Exploring the Role of Project Work in Secondary Schools Beyond Continuous Assessment

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Abstract

This article presents the findings of a qualitative inquiry that explored what secondary school students in Tanzania learn from their research project work beyond just grades. Guided by Vygotsky's (1978) constructivist theoretical perspective, the study collected data from 38 students and 10 teachers through focus group discussions and interviews, respectively. The study found that, besides obtaining grades and rewards, engaging in project work provided students with opportunities to develop research, problem-solving, creativity, communication, collaboration, and leadership skills. It further reveals that the effectiveness of project work in secondary schools is undermined by its lack of emphasis, as many schools conduct it solely as a means of continuous assessment that contributes to the student's overall grades. However, the study documents that well-conducted research projects have the potential to cultivate and enhance important educational skills beyond the expectations of continuous assessment. The implications of the findings for policy and practice are discussed.

Keywords: *continuous assessment, project work, secondary education, grades*

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Background

Project work is a beneficial teaching and learning approach (Sukiawati & Nurfaidah, 2021; Viro & Joutsenlahti, 2020). Indeed, project work can help students acquire 21st-century skills, such as information processing and knowledge creation (Sukiawati & Nurfaidah, 2021). Moreover, project work can foster social interaction, which is an essential aspect of students' learning (Viro & Joutsenlahti, 2020) and in developing their critical thinking skills (CTS). Furthermore, project work allows students to draw on their experiences, making it an effective approach

to the teaching and learning process (Viro & Joutsenlahti, 2020). Additionally, it is essential in constructing new meanings. Students can also engage and deal practically with topics or challenges through such projects, which challenge and motivate them while completing them.

As a student-centred learning approach, project work is characterised by the learners' autonomy, engaging students in investigations, goal-setting and collaborative work to achieve the goal. In effect, during such project work, students engage in solving real-world problems or answering specific questions (Kokotsaki et al., 2016; Oyewo et al., 2022). Thus, when students learn through project work, they also have the opportunity to choose an investigation question, plan the investigation procedures, engage in inquiry, collect and analyse data, and draw conclusions from the data. In essence, project work allows students to take control of the learning process, with the teacher playing a facilitative role. Project-based learning also constitutes an inquiry-based task, as it involves all facets of inquiry-based learning. It revolves around a genuine topic that needs addressing through inquiry processes (Kokotsaki et al., 2016; Oyewo et al., 2022). When students engage in such tasks, they not only consume knowledge but also critique the acquired knowledge and participate in the knowledge-creation process.

The benefits of project-based learning for students, according to Sukiawati and Nurfaidah (2021), include enhancing their writing and communication skills, which are essential in the 21st century, in addition to nurturing self-reliance (Dimmitt, 2017). In that regard, students who engage in project work can make independent decisions pertaining to planning and executing their project activities (Eklöf, 2014). Although project work is often closely linked to student assessments of curriculum content, studies have found that, in some cases, students' research projects go beyond grades, fostering learning from the content and encouraging creativity (Eklöf, 2014; Oyewo et al., 2022).

In a more modern teaching approach, project work is referred to as project-based learning applicable in diverse contexts. In Finland, project work has been an integral part of the curriculum from kindergarten to the university level (Viro & Joutsenlahti, 2020). The curriculum requires integrating the project work element into at least one module each year. Dobson and Dobson's (2021) study on empowering student voice in secondary schools conducted in England found that project-based teaching of lessons engages students and enhances their voices in the teaching and learning process. Kokotsaki et al. (2016) noted that project-based learning is a method that involves students in the educational process. The learning context is guided by a real-world question that allows students to incorporate their prior knowledge into the process. In project-based learning, both teachers and students require support to ensure effective group planning to guarantee results-

driven practical work and strike a balance between independent and instructional learning, enabling students to comprehend the material before engaging in inquiry (Kokotsaki et al., 2016).

The literature also suggests engaging learners in reflection, peer and self-evaluation and ensuring that students enjoy autonomy in the project work process. For example, Eklöf's (2014) study, conducted in the Swedish context, explored how students undertaking project work engaged in independent learning and critical thinking. The study found that even though project work can enable students to acquire skills beyond obtaining grades, such as CTS, educators must be aware of the inherent risks associated with students' independent learning and investigation. Implicitly, the outcome of well-planned project work can extend beyond the students' continuous assessment (CA). After all, project work can induce the development of students' skills through problem-solving tasks and creativity, as well as through evaluating, communicating information, and developing new ideas.

