Emerging Challenges of Teacher Professional Development in Science, Technology and Mathematics Education in Nigeria

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Abstract
Thestudyinvestigatedemergingchallengesofteacherprofessionaldevelopmentinscience,technologyandmathematicseducation.Tworesearchquestionsguidedthestudy.Thestudyadoptedthedescriptivesurveydesign.Multi-Stagesamplingwasusedtodrawasampleof200teachers.QuestionnairetaggedEmergingChallengesofTeacherProfessionalDevelopment(ECTPD)withoverallreliabilitycoefficientof0.80asdeterminedbyusingcronbachAlpha,wasusedfordatacollection.Arithmeticmeanwasusedtoanalyzethedata.Findingsrevealedtoahighextentthatemergingchallengesofteacherprofessionaldevelopment,include;lackofresources,infrastructures,trainingfacilities,technologyintegrationskills,funding,monitoring,collaborationandnetworking,mentoringandinadequatesupport.Basedonthesefindings,itwasrecommendedamongothersthatgovernment,institutionsandstakeholdersshouldcollaborateandfindsolutionstothesechallenges..

Keywords: Teacher,professionaldevelopment,science,technology,mathematicsandeducation.

Introduction

Theimportanceofscience,technologyandmathematicseducationcannotbeoveremphasizedbecauseitisthebasisofalltechnologicaladvancement.AccordingtoOkeke(2017)scienceisasystematicprocessofobtainingvariableandtestableknowledgeaboutnature.Okekealsodefinedtechnologyasapracticalapplicationofscienceinsolutionofproblemsencounteredintheenvironment.Mathematicseducationisthestudyofhowpeoplelearnandteachmathematicsmeaningfully(https://math.asu.edu).AccordingtoCotic(2024),mathematicseducationmeanstheabilitytousemathematicsinone'sprofessionalwork.ManagersofeducationinNigerianowhavedauntingchallengeofprovidingqualityscience,technologyandmathematicseducationasanecessarytoolforeradicatingignorance,povertydiseaseandinsecuritythroughqualityteacherprofessionaldevelopment.Teachershavevitalroletoplayinthedevelopmentofanation,especiallyinbringingupleadersandintellectualsoftomorrowwhowillsustainnationalreconstruction(Alfa,2018).Teachingandlearningcannotbeeffectivewhenteacherslackappropriateprofessionaldevelopmentandskillstodotheirjob.Thiscanonlybeachievedthroughteacherprofessionaldevelopment.Teacherprofessionaldevelopmentreferstoskillsandknowledgebytheteacherforbothpersonaldevelopmentandcareeradvancement(Gabriel,2019).AccordingtoAbuh(2021),variousteacherdevelopmentalprogrammeshavebeenputinplacetoupdateteachersknowledgeonlearner'sevaluation,methodsofteachingandlearning,studentsdiscipline,classroommanagementanduseofinstructionalmaterialsbybothStateandFederalgovernment,whichareinservicetraining,ICTTraining,seminars,workshopsandinductionprogrammesforteachers.

Despitegovernmenteffortandinvestmentinteacherdevelopmentprogrammes,studentstaughtbytheseteacherscontinuetoperformpoorlyinstandardizedexaminationssuchasWASSECandNECO(ChiefExaminersReports2014-2023).Someeducators,likeAchorandAbuh(2021)blamethisonsomeemergingchallengestoteachers'professionaldevelopmentrangingfromineffectivemanagementoftheprogrammebythoseconcernwhileotherslikeGabriel(2019)andEule(2021)attributeittothepoorattitudeofteacherstoteachingprofession.Hencetheneedtoaddresstheemergingchallengesofteacherprofessionaldevelopmentinscience,technologyandmathematics(STEM)educationinNigeria.

Emergingchallengesofteacherprofessionaldevelopmenteitheratpre-serviceorpost–servicetrainingincludeaccesstoqualitytraining,technologicalintegration,Pedagogicalskills,Limitedfinancialresourcesandinadequatesupport(Oke,2018).Theseemergingchallengesofteacherprofessionaldevelopmenthaveadverseeffectontheteachingandlearningof STEMeducaton.Therefore,itbecomespertinenttoposethequestiontowhatextentdoesemergingchallengesofteacherprofessionaldevelopmentaffectSTEMeducationinSeniorSecondarySchoolsinKogiState,Nigeria.

