

ルワンダ共和国
ルワンダ教育委員会

ルワンダ国
学校ベースの現職教員研修の制度化
・ 質の改善支援プロジェクト
プロジェクト業務完了報告書

令和2年1月
(2020年)

独立行政法人
国際協力機構 (JICA)

株式会社パデコ

人間
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略 語

AIMS	African Institute for Mathematical Sciences	アフリカ数理科学研究所
BLF	Building Learning Foundation	(英国援助機関のコンソーシアム)
CBC	Competence Based Curriculum	新カリキュラム
CIES	Comparative and International Education Society	比較国際教育学会
C/P	Counterpart	カウンターパート
CoP	Community of Practice	実践共同体
CPD	Continuous Professional Development	継続的職能開発
DCC	District CPD Committee	郡継続的職能開発委員会
DDE	District Director of Education	郡教育長
DEO	District Education Officer	郡教育官
DETA	Distance Education and Teacher Education in Africa	アフリカ遠隔教育教師教育
DFID	Department for International Development	英国国際開発省
DP	Development Partner	開発パートナー
EDC	Education Development Center Inc.	(米国の非営利団体)
ESSP	Education Sector Strategic Plan	教育セクター戦略計画
GS	Groupe Scolaire	(学校の種類)
ICET	International Council on Education for Teaching	国際教員養成協議会
ICT	Information and Communication Technology	情報通信技術
IEE	Inspire, Educate and Empower	(ルワンダの NGO)
JCC	Joint Coordination Committee	合同調整委員会
JICA	Japan International Cooperation Agency	国際協力機構
NST	National Subject Trainer	国家教科研修講師
NT	National Trainer	国家研修講師
PDM	Project Design Matrix	プロジェクト・デザイン・マトリックス
PLC	Professional Learning Community	プロフェッショナル・ラーニング・コミュニティ
PO	Plan of Operation	活動計画
REB	Rwanda Education Board	ルワンダ教育委員会
RENCP	Rwanda Education NGO Coordination	ルワンダ NGO 調整会議

	Platform	
R/D	Record of Discussion	討議議事録
SBI	School-Based In-service teacher training	学校ベースの現職教員研修
SBCT	Project of Strengthening School-Based Collaborative Teacher Training	教員間の校内相互研鑽強化プロジェクト
SBM	School-Based Mentor	学校メンター
SBMP	School-Based Mentorship Programme	メンタープログラム
SCC	Sector CPD Committee	地区継続的職能開発委員会
SEO	Sector Education Officer	地区教育官
SIQS	Supporting Institutionalizing and Improving Quality of SBI Activity	学校ベースの現職教員研修の制度化・質の改善支援
SMASSE	Project of Strengthening Mathematics and Science in Secondary Education	中等理数科教育強化プロジェクト
SSL	School Subject Leader	学校教科主任
TDM&CGC	Teacher Development and Management & Career Guidance and Counseling Department	教員訓練管理及びキャリアガイダンス・カウンセリング局
TPD-TWG	Teacher Professional Development Technical Working Group	教員職能開発作業部会
UNESCO	United Nations Educational, Scientific and Cultural Organization	国際連合教育科学文化機関
UNICEF	United Nations Children's Fund	国際連合児童基金
UR-CE	University of Rwanda, College of Education	ルワンダ大学教員養成大学
USAID	United States Agency for International Development	米国国際開発庁
VVOB	Flemish Association for Development Cooperation and Technical Assistance	(ベルギーの地方援助機関)
WALS	World Association of Lesson Studies	世界授業研究学会

添付資料

- 添付 1: PDM 初版
- 添付 2: PDM 第 2 版
- 添付 3: 機材リスト
- 添付 4: 詳細活動計画
- 添付 5: 業務フローチャート
- 添付 6: ベースライン調査報告書
- 添付 7: エンドライン調査報告書
- 添付 8: 第 3 年次 CBC 研修ユーザーガイド
- 添付 9: DCC オリエンテーション及び問題分析ワークショップマニュアル
- 添付 10: DCC/SCC コンセプトノート改訂版
- 添付 11: 地区及び学校レベル CPD ガイドライン
- 添付 12: 授業研究実践ガイド
- 添付 13: DCC/SCC 四半期モニタリングレポート (2019 年第 1 四半期)
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- 添付 20: 第 4 回 JCC 議事録
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- 添付 22: ICET 2017 学会発表資料
- 添付 23: DETA 2017 学会発表資料
- 添付 24: WALs 2017 学会発表資料
- 添付 25: WALs 2018 学会発表資料
- 添付 26: CIES 2019 学会発表資料
- 添付 27: ICET 2019 学会発表資料
- 添付 28: WALs 2019 学会発表資料

第1章 プロジェクトの概要

1.1 プロジェクトの背景

ルワンダ政府は2020年までに中所得国になることを目指しており、教育システムのすべての段階における科学技術教育を推進している（Rwanda Vision 2020）。政府は過去10年の間に、2つの大きな教育改革を断行した。1つ目は2009年に実施された教授言語のフランス語から英語への変更であり、これにより現職教員の研修が必要となった。

かかる状況下、教育省は現職教員の能力向上を主要な優先課題と位置づけ、ルワンダ教育委員会（Rwanda Education Board: 以下「REB」）を通じて、2008年から2011年にわたり、国際協力機構（Japan International Cooperation Agency: 以下「JICA」）の協力の下、中等理数科教育強化プロジェクト（Project of Strengthening Mathematics and Science in Secondary Education: 以下「SMASSE」）を実施した。SMASSEは中等学校における理数科の授業改善を目指したもので、研修を受けた教師の教授能力が大きく改善し、プロジェクト目標が達成された。しかし、研修受講者が研修で学んだ知識やスキルは同僚教師には十分に共有されなかったことから、学校レベルで校内研修（School-Based In-service teacher training: 以下「SBI」）を促進し、前期中等教育レベルの教育の質を向上させることを目的として、2013年から2015年に教員間の校内相互研鑽強化プロジェクト（Project of Strengthening School-based Collaborative Teacher Training: 以下「SBCT」）が実施された。SBCTでは、レポートを提出した19郡の前期中等レベルの学校の98.8%でSBIが実施されたことが報告されている。

2つ目の主要な教育改革は2016年に就学前から高校レベルで実施された新カリキュラム（Competence-Based Curriculum: 以下「CBC」）の導入である。この改革により、教育業界は、前述の国家的な展望と足並みを揃え、学校で習得する知識・スキル・態度・価値観によって、21世紀の課題に対応していく人材を育成すべく、大きな方針転換を求められることとなった。CBCにおいては、教師には新しい教授方法を身につけるため、多大な努力が求められる。他方で、SBCTプロジェクトでは、1) SBIが十分に制度化されなかったこと、2) SBIの質が十分ではないこと、3) SBIのモニタリングシステムが十分に機能していなかったことが課題とされた。これらの状況に対処するため、REBとJICAは2017年1月から2019年12月の3年間にわたり、学校ベースの現職教員研修の制度化・質の改善支援プロジェクト（Project for Supporting Institutionalizing and Improving Quality of SBI: 以下「SIQS」）が実施されることとなった。SIQSプロジェクトは、1) 教師のCBCに関する知識やスキルを向上させること、及び2) 学校、地区、郡、国レベルで継続的職能開発（Continuous Professional Development: 以下「CPD」）に関する一貫したメカニズムを構築することを目的として実施された。

1.2 PDMの改訂

2016年10月にプロジェクト実施のために討議議事録（Record of Discussion: 以下「R/D」）とともにプロジェクト・デザイン・マトリックス（Project Design Matrix: 以下「PDM」）が策定された。しかし、プロジェクト開始以降、カウンターパート（Counterpart: 以下

「C/P」)の業務計画に従いプロジェクトの活動が明確化され、さらに他の開発パートナー (Development Partner: 以下「DP」)の活動との関連や連携を踏まえて、プロジェクトを取り巻く環境がPDM策定当初と異なってきた。そのため、指標や活動をより明確に規定するために、PDMを改訂することとなった。2019年1月に開催された第4回合同調整委員会 (Joint Coordination Committee: 以下「JCC」)で提出した業務計画及びPDM改訂案に基づき、活動計画 (Plan of Operation: PO)を修正した。PDM初版及び改訂版PDM (第2版)はそれぞれ添付1、添付2のとおりである。

1.3 プロジェクトの概要

PDM第2版で規定されたプロジェクトの枠組の概略を表1-1に示す。

表 1-1: プロジェクトの枠組

プロジェクト名	ルワンダ国学校ベースの現職教員研修の制度化・質の改善支援プロジェクト
実施機関	2017年1月～2019年12月 (3年間)
上位目標	生徒の学習プロセスが改善される。
プロジェクト目標	SBI ¹ 活動を通して教室におけるCBCに基づいた授業の実施が強化される。
期待される成果	成果1: SBI活動を通して教室におけるCBCに基づいた授業の実施が強化される。 成果2: 教員によるCBCの授業実践への理解が高まる。
活動	0-1 ベースライン調査 0-2 エンドライン調査 1-1 CBCに基づく授業の教員向けガイドライン (授業計画マニュアル、ヒント等を含む)を開発する。 1-2 教員向けのCBCに基づく授業サンプルを作成する (例: ビデオ動画)。 1-3 CBCに基づく授業において生徒の学びを評価する教員向けのガイドラインを開発する。 1-4 CBCに基づく授業実践に関するカスケード型ワークショップを行う。 1-5 CBCに基づく授業の好事例をつくるため、モデル学校を支援する。 1-5.1 CBCに基づく授業の好事例をつくり全国に共有するため、モデル学校で授業研究を支援する。 1-5.2 授業研究において、児童・生徒の学び (学力)を測定する。 2-1 郡継続的職能開発委員会 (District Continuous Professional Development Committee: DCC)の機能化に関する郡教育官 (District Education Officer: DEO)向けの実践マニュアルを開発する。 2-2 DCCの重要性に関する意識を向上させ、その役割への理解を高める (活動例: ワークショップ)。 2-2.1 DCCの重要性に関する意識を向上させ、その役割への理解を高めるため、ワークショップを開催する。

¹ C/P 及び DP において、本プロジェクト期間に CPD という包括的な用語を使用する認識が共有されたため、SBIはCPDに統合された。本報告書では、PDM等で使用されている場合を除き、SBIをCPDに読み替えて記載する。

	<p>2-2.2 DCC によるモデル校の好事例共有イベント（Open day など）開催企画を支援する。</p> <p>2-3 教員向け CPD 実践マニュアルを開発する（手順書を含む）。</p> <p>2-4 CBC に基づく授業の観察に関する校長、地区教育官（Sector Education Officer: SEO）、DEO 向けのガイドラインを開発する。</p> <p>2-5 既存のものを踏まえ、簡易調査を行うことで、校長、SEO、DEO が使用するモニタリングフォームをデザインする（電子版を含む、簡素で使いやすいもの）。</p> <p>2-6 データを収集・分析し、解決策を講じる能力を高める研修を、JICA 専門家がルワンダ教育委員会（Rwanda Education Board: REB）に対して行う。</p> <p>2-6.1 CBC 研修のニーズ調査において、REB がデータを収集・分析し、解決策を講じる能力を高める技術支援を行う。</p> <p>2-7 CBC に基づく授業を評価する能力を高める研修を、受注者が REB のメンバーと国家教科研修講師²（National Subject Trainer: NST）、ルワンダ大学教員養成大学（University of Rwanda, College of Education: UR-CE）の教員に行う。</p> <p>2-8 CBC に基づく授業を評価する能力、データを収集・分析して解決策を講じる能力を高める研修を、校長、SEO、DEO に対して行う。</p> <p>2-9 CBC および CPD 実践に関するモニタリングを行う（Email での調査、技術的な助言の提供を含む）。</p> <p>2-9.1 CBC および CPD 実践に関する DCC の活動の学期モニタリングを行い、量的データを収集する。</p> <p>2-9.2 DCC の活動の四半期現地モニタリングを行い、質的データを収集する。</p> <p>2-10 REB に提出された報告書で認識された課題に向け、対策を講じる教材を開発する。</p> <p>2-10.1 モニタリング結果の分析報告書を作成する（好事例集を含む）。</p> <p>2-11 上記の教材をもとに、REB 及び国家教科研修講師に対して研修を行う。</p> <p>2-11.1 DCC 全国大会を開催し、モニタリングシステムの向上について啓発する。</p>
対象地域	<p>キガリ（REB）及び全国の初中等学校</p> <p>モデル校：EP Buhande, GS Kabuye Catholique, GS Mukarange Catholique, GS APAGIE Musha, GS St Aloys Rwamagana, Lycée Notre Dame des Apôtres Rwaza（86 教員）</p>
ターゲットグループ	<p>全教科の教員。初等教員 44,544 人、中等教員 30,040 人（ただし、教科内容への支援は理数科に限る）</p>
C/P	<p>REB 教員訓練管理及びキャリアガイダンス・カウンセリング局（Teacher Development and Management & Career Guidance and Counseling Department: 以下「TDM&CGC」）</p>

² 国家教科研修講師は本プロジェクト実施期間においては、国家研修講師（National Trainer）に改名されており、英文版 PDM では National Trainer に統一している。本報告書では「国家研修講師」を用いる。

第2章 投入実績

2.1 投入の概要

投入実績の概要は表 2-1 に示すとおりである。機材リストは添付 3 に示す。

表 2-1 : 投入実績の概要

投入	
日本側	専門家 計 8 名 (36.10 MM) 総括/教授法、副総括/地方教育行政、数学教育、数学教育 2、理科教育、教育評価、問題解決能力向上、モニタリング/業務調整
	携行機材: 1,330,317 円 パソコン (3 台)、複合機 (1 台)、モバイルプロジェクター (1 台)、アクションカメラ (1 台)
ルワンダ側	カウンターパート
	プロジェクトに関連するデータ
	オフィス、光熱費、通信費等

注: 「地方教育行政」と「数学教育」でそれぞれ 2 名の専門家が従事した。

C/P は REB の組織改編や人事異動に伴い、表 2-2 のとおり入れ替わった。

表 2-2 : カウンターパート

プロジェクトにおける役割	役職	プロジェクト開始時	プロジェクト終了時
Project Director	総裁	Mr. GASANA I Janvier	Dr. NDAYAMBAJE Irénée
Project Manager	TDM&CGC 局長	Mr. NZITABAKUZE Claudien	Mr. NGOGA James
C/P	教員研修課長	Mr. MUTSINZI Antoine (代理)	Mr. MURASIRA Gerard
	オフィサー	Mr. MUTSINZI Antoine	Ms. NSHIMIRIMANA Nadine
		Ms. MUKAKIMENYI Ruth	Ms. KABATESI Emerthe
		Ms. UMURERWA Harriet	Ms. NABAKUJIJE Marie Florence
			Mr. HABİYAKARE Poponi
		Mr. NDAYISHIMIYE Diacre Alain	

2.2 要員配置

日本人専門家の要員配置の実績を図 2-1 に示す。

2.3 ローカルスタッフ

雇用スタッフ一覧を表 2-3 に示す。本プロジェクトでは、プログラムオフィサー及び秘書兼経理担当の 2 名の常勤スタッフを通期雇用した（2019 年は定常的なモデル校指導を行うため、授業研究指導員 1 名を常勤で雇用）。必要に応じ、教育アドバイザー、調査補助員等を非常勤または臨時で雇用した。

表 2-3 : ローカルスタッフ一覧

担当	氏名	従事期間	備考
プログラム オフィサー	Ms. Berthine GIKUNDIRO	2017/1/10～2018/1/31	
	Ms. Clarisse DUSABIMANA	2018/ 2/6～2019/10/18	
授業研究指導員 1	Mr. Hashituky HABİYAREMYE	2017/5/15～2019/12/20	2017/18 非常勤 2019 常勤
授業研究指導員 2	Mr. Kizito NDIHOKUBWAYO	2017/5/15～2019/12/20	非常勤
教育アドバイザー	Mr. Antoine MUTSINZI	2019/1/25～2019/12/13	非常勤
秘書/経理	Ms. Anathalie NIYIDUKUNDA	2017/2/1～2019/12/31	
調査補助員	Mr. Hashituky HABİYAREMYE Mr. Kizito NDIHOKUBWAYO	2017/3/8～2017/4/13	臨時雇用
	Mr. Augustin NDAYISEYE Mr. Pascal RWAYITARE Mr. Sharif NIZEYIMANA	2019/6/19～2019/8/16	臨時雇用
データ入力管理	Mr. Jean Claude RUKUNDO	2019/2/23～2019/3/1	臨時雇用
WEB 質問紙開発	Mr. Serge RUGIRA	2019/2/23	臨時雇用
データ入力補助	Mr. Aimable MUVUNYI Mr. Alexis NGABONZIZA Mr. Eric AKIMANA Ms. Angelique BAGWIRE UWERA Ms. Beny Grace BIMENYIMANA Mr. Robert HABIMANA Ms. Giselle HATANGIMANA Mr. Fidele IRAGUHA Ms. Suzanne MUKAMAJORO Mr. Jean Boris MUTABARUKA Mr. Jules RUTABINGWA Mr. Arsene SHEMA Mr. Maxime SHEMA Ms. Eurempie TWIZEYIMANA Mr. Faustin UKUNDIMANA Ms. Christine UWIMANA	2019/2/24～2019/3/1	臨時雇用
ビデオ 文字起こし	Mr. Lambert RUKUNDO Mr. Pascal RWAYITARE Mr. Sharif NIZEYIMANA	2019/6/11～2019/8/16	臨時雇用

第3章 活動実績

3.1 活動実績の概要

本プロジェクトの活動は、以下の4つのコンポーネントに大別される。

1. ベースライン・エンドライン調査など効果測定に関連する調査活動
2. 成果1 関連：SBI 活動を通じた教室における CBC 授業の実施強化にかかる活動
3. 成果2 関連：教員による CBC の授業実践への理解を高める活動
4. その他：JCC の開催などプロジェクトマネジメント全般にかかる活動

これら活動を詳細活動計画（添付4）及び業務フローチャート（添付5）に基づき実施した。プロジェクト期間中の活動の概要を以下に述べる。

3.2 調査関連活動

3.2.1 ベースライン調査

活動開始時のルワンダの授業の現状を把握し、また活動の阻害要因となりうる課題を特定するほか、プロジェクトの活動進捗をモニタリングするためのベンチマークとなるベースライン値を収集するため、2017年3月から6月にかけてベースライン調査を実施した。7郡の郡教育長（District Director of Education: 以下「DDE」）の助言に従い、2017年3月8日～17日、及び4月24日、26日に20校を訪問し、授業観察（原則1校1授業）、校長・教師への質問紙調査及びインタビューを行った。並行して REB から卒業試験結果を収集し、教師の CPD に対する認識と児童・生徒の学力の相関関係を調査した。これらデータを参考に、ベースライン調査において介入効果を測定する学校を選別し、6月16日、23日にプロジェクトが作成した数学、理科の学力テスト³、を小4、中1、高1の学年に在籍する児童・生徒に実施した。ベースライン調査結果は、添付6のとおり、ベースライン調査報告書として取りまとめられた。

参考：ルワンダの学校種別

ルワンダの基礎教育は、もともと初等学校（Primary School: 6年間）と中等学校（Secondary School: 6年間）からなっていたが、2008年に9年間、2012年に全12年間が無償化され、就学者が急増した。中等学校は広域から進学者を受け入れる必要があったことから原則寄宿制であり、定員をすぐには増やすことができない。そこで政府は初等学校を拡充し、通学制の小中一貫校、小中高一貫校を増やすことで対応している。これら学校は中等学校に対し基礎教育学校と呼ばれている。表3-1、表3-2においては、初等学校を「小」、基礎教育学校を「小中」及び「小中高」、中等学校を「中高」と示すこととした。通例、小学校及び中学校卒業試験の成績優秀者は中等学校に進学し、それ以外は基礎教育学校に進むため、基礎教育学校と中等学校では、授業の様相、成績分布が大きく異なることに注意が必要である。

³ のちにモデル校となる GS Mukarange 及び GS Notre Dame des Apôtres Rwaza 並びに 2019 年のエンドライン調査時に統制群として設定された学校では、実験群と統制群を比較するため、学力テストを 2019 年 2 月に実施した。実験群及び統制群のいずれにも属さない学校では学力テストを実施していない。

表 3-1 : ベースライン調査における授業観察、授業案、学力テストのサンプル数

郡	学校	学校種別	調査内容	小学校		中学校		高校	
				算数	理科	数学	理科	数学	理科
Musanze	CS Muhe *	小	授業	小 5					
	GS Muhoza I *	小中高	授業		小 5				
	GS Notre Dame des Apôtres Rwaza	中高(女子)	授業						高 3(化)
Rulindo	EP Buhande	小	授業	小 5					
			テスト	21	21				
	GS Kinihira *	小中高	授業	小 1					
	Lycée Notre Dame de laVisitation	中高(女子)	授業				中 2(化)		
Karongi	EP Rubengera I *	小	授業	小 4					
			テスト						
	GS Bubazi	小中	授業				中 2(化)		
Nyabihu	EP Bukinanyana ADEPR	小	授業	小 4					
			テスト	56	53				
	GS St Raphael Rambura *	小中高	授業				中 2		
	GS Rambura Garçon	中高	授業						高 3(生)
Muhanga	EP Remera *	小	授業		小 4				
	GS Munyinya *	小中高	授業				中 1		
Rwamagana	EP Runyinya *	小	授業	小 5					
	GS APAGIE Musha	中高	授業				S2(物)		
			テスト			64	53	45	52
GS St Aloys Rwamagana**	中高	授業							
Gasabo	EP Gasabo	小	授業		小 4				
			テスト	143	170				
	GS Gihogwe Catholique ***	小中高	授業				中 2(生)	高 2	
			テスト	63	66	161	68	24	—
Kayanza	GS Mukarange Catholique **	小中高	テスト	36	36	98	154	80	34
合計	観察(撮影)した授業数			6	3	2	5	1	2
	収集した授業案の数****			6	1	1	5	1	2
	学力テスト受験者数			354	382	596	566	438	302

* 授業観察のみ実施した。

** テストのみ実施した。ただし GS Kabuye Catholique は中学校のテストは実施していない。

*** 小中高一貫校だが、高校は理系専攻が存在しないため、高校の授業観察、テストとも実施していない。

**** GS Muhoza 小 5 算数、EP Gasabo 小 4 理科、GS Munyinya 中 1 数学の授業案は作成されていなかった。

表 3-2 : ベースライン調査における質問紙調査及びインタビューのサンプル数

学校	学校種別	質問紙調査 (教師)	フォーカスグループ インタビュー (教師)	質問紙/ インタビュー (校長)
CS Muhe	小	7	3	1
GS Muhoza I	小中高	6	6	1
GS Notre Dame des Apôtres Rwaza	中高	12	1	1
EP Buhande	小	9	7	1
GS Kinihira	小中高	9	9	1
Lycée Notre Dame de la Visitation	中高	6	6	1
EP Rubengera I	小	9	9	1
GS Bubazi	小中	8	8	1
GS Nyarubuye	小中高	7	7	1
EP Bukinanyana ADEPR	小	4	4	1
GS St Raphael Rambura	小中高	8	8	1
GS Rambura Garçon	中高	10	10	1
EP Remera	小	15	15	1
GS Munyinya	小中高	15	15	1
EP Runyinya	小	5	5	1
GS APAGIE Musha	中高	4	5	1
GS St Aloys Rwamagana	中高	12	0	1
EP Gasabo	小	12	12	1
GS Kabuye Catholique	小中	11	0	1
GS Gihogwe Catholique	小中高	9	9	1
	合計	178	139	20

3.2.2 エンドライン調査

モデル校での授業研究や CPD 実施体制の支援に重点を置いて、プロジェクトの活動が CBC における指導や学びにどのような変化や成果をもたらしたか評価するため、2019 年 6 月～9 月にエンドライン調査を実施した。モデル校を実験群とする実験計画を検討し、実験群と統制群（非介入の学校）の間で授業観察、授業案、校長・教師の質問紙調査やインタビューへの回答、学力テストの結果などの比較を行った。さらに、郡継続的職能開発委員会（District CPD Committee: 以下「DCC」）や地区継続的職能開発委員会（Sector CPD Committee: 以下「SCC」）に対するインタビューも行った。授業観察、授業案、学力テストのサンプルサイズを表 3-3 に、学校における質問紙調査とインタビューのサンプルサイズを表 3-4 に、DCC 及び SCC に対するインタビューのサンプルサイズを表 3-5 に示す。調査結果はエンドライン調査レポートとして取りまとめられた（添付 7 参照）。

表 3-3 : エンドライン調査における授業観察、授業案、学カテストのサンプル数

グループ	学校	学校種別	調査内容	小学校		中学校		高校		
				算数	理科	数学	理科	数学	理科	
実験群	EP Buhande	小	授業	小 5	小 5					
			テスト	36	40					
	GS Kabuye Catholique	小中	授業	小 5	小 5	N/A*	中 2(生)			
			テスト	128	137	41	25			
	GS Mukarange Catholique	小中高	授業	小 5	小 5	S2	中 2(生)	高 3	高 2(物)	
			テスト	39	42	45	45	57	14	
	GS St Aloys Rwamagana	中高	授業			中 2	中 3(生)	高 2	高 2(化)	
			テスト			56	69	100	64	
	GS APAGIE Musha	中高	授業			中 2	中 2(生)	高 3	高 2(化)	
			テスト			47	48	54	37	
	GS Notre Dame des Apôtres Rwaza	中高(女子)	授業			中 2	中 2(生)	高 2	高 2(化)	
			テスト			35	38	39	77	
統制群	EP Bukinanyana ADEPR	小	授業	小 5	小 5					
			テスト	61	69					
	GS Bubazi	小中	授業	小 5	小 5	中 2	中 2(化)			
			テスト	48	44	45	48			
	GS Gihogwe Catholique	小中高	授業	小 5	小 5	中 2	中 2(生)	N/A **	N/A **	
			テスト	137	140	78	73	N/A **	N/A **	
	GS Rambura Garçon***	中高	授業			中 2	中 2(生)	高 3	高 2(化)	
			テスト			43	44	87	34	
	Lycée Notre Dame de la Visitation****	中高(女子)	授業			中 2	中 2(生)	高 3	高 2(物)	
			テスト			22	21	19	20	
	合計	観察(撮影)した授業数			6	6	8	9	6	6
		収集した授業案の数			6	6	6	9	5	5
学カテスト受験者数			449	472	412	411	356	246		

* 時間割の都合で中学数学授業は観察できなかった。

** 小中高一貫校だが、高校の理系専攻が存在しないため、高校では授業観察、学カテストとも実施していない。

*** 中 2 数学、高 3 数学、高 2 化学の授業案は収集できなかった。

**** 中 2 数学の授業案は作成されていなかった。

表 3-4 : エンドライン調査における学校での質問紙調査及びインタビューのサンプル数

学校	質問紙調査 (教師)	フォーカスグループインタビュー (教師)	質問紙/インタビュー (校長)
EP Buhande	9	9	1
GS Kabuye Catholique	12	13	1
GS Mukarange Catholique	14	11	1
GS APAGIE Musha	8	9	1
GS St Aloys Rwamagana	8	8	1
GS Notre Dame des Apôtres Rwaza	4	3	1
EP Bukinanyana ADEPR	5	6	1
GS Gihogwe Catholique	16	12	1
GS Bubazi	6	5	1
Lycée Notre Dame de la Visitation	5	4	1
GS Rambura Garçon	14	14	1
合計	101	94	11

表 3-5 : エンドライン調査における DCC 及び SCC に関するインタビューのサンプル数

DCC	インタビュー (DDE)	SCC	インタビュー (SEO)
Rwamagana	1	Musha	1
		Kigabiro	1
Gasabo	-	Gatsata	1
Nyabihu	1	Jenda	1
		Rambura	1
Musanze	-	Remera	1
Rulindo	-	Bushoki	1
Kayonza	1	Mukarange	1
Karongi	1	Rubengera	1
合計	4	合計	9

3.3 成果 1 関連活動の実績

3.3.1 第 3 年次 CBC 研修の教材開発

活動 1-1 : CBC に基づく授業の教員向けガイドライン（授業計画マニュアル、ヒント等を含む）を開発する。

活動 1-2 : 教員向けの CBC に基づく授業サンプルを作成する（例：ビデオ動画）。

活動 1-3 : CBC に基づく授業において生徒の学びを評価する教員向けのガイドラインを開発する。

2017 年 9 月 17 日～24 日に第 3 年次 CBC 研修の教材開発ワークショップが援助協調の枠組のもと開催された。国際連合児童基金（United Nations Children's Fund: 以下「UNICEF」）など、他の DP と連携し、視聴覚教材の形式で CBC に基づく授業の教員向けガイドライン開発を支援した。

本プロジェクトでは、第 3 年次 CBC 研修で、参加教師に期待される CBC 授業の具体像を映像で示すことになっていた。そこでプロジェクトでは教材開発ワークショップに先立ち、2017 年 2 学期にモデル校において授業研究を行い、モデル授業の開発、授業ビデオの編集を行っていた（活動 1-2）。プロジェクトでは理数科のみを対象とした授業開発を行っていたが、CBC 研修は理数科以外の教科を含む全教員が対象であるため、事前に他の DP と協議し、他教科でのモデルとなる授業ビデオも収集した。プロジェクト開始前からの従前の計画で、第 3 年次 CBC 研修のテーマが「アセスメント」とであることが決まっていた。一方、本プロジェクトのベースライン調査から、CBC が導入されても引き続き教師は、「はい/いいえ」で回答できる簡単な質問や、覚えていることを確認・暗唱させるような問いかけを授業内で多用し、児童・生徒の思考を十分に評価できていないことが確認されていた。そこで本ワークショップでは、「発問」の指導を通じてアセスメント（形成的評価）の強化を目指すことを基本方針とすることを C/P と合意し、他 DP のコンサルタントらと協力して、ワークショップ用の教材を準備した。ワークショップでは日本人専門家が中心となり、参加者（国家研修講師候補者）にベースライン調査の結果を説明し、プロジェクトが開発したり他の DP から収集したりしたビデオを見ながら、授業の課題を具体的

に示すことができる映像を特定した。その上で、CBC 研修教材のプロトタイプを開発した。またこれらの活動を通じて、生徒の学びを評価する教員向けのガイドラインを示し（活動 1-3）、教材に取り入れた。

なお CBC 研修は教員向け研修と地方教育行政官向け研修（活動 2-8）が一体的に実施されることになっており、CPD や授業観察など教員の研鑽に関する共通項目も本教材の開発項目である。教員向け CPD 実践マニュアル（活動 2-3）及び CBC に基づく授業の観察に関するガイドライン（活動 2-4）も合わせて作成され、本教材に組み込まれている。

3.3.2 第 3 年次 CBC 研修の設計、準備と実施

活動 1-4：CBC に基づく授業実践に関するカスケード型ワークショップを行う。

活動 2-7：CBC に基づく授業を評価する能力を高める研修を、受注者が REB のメンバーと国家教科研修講師、ルワンダ大学教員養成大学の教員に行う。

(1) 第 3 年次 CBC 研修の設計と準備

第 3 年次 CBC 研修（カスケード型ワークショップ）が実施できるよう C/P を支援して、研修計画（日程、対象人数の計算、予算の積算）を策定し、コンセプトノートの決裁を取り付けた。上述のとおり、ベースライン調査やモデル授業の開発を通じて、CBC 授業の課題が具体化され、発問を主題とすることが確認されており、それに合わせたコンセプトノートが作成できるよう C/P を指導した。C/P は REB の幹部及び DP に研修企画案を説明し、研修内容及び予算承認を取り付け、参加者に通達した。

(2) 国家研修講師候補者向け研修の実施

2017 年 11 月 2 日～7 日に、学校や教師教育関係機関から招集された 141 名の国家研修講師候補者を対象として CBC 研修が実施され、日本人専門家は視聴覚教材のプロトタイプを使用して、参加者を指導した。CBC 研修では授業改善のための実践的なテクニックを具体的に見せる必要があり、また講師ごとの説明の揺らぎを減らすため、ナレーション付きの視聴覚（DVD）教材が作成された。このような新しい媒体の研修教材を使うことのデメリットも懸念されたが、参加者の多くは教材作成ワークショップから参加しており、すでに最終版のイメージを共有していたことから、円滑に教材に習熟することができた。教材の最終化に必要なフィードバックを得て、本プロジェクトが主体となり、開発業者と協議の上教材を最終化した。開発途中での成果品チェック、最終成果品の検収などの支援も行った。開発した視聴覚教材を DVD として別添し、視聴覚教材の使用法を説明したユーザーガイドを添付 8 に示す。

同時に研修の事前・事後テストの作成、国家研修講師の選抜を支援した。テスト結果について C/P と協議し、事後テストの成績上位 100 名が国家研修講師として REB から正式に任命された。C/P はこのプロセスを通じて、講師の選抜方法やテスト結果の分析、評価方法についての知見を深めた。

(3) 地区レベル研修講師研修の実施

2018年1月10日～17日に10箇所の研修会場で地区レベル研修講師を対象とした第3年次CBC研修が実施された。任命された100名の国家研修講師が各会場に均等に配置され、視聴覚教材を含む研修教材を用いて研修を進めた。C/Pも各会場に配置され、参加者の出欠、食事の手配、講師との打ち合わせや反省会、経費の支払いなど、責任者として研修管理を行った。遅刻や幼児を連れての参加、体調を崩した参加者への対応など、期間中には様々な問題が生じたが、日報やWhatsAppを使って各会場の情報を共有し、問題の迅速な解決を図った。最終的には4,160名の参加予定者のうち、3,835名(92.2%)が研修に参加し、3,785名(91.0%)が事後テストを受験した。日本人専門家は各会場を巡回し、C/Pや講師へのアドバイスをするとともに、研修の事前・事後テストを作成し、地区レベル研修講師の評価実施を支援した。事後テストでは成績が向上したことが確認された。

地区レベル研修講師は、別途行われる地方教育行政官向け研修(活動2-8)を受けた地区教育官(Sector Education Officer:以下「SEO」)⁴と協力して地区レベル研修(カスケード最下層)を実施した。2018年6月のモニタリングにおいて、全416地区中312地区から回答があり、うち269地区(86%)から地区レベル研修を実施したとの回答を得た。

3.3.3 モデル校支援

活動1-5: CBCに基づく授業の好事例をつくるため、モデル学校を支援する。

1-5-1: CBCに基づく授業の好事例をつくり全国に共有するため、モデル学校で授業研究を支援する。

1-5-2: 授業研究において、児童・生徒の学び(学力)を測定する。

(1) モデル校での授業研究実施の背景

ベースライン調査の結果や郡からの推薦に基づいて選定したモデル校⁵において、3年間にわたり理数科の授業研究を支援した。授業研究を採用した理由は1つではなく、以下のような状況があり、総合的に判断した。

- C/PがSMASSEの活動や日本留学中に授業研究の経験を有していた(そのため、日本による支援として授業研究が採用されたのは自然な流れであった)。
- プロジェクト目標として生徒の「表面的な行動の変化」、上位目標として「本質的な学びに寄与する生徒の活動、思考の動き、授業への参加活動が行われている」ことが目指された(特記仕様書「6.(7)指標に関する留意点」参照)。特に本質的な学びの変化を生み出すためには、より深い教材研究や授業案の検討、個々の生徒の学びの支援や評価など包括的対応が必要であり、授業研究が適していると考えた。
- 小中高の理数科のモデル授業(10授業)を短期間かつ最低限の予算で、効率的に開発するためには、授業研究のような型を用いて同時並行的に進める必要があった。

⁴ SEOは2019年1月の閣議によりSector Education Inspector(SEI)に改められたが本報告書では「SEO」で統一する。

⁵ Lycée Notre Dame de la Visitationは初年度に一度パイロットしたが、継続できずモデル校から除外した。

- ルワンダでは JICA は小学校の授業改善の経験がなく、CBC に基づく授業への対応も今フェーズが初めてであった。このように、過去の支援の蓄積がないため、日本人専門家も現状を研究しながら進める必要があった。
- プロジェクト2年目以降は全国規模のCBC研修が予定されておらず、モデル校での授業改善活動を支援する計画であったことから、教師の校務の中で、最小限の予算で継続的に実施できるモデルとしては授業研究が適切であろうと考えた。
- プロジェクトが構築を目指した国全体の「Problem Solving Cycle」の基礎となる学校レベルでのCPD改善サイクルを生み出す際に、授業研究のプロセスは良い具体例であった。
- 6章に後述するとおり、授業研究は教師の効果的な職能開発の要素を網羅している。

