of Participants stated that they were still motivated to complete the project, 10 % of Participants identified that they were less motivated and 15 % of Participants stated that they were not motivated towards the end of the project. It is noted that Participant 8 did not complete this portion of the questionnaire. Participant 8 did not present due to absence from school.

The dominant theme that is identified by 71 % of participants as a motivating factor at the end of the project is a sense of achievement. This is expressed by Participant 4 who states, “I was getting excited to finally show off our hard work and have the project finished.” This is echoed by Participant 6 who writes, “I was more motivated, I really liked my end product, and I was

satisfied that I had pulled it off," and Participant 12 who writes, "I was motivated. I liked presenting my project and showing everyone what I had created." This sentiment is shared by Participant 19 who writes, "I felt quite motivated as I was excited about our final project, and I was proud of what we produced. This was very exciting as I could see all the work coming together to form our project," and Participant 20, who writes "I was highly motivated because I could see my progress and that motivated me even more." This feeling is elaborated on by Participant 9 who identifies not only a successful end product, but the process itself as creating that sense of achievement, they state, "I felt very motivated because I could see that we were going to be able to finish the project and I was glad that we had been able to do everything that we needed to do for it, and the components that we had struggled with in the middle of the project had either been sorted out or we made a new plan and that had worked."

School culture emerges as a factor that impacts negatively on motivation, with 14 % of Participants identifying the pressure of presenting or school pressure. This is shown by Participant 15 who writes, "We were under a lot of pressure to finish the project as well as other school work and sport we had to do."

Participant 16's overall statement at the end of the project is noteworthy, as it speaks to a desire for newness being a motivating factor, they write, "I was excited to present and move on to the next project. I did enjoy a bit of the process of completing it, but all in all it was more of a neutral experience."

Participant 18's overall statement at the end of the project, is also noted, as it speaks to how the structure of the project needs to be modified, they write, "It was mostly stress that pushed us to complete it. Again, a plan would have prevented this and allowed us to finish it on time and maintain the sense of freedom and accomplishment." Participant 18 goes on to show that although some external structure is needed for the process, there is also a need for learner's to take greater responsibility, and that they believe there would be value in repeating the process, this is shown by the remainder of the statement where they write, "HOLD ON THOUGH, this is not to say the teachers must now force us to build a plan and push structure down our throats. Different people plan differently, so even if the teachers told us how to organise the project, it would not have been effective. People need to try, fail and learn what works for them."

As with the first questionnaire, the second questionnaire had a question that considered sustained enquiry, but it was phrased differently to the questions above. The question asked: "Did you feel you worked at the same level throughout the project? If not, why? Try identify a day in which you worked at your best and worst? Comment on what happened that made these days different". The results are shown in the table (table 5.7) and bar graph (figure 5.8).

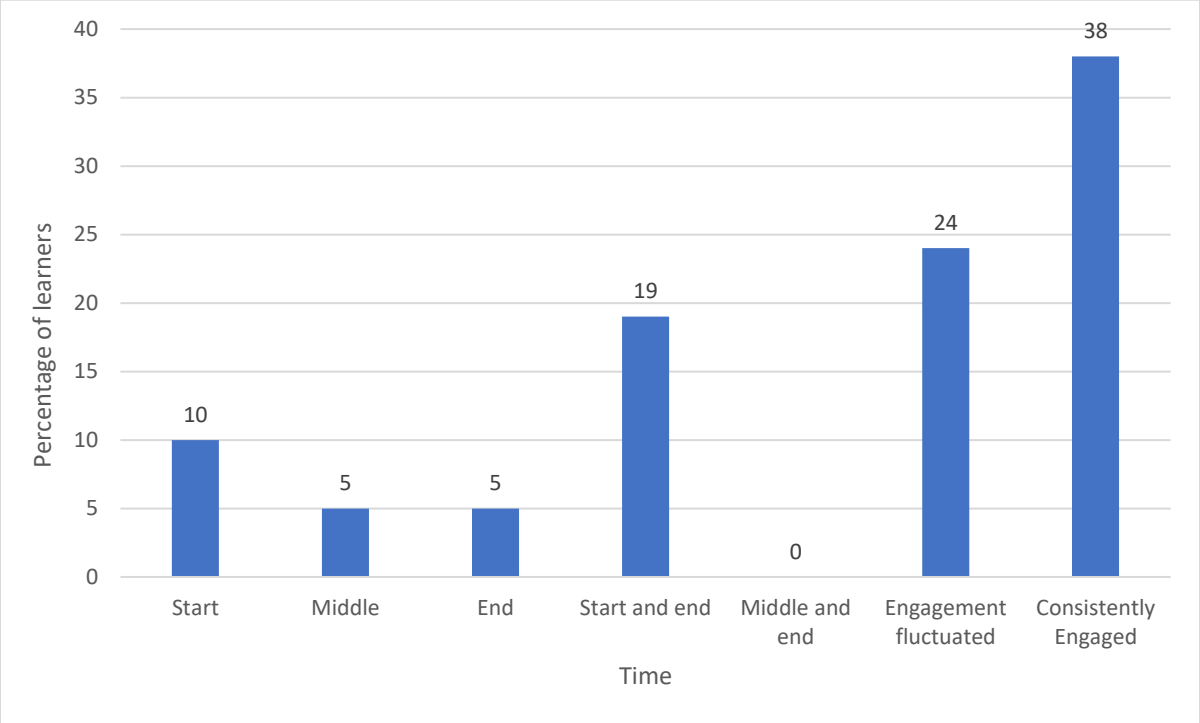
Table 5.7

Table showing learners perception as to when they were best engaged in the project

Time of Project	Percentage of learners
Start	10
Middle	5
End	5
Start and end	19
Middle and end	0
Engagement fluctuated	24
Consistently Engaged	38

Figure 5. 8

Bar graph showing learners' perception as to when they were best engaged in the project



As can be seen by the graph (figure 5.8) 38 % of participants felt they were consistently engaged in the project. This is expressed by Participant 6 who writes, “I think I did work at the same level, I like to manage my time well,” and Participant 12 who writes, “I did work on the same level throughout. I put in a lot of effort.”

Participant 16’s response emphasises the link between motivation and engagement, where they state, “I probably worked best during the first or second week of the project because I felt so motivated.” Participant 22’s response emphasises the influence of a group on motivation, where they write, “I felt that I worked at the same level throughout the project, as I mentioned before I did lose a bit of interest but because I was working in a group, I did not let my loss of interest impact my work standard. I think working in groups was very beneficial because it allows us to be social in our work and to work with others that have similar interests to ourself.”

10 % of the participants identified the impact of their teachers on their motivation during the project, Participant 13 writes, “I finished strong because of how afraid I was of disappointing my teacher. Motivation gets you far, but fear gets you farther,” and Participant 21 writes, “It also didn't help that some of the teachers were on our backs, telling us what to do. PBL should be a free subject, where students can experiment and create as they wish. If we want help, we will ask for it.”

10 % of participants identify factors relating to school culture that impact on motivation. These include the timetable, and how the time of day impacts on motivation, this is shown by

Participant 17 statement, “Days on which we had this lesson in first period and the last period, influenced my work ethic. Having the lesson in the morning had me unmotivated because I was still tired and waking up. Having this lesson late in the afternoon made me annoyed because all I wanted to do was to go home and relax, so I didn't put enough time and energy into the project.” Participant 15, also identifies the pressure of other school subjects as a factor that impacts on motivation, this is shown by, “I did not (work consistently) as we had some days where we all wanted to work and some days where we just felt like doing nothing and relaxing because of the stress of other school subjects.”

The researcher then completed the same analysis that was completed for the traditional PBL Project. The percentage of candidates who identified a theme was calculated. As this particular analysis focused on the prevalence of the theme within the sample rather than the impact of the theme on motivation, the researcher did not consider if a theme was identified as either positively or negatively impacting on motivation. The results of this analysis are shown in the table (table 5.9) and graph (figure 5.10).

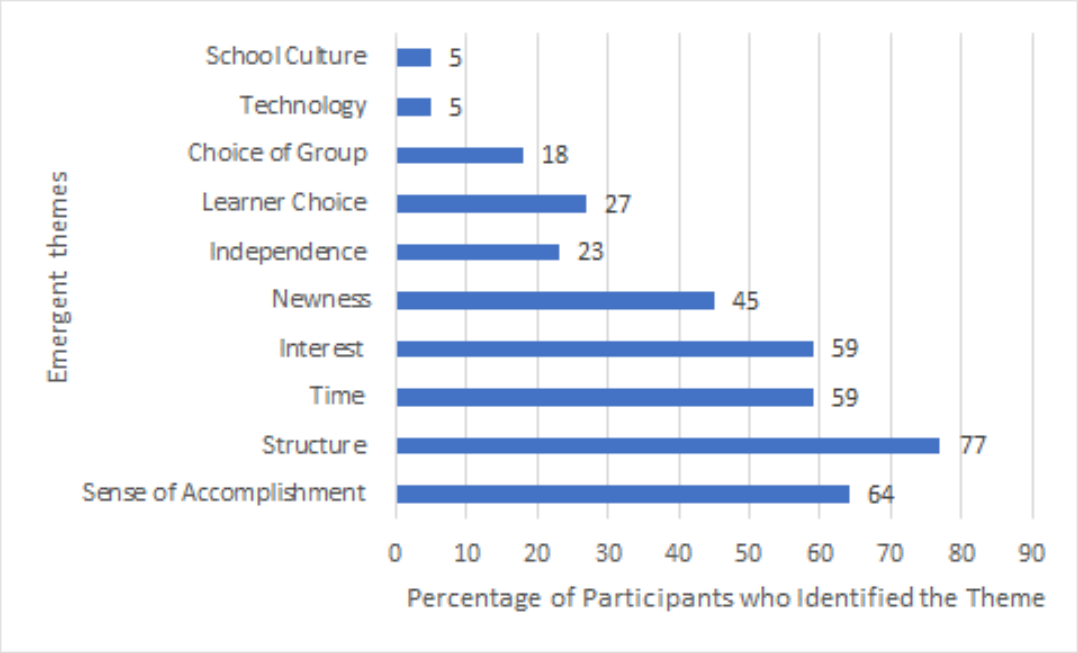
Table 5. 9

Table showing the percentage of participants who identified a theme as influencing motivation