PurposeoftheStudy

Thepurposeofthisstudyistoinvestigateemergingchallengesofteacherprofessionaldevelopmentinscience,technologyandmathematicseducationatSeniorSecondaryschoolsinKogiState.Specifically,thisstudysoughtto:

1.Identifytheextenttowhichemergingchallengesofteacherprofessionaldevelopment(TPD)affectSTEMeducation

2.Investigateteachers'responsesontheextentofgovernmentcommitmenttoovercomingemergingchallengesofTPDinSTEMeducation

ResearchQuestions

1. TowhatextentdoemergingchallengesofteacherprofessionaldevelopmentaffectedSTEMeducation?
2. Whatistheextentofteachers'responseongovernmentcommitmenttoovercomingemergingchallengestoteacherprofessionaldevelopmentinSTEMeducation?

Methodology

Thestudyadopteddescriptivesurveydesign.ThestudywasconductedinKogiEastEducationZoneinNigeria.KogiStateislocatedtotheNorthcentralregionofNigeria.ItsharesboundarieswithBenue,NasarawaandEnugustatetotheWest,NorthandSouthrespectively.Thezonecomprisesninelocalgovernmentareas.Populationforthestudycomprised5,180teachers.Multistagesamplingwasusedtodrawthesample.Thisresultedto200teachersassamplesize.DatawascollectedusingquestionnaireTaggedEmergingChallengesofTeacherProfessionalDevelopment(ECTPD)withoverallreliabilitycoefficientof0.80,determinedusingCronbachAlphaTechniques.Copiesoftheinstrumentwereadministeredon200sampledSeniorSecondarySchoolteachers.Instrumentsweredulycompleted,returnedandusedforthestudy.Analysiswasdoneusingarithmeticmeantoanswerthetworesearchquestions.Itemswithmeanscoresabove2.5weretakenasagreement(highextent)whilethosewithmeanscoresbelow2.5weretakenasdisagreement(lowextent).

Results

Table1:EmergingChallengesofTeacherProfessionalDevelopment(TPD)STEMEducation.

S/N	Items
1.	ExtentlimitedaccesstoqualityTPDduetolackofresourcesaffectteaching
2.	ExtentLackofsuitableinfrastructuresforqualityTPDaffectteachingandlearning
3.	ExtentLimitedtrainingfacilitiesposechallengestoTPDforeffectiveteaching.
4.	ExtentLackoftrainingontechnologyintegrationintoclassroomlessonthroughseminarsandworkshopsposechallengestoquali
5.	ExtentLackofaccesstotechnologyandnecessaryskillsaffectTPDONteaching
6.	ExtentLackofPDPtoimproveteacherpedagogicalskillstomeettheDLNofstudentsposechallengetoTPD
7.	ExtentLackoffundforPDPhinderimplementationofTPDtraining
8.	ExtentInadequatesupportforPDPhinderimplementationofTPDtraining.,
9.	ExtentLackofmonitoringofPDPforqualityassuranceposechallengetoTPD
10.	ExtentLackofevaluationofPDPposechallengetoteacherprofessionaltraining
11.	ExtentLackofcollaborationandnet-workingopportunitiesamongteachershinderknowledgesharingandpromotionofcontinu
12	ExtentLackofmentoringandcoachingsupportforSTEMteachersinhibitsprofessionalgrowthforeffectiveteaching&learning

KEY:TPD-TeacherprofessionalDevelopment,PDP-ProfessionalDevelopmentProgrammes,DLN-DiverselearningNeeds

Table1showsthatthemeanscoresforitems1-12were3.14,2.98,2.78,2.68,2.56,3.62,3.70,2.72,2.8,2.74,2.96,and2.70respectively.Alltheitem1to12wereagreedtobecausetheirmeanscorewere2.50andabove.

Table2:Teachers'ResponseonExtentofGovernmentCommitmenttoOvercomingEmergingChallengesofTPDinSTEMEducation.