プロジェクトの中では、CBCモデル授業開発支援や、評価方法の開発・指導などが成果1・2関連活動に分散しているが、これらを授業研究のプロセスに沿って一体的に活動を進めることで効率的なプロジェクト運営が期待できた。授業研究は効果的なCPDモデルの1つとして他のDPからも関心が高く、結果として3.5.2で後述のとおり、授業研究実施方法に関するコンテンツを融通するなどの連携が生まれた。また授業研究がテーマのJICAの課題別研修にC/Pが参加する機会を得たなどの相乗効果もあった。

(2) 授業研究の概要

モデル校の基本情報と授業研究活動の概要をそれぞれ表3-6、表3-7に示す。理数科を教える合計86名の教師が授業研究に継続的に参加した。

表 3-6 : モデル校における授業研究一覧

学校	学校種別	支援開始年	授業研究支援			
			2017年 2学期	2018年 2学期	2019年 1学期	2019年 2学期
EP Buhande	小	2017	✓	✓	✓	✓
GS Kabuye Catholique	小中	2013	✓		✓	
GS Mukarange Catholique	小中高	2018		✓	✓	✓
GS APAGIE Musha	中高	2017	✓	✓	✓	✓
GS St Aloys Rwamagana	中高	2013	✓		✓	
GS Notre Dame des Apôtres Rwaza	中高(女子)	2018		✓	✓	✓

モデル校では、課題の特定から授業の実施、授業検討会に至るまで、一連のプロセスを包括的に指導したが、授業の変化を図る指標の1つとして教師の発問(Open question)に着目した。プロジェクト目標及び上位目標の指標としてそれぞれ生徒の行動の表面的な変化と本質的な学びの変化を達成することが求められていたが、ベースライン調査時点で、グループワークの実施など、すでに生徒の活動に表面的な変化は見てとれた。しかし、その内容は覚えた知識の確認に留まっており、教師の発問がほぼClosed questionで占められていることから、生徒の本質的な学びに結びついていないことが明らかとなった。

他方で、すでに第3年次 CBC 研修のテーマが「アセスメント」に決定しており、C/P との具体的な研修内容の検討過程で、ベースライン調査結果を踏まえて、生徒の概念理解、推論や考察の確かさを確認するための発問・評価設問を作成する演習を中心に据えることとした。

表 3-7 : 活動の概要

段階	概要
第1段階： 課題特定	数学・理科の授業研究グループを組成し、メンバーである教師が直面している課題やその原因、解決策について議論する。その後、授業研究で対処する課題と単元について合意する。
第2段階： 授業案作成	授業案のフォーマットを使い、授業研究グループとして第1段階で選んだ単元の授業案を作成する。
第3段階： マイクロ ティーチング	各グループの教師1名が、生徒役を演じる同僚教師の前で授業案に基づいて授業を練習する。練習後、うまく行ったこと、改善が必要なことについて話し合う。
事前テスト	各授業研究グループの単元に関するテストをプロジェクトが作成し、事後テストと比較するため、研究授業の前に生徒に対して実施する。
第4段階： 研究授業	マイクロティーチングと同じ教師が実際の教室で授業案に従って授業を行い、同僚教師はそれを観察する。
事後テスト	研究授業の約2週間後に、プロジェクトが作成したテストを生徒に対して実施する。
第5段階： 授業検討会	授業後に、さらなる改善が必要な点などを議論し、授業案に反映させる。

このように、ベースライン調査からの授業の変化を評価する指標として、また第3年次 CBC 研修のテーマに即した授業改善として、モデル校の授業研究で発問の改善に取り組んだ⁶。2017年の授業研究の研究授業は、3.3.1で前述のとおり、撮影編集され、CBC研修の視聴覚教材に使用された。また、様々な報告書で指摘されているCBCの課題に対処するため、2019年1学期の授業研究で開発した授業のうち、3授業がモデル授業サンプルとしてREBのeラーニングプラットフォームに掲載された（活動2-10）。

さらに、モデル校の教師間で実践共同体（Community of Practice: 以下「CoP」）を組成し、醸成するため、2019年5月18日にキガリで経験共有ワークショップを開催した。授業研究を実践するモデル校の全ての校長・副校長・教師と、各学校を管轄する郡・地区のDDEまたは郡教育官（District Education Officer: 以下「DEO」）及びSEOが参加し、授業研究の経験を共有した。参加者は授業研究の重要性やCPD実践に関する課題、事前・事後テストの活用法、授業研究の好事例を広めるための郡や地区の役割について議論した。

また、2019年6月に、モデル校間の学び合いや協働を促進するため、お互いの学校が授業研究で開発した理数科の授業を見学し合う相互訪問を支援した。EP Buhande と GS Mukarange Catholique がお互いの小学校レベルの授業を訪問し、GS Notre Dame des Apôtres Rwaza と GS APAGIE Musha が中等レベルの授業を訪問し合った。受入側と訪問側のDDEやSEOも参加した。

⁶ 授業研究は発問の改善支援のみに特化したわけではなく、授業改善全体を支援した。

(3) 学習理解度の事前事後比較

授業準備段階で生徒の既習知識や弱点を把握すること、授業後の学習理解度を測定することを直接的な目的とし、2018年からは授業研究の前後で同じテストを実施し比較することとした。さらにはエビデンスに基づいて客観的に議論する習慣を身につけ、学力への関心を高め、自分の教えに責任を持つ態度の育成を目指した。

2019年2学期のモデル校での事前・事後テストの平均点の変化を表3-8及び表3-9に示す。平均点はすべて事後のほうが高かったが、これは当然の結果であるため、平均点の上昇に一喜一憂せず、内容について議論するよう留意した。時折事後の結果が悪くなる問題があったが、これら問題は特に教師の興味を喚起し、「授業研究らしく」議論が白熱する様子が観察された（当該授業の準備不足や教え方の不備、欠席が多かったなどの考察があった）。これら議論を通じて、教師たちは、生徒の学びにより興味を持つようになった。

表 3-8 : テスト結果の事前事後比較（数学: 2019年2学期）

EP Buhande (P5)			GS Mukarange Catholique (P5)			GS Mukarange Catholique (S2)			GS APAGIE Musha (S2)			GS APAGIE Musha (S5)			GS Notre Dame des Apôtres Rwaza (S5)		
事前	事後	差	事前	事後	差	事前	事後	差	事前	事後	差	事前	事後	差	事前	事後	差
27.6	42.3	14.8	31.0	38.5	7.5	35.0	39.0	4.0	45.7	48.5	2.8	61.0	72.5	11.5	56.3	62.7	6.4

配点 100 点

表 3-9 : テスト結果の事前事後比較（理科: 2019年2学期）

EP Buhande (P5)			GS Mukarange Catholique (P5)			GS Mukarange Catholique (S2)			GS APAGIE Musha (S2)			GS APAGIE Musha (S4)			GS Notre Dame des Apôtres Rwaza (S4)		
事前	事後	差	事前	事後	差	事前	事後	差	事前	事後	差	事前	事後	差	事前	事後	差
28.9	30.9	2.0	25.4	30.5	5.1	25.0	30.8	5.8	34.4	43.4	9.0	34.3	53.1	18.8	32.4	38.8	6.4

配点 100 点

ルワンダ教育省は、2019年1月の学力保証に関する閣議決定を受け、Comprehensive Assessmentを導入した。これは教師に各授業での形成的評価や章ごとの総括的評価を習慣づけるとともに、各郡に経験豊富な教師からなる評価チームを組織し、郡統一学力テスト（2学期末）を実施すること、REBに全国統一学力テスト（3学期末）を実施することを義務付けた。これにより域内・全国の学力の変化を継続的・客観的に測定し、学校・教師にフィードバックすることが可能となる。この施策の導入以降、授業研究の事前・事後テストの比較検討は、Comprehensive Assessmentの対応も兼ねることになった。

3.4 成果2 関連活動の実績

3.4.1 DCC 支援

活動 2-1 : DCC の機能化に関する DEO 向けの実践マニュアルを開発する。

活動 2-2 : DCC の重要性に関する意識を向上させ、その役割への理解を高める（活動例：ワークショップ）。

2-2-1 : DCC の重要性に関する意識を向上させ、その役割への理解を高めるため、ワークショップを開催する。

2-2-2 : DCC によるモデル校の好事例共有イベント（Open day など）開催企画を支援する。

(1) DCC 実践マニュアルの開発

DCC のオリエンテーション及び問題分析ワークショップのマニュアルを開発した（添付 9）。また、DCC を支援する Building Learning Foundation（以下「BLF」）など、他の DP と協力して、2016 年に承認された DCC コンセプトノートを再検証し、現状に即するよう改訂案を作成した。改訂案については、後述する DCC 全国大会を通じて参加者からコメントをもらい、新コンセプトノートとして反映させた（添付 10）。

(2) DCC ワークショップの実施

パイロットの 4 郡（Gasabo、Musanze、Rulindo、Rwamagana）とその他 11 郡で DCC オリエンテーションと問題分析ワークショップを実施した。2018 年 6 月以降は、同様のオリエンテーション及びワークショップを実施する BLF が費用を負担し、本プロジェクトが問題分析ワークショップを提供することで協働の仕組みを構築した。ワークショップは問題分析、目的分析及び行動計画策定からなる。ワークショップ後に、各 DCC が策定した行動計画の項目を確認し、フィードバックをするなどして、計画を実行に移すことを促した。またパイロットの 4 郡に対してはフォローアップの会議を実施した。DCC 支援に関する活動スケジュールを表 3-10 にまとめる。

表 3-10 : DCC 支援活動のスケジュール

郡	オリエンテーション 実施日	ワークショップ 実施日	フォローアップ会議 実施日
Rulindo	2017/4/21	2017/7/5	2017/9/11
Gasabo	2017/4/30	2017/6/30	2017/10/24
Musanze	2017/5/2	2017/6/29	2017/10/12
Rwamagana	2017/5/3	2017/7/6	2017/9/12
	BLF による実施	2019/2/27*	-
Kayonza	2018/3/2	2018/6/22*	-
Nyarugenge	2018/3/10	2018/3/10	-
Muhanga	2018/5/21	2018/3/21	-
Gicumbi	2018/5/28	2018/3/28	-
Burera	2018/6/4*	2018/6/4、2018/7/6*	-
Nyabihu	2018/6/5*	2018/6/4、2018/8/24*	-
Rubavu	2018/8/2*	2018/8/2*	-
Karongi	2018/9/13*	2018/9/13*	-
Gisaraga	2018/12/6*	2018/12/6*	-
	BLF による実施	2019/3/12～14*	-
Nyanza	2018/12/7*	2018/12/7*	-
Kirehe	BLF による実施	2019/2/27*	-

* BLF の費用負担により開催されたオリエンテーション及びワークショップ。これらの活動では BLF がオリエンテーションのファシリテーターを務め、本プロジェクトが問題分析ワークショップのファシリテーターを務めた。

(3) DCC 全国大会

JICA ルワンダ事務所と VVOB の費用支援の下、2018 年 1 月 26 日に DCC 全国大会を実施し、DCC の活動の活性化に向けて、関係者に DCC 及び SCC の重要性の啓発を行った。招待者は各郡から 5 名（DDE、DEO、SEO、校長、地区レベル研修講師）、全 16 箇所の教員養成校校長、教育省・REB の代表者及び関連する DP で、合計 180 名が参加した。

プログラムについては事前に VVOB と協議を重ね、CPD の概念紹介、DCC 及び SCC の課題、DCC の役割と責任に関するグループワーク、6 つの DP による活動紹介・経験共有とした。グループワークのファシリテーションは援助協調により進められ、JICA 事務所と本プロジェクトのほか、VVOB、BLF、UNICEF/Inspire, Educate and Empower（以下「IEE」）が担当した。後日、グループワークで挙げたコメントを分類し、DCC の新コンセプトノートに反映した。

(4) Open Day

2019 年 2 月 13 日に GS Kabuye Catholique で開催された Open Day の実施に関し、当校と Gasabo 郡 DCC を支援した。良い授業とはどのようなものか、実際に見せることで教育関係者の理解を促進し、CPD を実施する上での自らの役割を考えてもらうことが目的で、全郡の DCC・SCC 代表者や当校の保護者代表も招待された。

準備段階では小学校・中学校レベルの理数科または英語を担当する教師 11 名の授業案作成に関して技術的な助言を提供した。他方、Gasabo 郡 DCC に対してはプログラムの作成や郡への支援要請に関して支援した。

Open Day 当日は、11 名の教師がそれぞれのクラスで同時に授業を公開し、Gasabo 郡 DCC の委員が授業検討会でのモデレーターを務めた。授業観察や授業検討会を通じて、参加者らは、授業案を推敲すること、個々の生徒の学びに目を向けること、グループワークについては慎重に検討すること等の重要性を理解した。

3.4.2 授業改善のためのリソース整備と活用の支援

活動 2-3：教員向け CPD 実践マニュアルを開発する（手順書を含む）。

活動 2-4：CBC に基づく授業の観察に関する校長、SEO、DEO 向けのガイドラインを開発する。

活動 2-8：CBC に基づく授業を評価する能力、データを収集・分析して解決策を講じる能力を高める研修を、校長、SEO、DEO に対して行う。

DCC メンバーである校長や SEO、DEO に対しては、3.4.1 に前述した DCC 支援関連活動において、授業観察、授業評価の能力、データ収集・分析を通じて解決策を講じる能力強化のための支援を行った。加えて下記のような支援を行った。

(1) CBC 研修教材開発の一環としてのマニュアル・ガイドライン整備

第 2 年次 CBC 研修のため、地区レベル CPD 活動の背景、計画、実施に関するガイドラインを含む地区及び学校レベル CPD のマニュアルを作成した。マニュアルは 2017 年 5 月に REB 総裁に承認され、全郡・地区に配布された。開発したマニュアルを添付 11 に示す。

また 3.3.1 に前述したとおり、第 3 年次 CBC 研修教材開発の一環として、授業研究の実施方法をグループ組成段階から研究授業の振り返り段階にわたり紹介する CPD 実践マニュアルを視聴覚教材に統合した。

(2) 地方教育行政官向け第 3 年次 CBC 研修の実施

(1)で開発した教材を用いて、DDE、DEO、SEO 向け第 3 年次 CBC 研修を実施した。3 箇所の研修会場（3 グループ）において、それぞれ 2018 年 3 月 7 日～8 日、12 日～13 日、15 日～16 日の日程で開催され、471 名（対象者の 93.1%）が受講した。ベースライン調査結果を踏まえた CBC 授業の課題の把握に加えて、卒業試験の成績分析の方法や、各地区の問題解決方法の分析についての参加型研修を行った。研修教材を DVD として別添する。

(3) 他のイニシアチブを通じたリソース整備と活用の支援

ルワンダでは CPD の推進は援助協調の枠組の中で行われており、様々な DP が CPD を支援している。それら DP と協力して、CPD 実践や授業改善（観察）に関する政策文書、マニュアル、ガイドラインなど各種リソースの開発を支援した。主なものは以下のとおりである。

教育セクター戦略計画（ESSP）2018/19-2023/24

DP に共有された教育セクター戦略計画（Education Sector Strategic Plan: 以下「ESSP」）2018/19-2023/24 の案に対して修正を提案した。最終案では優先課題の 2 番目に CPD が取り入れられ、CPD を強化する組織として DCC が言及されることとなった。

National Teacher CPD Framework

教師の能力基準を規定する National Teacher CPD Framework の文書が国際連合教育科学文化機関（United Nations Educational, Scientific and Cultural Organization: 以下「UNESCO」）の支援により 2017 年より進められた。同文書には、教師の能力開発基準、CPD 実施メカニズム、授業設計や観察の基準などが規定され、CPD 計画表、CPD 報告書、授業評価シートなど各種様式が添付されている。

プロジェクトは開発当初からこれに協力し、数次のワークショップに参加するとともに、ドラフト版のレビューを行った。プロジェクトが提案してきた“Problem Solving Cycle”はルワンダの CPD を象徴する概念図（The Model for Teacher CPD in Rwanda）として採用された。教員向け CPD（Technical）＋行政官による CPD 支援（Administrative）という本プロジェクトの設計の基盤となっている考え方も、本文書に採用されている。

2018 年 5 月に最終ドラフトが提示された際には、同時期に公表された教員養成カリキュラムフレームワークと不整合な点が多く散見されたため、C/P、UNICEF、VVOB と協議し、両者の整合性を取るための臨時ワークショップを共催し、修正案を作成・提示した。National Teacher CPD Framework は 2019 年に政府から正式に承認され、全国の学校に配布されるべく印刷された。プロジェクトでは本文書を参考に授業案評価基準（ループリック）を作成し、エンドライン調査の分析に活用した。

School-based CPD Manual

2017年から進められた、メンタープログラム（School-Based Mentorship Programme: 以下「SBMP」）の School-Based CPD Manual（全4巻）の開発に協力した。マニュアル設計段階で、コンテンツに本プロジェクトや他の DP の資料などとの重複も多く見られたことから、日本人専門家がマニュアルのカリキュラム分析、コンテンツマップの作成を支援した。また授業研究に関連するコンテンツ開発を行い、本マニュアルに統合した。マニュアルは2018年12月に完成し、UNICEFの支援で印刷された。2019年12月現在、全国の学校への配布方法を協議中である。

2018年7月には、本マニュアルを有効活用するために、SBMP タスクフォースに参加する DP とともに、学校での CPD 実践好事例を収集するためのワークショップを共催した。ワークショップに先立ち、タスクフォースメンバーが CPD の好事例を視察する会が催されたが、その視察先には、プロジェクトのモデル校である GS Kabuye Catholique が選ばれた。VVOB の支援により、その視察で確認された好事例はビデオに編集され、ワークショップで発表された。

Diploma/Certificate CPD Course

VVOB が支援し、ルワンダ大学教員養成大学（University of Rwanda、College of Education: 以下「UR-CE」）が実施する、校長・教師及び SEO 向けの CPD 学位取得コースのプログラム開発に2017年から協力した。CPD 実践ガイドラインを開発するための会議・ワークショップに参加し、ドラフト版のレビューを行うとともに、授業研究について解説する章の執筆を担当した。CPD コースは2019年末に1,400名が修了した。

(4) 授業研究実践ガイドの作成

CBC 及び CPD に関するモニタリングに基づき、CBC で期待される望ましい授業を行うための実践方法や授業観察シートからなる授業研究実践ガイドを作成した（添付 12）。ガイドは2019年11月の最終セミナーの参加者に配布された。また各郡の代表の SEO に各自の郡の全地区分のガイドを手渡し、後日配布するよう依頼することで全地区区に行き渡るよう配慮した。

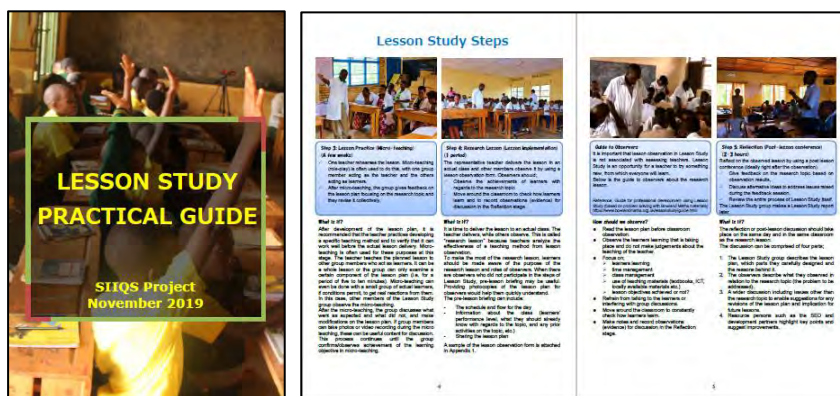


図 3-1：授業研究実践ガイドのイメージ

3.4.3 CBC 及び CPD 実施に関するデータ収集・分析

活動 2-5：既存のものを踏まえ、簡易調査を行うことで、校長、SEO、DEO が使用するモニタリングフォームをデザインする（電子版を含む、簡素で使いやすいもの）。

活動 2-6：データを収集・分析し、解決策を講じる能力を高める研修を、JICA 専門家が REB に対して行う。

2-6-1：CBC 研修のニーズ調査において、REB がデータを収集・分析し、解決策を講じる能力を高める技術支援を行う。

活動 2-9：CBC および CPD 実践に関するモニタリングを行う（Email での調査、技術的な助言の提供を含む）。

2-9-1：CBC および CPD 実践に関する DCC の活動の学期モニタリングを行い、量的データを収集する。

2-9-2：DCC の活動の四半期現地モニタリングを行い、質的データを収集する。

活動 2-10：REB に提出された報告書で認識された課題に向け、対策を講じる教材を開発する。

2-10-1：モニタリング結果の分析報告書を作成する（好事例集を含む）。

活動 2-11：上記の教材をもとに、REB 及び国家教科研修講師に対して研修を行う。

2-11-1：DCC 全国大会を開催し、モニタリングシステムの向上について啓発する。

(1) 第 2 年次 CBC 研修におけるモニタリング支援

プロジェクトの本格的な支援は第 3 年次の CBC 研修から実施する計画であったが、前年の第 2 年次 CBC 研修のうち地方教育行政官（SEO）向け研修の実施が遅れていた（そのため教員向け地区レベル研修が実施できない状況にあった）。本研修を支援する UNICEF と協力して、CPD とオンラインモニタリングに関するセッションの研修コンテンツ開発を支援した。

SEO 研修は 2017 年 5 月 9 日～20 日に 3 グループに分けて実施された。研修において、SEO はオンラインシステム上の調査票で地区レベル研修実施予定日や研修ニーズなどのモニタリングデータ入力の練習を行った。

その後オンラインシステムには 416 地区中、263 地区から回答があったが、その 3 分の 1 程度は無効な回答であり、データ収集に課題が残ることとなった。

(2) 第 3 年次 CBC 研修のモニタリング

前年の反省を踏まえ、第 3 年次 CBC 研修の地区レベル研修の報告には、オンライン形式に加え、紙形式のレポートフォームを作成することとし、このモニタリングの実施を支援した。紙形式のレポートフォームは 2018 年 5 月に教育省が実施する「教育の質に関するキャンペーン」で、REB 職員が各郡の視察を行う際に SEO に配布され、416 地区中 312 地区から回収した。その結果、269 地区が地区レベル研修を実施していたことが確認された。

(3) CBC 研修に関するオンラインアセスメントコースの開発と試行

(1)(2)のモニタリングを通じて、カスケード最下層での CBC 研修の実施に懸念が認められたことから、REB の eラーニングプラットフォームに、過去3年分の CBC 研修内容の理解度を確認するためのテストを構築した。eラーニングサイトは当初第3年次 CBC 研修の視聴覚教材を開発した企業からシステム構築の提案を受けていたが、C/P が ICT 部局らとの協議を重ねて、REB のシステムを活用することとなった。ICT 部局の協力を得て、C/P、日本人専門家、ICT 部局職員が合同でテスト問題の作成を行い、従来の紙形式では出題できない形式の問題を作成したり、選択式問題と記述式問題を組み合わせたりするなど、工夫を重ねた。また一定のレベルに達しないと次の問題に進めないなど、運用面のルールについても検討を行った。この過程を通じて、C/P はオンラインアセスメントに対する見識を深め、ICT 部局との協働の方法を学んだ。

テストは2018年11月に公開され、全30郡から選ばれた60名の教師に対して、Muhanga 郡教員養成校にてオリエンテーションを実施し、その後パイロット運用を行った。その結果、受講者の平均点は82.9%に達した。また、2019年12月から、教育情報ポータルでも、CPD コンテンツとして紹介されている。教師の理解度については懸案が払しょくされたが、他方でシステムの運用にはインターネットアクセスなどインフラ面、教師の ICT リテラシーの不足、C/P のシステムメンテナンス能力面などの課題が確認されることとなった。

(4) オンラインニーズ調査

第4年次 CBC 研修計画作成を支援し、ブリティッシュカウンシルの財政支援により第4年次 CBC 研修が実施されることになった⁷。本研修はモニタリングやニーズ調査を行い、学校での CBC 実施上の課題や研修ニーズを特定した上で、研修教材を開発する計画であった。そこでブリティッシュカウンシルは、オンラインアンケート（Google フォーム）を活用し、インターネットやコンピュータールームが整備された学校において、当該校及び近隣校の教師を招いてアンケートに回答する手法を取り、本プロジェクトはアンケート内容の開発、及びアンケート会場校での事前オリエンテーション（各郡3校）に協力した。2019年2月にデータ収集が実施され、教師（4,179名）、校長（501名）、SEO（85名）、DDE/DEO（22名）から回答を得た。

ブリティッシュカウンシルは主に CBC 実践に関する分析を、本プロジェクトは CPD 実施に関する分析を支援した。部局内において簡易データ分析ワークショップを開催し、分析結果を報告書にまとめた。

CBC 実践上の課題は研修計画に反映され、2019年10月に教材開発ワークショップが、12月に国家研修講師を対象とした研修がブリティッシュカウンシルの支援により実施された。CPD の課題は、後述する DCC/SCC モニタリング報告書の一部としても報告された。

(5) DCC/SCC 月次及び四半期モニタリング

(4)のブリティッシュカウンシルによるオンラインアンケートの成功は、CBC 及び CPD に関する DCC/SCC 月次モニタリングシステム構築のヒントとなるものであったが、事前

⁷ その過程で、第4年次 CBC 研修という名称は廃止され、ブリティッシュカウンシルの意向と予算規模などから小学校教師を対象とした教科別研修にスコープが変更された。

オリエンテーションを対面で実施する、入力会場校の ICT 技術スタッフに入力支援を依頼するなど、コスト・労力ともに負担の多い方法であった。また REB の定常モニタリングとしては、Google フォームなど汎用システムを使うことに対して関係者の理解を得ることが難しい面もあった。

そこでメールベースで提出できるよう、エクセルフォームによるアンケートを開発し、Gicumbi 郡、Kirehe 郡、Rulindo 郡、Rwamagana 郡で試行した上で、2019 年 4 月に月次モニタリングを開始した。DCC 及び SCC は各月の CPD 活動の内容、実施日、会場、目的等の概要を記載し、活動の達成状況などの評価も記載の上、メールで REB に提出する。このフォームでは特に量的情報収集を主目的とし、より詳細な調査が必要と考えられる郡については、四半期ごとに訪問調査を実施することとした（表 3-11 参照）。

表 3-11 : 四半期モニタリングの対象郡及び地区

四半期	郡	対象者	日程	地区	対象者	日程
2019 年 第 1 四半期	Kirehe	DDE	2019/4/23	Mahama	SEO	2019/4/23
	Rulindo	DDE	2019/4/23	Kisaro	SEO	2019/4/23
				Cyinzuzi	SEO	2019/4/24
				Masoro	SEO	2019/4/24
Gisagara	DDE	2019/4/29	Nyanza	SEO	2019/4/29	
2019 年 第 2 四半期	Bugesera	DDE	2019/8/26	Ruhuha	SEO	2019/8/26
	Rwamagana	DDE	2019/8/27	Fumbwe	SEO	2019/8/27
				Kigabiro	SEO	2019/8/27
				Musha	SEO	2019/8/27
	Nyabihu	DDE	2019/8/27	Rurembo	SEO	2019/8/27
				Jenda	SEO	2019/8/27
				Rambura	SEO	2019/8/29
	Gisagara	DDE	2019/8/28	Ndora	SEO	2019/8/28
	Rubavu	—	—	Kanama	SEO	2019/8/28
	Muhanga	DEO	2019/8/29	Kibangu	SEO	2019/8/29
	Musanze	—	—	Shingiro	SEO	2019/8/29
				Remera	SEO	2019/8/29
				Kisaro	SEO	2019/8/30
	Rulindo	—	—	Bushoki	SEO	2019/8/30
				Mukarange	SEO	2019/9/3
	Kayonza	DDE	2019/8/30	Gatsata	SEO	2019/9/4
Gasabo	—	—	Rubengera	SEO	2019/9/6	
Karongi	DDE	2019/9/6	Mudende	SEO	2019/10/21	
2019 年 第 3 四半期	Rubavu	—	—	Bugeshi	SEO	2019/10/22
				Nyamyumba	SEO	2019/10/24
				Gihango	SEO	2019/10/23
	Rutsiro	—	—	Mushonyi	SEO	2019/10/24
				Ruhango	SEO	2019/10/24
				Nyabirasi	SEO	2019/10/25
	Ruhango	DDE	2019/12/11	Byimana	SEO	2019/10/29
				Kabagali	SEO	2019/10/30
	Ngororero	—	—	Kabaya	SEO	2019/10/28
				Gatumba	SEO	2019/10/30
	Huye	DDE	2019/12/11	—	—	—
Kamonyi	DDE	2019/12/11	—	—	—	

注：第 2 四半期モニタリングでは、Rubavu、Musanze、Rulindo、Gasabo 郡の DDE の都合が悪く、訪問できなかった。また第 3 四半期モニタリングでは、Rubavu、Rutsiro、Ngororero 郡 DDE を訪問できなかった。

ここでは半構造化インタビューにより DCC 及び SCC の状況や CPD 活動、好事例、課題について聞き取りを行った。日本人専門家は、インタビュー方法の指導を行い、C/P を支援して四半期モニタリングレポートをとりまとめ、REB に提出した。2019 年第 1～第 3 四半期モニタリングレポートを別添する（添付 13～15）。

(6) 統一オンラインモニタリングシステムの開発と運用

(1)～(5)に述べてきたように CBC 及び CPD モニタリングシステムの構築には、いくつかの希望が見出せながらも、様々な課題が噴出した。他方で多くの DP が CPD 支援活動に参加し、モニタリングの重要性がクローズアップされ、それぞれの CPD 活動が独自にモニタリングシステムの構築に動くなどのリスクも顕在化してきた。DP ごとに異なる用語（SBI、Peer Learning、CoP など）を用いることで教師や SEO、DDE らが混乱し、誤認識から効率的な情報収集が妨げられている様子も四半期モニタリングでは散見されていた。

そこで C/P、BLF、本プロジェクトが主体となり、2019 年 6 月から統一オンラインモニタリングシステム構築にかかる協議を行ってきた。8 月に全郡の DCC 代表を集め、システム構築に関する意見交換を行った。その意見を基に、9 月には関係者間でモニタリングフォームに含める事項（質問項目）とモニタリングの頻度（学期ごと）について基本合意し、全郡の DDE にモニタリングフォームを送付、コメントを求めた。その上でモニタリングフォームを最終化し、10 月の DCC ワークショップでオリエンテーションを実施した。開発したモニタリングフォームの質問項目を別添する（添付 16）。

オンラインシステムは当初、REB の教師向けサイト上に構築され、11 月末に公開予定であったが、報告者は基本的に地方教育行政官（DDE/DEO、SEO）のため、教師向けサイトでは混乱が生じることが懸念された。そのため、教育情報ポータル（reb.education.rw）への構築に変更となり、12 月中旬に統合が完了した。

(7) 最終セミナーの開催とモニタリングの啓発

DCC 全国大会を最終セミナーの形で 2019 年 11 月に開催した。郡、地区、学校からの代表者や DP など計 157 名が参加し、今後の CPD メカニズムの向上について協議した。

3.5 プロジェクトマネジメント

3.5.1 JCC の開催

JCC は 2017 年 3 月、2017 年 10 月、2018 年 3 月、2019 年 1 月、2019 年 7 月の計 5 回開催された。主に、プロジェクトの進捗と成果達成状況について報告、議論を行った。

表 3-12 に各 JCC の開催概要を示す。また、議事録を別添する（添付 17～21）。

表 3-12 : JCC 開催概要

回	日程	会場	主な議題
1	2017/3/23	TDM 会議室 (REB)	- プロジェクト概要 - プロジェクトマネジメントの仕組み - ベースライン調査結果の速報

回	日程	会場	主な議題
2	2017/10/31	TDM 会議室 (REB)	- 成果 1 及び 2 の活動進捗 - プロジェクトマネジメント上の課題
3	2018/3/14	TDM 会議室 (REB)	- 成果 1 及び 2 の活動進捗 - プロジェクトのモニタリング・評価
4	2019/1/23	TDM 会議室 (REB)	- 成果 1 及び 2 の活動進捗 - 年次活動計画
5	2019/7/23	本館会議室 (REB)	- PDM 改訂及び成果 1 及び 2 の活動進捗 - エンドライン調査結果の速報 - 今後の活動

3.5.2 援助協調

CPD や DCC/SCC については全国的な取り組みであり、多様な DP との連携が求められること、最新の政策や教育セクターの動向に関する情報収集が必要なことから、表 3-13 に示す教員の職能開発関連の援助協調プラットフォームに定期的に参加した。

表 3-13 : 援助協調プラットフォーム

プラットフォーム	主な活動	頻度
Teacher Professional Development Technical Working Group	Basic Education Strategy Group の作業分科会で、教員養成／訓練分野で活動する DP が参加。TDM&CGC と米国国際開発庁 (United States Agency for International Development: 以下「USAID」) が共同議長。	毎月
School-Based Mentorship Programme Task Force	学校メンター (School-Based Mentor: 以下「SBM」) の問題や計画について議論する分科会。TDM&CGC と UNICEF が共同議長。	隔月
Rwanda Education NGO Coordination Platform (RENCP)	ルワンダ NGO 調整会議。教育分野で活動する NGO の協調のためのプラットフォーム。	四半期に 1 回
RENCP Teacher Development and Education Leadership Working Group	RENCP の分科会の 1 つ。教員の職能開発に関係する NGO が所属する。	随時

また、表 3-14 のとおり、他の DP と個別に協力した。

表 3-14 : 各パートナーとの援助協調

DP	プロジェクトが行った協力
BLF	3.4.1(2)及び 3.4.3(6)に示したとおり、DCC 及び SCC のオリエンテーションとワークショップを共同で実施し、モニタリングツールを開発した。
Education Development Center Inc. (EDC)	高校や技術教育・職業訓練分野に CPD を普及していく方策について、2017 年 9 月に EDC が企画した Akazi Kanoze 2 プログラムのワークショップで EDC 職員や参加者と意見交換した。
Kuder	2017 年 10 月 26 日に開催された「Rwanda Summit on national Career Guidance and other Education Innovations」に登壇団体の一つとして招待された。500 名以上の参加者に対し、プロジェクトを紹介した。

DP	プロジェクトが行った協力
VVOB	3.4.1(3)のとおり、DCC 全国大会開催時に協働した。また、3.4.2(3)のとおり、要請に基づき、教師及び SEO 向けの教育メンターシップとコーチングに関する CPD 資格コース作成時に授業研究に関する研修コンテンツを提供した。
UNICEF	3.4.2(3)のとおり、第3年次 CBC 研修教材開発と国家研修講師の研修において協働した。また、SBMP を通じて、学校ベースの CPD マニュアル作成時に、授業研究に関するコンテンツを提供した。

3.5.3 国際学会における発表

プロジェクトの活動から得られた知見を以下の教育分野の国際学会で発表した。

- 国際教員養成協議会（International Council on Education for Teaching: 以下「ICET」）
- アフリカ遠隔教育教師教育（Distance Education and Teacher Education in Africa: 以下「DETA」）
- 世界授業研究学会（World Association of Lesson Studies: 以下「WALS」）
- 比較国際教育学会（Comparative and International Education Society: 以下「CIES」）

学会発表の概要を表 3-15 に示す。発表資料は添付 22～28 のとおりである。

表 3-15 : 国際学会発表の概要

学会	発表タイトル及び発表者（共同発表者含む）	開催地	発表日
ICET 2017	タイトル: Bridging the Gap between Policy and Practice: The Case of Competency-Based Curriculum in Rwanda 発表者: Kyoko Yoshikawa, Antoine Mutsinzi, Yumiko Ono, Ryuichi Sugiyama, Sayaka Matsuzuki	チェコ マサリック大学	2017/6/29
DETA 2017	タイトル: Exploratory Analysis on Motivational Factors Influencing Teachers' Participation to School-Based In-service teacher training (SBI) Programme in Rwanda 発表者: Claudien Nzitabakuze, Antoine Mutsinzi, Ruth Mukakimenyi, Ryuichi Sugiyama, Kyoko Yoshikawa, Sayaka Matsuzuki, Yumiko Ono	ルワンダ UR-CE	2017/8/24
WALS 2017	タイトル: Theory into Practice: Developing Model Lessons Based on New CBC Curriculum through Lesson Study in Rwanda 発表者: Antoine Mutsinzi, Kana Yamashita, Yumiko Ono, Tateo Abe, Keiichi Naganuma, Kenji Ohara, Sayaka Matsuzuki, Ryuichi Sugiyama	日本 名古屋大学	2017/11/25

