International Research Journal of
SCIENCE, TECHNOLOGY, EDUCATION, AND MANAGEMENT
P-ISSN: 2799-063X — E-ISSN: 2799-0648
Volume 4, No. 1 | March 2024

The relevance of science and technology research in community development: A case study of C. K. Tedam University of Technology and Applied Sciences

Belinda Seyram Berdie[1], Nasir Koranteng Asiedu[2], Elliot Akuna[3], Bernard Kissi Abrokwah[4], Vincent Anum Ankamah-Lomotey[5]

[1]*Department of Earth Science/ C. K. Tedam University of Technology and Applied Sciences, Ghana*
[2]*University Library/ C. K. Tedam University of Technology and Applied Sciences, Ghana*
[3]*University Registry/ C. K. Tedam University of Technology and Applied Sciences, Ghana*
[4]*School of Mathematics and Science Education/ C. K. Tedam University of Technology and Applied Sciences, Ghana*
[5]*University Registry/ C. K. Tedam University of Technology and Applied Sciences, Ghana*
Corresponding email: nasiedu@cktutas.edu.gh

ABSTRACT

Research in science and technology is essential to determining community development because it provides creative ideas, encourages sustainable practices, and improves general well-being. The main purpose of this study was to bridge the knowledge-sharing gap between those in academia and the community within which the university finds itself by seeking the opinions of the community stakeholders on the topic that was tabled for discussion. The study was underpinned by the "social ecological systems (SES) theory". Using the interpretive paradigm approach, an exploratory design with unstructured interview guide was used to seek the views of 61 participants on the relevance of science and technology research in community development. The participants in the study were stakeholders within the Navrongo community in the Upper East Region of Ghana. Based on the analysis of the data, the themes that emerged consisted of agriculture, health, innovation and problem solving, education and knowledge transfer, and capacity building. The findings of the study revealed that integrating a novel approach with an emphasis on sustainability and inclusion would not only boost agricultural output but also make a substantial contribution to the overall well-being of communities. It was discovered by the study that if the university uses its research to improve the health conditions of the people within the community through the Schools of Public Health and Medical Sciences it will help advance the working relationship with neighbourhood clinics and by so doing will lead to a collaborative provision of health screenings, immunisations and consultations on-site. Additionally, the study also revealed that the foundation of community development is the collaboration of scientific and technological research through knowledge sharing and capacity building. The study at the end recommended that there should be a conscious effort in the area of knowledge and skill transfer with the intention of improving indigenous technology. It was also recommended that the university should use its platform to emphasise on how technology can be used to solve local problems.

ARTICLE INFO

Received : Jan. 26, 2024
Revised : Mar. 8, 2024
Accepted : Mar. 31, 2024

KEYWORDS

Community development, Science café, Science and technology

Suggested Citation (APA Style 7th Edition):

Berdie, B.S., Asiedu, N.K., Akuna, E., Abrokwah, B.K., & Ankamah-Lomotey, V.A. (2024). The relevance of science and technology research in community development: A case study of C. K. Tedam University of Technology and Applied Sciences. *International Research Journal of Science, Technology, Education, and Management*, 4(1), 120-133. https://doi.org/10.5281/zenodo.10972275

INTRODUCTION

Research in science and technology plays a crucial role in community development. The effectiveness of research can be achieved through collaborative and community engagement, where societal difficulties or challenges are addressed for better solutions (Bokolo, 2023). Adaptation of science and technology in daily lives improves the way of reasoning and how an entity acts towards nature (Anaeto et al., 2016). United Nations Conference on Trade and Development (UNTCD) were of the view that investing in science and technology reduces poverty and creates employment opportunities for the youth (UNCTD, 2018). Dainiene and Dagiliene (2015) also asserted that science and technology research improve innovative ideas, fosters community growth and development, addresses community challenges and ensures environmental sustainability.

On the contrary, Maru (2018) believes that investing so much in science and technology reduces cultural practice and helps people deviate from community norms. The modernization of the world requires critical attention to science and technology. There are a number of advantages in science and technology that need to be looked at on both local and international levels to see how the human race can match the speed of technological innovations and tap into their benefits for community development (Anaeto et. 2016). The era the world finds itself paves the way for scientists and non-scientists to team up and share knowledge on matters that affect the environment in which they reside (Betz al et., 2023). Knowledge sharing is one of the ways of moving a community to the apex. It involves the process through which information is transferred or shared from one entity to another to ensure that all entities are on the same level of knowledge consumption (Rusuli & Tasmin, 2010; Zheng, 2017). Apart from, stakeholder engagement with the end user of research facilitates the uptake and utilization of the product of science and technology research is not remote from the end user, in this case, the community (Dwivedi al et., 2023). Noorhaslinda et al. (2023) concluded that the knowledge-sharing practises between local communities and universities help provide a practicable solution to the knowledge gap. Moreover, Bakker et.al, (2019) and Magis (2010) were of the view that such collaborative initiatives foster bonding and social cohesiveness between the community and university.

