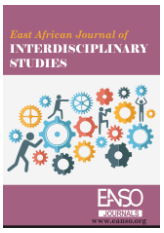

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Original Article

Co-Curricular Activities for Values-Based Science Education: A Case Study from Luweero District, Uganda

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ABSTRACT

In Uganda, co-curricular activities (CCAs) are often undervalued in formal education, yet they present opportunities to foster values critical for holistic learning. Despite their recognised potential, little is known about how science teachers in Ugandan primary schools use CCAs to promote values education, particularly through means such as CCAs. This study examined how science teachers utilise CCAs to foster values among learners in two government-aided primary schools in Luweero District, with the overall aim of identifying strategies to enhance the value-promoting potential of CCAs in science education. Anchored in an interpretivist paradigm, a qualitative case study design was employed. Data were collected through semi-structured interviews with five purposively sampled science teachers and focus group discussions with 28 purposively sampled pupils. Findings revealed that while some teachers and learners participated in CCAs such as debates, leadership roles, and occasional science exhibitions, their involvement was inconsistent and largely implicit, promoting values notably cooperation, sharing, and creativity among learners. Science-based CCAs, such as science clubs and fairs, were notably absent, primarily due to limited time, unclear responsibilities, and inadequate support. Nonetheless, all teachers acknowledged that CCAs have the potential to cultivate values such as cooperation, creativity, and responsibility. The study concludes that CCAs remain an underutilised avenue for values education in science. Their effective integration requires increased administrative support, timetabling these activities, teacher training, and adequate resources. It is recommended that education stakeholders provide guidance, capacity building, and policy backing to elevate CCAs as strategic platforms for values-based science education in Ugandan primary schools. These findings underscore the need for interdisciplinary collaboration between science teaching, values education, and reimagining CCAs as deliberate tools for fostering both science concepts and moral development in pupils.

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INTRODUCTION

Since the 19th century, science has often been regarded as a discipline concerned solely with uncovering objective facts. However, this perception has increasingly been challenged (Koster & de Regt, 2020). Scholars argue that a more holistic view of science education, one that integrates affective elements such as values, can enrich learning experiences. Research suggests that values are central to human thought and behaviour (Saldaña, 2021), and their incorporation into subject teaching can improve learning outcomes (Gamage et al., 2021). Within the context of science education, recognising and intentionally fostering values can deepen learners' engagement and promote socially responsible understanding of science concepts (Yaman & Anilan, 2021).

A whole school approach, which involves incorporating values throughout every facet of school life, such as the curriculum, institutional policies, daily interactions, and co-curricular engagements, is commonly implemented (Mathie, 2024). For example, Kenya's education framework demonstrates this strategy by recognising schools as key environments for fostering values, especially through co-curricular activities (CCAs), which have proven to be important settings for modelling and practising values (Mugambi, 2022).

CCAs are structured, school-facilitated activities outside the formal curriculum and include school clubs, sports, student leadership roles, and voluntary service (Jackson & Bridgstock, 2020). Of specific interest are science-based CCAs such as science fairs, science clubs, and science competitions, which relate directly to the teaching and learning of science. Though not explicitly instructional, these activities promote values like teamwork, perseverance, curiosity, and respect through experience-based engagement (Dillon & Watts, 2023).

There is growing evidence that values can be acquired outside formal teaching, particularly through participation in CCAs (McDonnell et al., 2020; Zajda, 2023; Yun et al., 2023). Science-related CCAs have also been shown to boost interest in science learning while strengthening learners' social and emotional skills (Rahman et al. 2021). This approach ensures that values are reinforced across disciplines, including science, rather than being taught in a single subject, thereby offering a platform for integrated cognitive and affective learning. While values such as creativity and innovation are said to be embedded across practical subjects like science, participants in the study conducted by Nkhata et al. (2020) avoided using strategies which encourage hands-on experiences to develop such values. This generally suggests that although CCAs are increasingly recognised as effective avenues for promoting values alongside formal teaching of science, rather than confining them to civic or religious education, there appears to be a disconnect between theory and practice.

