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RELATIONSHIP BETWEEN PEDAGOGICAL PRACTICES AND OUTCOME OF SCIENTIFIC TRAINING ON BIOLOGICAL EVIDENCE MANAGEMENT IN NAIROBI COUNTY, KENYA

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ABSTRACT
Crime scene Investigations is a crucial aspect in the judicial process. To ensure that justice prevails, all the crime scenes need to be well managed by the Crime Scene Investigators. Failure to manage the crime scenes properly, some citizens fall victims of wrongful convictions and at other times the suspects are acquitted by the court due to lack of substantive evidence. For purpose of proper management of crime scene, the Crime Scene Investigators require to undergo a scientific training which acquits them with knowledge and skills. Such knowledge and skills enable them to handle various types of evidence and especially the biological evidence. Majority of studies have been on scientific training at primary, secondary schools and colleges. However, Minimal research has been conducted on the scientific training on biological evidence management for the crime scene investigators at police training institutions. This study therefore, sought to address the existing knowledge gap by establishing the relationship between content and outcome of scientific training on biological evidence management in Nairobi County, Kenya. To achieve the objective descriptive research design was adopted. A sample of 132 respondents was obtained from a target of 198 by use of Krejcie and Morgan sample determination table. Data was collected using questionnaires and interview schedule. Prior to data analysis, common themes were noted. The data was analyzed quantitatively using descriptive and inferential statistics with the aid of Statistical Package for Social Sciences (SPSS) version 25.0. The research hypotheses were tested at 95% level of confidence. The findings indicated that content for scientific training on biological evidence management was inadequately covered due to allocation of a few lessons. It was therefore, recommended that there should be more lessons allocated for biological evidence management scientific training to enable adequate coverage of the diverse content areas.

Keywords: Scientific training, Pedagogical practices, biological evidence management, Crime scene investigators.

INTRODUCTION
The outcome of scientific training on biological evidence management is determined by the extent of knowledge and skills acquired by Crime Scene Management Trainees. The outcome being the product or the way a thing turns out due to an act or omission,

means that the level of scientific training of Crime Scene Investigators determines the actions to be taken at the crime scenes. Crime Scene Investigators should therefore, be adequately trained in all areas of forensic crime scene investigations for better outcome thus avoiding wrongful convicts or failure of cases in court of law due to poorly managed crime scenes in Kenya.
Scientific training involves teaching and learning of science to college students or adults within the general public for purpose of a product, that is a learner who is well versed in-terms of knowledge and skills acquired during science education. The field of science education includes work in science content, science process (the scientific method), some social science, and some teaching pedagogy (Science education, journal).The content area for scientific training on biological evidence management include securing, preserving, selecting, labelling, collecting, packaging, transporting, storing and analysis of biological evidence at the crime scene and in the laboratory as well as preparing biological evidence reports (Kampen, 2020). According to Richard (2012), laboratory analysis uses scientific procedures in examining evidence, identifying biological fluids and comparing individuals' characteristics of the biological evidence collected. Biological evidence management make use of deductive reasoning which is associated with scientific approach and inductive reasoning associated with hypothesis generating approach, thus scientific process (Davis, 2021).

Organizations in many countries, Kenya included invest immensely in training and development of its human resource base.
One such organization is the Directorate of Criminal Investigations which deals with Crime Scene Investigations (National Police Service Standing Orders, 2018). Despite the training in Crime Scene Management, crime has been on the rise. Researchers in social and psychological fields have attempted to explain the increased reports on serious crimes. Among the reasons, studies indicated is the minimal or lack of relevant training in biological evidence management and move by perpetrators to cope and thrive amidst increasing vulnerabilities (Treves, 2013). The studies indicated that crime rate is closely tied to the strength of the economy, increased rate being witnessed during economic recessions whereas during more economically favorable periods the rates have a tendency to fall. Whatever the extent of crime, management of criminal activities is the prerogative of Crime Scene Investigators who carry out various forensic crime scene procedures at the crime scene.