There are so many ways of sharing knowledge to solve societal or organisational problems in order to enhance growth in the community. Among these are the use of communities of practice, science cafés, durbars, science fairs, open days and other community groups which are geared towards looking for solutions to address organisational or communal issues (Janssen & Curnick, 2022; Pierce, 2012). For the purposes of this study, the attention is going to be on science café.

Science café is an activity that takes place in an informal setting mostly outside the premises of a typical academic environment like classrooms or lecture halls. This casual activity is organized to help bring academics, industry players, students, and all types of workers together in a free environment to share ideas on science, globalisation, and technology (Janssen & Curnick, 2022). It is a way of bringing the whole community together with no specific way of organising it. Organisers may only have to make sure that it is happening in an informal place and does not include only people in the academia but rather people from all types of occupations. Science cafés are characteristically organised in bars, restaurants, community or academic auditoriums to provide a sense of easiness among people who are not academics to be able to mingle freely and share their opinions on issues being discussed. Additionally, sharing ideas is not done formally therefore people are not expected to do PowerPoint presentations. In a nutshell, everything about the event is informal and organized in a relaxed mood (Jassen & Curnick, 2022; Norton & Nohara, 2009).

The little history about science café shows that, it started in 1998 in Leeds, the United Kingdom. Originally, the concept behind the event leading to its name "science café" was borrowed from France in 1992 from a philosopher called Marc Sautet who initiated something in the form of a science café but called it "café philosophique" (Pierce, 2012).

Judging by the low level of awareness of the event globally, not much empirical reports are found on it. With this, the first public university in the Upper East Region of Ghana decided to organise its first science café by bringing the university community and the public together specifically people from Navrongo to discuss the relevance of

science and technology research in community development. The aim was to bridge the knowledge-sharing gap between those in academia and the community within which the university finds itself and to also seek opinions on the topic that was tabled for discussion. It is therefore against this backdrop that this study was conducted to bring to the fore the views/opinions of all shareholders on the importance of science and technology research in community development.

THEORETICAL FRAMEWORK

This study was underpinned by the "Social Ecological Systems (SES) Theory" which was propounded by Elinor Ostrom in 2005. The theory was based on the interaction between social systems and the surrounding ecological environment. Ostrom (2005) acknowledged that social, economic, cultural, and environmental issues have an impact on community development. The theory emphasized that human aspects of a community, such as its social organization, governing structures, cultural norms, and economic activities, are referred to as social systems (Colding & Barthel, 2019). Within this approach, science and technology research focuses on comprehending and addressing social factors like stakeholder collaboration, knowledge sharing, and community participation. It acknowledges the value of community involvement and empowerment in determining development projects. The SES theory recognizes how science and technology research could help with sustainable environmental management as well as the crucial role ecological systems play in community development (Berkes, 2003). The authors believe that aligning themselves with this SES theory could help share knowledge on climate change adaptation, sustainable agriculture, biodiversity preservation, and renewable energy.

Again, the SES theory places a strong emphasis on the interactions and feedback loops that exist between social and ecological systems (Folke, 2010). In line with the study, the relevance of science and technology research on community development could be examined when there are connections and feedback between social and ecological systems to comprehend the intricate dynamics that influence community development. However, the SES theory also emphasizes the capacity to learn, adapt, and react to changing situations, which is referred to as adaptive capacity. Within this approach, the C. K. Tedam University of Technology and Applied Sciences organised a science café to help investigate how its novel technologies, knowledge transfer, and capacity-building programmes could improve community resilience and adaptability.

The SES theory sheds more light on how collaboration, decision-making, and resource management are made easier by effective governance structures and institutions. Within this theory, the authors look at how science and technology research could inform institutional arrangements, policy frameworks, and governance structures to find strategies to enhance community development. From this study, the SES theory could be useful in how science and technology research could inform community development on the interconnectedness of social and ecological systems.

MATERIALS AND METHODS

Study design, population and sample

The study was underpinned by interpretive assumptions, where an exploratory design with unstructured interview format was used to seek information from stakeholders within the Kassena-Nankana Municipal on the relevance of science and technology research in community development (Creswell & Creswell, 2018; Creswell & Poth, 2018). The study was conducted at C. K. Tedam University of Technology and Applied Sciences (CKT-UTAS) during a science café programme where leaders of various institutions and community heads were invited to share their views on how the relevance of science and technology research can be used to develop our community. The researchers officially wrote to the University to seek for permission to use its name and premises for the study. The decision to use the name of the University without anonymizing it by the researchers was done intentionally to create visibility for the University as one of the first to organize science café in the Upper East region of Ghana which

brought together stakeholders in the community to discuss the relevance of science and technology research in community development. The total number of invited guests was 150 and 123 participants responded to the study.