学会	発表タイトル及び発表者（共同発表者含む）	開催地	発表日
WALS 2018	<p><u>タイトル:</u> Improvement of Teachers' Questioning Skills in Mathematics and Students' Higher Order Thinking Skills through Lesson Study in Rwanda</p> <p><u>発表者:</u> Kenji Ohara, Ryuichi Sugiyama, Sayaka Matsuzuki, Yumiko Ono, Tateo Abe</p>	中国 北京師範大学	2018/11/25
CIES 2019	<p><u>タイトル:</u> Decentralizing and Contextualizing Teacher Continuous Professional Development in Rwanda - increasing effectiveness of CPD for equitable learning</p> <p><u>発表者:</u> Kyoko Yoshikawa Iwasaki, Ryuichi Sugiyama, Yumiko Ono, Sayaka Matsuzuki, Kenji Ohara</p>	米国 Hyatt Regency San Francisco hotel	2019/4/16
ICET 2019	<p><u>タイトル:</u> Strengthening Teachers' Questioning Skills in Mathematics and Students' Higher Order Thinking Skills through Lesson Study in Rwanda</p> <p><u>発表者:</u> Yumiko Ono, Antoine Mutsinzi, Sayaka Matsuzuki</p>	南アフリカ ヨハネスブルグ大学	2019/7/6
WALS 2019	<p><u>タイトル:</u> A Case Study of Teacher Learning and Teacher Change through Lesson Study as School-Based CPD</p> <p><u>発表者:</u> Yumiko Ono, Sayaka Matsuzuki, Ryuichi Sugiyama, Antoine Mutsinzi, Kizito Ndiokubwayo, Hashituky Telesphore Habiyaemye</p>	オランダ The Johan Cruijff Arena	2019/9/4

第4章 プロジェクトの成果

4.1 PDM 指標の達成状況

プロジェクトの介入の効果を客観的に測るため、PDM にはモデル校（実験群）とコントロール校（統制群）の比較分析の指標が含まれる。統制群はプロジェクト開始時点でモデル校と同様の属性をもつ学校である。これらの学校の属性及び卒業試験の結果比較をそれぞれ表 4-1 及び表 4-2 に示す。モデル校に関する指標の達成状況を比較するため、プロジェクトでは 2019 年 6 月～9 月にエンドライン調査を実施した。詳細はエンドライン調査レポート（添付 7）に示すが、本章では主に各指標に沿って達成状況の全体像を記載する。

表 4-1：調査対象校の属性

グループ	学校	学校種別	小学校	中学校	高校
モデル校 (実験群)	EP Buhande	小	✓		
	GS Kabuye Cathorique	小中高	✓	✓	
	GS Mukarange Cathorique	小中高	✓	✓	✓
	GS APAGIE Musha	中高		✓	✓
	GS St Aloys Rwamagana	中高		✓	✓
	GS Notre Dame des Apôtres Rwaza	中高 (女子)		✓	✓
コントロール校 (統制群)	EP Bukinanyana ADEPR	小	✓		
	GS Gihogwe Cathorique	小中高	✓	✓	✓
	GS Bubazi	小中	✓	✓	
	Lycée Notre Dame de la Visitation	中高 (女子)		✓	✓
	GS Rambura Garçons	中高		✓	✓

表 4-2：調査対象校の卒業試験結果比較

教育課程	モデル校					コントロール校				
	学校	在籍者数	1 教師 当たり 生徒数	卒業 試験 合格率	卒業率	学校	在籍者数	1 教師 当たり 生徒数	卒業 試験 合格率	卒業率
小	EP Buhande	531	37.9	57.9	54.7	GS Bubazi	603	76.5	76.9	72.2
	GS Mukarange Cathorique	1,278	53.3	96.9	56.3	EP Bukinanyana ADEPR	918*	60.3	71.7	70.8
	GS Kabuye Cathorique	2,194	109.7	99.1	72.2	GS Gihogwe Cathorique	1,614	70.2	99.0	97.1
	平均	1334.3	67.0	84.6	61.0	平均	1045.0	69.0	82.5	80.0
	GS Kabuye Cathorique	373	53.3	94.2	111.4	GS Bubazi	390	26.0	89.1	85.4
中	GS Mukarange Cathorique	889	80.8	76.9	64.9	GS Gihogwe Cathorique	658	65.8	90.9	80.9
	GS APAGIE Musha	285	35.6	100.0	100.0	GS Rambura Garçons	321	35.7	100.0	100.0
	GS St Aloys Rwamagana	431	47.9	100.0	93.2					
	GS Notre Dame des Apôtres Rwaza	246	41.0	100.0	100.0	Lycée Notre Dame de la Visitation	216	43.2	100.0	100.0
	平均	444.8	51.7	94.2	93.9	平均	396.3	42.7	95.0	91.6

教育課程	モデル校					コントロール校				
	学校	在籍者数	1 教師 当たり 生徒数	卒業 試験 合格率	卒業率	学校	在籍者数	1 教師 当たり 生徒数	卒業 試験 合格率	卒業率
高	GS Mukarange Catholique	491	44.6	82.1	78.71	GS Gihogwe Catholique	204	29.1	92.1	89.2
	GS APAGIE Musha	280	31.1	99.0	99.0	GS Rambura Garçons	469	33.5	97.8	97.8
	GS St Aloys Rwamagana	652	43.5	100.0	100.4					
	GS Notre Dame des Apôtres Rwaza	360	30.0	99.0	96.2	Lycée Notre Dame de la Visitation	175	21.9	100.0	100.0
	平均	445.8	37.3	95.0	93.6	平均	282.7	28.2	96.6	95.7

卒業試験合格率：受験者数に対する卒業試験合格率

卒業率：最終学年在籍者数に対する卒業率（卒業試験合格率）

*2019 年のデータ

4.1.1 上位目標：「教室における生徒の学習プロセスが改善される」

プロジェクトの介入により、生徒の学習プロセスは適切に改善された。モデル校では、生徒が多様な回答をする機会がコントロール校の生徒より多く与えられ、学力テストの結果も高かった。各指標のデータ及び根拠を以下にまとめる。

指標1：コントロール校と比較して、モデル校において教員からの Open question に対して、多様な回答が増加する。

達成根拠：エンドライン調査において、表 4-3 のとおり、コントロール校よりモデル校のほうが生徒から多様な回答⁸が挙がってきているという望ましい傾向を確認することができた（ただし、小学校算数を除く）。プロジェクトの活動がモデル校の生徒の学習行動のポジティブな変化を促したといえる。この変化は、後述のとおり、間接教授が増え、より生徒中心の授業ができることになったことでもたらされたといえる。

表 4-3：生徒の授業中の発話における多様な回答の出現割合

教育課程	教科	モデル校		コントロール校	
		n	割合 (%)	n	割合 (%)
小学校	算数	3	11.1	3	16.3
	理科	3	14.3	3	9.1
中学校 (O レベル)	数学	4	20.6	4	15.5
	理科	5	20.6	4	15.5
高校 (A レベル)	数学	4	54.7	2	34.2
	理科	4	28.5	2	10.4

n: 授業観察数

モデル校とコントロール校のうち、割合が高いほうを網掛けで示す。

⁸ ここで「多様な回答」とは、授業のプロトコル分析において、教師の発問や指示の種類に関わらず、「教師への意見」「他の児童・生徒への意見」「発表」のいずれかに分類された児童・生徒の発話を指す。

指標 2：コントロール校と比較して、モデル校において学力テストの成績がより向上している。

達成根拠：エンドライン調査において、表 4-4 のとおり、モデル校のほうがコントロール校より生徒の学力テスト平均点が有意に高かった（ただし、中等学校の中学校理科を除く）。指標 1 と同様に、プロジェクトの活動がモデル校の生徒の学力到達度の改善に貢献したといえる。

表 4-4：介入・教育課程別の学力テスト比較

教科	教育課程	設問数	モデル校			一般校			
			<i>n</i>	平均	標準偏差	<i>n</i>	平均	標準偏差	
数学	小学校	33	203	14.8	4.5	246	13.1	4.1	**
	中学校 (中等学校)	40	138	24.4	6.3	65	19.6	5.5	**
	中学校 (基礎教育学校)	40	86	15.5	4.8	123	13.5	4.4	**
	高校 (中等学校)	40	193	24.9	6.1	106	20.3	5.8	**
理科	小学校	13	219	7.4	2.4	253	6.0	2.5	**
	中学校 (中等学校)	24	155	12.6	3.4	65	12.5	3.0	
	中学校 (基礎教育学校)	24	70	8.7	2.8	121	7.7	2.3	*
	高校 (中等学校)	40	178	19.6	4.6	54	17.1	5.0	**

** $p < .01$, * $p < .05$

配点は1問1点。モデル校とコントロール校のうち、得点が高いほうを網掛けで示す。

4.1.2 プロジェクト目標：「SBI 活動を通して教室における CBC に基づいた授業の実施が強化される」

SBI (CPD) の1手法である授業研究を通して、モデル校で CBC に基づく授業の実施強化を図った結果、生徒中心の授業を実施するにあたり、教師が効果的な授業案を作成し、効果的な発問をできるようになった。各指標のデータ及び根拠を以下にまとめる。

指標1：授業案に、National Teacher CPD Framework に規定された授業設計要件を満たす要素が記述される。

達成根拠：エンドライン調査において、モデル校の教師が作成した授業案のほうがコントロール校の教師の授業案より、National Teacher CPD Framework の Competence 2.1 に規定される授業設計要件を満たしていることを確認した。エンドライン調査では、Competence 2.1 の要件を評価基準とし、表 4-5 のとおり、4段階のルーブリックを作成した。

表 4-5 : 授業案のルーブリック

評価基準		なし	Poor	Fair	Good
1. Clear and measurable outcomes and objectives and activities to achieve them.	1-1. Clear and measurable outcomes and objectives	0	1	2	3
	1-2. Attainableness of Activities	0	1	2	3
2. Learning outcomes and objectives support learners to move from simple and familiar to more complex and sophisticated knowledge and skills		0	0	1	2
3. Regular revision of learning and learning assessments.		0	0	1	2
4. Adaptions for specific learners.		0	0	1	2
5. Use a range of teaching and learning resources, vary interaction patterns		0	1	2	3

モデル校とコントロール校の授業案の評価点比較結果を表 4-6 に示す。モデル校においても評価基準 2 と 4 の平均評価点は低いが、全体では相対的にコントロール校よりもモデル校のほうが高い結果となった。

表 4-6 : 授業案の評価点 (平均)

学校	教科	n	1-1	1-2	2	3	4	5
モデル校	数学	11	3.0	2.3	0.0	1.8	0.6	2.0
	理科	12	3.0	2.3	0.8	1.3	0.3	2.0
コントロール校	数学	5	3.0	2.4	0.0	0.6	0.4	2.0
	理科	8	2.5	2.1	0.0	0.6	0.6	1.5

外観的にもモデル校の授業案が改善されたことが見てとれる。図 4-1 はあるモデル校の教師が授業研究開始前の 2017 年とエンドライン調査時の 2019 年に作成した授業案の比較である。ひと目で、2019 年の授業案のほうがより多様で詳細な情報が盛り込まれており、2017 年の授業案に比べて大きく改善されたことがわかる。これらのことから、プロジェクトの活動が、National Teacher CPD Framework の Competence 2.1 に規定された授業設計要件に基づく授業案の改善に貢献したと結論づけることができる。

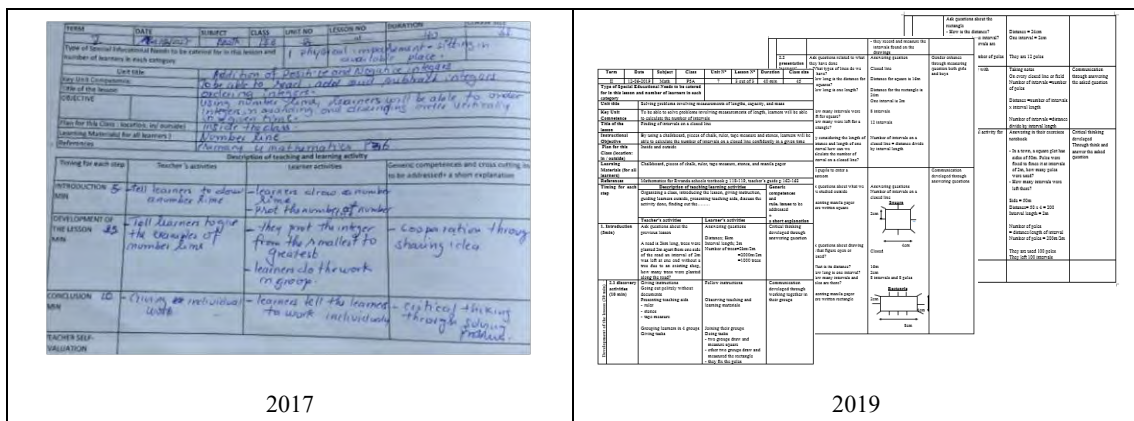


図 4-1 : モデル校の授業案の変化

指標2：コントロール校と比較して、モデル校においてOpen questions が多く発問される。

達成根拠：エンドライン調査において、モデル校の教師のほうがコントロール校の教師より Open question を多用しているという望ましい傾向を確認することができた（ただし、高校理科を除く）。表 4-7 は教育課程・教科別にモデル校とコントロール校の Open question の平均出現割合をまとめたものである。

表 4-7：教師による Open Question の出現割合

教育課程	教科	モデル校		コントロール校	
		n	割合 (%)	n	割合 (%)
小学校	数学	3	1.0	3	0.5
	理科	3	9.3	3	4.5
中学校	数学	4	2.2	4	0.2
	理科	5	6.3	4	5.5
高校	数学	4	2.2	2	1.3
	理科	4	5.2	2	10.0

n: 授業観察数

モデル校とコントロール校のうち、割合が高いほうを網掛けで示す。

エンドライン調査では、モデル校の教師のほうが、間接的な方法で教授している傾向があることが確認された。この傾向は特に数学でみられた。ここでは、エンドライン調査で授業観察を行った授業の教師の発話をすべて文字起こしし、「open question」「closed question」「explanation」「justification」などの特定の教授法コードに分類した。いくつかの教授法は生徒が受身となる指示的なものである一方で、「open question」「rephrase student」などの教授法は生徒に能動的に考えることを促すものである。後者を「indirect teaching」（間接教授）と呼ぶこととする。表 4-8 は教育課程及び教科別にモデル校とコントロール校の間接教授の割合の平均を示したものである。Flanders (1965)⁹によれば、直接教授により教えられた生徒より、間接教授により教えられた生徒の学力到達度のほうが高いという。エンドライン調査においても、直接教授と間接教授の差が上述のモデル校での学力到達度に結びついたと考えられる。

表 4-8：教師による間接教授の割合

教育課程	教科	モデル校		コントロール校	
		n	割合 (%)	n	割合 (%)
小学校	数学	3	88.4	3	73.3
	理科	3	82.4	3	85.3
中学校	数学	4	77.5	4	67.8
	理科	5	71.1	4	78.8
高校	数学	4	80.6	2	60.3
	理科	4	67.7	2	64.1

n: 授業観察数

モデル校とコントロール校のうち、割合が高いほうを網掛けで示す。

⁹ Flanders, N. A. (1965). Teacher influence, pupil attitudes and achievement. Washington, DC: United States. Dept. of Health, Education and Welfare.

4.1.3 成果 1：「教員による CBC の授業実践への理解が高まる」

指標 1：教員の CBC 研修の理解度テストの結果が平均 70%以上となる。

達成根拠：各研修の事後テストにより、教員の CBC に基づく授業実践への理解が十分であることが確認された。プロジェクトでは 2017 年後半から 2018 年初頭にかけて、国家研修講師と地区レベル研修講師を対象とした第 3 年次 CBC 研修を直接支援した（3.3.2 参照）。国家研修講師と地区レベル研修講師の研修後の理解度テストの結果はそれぞれ 73.7%と 74.0%であった。加えて、2018 年 11 月に第 1 年次から第 3 年次までの CBC 研修の内容に関する教師の理解度を確認するために実施したオンラインアセスメントでは、参加者の平均点が 82.9%に達した。

指標 2：CBC に基づく授業の理解に関する教員の自己評価が 90%以上で維持される。

達成根拠：ルワンダの学校の教師は概して CBC に基づく授業の理解に関して当初から自己評価が高かった。ベースライン調査時点で、90%以上の教師が CBC に基づく授業の実施と生徒のコンピテンシーの向上に対して自信を持っていた。また、地区レベル研修講師においても、90%以上が自ら第 3 年次 CBC 研修の講師として十分なコンピテンシーがあるととらえていた。この傾向は現在まで続いており、エンドライン調査時の自己評価設問においても、「私は CBC の概念を理解している」というステートメントに「強く同意する」または「同意する」と答えた教師が 97.9%を占めた。

4.1.4 成果 2：「学校、地区、郡、国レベルで課題解決能力が高まる」

指標 1：全地区が CBC 導入研修を実施する。

達成根拠：本指標については、実態に関わらず、全地区での CBC 導入研修の実施を確認することができなかったことから、部分的に達成といえる。地区レベル研修講師向け第 3 年次 CBC 研修の実施から約半年後の 2018 年 6 月時点で、269 地区が CBC 導入研修の実施状況について回答し、そのうち 84%（226 地区）が実施したと報告している。

指標 2：DCC が設立された郡から、学校での CPD に関する好事例が四半期に 1 件以上報告される。

達成根拠：学校での CPD に関する好事例は定期的に報告されている。プロジェクトでは 2019 年第 1 四半期から四半期モニタリングを開始し、以来訪問したすべての郡において、好事例が確認されている。DCC 及び SCC においては、CPD 実施に関する障害として交通費負担の問題がよく挙がっていたが、一部の DCC 及び SCC では、外部から教師等を招いたり、他校に赴いたりして互いに CPD 活動を訪問する際に学校が学校交付金を使って給付するよう勧めていた。このように学校レベルでは CPD に関する主要な問題を自助努力により解決しようと乗り出している。この好事例はプロジェクトの最終セミナーで情報共有された。

CPD に関する報告システムを強化し、持続する政策も継続されていた。例えば、REB は 2019 年 7 月に郡レベルでパフォーマンス・コントラクト（イミヒゴ）に CPD に関する活動

を盛り込むよう通達を出している。この通達については 2019 年 12 月現在、地方自治省との間で協議中である。さらに、プロジェクトは、教師のコンピテンシーについて定め、全国的な CPD のモニタリング・レポーティングの仕組みを強化するために策定された National Teacher CPD Framework の作成過程にも協力した。プロジェクトが提案した、CPD における“Problem Solving Cycle”のコンセプトは、関係者が全国から CPD の好事例を即時に共有し、効率的に CPD のモニタリングやレポーティングを行うための仕組みとして、本文書の中で「ルワンダにおける教師の CPD モデル」として位置づけられた。本文書は 2019 年に正式に承認された。

指標 3：CPD に参加する教師の割合がベースライン値の 75%から 90%に増加する。

達成根拠：エンドライン調査では、学校で実施される CPD への参加率が高いことが確認された。今後も高い参加率が維持されることが見込まれる。プロジェクトでは定期的に教師の学校レベルの CPD への参加率を調査してきた。ベースライン調査では、全調査対象校において CPD が開催されており、75%の教師が参加していることを確認した。C/P とブリティッシュカウンシルと共に 2019 年 3 月に実施したオンライン調査では、2018 年において学期中に 1 回以上学校レベルの CPD に参加した教師の割合が 4,178 名の回答者のうち 81%に上ることが確認された。エンドライン調査では、CPD 参加率は 98%に達した。このことから、全国的な CPD の推進に伴い、DP の活動の有無に関わらず、教師が CPD に参加しているといえる。参加率の高さの背景には DCC や SCC が設立されたことが関係している可能性がある。DCC や SCC の設立により、CPD は教師の義務という認識が強まった。また、REB は 2021 年度から現職教員に義務付ける CPD コース（単位認定）の内容の検討を開始した。CPD を学校の時間割に含めることなど、他の政策やガイドラインも学校レベルでの CPD の継続を促進している。以上のことから、今後も教師が CPD を継続していく見込みは高い。

指標 4：開発された報告フォームを使ったレポート提出率が 50%以上となる。

達成根拠：2019 年 12 月に、BLF の支援により新しい CPD レポーティングシステムが REB のウェブサイト統合された。これにより、全国の DCC 及び SCC からの CPD レポート提出率は高くなると考えられる。CPD は今やナショナルアジェンダであり、REB と DP は様々な主体による CPD 活動を網羅的に把握するため、国レベルの一貫した CPD レポーティングシステムについて協議を進めてきた。特に本プロジェクトと BLF が協働してオンライン CPD レポーティングシステムを開発した。システムの設計・開発過程においては、IEE から各郡に派遣されている CPD アドバイザーが、郡による書面での CPD レポート提出を支援してきた。その結果、2019 年 9 月には 16 郡（53.3%）から CPD レポートが REB に提出されている。その他に、オンラインレポーティングシステムについて 2019 年 10 月以降、本プロジェクトと BLF で DCC ワークショップを実施し、新しい CPD レポーティングシステムに関する説明を行った。これらのことから、DCC 及び SCC においては、書面のレポートからオンラインレポートへの移行の準備ができており、指標に定められた 50%以上の提出率を達成できると考えられる。

第5章 教訓と課題

5.1 授業改善の教訓

5.1.1 授業研究の効果

前フェーズでは、CPD（SBI）の普及を優先したため、特定の CPD モデルは採用しなかった。一方、本プロジェクトでは、より本質的な教師の教え、生徒の学びを改善するために、授業研究を CPD モデルとして採用した。

エンドライン調査では、モデル校の教師のほうがコントロール校の教師よりも、CBC 授業に関して、単にグループワークを取り入れれば良い等の表面的な理解や典型的な誤解が少なく、授業案が大きく改善されていることが示された。授業では質問を多用し、より間接教授を行っている傾向があることが示された。さらには、モデル校の児童・生徒は「はい/いいえ」のような簡単な回答、覚えていることを確認・暗唱するような回答ではなく、オープンな回答をする機会がコントロール校よりも多く、また児童・生徒間のコミュニケーションが多いことも確認された。モデル校とコントロール校では、卒業試験の結果やクラスあたりの児童・生徒数などの比較においては類似性があると考えられるが、エンドラインの学力調査では、小中高、理数ともすべてモデル校の平均点のほうが高かった（中学理科以外は、有意に高かった）。

授業研究は各学期に 1 サイクルであり、プロジェクト期間内で数度の授業研究サイクルを回したのみである。したがってこれが学力の向上に貢献したとの結論を出すのは時期尚早である。しかしながら、CBC が望むような好ましい授業の変化、学びの変化は教室内で確認されており、授業研究はルワンダにおいても授業を変えるのに有効な手段であったと結論付けることは可能であろう。

授業研究を通じた好ましい授業の変化及び学びの変化の例

モデル校での授業研究を通じて、授業内で以下のような変化が確認されている。

- 児童・生徒の回答に対して、理由を聞くことで深い学びを促している
- 児童・生徒の発表をわかりやすく言い換えたり、説明を加えたり、間違いを他の児童・生徒に説明させたりしながら、クラス全員が理解できるよう工夫している
- グループワークにおいても、代表者だけでなく全員にノートを取るよう促している
- 実験の目的及び方法をクラス全体で明確にしてからグループで実験を行わせている
- 授業の最後に形成的評価のための質問を個々の児童・生徒に解かせ、それを教師が回収して次回の授業でフィードバックしている

5.1.2 教師の態度の変化

授業研究の効果の一つに同僚性の向上があることは、多くの先行研究（例えば木原，2004¹⁰）が示唆しているが、ルワンダにおいても、授業研究に参加したモデル校の教師は、

¹⁰ 木原俊行（2004）『授業研究と教師の成長』日本文教出版

コントロール校の教師に比べて、学校のビジョンの共有など意思統一がなされて、同僚性が高い傾向があることがエンドライン調査の結果に示された（ただしSBMや学校教科主任（School Subject Leader: 以下「SSL」）など校内のリソースパーソンとの関連性を示す因子得点が低かった、これはプロジェクト専門家への依存度が高まってしまったためと考えられる）。実際にモデル校の校長や教師も、授業研究を実施することで教師たちのチームワークが良くなり、マネジメントが楽になった実感があるなどのコメントしている。従って、授業の変化が直接的に児童・生徒の学力向上に貢献したというよりも、同僚性の向上などとの相乗効果が学校経営の改善に繋がり、その結果が学力向上に繋がったと考えるほうが妥当であろう。違う見方をすれば、授業研究を学校経営改善の手段として考えることも可能である。これは授業研究の副次的な効果といえる。

5.1.3 授業案を通じて授業の改善を視覚化

円滑に授業研究を導入することができたモデル校がある一方で、教師の巻き込みがうまくいかずに、授業研究を断念したモデル校もある。最後まで持続したモデル校の中にも、途中まで教師の巻き込みがうまく行かずに苦労したと漏らす校長もいる。とりわけ本プロジェクトが試行した授業研究は、教師に手当を払わずに、教師としての業務の一環と位置付けて実施してきたが、追加的業務と認識する教師や、類似の活動に手当を支払うDPもあることから、理解を得るのが難しい側面があった。金銭的支援に代わるインセンティブを用意する必要があった。教師にとってCPDを実施する一番のモチベーションは、自身の能力の向上であり、プロジェクトの立場から端的に見ればそれは「授業が上手になること」である。しかしながら授業の変化を本人が実感するように見せるのは難しい（元々の授業をそれほど悪いと自覚していないという側面もある）。このとき改善した授業案を見ることで、授業の改善度合いが視覚的にわかり、授業研究への参加に否定的であった教師が興味を持つようになった、との証言があった。プロジェクトのJCCに参加したREBの幹部からも、「授業案の改善は成果がひと目でわかり、様々な数字データを見せられるよりも説得力がある、授業案が適切に書けずに良い授業ができるわけがない」とのコメントがあった。授業研究の一番の特徴は、対象の授業を直接観察し改善を図ることであるが、それゆえ研究授業の指導に力点を置きがちである。ルワンダでは授業案の指導により一層力を入れることで、改善がさらに加速する可能性がある。

5.2 授業改善に残された課題

5.2.1 教科専門家

プロジェクトでは、日本人専門家や日本留学経験のあるルワンダ人ローカルスタッフがモデル校を巡回し、授業研究を直接指導してきた。これは、授業研究の一番の特徴は授業を直接見て改善することにあるからであり、また授業研究指導員の養成など通じて間接的に授業の改善を図ることは想定されていなかったためである。他方で、これまでにJICAが実施してきた授業研究支援の先行プロジェクトで明らかになっているとおり、授業研究の知見を持たない教師のみでの授業研究は改善効果が薄い。授業改善を図るためのCPDは授

業研究に限らないが、いずれにせよ教科内容に詳しい人材の先導なくして、さらなる授業改善は難しいであろう。教科指導が期待できる人材としては、SBM や SSL が考えられる。SBMP は全国の SBM を定期的に研修する仕組みを構築しているが、SSL については、例えば BLF の支援対象は小学校低学年の英数、アフリカ数理科学研究所（African Institute for Mathematical Sciences：以下「AIMS」）の支援対象は中等レベルの理数に限定されているなど偏りがある。教科専門家の育成は今後の課題となろう。

5.2.2 教授言語としての英語

プロジェクトでは発問や言い換えを駆使した「間接教授」が、暗唱などの児童・生徒の画一的な応答ではなく、多様な発言を生みだし、ひいては学力改善に繋がっている可能性を示した。間接教授は、教師、児童・生徒相互のコミュニケーションを基盤としているため、教授言語は大変に重要な要素となる。教育省は教師に英語力の定期的な測定を義務付け、児童がより早くから英語に親しめるよう、小学校 1 年生からの教授言語の英語化する予定であるが、これは逆説的に、授業中のコミュニケーションが円滑に行われていないことを示唆する。実際英語が不自由であるために教師が十分に説明できなかつたり、児童・生徒が理解できていないだろうと思われる場面は多数観察された。そのためプロジェクトでは、発問の趣旨が明確に伝わっていないと感じた際には、積極的に現地語で言い換えるよう指導してきた。教授言語の習熟、現地語との併用（妥協点の見出し）は引き続き課題である。

5.3 CPD の普及に関する教訓

プロジェクトが支援した郡の中で、DCC や SCC の活性化が進み、最も CPD の普及に成功したのは Rulindo 郡であろう。Rulindo 郡は小学校卒業試験の成績が低迷し、2017 年まで全国最下位を継続していたが、2018 年には最下位を脱している（29 位）。Rulindo 郡において観察された CPD 関連活動の好事例には次のようなものがある。

- 郡が DCC、SCC 活動費用を予算化した
- 郡レベル CPD 実行計画が作成され、翌年改訂された
- CPD 実行計画に授業研究が含まれた
- 全校に CPD 実施報告書作成が義務付けられた（モデル校においては、授業研究以外の CPD 実施報告書があることを本プロジェクトで確認済）
- SCC はプロジェクトが試行したモニタリングフォームを利用して DCC への月次報告を継続している
- SCC が学校間 CPD の日程を調整し、コストや業務分担を指示して（ホスト校が昼食を準備し、ゲスト校が報告書を作成するなど）学校間の学び合いを促進している
- 学校 CPD に指導員や保護者代表を呼ぶ場合には、学校交付金から交通費を支出する

プロジェクトのモニタリングを通じて、学校や DDE/DEO や SEO 個人の努力に由来する「点」での好事例を発見することは難しくなかったが、Rulindo 郡のように組織的に CPD

を推進した地域は多くない。Rulindo 郡の事例を参考に、CPD 促進のための教訓を抽出する。

5.3.1 リーダーの CPD への理解

Rulindo 郡の CPD 普及の促進要因としては、郡の CPD 計画力、実行力の高さがある。Rulindo 郡では CPD 実行計画が策定され、DCC や SCC の活動経費が予算化されている。これは知事や DDE から郡の幹部の理解がなければ実現できない。モニタリングでも、DDE 等へのヒアリングから知事の教育への関心の高さが窺えた。これは、Rulindo 郡はプロジェクト開始初期から介入した郡であり、地道な啓発の成果と考えられる。

ルワンダでは教師の採用は郡の管轄¹¹であったものの、現職教員の再訓練は REB など国の機関、DP らの支援で実施されてきた。そのため郡や地区では現職教員研修に関するオーナーシップを持つ必要性が理解されにくく、実際 DCC が未だ十分にリーダーシップを発揮できていない郡も少なくない。首長をはじめとするリーダーの理解が得られるためには、地道な啓発を継続する必要があるだろう。

5.3.2 現場の裁量で使える予算の維持

CPD は教師の活動であり学校レベルで実施されることが基本である。移動や日当宿泊費などのコストを伴わず、ゆえに CPD は費用対効果の高い教員研修手段としても認識されている。しかしこれは「CPD 予算は不要」ということを意味するものではない。実際 Rulindo 郡では、郡や学校交付金などの予算を活用し、これが CPD を活性化していると考えられる。一方で、これらは国や DP から財政支援ではなく、自助努力で実現可能な範囲で費用を工面し、CPD 活動を実現するものである。

現在多くの DP が CPD を支援し、様々な方法論が試されている。こうした多様性は CPD を発展させ、さらには CPD を教員文化とするために重要である。ルワンダでは以前 SBM を配置するために、学校交付金を国が一元管理したために、学校の CPD に対するオーナーシップが減退したことがある。SBM 制度推進の点では優れた施策であったが、自由に使える予算がなくなり CPD をはじめ、各学校の自主性を阻害する面もあった。各学校が創意工夫に基づき、学校交付金支出の柔軟性が担保されるよう啓発をし続ける必要がある。

5.3.3 SCC の活性化

学校レベルの CPD を活性化する際、直接指導的役割を果たすのは SCC である。Rulindo 郡の事例からは、DCC が SCC の活動に予算を配分したり、各学校に CPD レポートの作成を義務付けたりする（それにより SCC が各学校の CPD 実施度合いを容易に把握できる）など、SCC が定常的かつ積極的に CPD に関与できるように「仕向けて」いる様子が窺える。DCC もまた、各 SCC に CPD レポートを求めてフィードバックをしている。

DCC は直接 CPD に介入するのではなく、郡内で CPD 活性化のための施策を講じ、CPD 基盤を整備する役割を担うことが重要である。

¹¹ ただし 2019 年から国が主導する全国統一教員採用試験が実施された（試験会場は各郡）。

5.4 CPD の普及に残された課題

5.4.1 CPD の多様化

CPD に取り組む援助関係者が増えたこともあり、ルワンダにおける CPD の普及は非常に堅調である。授業研究、CoP、プロフェッショナル・ラーニング・コミュニティ（Professional Learning Community: 以下「PLC」）など多様な CPD 活動が生まれ、エンドライン調査では、全体で98%の教師が CPD に参加していることを確認した。一方、こうした CPD メニュー・用語の多様化が、関係者間の共通理解やコミュニケーションを妨げている場面も生じてきている（例えば、CoP 参加者が CPD には参加したことがないと答える、CPD の議論中にある者は CoP、ある者は PLC を想定しながら発言し齟齬が生じるなど）。このためプロジェクトのモニタリングでも CPD 活動の全体像の把握が難しかった。また CPD の多様化自体は自立発展性を高める上で望ましいが、今後は効果的な CPD と効果の低い CPD の差異も生じてくるだろう。CPD の多様化を推進しつつ、関係者の共通理解を高めていくことが今後の課題である。

5.4.2 CPD 時間の争奪

時間割に CPD 実践の時間を設け、学校として CPD に取り組むよう関係者は指導している。他方で、上述のとおり、CPD が多様化する中、各 CPD メニューの推進団体は、自分たちの CPD モデルを各学校に実施するよう求めている。モデル校においても、理数科教師は授業研究を行い、他教科は SBM が主導する CPD を行うなどの差が生じている。異なる CPD メニューを行うことが、教師間の軋轢を生まなければ問題ないが、これをストレスと感じ「CPD を強要される」という意識が芽生えてしまうと CPD の効果を損なうだろう。支援側も過剰な要求をせず、各学校の自主性を重んじて、限られた CPD 時間をどのように活用していくか、共通理解を醸成していく必要がある。

5.4.3 統合的モニタリングシステムの構築

今や CPD は国家的関心事である。上述のとおり、多くの DP が支援し、多様な CPD メニューが実践されている。現場関係者の CPD に対する認識も様々である。プロジェクトでは、紙媒体、報告書のメール添付など複数の方法で DCC や SCC に CPD 報告を求めたが、いずれも回答率は 50%程度に留まっている。また提出された報告書に有益な回答が多くは含まれておらず、報告者の報告書作成能力にも課題が残った。そのためプロジェクト最終年次から、他 DP と協力して、定期的に CPD モニタリングのあり方を協議する会議を設け、2019 年 8 月に、校長、SEO、DDE/DEO の代表者を招いて、モニタリングフォームを開発するためのワークショップを実施した。モニタリングフォーム案は、全 DCC に送付しコメントを求めた上で最終化され、10 月以降 BLF と共同で支援した DCC ワークショップで、DCC 及び SCC 関係者に利用方法に関するオリエンテーションが実施された。並行して、BLF のもと、フォームのオンライン化作業が進められ、教育情報ポータルにて 12 月 13 日に公開された。BLF の活動が 2023 年まで延長されたことで、システム運用面での心配は当面なく、オリエンテーションも実施されていることから、モニタリングが機能することは

十分に期待できるが、最終的な提出は、報告者への動機付けにかかっている。実際 DCC、SCC がうまく機能している郡では、すでに SCC から DCC へ報告書が定期的に提出されている。一方 DCC のリーダーシップが弱い郡では、限られたやる気のある SCC からしか報告書が提出されていなかった。ワークショップなどを通じてモニタリングへの動機付けをさらに高めていく必要があるだろう。