Although the project work appears advantageous because of its potential to support students' development of various skills, studies have reported challenges in the implementation process (Aksela & Haatainen, 2019; Aldabbus, 2018; Sagita et al., 2023). These challenges can hinder students' effective engagement with various vital skills. These challenges include time management, insufficient resources (Aksela & Haatainen, 2019; Aldabbus, 2018), lack of effective collaboration among students, and a lack of technical skills essential for project implementation and management (Aksela & Haatainen, 2019; Sagita et al., 2023). Also, designing and implementing assessments in a project activity is challenging in the absence of the necessary skills (Aldabbus, 2018). For meaningful and effective project implementation, learners need self-management skills, which, when lacking, hinder implementation (Sagita et al., 2023). When students lack self-management skills, the teacher must act as a facilitator to ensure the attainment of the project goals.

In Tanzania, project work at both ordinary and advanced-level secondary schools, as well as teacher training colleges, contributes to continuous assessment (CA) grades (Ministry of Education, Science and Technology [MoEST], 2024), which are then combined with final examination results. National Examinations Council of Tanzania (NECTA) has the national mandate of assessing students' learning outcomes at the end of their education cycle. Both CA (i.e. 30%) and final examination (i.e. 70%) results (MoEST, 2024) contribute to the final tally of a student's grade (i.e. 100%). NECTA requires secondary school students to engage in project work (accounts for 7%), which contributes to a total CA score (accounts for 30%), as outlined in MoEST's (2024) continuous assessment guidelines for secondary schools and teacher training colleges. Project activities for ordinary secondary schools typically take place at the end of Form Three and the beginning of Form Four, with working groups of 4 – 6 students who are

at liberty to choose a topic for their project work and conduct research (MoEST, 2024). Project work involves students selecting a research inquiry topic, conducting investigations, collecting and analysing data, drawing conclusions, and communicating their findings, all of which are aspects of CTS. When well-designed and implemented, project work can be an effective teaching and learning approach that helps students develop CTS. In the Tanzanian context, project work is widely executed in schools to contribute to students' continuous assessment.

Chin and Chia's (2010) study investigated how to implement project work in biology subjects through problem-based learning in China. Canziani and Tuller's (2017) study in the US focused on developing CTS through consulting projects. Moreover, van der Zanden et al. (2020) assessed teachers' practices in fostering students' CTS as they prepared for university education. Apparently, the literature reviewed indicates that little has been done so far, especially in the Tanzanian context, on the benefits—beyond obtaining grades—of project work conducted in secondary schools. This study forms part of a broader project aimed at examining the current practices and experiences of both teachers and students with respect to project work. Specifically, this study explores (i) what students learn from project work beyond obtaining grades and (ii) what challenges limit the effective implementation of project work for students.

Theoretical framework

This study applied Vygotsky's (1978) constructivist theory because project work fosters collaborations and social interaction among both students and, subsequently, their teachers, leading to meaningful learning materialising. In accordance with Vygotsky's zone of proximal development theory, students must engage with peers and receive assistance from their teachers to achieve conceptual growth (Vygotsky, 1978). Teacher-student engagement and cooperation are crucial in all project work tasks, including formulating a research topic, designing an investigation, investigating, gathering and analysing data, and reporting the findings. Project work accords students opportunities to answer research questions relevant to their experiences. From Vygotsky's constructivist perspective, students both receive information and engage in the creation of knowledge. After all, students in the learning process are not *tabula rasa* as they come with their prior knowledge and experience (Vygotsky, 1978). The constructivist perspective also encourages students to engage in activities that enable them to develop CTS (Miri et al., 2007). Such experience can serve as a framework for catalysing further learning (Driver et al., 1994). In such an amicable learning context, students can develop critical thinking and problem-solving skills.