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Gaps in Ugandan Research

In Uganda, existing studies have primarily examined CCAs in relation to academic and social development. For instance, Ampaire and Nwana (2024) found that physical school environments influence pupils' participation in CCAs, while Alero (2016) highlighted the role of CCAs in supporting learning and social interaction in Arua District. However, little attention has been given to their potential role in values education, particularly in the primary school context. Studies in Kenya (such as Muema, 2019) similarly noted implementation challenges such as limited resources and low participation. While CCAs are known to support academic and social development, their potential role in values education remains underexplored and undervalued in Ugandan education research and practice.

There is a notable gap in research on how CCAs foster values in Ugandan primary schools, particularly in Luweero District. This study, therefore, sought to address this gap by examining how science teachers use CCAs to foster values in learners, with the overall aim of identifying strategies to enhance the value-promoting potential of CCAs in science education.

LITERATURE REVIEW

Co-Curricular Activities and Learner Development

Participation in co-curricular activities (CCAs) contributes significantly to learners' personal and social development. Rahman et al. (2021) emphasises that CCAs strengthen learners' social skills and recommends aligning them with curriculum content to maximise learning outcomes. Beyond supporting growth in specific areas of intelligence, these activities also contribute to broader personal development, underscoring their complementary function in fostering learners' holistic growth (Wang et al., 2024). Importantly, CCAs can therefore enhance teacher-learner relationships, supporting the development of values. Despite this potential, limited empirical evidence exists in Uganda, particularly in Luweero District, regarding how various CCAs influence value acquisition among primary school learners.

Research consistently shows that CCAs support academic performance alongside social development. Abuelenain et al. (2021) and Mars (2022) found that participation in CCAs improves academic outcomes and challenges the assumption that such activities detract from academic focus. Although these findings are drawn mainly from studies involving older students, they suggest a promising direction for primary education. However, more research is needed to understand how these benefits manifest among younger learners in diverse contexts.

Enhancing Affective Learning through CCAs as Values Platforms

Innovative approaches, such as using outdoor classrooms and club-based learning, can foster affective outcomes like self-confidence. Sheokarah and Pillay (2020) demonstrated that co-curricular spelling activities in South Africa helped learners overcome anxiety and improve language skills. These findings underscore the potential of alternative, interest-driven environments in supporting both emotional and academic growth. However, the extent to which Ugandan primary schools adopt such approaches remains unclear.

Science-based CCAs offer unique opportunities to integrate values education into school life. Mhando (2023) identifies several such activities, including science clubs, environment conservation projects, leadership roles, and literacy programmes, as valuable platforms for fostering values. These activities blend entertainment and learning, and vary in format from teacher-moderated debates to informal engagements like dance (Dillon & Watts, 2023). Each offers distinct benefits, yet there is insufficient research comparing the impact of formal versus informal CCAs on values development.

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Beyond CCAs, other structured activities like school assemblies also play a vital role in values education. Döring et al. (2024) reported that assemblies are used in England as a means to promote awareness of values, for instance by discussing and reflecting upon a theme linked to a national value. However, the specific values promoted during such assemblies in Ugandan schools remain undocumented, representing another area requiring investigation.

Barriers to Effective Implementation

Despite their benefits, science-based CCAs are often underutilised due to structural and pedagogical barriers. Simon and Connolly (2020) point to rigid curricular demands and a lack of role models as obstacles, while Lin et al. (2025) suggests providing teacher training in CCAs and improving infrastructure such as the co-curricular facilities. Without such systemic support in funding and infrastructure, teachers may struggle to integrate CCAs effectively.

However, studies highlight further challenges to the effective integration of CCAs. Teachers' participation in CCAs is often driven by extrinsic motivation, including rewards, recognition, and promotion (Muema, 2019). Further, while countries like Nepal have integrated CCAs into national policy frameworks (Giri et al., 2023), Uganda's policy stance remains unclear, particularly concerning science teachers' involvement. These challenges underscore the need for clear policy direction and institutional support to ensure that CCAs are not only valued but systematically integrated into science education as platforms for values development.

Summarily, the literature review highlights the educational value of CCAs in promoting learners' personal, social, and academic development, including values such as cooperation, respect, and creativity. It presents evidence from various contexts supporting the integration of CCAs into school routines, particularly in science education. However, it identifies major gaps: limited research on how primary school science teachers use CCAs for values education, lack of structured implementation in Ugandan schools, and insufficient policy clarity and teacher support, especially in rural settings like Luweero District. These gaps underscore the need for further empirical investigation.