5.4.4 教育省、地方自治省、REB、地方政府の連携強化

ルワンダの教育課題は CPD に限らない。学校施設改善、進路指導、栄養改善、学力測定など様々は課題の改善が郡や地区に求められている。SEO はこれら重圧に晒され、連日ワークショップに呼ばれたり、学校を指導するよう求められたりしている。他方で人員は限られている。地方教育行政をめぐる、教育省、地方自治省、REB、地方政府のありかたについては、以前から多くの関係者が問題視してきた。SEO らが効率的に業務に取り組める環境整備は、学校現場の改善に直結しており、現在なお一層重要な課題になってきている。関係機関が一丸となってグランドデザインを描いていく必要がある。

5.5 プロジェクトマネジメントに関する教訓（促進要因）

ルワンダの CPD を取り巻く環境はプロジェクト開始当初から大きく変化し、ルワンダ政府の政策、REB の体制、他の DP の動向等がプロジェクトの活動や目標に影響を与えた。

5.5.1 ルワンダ政府の政策

CPD に関連する様々な政策文書が策定され、制度的枠組が急速に整備された。例えば ESSP では、CPD を優先課題の第 2 項に掲げ、国家レベルの CPD 推進体制を規定する National Teacher CPD Framework が策定・承認された。主要な CPD 施策を表 5-1 に示す。

表 5-1 : CPD に関する近年の大きな取り組み

政策レベル	- 教育セクター戦略計画 (ESSP)	2017
	- Teacher Statute	2019
	- Teacher Development and Management (TDM) policy	未定
	- National Teacher CPD Framework	2019
その他の決議及び通達	- 教師の昇進基準に CPD の実施状況を含むことが閣議決定事項として発表される	2019
	- CPD をパフォーマンス・コントラクト (イミヒゴ) に含めることを要請する通達が REB より発出される	2019
国レベルで承認されたマニュアル及びガイドライン	- DCC guideline	2016
	- SBMP Framework	2016
	- School-based CPD manual	2019
CPD コース (単位認定)	- UR-CE での CPD ディプロマ/単位認定コース - 教師や学校管理者向けの必修 CPD コース (単位認定:7 分野) が 2021 年度から開始予定	

前述のとおり、本プロジェクトは ESSP 策定の際に CPD の重要性を訴え、計画に含めることを提案したり、National Teacher CPD Framework の策定ワークショップに参加してルワ

ンダの CPD の理想概念として Problem Solving Cycle を提案したりした。一連の政策文書の中で、ルワンダ政府が CPD を重視する姿勢をとったことで、本プロジェクトの活動に対する C/P や他の DP の理解が高まり、CPD 支援環境が整った。他の DP の CPD 支援にも勢いがつき、多様な CPD が提案されている。CPD の多様化は自立発展性の源であることから、CPD はルワンダに根付くと予想される。

5.5.2 援助協調の推進

本プロジェクトが前フェーズから一貫して CPD を推進してきたことで、プロジェクト開始当初から CPD 支援に関して C/P と連携して活動を進めたり、援助協調の中で他の DP の基盤づくりに間接的に貢献する機会が生まれた。ESSP の優先課題に CPD が含まれたこともあり、本プロジェクトの他にも多くの DP が前述の制度・施策の策定を支援するようになった。また他方で制度が確立されることで DP が活動を促進できるという好循環が生まれ、多彩な CPD 活動が実践されている。ガイドラインやマニュアル等の教材の配布も進んでいる。主な DP の支援内容を表 5-2 に示す。

表 5-2 : CPD を支援する DP とその支援内容

DP	プロジェクト	目的	対象	アプローチ	地域
JICA	SIHQ	<ul style="list-style-type: none"> ・理数科授業の改善 ・CPD フレームワーク強化 	<ul style="list-style-type: none"> ・小中高教師 ・DDE/DEO/SEO 	<ul style="list-style-type: none"> ・CBC 導入研修、授業研究 ・DCC/SCC 支援 	全国
UNICEF/IEE	SBMP	SBM を通じた学校レベルでのコーチングの強化、英語力向上	小中高 SBM	<ul style="list-style-type: none"> ・メンター講師配置 ・郡 CPD アドバイザー配置 	全国
DFID	BLF	<ul style="list-style-type: none"> ・CoP による識字・計算能力強化 ・PLC による CPD リーダーシップ強化 ・CPD の M&E 強化 	<ul style="list-style-type: none"> ・小学校低学年 SSL ・小学校校長 ・DCC/SCC 	<ul style="list-style-type: none"> ・SSL 研修 ・教材整備、英語訓練、e ラーニングの活用 ・州 CPD 調整員配置、DCC/SCC 支援 	全国
USAID	Soma Umenye	識字	小学校低学年教師	教材整備と CPD を通じた学校現場での実践強化	全国
VVOB	Girls on MARS CPD ディプロマコース	<ul style="list-style-type: none"> ・女子数学力強化 ・CPD ディプロマコースの運営 	小中高校長	<ul style="list-style-type: none"> ・UR-CE と連携した遠隔教育（単位認定コース） ・CPD を通じた新任教師の数学強化 	17 郡
Wellspring	Multiplier	学校レベルでのコーチングの強化	Multiplier	Multiplier 研修	Gasabo Rubavu
Mastercard Foundation	AIMS	STEM 教育の推進	中高理数 SSL	SSL 研修	全国

SBMP のもと、CPD アドバイザーが各郡に配置されたことにより、CPD アドバイザーとメンター講師が協力して継続的な SBM の研修を行うようになった。VVOB や Wellspring が活動する郡では、Peer Learning や Multiplier による支援などの CPD が普及している。BLF

は全国規模で英語と算数の SSL を研修することで CPD の強化を図っている。これらが、SBI に加え、現在の CPD の基盤となっている。またプロジェクトのモニタリングが明らかにしたように、すでに大半の教師がなんらか CPD に参加し、さらには、2021 年度から政府認定の必修 CPD コースを教師に提供することも発表された。CPD の自立発展性の展望は非常に明るく、今後教師の職能開発の原動力となる可能性は極めて高い。

こうした連携が進んだ理由としては、上述のとおり政策・制度的枠組みが整備されたことに加えて、教員職能開発作業部会（Teacher Professional Development Technical Working Group: 以下「TPD-TWG」）を介して、DP の議論・意見交換が活発になされていることがあげられる。3.5.2 に記載の通り、お互いの活動にコンテンツを融通し合ったり、費用を折半して合同ワークショップを実施したりするなど、実際の活動においても連携が進んだ。本プロジェクトの執務スペースが C/P 機関にあることで、C/P とだけでなく、各地に点在する各 DP との円滑なコミュニケーションに貢献している部分はあるだろう。またこうした連携が進むことで小規模な本プロジェクトでも、CPD のインパクトが十分に期待できる状況を作り出すことができた。

5.6 プロジェクトマネジメント上の課題（阻害要因）

5.6.1 C/P の交代

2 章で述べたように、プロジェクト期間中に、REB の組織改編や人事異動に伴い C/P が全員入れ替わることとなった。このため、プロジェクト期間にわたって一貫した技術移転を行うことはできず、C/P の交代の度にプロジェクトの目標・活動やそれまでの成果に関して丁寧に説明を行い、協働体制を改めて構築することとなった。加えて、ルワンダは「小さい政府」を志向しており、DP や NGO と協力して活動を進めていく傾向がある。各職員が、DP 等の活動との連携を含む多くの業務を担当している。なお、地方行政も同様であり、人員不足の中、異動や交代も頻繁にあることから、DDE/DEO/SEO は、現地で長く活動する DP 等との協力が欠かせない。プロジェクトとしては、R/D 締結時点で C/P との連携に関して共通理解をもつことが鍵であろう。

5.6.2 REB でプロジェクトを実施することの難しさ

REB は教育省の実施機関（Executive Agency）であり、教育省が決定した政策に従って業務を遂行するなど、自らの裁量で活動を実施できない難しさがある。また特に公平性を重視するため、REB の活動として特定のグループを対象とするパイロットやモニタリングを行うことは好まれない。これら活動を実施する場合には、REB 内で繰り返しの説明が求められ、決裁に時間を要することが多い。DCC や SCC を対象とする場合は、教育省や地方自治省に対する説明も必要である。こうしたステークホルダーが多岐にわたるパイロット活動については、プロジェクト開始前に広く関係者と R/D レベルで合意形成を行うことで、とりわけ本プロジェクトのように投入量が少ないプロジェクトの場合は、円滑に業務を進めることができるであろう。

第6章 提言 ～CPDの普及拡大から質の向上へ～

6.1 ルワンダにおけるCPD及び授業研究の展望

5章で述べたように、CPDの自立発展性の展望は非常に明るく、今後教師の職能開発の原動力となる可能性は極めて高い。上位目標（本質的な学び）の達成は十分現実的である。ただし、その達成をより戦略的、効率的に成し遂げるためには、CPDの質の向上が不可欠である。例えば、各学校の自主性に完全に委ねられた学校CPDにおいては、依然として知識伝達型講習になっていたり、時間の関係からプログラムの一部のみの不十分な実施になっていたりするなど、質に課題が見られるケースが各地で散見される。つまり、ルワンダにおけるCPDの課題は、今後は量的拡大から質の向上に焦点が移ると考えられる。

プロジェクトでは、計画 - 実施 - モニタリング・評価 - 改善、という一連のCPDサイクルを的確に運営できるよう、成果2関連活動を通じてこの強化に取り組んできたが、1) モニタリングができること、2) 実施に関する好事例を共有できること、が当座の目標であった。その結果、CPDサイクルを運用することはできるようになったが、CPDの質を問うには至っていない。この方策を考えることができるかが真のCPD成功の鍵である。どのような方策が必要か次項以降で考えてみたい。

6.2 関係者間の連携強化

6.2.1 一貫性あるカリキュラムの実施のための横断的な体制構築

CPDを通じて学力向上を目指すことは、つまりは「カリキュラム」、「教室実践」及び「教育アセスメント」の一貫性ある実施を図ることに他ならない。幸いなことに、ルワンダではComprehensive Assessmentと呼ばれる施策が2019年に導入され、2学期末は郡統一学力テスト、3学期末には全国統一学力テストが実施されることとなった。そのため学力の比較分析が容易になり、CPDで教え方を改善し、学力向上に繋げようとの機運が郡レベルでは醸成されつつある。

しかしながら、国レベルでは、アセスメントはREBの試験局が担当し、また教育省・視学官が学校のモニタリングを監督するが、これらの連携は未だ極めて薄い。例えばSEOは現在教育省に対して学校施設、就学状況、学校環境衛生、CPDなど、教育のあらゆる項目を含むレポートを毎月提出している。報告事項にCPDに関する項目が含まれるがデータはREBに共有されていない。

TPD-TWGは教育セクターにおいて最も活発かつ有益な議論が交わされている作業部会の一つであるが、REBのTDM&CGC部局内の調整機能に留まっている。CPDや学力向上など複数部局にわたる事案については、組織横断的な作業部会を設置することが望ましいと考えられる。

6.2.2 パフォーマンス・コントラクト（イミヒゴ）の利用

REB は 2019 年、各郡のパフォーマンス・コントラクト（イミヒゴ）に CPD を含めるよう通達を出した。ルワンダにおいてイミヒゴの効力は非常に高く、こうした組織横断的な事案は、関係機関で連携することにして、統合的なイミヒゴを合意することは効果的であろう。

6.3 包括的モニタリング

CPD は量的拡大から質保証に課題が移るだろうことを前述した。しかしながらプロジェクトが構築を図った統合的オンラインモニタリングシステムは、現状に合わせ、量的拡大の度合いをモニタリングすることに主眼が置かれ、CPD の質を評価するには適さないのが実情である。CPD の成熟度合いに合わせて、ある時点でシステムを更新し、より質の評価に適した内容に移行することが望ましい。

6.4 柔軟な予算措置

上述した通りルワンダにおける CPD は多様化している。様々な CPD 手法や取り組みが提案され、それが教師にとって CPD を実践する動機付けとなっている。今後も教師がアクティブラーナーであり続けるためには、研修を提供する側は CPD の手法について定期的に最新情報を把握し、新しいアイデアを導入することで教師の知的好奇心を刺激し、無理なく CPD を継続できるように取り組まなくてはならない。5 章にも記載したとおり、特定の活動に予算を分配するばかりでなく、例えば学校交付金のような、いかなる CPD に対しても支出可能な財源は、新規手法提案側、参加者側双方を活性化し、より創造的な CPD 環境を創出することができるだろう。

6.5 授業研究の普及

本プロジェクトでは、ルワンダにおいても授業研究は、授業改善、学力向上の有効なアプローチであることを示した。CPD の目的や手法は様々であるが、授業改善を CPD の目標に置くのであれば、最善策は教室内で授業を直接修正することであり、授業研究は優れた CPD 手法の一つである。ルワンダにおける授業研究の普及推進の提言を以下にまとめる。

6.5.1 授業研究の必要性の判断

ルワンダにおいて CPD は、教授言語の英語化への対応、CBC 授業への対応など、教師の授業改善ニーズに応える形で普及拡大してきた。他方で CBC の導入は、授業改善以外にも、ICT 活用、インクルーシブ教育、進路指導など様々な教師の職能開発ニーズを喚起してきており、これらも CPD で対応していくことになるだろう。実際、2020 年度から必修 CPD コースを実施するとの方針が 2019 年 12 月の TPD-TWG で REB から示されているが、それらは 1) 教授法、2) インクルーシブ教育、3) 進路指導、4) ICT、5) 自己認識、6) コー

チング、7) 教育測定評価の 7 領域が対象とのことであった。これらは教師個人の CPD であり（オンラインコース化も検討中とのこと）、授業研究や CoP のような、学校や地区で実施するクラスター型の CPD とは異なるが、教師の負担を軽減するため、時間割内に設けられた CPD 時間の中で実施するよう指示される可能性は高い。加えて様々な DP が CPD メニューを提案しているため、学校での CPD 活動は飽和状態になることが予想される。

(1) 授業研究が必要な時期の見極め

こうした中で授業研究の実施を強硬に主張するのは得策でないと考える。授業研究の普及・強化を検討する場合には、支援時期の見極めが重要となろう。

Comprehensive Assessment が実施されたことで、学力改善に資する CPD 支援のニーズは自然に高まっていくと予想される。仮に必修 CPD コースで「1) 教授法」を学んでも、それを教室内で活用するには、さらに実践での訓練が必要となることは、CBC 導入研修のみでは授業改善に課題が残った過去の経験が示唆している。学力向上の機運、現状の授業に対する REB や地方教育行政官の問題意識、あるいは教員のモチベーションが高まったタイミングを見極め、授業研究を導入すれば、普及定着する可能性が高まるであろう。

(2) 教科専門家の配置と継続的な訓練メカニズムの構築

Darling-Hammond、Hyler、Gardner (2017)¹²は、表 6-1 に示すとおり効果的な教師の職能開発の 7 要素を特定したが、プロジェクトの授業研究はそのすべてを満たしている。有効な CPD は授業研究に限らないが、授業研究は教師が 7 要素を知らずとも、自然に効果的な CPD に参加できるという良さがある。逆に言えば、授業研究を実施するには、これら 7 つの要素を満たす条件が整っているかを吟味することが肝要である。

ここで、特に注目されるのが、Comprehensive Assessment において各郡で統一学力テストが実施される際に形成される、各教科の問題作成チームである。Comprehensive Assessment のガイドラインによれば、このチームは各郡が経験豊富な教師を選抜して形成することになっている。日本では各教育委員会が、教授法と各教科に精通したベテランの教師の中から指導主事を任命し（小規模の市町村の教育委員会の場合には、都道府県の教育委員会が指導主事を派遣したり配置したりするなどの支援を行う）、指導主事が授業研究の外部専門家として授業研究で指導的役割を果たす。これに倣い、Comprehensive Assessment の問題作成チームが、同時に各郡の授業研究の指導も行えば、授業の実践から評価に至る一貫した指導・監督体制を構築できる。さらにメンター講師が SBM を定期的に訓練する仕組みを踏襲し、問題作成チームが SSL を定期的に研修する制度を構築することができれば、自立発展性を高めることができる。JICA がエチオピア国で実施した「理数科教育アセスメント能力強化プロジェクト (LAMS)」の支援内容と研究授業指導を組み合わせ、ルワンダでも各郡の問題作成チームの能力強化を目的とした支援を実施することは一考に値するだろう。

¹² Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). Effective teacher professional development. Palo Alto, CA: Learning Policy Institute.

表 6-1 : 教師の効果的な職能開発の 7 要素

効果的な教師職能開発モデルの特徴	概要	授業研究における解釈
1: コンテンツ重視	教師の教室の文脈の中で特定のカリキュラム内容に関する指導戦略を重視。	特定の授業を選択し、授業案を作成する。
2: アクティブラーニング	教師が直接指導戦略を検討し、試行できる上に、教師にとっても、生徒に対して想定しているのと同じ学び方を実践する機会が与えられる。	教師は実践的かつ参加型の授業案作成、マイクロティーチング、研究授業及び振り返りの機会が与えられる。
3: 協働	教師が自らの学びにおいて、職務に根ざした環境の中でアイデアを共有したり、協働したりする場が創出される。	授業を共に開発するために議論し、協働することを促している。
4: 効果的な実践モデルを提供	最適な指導戦略がどのようなものかについて明確なビジョンが与えられる。	研究授業において、具体的なテクニックやモデルを適用する。
5: コーチングや外部専門家の支援	各教師のニーズに直接着目して、コンテンツやエビデンスベースの実践に関する専門的知見が与えられる。	授業の文脈の中で助言を与えられるよう、副校長、SBM、SSLなどを関わらせる。
6: フィードバックと振り返り	CPD の時間の中に、振り返りのファシリテーションやフィードバックを募る場面があり、教師が考えたり、インプットをもらったり、指導法を変えたりする時間が組み込まれている。	マイクロティーチングと授業研究の最後に振り返りや授業案の修正の時間が確保されている。
7: 十分な時間	指導を改善するための新しい戦略について学び、練習し、実践し、振り返るための十分な期間が与えられている。	学校での日常業務の中に計画、実践、振り返りの継続的なサイクルが組み込まれている。

(3) 授業研究実施時間の確保

授業研究を実施するためには、計画 - 実施 - モニタリング・評価 - 改善の一連のプロセスをすべて実施しなければ効果は期待できず、十分な CPD 時間を確保する必要がある。しかし繰り返し述べてきたように、現状 CPD メニューは多彩で、必修 CPD コースの導入も予定される中、授業研究の時間が担保されるのかについては、仮に支援を検討するのであれば、事前に現地側と十分な協議を行い、合意形成をしておかなければならないだろう。

(4) 教員養成校附属校の活用

世界銀行の支援により、教員養成校附属校の増改築、施設更新が行われる予定である。ルワンダ政府は附属校を各地域のモデル校とし、教育実践を強化し、教育実習の質の向上を図る計画であるが、その具体的な方策はまだ明らかではない。授業研究は、授業が拙い教育実習生が実施者になるほうが、改善点が多く、また授業観察者も実習生の授業に対しては気兼ねなく指摘できるため、リフレクションが活性化する傾向にある。教育実習と授業研究の相性は良い。従ってこの附属校改革は、各地に授業研究を導入する好機であり、連携の機会を窺うことが望ましい。

添付資料

添付 1. PDM 初版

ANNEX: Project Design Matrix (PDM)

Project Title: Project for Supporting institutionalizing and Improving Quality of SBI Activity

Implementing Agency: Rwanda Education Board (REB)

Target Group: Primary, lower secondary, and upper secondary school

Project Period: January, 2017 - December 2019 (three years)

Target Area: REB (Kigali), Schools (Nationwide)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions										
Overall Goal Students' learning process in classroom is improved.	1) Degree on Student participation in lessons. 2) Result of the test (e.g. TIMSS type) to evaluate the conceptual understanding of learners.	1) Survey in sampled schools 2) Survey in sampled schools											
Project Purpose Implementation of CBC-based lesson in the classroom is strengthened through SBI activities.	1) Quality of lesson plans developed by teachers 2) Result of lesson observation focusing on teachers' behavior 3) Result of lesson observation focusing on learners' behavior	1) Survey in sampled schools 2) Lesson observation in sampled schools 3) Lesson observation in sampled schools											
Outputs 1. Teachers' understanding of CBC-based lesson implementation is enhanced. 2. Problem-solving capacities are enhanced at school, sector, district, and national level.	1) Result of understanding test of workshop participants 2) Self-evaluation of teachers' understanding of CBC-based lesson 1) Understanding of participants in workshop 2) Good practices of SBI and CBC lessons at school 3) Rate of schools implementing SBI 4) Rate of reports submitted using developed report forms	1) Questionnaire survey to trainees 2) Questionnaire survey to trainees 1) Questionnaire survey to trainees 2) Monitoring Report, DCC minutes 3) Questionnaire survey for SEO 4) Monitoring Report	PCs are distributed to all SEOs and used by them. Textbooks are distributed to all schools.										
Activities 0-1 Baseline survey 0-2 End-line survey 1-1 To develop a CBC-based lesson guideline (including lesson planning manual, tips, etc.). 1-2 To develop CBC-based lesson samples (e.g. video). 1-3 To develop a guideline on CBC-based lesson assessment. 1-4 To conduct workshops regarding CBC-based lesson implementation. 1-5 To support model schools to develop good practices on CBC-based lessons. 2-1 To develop a practical guideline on functioning DCC. 2-2 To raise awareness about the importance of DCC and to enhance understanding of the roles (e.g. workshop). 2-3 To develop a SBI implementation manual (including the procedure). 2-4 To develop a guideline on observing CBC-based lessons. 2-5 To design monitoring forms (including electronic form, simple and user-friendly) by reviewing the existing ones and conducting a rapid survey. 2-6 To conduct training for REB by JICA Experts to develop the capacity to collect and analyze data, and to develop solutions. 2-7 To conduct training for REB and National Trainers (including professors of UR-CE) to develop the capacities to evaluate CBC-based lessons by JICA Experts. 2-8 To conduct training for HT/SEO/DEO to develop the capacities to evaluate CBC-based lessons, to collect and analyze data, and to develop solutions 2-9 To conduct monitoring on the situation of CBC and SBI implementation (including email questionnaire survey and technical advice). 2-10 To develop materials to address challenges identified in the reports submitted to REB. 2-11 To conduct a training based on the materials developed above for REB and National Trainers.	<table border="1"> <thead> <tr> <th colspan="2">Input</th> </tr> <tr> <th>Japanese Side</th> <th>Rwandan Side</th> </tr> </thead> <tbody> <tr> <td> 1. Expert Teaching Method Specialist Math and/or Science education Specialist Monitoring Specialist 2. Equipment and Materials When necessary </td> <td> 1. Counterpart personnel and administrative personnel 2. Suitable office space with necessary equipment including utility cost 3. Training Cost: REB will provide the necessary budget for local training. </td> </tr> </tbody> </table>	Input		Japanese Side	Rwandan Side	1. Expert Teaching Method Specialist Math and/or Science education Specialist Monitoring Specialist 2. Equipment and Materials When necessary	1. Counterpart personnel and administrative personnel 2. Suitable office space with necessary equipment including utility cost 3. Training Cost: REB will provide the necessary budget for local training.	Budget for conducting cascading workshop after 2017 is ensured.	<table border="1"> <thead> <tr> <th>Pre-condition</th> </tr> </thead> <tbody> <tr> <td> Security condition of Rwanda is stable, etc. </td> </tr> <tr> <td> Major Stakeholders collaborate with the project </td> </tr> <tr> <td> SBI is continuously used as the measure for CBC implementation. </td> </tr> </tbody> </table>	Pre-condition	Security condition of Rwanda is stable, etc.	Major Stakeholders collaborate with the project	SBI is continuously used as the measure for CBC implementation.
Input													
Japanese Side	Rwandan Side												
1. Expert Teaching Method Specialist Math and/or Science education Specialist Monitoring Specialist 2. Equipment and Materials When necessary	1. Counterpart personnel and administrative personnel 2. Suitable office space with necessary equipment including utility cost 3. Training Cost: REB will provide the necessary budget for local training.												
Pre-condition													
Security condition of Rwanda is stable, etc.													
Major Stakeholders collaborate with the project													
SBI is continuously used as the measure for CBC implementation.													

添付 2. PDM 第 2 版

Project Title: Project for Supporting institutionalizing and Improving Quality of SBI Activity

Implementing Agency: Rwanda Education Board (REB)

Target Group: Primary, lower secondary, and upper secondary school (74,584 teachers)

Period of Project: January, 2017 - December 2019 (three years)

Project Site: Kigali (REB) Model Site: EP Buhande, GS Kabuye Catholique, GS Mukarange Catholique, GS APAGIE Musha, GS St Aloys Rwamagana, Lycee Notre Dame des Apotres Rwaza (86 teachers)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptior
Overall Goal Students' learning process in classroom is improved.	1) More students in model schools than those in non-model schools present relevant responses to an open question posed by a teacher. 2) Result of the academic achievement test developed by the Project improves more in model schools compared to non-model schools.	1) Lesson observation in sampled schools* 2) Results of the academic achievement test in sampled schools	
Project Purpose Implementation of CBC-based lesson in the classroom is strengthened through SBI activities.	1) Lesson plans developed by teachers in model schools include five focused elements out of six specified in Competence 2.1 of the National Teacher CPD Framework. 2) Teachers give more open questions in model schools compared to non-model schools.	1) Lesson plans developed by Lesson Study in sampled schools 2) Lesson observation in sampled schools	
Outputs 1. Teachers' understanding of CBC-based lesson implementation is enhanced. 2. Problem-solving capacities are enhanced at school, sector, district, and national level.	1) Post-test results of participants in trainings and workshops including an e-learning course exceed 70%. 2) Self-evaluation of teachers' understanding of CBC-based lessons continues to be 90% or above. 1) All sectors implement sector-based CBC training. 2) More than one good practice of school-based CPD is reported quarterly from all DCCs that have been established. 3) The rate of teachers' participation in school-based CPD increases from 75% (baseline) to 90%. 4) More than 50% of DCCs and SCCs submit monitoring reports using a developed form on a termly basis.	1-1) Post questionnaire survey to participants in technical stream of CBC training 1-2) Online CPD course assessments 2-1) Questionnaire survey at sampled schools 2-2) Questionnaire survey to participants in technical stream of CBC training 1) Monitoring conducted by REB 2-1) Termly Monitoring Report submitted by DCCs and SCCs 2-2) Quarterly Monitoring Report 3-1) Questionnaire in sampled schools 3-2) Termly Monitoring Report submitted by DCCs 4) Termly Monitoring Report submitted by DCCs and SCCs	PCs are distributed to all SEOs and used by them. Textbooks are distributed to all schools.
Activities	Inputs		
0-1 Baseline survey 0-2 End-line survey 1-1 To develop a CBC-based lesson guideline (including lesson planning manual, tips, etc.). 1-2 To develop CBC-based lesson samples (e.g. video). 1-3 To develop a guideline on CBC-based lesson assessment. 1-4 To conduct workshops regarding CBC-based lesson implementation. 1-5 To support model schools to develop good practices on CBC-based lessons. 1-5-1 To support Lesson Study to share good CPD practices nationwide. 1-5-2 To measure learners achievement in Lesson Study 2-1 To develop a practical guideline on functioning DCC. 2-2 To raise awareness about the importance of DCC and to enhance understanding of the roles (e.g. workshop). 2-2-1 To conduct workshops on DCC 2-2-2 To support DCC in conducting an Open Day to share good CPD practices. 2-3 To develop a CPD implementation manual (including the procedure). 2-4 To develop a guideline on observing CBC-based lessons. 2-5 To design monitoring forms (including electronic form, simple and user-friendly) by reviewing the existing ones and conducting a rapid survey. 2-6 To conduct training for REB by JICA Experts to develop the capacity to collect and analyze data, and to develop solutions. 2-6-1 To enhance capacity of REB to collect and analyze data and to develop solutions through the need assessment survey of CBC training. 2-7 To conduct training for REB and National Trainers (including professors of UR-CE) to develop the capacities to evaluate CBC-based lessons by JICA Experts. 2-8 To conduct training for HT/SEO/DEO to develop the capacities to evaluate CBC-based lessons, to collect and analyze data, and to develop solutions. 2-9 To conduct monitoring on the situation of CBC and CPD implementation (including email questionnaire survey and technical advice). 2-9-1 To collect quantitative data of CBC and CPD implementation through termly monitoring. 2-9-2 To collect qualitative data of CBC and CPD implementation through quarterly monitoring. 2-10 To develop materials to address challenges identified in the reports submitted to REB. 2-10-1 To elaborate analysis reports of monitoring (including good CPD practices). 2-11 To conduct a training based on the materials developed above for REB and National Trainers. 2-11-1 To conduct a national DCC/SCC forum to enhance monitoring mechanisms.	The Japanese Side 1. Expert Teaching Method Specialist Math and/or Science education Specialist Monitoring Specialist 2. Equipment and Materials When necessary	The Rwandan Side 1. Counterpart personnel and administrative personnel 2. Suitable office space with necessary equipment including utility cost 3. Training Cost: REB will provide the necessary budget for local training.	Budget for conducting cascading workshop after 2017 is ensured. Pre-Conditions Security condition of Rwanda is stable, etc. Major Stakeholders collaborate with the project SBI is continuously used as the measure for CBC

*Sampled schools(11): model schools(6) + non-model schools(5)
Model schools are listed below.
• EP Buhande
• GS Kabuye Catholique
• GS Mukarange Catholique
• GS APAGIE Musha
• GS St Aloys Rwamagana
• GS Notre Dame des Apôtres Rwaza

Non-model schools are listed below.
• EP Bukinanyana ADEPR
• GS Gihogwe Catholique
• GS Bubazi
• Lycée Notre Dame de la Visitation (LNDV)
• GS Rambura Garçons

**Five focused elements are listed below.
1. Clear and measurable learning outcomes and objectives and activities to achieve them.
2. Learning outcomes and objectives support learners to move from simple and familiar to more complex and sophisticated knowledge and skills
3. Regular revision of learning and learning assessments.
4. Adaptions for specific learners.
5. Use a range of TLRs, vary interaction patterns

添付 3. 機材リスト

No.	Name of Equipment	Type	Currency	Price	Date of purchase (YYYY/MM/DD)	Note	after the project period
1	All-in-one printer	WorkCentre 7225	USD	6,386	2017/1/26	Printing under wired connection	Handed over to REB
2	Laptop PC	HP Probook Core i5 450	RWF	650,000	2017/1/17		Handed over to REB
3	Laptop PC	HP Probook Core i5 450	RWF	650,000	2017/1/26		Handed over to REB
4	Laptop PC	HP Probook Core i7	RWF	650,000	2017/5/22		Handed over to REB
5	Projector	Epson EB-1761W	JPY	65,284	2017/2/19		Handed over to REB
6	Action camera (wearable camera)	Telepathy Walker TPC008	JPY	92,592	2017/3/31		Handed over to REB
7	Projector	Sony VPL-DW126 Projector	RWF	964,920	2014/2/21		Returned to JICA Office

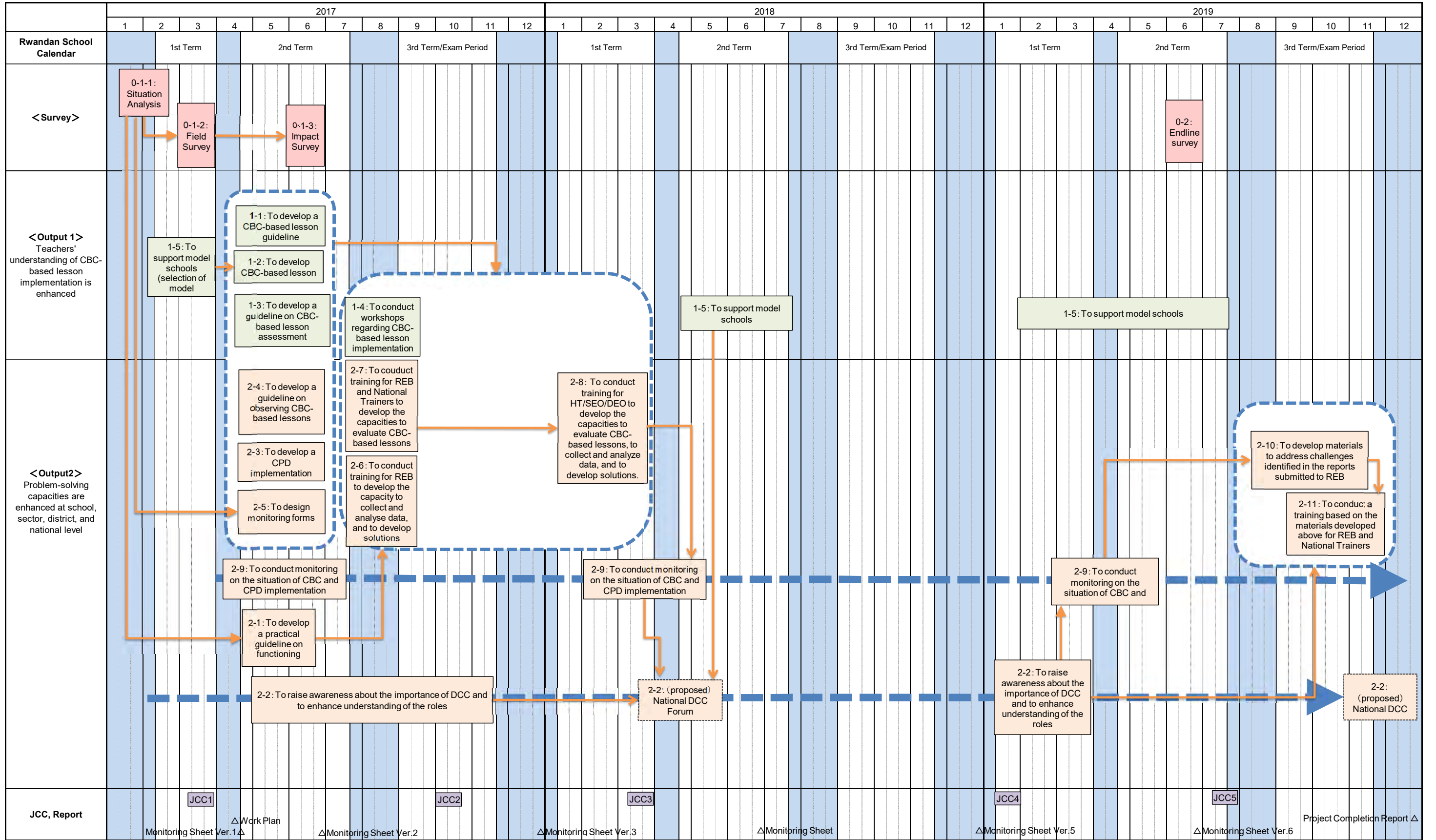
添付 4. 詳細活動計画

Detaild Work Plan

Activity	2017												2018												2019															
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12				
Rwandan School Calendar	1st Term				2nd Term				3rd Term/ Exam Period				1st Term				2nd Term				3rd Term/ Exam Period				1st Term				2nd Term				3rd Term/ Exam Period							
0-1 Baseline survey	█				█																																			
0-2 Endline survey																									█															
Output 1																																								
1-1 To develop a CBC-based lesson guideline (including lesson planning manual, tips, etc.)					█																																			
1-2 To develop CBC-based lesson samples (e.g. video)					█																																			
1-3 To develop a guideline on CBC-based lesson assessment					█																																			
1-4 To conduct workshops regarding CBC-based lesson implementation					█																																			
1-5 To support model schools to develop good practices on CBC-based lessons					█								█																											
Output 2																																								
2-1 To develop a practical guideline on functioning DCC					█																																			
2-2 To raise awareness about the importance of DCC and to enhance understanding of the roles (e.g. workshop)	█																																							
2-3 To develop a CPD implementation manual (including the procedure)					█				█																															
2-4 To develop a guideline on observing CBC-based lessons					█				█																															
2-5 To design monitoring forms (including electronic form, simple and user-friendly) by reviewing the existing ones and conducting a rapid survey	█												█				█																							
2-6 To conduct training for REB by JICA Experts to develop the capacity to collect and analyse data, and to develop solutions					█																█																			
2-7 To conduct training for REB and National Trainers (including professors of UR-CE) to develop the capacities to evaluate CBC-based lessons by JICA									█				█																											
2-8 To conduct training for HT/SEO/DEO to develop the capacities to evaluate CBC-based lessons, to collect and analyze data, and to develop solutions.													█																											
2-9 To conduct monitoring on the situation of CBC and CPD implementation (including email questionnaire survey and technical advice)					█																																			
2-10 To develop materials to address challenges identified in the reports submitted to REB																	█																							
2-11 To conduct a training based on the materials developed above for REB and National Trainers																													█											
Report	Monitoring Sheet Ver.1 Δ Δ Work Plan Δ Monitoring Sheet Ver.2 Δ Monitoring Sheet Ver.3 Δ Monitoring Sheet Ver.4 Δ Monitoring Sheet Ver.5 Δ Monitoring Sheet Ver.6 Project Completion Report Δ																																							

添付 5. 業務フローチャート

Work Flow Chart



添付 6. ベースライン調査報告書



REPUBLIC OF RWANDA RWANDA EDUCATION BOARD

Baseline Survey Report

The Project for Supporting Institutionalizing and
Improving Quality of SBI Activity (SIIQS)

September 2017

The SIIQS project is the initiative under Teacher Education Management and Professionalisation department (TEMP) in Rwanda Education Board (REB) assisted by PADECO Co. Ltd. through Japan International Cooperation Agency (JICA).