Theme	Percentage of participants who identified factor as influencing motivation
Sense of Accomplishment	64
Structure of the Project	77
Time Management	59
Interest	59
Newness	45
Independence	23
Learner Choice	27
Choice of Group	18
Technology	5
School Culture	5

Figure 5. 10

Graph showing the percentage of participants who identified a theme as influencing motivation



As can be seen from figure 5.10 the structure of the project and the sense of accomplishment, followed by interest and time management are the factors that are identified the most by participants as influencing their motivation.

The researcher then looked at the extent to which a theme impacted on motivation. This was done by counting the number of times a theme was mentioned by all of the participants. Thus a theme that was mentioned many times by a participant, was take to have a higher impact on motivation, than a theme that was mentioned less. As with the previous question, if a theme was identified either positively or negatively it was counted towards the tally. The results of this analysis can be seen in the table (table 5.11) and graph (figure 5.12).

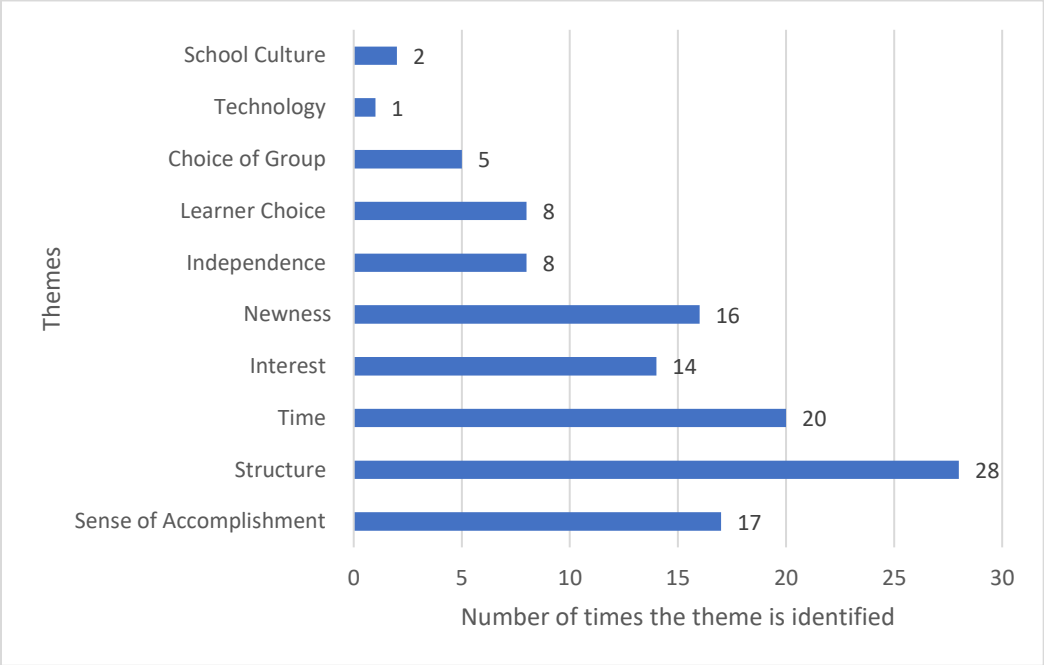
Table 5. 11

Table showing the number of times a theme is identified as influencing motivation

Theme	Total number of times identified
Sense of Accomplishment	17
Structure of the Project	28
Time Management	20
Interest	14
Newness	16
Independence	8
Learner Choice	8
Choice of Group	5
Technology	1
School Culture	2

Figure 5. 12

Graph showing the number of times a theme is identified as influencing motivation

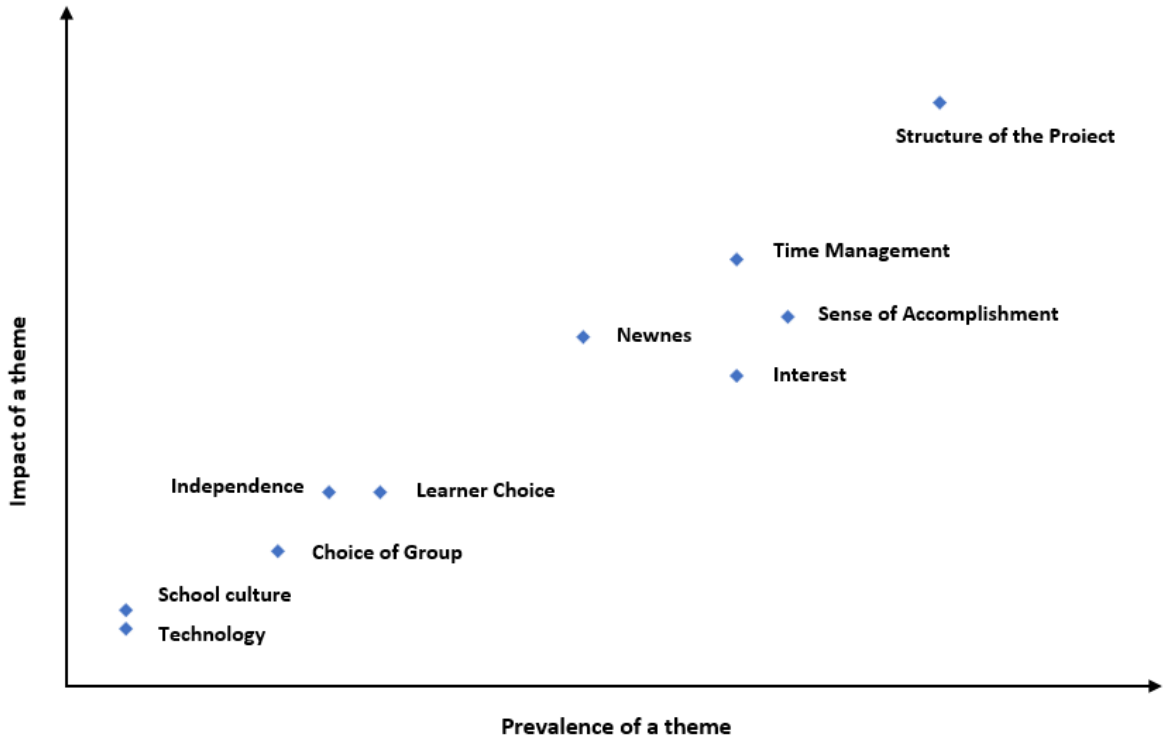


As can be seen from the graph above (figure 5.12) the structure of the project and learner's time management skills have the greatest impact on the learners' motivation to complete the project designed through the co-creation process. Learner's choice of group, school culture and technology have the least impact on learners' motivation to complete the designed project.

The information from figure 5.10 (page 116) and figure 5.12 (page 118) was then combined to provide the researcher with a comparison of the themes if one considered both prevalence and impact. This information is shown in the graph (figure 5.13).

Figure 5. 13

Graph showing the importance of a theme based on prevalence and impact on motivation



As can be seen in the graph when completing a project that has been designed through the process of co-creation, the structure of the project is the most important theme as it impacts the highest number of learners and has the greatest impact on engagement. Choice of group which was an important theme during the traditional PBL project becomes less important with the designed project.

Although the analysis of considering themes both in terms of their prevalence and impact was useful as it allowed for comparison. It was evident that some themes were only mentioned in either a positive or negative context. Thus, the number of times a factor was identified as either

positively or negatively influencing motivation was also considered. As with the previous analysis, the number of times a theme was mentioned, was considered to be an indicator of the extent to which the theme has impacted on motivation. The information regarding how many times a factor is influenced as either positively or negatively influencing motivation, is shown in the table (table 5.14) and graph (figure 5.15) below.