MATERIALS AND METHODS

Research Paradigm and Approach

This study was guided by an interpretivist paradigm, which emphasises understanding the meanings individuals assign to their experiences (Tracy, 2020). A qualitative naturalistic inquiry was adopted to explore how science teachers engage learners in CCAs as a means for fostering values. This approach was considered appropriate because it supports the in-depth exploration of social phenomena within participants' real-world educational settings (Grønmo, 2020). It allowed the researcher to examine subjective participant perspectives and contextual practices in order to explore how CCAs are used to promote values-based science education and devise strategies for enhancing this potential. To fully achieve this objective, the study necessitated extensive fieldwork carried out over a prolonged period of over a month.

Research Design

A multiple case study design was employed, involving two government-aided primary schools in Luweero District. Rather than serving a comparative function, the two-case configuration was intended to provide complementary insights and enhance the richness of interpretation (Yin, 2018). Pseudonyms, Mukisa Primary School (P/S) and Muliisa P/S, are used to ensure anonymity. The two schools were purposively selected with the support of experienced in-service tutors, Centre Coordinating Tutors (CCTs), based on their consistent instructional planning and sustained academic performance. These indicators were

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thought to signify a shared professional culture among teachers, marked by constructive social interactions and a commitment to common educational aims and values (Skaalvik & Skaalvik, 2021). Selecting schools with such a values-aligned culture can foster more coherent teaching practices and improved learning outcomes, demonstrating how school norms grounded in values promote academic achievement. Although purposive sampling enabled the selection of information-rich cases, it also introduces the possibility of selection bias, since the process relied on recommendations from in-service teacher educators (CCTs) and may not reflect the full range of teacher experiences and practices in the district.

Participant Selection and Sample Size

Participants included five science teachers of Primary Five and Six. These teachers were selected because science is formally timetabled and co-curricular involvement is more structured in these classes. A total of six teachers were purposively selected: four from Mukisa P/S and two from Muliisa P/S, but five teachers were interviewed. This number was considered sufficient to generate insights related to values in co-curricular participation. While saturation is often used as a guiding principle for determining sample sizes in qualitative studies, there remains limited clarity on the factors that affect its attainment (Hennink et al., 2019). Therefore, the sample size was guided by the richness of the data expected, with a provision to add more participants when necessary.

A total of 28 learners participated in focus group discussions (FGDs). Guest et al. (2016) revealed that three to six focus groups are sufficient to uncover most of the themes in a dataset, suggesting that saturation, when little to no new information emerges, can be reached fairly early in the data collection process. Based on this, the current study considered four focus groups to be sufficient. Participants were selected based on their active engagement in class, involvement in leadership roles, and ability to express themselves clearly, as these qualities were likely to provide meaningful insights into their experiences with values education during co-curricular participation.

Data Collection Methods

To generate data on how CCAs are used to promote values, the study focused on co-curricular participation in general, acknowledging that science teachers often facilitate or contribute to a wide range of CCAs beyond those explicitly labelled "science-based". Data was gathered through semi-structured interviews and FGDs. Five in-depth interviews were conducted, two with Primary Five teachers and three with Primary Six teachers. The semi-structured format allowed for a consistent line of inquiry while maintaining enough flexibility to explore unique insights and classroom examples (Cohen et al., 2018).

Constraints and Limitations

Apart from debates, most CCAs were not formally scheduled in the school term's calendar or class timetables, making it difficult to observe them in practice. The researcher, therefore, relied on teacher and pupil reports about their involvement in CCAs during interviews and FGDs, which practically constrained structured direct observation. This methodological limitation is acknowledged and was partially mitigated by probing for detailed examples during interviews and discussions.

Data Analysis

Data collected from interviews and FGDs were analysed by inductive content analysis (ICA). Unlike thematic analysis, which usually seeks to develop a clearly theorised overarching interpretation, ICA tends to remain closely aligned with the specific phenomenon under investigation (Vears & Gillam, 2022). It aims to generate an interpretation that offers a detailed and contextually meaningful response to the research questions, with practical relevance to the study setting.

In addition to inductively synthesising categories from participants' narratives (e.g., constraints in

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implementation), other categories were deductively derived from the research purpose (e.g., teacher roles, types of CCAs, values promoted).