Methodology

Research design and areas of study

This qualitative research employed a multiple case study design to enable the researchers to compare individual cases with others and, thereby, enrich the findings (Campbell & Ahrens, 1998; Bryman, 2013). The study was conducted in five secondary schools in Tanzania purposively selected based on their students' performance in the Certificate of Secondary Education Examination (CSEE) administered by NECTA. These schools were categorised into three groups. The first group consisted of two secondary schools with exemplary performance in CSEE for three consecutive years (i.e. 2018, 2019, and 2020), which were coded as School A and School B, located in Morogoro and Mbeya regions, respectively. The second group consisted of two secondary schools from the Mtwara region, which had unsatisfactory performance in the CSEE conducted in 2020, coded as School D and School E. The third category consisted of one school with satisfactory performance in the CSEE undertaken in 2020, coded as School C, located in the Iringa region. Each school served as a separate case to explore context-specific insights related to students' project work.

School A

This school, which is located in the Morogoro region, is a public secondary special school for best-performing boys. The school had different arrangements for the implementation of project work. One arrangement entailed conducting students' project work each year for Form Three and Four candidates as part of their CA. The second arrangement involved competitive projects, with different organisations striving to harness the best students' research ideas. Students benefited from the support available to develop their projects for competitions, with the winners receiving rewards. This feature was a unique case among the schools under review. The school was also located near a university with resources and equipment that students used to test their experimental materials.

School B

This was a high-performing private girls' secondary school located in the Mbeya region. Students in school B participated mostly in project activities mainly as a part of their CA. Notably, the COVID-19 pandemic prompted students in this school to engage in online research projects.

School C

This co-education public school located in the rural segment of the Iringa region, which had a moderate performance with satisfactory results, had a special teacher

tasked with nurturing students' project research skills through project work. Before embarking on project work, the students received training from the teacher on procedures for conducting project work.

School D

This public school located in the Mtwara region was also co-education for lower or ordinary secondary education (Forms I-IV). The school is a hybrid, catering to both boarding and day students. Performance-wise, the school belonged to the group of low-performing schools. It was largely inactive in project work, with Form IV students engaging in a one-off set of project activities only for their mandatory CA.

School E

This private co-educational school is located in Mtwara-Mikindani municipality, with a moderate performance in CSEE, and accommodates both boarding and day students to pursue lower secondary education. At this school, the teacher responsible for academic matters also nurtured students' research skills and ensured they completed their projects effectively by training other teachers in supervisory skills and students in basic research steps.

Participants and data collection methods

The study used in -depth interviews and focused group discussions (FGD) to generate data from teachers and students, respectively. The study involved Form III and IV teachers supervising project work, as well as students who had been engaged in it. Two Form III and IV teachers from each school participated in in-depth interviews aimed to determine lessons learned from the project work that could enhance students' development of CTS. Meanwhile, 6 to 8 students from each school took part in focus group discussions (FGDs) aimed at exploring their experiences with project selection and report writing. Students also shared their project activities and the benefits accruing from them. Table 1 presents the demographic characteristics of the study participants.

Table 1

Participants' Demographic Profile

School ID	Students	Teachers
School A	Male (6) Female (0) Total (6)	Male (2) Female (0) Total (2)

School B	Male (0) Female (8) Total (8)	Male (1) Female (1) Total (2)
School C	Male (4) Females (4) Total (8)	Male (2) Female (0) Total (2)
School D	Male (4) Female (4) Total (8)	Male (1) Female (1) Total (2)
School E	Male (4) Female (4) Total (8)	Male (1) Female (1) Total (2)
Total	Male = 18 Female = 20	Male = 7 Female = 3

Data Analysis

The study analysed the resultant data inductively (Erickson, 2012). The data initially collected in Kiswahili were transcribed and translated into English. Reading through the datasets facilitated the researchers' understanding of the material, while the ATLAS-TI software facilitated data analysis. The transcripts from the interviews and focus group discussions were imported into the programme for further analysis. The coding scheme was developed inductively as they emerged from the transcriptions (Erickson, 2006). The identification and labelling of the various emerging benefits and challenges of engaging students in project work formed the basis of the codes used in the study. The codes were arranged into prominent themes discussed in the findings section (Clarke et al., 2015). The researchers employed member verification and peer debriefing techniques to ensure data dependability. They also reduced their own biases and confirmed their interpretations with feedback from the peer experts, thereby enhancing the credibility, dependability, objectivity and confirmability of the findings. Moreover, they co-opted the participants in the verification and validation processes to ensure an accurate representation of their opinions.

