



Original Article

Effect of Active Teaching and Learning Methodologies on the Academic Achievement of Learners in National Teachers' Colleges in Uganda

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Active Teaching and Learning,
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Academic Achievement,
Technological Skills.

The study examined the effect of Active Teaching and Learning (ATL) methodologies on the academic achievement of learners in National Teachers' Colleges (NTCs) in Uganda. The objectives of the study were two-fold: i) to examine the effects of learning stations on the academic achievement of learners in NTCs in Uganda, ii) to analyse the effect of project-based learning on the academic achievement of learners in NTCs in Uganda. The study adopted a cross-sectional design and was underpinned by pragmatist philosophy with an explanatory sequential type of mixed methods approach. Tools for data collection included questionnaires, which were administered to lecturers and students. Interviews were held with selected Ministry of Education officials, institutional heads and Enabel staff. Document review of academic award meeting minutes and portfolios was also done. Data was collected from 681 respondents. Quantitative data were analysed using SPSS version 29, while qualitative data was analysed in themes to draw conclusions for the study. Results revealed that there was a strong positive correlation between learning stations and skills learners acquire at learning stations at $P < 0.01$. Further, there was a strong positive correlation between project-based learning and technological skills acquired by learners at $P < 0.01$. It was concluded that, whereas the learning stations were appreciated for promoting peer support, they consumed a lot of time, especially for large classes, and required a lot of technical support from the teacher to learners. The study recommended continuous professional development for teacher trainers, which may help them to apply Active Teaching Learning methodologies effectively for better academic achievement.

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INTRODUCTION

Active learning techniques are increasingly being adopted in higher education to foster student engagement and improve learning outcomes. World over, discussions that concern learner-centred techniques that promote active teaching and learning, critical thinking and learners' grades often trigger heated conversations (Pho et al., 2021). Many scholars present ATL methodology as modern methods to replace the traditional methods like the lecture method in the promotion of learner grades and quality class work, which could be a wrong perception or not (Cherono et al., 2016).

In some countries like the USA, there are national policies and frameworks that promote active learning, such as the Next Generation Science Standards (NGSS) (Abugre & Kpinpuo, 2017). In Germany, learning stations are used to reduce the time to set up learners' activities and the amount of resources required for teaching and learning to enhance students' grades, skills and completion rate (Navas et al., 2025). Learning stations are points of physical locations in or outside the classroom where learners are asked to create activities or take a task for learning using the resources available (Pho et al., 2021). In China, education prepares students for success in life, and the focus is on a project-based world with better pedagogies (Wang, 2024). Because of its focus on 21st-century skills, the project-based learning in African schools is used to enhance students' technology abilities (Abomeh & Yusuf, 2019). Project-based learning helps students develop teamwork and problem-solving

skills along with the ability to communicate effectively with others (Abomeh & Yusuf, 2019).

In African education systems, Project-Based Learning (PBL) is increasingly being used to develop 21st-century skills, particularly in technology and communication (Abomeh & Yusuf, 2019). In Uganda, PBL is being explored within the secondary school curriculum, encouraging interdisciplinary learning, student autonomy, and teacher facilitation rather than direct instruction (Algolaylat et al., 2023). In Nigerian schools, the method was used to develop self-study and autonomy competencies among learners for better completion of classroom exercises and project work (Sasaoka & Nishimura, 2010). In some African schools, learners can work individually, in pairs or in smaller groups, support one another, answer questions and solve problems, critically think and enhance learning through peer reviews (Mugo et al., 2015).

Even in developing economies of East Africa, such as Kenyan and Tanzanian schools, learning stations have been used for all subjects and for students of all levels, especially in schools where the teachers have been well trained and are competent enough to do effective planning of content, class exercises, that aid student quality content (Mugo et al., 2015).

In Uganda, the competence-based lower secondary school curriculum is designed to support learning stations that ensure student interaction, flexible peer review and guided research for learning (Sasaoka & Nishimura, 2010). Using learning stations, the teacher is expected to create different materials and

work activities for all learners using different formats to promote critical thinking and problem-solving skills (Oketch & Rolleston, 2007b). Students develop independent work habits, which is very important for students because they must solve different problems without teachers' explanation in detail (Pho et al., 2021). Learners only receive the teacher's instruction in general, and students themselves will be active in dealing with tasks at different stations, and develop their own speed of working (Krain et al., 2015). Students can move from one station to another after finishing a task; they do not need to sit at their seats too long to feel bored because elementary students love movement, and they are more excited if they can move around stations to accomplish coursework, develop good communication and listening skills. (Pho et al., 2021).