The analysis process involved several iterative stages: familiarisation with transcripts, generation of initial codes, grouping of codes into potential themes, reviewing themes for consistency and relevance to the research questions, and refining them to represent key insights. Manual coding was used to ensure direct engagement with the data.

Ethical Considerations

This study adhered to established ethical research principles involving human participants. Prior to data collection, permission to access the schools was secured through the school headteachers. Participants were fully informed about the nature, purpose, and voluntary nature of the study. Informed consent was obtained in writing, and participants were assured of their right to withdraw at any stage without penalty. FGDs were conducted with learners after obtaining proxy consent from gatekeepers (school headteachers and teachers) and learner assent. All interviews and discussions were conducted with sensitivity to participants' time and privacy.

To maintain confidentiality, pseudonyms were assigned to both schools and participants. Data were anonymised during transcription and securely stored to prevent unauthorised access. Only aggregated findings were reported to protect individual identities. By prioritising informed consent, proxy consent, assent and confidentiality, this study upheld a high ethical standard.

RESULTS

Theme 1: Limited and Uneven Participation in CCAs

Interviews revealed that some science teachers and pupils were involved in various CCAs, such as athletics, music, and liturgy. For instance, Teacher S52 from Mukisa P/S participated in athletics, while Teacher S61 at Muliisa P/S was involved in music and drama. However, participation was not universal. Teacher S52 noted that the absence of a playground limited full engagement in CCAs. Similarly, Teacher M61 distanced herself from these activities, saying, "…they go for competitions in music and athletics", implying a lack of direct involvement.

Unstructured observations confirmed that only select pupils participated in specific CCAs, such as athletics, often pulled from regular lessons. The optional nature of CCA participation suggests missed opportunities for their consistent use as platforms for values education.

FGDs with pupils largely confirmed teachers' reports. Pupils generally reported engaging in five categories of CCAs: religious activities, Physical Education (PE), leadership, music/dance/drama (MDD), and science-related activities, particularly debates.

Religious CCAs were more regular, involving song, scripture competitions, and cleaning worship areas. Leadership activities, such as managing the library or maintaining order at school facilities, were especially valued but performed by very few pupils. Pupils in these roles demonstrated awareness of values like respect, responsibility, and discipline, showing the strong potential of leadership CCAs in cultivating social and moral competencies. However, like the teachers, pupils noted that participation in sports and other CCAs was inconsistent and infrequent, suggesting an underutilised channel for fostering values among learners.

Theme 2: Lack of Science-based School Clubs and Unclear Responsibility

Most teachers reported uncertainty about the existence and responsibility for school clubs. For example, Teacher S51 was unsure whether Mukisa P/S had any clubs, while Teacher S61 noted the absence of both science and young farmers' clubs despite teaching about them in the science class. This particular teacher asked, "Are they [clubs]

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supposed to be organised by teachers… or by the head of the science department?" This indicates institutional ambiguity and a lack of initiative, contributing to the underutilisation of CCAs like science-based clubs that could support values education.

Most FGDs similarly revealed a lack of membership in not only science-based clubs, but also other school clubs in general, citing a lack of proper direction by teachers. The results suggest that efforts to promote values through school clubs are undermined by unclear institutional roles and limited teacher engagement. This creates missed opportunities to use clubs as avenues for nurturing values like responsibility, teamwork, and environmental awareness. Without clear guidance and active coordination, science and young farmers' clubs remain underused, reducing their potential to support values development among learners.

Theme 3: Debates as a Prominent Science-Based CCA

Unlike other CCAs, debates were more consistently mentioned by teachers to be prominently used as science-based CCAs. For instance, Teacher S51 indicated that debates were held weekly, and sometimes touched on science topics, although he could not recall specific details. Teacher S61 and others remembered motions such as "science and technology have done more harm than good." At Muliisa P/S, debates were regularly held every Friday, with topics ranging from "Fire is better than water" to "Bottle feeding is better than breastfeeding."

However, not all science teachers actively participated in organising or integrating debates into science lessons, raising concerns about inconsistent use of this platform for values development. FGDs with pupils similarly revealed that not all pupils actively participated in debates, despite being a weekly activity. They also contended that debates featured science-based motions like "Science and technology have done more harm than good", "A doctor is better than a teacher".