Study tool and data collection

The data collection tool was an unstructured interview guide. This was the best way to seek information from a large group where individuals were allowed to share their views freely. This form of data collection allowed participants to build rapport and have an open exchange of experiences (Fraenkel et.al, 2023). Prior to the start of the science café programme, the research assistants within the university received training on the purpose of the study and how data would be collected. Invitation letters were also sent to participants, explaining the purpose and data collection procedure. The participant's interview was done face-to-face, and the entire programme lasted for 3 hours. The programme took place on June 14, 2023, on CKT-UTAS campus auditorium.

DATA ANALYSIS

Thematic analysis was used to analyse the data (Braun & Clarke, 2006). The data was manually coded and examined by the researchers. It was essential to improve intercoder reliability because various coders were involved. As a result, intercoder reliability, or repeatability between coders, which is concerned with whether multiple coders would code the same data in the same way, increased trustworthiness (Creswell & Creswell, 2018). The coding procedure and results were examined by three impartial moderators who are skilled in qualitative research. No significant diversions were noticed (Creswell & Creswell, 2018). Through data saturation the authors gather information until we realise that it was not significantly advancing or using all the information provided by participants because we realised participants groupings were giving the same response.

Trustworthiness of the study

The researchers upheld the principles of trustworthiness proposed by Lincoln and Guba (1989), which include credibility, dependability, confirmability, and transferability. Credibility was achieved when the research assistants had the necessary training, skills, and expertise to conduct the interviews while the purpose and data collection process were explained to the participants. Interviews were also performed in convenient locations that had been suggested and approved by the management of the university. The researchers used a variety of techniques to guarantee the participants' candour when providing information (Lietz, Langer, & Furman, 2006). A regular debriefing session was done by the authors to explain the purpose of the programme so that participants do not lose track on the main aim. Dependability was assured by creating a study protocol, keeping meticulous records of all data collection procedures, and making sure that the coding was accurate and double-checked by all the authors (Lincoln & Guba, 1986). Confirmability was ensured through co-coding and experts checking the transcribed data. Transferability was achieved through the authors' description of the study's methodology in this report, which was followed and reproduced (Shenton, 2004). The research design, setting, and use of the purposive sampling technique to choose participants who met the inclusion criteria have all been described in detail (Fraenkel, Wallen, & Hyun, 2023).

Ethics approval

All research protocols were followed. Letters were officially written to all participants to introduce the topic to them and to also seek their consent before participating in the study. These included participants voluntary participation, informed permission, anonymity, confidentiality, and the freedom to leave the interview without suffering repercussions (Creswell & Creswell, 2018). The interviews took place in a relaxed environment.

RESULTS

From the data saturation, the researchers realised that out of 123 participants who responded to the study, information from 61 participants was used during the data analysis. With the assistance of all the five researchers and three

additional research assistants the study was conducted without any issues. The participants used for the study were made up of university staff, college tutors and principals, dressmakers, headteachers, media personnel, bankers, farmers, traders, security officers, drivers, food vendors, and national service personnel. To ensure anonymity, participant comments and identities were not used, but rather numbers were used to represent participants in the study. The analysis of 61 selected participants data was reported in this section. After data transcription, these major themes and subthemes were developed from the data. These themes consist of agriculture, health, innovation and problem solving, education and knowledge transfer, and capacity building.

Agriculture

On this theme, participants made different comments, considering how they think improvement in agricultural science could be a relevant tool for community development. The participants comments ranged from crop improvement, farming with a precise aim, sustainable agriculture, post-harvest management, crop protection, and pest management.

Crop improvement

These participants asserted that inventing in hybrids and varieties of crops could help improve agriculture in the municipality (P8 & P9). However, P8 further commented that "*improvement in crop science, such as yield potential and disease resistance, could help increase the nutritional content of crops*". In the same vein, P9 believes that "*employing scientific methods such as molecular breeding and biotechnology could be the best way to improve crop production*".

Farming with a precise aim

P21 commented "application of *biotechnological technology to enhance agricultural produce*". In the same vein, P12 added that "*technologies such as remote sensing, geographic information systems, and data analytics provide assistance to farmers in improving the effectiveness of crop monitoring and management* ". "*Science café could help bring ideas where farmers can adopt to maximise their farm output and minimise input wastage" (P29).* These participants were of the view that science and technology research have meaningful insights to help farmers on a variety of topics, including the fertility of the soil, the levels of moisture in the soil and pest infestations (P13, P31, P43, & P61).

Sustainable agriculture

The participants consent that the involvement of science and technology research could create an enabling environment for the youth to engage in agriculture (P10, P19, P33, P45, 52 and P54), while P2, P6, P45, P58 and P61 emphasise how science and technology research could bring the attractiveness of agriculture to the youth. P4 and P3 concluded that agriculture helps improve the economic and livelihood of members of the community.
In the same vein, P15 asserted, *"There is an unmet need for CKT-UTAS to set up a central lab to aid in the development of local technologies for agriculture."* In addition, P36 concluded that *"the need to improve agriculture through scientific and modern methods of farming could make agriculture attractive to the youth.".*

On this theme, P23 concluded that the involvement of science and technology research could help smart agriculture and water management, while P40 said that this could help smart strategies and approaches for water conservation. In addition, P42 was of the view that science and technology research could help indigenous people have practical knowledge to make decisions with regards to climate change uncertainty.