While substantial evidence demonstrates active learning's cognitive and non-cognitive achievements among learners, gaps remain in understanding optimal implementation. More research is needed on which techniques have the greatest efficacy for specific learning objectives and contexts (Aryan and Saman, 2024). For example, Prince (2004) found that collaborative learning positively impacts academic achievement, but effects vary across disciplines, course levels, and types of collaborative activities. Comparing the effectiveness of distinct techniques can guide pedagogical choices. As hybrid courses proliferate in Uganda's education system, examining the performance of how different active teaching and learning methods are faring across different disciplines in teacher training institutions is crucial. This is because knowing how each ATL methodology works is important in guiding stakeholders about which one needs more investment as compared to the rest, and hence optimise active learning strategies and expand their benefits across educational settings, right from NTCs and spiral to secondary schools. The current study, therefore, sought to study the effect of Active Teaching and Learning (ATL) methodologies on the

academic achievement of learners in NTCs in Uganda by specifically examining the effects of learning stations on the academic achievement of learners in NTCs in Uganda and analysing the effect of project-based learning on the academic achievement of learners in NTCs in Uganda.

MATERIALS AND METHODS

Study Area

The study was carried out in five NTCs of Muni, Unyama, Mubende, Kabale and Kaliro. The five NTCs were selected because they were the centres of training for lower secondary school teachers. For the last 10 years, the five NTCs through the Teacher Training and Education (TTE) project and the Ministry of Education and Sports provided them with interventions to promote ATL methodologies for better academic achievement. As all NTCs transition to degree awarding, it is important to establish their readiness in terms of methodology for better academic achievement through the use of learning stations and project-based learning.

Research Design, Study Population and Sampling.

The study adopted a cross-sectional research design to suit the pragmatist philosophy (Bogdan, 1975). The explanatory sequential mixed method approach was adopted, whereby the quantitative data was collected first, followed by qualitative data (Gogo & Musonda, 2022). The choice of such an approach was informed by the fact that there was a need to first objectively analyse the quantitative data from the questionnaire and then use the obtained evidence in the effective moderation of the qualitative interviews (Schoonenboom & Johnson, 2017).

The study targeted a population of respondents who included MoES officials from the special needs department, Enabel staff who supported ATL implementation in NTCs, NTCs' principals as accounting officers, heads of departments, registrars, and all who were purposively selected,

whereas principal lecturers, lecturers, and students were simply randomly sampled. These categories were believed to have information on ATL methodologies, and others were beneficiaries of ATL methodology trainings by the TTE project of Enabel through MoES.

Sample Size Determination

Sample size was determined using a sample size calculator, as shown in Equation 1

Sample size = $1 + \left(\frac{Z^2 E^2 N}{n} \right)$Equation 1

Where N is the population = 5349

E is the margin of error = 0.95

Z is the z-score = 1.96

P-value is 0.0157

= 681 respondents

Adapted from Adam (2020)

Methods of Data Collection

Data was collected using interviews, questionnaire method and documentary review methods.

Interview

Open-ended questions were administered during the interview with institution heads (principals), HoDs, the Academic registrar, and MoES using an interview guide (Taherdoost, 2018). Interviews were used to collect valid and diverse qualitative information about ATL methodologies and the academic achievement of learners within a short period of time, with in-depth information.

Questionnaire Method

The questionnaire method was used to collect data for both qualitative and quantitative information. While using a questionnaire for lecturers and students, open-ended questions were used at the end of every set of questions. Closed-ended questions were used to collect quantitative data from staff and student leaders (Canals 2017). The method was used

because it was easy and also cheap to collect a large amount of data in a short period of time. The questionnaire was constructed using the Kobo Collect tool (Skutil et al., 2018). The link was sent to the IT managers, who also shared it with students and lecturers in each college. Printed copies of the questionnaires were also used for some respondents who had no internet access.