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Abbreviations and Acronyms

9/12 YBE	9 Years Basic Education School and 12 Years Basic Education School
AAT	Academic Achievement Test
AL	Active Learning
BLS	Baseline Survey
CBC	Competence Based Curriculum
CPD	Continuous Professional Development
DCC	District CPD Committee
DDE	District Director of Education
DEO	District Education Officer
DOS	Director of Study
HOT	Higher Order Thinking
HT	Head Teacher
INSET	In-Service Teacher Training
JICA	Japan International Cooperation Agency
LCP	Learner Centered Pedagogy
LS	Lower Secondary
MINEDUC	Ministry of Education
PS	Primary School
RCA	Rate of Correct Answer
REB	Rwanda Education Board
SBCT	School-based Collaborative Teacher Training
SBI	School-based INSET
SBM	School-based Mentor
SBT	Sector-based Trainer
SEO	Sector Education Officer
SIIQS	Supporting Institutionalizing and Improving Quality of SBI Activity
SSL	School Subject Leader
TEMP	Teacher Education Management and Professionalisation Department
TIMSS	Trends in International Mathematics and Science Study
TTC	Teacher Training College
TWA	Typical Wrong Answer
US	Upper Secondary

1 Introduction of the Baseline Survey

1.1 Background

The introduction of a Competence-based Curriculum (CBC) calls for a major paradigm shift on teaching. With CBC, the teacher is expected not only to deliver the knowledge, but also to facilitate the learners in their learning process to attain competencies. The teacher is also expected to be the reflective practitioner, constantly thinking critically for improving lessons. This transformation must take place with all teachers, regardless of their years of experience.

The Project of Supporting Institutionalizing and Improving Quality of SBI (SIIQS Project) aims at prompting this transformation, particularly in Mathematics and Science through strengthening the School-Based INSET (SBI) framework. To this end, the SIIQS Project is to develop CBC training materials in mathematics and science for SBI, and to enhance capacities of districts and sectors for resolving problems of CBC and SBI so that schools can improve CBC lesson quality in a timely manner. Table 1-1 describes the outline of the SIIQS project.

Table 1-1 Project Design of SIIQS

Overall Goal (Indicators)	Students' learning process in classroom is improved. 1) Degree on Student participation in lessons. 2) Result of the test (e.g. TIMSS type) to evaluate the conceptual understanding of learners.
Project Purpose (Indicators)	Implementation of CBC-based lesson in the classroom is strengthened through SBI activities. 1) Quality of lesson plans developed by teachers 2) Result of lesson observation focusing on teachers' behavior 3) Result of lesson observation focusing on learners' behavior
Outputs (Indicators)	(1) Teachers' understanding of CBC-based lesson implementation is enhanced. 1) Result of understanding test of workshop participants 2) Self-evaluation of teachers' understanding of CBC based lesson (2) Problem-solving capacities are enhanced at school, sector, district, and national level. 1) Understanding of Participants of Workshop 2) Good practices of SBI and CBC lessons at school 3) Rate of schools implementing SBI 4) Rate of reports submitted using developed report forms
Target Area	Kigali (REB) – Main workplace, Primary and Secondary schools
Duration	Jan. 2017 ~ Dec. 2019 (3 Years)
Beneficiaries	Primary school teachers (39,370), Secondary school teachers (18,593) *Mainly mathematics and Science teachers

1.2 Objectives

The SIIQS project conducted the Baseline Survey (BLS) as the first project activity. Objectives of BLS were 1) to grasp the current situation, 2) to collect baseline data for benchmarking to monitor the progress of the project and 3) to identify potential obstacles which may interrupt project activities. Key focus areas were as follows;

1.2.1 Curriculum Delivery

The SIIQS project assumed the curriculum delivery model as shown in Figure 1-1. If the steps in the figure are completely fulfilled, students attain competences as expected. The project needs to understand issues and challenges of curriculum delivery to improve the situation.

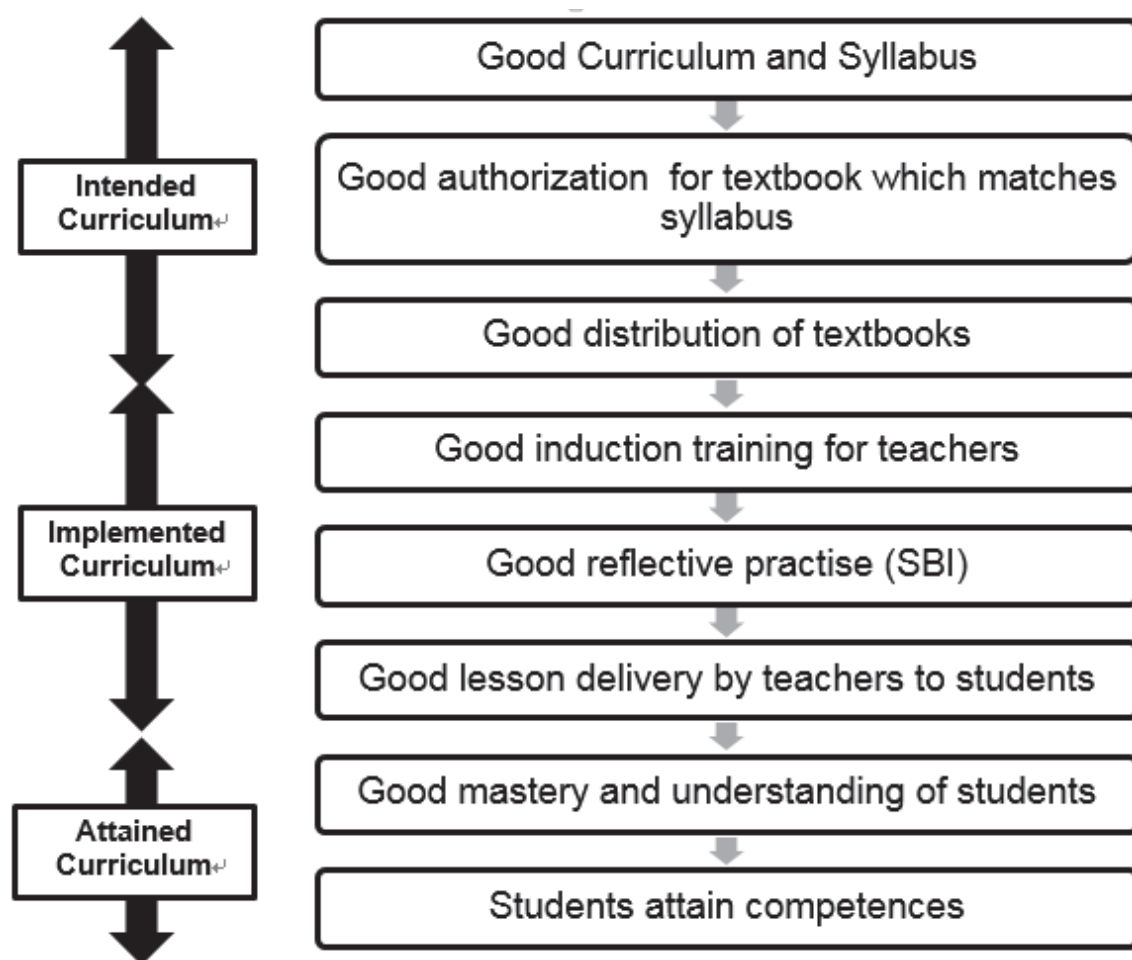


Figure 1-1 Curriculum Delivery Model

1.2.2 SBI Status

When CBC was inducted in 2016, CBC trainings for in-service teachers were cascaded from national to school level. All teachers had to be trained in schools as a form of SBI. Thus, it is important to investigate how each school conducted SBI for further SBI promotion. It should be noted that education stakeholders have intended to harmonize terminology and agreed to use the term Continuous Professional Development (CPD) which corresponds to SBI. In this BLS, the term “SBI” shall be replaced with “CPD” as appropriate.

1.2.3 CBC and SBI support mechanisms for district and sector

In 2016, REB requested all districts to establish a committee to promote CPD of teachers to ensure quality CBC and SBI practices in each school nationwide. The District CPD Committee (DCC) and Sector CPD Committee (SCC) were designated to be the main body to support and drive the CPD activities. The project should understand the current status of DCC and SCC in order to develop the plan to enhance the capacity of them.

1.3 BLS Target Areas and Groups

BLS mainly targeted the following groups.

1.3.1 Schools

BLS surveyed Head Teachers (HT), Director of Studies (DOS), teachers and students in primary, lower secondary and upper secondary levels. Teachers who teach the grades which CBC has been introduced, that is; P1, P2, P4, P5, S1, S2, S4, S5 are targeted. BLS covered all districts in four Provinces and Kigali City.

1.3.2 DCCs

BLS surveyed District Education Officers (DEOs) of the districts where targeted schools are located.

1.4 Methodology

1.4.1 Overview

BLS is phased in three stages, from situation analysis to academic achievement test (AAT) as shown in Table 1-2.

Table 1-2 Outline of BLS

Stage	Period	Curriculum delivery	SBI Status	Support Mechanism
Situation Analysis	Jan – Mar	n/a	<ul style="list-style-type: none"> • Interview w/ TEMP • Observation of Sector-SBI 	<ul style="list-style-type: none"> • Literature review on Imihigo • Telephone interview on DCC formation
Field Study	Mar	<ul style="list-style-type: none"> • Lesson observation • Interview with HT(DOS) and Teachers • Questionnaire survey to HT(DOS) and Teachers 	<ul style="list-style-type: none"> • Interview with HT (DOS) and Teachers • Questionnaire survey to HT(DOS) and Teachers 	<ul style="list-style-type: none"> • Interview to DEO
Academic Achievement Test (AAT)	Jun	<ul style="list-style-type: none"> • Academic Achievement Test (AAT) 	n/a	n/a

(1) Situation Analysis

Situation Analysis is the preparatory stage to elaborate research questions for field study and AATs, so that the project can select target areas for the field study and design survey tools properly.

(2) Field Study

Field Study is the main activity of BLS to analyze the actual current situation of final target groups.

(3) Academic Achievement Test

AATs were conducted based on the preliminary findings of the field study. AATs were prepared to measure students' performance.

1.4.2 Selection of Schools for Field Study

Target schools were selected from seven districts to cover all the provinces. The survey team consulted with DEOs to select the schools, as they know the situation of schools well. In order to grasp the whole picture of CBC implementation status, all types of schools ranging from primary, secondary, and 9/12 year basic education (9/12 YBE) were selected from nearly all the districts. The team attempted to include both good performing and poor performing schools. Table 1-3 shows the 20 selected schools.

Table 1-3 List of Selected School¹

Province	District	Sector	School name	School Type ²
Northern	Musanze (MSZ)	Musanze	Centre Scolaire Muhe (CS Muhe)	PS
		Kinigi	GS Muhoza I	9/12
		Remera	GS Notre Dame des Apotres de Rwaza (GS NDAR)	SS
	Rulindo (RLD)	Bushoki	EP Buhande	PS
		Kinihira	GS Kinihira	9/12
		Bushoki	Lycée Notre Dame de la Visitation Rulindo (LND)	SS
Western	Karongi (KRG)	Rubengera	EP Rubengera I	PS
		Rubengera	GS Bubazi	9/12
		Rubengera	GS Nyarubuye	9/12
	Nyabihu (NBH)	Jenda	EP Bukinanyana ADEPR (EP Bukinanyana)	PS
		Rambura	GS St Raphael Rambura (GS St Rapahel R)	9/12
		Rambura	GS Rambura Garçons (GS Rambura G)	SS
Southern	Muhanga (MHG)	Nyamabuye	EP Remera	PS
		Shyogwe	GS Munyinya	9/12
Eastern	Rwamagana (RWG)	Gahengeri	EP Runyinya	PS
		Gahengeri	GS Apagie Musha	SS
		Kigabiro	GS St Aloys Rwamagana (GS St Aloys RWG)	SS
Kigali	Gasabo (GSB)	Rutungu	EP Gasabo	PS
		Gatsata	GS Gihogwe Cathorique (GS Gihogwe)	9/12
		Jabana	GS Kabuye Cathorique (GS Kabuye)	9/12

1.5 Preparation of Survey Tools

A set of questionnaires and interview sheets for HTs and teachers were prepared to gauge the current CBC and SBI status at schools. Outlines of the school survey tools are listed below.

¹ Words in brackets are abbreviations for districts and schools used in this report.

² PS: Primary School, SS: Secondary School, 9/12: 9 years or 12 years Basic Education School

1.5.1 Questionnaire for Head Teachers

To collect the general information about schools and status of CBC and SBI, a questionnaire for head teachers (Appendix A) was prepared. It covered the following items:

- Basic information (name, school type and facilities)
- Status of SBI and CBC
- Status of School Based Mentor (SBM) and School Subject Leader (SSL)

1.5.2 Questionnaire for school teachers

The questionnaire for teachers (Appendix B) aims at understanding teachers' impression of SBI and CBC, and participation in school-based CBC induction training which was supposed to be conducted in the previous fiscal year. It covered the following items:

- Basic information (name, gender, years in service, etc.)
- Impression and experience of SBI and CBC
- Attendance of school-based CBC induction training
- Perception of school management

1.5.3 Interview with HT and teachers

Interview sheets with HT (Appendix C) and teachers (Appendix D) were designed to gain a clear understanding of their situation and to extract further information or their true feelings. Interviews with teachers were conducted as a group. It covered the following items:

Interview sheet with HT

- Overall impression of CBC
- Implementation of SBI
- Performance contract (Imihigo)

Interview sheet with teachers

- Overall impression of CBC
- Implementation of SBI
- General problems

1.5.4 Academic Achievement Test (AAT)

AATs with multiple choice questions were developed to grasp students' comprehension in mathematics and science (Appendix E). The tests were for P4, S1 and S4, which are the initial grades that CBC was introduced in 2016. The process of test question development included reviewing of curriculum and collection of textbooks and other teaching materials, and extraction of some questions from past national exams, TIMSS (Trends in International Mathematics and Science Study) and AATs from other countries. The tests covered different topic areas evenly and included questions which students learned in previous grades. The tests were designed to be completed within 40 minutes. Multiple choice options were carefully considered so that the survey team could also analyze why they reached wrong answers.

1.6 Field Study

1.6.1 Schedule

In consideration of the school calendar, the field study was conducted in March and April as shown in Table 1-4. Basically, two sub teams were formed to conduct the survey simultaneously.

Table 1-4 Detailed Field Study Schedule

Date	Day	District	Team A	Team B
8 March	Wed	(Kigali)	Orientation	
9 March	Thu	MHG		- GS Munyinya - EP Remera
10 March	Fri	RWG		- GS Apagie Musha - EP Runyinya
11 March	Sat			-
12 March	Sun			-
13 March	Mon	GSB	- GS Gihogwe - EP Gasabo	- District Education Office
14 March	Tue	RLD	- LND - EP Buhande	- GS Kinihira - District Education Office
15 March	Wed	MSZ	- GS NDAR - CS Muhe	- GS Muhoza I - District Education Office
16 March	Thu	NBH	- GS Saint Raphael - EP Bukinanyana	- GS Rambura G - District Education Office
17 March	Fri	KRG	- GS Nyarubuye - EP Rubengera I	- GS Bubazi - District Education Office
24 April	Mon	GSB	- GS Kabuye	
26 April	Wed	RWG	- GS St Aloys RWG	

1.6.2 Survey Team

The BLS sub teams were formed with selected Rwandan counterpart personnel from TEMP, Japanese experts and survey assistants. The following members listed in Table 1-5 participated in the field study.

Table 1-5 Survey Team Members

Name	Affiliation	Sub team
Mr. Antoine MUTSINZI	Acting Director of Teacher Development and Training Unit, TEMP	A
Ms. Ruth MUKAKIMENYI	Teacher Training Officer: Language, Teacher Training & Development Unit, TEMP	A
Mr. Ryuichi SUGIYAMA	Team Leader/ Pedagogy (Japanese Expert)	B
Ms. Kyoko Yoshikawa IWASAKI	Deputy Team Leader/ Institutional Development (Japanese Expert)	B
Ms. Yumiko ONO	Educational Evaluation (Japanese Expert)	A
Ms. Sayaka MATSUZUKI	Monitoring/Project Coordinator (Japanese Expert)	B
Ms. Berthine GIKUNDIRO	Project Officer	B
Mr. Hashituky HABİYAREMYE	Survey Assistant	B
Mr. Kizito NDIHOKUBWAYO	Survey Assistant	A

1.6.3 Survey Timetable

BLS activities were organized through prior arrangement and on-site consultation between HT and the survey team, to effectively conduct the survey without interfering with school activities and lessons. One to two schools were visited per sub team/ per day. A standard timetable of BLS at a school is shown in Table 1-6.

Table 1-6 Survey Organization at a School

School A	
AM	Lesson Observation/Video Shooting
	HT Interview/Questionnaire survey
	Teacher Interview/Questionnaire survey
School B	
PM	Lesson Observation/Video Shooting
	HT Interview/Questionnaire survey
	Teacher Interview/Questionnaire survey

1.7 Academic Achievement Test

1.7.1 Schedule

The AAT tests were conducted in five selected schools out of 20 target schools of the field study in June. They were, EP Buhande and Lycee Notre dame de la Visitation (LND) in Rulindo district, GS Apagie Musha and GS St Aloys Rwamagana (GS St Aloys RWG) in Rwamagana district and GS Kabuye in Gasabo district. Table 1-7 shows the schedule.

Table 1-7 AAT Schedule

Date	Day	District	School
16 June	Fri	RLD	- EP Buhande - LND
		RWG	- GS Apagie Musha - GS St Aloys RWG
23 June	Fri	GSB	- GS Kabuye

1.7.2 Survey Team

A survey team was formed with Japanese experts and local staff listed in Table 1-8. They were involved in the development of test questions and supervision of administered tests at schools.

Table 1-8 Survey Team Members

Name	Affiliation
Mr. Kenji OHARA	Mathematics Education (Japanese Expert)
Mr. Keiichi NAGANUMA	Science Education (Japanese Expert)
Ms. Berthine GIKUNDIRO	Project Officer
Mr. Hashituky HABİYAREMYE	Survey Assistant/ Monitoring Officer
Mr. Kizito NDIHOKUBWAYO	Survey Assistant/ Monitoring Officer
Ms. Anathalie NIYIDUKUNDA	Secretary/Accountant

2 Composition of the Samples and Limitations

2.1 Sample Size

2.1.1 Sample size in Field Study

In the field study, data was collected from a total of 20 schools in seven districts across four provinces and Kigali City as shown in Table 2-1. The number of lessons observed was 20. All HTs participated in the questionnaire and interview. A sum of 178 teachers responded to the questionnaire, and 139 teachers among them were selected to participate in the interview. In some schools, two lessons in different grades were observed. Gender balance was considered when selecting interviewees from teachers.

Table 2-1 Sample Size of Field Study

District	Sector	School Name	School Type	LO*	Questionnaire		Interview	
					HT(DOS)	Teacher	HT(DOS)	Teacher
MSZ	Musanze	CS Muhe	PS	1	1	7	1	3
	Kinigi	GS Muhoza I	9/12	1	1	6	1	6
	Remera	GS NDAR	SS	1	1	12	1	1
RLD	Bushoki	EP Buhande	PS	1 1	1	9	1	7
		GS Kinihira	9/12	1	1	9	1	9
	Bushoki	LND	SS	1	1	6	1	6
KRG	Rubengera	EP Rubengera I	PS	1	1	9	1	9
	Rubengera	GS Bubazi	9/12	1	1	8	1	8
	Rubengera	GS Nyarubuye	9/12	1	1	7	1	7
NBH	Jenda	EP Bukinanyana	PS	1	1	4	1	4
	Rambura	GS St Raphael R	9/12	1	1	8	1	8
	Rambura	GS Rambura G	SS	1	1	10	1	10
MHG	Nyamabuye	EP Remera	PS	1	1	15	1	15
	Shyogwe	GS Munyinya	9/12	1	1	15	1	15
RWG	Gahengeri	EP Runyinya	PS	1	1	5	1	5
	Musha	GS Apagie Musha	SS	1	1	4	1	5
	Kigabiro	GS St Aloys RWG	SS	-	1	12	1	0
GSB	Rutunga	EP Gasabo	PS	1	1	12	1	12
	Jabana	GS Kabuye	9/12	-	1	11	1	0
	Gatsata	GS Gihogwe	9/12	1 1	1	9	1	9
Total				20	20	178	20	139

* Lesson Observation

2.1.2 Sample size of Academic Achievement Test (AAT)

Students in target schools were requested to sit for either a mathematics test or science test. The team tried to keep even the number of students who took the mathematics test and those who took the science test. Table 2-2, Table 2-3 and Table 2-4 shows the sample size of the AAT for mathematics and science at each level.

AAT for P4 was implemented in EP Buhande and GS Kabuye. GS Kabuye was a pilot SBI school in the Project of School-based Collaborative Teacher Training (SBCT Project), located in Gasabo district, Kigali City, and it achieved outstanding improvements in the national examination after adopting SBI. EP Buhande is a primary school located in the Rulindo district, and its performance in the national examination is almost average. The total number of students who took the AAT is 164 for mathematics and 192 for science respectively.

Table 2-2 Sample Size of AAT for P4

Province	District	Sector	School Name	School Type	# of Students ³				Total
					Math		Science		
					Male	Female	Male	Female	
Northern	RLD	Bushoki	EP Buhande	PS	9	12	6	15	42
Kigali	GSB	Jabana	GS Kabuye	9/12	59	84	96	74	313
Total					68	96	102	89	355

The AAT for S1 was implemented in secondary schools; Lycee Notre Dame de la Visitation (LND), GS Apagie Musha and GS St Aloys Rwamagana (GS St Aloys RWG). GS St Aloys RWG is a pilot SBI school in the SBCT Project, located in the Rwamagana district, that also improved in the national exams upon adopting SBI. LND and GS Apagie Musha are well performing schools which attain above-average grades in the national examination. The total number of students who took the AAT was 156 for mathematics and 146 for science respectively.

Table 2-3 Sample Size of AAT for S1

Province	District	Sector	School Name	School Type	# of Students				Total
					Math		Science		
					M	F	M	F	
Northern	RLD	Bushoki	LND	SS	-	25	-	22	47
Eastern	RWG	Musha	GS Apagie Musha	SS	38	26	21	32	117
		Kigabiro	GS St Aloys RWG	SS	34	33	39	32	138
Total					72	84	60	86	302

³ One student who took the math test did not specify gender, thus the total number does not match the sum of the sample.

The AAT for S4 was implemented in the same schools as for S1. The total number of students was 193 for mathematics and 158 for science respectively. In GS St Aloys RWG, one class of students who did not take any science subjects as elective subjects all sat for the mathematics test, so the number of students who took mathematics exceeded that of science.

Table 2-4 Sample Size of AAT for S4

Province	District	Sector	School Name	School Type	# of Students				Total
					Math		Science		
					M	F	M	F	
Northern	RLD	Bushoki	LND	SS	-	28	-	28	56
Eastern	RWG	Musha	GS Apagie Musha	SS	23	22	23	29	97
		Kigabiro	GS St Aloys RWG	SS	61	59	42	36	208
Total					84	109	65	93	351

2.2 Composition of the Samples

2.2.1 Teacher Respondents to the Questionnaire

Table 2-5 shows the composition of teacher respondents by gender and academic qualification.

Table 2-5 Composition of Samples for Teacher Questionnaire

School Type	District	School Name	Male					Female					Total ⁴
			A0	A1	A2	N/A	Sub-total	A0	A1	A2	N/A	Sub-total	
PS	GSB	EP Gasabo	-	1	6	-	7	-	-	3	2	5	12
	KRG	EP Rubengera I	-	-	2	-	2	-	-	6	1	7	9
	MHG	EP Remera	-	1	1	-	2	1	-	8	4	13	15
	MSZ	CS Muhe	-	-	3	1	4	-	-	2	1	3	7
	NBH	EP Bukinanyana	-	-	3	-	3	-	-	1	-	1	4
	RLD	EP Buhande	-	-	1	1	2	1	-	5	-	7	9
	RWG	EP Runyinya	-	-	-	1	1	-	-	4	-	4	5
PS Total			0	2	16	3	21	2	0	29	9	40	61
9/12	GSB	GS Gihogwe	2	1	-	-	3	4	1	-	-	5	9*
		GS Kabuye	3	-	-	-	3	2	-	6	-	8	11
	KRG	GS Bubazi	-	-	1	-	1	1	1	5	-	7	8
		GS Nyarubuye	-	-	1	-	1	2	2	2	-	6	7
	MHG	GS Munyinya	2	2	3	-	7	3	-	4	1	8	15
	MSZ	GS Muhoza I	-	-	1	2	3	-	-	2	1	3	6
	NBH	GS St Raphael R	1	4	1	1	7	-	1	-	-	1	8
	RLD	GS Kinihira	1	-	1	1	3	-	1	5	-	6	9
9/12 Total			7	6	8	4	25	8	5	24	2	39	64

⁴ One teacher did not specify gender, thus the total number does not match the sum of the sample.

School Type	District	School Name	Male					Female					Total ⁴
			A0	A1	A2	N/A	Sub-total	A0	A1	A2	N/A	Sub-total	
SS	MSZ	GS NDAR	5	2	-	2	9	2	1	-	-	3	12
	NBH	GS Rambura G	6	3	-	-	9	1	-	-	-	1	10
	RLD	LND	5	-	-	-	5	1	-	-	-	1	6
	RWG	GS Apagie Musha	3	-	1	-	4	-	-	-	-	-	4
		GS St Aloys RWG	10	-	-	-	10	2	-	-	-	2	12
SS Total			5	5	2	3	40	6	2	5	0	13	53
Grand Total			14	14	25	9	86	20	7	53	11	91	178

Most of the primary school teachers hold A2 level qualification, which is equivalent to twelve-years basic education. Almost all secondary school teachers hold either A1 (Diploma Level) for lower secondary teaching or A0 (Degree Level) for upper secondary teaching.

The average age and years are almost the same across school types (See Table 2-6 and Figure 2-1). However, male teachers in 9/12YBE schools and female teachers in secondary schools are younger than those in other schools. The number of years in service reflects their age.

Table 2-6 Average Age and Years in Service by School Type

School Type	Total			Male			Female		
	Ave. Age	Ave. Years in Service	N	Ave. Age	Ave. Years in Service	N	Ave. Age	Ave. Years in Service	N
PS	38.3	14.5	61	36.7	10.5	21	39.3	16.4	40
9/12	36.3	11.7	72	33.9	8.6	28	37.9	13.7	44
SS	36.3	10.3	44	37.0	10.4	37	32.4	9.7	7
Total	37.0	12.3	177	35.9	9.8	86	38.0	14.6	91

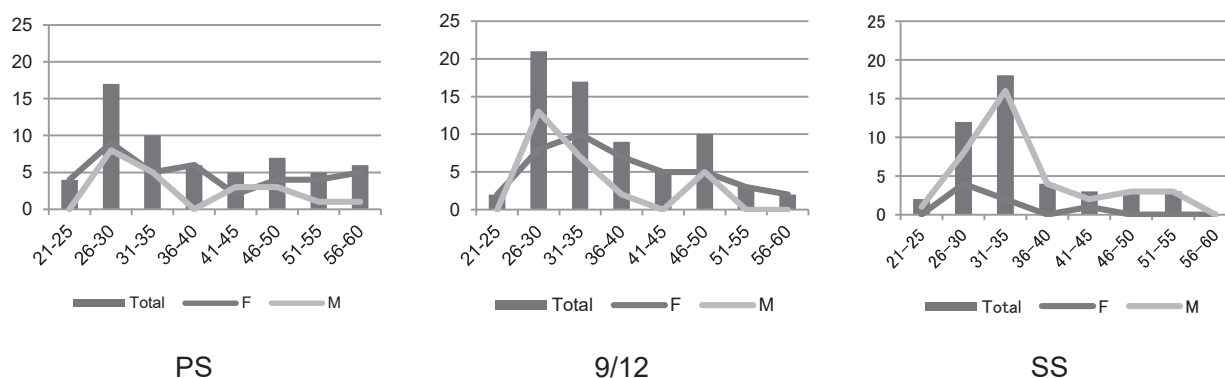


Figure 2-1 Age Distribution by School Type
(Horizontal Axis: Age group, Vertical Axis: Number of Respondents)

2.3 Limitation

2.3.1 Geographical Traits

Geographic characteristics were basically not considered, since the samples were not enough. The objective of BLS is to study overall trends in Rwandan schools.

2.3.2 Analysis of Interviews

Interviews were supplementary used to interpret quantitative data analysis results such as questionnaires and AATs. The ideas, comments and opinions suggested during the interviews are not directly argued in this BLS report.

2.3.3 Gender Gap

Preliminary analysis indicated that gender influences test scores. In AATs, male's scores were all higher than females. T-test method⁵ detected statistically significant differences in most of them. The discussion about gender gap is eliminated from the following detailed analysis.

2.3.4 Progress of Lessons

Scores of AATs may be influenced by the progress of lessons taught at each school at the time of the BLS. Such differences however were hard to identify and, therefore, were not considered in the analysis.

⁵ It is a statistical test to examine if average scores in two groups are significantly different or not. If a statistical significance is not detected by the test, average scores are recognized as same.

3 Readiness of CBC Implementation (Implementation status of intended curriculum at school level)

3.1 Distribution of resource materials

The questionnaire for HTs revealed the distribution status of resources (See Table 3-1). Only six schools out of 20 had syllabuses for all subjects. Half of the schools answered that they had a syllabus for some subjects. There were two schools which did not have any syllabus at all. The distribution status of textbooks at schools is similar to that of syllabuses. While textbooks for all subjects were available at five schools, two schools had no textbooks at all. This implies that the intended curriculum of availability of CBC-related documents has not yet been satisfied.

Table 3-1 Organization of induction training at school level

Material	For all subjects	For some subjects	None	N/A
Syllabus	6 (30%)	10 (50%)	2 (10%)	2 (10%)
Textbook	5 (25%)	11 (55%)	2 (10%)	2 (10%)

3.2 Implementation of CBC training at school level

3.2.1 CBC Training Phase I

The Questionnaire for HTs asked about the implementation record of CBC training phase I (See Table 3-2). More than half of the HTs responded that they fully implemented the CBC trainings for phase I, while 45% of them stated that they partly implemented. There was no HT who did not organize any CBC training.

Table 3-2 Organization of induction training at school level

School Type	Fully	Partly	Not Organized
PS	4	3	0
9/12	4	4	0
SS	3	2	0
Total	11 (55%)	9 (45%)	0 (0%)

The Questionnaire for teachers asked about their participation in the CBC trainings (See Table 3-3). Less than 50% of teachers attended the full training, while 15.6% of teachers either missed or stated that their school did not organize CBC training. Lastly, 37% only attended part of the training. Attendance varied among school settings, with the lowest attendance observed in the Basic Education Schools.

Table 3-3 Teachers' Attendance of Induction Trainings

School Type	Fully attended	Partially attended	Missed	Was not organized at school
PS	25 (41.7%)	29 (48.3%)	5 (8.3%)	1 (1.7%)
9/12	27 (38.6%)	22 (31.4%)	8 (11.4%)	13 (18.6%)
SS	30 (69.8%)	13 (30.2%)	0 (0.0%)	0 (0.0%)
Total	82 (47.4%)	64 (37.0%)	13 (7.5%)	14 (8.1%)

Table 3-4 gives a broader picture of the implementation status of the CBC induction training phase I as a reference. This data was collected during the follow-up survey of the SBCT project. 22 DEOs responded to a monitoring form on the organization status of induction training at the school level. Within the districts, nearly 90% of schools conducted CBC induction training, but there is a possibility that some schools only partially conducted the training. The number of teachers who missed the training were 2,331, or 5%. Given that the number of teachers in the schools which did not conduct the training is not included, overall, a considerable number of teachers have not received the training. Since REB has aimed at ensuring all teachers in the country are CBC trained, this situation should be taken seriously.

Table 3-4 Organization of Induction Training at School Level According to the Monitoring (2016)

District submitted the monitoring form	# of schools which conducted CBC induction training	# of Teachers who missed the CBC induction training
22 (73.3%)	2,790 (88.4%)	2,331 (4.8%)

3.2.2 Characteristics of teachers who did not participate in CBC training

To investigate what are the characteristics of teachers who did not attend the trainings, an exploratory factor analysis was employed. Five factors were eventually derived: shared school vision, participatory school management, collegiality for lesson improvement, evidence-based school planning, and resource persons as shown in Table 3-5.

Table 3-5 Result of Exploratory Factor Analysis

Factors	Questions	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Communality
Shared school vision	There are clear aims or objectives at my school.	.923	-.062	-.126	.071	-.030	.747
	There is a cooperative system among different subjects at my school.	.722	-.112	.185	-.174	.358	.710
	The vision/mission of my school is shared among school community members.	.667	.085	.111	.025	-.097	.608
	The vision/mission of my school is/are clearly stated.	.623	.241	.003	.000	-.125	.576
Participatory school management	My head teacher is supportive in improving teaching and learning at my school.	-.043	.980	.023	.061	-.179	.873
	The school leaders encourage us to give some comments/ ideas to contribute to school improvement.	.232	.545	-.038	-.041	.120	.521
	My opinions often contribute to the process of making decisions at my school.	-.024	.511	.234	.016	.139	.523
	My students' parents/guardians contact me to talk about the students' performance.	.023	.423	.053	-.040	.269	.373
Collegiality for lesson improvement	I often give advice/consultation to my colleagues to improve their teaching.	-.012	.065	.851	-.076	.178	.843
	I often receive advice/consultation from my colleagues to improve my teaching.	-.134	.044	.743	.075	.172	.613
	I am willing to share my good lesson practices with my colleagues.	.135	.083	.648	-.079	-.058	.549
	I use the feedback/advice given by my colleagues to improve my teaching and learning process.	.062	-.094	.595	.215	.085	.502
Evidence-based school planning	School activities proceed as planned at my school.	-.225	.004	.149	.815	.042	.583
	I regularly contact my students' parents/guardians to talk about the students' performance.	-.018	.015	-.238	.616	.446	.624
	The objectives and plans are achieved successfully at my school.	.153	-.023	.086	.531	-.077	.412
	Results from the national examination are analyzed by all teachers together.	.232	.102	-.201	.507	.164	.513
	I make an effort to attain the vision/mission of my school.	.290	-.104	.296	.463	-.353	.597
Objectives and plans are developed based on evidence and data at my school.	.308	.055	.001	.404	.117	.503	
Resource persons	A School-based Mentor (SBM) at my school helps me improve my lesson.	-.018	-.016	.101	.054	.574	.371
	A School Subject Leader (SSL) at my school helps me improve my lesson.	-.077	-.019	.280	.053	.553	.425

Then, these factors were compared with teachers' participation, divided into three categories; fully attended the CBC trainings (Group1), partly attended (Group2) and did not attend at all (Group3). The factor scores for each group were plotted on a graph (as shown in Figure 3-1). It was found that Group 1 responded positively, while Group 2 were more or less neutral, and Group 3 were negative. The results suggest the importance of supporting an environment which encourages teachers' participation in school-based trainings, such as good school management, collaborative colleagues and effective resource persons. These aspects may reduce the difficulties around cascade training in reaching all target teachers, and therefore, should be emphasized when considering future training framework.