Whereas P14 concluded that *"the establishment of community groups together with the university to champion information centres to provide climate change information for farmers".*

Crop protection and pest management.

These participants were of the view that research in science and technology contributes to the development of effective solutions for crop protection and pest management (P20, P18 and P34). However, P17 was of the view that *"research in science and technology in agriculture should focus on strategies to introduce climate-smart agriculture in the community to protect crops and manage pests."*.

P1 added that science and technology research *"improve farming in and around Navrongo with new technological ways of farming and suggest chemicals that will improve the yield of farmers."*.

Post-harvest management.

Navrongo, as a farming and agriculture community, has a role to play in improving the economic activities of the community. However, CKT-UTAS can influence the adaptation of new technologies to promote post-harvest issues, with the goal of improving systems for storage, processing, and preservation of harvested goods (P3 and P11). These participants (P25, P37 and P59) were of the view that the CKT-UTAS should work to create technology that will lessen the amount of food that is wasted after harvesting, increase the food's shelf life, and make it safer to eat. P25 further stated that "*the application of agricultural scientific methods like post-harvest management such as packaging, drying, cold storage, and value-adding, all of which improve modern methods of farming"*.

However, P19 asserted that research on the early spoilage of vegetables such as carrots, some varieties of tomatoes, green peppers, etc. can be prevented with the help of effective post-harvest management.

In addition, *"science and technology bring about economic development by discovering ways of controlling post-harvest losses" (P26).*

Agricultural machinery and automation.

Investment in science and technology research is the primary tool for agricultural developments (P14 and P47). But P47 further explains that investment in agricultural machinery leads to greater levels of efficiency and productivity.

However, P59 and P14 believe that investing in seedlings, irrigating, and harvesting could be successful if the correct equipment and sensor technology are fully implemented.

P2 added that *"there is an unmet need for CKT-UTAS to set up a central lab to aid in the development of local technologies for agriculture within Navrongo."*.

Farmers have access to information and markets.

These participants were of the view that farmers access to information could help empower the youth and enhance people's interest in involving themselves in agriculture (P5, P8, P32, and P47).

P55 and P59 concluded that CKT-UTAS must have a forum for community members to help farmers access information. P59 further asserted that at the forum, CKT-UTAS can disseminate information through flyers and brochures.

Health Promotion

Another main theme that the participants raised concern about was how science and technology research could promote health. This theme comprised disease prevention and control, health policy development, public health education and awareness, and innovations in healthcare delivery.

Disease prevention and control

On this theme, P56 asserts that the *relevance of science and technology research "helps in getting to know and understand the needs of the community, portable drinking water, and some communicable diseases that can be eradicated or reduced through education".*

On this theme, P9 and 41 added that *"CKT-UTAS must set up infrastructure to conduct health research into diseases of the community. Science and technology are critical for the development of a community and, by extension, a nation. CKT-UTAS, being a science and technology university, has to play" (P20),* while *"CKT-UTAS has to play a critical role in research that can improve the health of the community" (P24).*

P30 asserted that "state-of-the *art AI simulation lab to aid in disease... and chronic cases to enhance medical care in Ghana. And to train the next generation of high-tech medical scientists.".*

In the same vein, science and technology research help to *"provide practical solutions to reduce the spread of diseases that are eroding the lives of the youth in Navrongo and its environment" (P37).*

Health policy formation

P11 believes that "*Research in science and technology generates evidence that can be used to guide the formulation of health policy*".

P36 said that "CKT-UTAS may generate data insights that forms policy decisions and support advocacy campaigns" either on health or environmental issues.

Innovation and Problem Solving

Community based research seek to address critical issues confronting local member. Collaborative engagement of all stakeholders enhances innovation and problem solving to address concerns to the discovery of viable solutions that have the potential to enhance the standard of living and general wellbeing of members of the community. On this theme, participants made several suggestions as to why innovation and problem solving is key when it comes to science and technology research.

P53 said that,

> *"Science and technological Research should be driven by problems in the community. CKT-UTAS can approach the community to find out their problems. Then the university can begin to see how those problems can be solved through research".*
> *"CKT-UTAS researchers may consider collaboration to use the knowledge of faculty from different areas to come up with a solution to solve community problems. For example, faculty from computing can work with those from other areas to come up with computerized models to solve problems." (P51)*

P48 narrated, *"I was thinking that CKT-UTAS can organise an innovation and invention challenge among the youth in the community so that those with the best innovative ideas can be nurtured".*

P28 shared that,

> *"CKT-UTAS has contributed much to science education in Ghana and around the world. I can contribute to science when the university has sufficient support for such funding for research to help us innovate and improve existing science initiatives".*
> *Science and technology research creates new knowledge and economic development. The knowledge created can be used by communities to solve their developmental challenges. CKT-UTAS can*

> *therefore play a role in... through its staff doing cutting-edge scientific and technological research (P32).*

P10 was of the view that "researchers in CKT-UTAS should be motivated to tackle community-centred issues and innovations that solve community issues and improve lives. This can be in the form of an award and competition".