Jerry (2016), cites that training is the most basic requirement for proper management of crime scene because Crime Scene Investigators acquire certain skills for efficient performance. This enables CSI to make general observations of the overall crime scene and patterns before focusing on specific evidence. The core aspect of investigators depends on their capability to identify places to collect materials that could provide evidence and in developing patterns to link up evidence and quickly develop an accurate working theory. Specialized training, backed with experience drawn from handling crime scenes plays an important role in building and developing the sufficient skill base required for handling biological evidence found in the most complex crime scenes.

To avoid instances of poorly managed crime scenes, the CSI need adequate skills and should always do the right thing. Therefore, Crime Scene Investigators should realize that the success of a case is determined by the knowledge and skills acquired during scientific training on handling various evidence and especially the biological evidence which is easily contaminated hence inaccurate results. Through appropriate scientific training the CSI are able to overcome the challenges of poor evidence gathering, collection of wrong or contaminated forensic evidence which results to criminals being set free or even prosecution of innocent members of the public (KIPPRA, 2022).

Pedagogical practices are activities that support teaching and learning. The actions developed from the planning and systemization of dynamics of learning process to concrete realization of learning are also referred to as pedagogical practices. Pedagogical practices such as subject matter or content, instructional method, assessment methods and various instructional resources used during the teaching process are the independent variables. Pedagogical practices are most critical in any form of training such as scientific training on biological evidence management. Training entails the instructional activities that are offered to the members of staff of a certain organization in order to equip them with knowledge, skills and attitudes and helping them to apply the same in their day-to- day responsibilities in the organization (Dale, 2012). Training which involves instruction and other practices is a key component in developing personnel in any given organization as it aims at equipping staff with skills that meet the standards of the organization. Moreover, training helps the staff to perform their roles effectively, competently and diligently. Armstrong (2012) cites that training is the methodical acquisition of knowledge, skills and attitudes by personnel in any organization that help in

improving their effectiveness in their daily tasks. Therefore, pedagogical practices used during training must consider the content or subject matter of training and the methods of teaching and learning.
Training and development of human resource is an important tool in improving the productivity of any organization. It equips the employees with knowledge and skills as well as increasing their resourcefulness. Moreover, training increases the competency and efficiency of the employees thus increased productivity (Nassazi, 2013). Several studies document positive outcomes in terms of increased productivity of employees as a result of training. Specifically, (Rohan & Madhumita, 2012) argue that for organizations to grow and perform well, employees should be trained on skills such as teamwork, problemsolving, decision making and communication skills which helps in maintaining healthy relationships at the workplace. Research maintains that training is one of the best methods of increasing employees' productivity and also sharing the organizational vision and goals to the human resource.

Lee & Pagliaro (2013), in USA, cites that crime scene training encompasses the cautious collection, processing and documentation of evidence. Biological evidence management is both scientific and investigative endeavor which require logical application of scientific methods, logical and creative thinking as well as experience. Since biological evidence management involves intense, intellectual, comprehensive, tedious, and difficult scientific activities, CSIs require thorough training in order to be effective in the practice (Shaler, 2012). During scientific training in biological evidence management CSI gain skills and knowledge through a pedagogical process which involves the use of a curriculum that has specific content. the specific content also requires teachers or trainers with high level self-efficacy in sciences.

Gehl (2017), in Colombia, observed that, for investigators to be objective and successful in yielding correct forensic crime scene evidence, they should have an investigative mindset. This investigative mindset cannot be achieved in any other way other than training of the CSIs. Therefore, training of the CSIs is important in ensuring that the evidence collected is accountable. Evidence accountability is dependent on ability and proficiency of those involved in harvesting, packaging, recording, transporting, handing over, storing and examining of the evidence from the scene of crime to law courts (Hormant & Kennedy, 2014).

Diwa et al. (2023), in Nigeria, investigated how school location affected teachers' effectiveness in content mastery for instruction in the classrooms in mathematics Calabar Education Zone. Survey research design was adopted for the study. The study used census sampling in selection of the respondents. Questionnaires were used as tools of collecting data. The study was guided by hypothesis which were tested using population t-test and independent t-test analysis. Findings of the study indicated that the location of the school influenced teaching effectiveness in relation to mastery of content in math subject and more so during the instructional process.