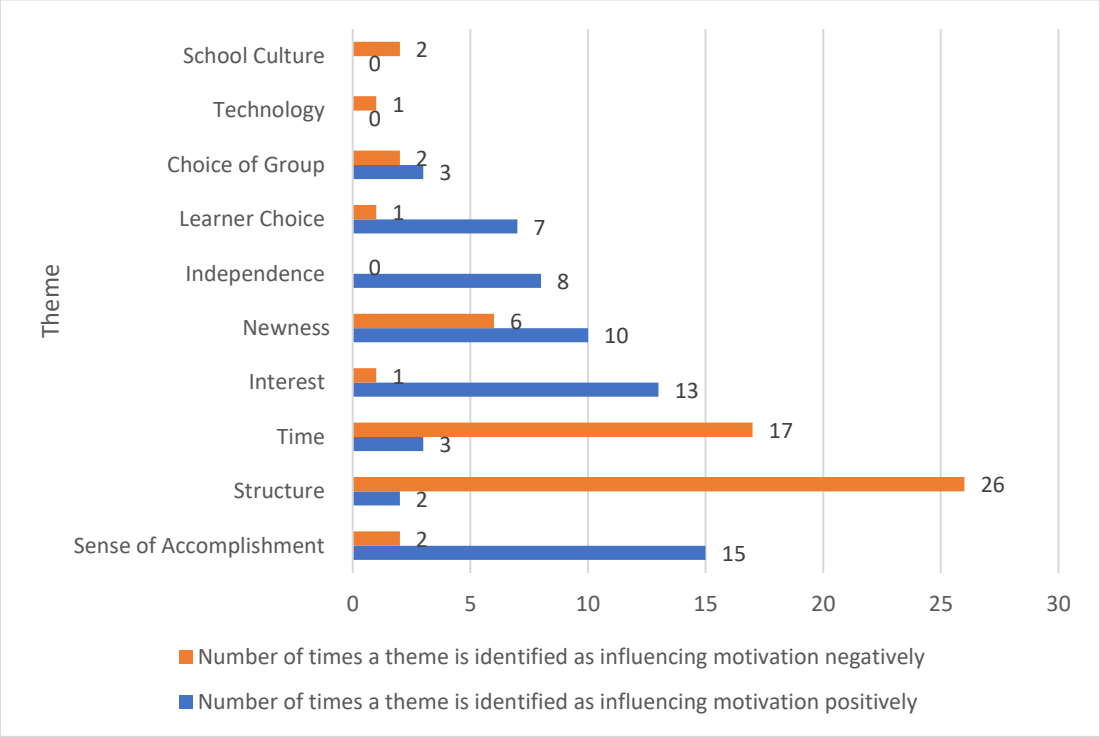
Table 5. 14

Table showing the number of times a theme was identified as influencing motivation positively or negatively.

Theme	Total number of times factor was identified as influencing motivation positively	Total number of times factor was identified as influencing motivation negatively
Sense of Accomplishment	15	2
Structure of the Project	2	26
Time Management	3	17
Interest	13	1
Newness	10	6
Independence	8	0
Learner Choice	7	1
Choice of Group	3	2
Technology	0	1
School Culture	0	2

Figure 5. 15

Graph showing the number of times a theme was identified as influencing motivation positively or negatively.



As can be seen from the graph (figure 5.15) the structure of a project and the time management skills influence learner motivation negatively. However, that some learners viewed these themes positively, indicates that a learner's ability to create structure and manage their time, also need to be considered. Problems with technology, and the stressful culture within the school influenced learner motivation negatively.

Although not asked to, 12 of the Participants used the opportunity to add a comment at the end of the questionnaire as an opportunity to make comparisons between the Phase One Project and the Phase Two Project. This allows for a comparison between the 'traditional' PBL Project and

the co-creation project. Of the 12 participants, 10 or 83.3 % of participants preferred the co-creation project, 1 or 8.3 % preferred the traditional PBL project and 1 or 8.3 % stated that they enjoyed both projects equally.

All participants who preferred the co-creation project, identified the ability to select a topic as their reason for preferring a co-creation project. This is shown by Participant 11 who states, “I preferred this project because we could choose what we wanted to do.” This ability to select a topic allowed learners to identify their own personal areas of interest and select topics they believe are relevant to them. This is shown by Participant 17 who states, “I enjoyed the new project more, simply because it is something I am highly interested in and is something that can help with my future subjects and careers,” and Participant 9 who wrote, “This one was a lot more fun as were able to expand our range and do more specific tasks that related to us more as an individual.” Participant 19’s statement also highlights the link between own choice, interest and perceived relevance of a topic, they state, “I felt much happier with the second PBL project as I looked forward to coming to class compared to grade 8 where I wasn't interested in the project. By letting learners pick their own projects, we experience how it is in the real world as we won't always have teachers checking in on us and making sure we are doing as we are supposed to.” Participant 6’s statement of, “I much preferred this project because I enjoyed doing it a lot more. I was more interested in this topic, and it motivated me to work harder,” emphasises the need for learner’s interests and choices to be taken into consideration, if one wishes for them to be engaged in a lesson.

A lack of structure was the reason given by the learner who preferred the traditional PBL project, this is shown by the statement, “I felt that I enjoyed the grade 8 project more than this year’s one. I think I preferred the first one more because we had more direction and timestamps to hit.” It is noted, that two learners comment on the need for repetition in order to master the co-creation process. This is shown by Participant 4 who writes that, “I had the experience of choosing my own project before, so I was more prepared to take on the project and use my time more effectively” thus this participant felt she coped better with the co-creation process due to her own prior experience. This point is also emphasised by Participant 21 who writes, “It was much more exiting that we got to choose our own topics, and I feel choosing the project ourselves should be introduced earlier in Grade 8, so we get more time to fail.”

5.3. Teacher Responses to Questionnaire

The design of the project through the co-creation process was facilitated by two teachers and the researcher[10]. At the start of the co-creation process, when the learners were designing their projects, the two teachers and the researcher managed the classes together, interacting and providing feedback to all learners. Once the projects had been designed, it emerged that there was a group of learners all of whom had an interest in sewing. These learners were grouped together and were assigned to Teacher B[11]. The remaining learners were facilitated by Teacher A

[10] As explained in Chapter 1 PBL is divided into Project, Sport and IT Skills, therefore two classes attend Project at a time.

[11] Teachers who completed the co-creation project were assigned letters, so that in the discussion they can be identified apart from the teachers who created the traditional PBL Project. The teachers who facilitated the traditional PBL project were assigned the numbers 1-4.

and the researcher. This group was managed as a whole, by both teachers, rather than assigning specific learners within the group to a specific teacher. It is noted that this resulted in Teacher B facilitating a smaller group of learners, all of whom were focused on completing projects around sewing. Teacher A and the researcher facilitated a larger group of learners with a greater variety of projects. This will be further discussed in Chapter Six.

The teachers completed two questionnaires that can be found in appendix 5 and 6. It was the intention of the researcher to review these separately as the first questionnaire (appendix 5) focuses on co-creation and the second questionnaire (appendix 6) focuses on the completion of the project designed through that co-creation process. However, after completing the research and reading the responses of the teachers to the two questionnaires, it is noted that there is significant overlap. Thus, when appropriate, the results of the two teacher questionnaires will be discussed together. When the researcher has observations that corroborate, contradict or elaborate on a point raised by a participant these have been included.

Motivation and Engagement During the Project Design

Both teachers identified that the learners were excited for the process of co-creation, the researcher agrees with this observation. Online schooling did make the process of designing the projects through the cocreation processes more challenging. Both teachers agreed that the online process negatively impacted the co-creation process as it made it more difficult to follow up with learners and reduced teacher-learner interactions.

Although the learners were online when the co-creation process began, they were engaged in lessons. It is also noted that the number of submissions was higher than is usually observed for PBL during online schooling periods. 95 % of learners submitted a topic proposal and 85 % of learners submitted research questions. As a comparison, a PBL task on artificial intelligence and computer programming was set during online schooling in July of 2021, 74 % of learners submitted the task[12].

Both teachers identified that learners selected a topic based on what interests them. Teacher A observes that, "The learners had an opportunity to choose their own topics which I believe showed their passion and interest in that particular topic." Teacher B expressed a similar view stating that, "I feel that the notion of choice motivates students." The researcher agrees with this observation in group of 148 learners, there were 84 different project titles. The variety of these projects was significant one learner interested in veterinary sciences learnt how to suture, one learner studied Japanese, a group of learners researched the school uniform and put forward a proposal to modernise it, one learner developed a website of short stories and another group of learners researched different forms of government and portrayed them in a Minecraft World. Friendships are also identified as a factor that influenced the choice of project completed, with many leaners selecting a project a friend had created and forming a group. However, the majority of the learners 57% of the whole grade selected the project they had designed.

[12] The percentages given in this paragraph are based on the whole Grade, and taken from the submission data provided by Microsoft Teams

When asked to identify the three characteristics of the co-creation process that the learners engaged in the most, both teachers identified topic selection and designing the activity. Teacher B also identified designing the end product and Teacher A identified learners managing their own time as areas where the learners engaged. The researcher's observations correlate with Teacher B, as the researcher agrees that the learners were engaged when designing the end product. However, time management is an area where the researcher observed that learners found challenging and that engagement from learners varied. Teacher B and researcher's observations correlate with the learners' responses as learners identified topic selection, activity design and design of end project as the areas that they liked the most[13].

When asked to identify the three characteristics of the co-creation process that learners engaged in the least, both teachers identify the opportunity for self-reflection as an area in which learners did not engage. Teacher A further identified managing their own time and the peer feedback process. Teacher B identified designing the research questions and teacher feedback. The researcher agrees that both the designing of research questions and the feedback process are areas in which learners did not engage. This correlates with the information in figure 5.3 (page 98) where learners identify designing their own research questions and feedback as areas, they enjoyed the least.

The researcher also made the following general observations with regards to feedback and self-reflection. Learners were able to provide peer feedback of a high standard, but they needed to

[13] Learner's responses are shown in Figure 5.3.

be held accountable for the feedback that was given. During the design process, learners were asked to complete a poster outlining their project, a teaching methodology known as a 'gallery walk' was then completed, and learners walked silently looking at the posters and writing on them to provide their peers with feedback. They were guided in this feedback in that they needed to provide an observation of something they liked and a way in which the project could be improved. There was an unintentional variation in the instructions given to the learners, where two of the groups were asked to write their names next to their feedback and this instruction was omitted for one of the groups. The quality of feedback was higher in the groups that were required to write their names.