Ethical Considerations

In adherence to the research code of conduct, the researchers obtained ethical clearance from the University of Dar es Salaam, which introduced them to the regional administrative secretaries of the respective research sites. The authorisation allowed the researchers to seek introductions from the district administrative secretaries to the

studied schools. Before and during data collection, the researchers obtained informed consent by explaining the purpose of the research to the participants and ensured confidentiality and anonymity throughout the data analysis and presentation.

Results

What do secondary school students learn from project work?

Since the study employed a multiple case study design, the results in this section are presented on a case-by-case basis.

School A

At this school, researchers learned that students' frequent participation in project work enabled them to engage in a wider range of skills that foster the development of CTS compared to their counterparts in other schools with limited exposure. The benefits of project work at School A were as follows:

Enabling the application of knowledge in real-life situations

Teachers' interviews at School A revealed that students connected classroom knowledge to real-life situations when designing their project work based on what they had learned in class. Indeed, when the students engaged in project work, the learning and teaching became practical-oriented, which enhanced their understanding of theoretical knowledge from the class. In their projects, the students learned about how to apply knowledge, for example, the appropriate use of chemical and non-chemical fertilisers. At School A, project work was an integral part of the student's school life. In this regard, students working on projects involving the use of manure could carry out their project throughout the year to study its impact on soil and plant growth, as shown in the excerpt below:

> For example… the use of compost manure and other organic residues. We have students who are doing their projects in the garden… they learn how to apply such organic fertilisers… they have learnt that such fertilisers are beneficial because of their lasting effect on the soil… (Teacher, School A, 24th June 2022).

Another teacher at the same school stated that project work allowed students to develop the attitude to apply theoretical knowledge from their subjects to real-life situations:

> …projects help students to apply concepts in real lives…. When we have hands-on education and investigations that are helpful to

> everyday lives, it makes a good link between theories gained in the classroom and practice… (Teacher, School A, 22nd June 2022).

Enhancing creativity

Both teachers' interviews and students' group discussions revealed that appropriately planned project work can nurture creativity among students. Creativity skills can also develop among students through practical activities that involve completing project tasks, such as investigating an issue to find an answer to a specific question. One of the teachers said creativity skills among students were evident during, for example, research on *Mlonge* (a traditional herbal medicine). Students developed their own questions for investigation, designed research methods, interviewed people using the medicine, and sent the medicine for content analysis in a laboratory as part of their inquiry. In our theoretical framework, these procedures constitute CTS elements. A teacher who supervised students' projects explained how the application of these procedures enhanced the students' creativity:

> …[projects] develop creativity …The student can have an idea. Maybe they have seen somebody doing something. When a student is engaged in doing, he becomes more creative… when students are told Mlonge is a medicinal plant, we tell them to follow procedures …they can send the plant to the lab and explore the contents of Mlonge…. Then they realise, ahhhh… Those who were using the herbal concoction did not conduct any investigation……..…[When the students conduct the investigation on the content of Mlonge and see the content, they realised that those patients who were using the medicine before were less informed] (Teacher, School A, 24th June 2022).

In other words, project work allowed students to learn from people around them, with whom they conducted inquiries and engaged in hands-on activities during investigations, ultimately fostering creativity. Likewise, another teacher reported that students at their school benefited from an opportunity to explore and design a gas leakage detector, which allowed them to be creative in solving problems around them.

Enhancing problem-solving skills

The study found that one aspect of CTS that could emerge from project work was problem-solving, which most of the teachers and students at the schools under review mentioned. By engaging in project work, students learned how to solve problems such as environmental problems at home, including dealing with various challenges such as electricity faults. Students also disclosed that by engaging in

project work, they learned how to solve multiple problems, such as exploring the effectiveness of local medicines, determining ways to prevent different diseases, and preventing fire accidents:

> I did a project on the effect of lemongrass on mosquitos… we took a sample of lemongrass. We had to grow it… Mosquitos did not like the scent…. So, when you plant it somewhere, the mosquitoes don't come… The conclusion was that… lemongrass can solve the problems mosquitoes cause, such as diseases like malaria (Student, School A, 24th June 2022).