Identifying Community Needs and Developing Sustainable Solutions

These participants (P38, P46, and P49) believe that collaborative views from community members through research makes it possible to systematically identify the obstacles facing communities. The impact of the relevance can be adhered through the following:

"Problems and needs identification through community engagements, surveys, focused group discussion" (P50) whereas P42 stated that *"establishment of partnership with local industries such as shea butter processing farming communities".*

> *"Use of science and technology to develop our community sanitation issues by way of developing machines and chemicals that can dispose of our liquid waste underground without using Zoomlion to dispose of them for us" (P39).*
>
> *"The technology and engineering departments should develop machines and equipment that can be used to clear our bushy environment easily without the use of labourers effort to weed and clear our environment" (P40).*
>
> *"Science and technology should be used to develop apps to perform specific assignments in offices and for the use of students to have easy access to lectures and interactions with staff and to access information for effective development in the programme of study" (P44).*

However, *P42 added, the significances to engage stakeholders in* the fields of science and technology focuses on the development of sustainable solutions that can address complicated issues faced by communities.

Advancing Technology and Knowledge

P31 and P42 posits that science can help our community in numerous ways:

> *"……..the use of biotechnology in producing natural products like antioxidants, alcohol, improving our crop productions, bioactive compounds for drug discovery etc. All these products will in turn generate income as well" (P35).*
>
> *"……..have made everyday lives easy and comfortable in all kinds of everyday activities, from communication to transportation to even the educational system. Hence, there is a need to encourage more scientific research in the field of science and technology so as to improve the quality of life and the educational system within the university community and society at large" (P21).*

P57 added that,

> *"CKT-UTAS can partner with other science organizations to organize invention programmes for the youth in the community to improve their livelihood with technology. Again, promoting the use of technology in the enhancement of community development".*

P60 concluded that,

> *"CKT-UTAS can guide some of their students conduct research and projects that focus on providing innovative science and technology for community or indigenous problems. Again, the institution should make sure that much investment goes into advanced way of teaching and learning will go a long way to develop communities".*

Knowledge Transfer and Capacity Building

Stakeholders are the centres of knowledge because they do research and produce insightful new findings. This theme assesses how knowledge transfer and capacity building are essential through community-based engagement on science and technology.

These participants shared their views,

"Establish AI research Lab to take advantage of the new ware in AI Technology" (P3).
"This avenue is very good for sharing and receiving information from other stakeholders to build our communities" (P26) while P2 concluded that *"it ensures that valuable knowledge is shared with the community members".*
"Through science café research findings are disseminated to key stakeholders within the community to seek their view for social and economic development" (P51).

"Research in the sciences and technologies makes it easier for research institutes to share their discoveries and bring new technologies and ideas to the general public" (P29).

"The shared ideas from science café helps communities to accept and implement new technologies by facilitating the transfer of technology and innovation" (P16).

P60 suggested that,

> *"Science and technology play a lot of important roles in community development, since CKT-UTAS is training students in science and technology, there should be more practical work that will make students efficient in serving the community, and in doing that, the contribution of science and technology to the role of CKT-UTAS will be achieved".*

DISCUSSION

From the findings, it was revealed that crop improvement research using science and technology is essential to community development. Research pertaining to yield, nutrition, resilience, and sustainability improves the general well-being and financial stability of agriculturally dependent populations. Adoption of enhanced crop varieties as a result of scientific discoveries makes a substantial contribution to the accomplishment of international development objectives concerning the elimination of poverty and assurance of food security, which are issues discussed during the science café. In support, Bouis and Welch (2010) stress the value of biofortification in raising crops' nutritional content. Pretty et al. (2018) and Van Eck et al. (2018) talk about the use of genetic engineering to create crops resistant to illness. However, the findings of Lobell et al. (2014) suggest the significance of crop improvement in adjusting agriculture to climate change through crop research.

Science and technology research is critical to the advancement of sustainable agriculture and has a significant influence on community development. Communities are able to construct resilient agricultural systems that guarantee food security, protect the environment, and promote economic prosperity by incorporating creative ideas that are based on scientific research. The development of thriving and sustainable farming practices depends on the ongoing synergy between scientific breakthroughs and community interaction. In support, AgTech, or agricultural technology, has emerged, utilising data analytics, artificial intelligence, and the Internet of Things to streamline farming processes. By facilitating data-driven decision-making, adopting creative solutions, and monitoring in real time, smart farming techniques increase output while lessening their environmental impact (Wolfert, Ge, Verdouw, & Bogaardt, 2017). In the same vein, Lee and Kim (2014) asserted that the creation of value chains and market access through research improves sustainable agriculture's economic feasibility. Market information systems, blockchain technology enabling transparent supply chains, and direct farmer-to-consumer interactions all help farmers become more economically independent.