Motivation and Engagement during the Co-creation Process and Implementation of the Designed Project

There was overlap between the two questionnaires completed by the teachers, with similar themes impacting on motivation and engagement during the co-creation process and the implementation of the designed project. Common themes that impacted on learner motivation and engagement through the co-creation process and implementation of the project included learner's interest in a topic and being able to select one's own group.

Both teachers identify learners being able to select a topic of interest as a motivating factor. Teacher A writes that, "The learners had an opportunity to choose their own topics which I believe showed their passion and interest in that particular topic." Teacher B expresses a similar view stating that, "I feel that the notion of choice motivates students." Teacher B further

elaborates by saying, “They are freed from the constraints of curriculum and can choose what interests them They also get positive validation that what interests them is meaningful and can lead somewhere”

The impact of peers and being allowed to select one’s own group is identified by Teacher A as a factor that impacted on motivation. Teacher A states, “Some were also allowed and encouraged to work in groups which I think also motivated individuals who are naturally not self motivated.” Teacher B observes that during the project implementation phase her learners ‘developed a little sewing group and the friendship and interaction was lovely to observe’ and that ‘Team work was motivating’. Teacher A does identify that allowing learners to join groups can be problematic in that, “Learners which join groups tend to sit back and let the project designer dictate where the project is heading and how it should be conducted. Very little challenging occurs when the idea is not your own.”

Motivation and Engagement during the Designed Project Implementation

The teachers were asked to comment on learner motivation at the beginning, middle and end of the project. The responses varied between the bigger group facilitated by Teacher A and the researcher, and the smaller sewing group facilitated by Teacher B.

Teacher A observes that at the start of the project, the learners “started off with no real motivation. Ideas were flying all over the place and learners had very little direction in terms of what they actually wanted to do. This unsure state I think made them not very excited for the

road ahead." Teacher A goes onto elaborate and show that as learners became more confident in the direction taken their motivation to engage improved. In the middle of the project, Teacher A observes that, "Once learners found a topic and dived deeper into research, their motivation and interest increased as the project progressed."

Teacher B observes a slightly different pattern in the progression of their project. Observing that at the beginning learners were "excited to try something new. Only one of my students had ever sewed anything before, the rest just liked the idea of making clothes" This group experienced a drop in motivation towards the middle of the project, and then an improvement towards the end. This is expressed by Teacher B in the following observations, "The messy middle is difficult to motivate. The lack of skills became evident, and frustration did creep in there."

Teacher B identifies a sense of achievement as a factor that improved motivation towards the end of the project, stating that, "They were motivated as things started to fall into place. In my project the being able to see concrete progress in their garments and their friends was motivating."

The structure of the project is identified as an area that could be improved upon to improve learner motivation and engagement. Teacher B identifies that learners, "struggled to stay motivated in the middle of the project, the excitement had worn off and the presentation was too far away". Teacher A recommends that "more regular and strict feedback to ensure students progression" this was needed as "Students (learners) also at times were shooting in the dark in

terms of their topics. I think that more clear and definitive approaches are necessary. There were many learners that produced under whelming projects given the amount of time they had to complete it." It is noted by the researcher that the problem of structure was exacerbated with Teacher A as this was the bigger group, with a greater variety of projects. Teacher A goes onto suggest that, "For learners who have no idea on what topics to choose, maybe a list of broad topics can be given out as guidance… Many students chose interesting topics but executed the project poorly."

The impact of having to present is also identified as a motivating factor with Teacher B writing, "the prospect of having to show what they had made publicly motivates learners" Teacher A expresses a similar statement, "I think learners had a feeling of relief and pride when they finally completed their presentation." As the researcher this motivation was enhanced when the teacher they were presenting to, played a significant role in their school lives. For example, a group of learners who were completing a project on basketball were more motivated upon hearing that they would present to the first team basketball coach. This was true for projects that were not related to sport, for example Participant 10 and 19 were motivated by their project being selected as one of the projects to be viewed by the Head of Academics. In terms of evaluating projects, Teacher A does observe that, "The fact that these projects would not count towards their term marks… There were no real repercussions for producing a poor project," as a factor that contributed negatively to learner motivation.

Self, peer and teacher feedback are identified by both teachers and the researcher as areas where learners could be more engaged. As the variety of the projects was so great, and time constraints of the term planner required that the whole grade required assessment over two days. A number of teachers, who are not directly involved in PBL assisted with assessing[14] the learners projects. These teachers included members of the sports department, subject specialists, and members of the management team such as the Head of Academics and Headmaster. This meant that the projects were assessed with a lower ratio of learners to teachers than had been achievable during Phase One of the research project. The projects, where possible, were assessed by teachers who had expertise in the field. This resulted in detailed feedback provided on the rubric for learners after they presented. However, as the teachers providing the feedback were sometimes unfamiliar with the learners, they were only able to provide input into the work completed and not the process. Thus, there is a need to improve the process of facilitating discussions and self-reflection around the learners' work throughout the project as well as their end products.

The teachers were asked to identify some of the techniques used to motivate learners. Teacher A identifies asking leading questions stating that, "I tend to ask leading or guiding questions to promote critical thinking. Often by planting these seeds, the learners eventually figure it out themselves." Teacher B identified encouraging learners when problems arose in their projects.

[14] As stated previously, PBL Projects are not allocated marks and do not form part of the learner's term average. However, projects are still assessed in that learners receive feedback on a rubric and an e-mail containing feedback is sent to the learner's parents.

The teachers were asked to identify specific skills that the learners required, but did not have, which impacted on their ability to carry out the co-creation project. An area identified by both teachers is research skills, this is elaborated on by Teacher B who writes, “the designing of research questions was difficult and also difficult to understand if you haven't really done a complex project before.” They go onto elaborate that, “I think we have to look at how we guide students in creating research questions. Maybe we need to start with draw a picture/mind map/vision board of what you want your product to look like in the end and then get teachers and peers to ask questions around that to help so the value of questions.” Research skills are also identified by Teacher A who states that, “Learners may have found all the information they have access to very overwhelming and may have put some learners off.”

IT skills and some of the technical skills required to complete specific projects for example, the use of the sewing machine or operating the 3D printer were also identified as areas where the level of learner’s skills did not align with the requirements for the project. Teacher B makes a suggestion that, “I would like to run an intro to sewing before students can pick a fashion design or material construction project”

Access to resources is also important when allowing for a variety of projects, Teacher B observes that, “It was hard in the middle because, there weren't enough machines for everyone to work, so there was a bit of waiting around and wasting time.” A similar observation is made by the researcher, in that access to the 3D printers negatively impacted on the progress of some projects. Access to teachers is also an area that needs to be factored in during the process,

Teacher B observes that, “The projects I mentored weren't projects the students could just be left on their own, so there was intensive demand on me and I wasn't as available as I needed to be.”

When asked to comment on the benefit of co-creation to the learners, Teacher A identifies that, co-creation “benefitted the students who are generally unmotivated and not driven.” A similar observation is noted by the researcher who felt there were fewer discipline issues during this project than previous PBL projects, particularly with learners who are unmotivated within a classroom setting. The opportunity to explore new areas is also identified by both teachers. Teacher A comments that, “Co-creation got these learners to explore new skills and get out of their comfort zones.” They go onto elaborate that, “I think it is an amazing opportunity for learners to explore and share their interests with others whilst developing new skills.” Teacher B states that, “My groups experienced the joy of making something concrete from scratch by themselves, the satisfaction was evident. They didn't have a deep learning experience but they had oodles of fun and I loved working with them. It was nice in our super tech digital world to do something as old school as sewing.” The researcher agrees with this observation, in that there was an element of fun to many of the projects and engaging with learners when discussing their own areas of interest, was rewarding.

When asked if the co-creation process should be incorporated into the PBL Program. The opinions of Teacher A and Teacher B vary. Teacher A observes that, “I believe that sometimes when working in groups, some individuals (at this young age) often end up picking up the slack

of others. If co-creation is going to be allowed, it will mean that proper delegation will need to be monitored and tracked." Teacher B observes that, "it fits in with our philosophy. Plus it is fascinating to see what the students come up with. We can think we understand what interests our students but often really get it quite wrong. Co-creation keeps us on our toes and gives us a deeper insight into what motivates our students." Teacher B and the researcher both observe that there is a need to repeat the project and refine the process. This is expressed by Teacher B who states that, "(there is a) need to run it (the co-creation project) again with tweaked time frames."

Chapter Five has presented the results for the Second Phase of the research project. This Second Phase involved the implementation of the co-creation process to design a project. Once this process had been completed, the learners were able to complete the project they designed or one designed by a peer. Learners and teachers were asked to complete the questionnaires at once the co-creation process and the completion of the designed project had taken place. In Chapter Six, the results from Chapter Four and Chapter 5 will be discussed. This discussion is followed by the recommendations in Chapter 7.

Chapter 6: Discussion of Results

6.1. Overview

In the discussion of results the researcher has made comparisons between the responses from the learners and the teachers to identify common themes and differences in opinions. A comparison has then been drawn between the results from Phase One of the project where learners completed the traditional PBL Project and Phase Two of the project where learners completed the co-creation process to design a project, and then carried out the project they had designed. When observations are made by the researcher based on the results that correlate or contradict information from the literature review this has been noted. The discussion of results is structured so that each discussion point is carried out under the sub-questions outlined in Chapter One.