This student's project investigated the prevention of malaria using lemongrass. Generally, the students reported that data from this investigation supported their conclusion that lemongrass can help prevent malaria.

School B

The results indicate that when students in School B were engaged in project work, they developed skills in critical thinking, such as collecting and analysing data, presenting data, drawing conclusions based on data, and problem-solving. Other skills included undertaking independent work and applying knowledge beyond the classroom.

Data collection, analysis, and presentation skills

At school B, participants reported that project work allowed students to employ multiple skills, including collecting and analysing data, data-driven drawing of conclusions, and presenting findings. Students confirmed that they engaged in both problem-solving and drawing conclusions from data in addition to collecting and analysing data, hence engaging with CTS:

> From the project, I gained the ability to think critically, apply knowledge beyond the classroom, collect and analyse data, and draw conclusions from data, as well as problem-solving and conflict-resolution skills in project work (Student, School B, 25th June 2022).

Investigation and independent working skills

Students in school B also reported that they acquired investigation skills and independence in task accomplishment through project work. Their inquiry-based learning entailed deciding on probe questions, designing investigations, investigating, and communicating results, which can support students' development of CTS. Likewise, students said that project work made them engaged in independent and critical thinking while evaluating information obtained online.

One of the students said:

> Through the project, I learned that the transport and communication system constitutes the cornerstone of the development of the economic sector. The project helped me to develop practical investigation skills and become independent in accomplishing tasks assigned to me. Moreover, some online information was unclear, so critical thinking was essential (Student, School B, 26th June 2022).

School C

Our findings suggest that project-based learning fosters curiosity and helps students at this school apply what they have learned in the classroom.

Developing an inquisitive mind

Through interviews, teachers claimed that when students engage in project work, their ability to inquire, thinking skills and capacity for problem-solving significantly improve. The ability to inquire implies crucial skills for asking scientifically oriented questions on a given phenomenon:

> The aim of doing projects is to make students curious. They must be able to inquire… [another aim is] to make them innovative…. If they face a challenge, they will be able to solve it (Teacher, School C, 16th April 2022).

Application of knowledge

Teachers at School C also reported that project work allowed students to go beyond what they had been studying in class and apply the acquired knowledge to real-life situations, implying the application of CTS. Implicitly, when students engaged in project activities, they acquired skills to apply class-acquired knowledge to the real world. One student at school C said:

> This is real…. In our environment, it is little by little, but it does happen…. For example, in the project, I learned about the usefulness of the project for development… I linked the knowledge learned in class to the real world…When I go back to class, I can apply [what I learned from the project … linking the knowledge from class to what I get from the project, I get a wider understanding (Student, School C, 16th April 2022).

In other words, the application of knowledge is twofold: students apply class-acquired knowledge to real-life situations and integrate experience from the real world into the classroom, thereby engaging in additive and meaningful learning.

School D

Besides contributing to students' CA at School D, project work also helped to develop students' creativity and self-confidence, as well as communication, critical thinking, and leadership skills.

Creativity and CTS

Even though students received guidance and advice from their supervisors, they took charge of their projects. Choices regarding what to investigate, where to execute the project, whom to interview, and how to present the materials were left to the students. In other words, students were responsible for project planning, management, and implementation within the timeframe and criteria set by the school. So, in this sense, the school fostered creativity among students through projects, as reported by the teachers from school D. One of the teachers said:

> To a large extent, students develop their level of creativity because everything is left for them to do to come up with an interesting thing, from topic selection to data collection and report writing (Teacher, School D, 18th October 2022).

Critical thinking constituted another important skill nurtured by project work in school D, as reported by the participants at this school. When conducting their projects, students asked themselves questions to come up with possible answers:

> Project work expands students' ability to think critically. While conducting their projects, students raise various questions and get answers, so their ability to think expands even more (Teacher, School D, 18th October 2022).