The findings revealed that addressing post-harvest issues and enhancing farmers' access to markets and information through science and technology research plays a major role in community development in agriculture. These developments not only lower post-harvest losses but also provide farmers with the information and resources they need to improve their output, earnings, and standard of living. FAO (2018) and Singh and Jan (2017) revealed that scientific advancements in cold chain technologies help to reduce post-harvest FAO (2018) and Singh and Jan (2017) revealed that scientific advancements in cold chain technologies help to reduce post-harvest losses by increasing the shelf life of perishable produce, minimizing spoilage, and offering effective storage solutions. However, Shrivastava and Jain (2017) were of the view that by lowering moisture content and inhibiting the growth of microbes, technological advancements in drying and dehydration procedures improve the preservation of fruits and vegetables. With the aid of mobile applications, inventory can be tracked in real time, which helps farmers minimise losses and efficiently manage their post-harvest operations (Kar, Choudhary, Garg, & Jain, 2015).

The finding revealed that community development depends critically on the integration of science and technology research in illness prevention, control, and improvements in healthcare delivery. These developments not only increase the efficacy of public health initiatives but also provide people with the ability to take an active role in preserving their health. Communities can create resilient healthcare systems and improve health outcomes by utilising scientific and technological advancements. In support, the Plotkin (2021) study revealed that the quick creation of COVID-19 vaccinations, for example, demonstrates the effectiveness of scientific research in addressing international health emergencies.

The finding revealed that science and technology-driven innovation and problem-solving are essential elements of community development. The organisation of science cafés may address regional issues, raise living standards, and establish inclusive and sustainable growth routes by utilising these advancements.

The goals of science and technology research are to ensure inclusion, close the digital gap, and make technological solutions available to everyone (Warschauer & Matuchniak, 2010). Arora et.al (2020) added that robust research and development initiatives propel technological innovations and provide a climate in which novel concepts are investigated and turned into workable solutions.

Research in science and technology is the driving force behind knowledge transfer and capacity building, which are essential elements of community development. Giving communities access to pertinent knowledge, resources, and tools improves their capacity to deal with problems as they arise and promotes resilience and sustainability over the long run. The development of digital literacy programmes, which guarantee that community members can access and use information and communication technologies, is aided by science and technology research. Online learning platforms facilitate ongoing education, enabling community members to gain new skills and information from a distance (Warschauer & Matuchniak, 2010). Suber (2015) concluded that open access initiatives encourage the broad sharing of knowledge, which benefits the scientific community as well as the general public. Incorporating local knowledge into the research agenda through community engagement in research processes promotes a cooperative approach to capacity building (MacGregor & Carver, 2014).

Implications for practices and policy

Below are the implications for practices and policy.

1. Communities should be assisted to initiate projects that will help them to improve their health and sanitation situation. Self-help programmes should be organised to enable the communities to take the lead in developing their own initiatives in agriculture and other areas. This could motivate them to assume responsibility for initiatives that tackle issues affecting them. Encourage joint research to improve indigenous technologies in the communities.

2. Initiate the development and promotion of local products. Discover waste from post-harvest losses and work with the communities to resolve them. Determine problems that are unique to the community and ask participants to come up with innovative solutions through brainstorming.
3. The University should use its research to improve the health condition of the people within the University Community through the Schools of Public Health and Medical Science. Medical professionals should work with neighbourhood clinics to provide health screenings, immunisations and consultations on-site. Utilise science cafés as avenues for health awareness initiatives that highlight common health problems in the neighbourhood. Talks about immunisation, physical activity, balanced diet, family planning and the need for routine medical check-ups. Planned events should be used to campaign against the stigma associated with mental health problems and offer guidance on how to get mental health resources and assistance.
4. Invite farmers, agronomists, and researchers who are knowledgeable about agriculture in the area to facilitate conversations to impart and transfer knowledge. Send students into the villages/communities to work with the local people to identify indigenous agricultural problems and help to address them.
5. There must be a knowledge and skill transfer with the intention to improve indigenous technology. Academia must appreciate and acknowledge customary and regional expertise. Encourage talks where elders in the community can impart their knowledge and experience, as they may have original answers. The University must use the opportunity to emphasize how technology can be used to solve local problems.
6. Set up mentorship programmes that place seasoned scientists and technologists in pairs with people in the community, particularly youth and students. Mentors should offer direction, impart knowledge, and assist mentees in acquiring necessary skills.
7. The University must initiate Open Days or Technology Fairs for practical demonstrations and hands-on activities to produce handicrafts for income generation. At such fairs the University should showcase cutting-edge farming instruments, methods, or technologies that can benefit the local people and industry.
8. Create avenues for children to learn more deeply and explore STEM disciplines, organise scientific camps during school breaks. This will encourage students to present their inventions and projects for technology fair competitions.
9. The University must provide practical training opportunities for community members to acquire skills in areas such as computer programming, data analysis, appropriate use of fertilizer, and elementary scientific investigations. Such activity should take into consideration different ability levels, cultural practices and groupings.

Theoretical implications

Below are the theoretical implications.