These findings imply that while debates are a more frequently used platform for integrating science topics and fostering values, their implementation is inconsistent across teachers and learners, limiting their effectiveness in promoting values through science education. This inconsistency weakens the potential of debates to serve as reliable avenues for developing values like respect, open-mindedness, and effective communication. Together, these findings underscore the need for clearer institutional frameworks and deliberate teacher involvement to harness their full value-promoting potential in science education.

Theme 4: Science Competitions and Exhibitions as Isolated Practices

Science exhibitions and competitions were reported to occur in Mukisa P/S during annual events like "school days." For example, Teacher S62 organised model-making and science quizzes to foster creativity and engagement. Yet, other teachers from the same school claimed no involvement in such events, suggesting individual effort rather than a structured programme.

In contrast, science competitions were largely absent in Muliisa P/S, with Teacher M51 citing logistical barriers such as lack of space, time, and resources. Reflecting on this issue, this teacher remarked, "I wanted to have a science fair… but we have tight programmes." Both teachers at Muliisa P/S emphasised the critical role of leadership, particularly the HoD, in initiating such activities. In the absence of such leadership, science-based CCAs were deprioritised, limiting their potential in promoting values.

The only form of competition that FGD participants from Ssanyu P/S revealed was reading holy books, an activity spearheaded by the school administration under the influence of the school foundation body. Science competitions and exhibitions were unheard of in these schools,

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suggesting that religious activities were the major known source of values fostered in learners in these schools.

Theme 5: Teacher Perceptions of Values Fostered through CCAs

All teachers agreed that CCAs have the potential to promote values. Commonly cited values included cooperation, sharing, and creativity. Teacher S61 expanded this list to include communication and problem-solving. Only one teacher, S62 gave an example of a pupil who constructed a model drum to demonstrate the topic "sound," highlighting how CCAs could be used to foster creativity.

While some teachers like M61 linked CCAs to competition and sharing, others, like S52, struggled to articulate which values were developed, despite supporting the idea that CCAs can promote them. These perspectives suggest a general appreciation for CCAs' value-fostering potential, although with varied depth of understanding and practice.

Theme 6: Measures to Enhance Teacher Capacity for Using CCAs to Foster Values

Most teachers emphasised the pivotal role of school administration in supporting co-curricular engagement. Suggested strategies included: (1) Providing opportunities for pupils to join scouts, guides, and leadership roles (e.g., flag hoisting); (2) Motivating learners with tangible rewards like pens and books to promote creativity and participation; (3) Encouraging voluntary participation by sensitising pupils about the long-term benefits of CCAs.

Beyond motivation, most teachers highlighted the need for infrastructural improvements, such as better access to playgrounds and facilities for internal events like science fairs. Teacher M51 noted that reliance on external venues limited regular engagement. Other teachers also stressed the need for financial investment and administrative support in planning CCAs.

Finally, lack of time in the school timetable was cited as a major barrier by all the teachers. For instance, Teacher M51 observed that weekly academic demands left little space for CCAs, and school assembly time was minimal. Therefore, without a deliberate balance between academic and non-academic priorities, science-based CCAs are unlikely to thrive.

DISCUSSION

Findings indicate that both teachers and pupils engaged in CCAs only sporadically, and participation was mostly voluntary rather than systematically embedded into school routines. Although regular debates and assemblies featured in the school timetables, not all science teachers participated in or utilised these forums to foster values. This finding is in agreement with previous studies, such as those by Hooshangi et al. (2022) and Mhando (2023), who observed that teacher and learner engagement in CCAs often varies due to constraints such as time, unclear roles, or lack of motivation. This limits the potential of CCAs to connect science with other disciplines, such as language (during debates) and ethics (through discussions about values), which could otherwise enhance holistic learning and values formation. Embedding such interdisciplinary opportunities into regular science teaching would not only strengthen conceptual understanding but also help normalise values education across subject boundaries.