Catalano et al. (2019) assessed the influence of teachers' expertise in sciences on their self -efficacy during teaching. The study was interested in determining the relationship between content and science teaching. One of the study objectives was to compare teachers who were in STEM programs with those in lower levels of education. The respondents in this study were 27 pre-service and 82 in-service teachers. The study findings indicated that teachers with low knowledge of science content had low self-efficacy in sciences. The study also observed that teachers who were in pre-service category had high levels of selfefficacy as compared to their counterparts who were in-serviced. The researcher recommended that teachers should seek to have more understanding of science content in order to be sufficiently prepared while teaching science subjects. On the contrary, teachers who believed that they have higher levels of self-efficacy in teaching sciences, they seemed not to be aware that they needed continuous training in order to improve in areas where they were weak and also because of the changing nature of science content.

Additionally, Muriuki (2022), in Kenya, carried out a study on the capability of DCI departments in Crime Scene Management as case study of Kajiado North Sub-County, Kenya. The study examined the level of training of DCI officers in general as well as how adequate were the technological resources that are used in crime scene management. It was found out that most of the officers had attended some form of formal training concerning crime scene management. Of those who had attended formal pieces of training, most of them received it before joining their current positions. The study recommended that all officers involved in crime scene management should be trained regularly so that they can be updated with the ever-changing world. The study found that

most of those who had formal training had been trained locally, with the training taking between one week and one month. It was found out that integration of technology and practical lessons were some of the areas that were missing in training.
Similarly, Muthini (2018) conducted a study at the DCI headquarters in Nairobi on the challenges facing CSIs found that there was an increase in the number of acquittals in the Kenyan law courts. The study attributed this trend to presentation of inconsistent or insufficient evidence by CSIs. Moreover, the study observed that they were more cases of failed prosecutions due to tampered evidence as well as wrongful convictions among other reasons. More specifically, the study focused on establishing the methods that were used in storage and retrieval of evidence and the correlation between the CSIs' level of training and the effectiveness in carrying out successful investigations. The study observed that 31% of respondents indicated inadequate training in crime scene investigation. Further, the study recommended specialized training for crime scene investigators.

Researchers have carried out studies on: how school location affected teachers' effectiveness in content mastery for instruction in the classrooms in mathematics, the capability of DCI departments in Crime Scene Management as case study of Kajiado North Sub-County, Kenya and the challenges facing CSIs. The studies did not focus on scientific training on biological evidence management in Kenyan perspective. Therefore, the study sought to establish the relationship between content and scientific training on biological evidence management in Nairobi County, Kenya.

METHODOLOGY

The study adopted descriptive survey design. 87 Crime Scene Management Trainees and 32 Crime Scene Trainers were stratified. The 8 Quality Control Officers were purposively sampled. Data was collected using questionnaires for both CSM trainees and CSI Trainers while interview schedule was applied on Quality Control Officers. A sample of 132 respondents was obtained from a target of 198 by use of Krejcie and Morgan (1970) table of determining sample size. Data obtained was analyzed quantitatively using descriptive and inferential statistics with help of SPSS software version 25.0.

RESULTS AND DISCUSSION.

The study sought to establish the relationship between content and scientific training on biological evidence management in Nairobi County, Kenya. Views of Biological Evidence Management Trainees on content was sort by use of ten items based on Likert scale. Table 1 presents information on content by BEM trainees.

Table 1: Content and Scientific Training on BEM (Trainees)

Content for training adequately covers	NE	LE	ME	GE	VGE	Total
Securing of crime scene	6.9	13.8	21.8	39.1	18.4	100.0
Preservation of biological evidence	10.3	16.1	24.1	31.0	18.4	100.0
Selection of biological evidence	10.3	11.5	28.7	32.2	17.2	100.0
Collection of biological evidence	9.2	11.5	34.5	28.7	16.1	100.0
Labelling of biological evidence	9.2	12.6	25.3	26.4	26.4	100.0
Packaging of biological evidence	9.2	19.5	24.1	32.2	14.9	100.0
Transportation of biological evidence	11.5	27.6	27.6	23.0	10.3	100.0
Storage of biological evidence	17.2	26.4	24.1	14.9	17.2	100.0
Analysis of biological evidence	39.1	17.2	18.4	9.2	16.1	100.0
Biological Evidence report writing	39.1	17.2	18.4	9.2	16.1	100.0