Documentary Review

This involved a review of NTC documents, especially minutes for awards meetings, graduation books, Quarterly review reports and enrolment data to get quantities about students, grades, completion rates and quality of class work. This information was in the office of the academic registrar of the college.

Data Collection Instruments.

The study used different instruments to collect data from the respondents.

A questionnaire of a five-point Likert scale of 1-5, where 1=Strongly Agree (SA), 2=Agree (A), 3=Neutral, 4=Disagree (D), 5=Strongly Disagree (SD) with constructs of ATL methodology effects on learners' academic achievement was designed. The questionnaire had open-ended questions at the end.

The researcher used questionnaires designed on the Kobo Collect tool. The link was sent to IT managers for sharing with staff and learners, and printed copies were also distributed. The aim was to collect both qualitative and quantitative data within the shortest period of time, as well as save the environment through an e-questionnaire.

An interview guide was used for qualitative data in various ways, with engaging the participants over the phone and scheduled Zoom meetings, especially for the MoES, Enabel staff, Principals, who were always very busy and off station for official duty, but also to reduce the cost of research and save the environment. Face-to-face interviews were

conducted especially for Enabel staff and MoES staff.

Documentary analysis for the ATL methodology involved reviewing and interpreting documents to understand policies, practices, and frameworks that promoted or hindered academic achievement (Corbin & Strauss, 2008). The documents included college quarterly reports, students' performance reports and award meetings for both quantitative and qualitative data, and graduation lists. Students' projects, research reports and lecturers' portfolios were also analysed to track students' grades and skills.

Data Collection Procedure

The researcher sought the approval of the research proposal. After approval of the data collection instruments, questionnaires, interview guides and documentary review checklist were digitalised and others printed in preparation to collect cross-sectional data from the five NTCs. The respondents (lecturers and students) were given the link to the questionnaire shared through the IT managers of NTCs, and others were given hard copies. Interviews for principals and MoES were conducted both face-to-face and online through Zoom sessions for those who could not be reached easily. The researcher sought approval from the Uganda National Council for Science and Technology (UNCST). For data collection to be easy with maximum returns and authentic, the researcher sought an authentication letter from UCU through the Research and Ethics Committee, allowing the researcher to collect data.

Data Analysis

Quantitative Data Analysis

The researcher used an interpretive strategy to analyse data derived from questionnaires for

lecturers and students. For this research, therefore, the process of data analysis involved coding, tabulation and interpretation. The data was further analysed, tabulated and represented graphically using a statistical computer package called SPSS version 29. This package helped to generate faster and accurate results during data analysis, especially in correlating variables of ATL and academic achievement of learners. Statistics generated included percentages, mean, from the tables, pie charts and Spearman's rank Correlation for the study variables (Canals, 2017). Inferential statistics involving correlations and multiple linear regression were generated during the analysis (Cohen et al., 2007).

Qualitative Data

For qualitative data, themes were created from the developing categories. Further cross-case comparison analyses were conducted under each theme in the presentation of findings, utilising some noteworthy quotes from participants. Participants' quotes or excerpts were used in this study for data analysis and interpretation in order to preserve their voices, reflections, and subjective viewpoints as proof of the emerging similarities and differences in their answers to particular questions, as well as to confirm and show the interpretive rigour and the credibility of such emerging research findings and the conclusions made. Mapping to establish a relationship was also well done. (Fereday, et al., 2006; Creswell, 2013).

RESULTS

Questionnaire Return Rate

For this study, 681 questionnaires were distributed to different categories of respondents, and 505 were returned, while 176 were not returned. The response rate is illustrated in Table 1.

Table 1: Response Rate

Response	Frequency	Percent
Returned	505	74.2%
Un returned	176	25.8%
Total	681	100%

Source: *Primary data 2024*

The response rate of 74.2% was good enough to provide reliable and valid data for the study. Even though NTCs were in transition to degree-awarding institutions, there were learners and staff to respond to the questionnaires.

Demographic Information.

To better present the results of the objectives aforementioned in the preceding paragraph,

preliminary descriptions of the socio-demographic characteristics from where the data came were presented. These included gender for participants in terms of males and females, years one had been at a given college, the position of the respondent, special needs category, and the specific NTC the respondent was from. The information was summarised in Table 2.