In this regard, our theoretical framework drawn from the literature shows that activities that can nurture students' CTS include engaging students in problem-solving, designing an investigation and investigating, data analysis, and drawing conclusions based on findings. Teachers at school D reported that students participating in project work could engage in such activities and develop CTS. Apart from CTS, project work helped to nurture students' leadership skills, which is one of the 21st-century skills. One of the teachers commented:

> In each project group, a leader-led their colleagues. Therefore, if you gave him/her leadership responsibilities, he/she himself/herself thought that he/she could lead (Teacher, School D, 18th October 2022).

Communication skills

It also emerged that having a project report as the output allowed students to practise and develop their writing skills. Teachers interviewed at school D reported that project work engaged students in report writing, thereby sharpening their communication skills, particularly their writing skills:

> …on the other hand, projects helped students develop writing skills through the reports they wrote at the end and submitted to their supervisors (Teacher, School D, 18th October 2022).

School E

In addition to contributing to their CA, the study found that project work enabled students at School E to engage in collaboration, teamwork, self-confidence, problem-solving, and communication skills to understand the subject matter in question better.

Collaboration and teamwork

When working on projects, students operated in small groups that allowed them not only to learn how to work better in groups by providing their ideas, listening to the views of fellow students, and settling disputes when they emerged but also forge a strong bond with supervisors, which offered them opportunities to develop a greater understanding of the topic. Students also created relationships with community members when working on projects, thereby acquiring new skills, attitudes, and experiences:

> In undertaking these projects, students worked in groups under the guidance of supervisors. Students in groups exchanged views, ideas, and opinions while collecting data together in the field. In so doing, they built relationships and solidarity amongst themselves, their supervisors, and community members, thereby gaining new insights that helped them solve realistic problems under investigation (Teacher, School E, 19th October 2022).

Problem-solving skills and an in-depth understanding of the subject matter

Students also learned how to solve various problems facing their respective societies more effectively when working on projects. At School E, participants reported that participating in a project activity enabled students to find solutions to problems around them, such as the prevention of diseases and proper fishing techniques:

> Projects provide opportunities for students to solve their problems and those of their respective societies. Two years ago, some students did

> their project on an incurable disease, HIV/AIDS. Their particular focus was on effective HIV prevention strategies and how to live with people with HIV. After this project, students became aware of strategies for preventing HIV and tips for taking care of and supporting people living with HIV (Teacher, School E, 19th October 2022).

Likewise, students reported that engaging students in project work enabled them to learn meaningfully by investigating interesting and relevant things to their culture. Thus, engaging students in project work contributes to students' CA and, according to our findings, may also enable authentic and meaningful learning.

Challenges affecting project work execution in secondary schools

Although the study findings indicate that the research projects conducted in secondary schools have the potential to develop critical thinking skills among students, several challenges undermined their effectiveness: over-emphasis on continuous assessment, low emphasis on the curriculum, heavy workload, and low cooperation from the field, limited financing, and supervisors being non-equipped with requisite research skills.

Over-emphasis on the continuous assessment

In the four schools (s B, C, D, and E) under review, over-emphasis on continuous assessment rather than other benefits students obtained from the project work emerged as a challenge to the effective implementation of project work in schools. Regarding over-emphasis on the continuous assessment, some teachers shared the following insights:

> Students do projects only once to obtain CA marks that will contribute to their final Form IV national examination results. The students' CA marks are obtained through terminal tests and one project (Teacher, School E, 19th October 2022).

The teacher at School C further contended that some students failed to take the activity seriously as they only participated in the research project to fulfil their CA requirement:

> Other students only fulfil the responsibility of completing their CA so that they are not marked with an incomplete grade. They do not take the exercise very seriously… (Teacher, School C, 16th April 2022).

Even though secondary schools receive directives from NECTA that every student has to participate in project activities to complete their continuous assessment and be eligible for the final examination, the curriculum does not emphasise the use of

of project-based learning as part of the pedagogical approach. One of the teachers said:

> The problem is that this thing [project work] is not emphasised in the curriculum although it has a significant role in the learning and assessment process…unlike the practical work in the labs where it is very clear to teachers that the students will conduct practical in their subjects, the conditions and environment for this work are well-elaborated in the books and teacher manuals, but less is known about how the teachers implement the project-based work…. (Teacher, School D, 18th October 2022)

Scarcity of resources

Teachers also cited scarcity of resources as one of the challenges afflicting the implementation of project work in Tanzania's secondary schools. All five schools (schools A, B, C, D and E) under review mentioned challenge. The following evidential statement illustrates the common view about this challenge:

> The big challenge that students face is the shortage of equipment and funds. You find that students need money to move from point A to B to collect data. Also, they need stationaries to write their project reports. So, the scarcity of these resources prevents many students from participating effectively in the exercise (Teacher, School D, 18th October 2022).