6.2. Influence of co-creation on learner's motivation to engage during PBL Lessons.

The first sub-question asks how co-creation influences a learner's motivation to engage during PBL lessons. In order to answer this question, the common factors that influence motivation are identified from the data collected. An analysis of the extent to which these factors are prevalent in the co-creation process is carried out. Recommendations are noted and discussed in detail in Chapter Seven.

Level of Interest

In a traditional PBL project a learner's level of interest in the topic has the greatest impact on their motivation. This can be seen in the correlation between figures 4.2 (page 62), 4.12 (page 84) and the written responses of the learners. Figure 4.14 (page 86) shows that when learners are interested in a topic, their level of motivation increases and when there is a lack of interest in a topic their level of motivation decreases. This information correlates with figure 4.15 (page 88) and 4.17 (page 89) that shows that teachers agree with learners that the learner's level of interest in the topic has the greatest impact on learner's motivation. Both the learners and the teachers written comments identify topics that are not only interesting, but relevant within learners' society and frame of reference, as being motivating. This correlates with literature as only tasks that are viewed as being relevant by learners are assimilated into existing cognitive structures (Chemi & Krogh, 2017).

The co-creation process provides learners with an opportunity to pursue a topic of interest. Thus, considering a learner's level of interest is a characteristic of the co-creation process that enhances learners' motivation and engagement. This is shown in figure 5.1 (page 96) where 95 % of learners selected a topic that interested them and figure 5.3 (page 98) where 81 % of learners identify selecting their own topic as the part of the co-creation process, they enjoyed the most. In the written responses, learners identify selecting topics within their areas of interest, and topics they consider relevant as important. This information correlates with the teachers' responses to the co-creation process, as both teachers identify that the learners' interest in the topics selected contributed to learners' motivation and engagement. Almulla (2020) found that

motivation is increased when the task is valued by a learner and allows them to achieve a personal goal (Almulla, 2020). Co-creation provides for this, as learners have the opportunity to pursue topics of interest and value and pursue personal academic goals. This is supported by the observation that 81 % of participants elected to complete the project they themselves designed during the co-creation process and that within the Grade there were 84 different project topics. Motivation can also be enhanced by learners having increased autonomy (Almulla, 2020). Co-creation provides learners with greater autonomy, as they have the opportunity to select the topic and guide the process. This increase in autonomy enhances motivation which leads to improvement in engagement and performance (Lee & Hannafun, 2016). The extent to which a teacher allows for learner autonomy and values their contribution to the learning process can also positively impact motivation (Darvin, 2019). This increased independence and autonomy was identified as a factor that learners found motivating during the co-creation project. This is best expressed by Participant 22 who writes that the designed project provided them with "the feeling of independence we long for in High School" This increased autonomy is also noted by Teacher B when they state that learners are "freed from the constraints of the curriculum" during the co-creation process. This statement correlates with the one made by Participant 13 who comments that there was an increase in "creative license" and the opportunity to complete something they "thought would never contribute to their education".

Learner's Choice of Group

Learners being allowed to select their own group is identified as a common theme that influences learner motivation by both learners and teachers during the traditional PBL project. This can be

seen by the correlation in graphs between figures 4.2 (page 62), 4.14 (page 86), 4.15 (page 88) and 4.17 (page 89). This ability to select one's group is an example of task authority as learners are able to take ownership of their own learning and make decisions on the social structure within a classroom. Task authority enhances learner motivation and engagement (Bardach, Lüftenegger, Yanagida, Spiel, & Schober, 2019).

The characteristic of learners being able to select their own group is present during the co-creation process as once the initial design of the projects had been completed, learners had the opportunity to choose between completing their own project or completing a project designed by a peer. A comparison of figure 4.12 (page 84) and figure 5.13 (page 119) shows that within the co-creation context, selecting one's group is less important than during the traditional PBL project. When provided with the opportunity to pursue a topic of personal interest or to work with one's friends, only 14 % of learners identified something their friends were doing as influencing their project choice.

Although the importance of selecting one's own group is less important during the co-creation project, the social climate does still influence learner's motivation. This is shown as learners identify a lack of peer interaction as a disadvantage to the online schooling that occurred. This is expressed by Participant 19 who worked less online as they weren't "under the pressure from my peers to work in class". The learners also expressed a desire for peer discussions as a way to improve the co-creation process. Towards the middle and end of the traditional PBL project the

social climate continues to influence learner motivation, with 13 % of participants identifying that a positive group dynamic improved motivation.

The learners' observations that the social climate does still impact on motivation correlates with Teacher B's observation with regards to the sewing group. Teacher B notes that, "We developed a little sewing group and the friendship and interaction was lovely to observe" Classroom consensus was evident within this group, and as a result authentic learning, perseverance and individual progress are valued (Bardach, Lüftenegger, Yanagida, Spiel, & Schober, 2019). Teacher A notes that a lack of consensus within the classroom environment impacts negatively on motivation. Teacher A comments that, "Ideas were flying all over the place and learners had very little direction in terms of what they actually wanted to do". Teacher A also observes that learners who joined projects that they had not designed were less engaged and tended to "sit back and let the project designer dictate". Investment is described by Darvin as the commitment of a learner to the goals and practices of the learning process (Darvin, 2019). Learners who joined groups are observed in this instance to be less invested in the projects that were designed by their peers.

A possible improvement to the co-creation process would thus be to allow learners to join groups earlier, and the researcher would recommend that this took place after the initial selection of project topics. Selecting topics individually, provides learners with an opportunity to consider their own areas of interest which is important for motivation. Allowing learners to then view other groups, and decide if they would like to join groups, meets learners' social needs of having

the opportunity to select one's group. Once the broad topic is selected, the project is then co-created amongst peers and teachers. This creates an environment where learners who have joined a group are more involved in the designing process, thus providing them with an opportunity to take greater responsibility for their learning and enhance their investment and task authority in the project.

Learner Choice

For both the themes of learner's level of interest and the learner's group. It is noted that greater learner choice emerges as motivating factor within the written comments of both the learners and the teachers. Although learner choice is predominately linked to selecting a topic of interest or selecting the structure of the group, this choice does extend to other aspects of the project such as a desire to select their presentation style and desire to be allowed to complete more practical tasks and discussions. These comments correlate with figure 4.14 (page 86) that shows that improving learner choice was identified as always positively influencing motivation. These findings on the learner's questionnaire correlate with the written responses of the teachers during the traditional PBL project, where teachers identified learner choice as a characteristic of a project that improves motivation. This is also supported by Teacher 3 observing that the strict rules of the Minecraft project made learners less motivated. Thus, the absence of choice, influences motivation negatively. This correlates with the learners' responses to the co-creation questionnaire where learners identify increased choice and independence as a motivating factor. This is expressed by Participant 13 who identified the "personalisation" of the designed project as a characteristic she enjoyed. This is echoed by Participant 19 who observes that "By letting

students pick their own projects, we experience how it is in the real world" During the co-creation project, Teacher B observes that, "choice motivates students" which correlates with the learners' comments. An increase in variety and learner choice are factors which positively enhance learner motivation and engagement (Thomas, 2000).

This desire for increased choice needs to be considered, as although co-creation may not always be possible within the constraints of the FET School. Teachers need to identify opportunities for co-creation on a micro-scale thus allowing learners elements of choice within a structured project. This recommendation correlates with the findings of Bovill (2015) who notes that institutional structures may limit choice. Co-creation on a smaller scale is seen to be more manageable (Bovill, Cook-Sather, Felten, & Millard, 2015).

Learner-Teacher Relationships

Figure 4.2 (page 62) and figure 4.12 (page 84) show that learners do not view their relationship with their teacher as an important factor in influencing their motivation. Figure 4.17 (page 89) shows that teachers disagree with learners in this regard, as 75 % of teachers identified the learner's relationship with the teacher as being an important influencer of motivation. The variation in answers between the learner and teacher participants indicate, that learner-teacher relationships play less of a role in motivation and engagement than other factors. However, they do still influence motivation and therefore need to be considered. In the written comments for the traditional PBL project, it emerges that the existing relationship between the learner and teacher, is less important than their interactions during the project. Learners identify a lack of

engagement from teachers as a factor that influenced motivation negatively, this is illustrated by Participant 16 where they express that, “I didn’t like how we were just left to just do whatever”. This correlates with the teachers’ responses where participating teachers identify their own involvement in the project as an important motivator. This need for interaction, is illustrated by Teacher 1 who wrote, “learners thrived when I was involved.” Bovill (2019) states that co-creation requires increased interactions between teachers and learners and this increased interaction improves learner- teacher relationships. These positive relationships are positive indicators of enhanced engagement and motivation (Bovill, 2019).Thus the increased interactions afforded by the process of co-creation has the potential to improve learner-teacher relationships and improve learner motivation.

During the co-creation project, it is noted that a factor that influences these relationships is the size of the group. Learners within the smaller sewing group benefitted from more interactions with Teacher B where learners in the bigger group experienced less interactions. Even in the smaller sewing group Teacher B notes that they weren’t “available as they needed to be”. This will be discussed further under recommendations.