Table 2: Demographic Characteristics

Gender	Frequency	Percentage
Male	209	51.9%
Female	194	48.1%
Total	403	100%
Years at college		
Above 20	38	9.4%
11-20	21	5.2%
6-10	19	4.7%
2-5	233	57.8%
Below 2 years	92	22.8%
Total	403	100%
Current position		
Principal	5	1.2%
Principal lecturer	6	1.5%
Lecturer	101	24.9%
Student leader	21	5.2%
Student	271	67.2%
Total	403	100%
Special needs		
Yes	24	6%
No	379	94%
Total	403	100%

Source: *Primary data 2024*

Data revealed that there were 209 (51.9%) males and 194 (48.1%) females, meaning that, for this study, more males responded than females. Generally, the population of males in NTCs was found to be more than that of females.

Most of the respondents were students, 271(67.2%), who had been at NTC between 2 and 5 years. This was because some students were pursuing a diploma course in primary education, which lasted for 3years. Lecturers were 101 (24.9%), representing the second largest number of respondents. Although

the principals were only 5 (1.2%), each college has only one principal, and they all responded.

There were only 24 (6%) of the respondents who had special needs, and this indicated the need for inclusivity, whereas 379 (94%) of the respondents had no special needs.

Effect of Learning Station Methodology on Academic Achievement of Learners in NTCs in Uganda

Data about how the learning station affected learners’ academic achievement in NTCs in Uganda was obtained using a 5-level Likert-based questionnaire. The information was sectioned into 3, as summarised in Table 3.

Table 3: Effect of Learning Station Methodology on Academic Achievement of Learners in NTCs in Uganda

Inclusive Learning Strategies	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree	Mean	SD
Learning stations							
Content supports all learners	42.9% (173)	49.6% (200)	4.5% (18)	2.7% (11)	0.3%(1)	4.32	0.70
Learners provide feedback to one another	37% (157)	55.8% (225)	2.0% (8)	3.0% (12)	0.2% (1)	4.19	0.68
Learners seek support from peers	27.8% (112)	54.8% (221)	10.0% (44)	5.5% (22)	1.0% (4)	4.14	0.60

Data from Table 3 revealed that the majority of respondents agreed that the content at learning stations supported all learners to learn irrespective of their special needs, hence improving academic performance. The majority of the respondents, 173 (42.9 %), strongly agreed and 200 (49.6%) agreed that the content at learning stations supported learning for all learners. Whereas 18 (4.5%) respondents were uncertain, and 8 (2%) minority of the learners disagreed. This implied that the quality of content contributed to the academic performance of learners in NTCs in terms of grades from classwork, coursework, and exams. From the students’ portfolio, it showed that different content was also developed at different stations by different learners, as most of the work was done as group work, compared to individualised content. This was evident in teamwork and peer support to one another for better learning outcomes in terms of communication skills, pedagogical and counselling skills.

Through interviews with one of the principals, it was revealed that;

“...Some learners still ask for notes from their teachers even after working on stations. They still need mind shift support.” Principal of NTC 1

This meant that in some instances, learning was more or less teacher-centred than learner-centred since learners wanted notes from teachers. This indicated that not all learners learnt while at a learning station, and so affected their grades from coursework, project work and exams.

The majority of respondents, 55.8% (225), agreed and strongly agreed, 37% (157) respectively, that learners provided feedback to each other at learning stations. Only 8 (2%) of the respondents were uncertain, whereas only 12 (3%) of the respondents disagreed, and 1 (0.2%) strongly disagreed. This indicated that learners provided feedback to each other to enhance their skills like critical thinking, problem solving, and pedagogical skills, which aided academic performance. The feedback of learners was evident in the development of better pedagogical skills, creative thinking and

improvement in the quality of content. This was indicative of the fact that the more learners provide feedback to one another, the better they do their classwork, and hence good grades from coursework, project work and exams.

From open-ended questions in the questionnaire, feedback promoted learners' self-confidence among teacher trainees, which enhanced their communication, pedagogical, critical thinking and problem-solving skills.

From documentary reviews, learners' portfolios also indicated that the feedback learners received from their peers in terms of marks and compliments promoted creative thinking and pedagogical skills. Only a few respondents, 5.5% (22), disagreed that learners sought support from their teachers. Whereas 10.0% (44) were uncertain. The majority, 54.8% (221) of respondents agreed that learners sought support from their teachers and peers while at learning stations.