Another teacher shared a similar view on the lack of funds:

> …. this activity lacks proper funding, sometimes we use our own money to support students' research activities including transport costs or stationeries …or sometimes we buy an internet bundle and give students our mobile phones to search for kinds of literature because our school does not have ICT facilities (Teacher, School C, 16th April 2022).

Moreover, the shortage of teachers relative to the large number of students enrolled in schools poses a great supervision challenge for students' research projects. One school participant said:

> The biggest challenge that students face is supervision. You know many schools have a large number of students, but the number of teachers is small. Therefore, it becomes difficult for teachers to supervise all students effectively and efficiently... (Teacher, School D, 18th October 2022).

Lack of cooperation

A lack of cooperation from participants in the research field sites also emerged as a major problem affecting the implementation of students' projects in Schools E and D, as one of the students from Schools E explained:

> There is low cooperation from the participants. Sometimes, they are unavailable even when you make an appointment...For example, we collect data from fishermen believing they will cooperate. Still, most of them are busy with their work, very few can accept the discussion, and some of them, even if you ask questions, do not cooperate satisfactorily (Student, School E, 19th October 2022).

Implicitly, personal, structural, and systemic barriers affect the effectiveness of projects in secondary schools under review. These challenges affect the design, implementation, and quality of the project outputs. They also impair the contribution of project activities aimed at developing the required skills and facilitating learning among students.

Inefficient skills for teachers

In all five schools under review, teachers claimed they lacked sufficient skills to guide students in project work. In some schools, only one or two teachers could guide students in project work (for example, in School C). Lack of research skills also featured a stumbling block to the implementation process as the few teachers available were overwhelmed by such a responsibility. One of the students said:

> There is a bit of a challenge there... You might find a teacher who has been here for five years but has never supervised any projects at all... maybe the teacher who used to supervise, Teacher X, has left... now this teacher who has never supervised needs the effort to encourage them... maybe give them past projects so they can understand and guide other teachers (Student, School A, 25th June 2022).

As shown above, the lack of research skills among teachers made the development of CTS through project work difficult. These inefficient skills among teachers had implications on the student's learning.

Discussion

This study explored what students learned from their projects and the associated challenges in executing project work in the secondary schools under review. The discussion of the study findings is informed by Vygotsky's (1978) social constructivist theory of learning. This perspective presupposes that students converge in the classroom with their prior knowledge and experiences, which serve as a framework for

for reinforcing further learning (Driver et al., 1994). Engaging students in project-based activities is consistent with the social constructivist perspective as they develop questions for investigation based on their prior experiences, use resources around them such as teachers, colleagues, and artefacts to design and conduct investigations, collect and analyse data before concluding, and communicate their results.

The study further revealed that project work in the secondary schools studied was mostly conducted once and contributed to the summative evaluation of students. The summative nature of such projects denied students opportunities to engage meaningfully in the work and acquire requisite skills. Usually, such summative evaluation focuses on grades with little emphasis on applying the knowledge acquired outside the classroom, thereby limiting their problem-solving skills. The Tanzania Secondary Education Curriculum identifies projects as one of the assessment methods teachers can use to determine students' understanding, reasoning, and critical thinking (MoEST, 2023). Sufficient engagement of students in the project work can help them develop observation and data collection skills (Kincheloe, 2007).

The study also found that, to some extent, project work in the schools under review helped students to develop important skills such as applying knowledge, creativity, and problem-solving, even though its primary purpose was to fulfil the CA component. Eklöf (2014) contends that school project work allows learners to acquire creativity as an added advantage beyond obtaining grades. Creativity is essential in the 21st century, as it can support socio-economic innovation (Collard & Looney, 2014).