Key: No extent (NE), Little Extent (LE), Moderate Extent (ME), Great Extent (GE), Very Great Extent (VGE)

Information obtained from the BEM trainees show that more than half of them (57.5%) believe that content of scientific training in biological evidence management adequately covers securing of crime scene, slightly less than a half (49.4%) felt it adequately covers preservation of biological evidence and selection of biological evidence (49.4%) while slightly less than this proportion (44.8%) believed the content adequately covers collection of biological evidence to a great extent or very great extent. Additionally, more than a half of the officers (52.8%) indicated that the content adequately covers labelling biological evidence, less than a half (47.1%) believed that it adequately covers packaging of biological evidence and about a third of the officers (33.3%) adequately covers transportation of biological evidence to a great or very great extent. Lastly, about a third of the BEM trainees (32.1%) indicated that the content adequately covers storage of biological evidence, about a quarter believe it adequately covers analysis of biological evidence (25.3%) and biological evidence report writing (25.3%) to a great and very great extent. Findings mean that on average, less than half of the BEM trainees (41.7%) sampled believe that content for scientific traini ng adequately covers biological evidence management concepts to a great or very great extent. Table 2 presents findings from BEM trainers on content for biological evidence management training concepts.

Table *2*: Content for Scientific Training on BEM (Trainers)

Content for training adequately covers	NE	LE	ME	GE	VGE	Total
Securing of crime scene	-	6.3	6.3	21.8	65.6	100.0
Preservation of biological evidence	-	9.4	12.5	31.3	46.8	100.0
Selection of biological evidence	-	15.6	6.3	43.8	34.4	100.0
Collection of biological evidence	-	12.5	6.3	43.8	37.4	100.0
Labelling of biological evidence		6.3	6.3	31.3	56.3	100.0
Packaging of biological evidence	-	9.4	6.3	43.8	40.5	100.0
Transportation of biological evidence	3.1	12.5	15.6	43.8	25.0	100.0
Storage of biological evidence	-	15.6	40.6	15.6	28.1	100.0
Analysis of biological evidence	25.0	21.9	21.9	9.4	21.9	100.0
Biological Evidence report writing	25.0	21.9	9.4	15.6	28.1	100.0

Key: No extent (NE), Little Extent (LE), Moderate Extent (ME), Great Extent (GE), Very Great Extent (VGE)

Information obtained from the BEM trainers show that a significant majority of the trainers (88.4%) believe that content of scientific training in biological evidence management adequately covers securing of crime scene, more than three quarters (78.1%) felt it adequately covers preservation of biological evidence and selection of biological evidence (78.2%) while a significant majority of the trainers (82.2%) believe the content adequately covers collection of biological evidence to a great extent or very great extent. Additionally, a significant majority of the trainers (87.6%) indicated that the content adequately covers labelling biological evidence, slightly less than this proportion (84.3%) believed that it adequately covers packaging of biological evidence and about two third of the trainers (68.8%) adequately covers transportation of biological evidence to a great or very great extent. Lastly, less than a half of the CSI trainers (43.7%) indicated that the content adequately covers storage of biological evidence, less than a quarter (30.3%) believe it adequately covers analysis of biological evidence and more than this proportion (43.7%) indicated that the content was adequate for biological evidence report writing to a great and very great extent. Findings mean that on average, more than two thirds of the BEM trainers (68.53%) sampled believed that content for scientific training adequately covers biological evidence management concepts to a great or very great extent. Results obtained from the BEM trainees were cross-tabulated against their conception of the appropriateness of Scientific Training on Biological Evidence Management. Findings were as presented in Table 3.