From interviews,

"...learning stations were able to improve learning outcomes for many learners, though there should be a combination of techniques and resources for learning to take place effectively". MOES 1

This meant that learners were able to solve problems, think critically and henceforth attain better grades in projects, classwork and even final grades.

From the portfolios of lecturers reviewed under documentary analysis, qualitative data revealed that teachers set up different learning stations for

learning in a given class for a given lesson, and learners completed classwork, coursework and attained good skills in terms of critical thinking and problem solving.

Documents revealed further that learning stations, as one of the ATL methodologies, emphasised activities undertaken by learners at various stations in relation to the learning outcomes. The construct was to examine the quality of content produced by learners, assess the feedback provided at different stations, and evaluate the learners' ability to complete their exercises. From additional open-ended questions from the questionnaire, this method was primarily implemented using group techniques, and most participants were familiar with it.

In an interview with one of the principals, he commented that;

"..Whereas there were activities at each station set by the teachers, learners were expected to interpret the activities and perform the tasks as per the instructions. They were then expected to reflect and provide comments to one another and reach a consensus, refine the work for quality results per station". Principal B from NTC 2.

This meant that reflective practice was core for learning to promote continuous learning and, henceforth, quality classwork, projects, and research reports and good grades for learners, as well as critical thinking and problem solving.

To establish the relationship between learning stations and the academic achievement of learners, a test of correlation was run and the results were presented in Table 4.

Table 4: Correlation Coefficient of Learning Stations and Academic Achievement of Learners.

	Pearson correlation		Academic achievement	
ATL strategy	Grades	Skills	Completion rates	
Learning stations	0.43	0.75	0.35	

N=390 tailed significant at P< 0.01

From Table 4, there was a weak positive relationship of 0.43 between learning stations and students' grades at a p-value of <0.01. There was a strong positive correlation of 0.75 between learning stations and skills learners acquired, whereas there was a weak positive relationship of 0.35 between learning stations and completion rates of learners. This implied that learners acquired a lot of skills like communication, pedagogy, counselling and class management skills through learning stations.

Effect of Project-based Learning on Learners' Academic Achievement at NTCs in Uganda.

Data about how project-based learning affected learners' academic achievement in NTCs in Uganda was obtained using a 5-level Likert-based questionnaire. The information was sectioned into 5 sections as summarised in Table 5.

Table 5: Effect of Project-based Learning Methodology on Academic Achievement of Learners in NTCs in Uganda

Project-based learning	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree	Mean	SD
Learners take records of project work	39.5% (159)	47.9% (193)	7.7%(31)	2.7% (11)	2.2% (9)	4.14	0.59
Learners participate in project work	34.2% (138)	47.1% (190)	10.7%(43)	6.0% (24)	2.0% (8)	4.03	0.73
Teachers provide support for the evaluation of projects	39.0%(157)	55.8%(220)	2.0% (8)	3.0%(14)	0.2%(5)	3.52	0.57
Learners document project trajectory	27.6% (103)	54.3% (219)	13.4% (54)	5.2% (22)	1.2% (5)	3.97	0.60
Record of scores from projects	24.3% (98)	57.8% (233)	11.9% (48)	3.5% (14)	2.5% (10)	3.98	0.54

Many of the respondents, 159 (39.5%), strongly agreed that learners took a record of their project progress that aided their improvement and better academic performance. The majority, 47.9% agreed. Only 7.7% of respondents were not certain, but the minority, 2.2% (9), disagreed that learners took a record of their project progress and scored better grades progressively. The mean score was 4.14 with a standard deviation of 0.59

From the analysis of the documents, learners for agriculture had a record of their project work properly and systematically recorded. According to student portfolio analysis, learners exhibited a high level of commitment to project work and performed better. Learners taking physics and fine arts had a good record of project work in files.

From interviews,

“...very many learners do projects practically but do not take good documents, as it is not a requirement for examination”. MOES 3

This meant that lecturers did not sufficiently guide learners appropriately on how to effectively document project work, which affected the scores.