Sense of Achievement

Figure 4.12 (page 84) and the learners written responses identify a sense of achievement as a factor that impacts on learner’s motivation. A sense of achievement is identified by some participants towards the middle of the project, and by more participants towards the end of the project during the traditional PBL project. The sense of achievement is also identified by learners,

as a motivating factor towards the middle of the project and more towards the end of the co-creation project. The sense of achievement is greater in the co-creation project with 71 % of learner participants identifying a sense of achievement as a motivating factor towards the end of the co-creation project compared to 56 % of learners identifying it as a factor that influenced motivation during the traditional PBL project.

The trend of a sense of achievement being enhanced by the co-creation project is evident in the teacher responses. None of the teacher participants who facilitated Phase One of the project where learners completed the traditional PBL project, identify a sense of achievement as a motivating factor for learners. Teacher B who facilitated the co-creation project identifies a sense of achievement as a motivating factor during the co-creation process and comments on the benefit of learners experiencing, “continued incremental and visible progress.” These observations are supported by literature as motivation is higher in learners who achieve academic success (Gupta & Mili, 2016). Although PBL at the FET school does not present learners with the opportunity to achieve academic success as the projects are not for marks, there are opportunities for success and progress to be achieved, and to be used to improve learner motivation. As can be seen within the sewing group, when there is class consensus over what constitutes success, in this case making progress on the garments, when this is achieved it is motivating for learners. The need to incorporate measurable success into the structure of the project will be discussed further in the recommendations.

In Chapter 1, a context to which co-creation was initially implemented at the school is provided, and within that it is noted that co-creation was introduced ad-hoc to try and motivate learners who were disengaged. Although not the key focus of this research, it is noted that Teacher A identified that the co-creation process, "benefitted students who are generally unmotivated" and an observation is made by the researcher that there were fewer behaviour problems during the co-creation process. Thomas found that PBL improved learner motivation and reduced disciplinary issues (Thomas, 2020). Although these studies were not directly related to co-creation, this research suggests that the characteristics of co-creation may further benefit learners who experience difficulties with motivation and discipline. The extent to which these learners would benefit would need to be further investigated.

The presentation of one's work is linked to the sense of achievement for both the traditional PBL project and the project designed through the co-creation process. In the traditional PBL project learners identify the fact that they need to present their work, as a motivating factor. This motivation is linked to learners wanting to demonstrate competencies to their peers and teachers. The teachers' responses during the traditional PBL project correlate with these findings where teachers identify the presentations as a factor that motivated learners. These findings correlate with comments from the learners and teachers during the co-creation project where presenting one's work publicly is a motivating factor. Teacher B observes that, "prospect of having to show what they had made publicly motivates students" The use of specialist teachers and members of management to assess the co-creation projects is noted by the researcher as a factor that improved the motivation of the learners, with regards to presenting. This was evident,

in particular, amongst learners who were presenting to someone with whom they had an existing relationship, for example a teacher who coached them or someone in a position of authority, for example the Head of Academics. This is supported by Bandurra (1977) who notes that teachers who are perceived highly by a learner will also have a greater impact on their motivation to learn (Bandurra, 1977). This observation by the researcher correlates with the written comment of Participant 13, who expresses that they did not want to “disappoint” their teacher.

Computer Gaming

Figure 4.12 (page 84) identifies gaming as a factor that impacts on learners’ motivation. However, the learner’s written responses to the game show that the impact of the game on their motivation changes over time. Games are seen as motivational initially, as being allowed to play a game in an academic setting was seen as something novel. This correlates with the teachers written responses which identify gaming as a motivating factor. However, once past the initial phase of the project, games need to be complex enough that they maintain learner’s attention if they are to continue to be seen as motivational. The relevance of the game to the learning context also needs to be evident to the learners in order for it to continue to be a motivational factor. These characteristics of computer gaming need to be considered when planning projects that involve computer games. Computer games should be used initially to motivate learners. However, if they are going to be used past the initial phases of a project, the purpose of the game and the use of it as a teaching tool, needs to be closely facilitated. Gaming did not form part of any of the co-creation projects, however, the use of games in PBL and co-creation shall be discussed further in the recommendations.

Structure of the Project

The structure of the project is identified as a factor that influenced learner motivation in both the traditional PBL Project and the co-creation Project. For the discussion of the structure of the project the researcher has considered a number of sub-sections namely: learner's ability to manage time, structure provided by teachers and communication.

Learner's ability to manage their time

Figure 4.12 (page 84) and the learners written responses identify time as a factor that impacts on learners motivation. However, the extent and manner in which time influenced learner's motivation varied between participants. Figure 4.14 (page 86) shows that the majority of learners found that poor time management skills influenced their motivation negatively. However, learners who were capable of managing their time viewed the greater independence in structuring their time positively. This correlates with the written responses of the learners, where Participant 19 expresses that they "liked working at my own pace." In contrast Participant 13 states that, "I was quite anxious in the middle of the project because I wasn't sure I would finish on time." The ability of learners to manage their time remains a factor throughout the project with learners expressing that they "finished early" or were "rushed" and this impacted on their motivation. This indicates that an individual learner's ability to manage their own time is important in order for them to remain motivated during a traditional PBL Project.

The observations that the extent to which time influenced a learner's motivation varied between learners, and that learners who displayed a higher level of competency with this skill were more

successful during the project, correlates with the responses of learners during the co-creation process and completion of the designed project. In figure 5.3 (page 98), 48 % of participants identifying managing their time as something they found challenging, where 14 % of participants identified managing their time as something they enjoyed. This graph correlates with the learners open-ended questions where 50 % of participants explain further how time management skills influenced their project. Learners who had a clear vision for how the lesson would be spent experienced greater motivation. In contrast to this Participant 20 “found it difficult to realistically plan out my lessons”. This correlates with the observation made by the researcher for the traditional PBL project that the more competent the learner is at managing their time, the more they benefit from the opportunity to manage their own time. Teacher A observes that, “many learners that produced under whelming projects given the amount of time they had to complete it.” This statement correlates with the learners’ observations that learners time management impacted on the co-creation process and the completion of the designed project. The need to develop learners’ time management skills shall be discussed further in Chapter Seven

Structure provided by teachers

During the traditional PBL project, structure emerged as a theme that influenced motivation with some learners expressing that they worked best when there was a ‘set plan’, while others preferred ‘flexibility’ within the lesson. This is shown by participant 2 who writes, ““I felt confident, as I knew what I was doing.” During the traditional PBL project, learners also expressed a desire for ‘clearer instructions’. The extent to which learners would like teachers to provide external structure during the co-creation project also varied between participants. Participant 13

states that she liked that “they (teachers) trust me to manage myself” and Participant 19 expressing that the “project made me feel responsible for my own work”. Bovill (2015) makes reference to this increased in shared responsibility as a characteristic of co-creation that requires a greater level of engagement (Bovill, Cook-Sather, Felten, & Millard, 2015).

Although learners desire the increased independence, 40 % of them expressed a need for greater involvement and guidance from the teachers. This is shown by Participant 9 who expresses that the lack of boundaries made deciding what to do more challenging. Learners suggested that this guidance could be provided in the form or previous project examples, lists of ideas and regular check-ins. This is expressed by Participant 17 who recommends a weekly check-in to ensure learners are “on the right track.” These suggested areas of improvement correlate with the recommendations made by Teacher A who recommends “more regular and strict feedback to ensure students progress”. Teacher A also recommended examples of past projects be provided.

Thus, learners and teachers comments indicate two simultaneous and contradictory desires experienced by the learners. These learners desire independence, choice and autonomy within the classroom environment, while also wanting to be dependent on the teacher for instructions, structure and monitoring of progress. A constraint of co-creation is that although learners desire increased control and collaboration, when given it, they revert back to established patterns of behaviour such as reliance on teachers (Chemi & Krogh, 2017). Managing this paradox within the classroom environment will be discussed further in Chapter 7.

It is noted that the need for structure is greatest towards the middle of the project, as shown by Participant 17 who stated that “In the middle of the project I felt a bit lost” This correlates with Teacher B, who identifies the “messy middle” as the time when learners’ motivation and engagement decreased.

Communication

The need for improved communication is identified as a compounding factor to the structure of projects. For the traditional PBL project this is best expressed by Participant 15 who recommends a need for “more communication between students and teachers” This correlates with the information provided during the co-creation process where learners expressed a desire for clearer steps. However, the need for this communication did vary between participants with Participant 21 expressing that “If we want help, we’ll ask for it” Communication is identified as central to the co-creation process and a key characteristic of teachers who manage the co-creation process effectively is the ability to communicate (Iverson & Pedersen, 2017). The need for improved communication between teachers and learners will be further discussed in the recommendations.

School Culture

A compounding factor to insufficient structure being provided by the teachers is the culture within the school. As observed by both the researcher and one of the teachers implementing the program, academic staff identify PBL as a lesson where if necessary they can leave the learners to complete work and continue with tasks they need to complete. It is noted by the researcher

that when teachers had been involved in the project design that the level of engagement improved. This observation could be used to improve the co-creation process going forward. As it was the first time co-creation was implemented at the school, the planning and initial implementation was carried out by the researcher with the other teachers having more of a supportive role. If the process was to be implemented again, it would be recommended that all the teachers contribute to the initial discussion and design of the co-creation process to allow for greater teacher ownership and engagement. It would also be recommended that during the implementation phase, even if teaching within a team, that the teacher leading the process be rotated throughout all members of the teaching team.