Table 3: Content for BEM Training Against Outcome of Scientific Training in BEM

			Content of BET		Total
			Not adequate	Adequate	
Outcome of Biological Evidence Training	Not Appropriate	f	28	4	32
		%	32.2	4.6	36.8
	Appropriate	f	18	37	55
		%	20.7	42.5	63.2
Total		f	46	41	87
		%	52.9	47.1	100.0

Findings from cross-tabulation show that slightly less than half of the BEM trainees (47.1%) believed that content for scientific training in biological evidence management was adequate compared to those who felt it was not adequate. Of those who believed that the content was adequate, a significant proportion (42.5%) felt that training in biological evidence was appropriate compared to those whose thoughts were to the contrary (4.6%). On the contrary, more of those who believed that the content was not adequate (32.2%) felt that training in biological evidence was not appropriate compared to those who indicated it was appropriate (20.7%). Chi square analysis was used to interpret this observation. Table 4 presents its findings.

Table 4: Relationship between Content and Outcome of Scientific Training in BEM

	Value	df	Asymptotic Significance (2- sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)	CC
Pearson ChiSquare	24.357[a]	1	.000			.468
Continuity[b] Correction	22.208	1	.000			
Likelihood Ratio	26.661	1	.000			
Fisher's Exact Test				.000	.000	
Linear-by-Linear Association	24.077	1	.000			
N of Valid Cases	87					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 15.08. b. Computed only for a 2x2 table

The Chi square results χ^2 (1) =24.357, $p<0.001$ showed that there exists a significant relationship between subject content and the outcome of scientific training in biological evidence management. Contingency Coefficient measure of Association (CC) illustrated that 46.8% of the total variance in the outcome of scientific Training could be attributed to Content for Scientific Training on Biological Evidence Management. Findings therefore led to the rejection of the first hypothesis, H01which stated that there is no statistically significant relationship between content for biological evidence management and outcome of scientific training in Nairobi County, Kenya. Qualitative data obtained from the QCO illustrated that the content for scientific training on biological evidence management covered the main areas critical for scientific training. According to interviewee B, content areas in scientific training on biological evidence management are;

"Collection and preservation of biological evidence such as DNA, blood, body tissues, body fluids among others. Other areas dealt with processing of crime scenes involving biological evidence to facilitate collection without contamination".

However, almost all the interviewees were in agreement that the content was inadequate for effective biological evidence training. Interviewee A noted that the content was "never enough thus was covered within a short time. In supporting this observation, interviewee D stated that, "if it was adequate, it could not be possible to cover within one or two lessons"

An analysis information obtained from the study show that generally, the content was appropriate for biological evidence management in some critical areas of scientific training. Descriptive data illustrated that content adequately provided for concepts such as securing of crime scene, collecting, preserving, labelling, packaging and transportation of biological evidence. Qualitative data obtained illustrated that content for training in biological evidence management was inadequate thus enabling the work to be covered in a very short time. Maryln and Miller (2017) argued that for efficient crime scene management, there are some factors to be considered such as identified sufficient and appropriate training of CSIs, provision of relevant resources and a conducive working environment free from any source of interference with a strengthened and functioning legal framework to direct and dictate the process of crime scene management. For proper development of capacity in crime scene investigators, the study emphasized that providing an ideal working environment and good remuneration is not a surety until it is matched with a properly trained, professional, and competent investigators.

Inferential analysis illustrated a significant relationship between subject content and scientific training in biological evidence management. Oketch et al. (2012) investigated the influence of actively engaging learners during class activities on their performance among primary school leaners in Kenya. One of the study objectives was to assess the length of time the learners were exposed to a certain content and later compare the difference in performance. The results showed that the level of exposure to the curriculum content led to better performance among the learners.

CONCLUSION

Findings indicated that Content was adequate but there was allocation of few lessons thus inadequate coverage of scientific training content on biological evidence management. In addition, the results from Chi square illustrated a significant relationship between content and scientific training on biological evidence management. It was therefore, concluded that content is significantly related to scientific training on biological evidence management.

RECOMMENDATIONS

i. The study recommended that biological evidence management training content should focus on all critical areas of forensic crime scene investigation.
ii. More lessons should be allocated for biological evidence management training to enable adequate coverage of the diverse content areas and acquisition of skills related to forensic crime scene investigations.

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