The majority of respondents, 81.3% agreed 138 (34.2%), 190 (47.1%) strongly agreed and agreed respectively that learners participate in group and individual projects. Only 43(10.7%) of respondents were uncertain, and a small percentage of 8 (2%) disagreed. From documentary analysis, reports of learners' progress in registry indicated qualitatively that there were specific subjects that had project work compulsory and to those subjects where projects were not compulsory, there was no evidence of project work.

From interviews;

“..some project work is expensive for some learners, much as they could be willing to participate in several project works”. Principal 4

This meant that learners required support so as to participate in meaningful and fruitful work that could aid good grades and quality completion.

On the whole, 321 (79.6%) of the respondents agreed that teachers support evaluation of the projects for learners to improve pedagogical skills, 27.5%, and 52.1% strongly agreed and agreed respectively. Few (13.9%) were not certain, whereas the minority, 3% disagreed, and 0.2% strongly disagreed. The mean score was 3.52, and the standard deviation was 0.57. This means that when projects were evaluated by teachers, learners were able to learn and unlearn some pedagogical practices.

Document analysis showed a record of project work marks per year from students of physics, agriculture and fine art with high grades as a sign of quality completion of their semester work.

From interviews,

“Students from NTCs had very good pedagogical skills, and they exhibited better teaching skills during school practice and in the world of work”. MOES 1

This meant that learners were able to learn from project work, acquire good grades in coursework and final exams and graduate on time.

Data on learners documenting the project trajectory and offering timely peer support to each other revealed that 27.6% strongly agreed, 54.3% agreed that learners were able to document project work, project trajectory, and offer timely peer-to-peer support. 13.4% of the respondents were not certain, whereas 5.2% of the respondents disagreed, and 1.2% strongly disagreed. The mean score was 3.97 with a standard deviation of 0.6. There was evidence

of marked learners' project work for different stages, and the final marks were also recorded in the mark sheets. This implied that project work was taken so seriously at NTC, and it aided the academic achievement of learners through project work. 24.3% of the respondents strongly agreed, while 57.7% agreed that there was proper recording of the learners' project work. Only 11.9% were not certain, whereas 3.5% disagreed and 2.5% strongly disagreed with a mean of 3.98 and SD of 0.54. From the awards sheets and records of marks for students from the NTC, there were right, well-aligned records for project work. There was evidence of higher scores that were above 60% in terms of percentage. These were in subjects like physics and agriculture.

In an interview;

“..at NTC every subject area had its own projects as per the syllabus, and so there were different guidelines set by each subject to support learners in doing their project work, much as most principles cut across. Each department, therefore, sets its own guidelines from the universal standard one to guide students in project preparation, implementation, and evaluation by the teacher in a timely manner” H.O.D NTC 1.

This also emphasised that projects were set per subject area, and some were individual, whereas others were for groups, depending on the nature of the project. Not all learners were able to participate in projects, so they missed out on grades from projects and research.

According to coursework records, the evaluation of projects ranged from coursework to also provided pedagogical skills for learners to apply in the real world of work. Teachers supported learners to develop skills of project initiation, implementation and evaluation that promoted critical thinking, problem solving and communication skills. These skills would be transferred to learners of secondary

schools by teacher trainees in terms of pedagogy and research skills.

The projects were assessed at every stage to establish the progress of each project activity and aided completion of one level of study to another in terms of semesters 1, 2, and 3.

A correlation coefficient was run to establish the extent to which project-based learning influenced learners' academic achievement, and the results are in Table 6.

Table 6: Correlation between Project-based Learning and Academic Achievement of Learners in NTCs in Uganda

ATL methodology	Pearson correlation		
	Grades	Skills	Completion rates
Project-based learning	0.57	0.83	0.41

N=390 tailed significant at P< 0.01

There was a moderate relationship between project-based learning and grades acquired by learners. There was a strong positive correlation of 0.83 at p-value <0.01 between project-based learning and skills acquired by learners. For example, technological skills were acquired through projects. The relationship between project-based learning and completion rates was low and positive at only 0.41. There was a moderate positive relationship between project-based learning and learners' grades.