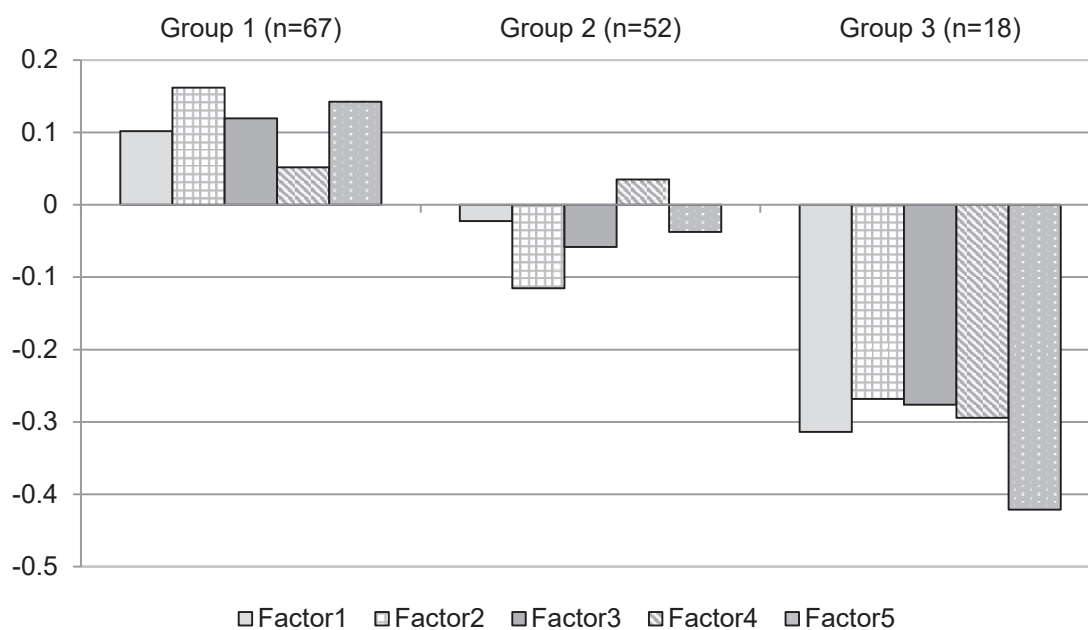


Figure 3-1 Factor Score by Participation

3.2.3 CBC Training Phase II

Phase II of CBC training in technical stream consisted of three layers; National Trainers trained Sector-Based Trainers (SBTs) at three centers and SBTs trained teachers in each sector. There has been a significant delay in delivering the last layer of the CBC training at the sector level as described in Table 3-6. The plan was to complete the sector-based training before starting the academic year 2017. However, in addition to issuing a letter to request Sector Education Officers (SEOs) to conduct sector-based trainings, SEOs needed to be trained. It was in May 2017 when training for SEOs was conducted. They were instructed to conduct orientation to start a series of sector-based trainings for technical stream, and finish by the second week of August. SEOs were supposed to conduct orientation at the sector level in two weeks after the SEO training.

Table 3-6 Plan and Actual Schedule for the Last Layers of Phase II Training

	Plan	Actual
Training for Sector Based Trainers (SBT)	3-12/1/2017	16-21/1/2017
Training for All Teachers at Sector Level	14-23/1/2017	June onwards/2017

Figure 3-2 (below) illustrates the planned schedule timings for orientation which was summarized from REB’s online monitoring system. Less than half of the sectors specified a reasonable timing for orientation, which was in between May and August. However, according to a telephone interview with SEOs, as of June 2017, most of the sectors had not yet conducted the orientation.

On the other hand, there were some sectors which conducted sector-based trainings on their own initiative without waiting for SEO training in May.

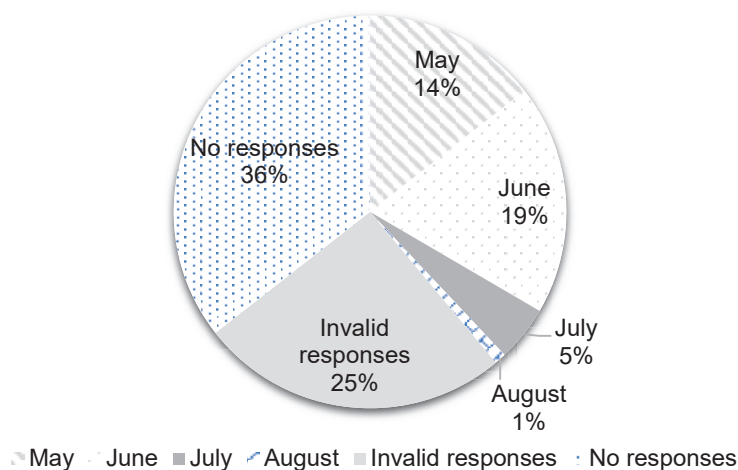


Figure 3-2 Planned Schedule for CBC Orientation

In September 2017, a total of 22 SEOs in Rulindo and Rwamagana districts were interviewed on the implementation status of sector-based trainings. Some SEOs conducted the orientation and training by the second week of August as requested by REB, while a few others planned for September. There were some SEOs who did not seem to have taken any action yet and were not aware of what sessions they were required to organize. One of them had conducted a training on CBC on their own.

Apart from the implementation status, they responded to a question about challenges and difficulties in organizing the trainings. They mentioned the absence of some teachers, SBTs' insufficient understanding of the training contents, lack of support from some HTs, lack of budget and lack of reporting channels, among others.

These challenges and difficulties, together with some SEOs' unawareness of their expected role, have hindered full implementation of the cascade training. Though the respondents represent only 5% of all SEOs, these issues can be found throughout the country. Measures should be taken for ensuring that SEOs take responsibility for the implementation of CBC training at the sector level.

3.3 Teachers' Training Needs on CBC

The questionnaire for teachers also asked about their training needs. They answered the degree to which they need training for different areas. As described in Figure 3-3, training needs for "knowledge of curriculum" was relatively high. Almost all teachers were more or less interested in it. On the other hand, training needs for "student evaluation and assessment practices", "teaching methodology in teaching my subject(s) field", "skills of English as an instructional

language”, and “knowledge and understanding of my subject field(s)” were low compared to other needs. This indicates they may have been trained in those areas or may be confident in their competences.

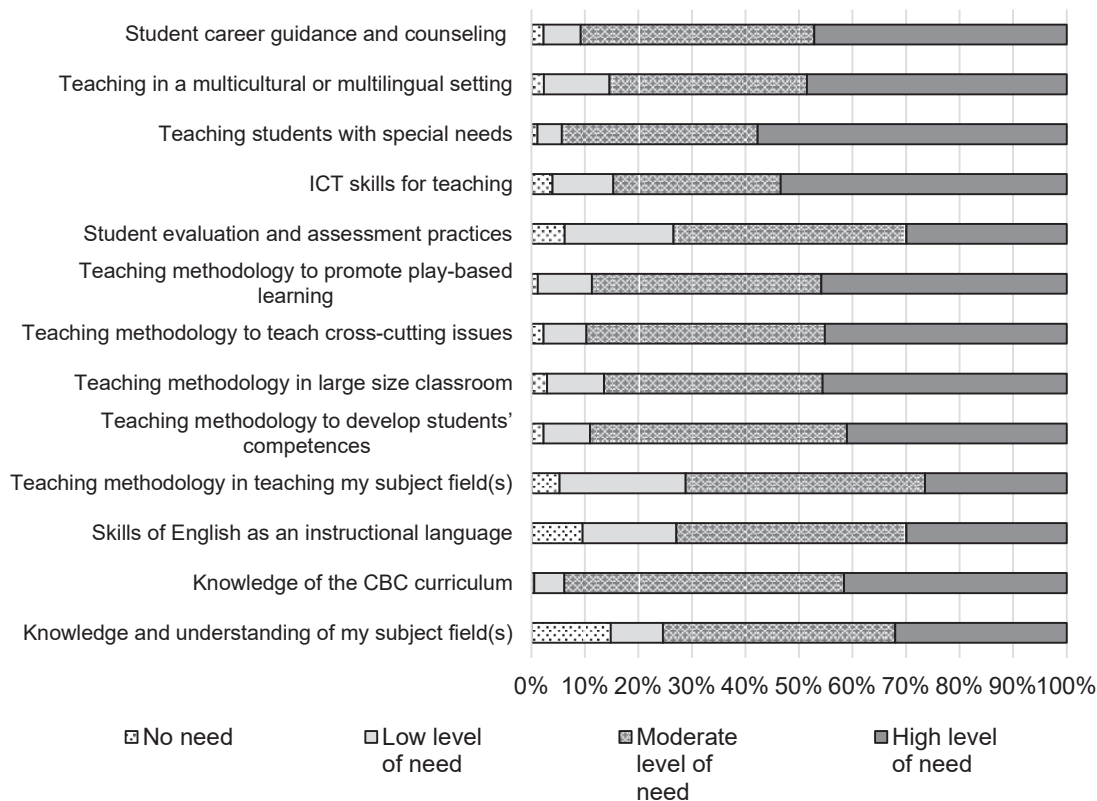


Figure 3-3 Teachers' Training Needs

3.4 Support from District with CBC Implementation

3.4.1 Results of Telephone Interview on DCC Status

REB issued a letter to request all districts to establish a District CPD Committee (DCC) in July 2016⁶. Since DCC is expected to play a pivotal role in the problem solving cycle (which SIIQS aims to strengthen) BLS conducted telephone interviews with DEOs across all districts to understand the establishment status of DCC in February 2017. This status information was then categorized according to the transtheoretical model of behavior change proposed by Prochaska and Velicer (1997) as shown in Table 3-7⁷.

⁶ In the letter, establishment of Sector CPD Committee (SCC) is advised as a sub-committee of DCC.

⁷ Prochaska, J. O., & Velicer, W. F. (1997). “The Transtheoretical Model of Health Behavior Change”. *American journal of health promotion: AJHP*, 12(1), 38-48.

Table 3-7 Transtheoretical Model

Stages	Description
Precontemplation	Individuals do not intend to make any changes in the foreseeable future. There is no desire or interest in undertaking change.
Contemplation	Individuals intend to undertake change in the near future. During this stage, they consider the benefits and disadvantages of change, and may decide to pursue change or not.
Preparation	Individuals plan to undertake change in the immediate future. They have considered the rationale, processes, and anticipated outcomes of change and made a definite decision to engage in change.
Action	Individuals make specific behavioral changes and actively pursue change.
Maintenance	Individuals strive to avoid resuming old behaviors. Internalization and institutionalization of change occurs.
Termination	Individuals no longer worry about resuming old behaviors as the new behaviors have become habit.

The results are shown in Table 3-8. Three districts claimed they already established DCC, so they can be categorized in the “action” stage. Six were considered to be motivated for establishment, so they can be categorized in the “preparation” stage. Seven were categorized in the “contemplation” stage, because they were considering pros and cons of establishment. Twelve districts did not seem to have any intention to establish DCC, and some districts were not informed of DCC. Therefore, they were categorized in the “precontemplation” stage. It should be noted that in the follow up interviews with DEOs during the field survey, three districts that stated they established DCC have not actually started any concrete activities yet. In sum, it seemed that the districts’ support to schools through DCC was not functioning as expected.

Table 3-8 Summary of DCC status (as per February 2017)⁸

Stage	District	DCC Status
Precontemplation (12 Districts)	Gatsibo	The Director of Education attended the workshop and learned about DCC but no actions have been taken for it.
	Nyagatare	The DEO does not know anything about DCC yet.
	Kayonza	The District Director of Education (DDE) does not know anything about DCC despite the district being selected as a DCC pilot in 2016. This lack of knowledge may be a result of the DDE being newly assigned after the piloting.
	Gakenke	The DEO knows about DCC, but nothing has been done yet in the district.
	Ngororero	The DEO does not know anything about DCC yet.
	Nyamasheke	The DEO has seen the letter but nothing was done after its reception.

⁸ Information on Ngoma and Nyaruguru districts is not available.

Stage	District	DCC Status
	Rubavu	The DEO attended the workshop on DCC in 2016, but did not remember anything about DCC.
	Rutsiro	The DEO joined the district in August 2016 and does not know anything about it.
	Gisagara	The DEO attended the workshop and learned about DCC but no actions have been taken for it.
	Ruhango	The DEO does not know anything about DCC yet.
	Gasabo	The DEO does not know anything about DCC yet.
	Kicukiro	The DEO does not know anything about DCC yet.
Contemplation (7 Districts)	Bugesera	The district conducted a meeting on DCC after the workshop in 2016, but no activities have proceeded since.
	Kamonyi	The district had a meeting on DCC, but it's not active yet.
	Huye	The district had a meeting on DCC, but it's not active yet.
	Burera	The district received the letter and discussed it, but there have been no formal meetings about the committee establishment.
	Nyarugenge	The district had a meeting introducing DCC but nothing came up after it.
	Muhanga	The district had a meeting on DCC.
	Nyanza	DCC has not yet been established, but the district had a meeting about its establishment and discussed how to use the skills that trained teachers in CBC have to share with their colleagues.
Preparation (ready) (6 Districts)	Kirehe	The district had a regular education meeting where the DEO intended to let participants discuss DCC upon presenting the letter from REB. However, the agenda was changed and they did not discuss it. DEO plans to conduct another meeting in the coming days.
	Gicumbi	The DEO is eager to establish DCC, but he has not been able to follow up on it because of many challenges. He will have a meeting with Soma Umenye (USAID-based project) to request technical support about establishment of DCC. The project has a mandate of establishing a good function of DCC.
	Rulindo	The district has not yet conducted a meeting on DCC, but had several informal discussions. It will have the first DCC meeting in March.
	Nyabihu	The district was supposed to conduct a meeting in January, but rescheduled the meeting because the members were busy with the personnel changes.
	Rusizi	DCC is not yet active, but according to the DEO it is in the process of being established.
	Nyamagabe	The district has previously conducted a meeting on DCC and it is supposed to be established in February.
	Rwamagana	DCC was established and the district has already conducted one meeting.
	Musanze	DCC was established and is active.
	Karongi	DCC was established but the DEO thinks it is not active enough.
Maintenance	No District	
Termination	No District	

3.4.2 Piloting DCC Activities

Based on telephone interviews in February 2017 and interviews with DEOs during the field study of BLS, five districts, namely; Musanze, Rulindo, Rwamagana, Gasabo and Nyarugenge were

selected to pilot sample activities that can be conducted at DCC. The pilot activities aim to extract some good practices and key factors for the operationalization of DCC.

Two pilot activities have been conducted so far. Firstly, DCC orientations was conducted in four pilot districts from April to July 2017. All members of DCC were invited, although the actual participants differed from one district to the other. The Vice Mayor, who is the chair of the meeting, attended at the beginning of the orientation in two districts, although all Vice Mayors agreed to conduct orientation and eventually to establish DCC. In the orientation, the background, rationale and structure of DCC were explained. Participants discussed several issues, for instance, demarcation between DCC and other existing platforms at the district level and possible challenges that DCC could address, and then agreed to establish the committee.

Secondly, from June to July 2017, four pilot districts held a problem analysis workshop. One district, which had not yet conducted the orientation, included an introductory session at the beginning of the workshop. The districts invited Japanese experts as facilitators. In these workshops, they analyzed the problems causing students' unsatisfactory performance in the national exam, and made action plans to address these challenges. Table 3-9 shows the schedule of DCC orientations and workshops at the districts.

Table 3-9 Schedule of DCC Orientations and Workshops

District	Date of Orientation	Date of DCC workshop	Number of participants
Rulindo	21st April	5th July	25
Gasabo	30th April	30th June	21
Musanze	2nd May	29th June	22
Rwamagana	6th July	6th July	15

3.4.3 Factors Influencing the Change

As a part of efforts to operationalize DCC, factors influencing the establishment and operationalization have been explored using existing literature. The final goal of the operationalization of DCC is to strengthen the local government's role in teachers' CPD. This requires an organizational change at the district level. Therefore, literature on organizational change has been reviewed, in order to get information on how to encourage districts and sectors to play a bigger role in promoting teachers' CPD. Fernandez and Rainey (2006) identified eight factors contributing to the success of governmental organizational change⁹. Table 3-10 shows these factors and suggestions in view of the current status regarding DCC. In the context of Rwanda, factors require a twofold process, i.e. at the central level and district level. Therefore, the status is described both at the central level and district level.

⁹ Fernandez, S. & Rainey, H.G. (2006) "Managing successful organizational change in the public sector". *Public Administration Review*, 66(2), 168-176.

Table 3-10 Factors for Organizational Change and Current Status Regarding DCC

Factors	Status of DCC
1. Ensure the need	<ul style="list-style-type: none"> • A letter explaining the need for DCC was distributed to all districts. • However, according to the telephone interview, some districts were unaware of the letter. • DCC members in the pilot districts were convinced of the importance of DCC.
2. Provide a plan	<ul style="list-style-type: none"> • Action plans were developed in a participatory manner based on the challenges identified in the workshop in pilot districts.
3. Build internal support for change and overcome resistance	<ul style="list-style-type: none"> • According to the questionnaire after the workshop, DCC members seemed to buy into the idea. • However, during the workshop they tended to deflect the causes for the unsatisfactory performance of students on the central government or guardians. They tend not to consider teachers as contributing to such performance.
4. Ensure top management support and commitment	<ul style="list-style-type: none"> • Generally, the attendance of Vice Mayors have not been active, though all of them agreed on the establishment and some even led the process of realizing the problem analysis workshop.
5. Build external support	<ul style="list-style-type: none"> • REB and development partners have been promoting the idea. Some are willing to support districts in establishing and operationalizing DCC. • There is a need to involve MINEDUC to ensure procurement of resources.
6. Provide resources	<ul style="list-style-type: none"> • Resources for teachers' CPD have not yet been availed to districts, which discourages districts in taking initiative in organizing CPD activities.
7. Institutionalize change	<ul style="list-style-type: none"> • Some DCC members were motivated to include teachers' CPD in their performance contract (Imihigo).
8. Pursue comprehensive change	<ul style="list-style-type: none"> • Comprehensive change to enhance the district role in teachers' CPD has not commenced yet.

Factor 1 is the first step where leaders verify and communicate the need for change by providing direction for the process. At the central level, REB verified the needs for DCC and requested its establishment by issuing a letter. It should be noted that seven out of twelve districts which are categorized as “precontemplation” were not even aware of the letter. At the district level, in the pilot districts, rationale for the establishment of DCC was explained to DCC members and they consented to establish it, which means that they verified the need and communicated the establishment among the members.

Factor 2 is where leaders develop a course of action for implementing change. As part of the project activities, the SIIQS Project team together with REB, specified a plan of operationalizing DCC through nominating pilot districts and implementing pilot activities in those districts. At the district level in the pilot districts, DCC members who are representatives of different organizations in the districts, developed action plans to attain optimal changes.

Factor 3 deals with building internal support for change and reducing resistance. Individuals resist change for a variety of reasons. In the case of Rwanda at the central level, so far there has been no resistance observed regarding changes in REB. At the district level in pilot districts, DCC members appreciated the need for change, but there was a tendency of deflecting the causes for unsatisfactory performance of students to central government or guardians.

Factor 4 is where top management supports the changes. At the central government level, DG signing the letter to request establishment of DCC symbolizes the support from REB top management. However, it should be noted that the importance of DCC has not yet been instilled

at the Ministry level, at least not enough. At the district level, top management is the Vice Mayor. In the pilot districts, they also recognized the need for change, but it cannot be stated that all of them are committed to it. They seemed to be too occupied with other duties to attend the workshops.

Factor 5 is where leaders develop support from overseers and key external stakeholders. They can influence reform efforts or have the knowledge, skills and resources to manage the transformation. At the central level, although some development partners expressed their willingness to support DCCs, how to ensure the procurement of resources from the Ministry of Education (MINEDUC) is a challenge. At the district level, teachers' support for DCC may be useful. Other stakeholders that can support and advance DCC's activities need to be identified, if any.

Factor 6 is to provide resources. Fernandez and Rainey pointed out that successful change usually requires sufficient resources to support the process. Otherwise, it would limit the capacity of the implementing bodies to achieve the objectives. Unfortunately, this is the case for DCC in Rwanda. The fact that the resources for teachers' CPD are not satisfactory has restricted DCCs from bringing about successful change. At the central level, REB is expected to mobilize support from MINEDUC and the Ministry of Finance and Economic Planning to avail the resources for teacher training at the district level; while at the district level, they are expected to continue looking for alternative sources for teacher training. Good practice on how to ensure resources at the district level should also be shared.

Factor 7 is where institutionalizing change is required. It is important to incorporate the behavioral changes into routines. In the case of Rwanda, incorporating teachers' CPD into the performance contract (Imihigo) may be one of the effective ways to strengthen the role of the district and sectors in teacher education. Perhaps a guideline on how to make imihigo target(s) on teacher training from the central level or district level would help. Fernandez and Rainey also suggest the need for monitoring that ensures the changes continue even after fully adopted.

Factor 8 is the final step where leaders pursue comprehensive change. This involves subsystem congruence to harmonize the changes in terms of the organizational transformation. Rwanda has not reached this point yet.

It should be noted that most of the status at the district level described above represents the status of pilot districts. How to support establishment and operationalization of DCC in non-pilot districts should be further considered. These factors suggest priorities for the future activities. In particular, the following two issues seem to be crucial at this point in this context.

(1) Nurturing Ownership among the DCC Members

Creating ownership is the key to successful change and this is also the very reason why DCC establishment was called for. By discussing issues related to teachers' CPD in their districts, understanding its importance in increasing students' performance and taking actions, DCC members are expected to nurture ownership in teachers' CPD in their districts. However, participants in the problem analysis workshop tended to deflect the causes for unsatisfactory

performance of students to the central government or guardians. Moreover, they tended not to consider teachers as contributing to such performance and they did not recognize their own potential or responsibility to improve the performance of teachers and students. In order to nurture ownership of DCC members, they drew up action plans by themselves. Generating success stories from their actions may help increase their commitment to DCC.

(2) Obtaining Strong Support from Leadership to Avail a Budget for CPD

In realizing organizational change, roles of political leaders as well as administrative leaders are important, depending on phases of the change (Kuipers et al., 2014)¹⁰. In other words, political leadership is necessary in the decision-making phase while administrative leaders can influence the content of change during the implementation phase. As described in the previous section, the Vice Mayors' attendance to the meetings and workshops have not been very active, although they agreed to establish DCC. The motivation of DEOs towards DCC varied too. Further analysis to investigate how to motivate Vice Mayors and DEOs is needed.

One of the ways to motivate Vice Mayors and DEOs is to encourage them to include teachers' CPD in the district's Imihigo, which is the only plan at the district level budgeted properly and monitored thoroughly. Realizing that teachers' CPD is important in enhancing students' performance would be the first step to include teachers' CPD in the Imihigo. Including teachers' CPD in their own Imihigo would also help in enhancing their motivation.

However, one of the obstacles to include teachers' CPD in Imihigo or to initiate any tangible action to promote teachers' CPD at the district level is the absence of budget for teachers' CPD. Capitation grants, which are given to the schools according to the number of students does not have a specific portion which is allocated to the teachers' CPD. Instead, the budget for teachers' CPD is currently managed at the central level. Involvement of and support from MINEDUC is expected to redirect budget for teachers' CPD to local governments.

¹⁰ Kuipers, B. S., M. Higgs, W. Kickert, L. Tummers, J. Grandia, and J. Van der Voet. (2014). "The Management of Change in Public Organizations: A Literature Review." *Public Administration*, 92 (1), 1–20.

4 Status of Implemented Curriculum

4.1 Result of lesson observation

BLS observed 20 lessons in sixteen schools. The below is the summary of findings from the lesson observations¹¹.

- Every teacher was preparing unit plans and lesson plans. They also encouraged and motivated learners to work collaboratively in groups. They recognized efforts of students by clapping, gestures and by signing. They were friendly and supportive. Some teachers prepared their own teaching aid. Even without textbooks and teaching materials, teachers tried hard to conduct CBC lessons.
- However, it was observed that basic knowledge and skills were not well acquired by students. For example, many upper primary students could not do simple calculations. Individual mastery of basic knowledge and skills should be a prerequisite for students to be engaged in critical and creative thinking.
- Some teachers jumped into group work without instruction or meaningful tasks. Some group works were not closely linked to the lesson objective and sometimes only a few students participated in the work. In general, it seemed that too much emphasis was placed on group work and it seemed that students were not effectively developing individually through group works.
- When asked if they understand during the lesson, students automatically answered “yes” in chorus, even though they seemed not understand. Teachers did not carefully observe students facial expression, answers to questions and exercises to assess their understanding.

4.2 Results of problem analysis

Issues and problems observed in the field study were sorted and analysed by survey team members. The affinity diagram was used to create a ‘problem tree’ which indicates the natural relationships between issues and problems as shown in Figure 4-1. The survey team recorded each issue and problem observed during the field study by writing it down with a marking pen on a separate sticky note and spreading them out on a large manila paper to make all the notes visible to everyone. Then, the entire team gathered around the notes and sorted out them to identify the root causes of the problems in CBC implementation.

¹¹ REB & JICA. (2017). *Preliminary findings from SIIQS Baseline Survey*. Kigali: REB.

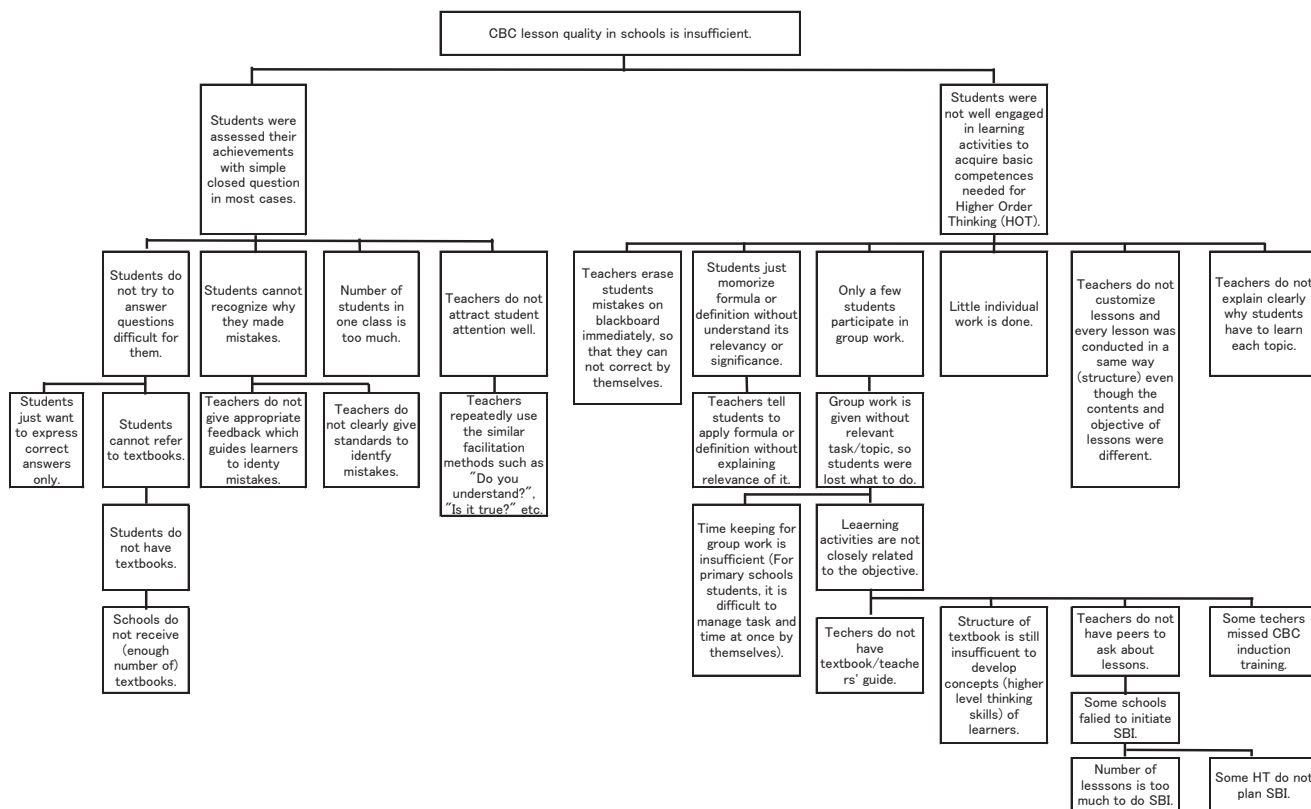


Figure 4-1 Problem Analysis Tree

The team lastly identified the two major hindrances of the current CBC lesson in classrooms, 1) students were assessed by their achievements with simple closed questions in most cases and 2) students were not well engaged in learning activities to acquire basic competences needed for Higher Order Thinking (HOT). The first issue stems from a formative assessment. Weak facilitation skills of teachers with some environmental problems, such as overcrowded classrooms and shortage of textbooks, prevented them from assessing students’ attainment in a timely manner. The second issue is related to the weak mastery of learning and teaching approaches required in CBC lessons such as Learners Centered Pedagogy (LCP) and Active Learning (AL). It implies that these issues should be included in the next phase III CBC induction training as its main target areas.

4.3 Quantitative Discourse Analysis

4.3.1 Methodology

In order to trace changes in the classroom discourse quantitatively, BLS used the analytical framework developed by Iketani (2009)¹². This framework categorizes both teachers and students' utterances by its function/intention. The transcribed data was coded based on the coding guidelines (Iketani, 2009; Nakawa, 2011)¹³.

Five mathematics lessons were selected from EP Bukinanyana, EP Rubengera I, EP Buhande, CS Muhe and GS St Rapahel R in Northern and Western provinces. Table 4-1 shows school category, grade, unit of the lesson, topic of the lesson and gender of the teacher. Four of the lessons were from primary schools.

Table 4-1 Observed Lessons

School	EP Bukinanyana	EP Rubengera I	EP Buhande	CS Muhe	GS St Rapahel R
School Type	PS	PS	PS	PS	9 years
Grade	P4	P4	P5	P5	S2
Unit	Positive and negative integers	Mathematical operation on whole numbers	Addition of positive and negative integers	Equivalent fractions and operations	Polynomial functions
Topic	Meaning of positive and negative integers	Division of 2-digit numbers without remainders	Ordering integers	Comparing fractions	Quadratic equation
Teacher	Female	Female	Female	Male	Male

4.3.2 Analysis of Discourse

The number and rate of teacher's utterance by code is shown in Table 4-2. Figures in the table indicate the number of each utterance that appeared in the lesson, and figures in the parentheses show the percentile rate against the total utterance of the lesson. It revealed that closed questions requiring recollection of information (e.g. 'What did we learn yesterday?'; 'Is it true?'; 'Yes or no?') were predominant in all lessons. Open or more thought-provoking questions were few, if any. Consequently, students had little opportunity to share their own opinion or explain their own thinking because the teacher did not pose questions that facilitate diverse opinions or thinking. When students made errors, no corrections by the teacher were observed. Lack of explanations left students unsure why they are wrong.

¹² Iketani, T. (2009). Lesson analysis of mathematics at upper basic education in Zambia: focusing on verbal interaction between teacher and students. *Journal of International Development and Cooperation*, 15(1/2), 125-140.

¹³ Nakawa, N. (2011). Investigation of students' learning process and the challenges involved: From grade five lessons of number bricks in the Central province of Zambia. *Journal of JASME (Japan Academic Society of Mathematics Education) Research in Mathematics Education*, 17(1), 9-15 (In Japanese)

Table 4-2 Number and Rate of Teacher's Utterance by Code

Code	EP Bukinanyana	EP Rubengera I	EP Buhande	CS Muhe	GS St Rapahel R
Closed Question	94 (41.6)	40 (26.0)	92 (43.4)	39 (28.3)	171 (47.0)
Open Question	3 (1.3)	2 (1.3)	0 (0.0)	1 (0.7)	2 (0.6)
Instruction	25 (11.1)	32 (20.8)	23 (10.8)	14 (10.1)	47 (12.9)
Confirmation	0 (0.0)	15 (9.7)	22 (10.4)	29 (21.0)	22 (6.0)
Explanation	27 (12.0)	8 (5.2)	7 (3.3)	13 (9.4)	43 (11.8)
Ask Agreement	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Point student	35 (15.5)	16 (10.4)	33 (15.6)	14 (10.1)	1 (0.3)
Encouragement	9 (4.0)	15 (9.7)	12 (5.7)	12 (8.7)	10 (2.8)
Justification	20 (8.9)	8 (5.2)	19 (9.0)	15 (10.9)	48 (13.2)
Others	4 (1.8)	12 (7.8)	4 (1.9)	0 (0.0)	14 (3.9)
Clap	0 (0.0)	6 (3.9)	0 (0.0)	0 (0.0)	0 (0.0)
Impossible to listen	9 (4.0)	0 (0.0)	0 (0.0)	1 (0.7)	6 (1.7)
Total	226	154	212	138	364

Figures in parentheses show the percentile rate against total utterances of the lesson.

In order to take a closer look at teachers' questions, BLS extracted open and closed questions and categorized them in four areas in Table 4-3: Presentation of task, asking knowledge and skills, asking how students think, and asking attitude. The result indicated that all or most questions were related to task presentation which give instructions to students. There were only a few questions essential for nurturing mathematical thinking or attitudes. Though teachers tried to deliver learner-centered lessons, the lessons were still teacher-centered.

Table 4-3 Number and Rate of Teacher's Questions by Category

Category	EP Bukinanyana	EP Rubengera I	EP Buhande	CS Muhe	GS St Rapahel R
Presentation of task	97 (100.0)	42 (100.0)	84 (91.3)	39 (97.5)	173 (100.0)
Asking knowledge and skills	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Asking how students think	0 (0.0)	0 (0.0)	4 (4.3)	0 (0.0)	0 (0.0)
Asking attitude	0 (0.0)	0 (0.0)	4 (4.3)	1 (2.5)	0 (0.0)
Total	97	42	92	40	173

Figures in parentheses show the percentile rate against the total questions of the lesson.

5 Status of Attained Curriculum

5.1 Results of Academic Achievement Tests

This section presents the rates of correct answers (RCA) by questions and histograms of total score for each grade in mathematics and science. The results were examined through t-test method and analysis of variance to assess whether the total scores are statistically different.

It should be noted that some of the P4 students showed difficulties in reading English during lesson observation in the field study. Therefore, question sentences, as well as answer choices were translated into the local language. The RCA and typical wrong answers (TWA), which are the wrong answers that were chosen the most, are detailed in Appendix F.

5.1.1 Mathematics

(1) P4 level

The AAT for P4 students in mathematics consisted of 33 questions. The RCA by questions are shown in Figure 5-1. Especially, the concept of fractions and decimal numbers had not been acquired by many students (Q11, Q15 and Q16). For example, in a question asking the smallest fraction among four options, 68% of students chose the fraction with the smallest denominator. They likely misinterpreted the smallest denominator for the smallest the fraction.

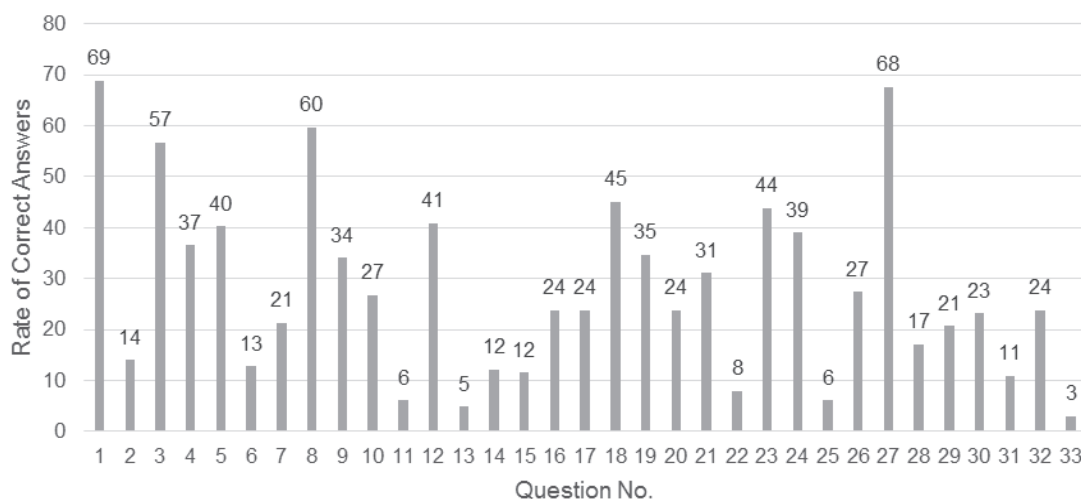


Figure 5-1 Rate of Correct Answers on P4 Mathematics Test

The overall average score of EP Buhande and GS Kabuye was 28.0%, which is equivalent to 9.2 correct answers out of 33. The average scores in EP Buhande and GS Kabuye were 15.4% and 29.8%, and the standard deviations (SDs) were 7.8 for EP Buhande and 10.1 for GS Kabuye, respectively. The analysis of variance (ANOVA) method detected statistically significant differences between the average scores of two schools ($F(1, 162)=38.97, p<.01$). This means that

the average score of GS Kabuye is scientifically higher than that of EP Buhande. In the Endline survey, this difference from the beginning shall be taken into account when analysing an AAT result. Figure 5-2 below shows the distribution of students' scores for these two schools. It clearly indicates that almost all the students performed poorly in EP Buhande (there were no well-performing students). The survey team noticed that most students in EP Buhande were not able to reach the last question within the allotted time (40 minutes), not only from taking too much time to figure out answers, but also spending considerable time to read the questions even in their local language.