1. The SES theory highlights how social and ecological systems are interrelated and how changes to one element can have an impact on the system. The authors believe that research on science and technology in community development should consider the mutual links that exist between technological interventions and the socio-ecological setting. For example, the introduction of a new agricultural technology may affect resource use and community dynamics in addition to crop output.
2. In adapting to environmental and social changes, adaptive capacity and resilience are critical, according to SES theory. The authors believe that giving communities the tools, information, and technologies, they need to adjust to changing circumstances, science and technology research in community development should work to increase adaptive capacity. For instance, advances in climate-smart agriculture can strengthen farming communities' resilience.
3. The SES theory presents the idea of panarchy and emphasises the value of flexible governance frameworks that permit long-term learning and modification. The authors were of the view that science and technology research for community development should consider the governance frameworks that facilitate flexible resource and technology management. Community-based participatory approaches that enable local stakeholders to actively participate in decision-making processes may be used for this.

4. The SES theory emphasises how crucial it is to deal with concerns about social justice and equity when allocating and managing resources. The authors believe that potential disparities that could result from the adoption of new technologies should be taken into consideration in science and technology research. It is imperative to undertake measures to guarantee that technological innovations foster social equity rather than intensify pre-existing inequalities in the community.

CONCLUSION AND RECOMMENDATION

1. The study showed that research into science and technology in agriculture is very important for helping farming communities with their many problems. The integration of novel approaches with an emphasis on sustainability and inclusion not only boosts agricultural output but also makes a substantial contribution to the overall well-being of communities.
2. In conclusion, the foundational pillars of community development include science and technology research in health. Developments in knowledge and technology allow communities to actively engage in the quest of holistic health and well-being, while also improving healthcare outcomes.
3. It was revealed that the opportunities for creativity and problem-solving at the nexus of science, technology, and community development. Science and technology research are important tools for creating a future where communities thrive, overcome obstacles, and actively participate in their own development through collaborative, inclusive, and adaptive approaches.
4. Finally, it should be noted that the foundation of community development is the collaboration of scientific and technology research, knowledge transfer, and capacity building. Communities may leverage the power of knowledge to enhance their skills, establish resilient systems, and determine a future characterised by fair and sustainable development by placing a high priority on inclusive and collaborative approaches.

Strength and limitation

First, the researchers' deeper comprehension of the variables that impact the relevance of science and technology research in community development in Ghana was made possible using a qualitative approach. Again, the experiences gained from the field would help change the policies and practices of stakeholders in the Navrongo community. However, during the science cafe, some participants failed to acknowledge the programme, and others failed to critique the discussion in depth.

REFERENCES

Anaeto, F. C., Asiabaka, C. C., Ani, A. O., Nnadi, F. N., Ugwoke F. O., Asiabaka I. P., Anaeto, C. A., & Ihekeronye N. (2016). The roles of science and technology in national development. *Direct Research Journal of Social Science and Educational Studies (DRJSSES) 3*(3), 38-43

Arora, A., Belenzon, S., & Patacconi, A. (2020). R&D as a Gateway to Entrepreneurship: Evidence from a Policy Experiment. *The Review of Economic Studies, 87*(3), 1214-1253.

Bakker, Y. W., de Koning, J., & van Tatenhove, J. (2019). Resilience and social capital: The engagement of fisheries communities in marine spatial planning. *Marine Policy*, 132–139.

Berkes, F., Colding, J., & Folke, C. (2003). *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge University Press.

Betz al et. (2023). Game changers in science and technology - now and beyond. *Technological Forecasting & Social Change 193* (2023) 122588. https://doi.org/10.1016/j.techfore.2023.122588.

Bokolo, A. (2023). The Role of Community Engagement in Urban Innovation Towards the Co-Creation of Smart Sustainable Cities. *Journal of the Knowledge Economy* https://doi.org/10.1007/s13132-023-01176-1

Bouis, H. & Welch, R. (2010) Biofortification—A Sustainable Agricultural Strategy for Reducing Micronutrient Malnutrition in the Global South. *Crop Science, 50*, 20-32.

Colding, J., and S. Barthel. 2019. Exploring the social-ecological systems discourse 20 years later. *Ecology and Society 24*(1):2. https://doi.org/10.5751/ES-10598-240102

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Los Angeles, CA: Sage.

Delvaux, I. & Van den Broeck, W. (2023). Social Marketing and the Sustainable Development Goals: Scoping Review (2013–2021). *International Review on Public and Nonprofit Marketing*. https://doi.org/10.1007/s12208-023-00372-8

Denzin, N. K., & Lincoln, Y. S. (2013). *Strategies of qualitative inquiry* (4th ed.). Los Angeles, CA: Sage.

Dwivedi al et. (2023). Opinion Paper: "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. *International Journal of Information Management 71*(2023) 102642. https://doi.org/10.1016/j.ijinfomgt.2023.102642.