DISCUSSION

In this study, learning stations aided learners in creating quality class work. This is supported by Oketch & Rolleston (2007b), who also emphasised the fact that through using learning stations, the teacher can create different materials and work on activities for all learners using different formats to promote critical thinking and problem-solving skills and have quality classwork. Also, Stamback (2009a) indicated that quality classwork produced better competencies, such as communication, cooperation, problem-solving and creativity, which helped to produce 21st-century learners who had better grades and skills needed in the market. This is because the time learners took doing tasks at each learning station helped to support openness in knowledge creation to promote learning, critical thinking and problem solving. Whereas the learning

stations were appreciated for promoting peer support, they consumed time, and they required a lot of technical support from the teacher for the learners. For very large classes, learners sometimes became so confused, and commotion developed at different stations. Teachers for large classes where the classroom spaces were small could not use learning stations as the method was not effective, whereas in small classes, the method was very effective.

Findings revealed that learners were able to document the project trajectory and offer timely peer support to each other. The majority, 79.9% of the respondents, agreed that learners were able to document project work and document project trajectory, and offer timely peer-to-peer support. This also agrees with Apollo & Mbah (2021) that project-based learning was a strong tool in promoting learners' competences and subsequent academic achievement.

In this study, project-based learning improved hands-on skills. This means that the project-based method promoted lifelong learning. This is in agreement with what Pho et al. (2021) noted that project-based learning promotes skills that connect students to the world beyond the classroom and prepares them to accept and meet challenges in the real world in a way that mirrors what professionals do every day. This is because the more learners got

involved in project work, the more they developed practical solutions for problems, gained confidence in the typical content concepts and were able to thrive in the competitive world.

Results revealed that learners scored highly in project work, although they were not able to implement desired concepts for projects due to time and financial constraints. Some projects required more than 2 years, and yet the courses lasted for only two years. This is in line with what Wood (2003) implied, that instead of planning a massive project, the learning process can be made more manageable by chunking the project into smaller parts, with frequent checkpoints built into the timeline for better skills development for learners, and this is what NTC students are using.

Much as project-based learning improved learners' academic achievement in NTCs according to the study findings, there was a smaller number of learners in specific subject areas, like agriculture and fine arts, who did project work, and for others, they did not do projects because of resource constraints and the nature of the curriculum in NTCs. This contradicts Krain et al. (2015), who stated that all learners ought to do a project while at school, document it and share the results of the project.

To teachers, project-based learning kept learners busy and promoted creativity and pedagogical skills in NTC learners. According to Machů & Lukeš (2023), project-based learning promoted teacher trainees' competences and attainment of better skills. According to Krain et al. (2015), continued investment and support, PBL has the potential to significantly improve educational outcomes, preparing students for future success in an increasingly complex world.

Limitations

This study was limited by the transition of NTCs from diploma awarding to degree awarding institutions, from Kyambogo to UNITE. There was a lot of anxiety among staff and students about what

the future would be in terms of teaching and learning, and learning outcomes for students. Some were not ready to provide information.

The research was very expensive considering the fact that the 5 NTCs are spread across five regions of Uganda. The highest cost was from transport and printing costs. However, part of the data was collected by the research assistant.

A huge amount of data was collected, both qualitative and quantitative, and this made the researcher take longer to analyse the data to make meaning than the expected time.

The programme for data analysis was not readily available for the research, but a license was later purchased, and the data was analysed.

Delimitations

Data was collected from staff and students who were pursuing a diploma in education, primary and colleges were operational.

Resources were saved by the researcher to have funds to foot the research expenses.

Data was managed using the SPSS programme and thematic analysis. The SPSS version 29 programme was procured to analyse the data.

CONCLUSION

Learning stations and project-based learning promoted critical thinking and problem-solving skills among learners. However, this depended on the extent to which they were efficiently used in terms of preparation, implementation and follow-up activities.

Project-based learning was the most impactful method in promoting skills among learners for academic achievement.

Recommendations

ATL methodology promoted skills among learners in NTCs so there is a need to invest in continuous professional development for NTC teachers/

lecturers, align all the constructs of ATL methodologies with the methods in the competence based curriculum plus the skills so that there is harmony between what learners or teacher trainees are trained on and its relevance at the world of work especially for secondary school level. Prioritising continuous professional development (CPDs) for teacher trainers in Uganda to enable them to train competent teachers for the 21st century by the government of Uganda through the Ministry of Education and Sports and the Uganda National Institute of Education is also urgent.

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