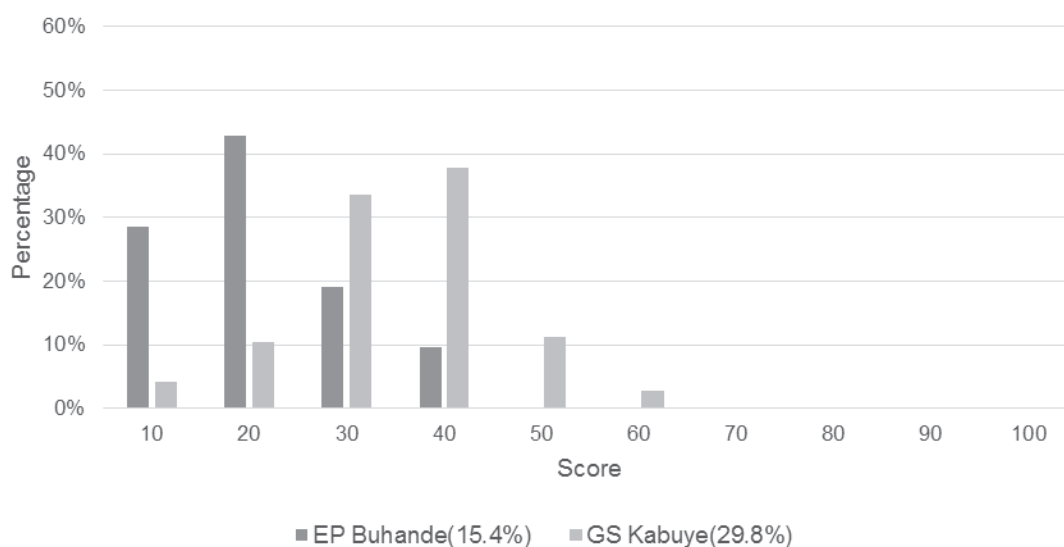


Figure 5-2 Histogram of Scores for P4 Mathematics Test

(2) S1 level

The AAT for S1 students in mathematics consisted of 40 questions. Obviously, there is a noticeable gap in RCA between easy questions and difficult questions as seen in Figure 5-3. Students performed relatively well on questions requiring only simple calculation skills. However, when it comes to questions requiring abstract thinking such as geometry, the RCA were low.

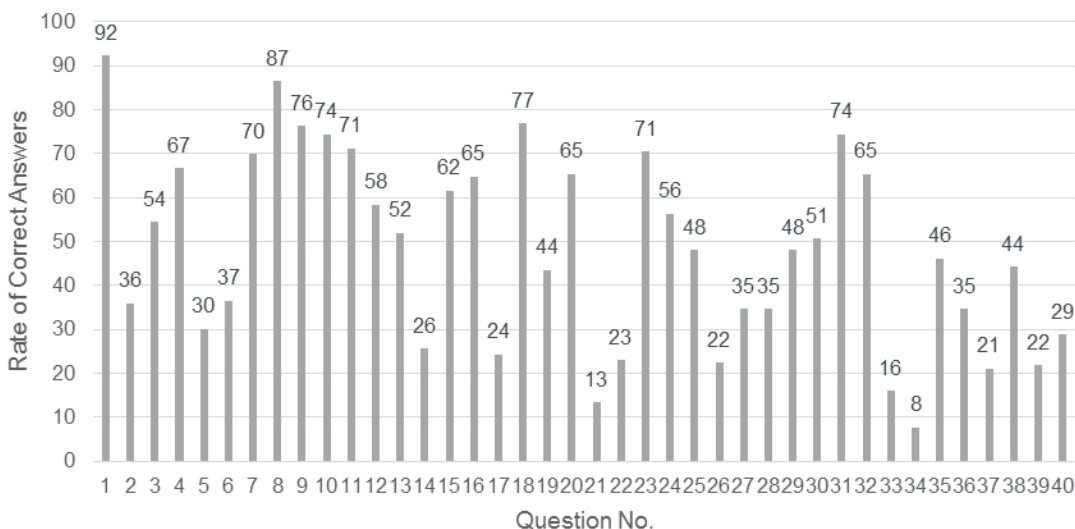


Figure 5-3 Rate of Correct Answers on S1 Mathematics Test

The overall average score of GS St Aloys RWG, GS Apagie Musha and LND was 51.4%, which is equivalent to 20.6 correct answers out of 40. The average score was the highest at LND at 55.4% (SD=9.3), followed by GS Apagie Musha at 52.7% (SD=13.4) and GS St Aloys RWG at 48.4% (SD=14.8). There was no significant difference between the average scores out of three schools ($F(2, 153)=3.03, n.s.$). It can be said that the level of S1 students’ competences in mathematics in the three schools are similar to each other. Figure 5-4 shows the distribution of the students’ scores for the three schools.

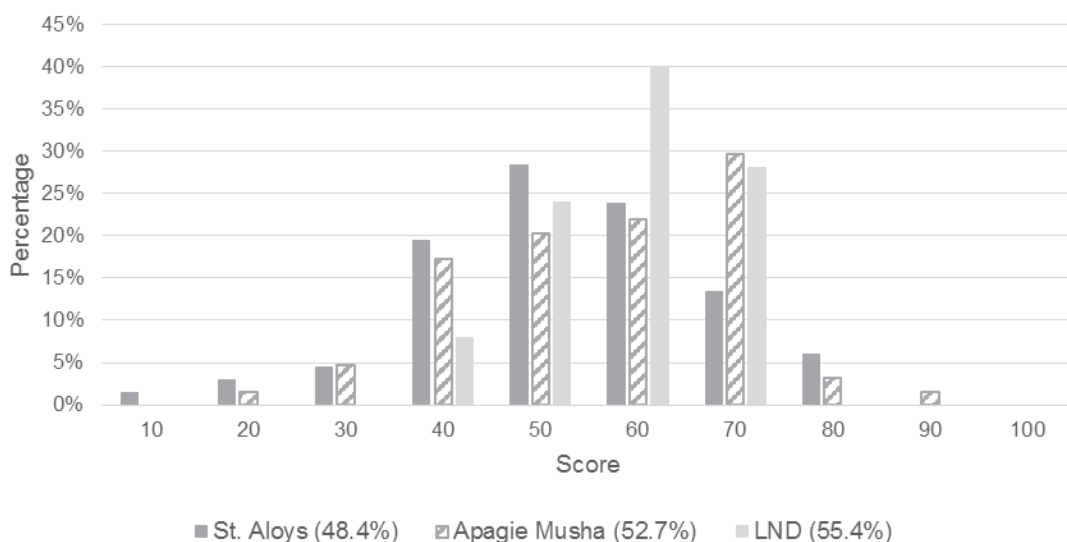


Figure 5-4 Histogram of Scores for S1 Mathematics Test

(3) S4 level

The AAT for S4 students in mathematics consisted of 40 questions (Figure 5-5). Surprisingly, the RCA for some questions which are common in the S1 test remains low, such as Q2, Q13 (Q14 in S1 test), Q17, Q21, Q22, Q26, Q31 (Q34 in S1 test), Q35 (Q37 in S1 test) and Q40. This indicates that students may not have opportunities to review what they learned in lower grades and build on such fundamental knowledge and skills.

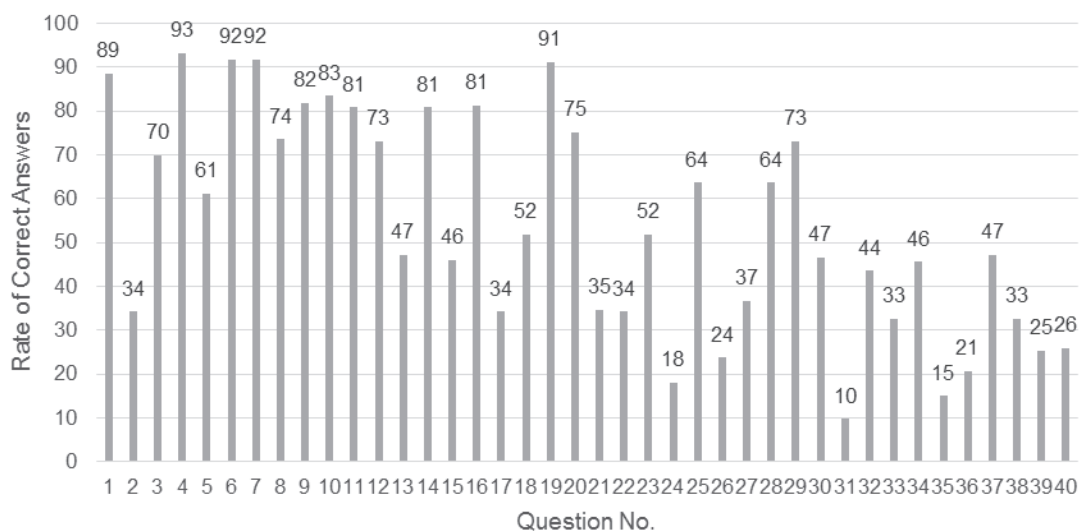


Figure 5-5 Rate of Correct Answers on S4 Mathematics Test

The overall average score of GS St Aloys RWG, GS Apagie Musha and LND was 54.4%, which is equivalent to 21.8 correct answers out of 40. Contrary to the result of S1, the average score was the highest at GS St Aloys RWG at 55.3% (SD=14.0), followed by GS Apagie Musha at 54.0% (SD=14.4) and LND at 51.1% (SD=9.6). There was no significant difference between the three schools ($F(2, 190)=1.13, n.s.$). It can be said that the level of S4 students’ competences in mathematics in the three schools are similar too. Figure 5-6 shows the distribution of students’ scores for the three schools. The variance is the smallest in LND, where half of the students fall into the score range of 41-50.

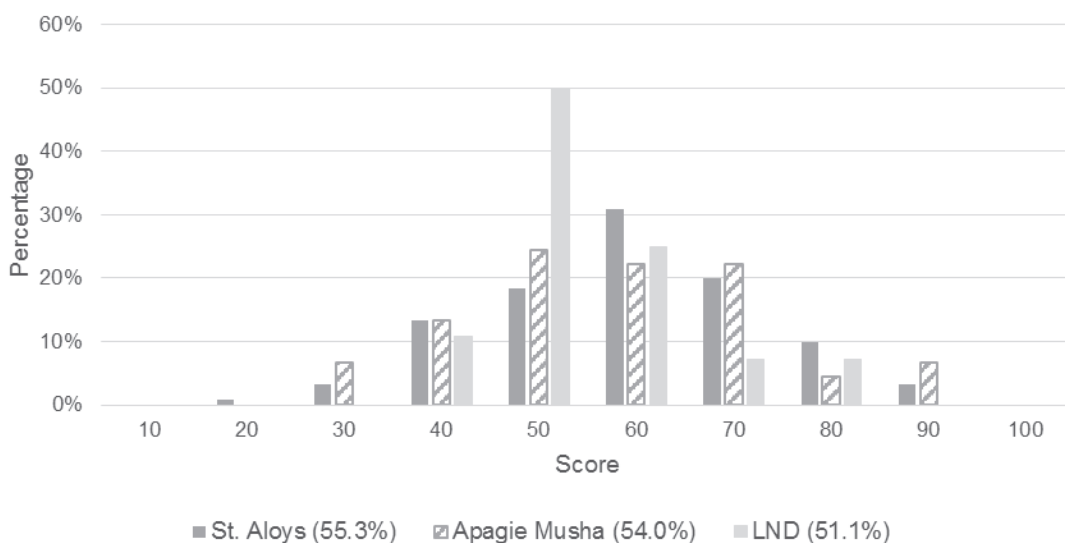


Figure 5-6 Histogram of Scores for S4 Mathematics Test

5.1.2 Science

(1) P4 level

The AAT for P4 students in science consisted of 18 questions (Figure 5-7). It was found that students tended not to choose any option when they thought there was no correct option, and that they performed poorly when the question instructed to choose one wrong option, which were Q2, Q7, Q14 and Q17.

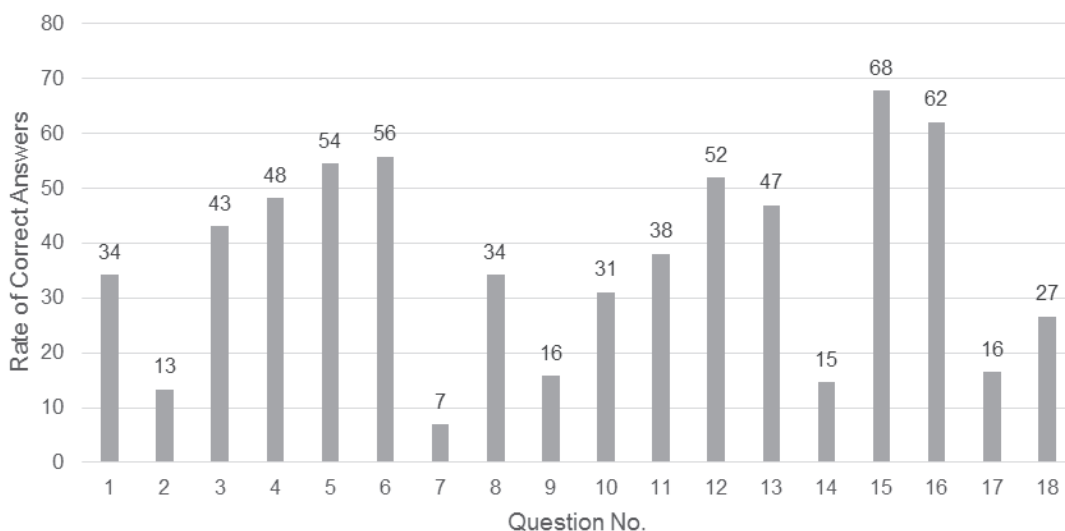


Figure 5-7 Rate of Correct Answers on P4 Science Test

The overall average score of EP Buhande and GS Kabuye was 36.7%, which is equivalent to 6.6 correct answers out of 18. EP Buhande performed lower than GS Kabuye, at a score of 23.5% (SD=18.1) and 38.7% (SD=16.7) respectively. There was a significant difference between the two schools ($F(1, 156)=14.49, p<.01$). The average score of GS Kabuye is scientifically higher than that of EP Buhande. In the Endline survey, this difference from the beginning shall be taken into account when analysing an AAT result.

The variance of scores is also bigger than mathematics. Figure 5-8 shows the distribution of students' scores for the two schools.

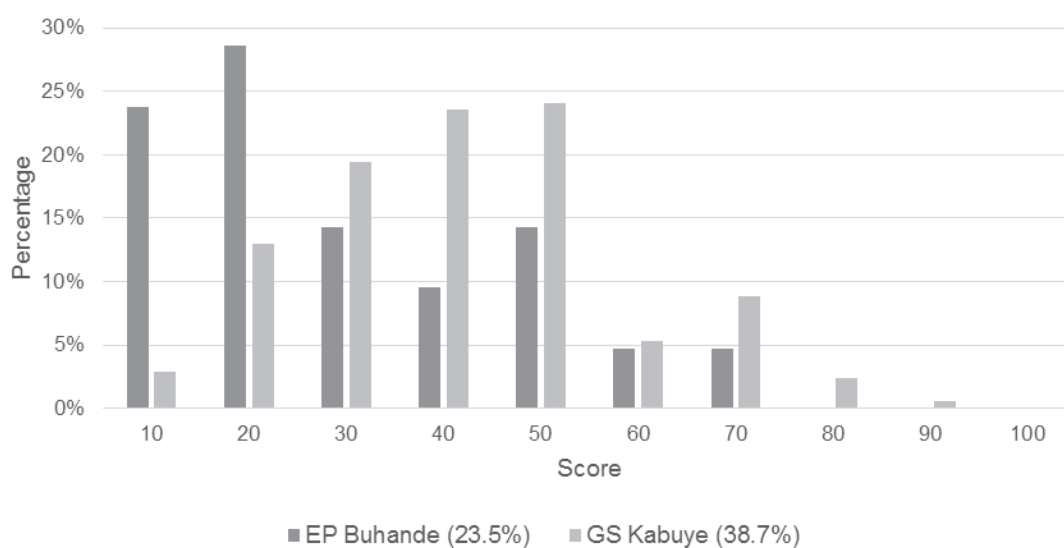


Figure 5-8 Histogram of Scores for P4 Science Test

(2) S1 level

The AAT for S1 students in science consisted of 25 questions (Figure 5-9). For questions taken from the TIMSS 2011, the scores in this AAT were below the international average in seven out of nine questions (Q B3, Q B4, Q B5, Q B6, Q B7, Q B8 and Q B9).

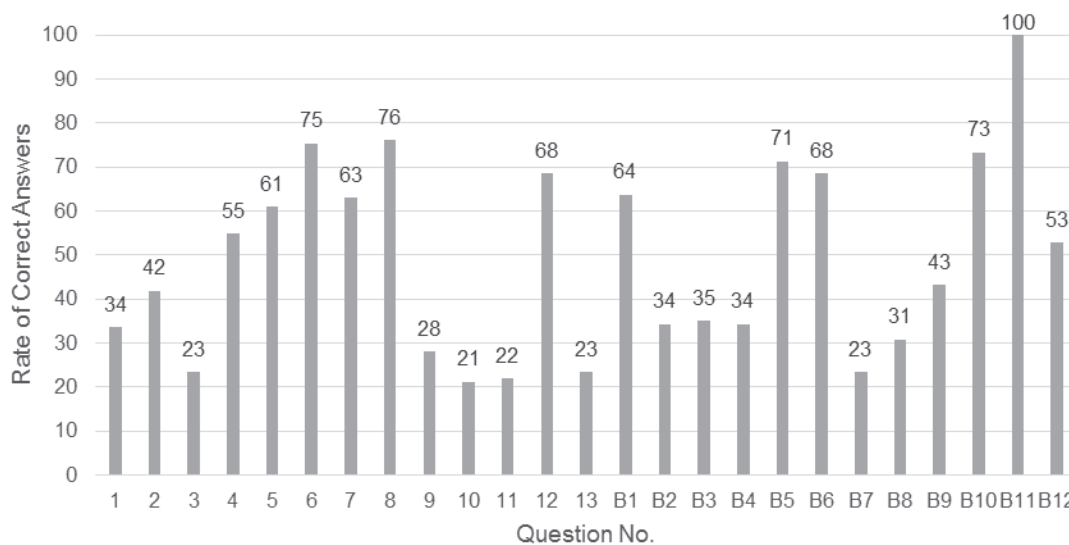


Figure 5-9 Rate of Correct Answers on S1 Science Test

The overall average score of GS St Aloys RWG, GS Apagie Musha and LND was 48.9%, which is equivalent to 12.2 correct answers out of 25. The score at GS St Aloys RWG was the highest at 54.0% (SD=13.3), followed by GS Apagie Musha at 46.9% (SD=11.4) and LND at 37.3% (SD=7.4). There was a significant difference between the three schools ($F(2, 143)=16.55, p<.01$). Then Holm’s multiple comparative analyses method was applied and identified that the average score of GS St Aloys RWG was significantly higher than that of the other two schools. The average score of Apagie Musha was also significantly higher than that of LND. In the Endline survey, this difference from the beginning shall be taken into account when analysing an AAT result. Figure 5-10 shows the distribution of the students’ scores for the three schools.

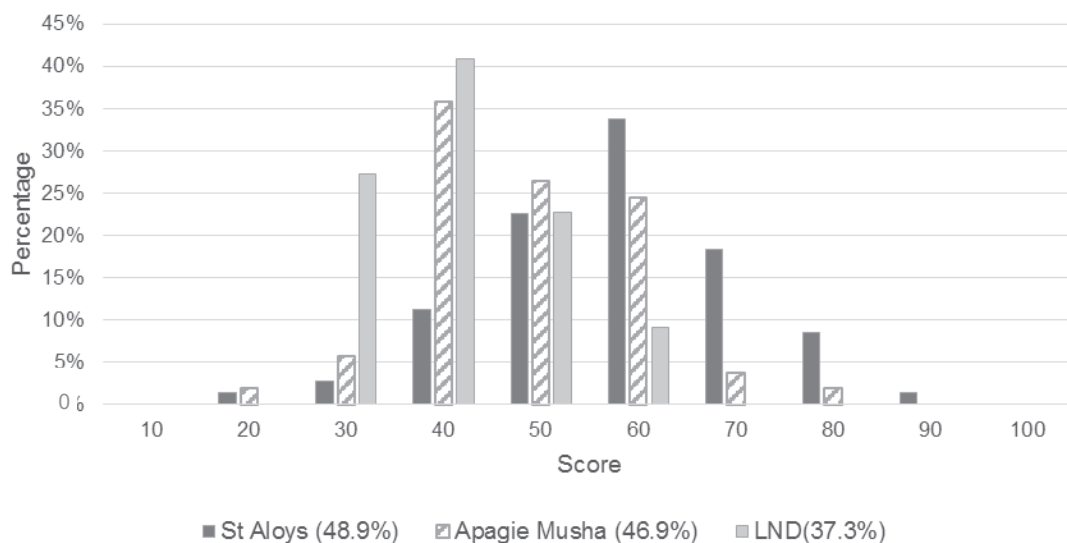


Figure 5-10 Histogram of Scores for S1 Science Test

(3) S4 level

The AAT for S4 students in science consisted of 35 questions (Figure 5-11). The students’ performance in this AAT exceeded the international average in 11 out of 19 questions which were picked up from the TIMSS 2011 (Q C3, Q C4, Q C5, Q C6, Q C8, Q C9, Q C10, Q C11, Q C12, Q C13 and Q C15). Questions Q1 to Q13 were the same as in the S1 test. The RCAs for these questions look similar to that of the S1 result, indicating that if students fail to acquire some knowledge and skills, they may never acquire them.

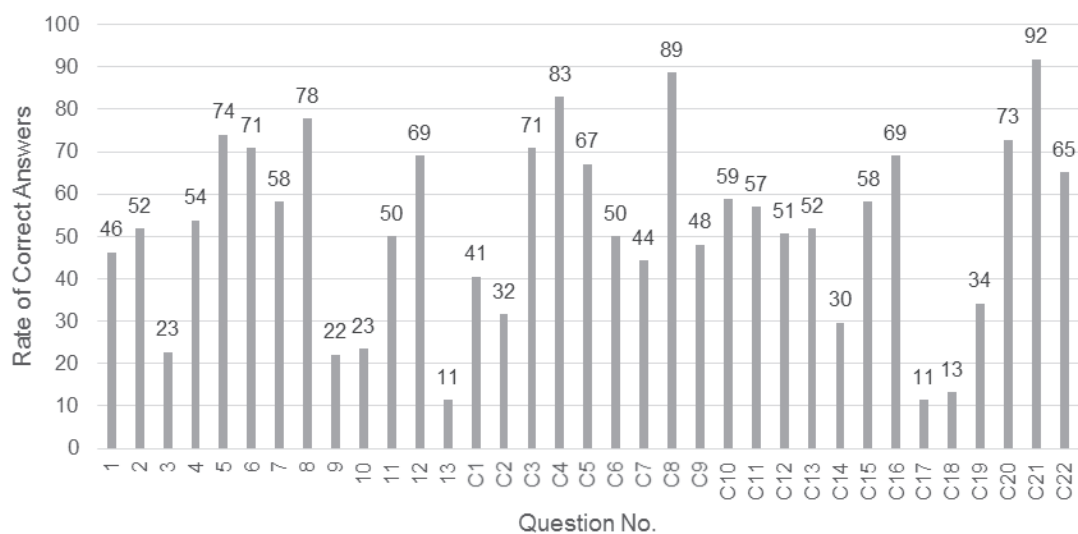


Figure 5-11 Rate of Correct Answers on S4 Science Test

The overall average score of GS St Aloys RWG, GS Apagie Musha and LND was 52.0%, which is equivalent to 18.2 correct answers out of 35. Similarly to the result of the S1 test, the average score at GS St Aloys RWG was the highest among the three, at 60.8% (SD=11.3), followed by GS Apagie Musha at 45.6% (SD=14.5) and LND at 39.4% (SD=14.3). ANOVA detected that there was a significant difference between the average scores of three schools ($F(2, 155)=36.81, p<.01$). Holm’s multiple comparative analyses method was then applied and identified that the average score of GS St Aloys RWG was significantly higher than that of the other two schools. The average score of Apagie Musha was also significantly higher than that of LND. In the Endline survey, this difference shall be taken into account from the beginning when analysing an AAT result. Figure 5-12 shows the distribution of students’ scores for the three schools.

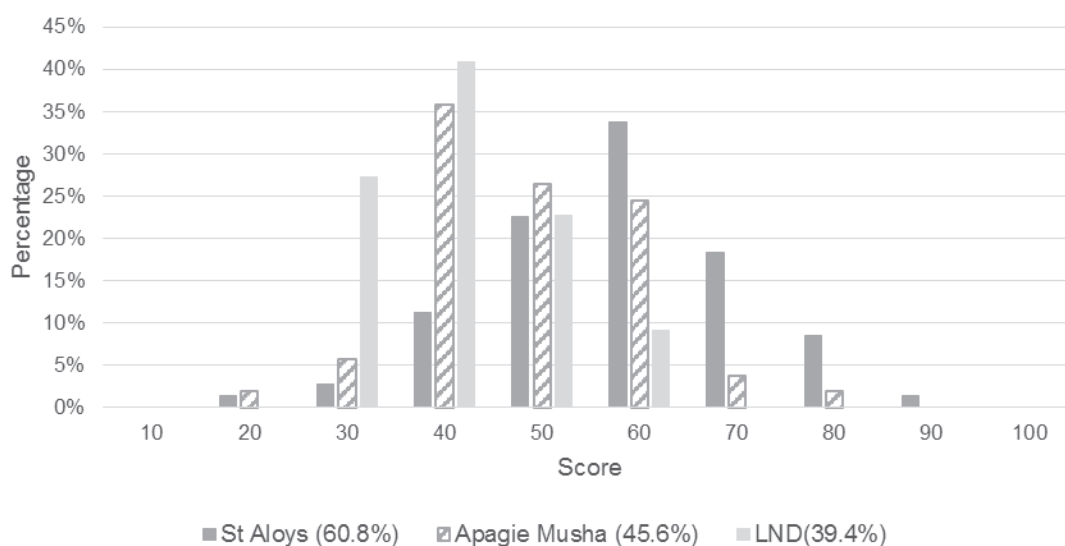


Figure 5-12 Histogram of Scores for S4 Science Test

5.2 Analysis of Students’ Learning

As mentioned earlier, the AATs included questions which students learned in previous grades. In other words, the AATs for S1 students included primary level questions, and S4 included primary level and lower secondary level questions. In order to confirm if the rates improve as grades advance, BLS compared the RCAs for primary level questions among the three grades, and S1 level mathematics questions between S1 and S4. As Table 5-1 shows, there is not a significant improvement in RCAs among the grades. Especially between S1 and S4, the difference is small. It may reflect the fact that the curriculum does not build upon competences in a spiral manner, and hence students do not revisit content in the upper grades again. It also implies that some students just memorize new content without a sound understanding of it due to the lack of basic knowledge and skills.

Table 5-1 Comparison of Rates of Correct Answers for Primary and S1 Level Questions

	P4	S1	S4
Mathematics	29.3%	<u>53.9% (Primary level)</u> <u>42.7% (S1 level)</u>	<u>60.5% (Primary level)</u> <u>43.2% (S1 level)</u>
Science	36.1%	<u>45.5%</u>	<u>48.6%</u>

6 Challenges around CBC

This chapter lists the challenges that the BLS has identified through situation analysis, field study and AATs. It includes challenges raised by DCCs. As a part of pilot activities for DCC, the workshops to analyze challenges around students' performance were conducted in four districts; Rulindo, Musanze, Gasabo and Rwamagana. DEOs, SEOs, HTs and representatives from the School General Assembly Committee participated in the workshop. Though challenges analyzed in the workshop were not specific to the new curriculum, some of them were relevant in the current context where CBC is being introduced.

6.1 Challenges around intended curriculum

Some DCC members pointed out that it is difficult to complete the syllabus due to a variety of reasons. Some claimed that it was because the double shift which makes it difficult to secure required time to complete the syllabus. Others claimed that there is a gap between expected knowledge and skills that the students in certain grades are supposed to have and what they actually have. If they do not have the expected knowledge and skills, teachers have to review what were taught in the previous grades, which reduces time that teachers have to teach new knowledge and skills. Some said that this was because of automatic promotion, though in some schools, they encourage parents to allow students to repeat the same grade if the attendance or attainment is not considered sufficient.

These challenges hinder effective implementation of the new curriculum, which limits its attainment by students. In the same workshop, DCCs developed action plans to tackle those challenges. They are expected to thoroughly implement the action plan and report the challenges that cannot be solved at the district level to the national level.

6.2 Challenges surrounding the implemented curriculum

The perception of teachers' competences varied among the districts. In some districts, DCC members pointed out that teachers do not come to class regularly. According to them, this might be caused by a lack of systematic inspection and monitoring by HT/DOS.

In most of the districts, they concurred that the lack of teaching skills to teach in English was a problem. They wished that SBMs would work better to help teachers enhance their skills on language instruction. According to DCC members, the unsatisfactory performance of SBMs might be caused by a poor selection process. They suggested that the selection criteria set by REB should be applied in a more flexible manner.

Whether teachers are equipped with general pedagogical skills or not varied among the districts. However, those who claimed that teachers were equipped with enough skills also stated challenges around teacher training. The challenges around teacher training were classified into two areas; lack of opportunities and insufficient quality of trainings.

Participants said that the lack of training opportunities should be mitigated by organizing CPD, although the problem around CPD was that teachers are not incentivized by organizing or attending CPD activities. In some districts, they proposed that CPD should be included in imihigo to add extrinsic motivation for CPD. Another reason why CPD is not organized frequently is due to the timetable. It is difficult for teachers to get together for CPD if they have available slots at different times and days of the week. One of the recommendations from the workshop was to encourage HTs to take the time for CPD into account when they make the timetable at the beginning of the academic year.

Insufficient quality of training is a multifaceted problem too. One of the challenges that they pointed out was the lack of post-training assessment. Post-training assessment would help understand whether training was delivered effectively, or whether participants acquired the necessary skills and knowledge. However, currently they barely conduct post-training assessment, so they would never know if the training was effective or if the participants actually learned something in the training. Another challenge was to find a good resource person for trainings. SCC would serve as a platform to exchange information on challenges that each school has and resource persons available in the sector.

6.3 Challenges around attained curriculum

The challenges in the intended curriculum and implemented curriculum resulted in a poorly attained curriculum. Although the sample in AATs was not large, the result of AATs revealed that student's performance was not sufficient, especially in primary schools, and that basic knowledge and skills did not improve significantly even when students proceed to upper grades. Taking into account the results of the situation analysis and field study, many schools are likely to face the same challenges more or less. These challenges make it difficult for teachers to develop students' HOT as well. Teachers have struggled to develop proper questions which fit the individual students and practice active learning.

7 Recommendation

In order to strengthen implementation of CBC based lessons in classrooms through SBI or CPD activities, the following recommendations should be taken into consideration.

- Training for the administrative stream is important to make sure that trainings are conducted in a timely manner and to ensure that all teachers are trained. As of July 2017, most of the sectors have not yet organized the phase II CBC trainings. Absence of an administrative stream in the original plan of CBC training for Phase II resulted in a significant delay of implementation of the last layer of cascade training at sector-based trainings. Besides, there are some teachers who have not attended CBC training fully or completely. Survey results from BLS suggest that training administrators is important in making sure all teachers attend CBC trainings.
- New teachers who graduated from Teacher Training Colleges (TTCs) in 2016 and 2017 have not been fully trained in CBC. These new teachers need support from their colleagues at the school level to deliver lessons according to the CBC. SBI can serve as a platform to give continuous support for them.
- Stronger involvement of SBM and SSL is expected in phase III of CBC training to make the most of these resource persons available at the school level. At the same time, it should be noted that the role that SBM and SSL can play is different according to the school settings.
- Subject specific contents were barely covered in the previous phases of CBC trainings. Selection criteria of SBTs did not include subject knowledge. Consequently, it was observed that too much emphasis was placed on some methodologies, such as group work and play-based learning, and some students failed to master foundational knowledge and skills which are prerequisites for students to engage in critical and creative thinking. Since the main theme of the phase III CBC training will be on assessment, training content should focus on questioning, formative and summative assessment, as well as past content which teachers have not acquired well.
- Training output (implementation and participation status) and outcome (comprehension level of teachers) were not evaluated. How to assure the quality of trainings (for example by conducting post-training tests for all levels of cascade trainings) should be considered in the Phase III CBC training.
- Literature argues that provision of many ad-hoc, one-off trainings has resulted in the inefficient use of teachers' valuable time and inequality of training opportunities among teachers (Mulkeen, 2010¹⁴). Therefore, it is critical to institutionalize school based CPD at schools and monitor activities. The establishment and operationalization of DCCs and

¹⁴ Mulkeen, A. (2010). *Teachers in Anglophone Africa: Issues in teacher supply, training, and management*. Washington, DC: The World Bank.

SCCs is highly important so that these organizations can coordinate and continuously monitor CPD activities near where teaching and learning takes place. If DCCs and SCCs can function well, the problem solving cycle from school level to national level can work as well.

- Online monitoring has not yet started functioning fully due to the lack of capacity and practice of SEOs, which makes it difficult to understand the implementation and participation status of CBC training at the national level. “How to use online monitoring” should be one of the topics to be covered in the phase III CBC training. This will enable REB, districts and sectors to understand the CBC training implementation status and teachers’ participation in the training more comprehensively.

Appendices

Appendices A

Questionnaire to Head Teachers

Appendix A

Questionnaire to Head Teachers

This is the questionnaire for end line survey for SIIQS Project. This questionnaire is NOT for your professional performance assessment so please provide honest information.