Moreover, the study found that project work facilitates the application of knowledge from class and fosters meaningful learning. When students apply what they have learned in class in real-world situations, they progress from the memorisation of facts to meaningful learning, which is essential in the 21st century as previous research (see, for example, Oyewo et al., 2022; Postholm, 2015) have also affirmed. In this regard, Postholm (2015) contends that project work enables learners to link their prior experiences with what they learn in class. Project work can also transcend theoretical teaching by offering practical application of knowledge to students' lives (Oyewo et al., 2022). This manifestation aligns with the social constructivist perspective of learning, proposed by Vygotsky (1978), that learners can engage in the knowledge-creation process when they get an opportunity to interact with their teachers, fellow students, and surrounding resources while associating their prior experiences.

Problem-solving is vital in fostering and nurturing CTS among students (Bailin et al., 1999; Chen, 2001; Samani et al., 2019). Engaging in problem-solving tasks allows learners to work with their problems and questions, including overcoming associated challenges, thereby boosting their motivation to learn (Postholm, 2015). The five cases under review indicate that students in schools that offer supportive environments for project work, such as school A, have provided opportunities for students to develop creativity and problem-solving skills. Learning environments facilitating exploration create conditions for students to develop creativity (Beghetto & Kaufman, 2014). Project work also accords students with opportunities to explore and control their learning to nurture their creativity.

Furthermore, opportunities for sharing their work and challenges in plenary discussions help the students develop their CTS (Bell, 2010). In the schools under review, students mostly collected data and produced reports for submission, with no room for presenting their work for feedback and further improvement. The study results resonate with previous studies that revealed that project-based learning plays an important role in developing critical thinking skills and creativity among students at various levels of education (Alsaleh, 2020; Eklof, 2014; Oyewo et al., 2022).

The study also reveals that students who participate in project activities develop skills in identifying investigation questions, designing methods, conducting investigations, collecting, analysing, interpreting data, and drawing conclusions, thereby enhancing their development of CTS (FitzPatrick & Schulz, 2015; Kipnis & Hofstein, 2008). However, Agarwal (2019) contends that engaging students in data collection and analysis without linking it with problem-solving prevents them from sufficiently engaging with problem-solving skills. Apart from data analysis, project activities pave the way to attaining report preparation and presentation skills, which are in high demand in the labour market (Akinoglu, 2008).

Likewise, evidence generated from our findings revealed other important skills that can be nurtured through project work, including communication, leadership, and collaboration. Collaboration is an important 21st-century skill (Rotherham & Willingham, 2010), and it plays a big role in learning motivation and can support the development of innovation among students (Lai & Viering, 2012). It also emerged that project work allowed students to share their results and conclusions when working in teams, in addition to helping them develop communication and teamwork skills, which are important aspects of 21st-century skills.

Limitations of the Study

While this study's findings effectively address the research questions, they should be interpreted cautiously due to certain limitations. First, the study explored teachers' and students' perceptions of implementing project work based on their

lived experiences, but it did not assess the specific critical thinking skills developed through project work across schools. Second, the lack of adequate records of students' research reports hindered the provision of detailed examples of project titles and specifics, relying instead on participants' explanations. Access to project reports would have allowed a thorough analysis of project assessments and a stronger connection between participant insights and actual projects conducted in schools. To address this limitation, the researchers triangulated data from different participant groups, such as teachers and students, to enhance the trustworthiness of the findings.

Conclusion

The study highlights the practical value of project work (PW) beyond its use for grading. Through PW, students gain group work experience, improve communication skills, and develop curiosity, creativity, and problem-solving abilities. However, fostering 21st-century skills through PW requires supportive school environments, teacher research capacity, and active involvement of field stakeholders and parents. Despite its importance for instruction and evaluation, the study found that PW is insufficiently prioritised in the curriculum. Teachers and students primarily view PW as a task to fulfil continuous assessment requirements, raising concerns about the planning and execution of PWs in secondary schools. To maximise their positive impact on learning and skill development, PWs must be integrated effectively. The study recommends training school administrators and teachers on the PW concept and best practices to ensure its meaningful application. The government, through the MoEST, should also allocate adequate funding and resources, while curriculum designers should emphasise PWs as a core teaching and learning strategy.

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