As in Vincent's (2018) study, where limited time reduced opportunities for classroom discussions about values, the current study found that congested academic schedules, especially in schools like Muliisa P/S, restricted the integration of CCAs into teaching practice. Teachers suggested that institutional changes, such as allocating dedicated time slots for CCAs, would be crucial in expanding their value-educational potential. These time allocations should be structured to allow interdisciplinary facilitation, where science lessons can extend into CCAs like debates or clubs,

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reinforcing content while cultivating cross-cutting values such as critical thinking and respect.

Several barriers hindered the consistent use of CCAs for values education. These included a lack of funding, insufficient facilities (e.g., playgrounds or halls), and limited support from school departments or leadership. Science teachers particularly cited these issues as reasons for the absence of clubs, science fairs, or exhibitions. These constraints mirror challenges identified in East African contexts (e.g., Mhando, 2023; Ampaire & Nwana, 2024), where underfunding and weak infrastructure diminish opportunities for effective co-curricular programming. Without recognising CCAs as platforms where science, the arts, and civic education intersect, their value remains underestimated. Therefore, schools must reframe CCAs not as optional extras, but as integrative learning avenues for achieving both cognitive and affective educational goals. Motivating teachers and learners to participate in these activities requires policy-level emphasis on CCAs to support holistic education.

Teachers also identified the need for better motivation strategies for both pupils and teachers. Recognition, rewards, or institutional support, similar to those suggested by Muema (2019) in the Kenyan context, were believed to encourage greater involvement in CCAs and ultimately improve educational outcomes. Without such incentives, teacher participation in science-based CCAs often remained a personal initiative rather than a coordinated effort. Incentivising interdisciplinary CCA initiatives, for example, science-art exhibitions, could attract broader participation and deepen learner engagement with scientific values such as inquiry and precision.

The absence of science clubs and other structured co-curricular groups highlighted a gap in institutional leadership and role clarity. Some teachers were unsure whether establishing and running clubs fell under their responsibility or that of the department heads. This ambiguity contributed to the underutilisation of potentially impactful science-based CCAs. Similar findings were reported by Nkhata et al. (2020), who noted that personal interest often determines involvement in particular CCAs in the absence of clearly assigned roles. Clarifying teacher roles across subject departments could foster interdisciplinary collaboration, allowing CCAs to serve as joint platforms where learning of not only science, but also other subjects, takes place together with cross-cutting values. Such coordination would support the integration of core values like fairness, perseverance, and collaboration into science learning through joint CCA planning across departments.

Despite implementation challenges, all teachers acknowledged that CCAs have the potential to cultivate important values in learners. Values frequently mentioned included cooperation, creativity, sharing, and responsibility, consistent with the findings of Rahman et al. (2021). For example, science exhibitions were reported to enhance creativity, while leadership roles fostered responsibility and interpersonal respect. Rahman et al. (2021) and Kropfreiter et al. (2024) further argue that CCAs enhance not only learners' social and emotional development but also their academic engagement. This underscores the need for schools to intentionally design and implement CCAs as structured, value-rich learning experiences that complement academic instruction.

Five major categories of CCAs were identified: science-based activities, leadership roles, religious activities, music, dance, and drama (MDD), and physical education (PE). Each category offers a unique platform for promoting different kinds of values. Science-based CCAs can cultivate values like curiosity and accuracy. Leadership roles develop qualities such as responsibility, teamwork, endurance, curiosity, and relating positively (Raudoniute & Beresford-Dey, 2024), while MDD encourages imparting various values among children (Biasutti & Habe, 2023; Nuwagaba et al.,

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2023). Such values include cultural expression, creativity, and social awareness. PE fosters values such as discipline, fair play, and resilience. However, participation in these CCAs was minimal, intermittent, and dependent on available resources and teacher initiative. As such, the potential of these platforms for values education remains underutilised, not only in science education, but also in other school disciplines. Promoting cross-disciplinary CCAs, for instance, science-themed drama or environmental debates, could stimulate engagement and make values learning more relevant across subject areas.

In summary, while science teachers occasionally engaged with CCAs such as debates, assemblies, and health parades to promote values, their involvement was inconsistent. Key constraints included overcrowded timetables, lack of institutional support, unclear teacher roles, and inadequate infrastructure and funding. Nevertheless, teachers recognised the potential of CCAs to foster values, reinforcing the need for better planning, administrative support, and integration into formal school structures to realise this potential.