The busy and pressured environment within the school contributes to learner fatigue. Learner fatigue is also influenced by the time of day that the lessons occurred. During the traditional PBL Project, learners identified that they were more motivated when they were not fatigued and PBL lessons were not towards the end of the day. This correlates with teacher's observations during this project where time of day is influenced as a contributing factor. This is also supported by learners' statements during the co-creation process where learners felt they worked best when PBL did not fall into the first or last lesson of the day. This is already taken into consideration as the school has a rotating timetable, therefore the lesson at the end of the day, becomes the first lesson the next day, and the second lesson the following day and so forth. Although this method of scheduling does not resolve the issue of learner fatigue, it does ensure that one lesson is not impacted more than others.

Technology and Resources

Figure 4.12 (page 84) and the learners written responses show that the use of technology does not play a significant role in learners' motivation. However, it is noted by both learners and teachers, that when the technology does not work it does impact significantly on the learners' ability to complete the project. The finding that problems with technology negatively impact on learner motivation correlates with the findings of the co-creation project where Participant 11 identifies using their IT skills as something they found difficult. During the co-creation project it was noted that access to the 3D printers and access to the sewing machines impacted negatively on motivation. Thus, it is important, that if conducting projects that require technology, schools have the necessary resources in place.

Newness

Newness is identified as a factor that impacts on learner motivation and engagement. However, figure 4.12 (page 84) shows that the overall impact is has is less than other themes. A new concept or project, is identified as being motivating at the start of the project by learners in the traditional PBL project. This is supported by the opposite of newness or excessive repetition of a skill or activity within a project being viewed as demotivating by both learners and teachers during the traditional PBL project. Newness impacting on motivation to a lesser degree than other factors is correlated by the responses in the co-creation with only 50 % of the participants commenting on it in their written responses to the questionnaire. These comments correlated with the findings of the traditional PBL project with repetition being identified as negatively impacting on motivation. In contrast to the traditional PBL project, where newness was only seen

to be motivating, the newness of the co-creation process did have a negative impact on motivation. At the start of the co-creation process, 14 % of participants identifying being either anxious or nervous. Iverson & Pederson (2017) identify effective communication as a requirement for the co-creation process to occur, as it is needed to manage the anxiety of learners through the process (Iverson & Pedersen, 2017).

In conclusion, co-creation incorporates characteristics of traditional PBL that improve learner's motivation. Some of the characteristics such as learner's interest, learner choice and learner's sense of achievement are greater in co-creation than they are in traditional PBL which further improves motivation. Co-creation also allows for increased learner independence and autonomy which improves motivation. In order to ensure the success of a co-creation project, the project needs to be well structured. The structuring of the co-creation projects will be discussed further in Chapter Seven.

6.3. Is sustained enquiry and engagement achieved through co-creation?

The next question that the research aimed to answer what if sustained enquiry and engagement was achieved through co-creation. This question is answered by comparing the levels of motivation and engagement reported by participants for the traditional PBL Project and the co-created project.

Figure 4.4 (page 63) shows that for the traditional PBL project most learners identify that they are most motivated at the start or end of the project. The information in figure 4.4 correlates

with the information in figure 4.5 (page 65) that shows motivation is highest at the start of the project with 100 % of learners identifying themselves as being motivated. Motivation is lowest in the middle of the project with 48 % of learners identifying themselves as being motivated. Motivation improves towards the end of the project with 68 % of learners identifying themselves as being motivated. The teachers' responses to the questionnaire in the traditional PBL project are different to the learners' perceptions with teachers identifying motivation at its lowest at the start of the project. Teachers then observed that motivation improved towards the middle of the project, and that learners maintained this level of motivation through to the end.

Figure 5.5 (page 105) shows that the majority of learners felt most motivated to complete the co-creation project at the start of the project. Motivation to complete a project is lower in the middle of a project and improves towards the end. This correlates to the learners' responses shown in figure 5.6 (page 106) that shows motivation is highest at the start of the project is lowest in the middle of the project and improves towards the end of the project. This trend correlates with the trend shown in the traditional PBL project.

Figures 4.4 (page 63), 4.5 (page 65), 5.5 (page 105) and 5.6 (page 106) all show that motivation is highest at start of a project, lowest in the middle of a project and improves towards the end of a project. A comparison of figures 4.5 (page 65) and 5.6 (page 106) demonstrates that although motivation does follow the same overall trend for both the traditional and co-creation project the degree to which learners are motivated is different in the two graphs. For these two figures, learners were classified as motivated, less motivated and not motivated. At the start of the

traditional PBL project, 100 % of participants identify themselves as being motivated to engage, this is in comparison to 95 % of participants in the co-creation project. In the middle of the traditional project 48 % of learners identify as motivated in comparison to 10 % of learners who identify in the co-creation project. 30 % of learners completing the traditional project identified as being less motivated compared to 75 % of learners completing the co-creation project who identified as being less motivated. At the end of the traditional PBL project, 68 % of learners identify as motivated and 18 % of learners identify as not motivated, compared to the co-creation project where 75 % of learners are motivated and 15 % are not motivated. The drop in motivation in the middle of the co-creation project, correlates with the statement made by Teacher 2 who observes that, “The messy middle is difficult to motivate”.

For the traditional PBL project, there is a correlation between figures 4.4 (page 63), 4.5 (page 65) and 4.7 (page 74) showing that motivation does influence the learners level of engagement during the traditional PBL project. Figure 4.7. (page 74) shows that learner engagement fluctuated with engagement being highest at the start of the project, lowest in the middle of the project and improving towards the end of the project. A similar trend is observed in the co-creation project as there is a correlation between figures 5.5 (page 105), 5.6 (page 106) and 5.7 (page 113), showing that learner’s level of engagement fluctuates and is highest at the start and end of the project.

Figure 4.7 (page 74) also shows that some learners felt they sustained their engagement throughout the project, however, these learners were in the minority at 30 %. This figure is

slightly higher in the co-creation project with 38 % of learners feeling they engaged consistently throughout the project.

The correlation between motivation and engagement is evident during the co-creation project as expressed by Participant 17 who states that they were “excited to come to the lesson and motivated to complete my work to the best of my capabilities”.

In conclusion learners’ motivation and engagement for traditional PBL and co-creation follow a similar trend of being highest at the start, lowest in the middle and improving towards the end. Co-creation has a higher level of sustained motivation than traditional PBL and a higher level of motivation at the end of the project. However, the drop in motivation towards the middle of the project is higher in co-creation than it is in traditional PBL. In both traditional PBL and co-creation motivation influences engagement, with higher levels of learner motivation resulting in higher levels of engagement.

6.4. Are there skill gaps that impact on a learner’s ability to successfully engage in co-creation?

The next question asked if there were skill gaps that impacted on the learner’s ability to successfully engage in co-creation. From the teachers’ and learners’ comments, specific skills that could be developed within the PBL program are discussed.

At the FET school, the Grade 8 year of PBL is spent developing the skills that are required for learners to manage the demands of Grade 9 PBL. This time is also used to develop the skills that are believed by the school to be required for success in the Senior Phase.

Learners and teachers identify research skills, journaling and self-reflection as skills that require further development in order for learners to meet the demands of co-creation. It is acknowledged that part of the reason the sample of Grade 9s may not have had these skills was influenced by their Grade 8 year being interrupted by the Covid-19 pandemic and the school closures. This is evident in the response from Teacher 4 during the traditional project who notes that the learners experiences of PBL were " interrupted by COVID and (they) did not understand the value of completing the process of that project on their return." However, the correlation between the learners' and teachers' responses in identifying these skills, indicates that they are significant and need to be considered when preparing learners for co-creation.

During the traditional PBL project, learners identify too much research as an area of the project they do not enjoy. This correlates with the observation of the teachers who agree that learners do not always see the value of the research component of the PBL projects. It is noted, that the data collected is not sufficient to draw conclusions on why learners do not enjoy or see the value in completing research and this would be an area for further study. It is hypothesised by the researcher that inadequate research skills are one possible factor that could contribute to this observation. The need to develop research skills further correlates with the findings of the co-creation project where 62 % of learners identify developing the research questions as an area of

difficulty. This is expressed by participant 3 who states, “I normally don't do any research”. Developing research questions are also identified by the teachers and researcher as skills that need developing during the co-creation process. Journaling and IT skills are linked to research skills, that both teachers and learners identify as needing developing

Figure 5.3 (page 98) identifies aspects of the co-creation project the learners found least enjoyable. These included peer feedback, teacher feedback and the opportunity for self reflection. These responses correlate with the feedback provided by the teachers who facilitated the co-creation process. Although the learners identify self-reflection as an area they are not motivated to complete the quality of the feedback provided indicates that they are capable of self-reflection, this is shown by Participant 20 who expresses that, “I do not think that there is anything to change, because lots of what I struggled with had to do with me.” The observations that the quality of peer feedback was improved when learners were unable to provide feedback anonymously and had to write their names, provides insight into how peer feedback can be improved. The observation by the researcher that the quality of teacher feedback improved during the co-creation project when the groups were smaller and specialist teachers assessed the projects, provides insight into how the process of feedback from teachers can be improved. Almulla (2020) notes that learners within a classroom setting receive a large quantity of feedback, but do not always have the ability to use it effectively (Almulla, 2020). As the PBL approach allows learners with an opportunity for reflection to take place, it is important that feedback and reflection skills are developed within this context. This will be discussed further in Chapter Seven.