Ekanem, S. A., Ekanem, R. S., Ejue, J. B., & Amimi, P. B. (2010). Science and Technology Research for Sustainable Development in Africa: The Imperative of Education. *African Research Review 4*(3) 71-89

FAO. (2018). *Cold Chain Management. Food and Agriculture Organization of the United Nations.* NY: Sage.

Folke, C., Carpenter, S., Walker, B., Scheffer, M., Chapin, T., & Rockström, J. (2010). Resilience thinking: integrating resilience, adaptability and transformability. *Ecology and Society*, *15*(4), 20. URL: https://www.ecologyandsociety.org/vol15/iss4/art20/.

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2023). *How to Design and Evaluate Research in Education.* NY: McGraw Hill LLC.

Janssen, B. & Curnick, J. (2022). Evaluating knowledge transfer after a science café: A qualitative approach for rural settings. *Science Education and Civic Engagement*, *14* (1), 64-76

Kar, S., Choudhary, A., Garg, A., & Jain, V. (2015). Android-based mobile application for real-time postharvest monitoring of fruits. *Computers and Electronics in Agriculture*, *114*, 87-94.

Lee, J., & Kim, T. (2014). An analysis of sustainable farming systems and its policy implications. *Sustainability*, *6*(9), 6233-6249.

Lietz, C, A., Langer, C. L., & Furman, R. (2006). Establishing trustworthiness in qualitative research in social work: Implications from a study regarding spirituality. *Qualitative Social Work, 5*(4):441-58.

Lincoln, Y. S. & Guba, E. G. (1986) But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation. *New Directions for Program Evaluation, 1986*(30):73-84.

Lobell, D. B. &Tebaldi, C. (2014) Getting caught with our plants down: the risks of a global crop yield slowdown from climate trends in the next two decades. *Environ. Res. Lett. 9* 074003. DOI 10.1088/1748-9326/9/7/074003.

MacGregor, S., & Carver, S. (2014). Collaboration between the computer and social sciences: Introduction to the special issue. *Journal of Artificial Societies and Social Simulation, 17*(3), 16.

Magis, K. (2010). Community resilience: An indicator of social sustainability. *Society and Natural Resources*, *23*(5), 401–416.

Maru, M. (2018). Science, Technology and Innovation as Social Goods for Development: Rethinking Research Capacity Building from Sen's Capabilities Approach. *Science and Engineering Ethics 25*, 671–692. https://doi.org/10.1007/s11948-018-0037-1

Norton, M. & Nohara, K. (2009). Science cafes. Cross-cultural adaption and educational applications. *Journal of Science Communication*, *8*(4), 1-11

Ostrom, E. (2005). Understanding Institutional Diversity. Princeton University Press.

Pierce, M. (2012). *Science cafes bring joy of discovery to Main Street*. http://membercentral.aaas.org/blogs/qualia/science-cafes-bring-joy-discovery-main-street?page=0,0

Plotkin, S. A. (2021). History of Vaccine Development. In Vaccines (Seventh Edition) (pp. 1-21). *Elsevier.*

Pretty, J. N. (2018). Intensification for redesigned and sustainable agricultural systems. *Science 362*(6417):eaav0294. DOI: 10.1126/science.aav0294

Real, J. A. B. (2022). 21st century competencies of teachers in teacher education institutions: Basis for designing faculty development program. *International Research Journal of Science, Technology, Education, and Management*, *2*(2), 153-164.

Real, J. A. B. (2022). The competency level of research students in writing research paper: Basis for recalibrating the research curriculum in the junior high school level. *International Research Journal of Science, Technology, Education, & Management* (IRJSTEM), 2(3).

Rusuli, M.S.C. & Tasmin, R. (2010). Knowledge sharing practice in organization. *International conference on ethics and professionalism.* 797-803

Shenton AK. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information, 22*(2):63-75.

Shrivastava, A., & Jain, R. K. (2017). Green drying of food products: A review. *Comprehensive Reviews in Food Science and Food Safety, 16*(4), 704-721.

Singh, S., & Jan, J. (2017). Controlled and modified atmosphere storage in horticultural crops. *Postharvest Biology and Technology, 128,* 134-143.

Suber, P. (2015). Open access, impact, and demand. *British Medical Journal, 350*, h210.

United Nations Conference on Trade and Development (UNCTAD). (2018). *Technology and Innovation Report 2018: Harnessing Frontier Technologies for Sustainable Development.* United Nations.

Warschauer, M., & Matuchniak, T. (2010). New technology and digital worlds: Analyzing evidence of equity in access, use, and outcomes. *Review of Research in Education, 34*(1), 179-225.

Warschauer, M., & Matuchniak, T. (2010). New technology and digital worlds: Analyzing evidence of equity in access, use, and outcomes. *Review of Research in Education, 34*(1), 179-225.

Wolfert, S., Ge, L., Verdouw, C., & Bogaardt, M. J. (2017). Big data in smart farming–A review. *Agricultural Systems, 153*, 69-80.

Zheng, T. (2017). A literature review on knowledge sharing. *Open Journal of Social Sciences*, *5*, 51-58.