While the study focused on science education, findings show that CCAs are integrative platforms that cut across subject boundaries, including science, religion, language, and performing arts. It is evident that the values fostered through CCA, such as respect, responsibility, cooperation, and creativity, are not exclusive to science but emerge most effectively when multiple domains intersect. Strengthening interdisciplinary collaboration and embedding CCAs into broader curricular and school development plans would be crucial to harnessing their full value-promoting potential in science and other subjects.

CONCLUSIONS

This study examined how science teachers utilise CCAs to foster values among learners. It concludes that while science teachers acknowledge the potential of CCAs in fostering values among learners, their actual use was limited, irregular, and largely implicit. Activities such as debates, school assemblies, and occasional science exhibitions were utilised, but were not consistently integrated into science instruction. Key science-based CCAs such as science clubs, fairs, and competitions were notably absent due to factors such as unclear teacher responsibilities, insufficient administrative support, and inadequate facilities. Despite these constraints, teachers agreed that CCAs can nurture important values, including cooperation, creativity, responsibility, and sharing, underscoring their underutilised potential in values education.

The overall aim of the study was to identify strategies to enhance the value-promoting potential of CCAs in science education. It concludes that to maximise this potential, schools need to provide clearer institutional support, allocate regular time for CCAs on the school timetable, and ensure adequate resources and infrastructure. Strengthening administrative support, offering teacher motivation and recognition, and inter-disciplinary collaboration, embedding CCAs into formal school programmes will be essential in creating enabling environments where values can be meaningfully cultivated alongside learning science content.

RECOMMENDATIONS

Based on the findings of this study, several recommendations are proposed to strengthen the role of CCAs in fostering values in primary science education in Uganda.

The Ministry of Education and Sports (MoES), in collaboration with the National Curriculum Development Centre (NCDC), should revise the national curriculum and related implementation guidelines to explicitly recognise CCAs, particularly science-based activities as formal avenues for values education. To strengthen this integration, curriculum policy should clearly define how CCAs relate to specific learning outcomes and

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values. Policy documents should also provide structured guidance on embedding CCAs, such as science clubs, fairs, and debates into the school routine. Additionally, national school inspection frameworks should include indicators that assess schools' efforts in promoting value-based CCAs. This would enhance accountability and signal institutional commitment to holistic education. NCDC should further develop resource materials and create model practices that illustrate how CCAs can be effectively linked to science education and values development, tailored to local contexts and school capacities.

Centre Coordinating Tutors (CCTs) should sensitise school leaders and teachers on the educational value of CCAs and their role in character development. This could be done through regular workshops, mentoring sessions, or Continuous Professional Development (CPD) platforms. Training programmes for teachers should therefore include practical sessions on organising and facilitating science-based CCAs, with emphasis on how to align them with curriculum topics. Integrating such training into pre-service and in-service teacher education would build long-term capacity for teachers to exploit CCAs as avenues for fostering values.

School headteachers and other administrators should institutionalise CCAs by creating timetabled slots for their regular implementation within the academic calendar. They should designate specific staff (e.g., Heads of Department or CCA Coordinators) to oversee these programmes, provide logistical support, and track pupil participation. This would ensure continuity and help embed CCAs into the school's operational culture. Motivation mechanisms such as recognising outstanding contributions by both teachers and pupils should also be established to enhance ownership and sustained engagement. Public recognition during assemblies or annual awards ceremonies could further raise the profile of CCAs.

Science teachers are encouraged to take personal initiative in initiating and facilitating science-based CCAs, aligning them with classroom topics to enhance the integration of values into learning. When teachers relate CCAs to ongoing lessons, it reinforces classroom knowledge and strengthens the real-life application of values. Peer collaboration among teachers should also be promoted, as it can help build confidence and share best practices in CCA implementation. Forming school-based professional learning communities can serve this purpose.

For further research, longitudinal studies should be conducted to track the long-term effects of sustained participation in science-based CCAs on learners' values development. Such studies would provide deeper insights into their educational value and guide future curriculum design. Additionally, experimental or quasi-experimental research could assess the relative effectiveness of specific CCAs (e.g., science clubs, fairs, debates) in promoting particular values such as teamwork, integrity, or environmental responsibility in a Ugandan context. This evidence would inform targeted investments in CCAs with the strongest impact on desired learner outcomes.

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