The ability to manage one's time is identified by both learners and teachers as an area that needs to be developed and this has been discussed under research question one. It is noted that time management is recognised by learners as being a graduate skill.

In conclusion, there are skill gaps that impact on learner's ability to successfully engage in a co-creation project. These skills include research skills, time management skills, IT skills and reflection skills.

Chapter Six provides a comparison between the results from Chapter Four and Chapter Five. This allows for observations to made by the researcher and for links to be made where the results correlate or contradict literature. The recommendations from this discussion for the successful implementation of co-creation into a PBL Program as well as areas for further research are described in Chapter Seven.

Chapter 7 Recommendations

Chapter Seven provides a summary of the research project described in the preceding chapters. Recommendations are then made with regards to the implementation of co-creation within a PBL program. This is followed by recommendations for future research.

7.1. Overview

Co-creation is a process that allows for learners and teachers to collaborate within a learning context. This collaboration allows for learners to experience increased autonomy and choice within the learning environment (Bovill, 2019). As part of this research project, the researcher assessed the levels of motivation and engagement within the traditional PBL classroom. This was followed by the implementation of the co-creation process where learners and teachers collaborated to design a project. After this project was designed, learners had the opportunity to complete the research project they had designed or complete a project designed by a peer. Questionnaires were completed by the research participants at the end of the traditional project and at the end of the project that was designed through the co-creation process. The results of these questionnaires can be found in Chapter Four and Chapter Five. In Chapter Six, the results of the questionnaires were discussed, and links were drawn to the literature review completed in Chapter Two.

7.2. Conclusions

The findings of the research project, were that co-creation incorporates characteristics of traditional PBL projects that improve learner's motivation. Learner's personal interests, learner's choice and learner's sense of achievement are greater in co-creation projects than traditional PBL projects and this further enhances motivation. PBL projects designed through the process of co-creation offer greater opportunities for learner independence and autonomy which further improves motivation and engagement. Learners involved in co-creation projects experience higher levels of sustained motivation than learners completing traditional PBL projects. However, learners involved in co-creation projects experience a greater drop in motivation levels towards the middle of the project. In order for the co-creation process to be successful this drop in learner motivation needs to be managed by the teachers facilitating the projects. Within the FET school, there were gaps in the learners skills which impacted negatively on the learners ability to successfully complete the co-creation project. These skills include research skills, time management skills, IT skills and reflection skills.

The characteristics of co-creation that enhance motivation and engagement are identified as the affordances of incorporating co-creation within a PBL program. The greater drop in motivation in the middle of the project as well as the need to address the identified skills gaps prior to beginning a co-creation project are identified as the constraints of incorporating co-creation within a PBL program. Although not essential for the implementation of co-creation within a PBL program, IT infrastructure and specalised equipment such as sewing machines or 3D printers is

advantageous. The costs and staffing requirements of these additions is also recognised as a constraint.

83 % of the learners who participated in the research study preferred the co-creation project when compared to the traditional PBL project. This is best expressed by Participant 6 who states that, “I much preferred this project because I enjoyed doing it a lot more. I was more interested in this topic and it motivated me to work harder.” This statement correlates with the observation made by Teacher B who writes, “It is fascinating to see what the students come up with. We can think we understand what interests our students but often really get it quite wrong. Co-creation keeps us on our toes and gives us a deeper insight into what motivates our students. Dollinger (2018) states that by allowing learners to contribute knowledge and resources that are different to their teachers creates an educational environment that fosters superior outcomes. The inclusion of co-creation within the PBL program would thus benefit learners as it impacts positively on learners’ motivation and engagement during lessons.

7.3. Recommendations for incorporating co-creation into a PBL Program

The following section provides recommendations for incorporating co-creation into a PBL Program. This section has been subdivided into learner’s skill development and the structuring of specific projects as these emerged as key gaps in the co-creation project.

Learners Skill Development

Research skills and IT skills are specific areas that are identified as impacting negatively on learner's abilities to successfully complete a co-creation project. These skills can be taught both within a PBL classroom and within a more traditional teaching environment. The FET school, has already independently of this research, incorporated the teaching of these skills into the Grade 8 and Grade 9 program. In conjunction with this it would be beneficial to the process, if schools are able to provide the necessary resources and IT infrastructure to support the learning process.

Learners expressed a simultaneous desire for both increased autonomy and increased structure provided by teachers. This suggests that a culture of co-creation needs to be fostered within a school environment, thus allowing learners to progress from being dependent on their teachers to being more autonomous. In order to foster this culture of co-creation teachers could incorporate aspects of co-creation process into aspects of the traditional PBL program and within the traditional classroom environment. An example of this would be allowing learners to contribute research questions to a prescribed task, allowing for variations in presentation style or allowing learners to contribute to an assessment rubric.

Learners who were successful in managing their time experienced greater success within both the traditional and co-creation project. Teachers need to be conscious of this when facilitating projects and provide learners with assistance when needed. The inclusion of timelines for projects could potentially assist learners. Active teaching of time management skills could also

be completed. An example of this, would have learners predict how long an aspect of the project would take, complete the aspect of the project and then reflect on the process.

Structuring a Co-Creation Process

Figure 2.2. (page 21) outlines that the co-creation process is cyclical in nature. After completing the co-creation process with the sample population, the researcher acknowledges that more time is needed to be spent on the design phase of the project. In particular, greater input was needed in evaluating research questions and time frames with the learners and re-designing when necessary. As identified by Participant 18, "A plan would have prevented this (referring to the stress experienced during the project) and allowed us to finish it on time. The implementation of strategies to assist learners drawing up research questions, such as mind-mapping[15] would also assist learners in the design phase of the project.

Linked to the cyclical nature of the project, and the need to evaluate and re-design if needed, is linked to the need to increase the amount of time spent on reflection. Almulla (2020) states that the PBL approach provides learners with the opportunity for reflection and more effective use of feedback to enhance learning (Almulla, 2020). An important aspect of this process, is that learners are provided with sufficient time and opportunity to act on the feedback provided and make improvements. As observed during the research project, learners are capable of insightful reflections and observations. This process can be enhanced by ensuring that feedback and reflections are not anonymous, as the quality of feedback improved when learners could be

[15] Mind Mapping is identified by Teacher B

identified. The use of specialist teachers during project presentations resulted in the learners receiving detailed and subject specific feedback and this would be recommended going forward.

Teachers facilitating the project need to be aware of the 'messy middle' and incorporate characteristics of co-creation and PBL that enhance motivation into the project at this stage. During this stage teachers could include, factoring in smaller goals to allow for learners to achieve a measurable success during the process, rather than only experiencing this success at the end. The inclusion of opportunities for social interaction, such as peer-peer feedback sessions could also benefit motivation levels during this dip.

When structuring the co-creation project, the researcher would recommend that learners be allowed to select topics and to complete an outline of the designed project. This would then be followed by allowing learners to combine groups or join a peer to complete their project. Once the groups have been finalised the design of the project can be completed. This method allows for learners to explore and consider their own interests, while still meeting their social needs.

If team teaching with co-creation as an overall strategy, it is recommended that all teachers are involved in leading a particular lesson to ensure ownership of the process. It would also be recommended that specific learners within the group be allocated to a specific teacher. This allocation of learners, enables the facilitator to structure check-in opportunities and provide more valuable and consistent communication that is specific to the learner.

As the co-creation process is new to many learners and many teachers, there is a need to repeat the design and completion of projects in order for learners to master the skills. This is best described by Participant 21, who observes that there is a need to complete a second co-creation project as there is educational merit in ""allow(ing) us (learners) to fail and improve"

7.4. Limitations of research

A limitation of the research is that it was carried out within one FET school and further research is needed to determine if the observations made within this school are applicable to other FET schools. The FET school is well resourced and learners have a high level of literacy, further research would need to be conducted to determine if the findings are applicable to schools that are less resourced and where levels of literacy are lower. Another limitation of the study is that the sample population was small, repeating the study with a larger sample would improve the validity and reliability of the findings.

7.5. Recommendations for further research

Further investigation is needed into why learners dislike completing research, and as to why they do not value the process. The researcher has suggested a possible hypothesis for this finding, however, further research is needed.

The variation in answers between the learner and teacher participants on the impact of the learner-teacher relationship on motivation and engagement requires further investigation. It is evident from the study, that the learner-teacher relationship, does impact levels of motivation. However, the characteristics of this relationship and its influence on learners has not been fully investigated.

The observation by both the researcher and Teacher A that learners who experience difficulties with discipline and motivation benefited from the co-creation process requires further investigation. The use of co-creation as a teaching strategy to provide extension opportunities could also be investigated.

The use of computer games is identified as a characteristic of a traditional project that influences motivation. The impact of computer games on motivation varied and was dependent on the time of the project it was used and the complexity of the game. The characteristics of gaming and their impact on learner motivation and engagement requires further investigation. The potential for computer games to be incorporated into the co-creation process needs to be investigated further. School culture and learner fatigue, are noted as impacting on learner motivation and engagement in both the traditional PBL project and the co-creation project. However, the data was insufficient to draw conclusions and make recommendations, thus further investigation is needed.

The use of co-creation within a PBL context has been shown to be an effective teaching strategy to improve learner motivation and engagement. By allowing learners to contribute to the planning of their educational activities teachers would increase the likelihood of achieving academic fulfillment. The creation of graduate skills through the use of co-creation within a PBL context would serve learners in their pursuit of higher learning.

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