S/N	Items	Mean	Decision
	Towhatextenthasyourschoolprincipalorganizedworkshoponinstructionalmateriall	2.19	Disagree
	Extentyouhavebeeninvolvedinre-trainingexerciseonuseofinstructionalmaterial	2.17	Disagree
	Extenttowhichyouweresupportedfinanciallytocarryoutimprovisation	2.15	Disagree
	Extentknowledgeacquiredfromworkshoponmethodsofteachingenhancedyoursuccessfulteaching	2.91	Agree
	ExtentyouattendedSeminarthroughsponsorshipltolearnpedagogicalskills.	2.17	Disagree
	Yourevaluationskillsislowbecauseyouhavenotbeenexposedtore-training	3.14	Agree
	Extenttowhichyouwereinvolvedincontinuousre-trainingtobemoreeffectiveintheuseofevaluationinclassviaworkshopandseminarisencouraging	2.16	Disagree
	Extenttowhichyouweretrainedoneffectiveclassroommanagementthroughmentoringandcoachingsupportisveryrewarding	2.91	Agree
	Extentcollaborationandnetworkingopportunitiesthroughworkshopandconferenceattendancehavehelpedyouingainingknowledgeandpromotionteachingpractice	2.12	Disagree
22.	Extentacquisitionanduseoftechnologyintegrationskillsthroughsponsorshiptore-trainingworkshopandseminar	2.14	Disagree
23.	Extentyourprofessionhastaughtyoutheuseofdemocraticvirtuesinclassroommanagement	2.96	Agree
24.	ExtentoffundingofPDPforefficientteachertraining	2.20	Disagree
25.	ExtentofevaluationofPDPtoenhanceitseffectivenessinteachingandlearning	2.16	Disagree

Table2revealsthatthemeanscoresforitems13-25were2.19,2.17,2.15,2.91,2.17,3.14,2.16,2.91,2.12,2.14,2.96,2.20and2.16respectively.Items13,14,15,17,19,21,22,24and25werethereforedisagreedtobecausetheirmeanscoreswerebelow2.50.Items16,18,20and23,werehoweveragreedtobecausetheirmeanscoreswereabovethecut-offmeanscoreof2.50.

Discussion

Findingsshowedthatlackofmaterialresources,lackofinfrastructures,limitedtrainingfacilities,lackoftrainingontechnologyintegrationskills,lackofprofessionaldevelopmentprogrammestoimproveteachers'pedagogicalskillstomeetthediverselearningneedsofstudents,lackoffund,lackofmonitoring,lackofcollaborationandnetworkingopportunitiesamongteachers,lackofmentoringandinadequatesupportforprofessionaldevelopmentprogrammestoahighextentposechallengestoteacherprofessionaldevelopmentinSTEMeducation.Thesefindingsdidnotdifferwith Oke(2018)whofoundthatemergingchallengesofteacherprofessionaldevelopmentarelackofresources,infrastructuresandlearningfacilities.Thefindingofthisstudyconcurwith Okeke(2017)whofoundthattechnologicalintegration,lackofpedagogicalskills,limitedfinancialresour

ces,evaluationandmonitoringofprofessionaldevelopmentprogrammestoaveryhighextentposechallengestoteacherprofessionaldevelopment

Findingsrevealedtoalowextentonorganizationoftrainingworkshop,instructionalmaterials'usage,financialsupportforimprovisation,teacher'ssponsorshiptoworkshopsandseminarstolearnpedagogicalandevaluationskillsduetolackoffund,fundingandevaluationoftheprofessionaldevelopmentprogrammes.Alfa(2018)arguedthatteachersinprimaryandsecondaryschoolshavefacedperiodoflittlelightbecausethegovernmenthadnotdonejusticeinprovidingteachersworkableplatformtodeveloptheirpotentials.ThisfindingisinlinewithAbuh(2021)thatvariousprofessionaldevelopmentprogrammeshavebeenputinplacebybothstateandfederalgovernmentbuttheproblemliesinevaluation,funding,monitoringandmanagementoftheprogrammes

Conclusion

Inthisstudy,factorsthatposechallengestoteacherprofessionaldevelopmentforeffectiveteachingandlearningofscienceandtechnology(STEM)educationhavebeenidentified,whicharelackofresources,inadequateinfrastructure,lackoftrainingfacilities,inadequatefunding,lackoftrainingintechnologyintegrationskillsintheclassroomthroughorganizationofworkshopsandseminars.

Recommendations

Basedonthefindings,theresearchersrecommendthefollowing:

1. Government,institutions,andstakeholdershouldcollaboratetofindsolutiontochallengesofteacherprofessionaldevelopmentinNigeria.
2. Workshopsandseminarsorganizedshouldbefullyequippedwithdifferentinstructionalmaterialssothatteachersgetfamiliarwiththemandhowtousetheminclassroom.

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