1. Basic Information

1.1 School Name: _____

1.2 Sector: _____ 1.3 District: _____

1.4 Type of School: Primary / 9YBES / 12YBES / SS

1.5 Type of ownership: Public / Government-aided / Private

1.6 Your Name: _____ (surname) _____ (given name) _____ (middle name)

1.7 Male or Female: M F 1.8 Age: _____ years old

1.9 Tel: _____ 1.10 E-mail: _____

1.11 Experience: (a) Head teacher: _____ years (b) In total: _____ years

1.12 Qualification: A0 / A1 / A2 / Others

1.13 Number of teachers in your school

		Male	Female	Total
Primary	Qualified			
	Non qualified			
Secondary	Qualified			
	Non qualified			

1.14 Number of mathematics and science teachers in your school

		Male	Female	Total
Mathematics	Qualified			
	Non qualified			
Science	Qualified			
	Non qualified			

1.15 Number of students

Grade	Classes	No of Students			No of repeaters			No of drop-outs		
		Boy	Girl	Total	Boy	Girl	Total	Boy	Girl	Total
P1										
P2										
P3										
P4										
P5										
P6										
S1										
S2										
S3										
S4										
S5										
S6										
Total										

1.16 Do you have the following resources? How many do you have?

a. Curriculum book	1. <u>for all teachers</u>	2. <u>for some teachers</u>	3. <u>for few teachers</u>	4. <u>none</u>
b. Syllabus	1. <u>for all subjects</u>	2. <u>for some subjects</u>	3. <u>for few subjects</u>	4. <u>none</u>
c. Textbooks	1. <u>for all subjects</u>	2. <u>for some subjects</u>	3. <u>for few subjects</u>	4. <u>none</u>

1.17 Available Facilities /Equipments

	Y	N		Y	N	How many?
Library			PC for teachers in use			
Internet access			PC for students in use			
Science laboratory						
Computer laboratory						

1.18 What are the major issues on your school management? Please specify in the box below.

2. Competence-Based Curriculum (CBC)

2.1 How much do you think your teachers change lesson style when conducting CBC?

0. none 1. slightly 2. moderate 3. very much

2.2 Did SSLs at your school organize the **school-based CBC induction training** last year?

1. Yes, SSLs fully conducted 2. Yes, SSLs partly conducted
 3. No, SSLs missed all or most of it. 4. SSLs did not organize it

➔ If SSLs conducted the school-based CBC induction training, please assess the training quality with the following criteria.

a. Attendance:	1. <u>all teachers attended</u>	2. <u>some teachers missed</u>	3. <u>most teachers missed</u>
b. Coverage:	1. <u>all topics were covered</u>	2. <u>some topics were missed</u>	3. <u>most topics were missed</u>
c. Understanding:	1. <u>fully understood</u>	2. <u>fairly understood</u>	3. <u>poorly understood</u>

➔ Please choose the criteria of the appointment for SSLs when you appointed them last year. (multiple choices are allowed)

1. English skill 2. Leadership 3. Subject knowledge 4. Pedagogical knowledge
 5. Position 6. Seniority 7. Teaching experience 8. Inter personal skill
 9. Personality 10. Commitment 11. Recommendation from other teachers
 12. No other choice (He/She is the only teacher in the subject) 13. Not appointed

➔ If you have not appointed SSL, please specify the reason of it.

Because:

2.3 Please specify the issues and challenges on the school-based CBC induction training.

3. School-Based In-Service Training (SBI)

3.1 Does your school conduct SBI regularly? (apart from the CBC induction training)

0. never 1. once a term 2. twice a term 3. three times or more a term

→ What are the benefits of the SBI for you? (Multiple choices are allowed)

1. Develop teachers 2. Improving lessons 3. Cost effective
4. Enjoyable 5. Sharing practical ideas 6. Easy to conduct
7. Other (Please specify: _____)

→ How many times did your school conduct SBI(s) in this term? (1st term of 2017)

0. never 1. once 2. twice 3. three times or more

3.2 If your school conduct SBI in this term, please specify the theme/topic of the SBI(s)

3.3 If your school did not conduct SBI in this term, please specify the reason.

4. School-Based Mentor (SBM)

4.1 Did you appoint School-Based Mentor (SBM)?

1. Appointed 2. Not appointed yet

→ If you appointed SBM, please choose the criteria of the appointment (multiple choices are allowed)

1. English skill 2. Leadership 3. Subject knowledge 4. Pedagogical knowledge
5. Position 6. Seniority 7. Teaching experience 8. Inter personal skill
9. Personality 10. Commitment 11. Recommendation from other teachers

→ Did you reduce the number of teaching periods of the SBM to handle SBM's tasks?

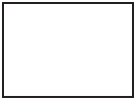
1. Yes 2. No What is his/her teaching periods?
BEFORE: _____ periods NOW: _____ periods

→ If you have not appointed SBM, please specify the reason of it.

Because:

Appendices B

Questionnaire to School Teachers



Appendix B

Questionnaire to School Teachers

This is the questionnaire for the survey of the SIIQS Project which aims at strengthen training program for in-service teachers. This questionnaire is NOT for your professional performance assessment but for SIIQS program improvement, so please provide honest information.

1. Basic Information

1.1 School Name: _____

1.2 Sector: _____ 1.3 District: _____

1.4 Your Name: _____
(surname) (given name) (middle name)

1.5 Male or Female: M F 1.6 Age: _____ years old

1.7 Tel: _____ 1.8 E-mail: _____

1.9 Teaching Experience: (a) In this school: _____ years (b) In total: _____ years

1.10 Qualification: A0 / A1 / A2 / Others

1.11 Level of students you are teaching this term (multiple choices are allowed)
 P1 / P2 / P3 / P4 / P5/ P6/ S1 / S2 / S3 / S4 / S5/ S6

1.12 Subject you are teaching in this term: _____

1.13 Your department in school: _____

1.14 (a) Are you a School-based Mentor (SBM)? Yes / No
(b) Are you a School Subject Leader (SSL)? Yes / No

1.15 How many periods do you teach **per week** in this term? _____ periods/week

1.16 **In a typical school week**, estimate the total number of hours in week you spend on the following. Please write 0 (zero) if none.

- | | |
|--|------------------|
| (a) Individual planning or preparation of lessons in school | _____ hours/week |
| (b) Individual planning or preparation of lessons out of school | _____ hours/week |
| (c) Team work and dialogue with colleagues within this school | _____ hours/week |
| (d) Marking/correcting of student work either in school or out of school | _____ hours/week |
| (e) Extracurricular activities (e.g. sports and cultural activities after class) | _____ hours/week |
| (f) Administrative duties either in school or out of school | _____ hours/week |

2. Competence-Based Curriculum (CBC)

2.1 (Question about Knowledge on CBC): Which of the below grade(s) CBC is being implemented this year? Please circle grade(s) (multiple choices are allowed).

Pre-primary / P1 / P2 / P3 / P4 / P5 / P6 / S1 / S2 / S3 / S4 / S5 / S6

2.2 Circle the document(s) that you have in your school (multiple choices are allowed).

1. Curriculum book
2. Syllabus of the subject(s) you are teaching
3. Textbook of the subject(s) and grades you are teaching
4. None

2.3 How much did you change your lesson style when conducting CBC?

0. never
1. slightly
2. moderate
3. very much

2.4 Please circle the number from 1 to 4 which most fits your opinion about CBC.

	Strongly disagree	Disagree	Agree	Strongly agree
(a) I am ready to conduct the CBC lesson.	1	2	3	4
(b) CBC is difficult for teachers.	1	2	3	4
(c) CBC is difficult for students.	1	2	3	4
(d) Students' capacity is too low to conduct CBC lesson.	1	2	3	4
(e) Teachers are not provided enough training to conduct CBC lesson.	1	2	3	4
(f) Teachers are not provided enough learning/teaching material to conduct CBC lesson.	1	2	3	4
(g) CBC requires more time for lesson preparation than before.	1	2	3	4
(h) I can organize learning/teaching activities required in CBC lessons.	1	2	3	4
(i) I can prepare learning/teaching materials required in CBC lessons.	1	2	3	4
(j) I can conduct assessment techniques to evaluate learner's achievement in CBC lessons.	1	2	3	4
(k) All CBC lessons have to include collaborative learning activity.	1	2	3	4
(l) CBC is a better curriculum than the previous one.	1	2	3	4
(m) I can develop competence of students.	1	2	3	4

2.5 Did you attend the **school-based CBC induction training** that SSLs conducted for teachers in your school last year?

1. Yes, I fully attended
2. Yes, I partly attended
3. No, I missed all or most of it.
4. My school did not organize it

→ If your answer to Question 2.5 is "1" or "2", please proceed to the questions in next page.

→ If your answer to Question 2.5 is "3" or "4", please specify the reason in the box below.

Because:

2.6 (For those attended school-based CBC induction training only)

Do you remember if the last CBC induction training covered the following topics? If so, what positive impact did these have on your CBC practice? For each topics please indicate 'Yes' or 'No' in part (A). If 'Yes' in part (A), please estimate the impact in part (B).

	(A) Topics		(B) Impact			
	Yes	No	No impact	A small impact	A medium impact	A large impact
(a) Background and Rationale of the New Curriculum	Y	N	1	2	3	4
(b) Concept of Competences	Y	N	1	2	3	4
(c) How to develop competences	Y	N	1	2	3	4
(d) Techniques used in developing competences	Y	N	1	2	3	4
(e) Assessment methodology in CBC	Y	N	1	2	3	4
(f) Teaching resources for CBC	Y	N	1	2	3	4
(g) CBC unit Planning/Scheme of Work development	Y	N	1	2	3	4
(h) CBC lesson Planning	Y	N	1	2	3	4
(i) Learning environment management	Y	N	1	2	3	4
(j) Inclusive education	Y	N	1	2	3	4
(k) Continuous Professional Development (CPD)	Y	N	1	2	3	4
(l) School-Based In Service training (SBI)	Y	N	1	2	3	4
(m) National CBC monitoring and evaluation mechanism	Y	N	1	2	3	4

2.7 What challenges do you have in implementing CBC?

3. School-based In-Service Training (SBI)

3.1 Does your school conduct SBI regularly (apart from the CBC induction training)?

0. never 1. once a term 2. twice a term 3. three times or more a term

3.2 How many times did you attend the SBI in this term? (1st term of 2017)

0. never 1. once 2. twice 3. three times or more

➔ If your answer to Question 3.2 is "1", "2" or "3", please specify the theme/topic of the SBI(s)

3.3 Please circle the number from 1 to 4 which most fits your opinion about SBI.

	Strongly disagree	Disagree	Agree	Strongly agree
(a) I understand well about SBI.	1	2	3	4
(b) SBI is effective in improving teaching and learning.	1	2	3	4
(c) I think that we can continue doing SBI for a long time.	1	2	3	4
(d) Allowance should be paid for participants in SBI.	1	2	3	4
(e) SBI is burdensome (heavy task).	1	2	3	4

4. Training needs

4.1 Please indicate the degree to which you currently need training for each areas listed below.

	No need	Low level of need	Moderate level of need	High level of need
(a) Knowledge and understanding of my subject field(s)	1	2	3	4
(b) Knowledge of the CBC curriculum	1	2	3	4
(c) Skills of English as an instructional language	1	2	3	4
(d) Teaching methodology in teaching my subject field(s)	1	2	3	4
(e) Teaching methodology to develop students' competences	1	2	3	4
(f) Teaching methodology in large size classroom	1	2	3	4
(g) Teaching methodology to teach cross-cutting issues	1	2	3	4
(h) Teaching methodology to promote play-based learning	1	2	3	4
(i) Student evaluation and assessment practices	1	2	3	4
(j) ICT skills for teaching	1	2	3	4
(k) Teaching students with special needs	1	2	3	4
(l) Teaching in a multicultural or multilingual setting	1	2	3	4
(m) Student career guidance and counseling	1	2	3	4

5. Performance Contract (Imihigo)

5.1 Have you made your imihigo for this year? Yes / No

5.2 Describe the target(s) that you set in your imihigo.

6. School Environment / Facility

6.1 Do you use a computer, smartphone or tablet to collect useful information when preparing lessons?

1. Always 2. Frequently 3. Occasionally 4. Never 5. I have no internet

➔ If your answer to Question 6.1 is "1", "2" or "3", choose the mode(s) through which you access internet (Multiple choices are allowed)

1. Computer 2. Smartphone 3. Tablet

6.2 Have you used "Teacher Community of Practice" (TCOP)?

1. Yes, I often use it 2. Yes, I have seen it.
3. No, I haven't, but I heard about it. 4. No, I haven't.

7. Perception on School Management

7.1 Please circle the number from 1 to 5 which most fits your opinion.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1 I am proud of teaching profession.	1	2	3	4	5
2 I want to continue teaching profession even if my tasks would become harder than now.	1	2	3	4	5
3 I cannot carry out a good lesson because teachers' salary is low.	1	2	3	4	5
4 The number of lessons per week is too much.	1	2	3	4	5
5 I cannot properly prepare lessons because of too many administrative duties.	1	2	3	4	5
6 I enjoy working with my colleagues in my school.	1	2	3	4	5
7 My head teacher is supportive in improving teaching and learning in my school.	1	2	3	4	5
8 <u>(O and A level only)</u> Director of Study (DoS) in my school is supportive in improving teaching and learning in my school.	1	2	3	4	5
9 School-based Mentor (SBM) in my school helps me improve my lesson.	1	2	3	4	5
10 School Subject Leader (SSL) in my school helps me improve my lesson.	1	2	3	4	5
11 I often receive advice/consultation from my colleagues to improve my teaching.	1	2	3	4	5
12 I often give advice/consultation to my colleagues to improve their teaching.	1	2	3	4	5
13 I am willing to share my good lesson practice with my colleagues.	1	2	3	4	5
14 I use the feedback/advice given by my colleague to improve my teaching and learning process.	1	2	3	4	5
15 School activities are proceeded as planned in my school.	1	2	3	4	5
16 There is atmosphere in my school to make challenges for new idea positively.	1	2	3	4	5
17 Results from national examination are analyzed by all teachers together.	1	2	3	4	5
18 I usually contact to my students' parents/guardians from my side to talk about students' performance.	1	2	3	4	5
19 My students' parents/guardians contact me from their side to talk about students' performance.	1	2	3	4	5
20 The vision/mission of my school is/are clearly stated.	1	2	3	4	5
21 The vision/mission of my school is shared within school community members.	1	2	3	4	5
22 I make my effort to attain the vision/mission of my school.	1	2	3	4	5
23 There are clear aims or objectives in my school.	1	2	3	4	5
24 The objectives and plans are achieved successfully in my school.	1	2	3	4	5
25 Objectives and plans are developed based on evidence and data in my school.	1	2	3	4	5
26 The school leaders encourage us to give some comments/ ideas to contribute school improvement.	1	2	3	4	5
27 There is cooperative system among different subjects in my school.	1	2	3	4	5
28 My opinions often contribute to the process of making decision in my school.	1	2	3	4	5
29 <u>(For those who are not SBM only)</u> I want to be an SBM	1	2	3	4	5
30 <u>(For those who are not SSL only)</u> I want to be an SSL	1	2	3	4	5

Thank you for your cooperation.

Appendices C
Interview Record Sheet
for Semi-Structured Interview
for Head Teachers

Appendix C

Interview Record Sheet for Semi-Structured Interview for **HT**

Date	
School Name	
Type of School (Circle one)	Primary 9YBES 12YBES SS
Name of the Interviewer	
Name of the Recorder	

Topic 1: Overall impression on CBC

(1) How do you like CBC? Why? How do you assess the performance of teachers as for CBC implementer?

(2) How did you organize the school-based CBC induction training last year? How did you organize training? Was it on weekday? How long did you spend the time for that training? Where was the venue?

(3) What are the major problems on CBC implementation at your school? (Particularly in math and science) Have you ever shared /reported the challenges to someone (HT/SEO)? What training do you need for further CBC improvement?

Topic 2: SBI

(1) Does your school conduct SBI? If yes, how do you like it? What were the themes of SBI so far? Were the objectives fulfilled? Do you think SBI is effective in improving teaching and learning? If no, what is the reason?

(2) Did you appoint SBM and SSLs? What do they do? How do they help SBI or CBC? Is SBM and SSLs given free time to organize mentoring or SBI?

(3) What sort of SBI are you planning? What SBI do you want to have in the further?

(4) Are there any challenges in conducting SBI? Do you think SBI is sustainable in your school? Do you use capitation grant (how much?) for SBI? Do you think SBI should have financial support? Have you ever reported the challenges to SEO to solve?

Topic 3: Performance contract

(1) How do you prepare school imihigo and personal imihigo? Are there any targets related to SBI/CBC in your performance contract (Imihigo)?

(2) How did you set the target? Do you have any reference document? Do you think CBC/SBI quality improvement can be your imihigo target?

Topic 4: General Problems, Request to REB, Willingness to work with us.

(1) Are there any other issues or problems on your school to be reported to REB on this occasion? Are such problems shared among teachers to overcome the issues?

(2) What are the advantages, good points of your school? What are the visions of your school? Are such visions shared among teachers to achieve goals? Do you want to work with us as a model school to improve the lessons even without financial support?

Appendices D
Interview Record Sheet
for Semi-Structured Interview
for Group of Teachers

Appendix D

Interview Record Sheet for Semi-Structured Interview for Group of Teachers

Date	
School Name	
Type of School (Circle one)	Primary 9YBES 12YBES SS
Name of the Interviewer	
Name of the Recorder	
Number of Participants	

Topic 1: Overall impression on CBC

(1) Did you attend school-based CBC induction training that SSLs conducted for teachers in your school last year? How was the training? How long was it? Were you fully involved?

(2) What do you think CBC? Do you like it or not? Why? What are the major problems on CBC implementation at your school? (Particularly in math and science) Have you ever shared /reported the challenges to someone (HT/SEO)?

(3) What training do you need for further CBC improvement?

Topic 2: SBI

- (1) Does your school conduct SBI? If yes, how do you like it? What were the themes of SBI so far? Were the objectives fulfilled? Do you think SBI is effective in improving teaching and learning? If no, what is the reason?**

- (2) What sort of SBI are you planning? What SBI do you want to have in the further?**

- (3) Are there any challenges in conducting SBI? Do you think SBI is sustainable in your school? Do you think SBI should have financial support?**

Topic 4: General Problems, Request to REB, Willingness to work with us

- (1) Are visions of your school shared among teachers to achieve goals? Are there good practices or problems on your school to be reported to REB on this occasion? Are such problems shared among teachers to overcome?**

- (2) Do you want to work with us as a model school to improve the lessons even without financial support?**

Appendices E
Academic Achievement Test

Appendix E
Academic Achievement Test

JICA SIIQS Project
Mathematics Test for Primary School Students (P4)

Name: First Name: _____ Middle Name: _____ Last Name: _____

School: _____ Class: _____ Student Number: _____

***** **Sample** *****

Calculate $2 + 5 =$

- A. 0
- ✓ B. 7
- C. 10
- D. 3

Circle or ✓ here.
Choose only one answer.

1. $7 + 2 =$

- A. 5 B. 72 C. 9 D. 27

2. The digit in the thousand's place in 72081 is ...

- A. 7 B. 2 C. 0 D. 8

3. Calculate : 8×7

- A. 42 B. 49 C. 56 D. 15

4. Add :
$$\begin{array}{r} 14 \\ + 7 \\ \hline \end{array}$$

- A. 7 B. 11 C. 21 D. 111

5. Calculate : $10 - 2 + 5$

- A. 3 B. 7 C. 13 D. 17

6. Multiply : 302×50

- A. 1600 B. 16000 C. 1510 D. 15100

7. Divide : $276 \div 4$

- A. 59 B. 69 C. 79 D. 64

8. Add : $597 + 236$

- A. 733 B. 833 C. 823 D. 723

9. Subtract : $600 - 236$

- A. 264 B. 374 C. 464 D. 364

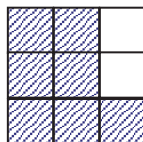
10. What fraction of the diagram below is shaded?

A. $\frac{7}{2}$

B. $\frac{9}{7}$

C. $\frac{7}{9}$

D. $\frac{2}{7}$



11. Which of the following fractions is the smallest? $\frac{1}{6}, \frac{2}{3}, \frac{1}{3}, \frac{1}{2}$.

- A. $\frac{1}{6}$ B. $\frac{2}{3}$ C. $\frac{1}{3}$ D. $\frac{1}{2}$

12. Calculate : $\frac{2}{7} + \frac{3}{7}$

- A. $\frac{6}{7}$ B. $\frac{5}{14}$ C. $\frac{5}{7}$ D. $\frac{8}{7}$

13. Simplify : $\frac{2}{5} \times \frac{3}{4}$

- A. $\frac{3}{10}$ B. $\frac{3}{5}$ C. $\frac{5}{9}$ D. $\frac{8}{15}$

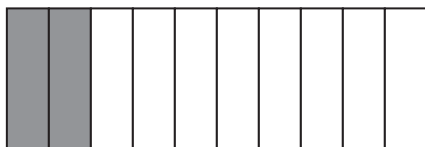
14. $\frac{4}{6} - \frac{1}{6} = m$, m is ...

- A. $\frac{1}{3}$ B. $\frac{1}{9}$ C. $\frac{1}{18}$ D. $\frac{1}{2}$

15. Which of the following is equal to 0.4?

- A. 4 B. $\frac{4}{10}$ C. $\frac{4}{100}$ D. $\frac{1}{4}$

16. Which decimal number does the following shaded part express?



- A. 2.8 B. 0.5 C. 0.2 D. 0.02

17. Change $\frac{123}{100}$ to a decimal number.

- A. 0.23 B. 1.023 C. 1.23 D. 12.3

18. Calculate: $0.23 + 1.37$

- A. 0.7 B. 1.7 C. 1.6 D. 1.5

19. Calculate: $19.82 - 5.28$

- A. 14.64 B. 14.54 C. 14.66 D. 14

20. Change 1.25 metres to centimetres.

- A. 12.5 cm B. 125 cm C. 1250 cm D. 102.5 cm

21. Emmanuel gets 0.5 litres of tomato juice from 5 tomatoes. How many litres of the juice can he get from 15 tomatoes?

- A. 1.5 litres B. 2 litres C. 2.5 litres D. 3 litres

22. A book contains 130 pages. Claudine read 78 pages of it. Which of the following shows the rest of the pages left?

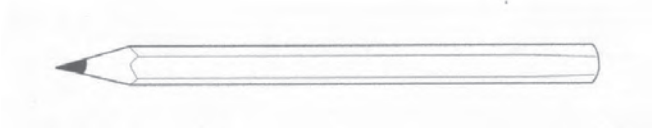
A. $130 + 78 = \square$

B. $\square - 78 = 130$

C. $130 \div 78 = \square$

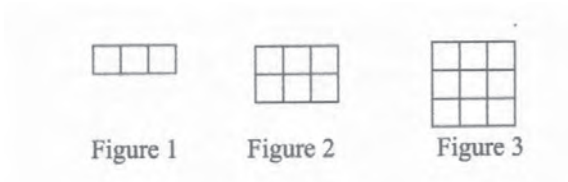
D. $130 - 78 = \square$

23. About how long is this picture of a pencil?



- A. 5 cm B. 10 cm C. 20 cm D. 30 cm

24. Here is the beginning of a pattern of tiles. If the pattern continues, how many tiles will be in Figure 6?



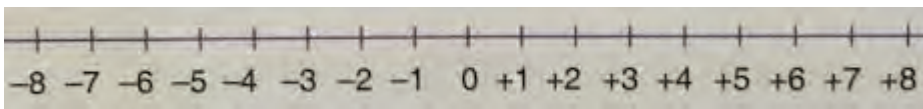
- A. 12 B. 15 C. 18 D. 21

25. Find the correct sign to compare the following number.

Seven hundred $617 + 83$

- A. =
B. >
C. <
D. None of the above

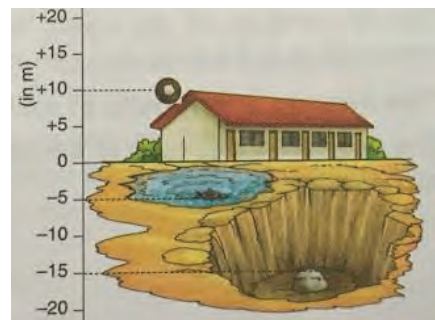
26. What is the distance between -3 and +6 on the number line?



- A. 3 B. 9 C. -3 D. -9

27. Study the diagram below and find the position of the top of the roof.

- A. -5 m
B. 0 m
C. +5 m
D. +10 m



28. Find the LCM of 12 and 15

- A. 3 B. 27 C. 60 D. 180

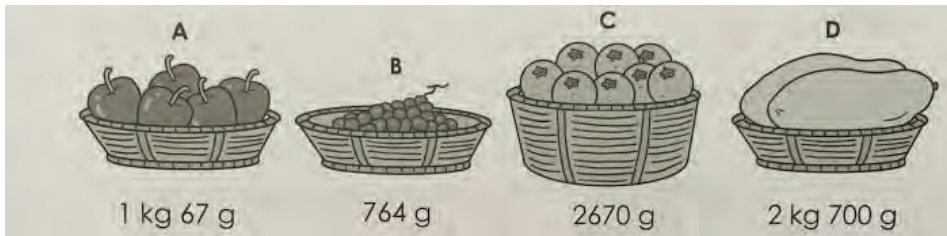
29. Evaluate $\sqrt{16}$

- A. 3 B. 16 C. 4 D. 8

30. Calculate 5 m 25 cm – 1 m 40 cm

- A. 4 m 15 cm B. 6 m 65 cm C. 4 m 65cm D. 3 m 85 cm

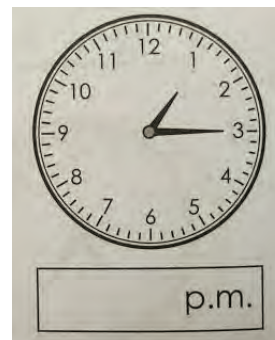
31. Find the correct answer.



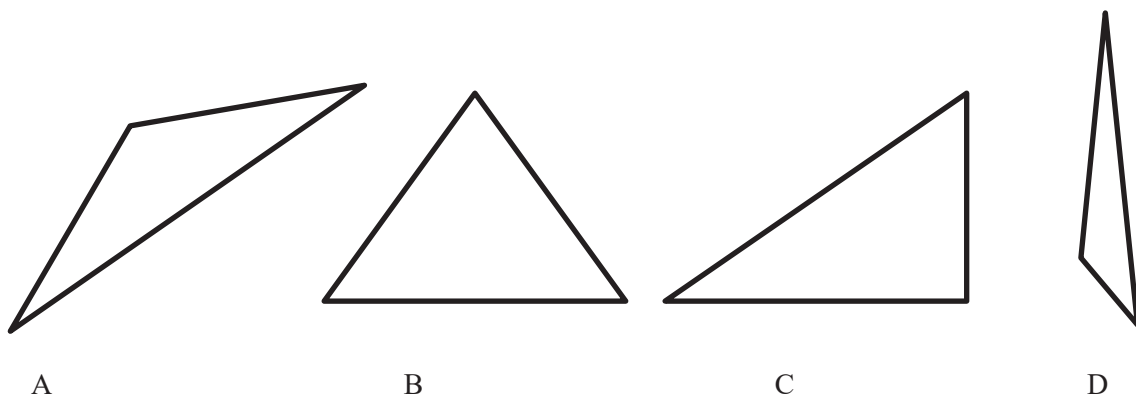
- A. Basket A is the lightest.
B. Basket C is the heaviest.
C. Basket A is lighter than Basket B
D. Basket D is heavier than Basket C

32. What time is it?

- A. 1:15 B. 1:03
C. 3:01 D. 3:10



33. Choose right angled triangle.



JICA SHQS Project
Maths Test for Secondary School Students (S1)

Name: _____
First name
Middle name
Family name

School: _____ Class: _____ Student Number: _____

***** **Sample** *****

Calculate $2 + 5 =$

- A. 0 ✓B. 7 C. 10 D. 3

Circle or ✓ here.
Choose only one answer.

1. Calculate : 8×7

- A. 42 B. 49 C. 56 D. 15

2. Calculate : $4 + 4 \div 4 - 4$

- A. 0 B. 1 C. -2 D. 8

3. Simplify : $26 - 32 + 43$

- A. 29 B. 49 C. 37 D. 101

4. Simplify : $23 - (-42)$

- A. 29 B. 21 C. -19 D. 65

5. Find the remainder of the following : $489 \div 37$

- A. 13 B. 6 C. 7 D. 8

6. The sum $691 + 208$ is closest to the following sum

- A. $600 + 200$ B. $700 + 200$ C. $700 + 300$ D. $900 + 200$

7. Multiply : $-12 \times (-25)$

- A. 120 B. -240 C. -300 D. 300

8. Subtract : $2.201 - 0.753$

- A. 1.448 B. 1.458 C. 1.548 D. 1.558

9. Divide : $24.6 \div 0.04$.

- A. 0.615 B. 6.15 C. 61.5 D. 615

10. Multiply 0.203 by 0.56

- A. 0.1288 B. 0.01288 C. 0.11368 D. 0.011368

11. Calculate the following : $\frac{3}{8} \div \frac{3}{4}$

- A. $\frac{9}{32}$ B. $\frac{1}{2}$ C. $\frac{3}{4}$ D. $-\frac{1}{2}$

12. Simplify : $\frac{3}{4} + \left(\frac{2}{3} \times \frac{1}{4} \right)$

- A. $\frac{1}{8}$ B. $\frac{5}{16}$ C. $\frac{5}{6}$ D. $\frac{11}{12}$

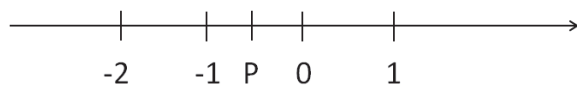
13. Which of the following fractions is the smallest? $\frac{1}{6}, \frac{2}{3}, \frac{1}{3}, \frac{1}{2}$.

- A. $\frac{1}{6}$ B. $\frac{2}{3}$ C. $\frac{1}{3}$ D. $\frac{1}{2}$

14. In which list of fractions are all of the fractions equivalent respectively?

- A. $\frac{1}{2}, \frac{2}{4}, \frac{4}{6}$ B. $\frac{2}{3}, \frac{4}{6}, \frac{8}{12}$ C. $\frac{2}{5}, \frac{4}{10}, \frac{8}{50}$ D. $\frac{3}{4}, \frac{2}{4}, \frac{4}{6}$ E. $\frac{3}{4}, \frac{4}{6}, \frac{6}{8}$

15. What number does the letter P represent on the number line below?

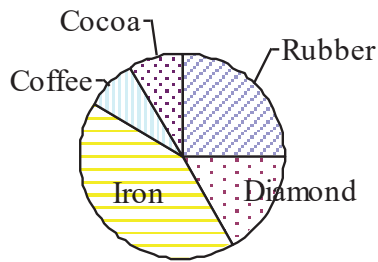


- A. $-\frac{3}{2}$ B. $-\frac{1}{2}$ C. $\frac{1}{2}$ D. $\frac{3}{2}$

16. Change 35% to the simplest fraction.

- A. $\frac{7}{2}$ B. $\frac{7}{20}$ C. $\frac{7}{200}$ D. $\frac{7}{2000}$

17. The pie graph below shows the main export of a country. What percentage of the shaded portion of the exports is rubber?



- A. 10% B. 15% C. 20% D. 25%

18. Find the value of x , if $12x - 10 = 6x + 32$.

- A. 5 B. 6 C. 7 D. 8

19. If the ratio 7 to 13 is the same as the ratio x to 52, what is the value of x ?

- A. 7 B. 13 C. 28 D. 364

20. An American tourist wants to change \$30.00 American dollars to Rwandan francs. How much Frw will he receive if \$1.00 exchanges for 820 Rwf?

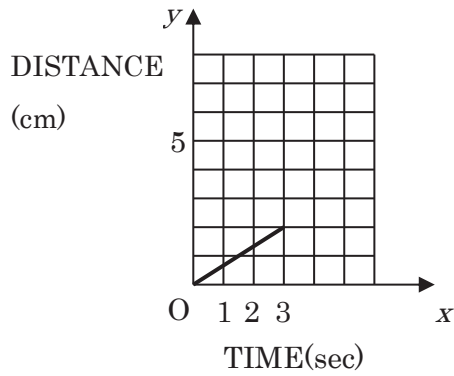
- A. 246 Rwf B. 2,460 Rwf C. 24,600 Rwf D. 820 Rwf

21. If x is proportional to y in the following table, find the value of p and q below.

x	3	6	q
y	7	p	35

- A. $p = 14$, $q = 31$ B. $p = 10$, $q = 14$
C. $p = 10$, $q = 31$ D. $p = 14$, $q = 15$

22. This graph shows how fast an ant walks along the straight line. If this ant keeps walking at the same speed as ever, what is the distance that this ant walks in 30 seconds?



- A. 5cm B. 6cm C. 20cm D. 25cm

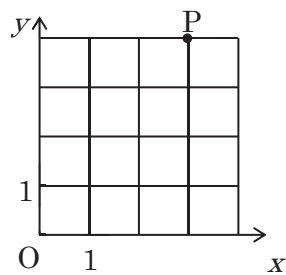
23. The table represents a relation between x and y . What is the missing number in the table?

- A. 9
B. 10
C. 11
D. 12

x	y
2	5
3	7
4	?
7	15

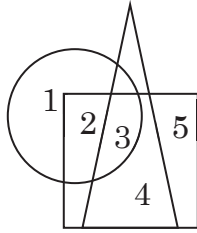
24. What are the coordinates of point P?

- A. (3, 4)
B. (4, 3)
C. (-3, 4)
D. (3, -4)



25. In the figure below, which number belongs to the square, the circle and not to the triangle?

- A. 1
- B. 2
- C. 3
- D. 4
- E. 5



26. Which is the smallest number among the following?

700mm, 6cm, 0.15m, 0.002km

- A. 700mm
- B. 6cm
- C. 0.15m
- D. 0.002km

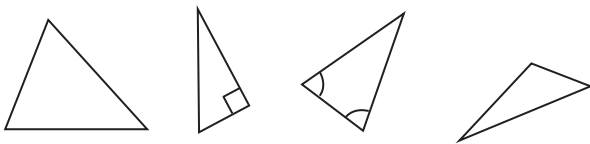
27. Which of the following is the closest to the value of

$$\pi : \frac{\text{circumference}}{\text{diameter}} ?$$

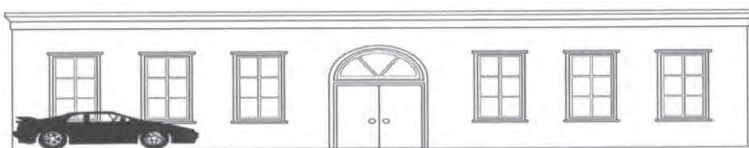
- A. 1.5
- B. 2.1
- C. 3.1
- D. 4.1

28. Which of the following is an isosceles triangle?

- A.
- B.
- C.
- D.



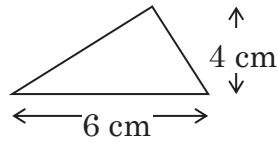
29. The car is 3.5m long. About how long is the building?



- A. 18m
- B. 14m
- C. 10m
- D. 4m

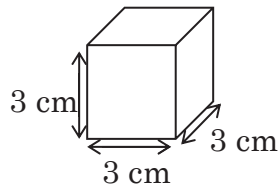
30. Which of the following is the area of a triangle whose base and height are 6 cm and 4 cm respectively?

- A. 10 cm^2
- B. 12 cm^2
- C. 24 cm^2
- D. 10 cm



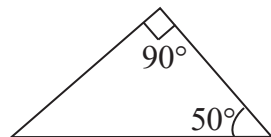
31. What is the volume of the cube below?

- A. 9 cm^3
- B. 18 cm^3
- C. 27 cm^3
- D. 64 cm^3

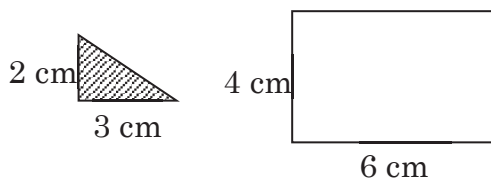


32. What is $\angle ABC$ in the triangle below?

- A. 20°
- B. 40°
- C. 50°
- D. 80°

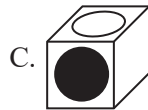
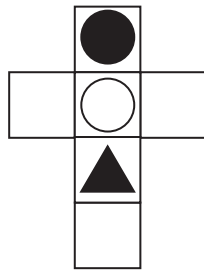


33. How many of the shaded right-angled triangles below are needed to cover exactly the surface of the given rectangle?



- A. Four
- B. Six
- C. Eight
- D. Ten

34. Which of the following cubes could be made by folding the figure below?



35. Find the highest common factor (HCF) and the least common multiple (LCM) of 12 and 18.

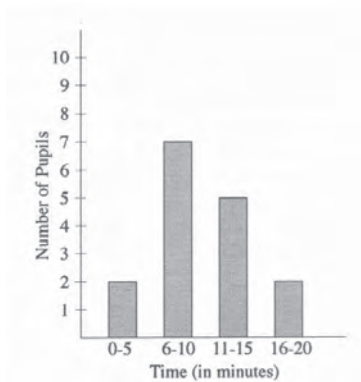
A. HCF = 4, LCM = 36

B. HCF = 6, LCM = 36

C. HCF = 6, LCM = 48

D. HCF = 8, LCM = 48

36. The graph shows the time of travel by students from home to school. How many pupils must travel for MORE THAN 10 minutes?



A. 2

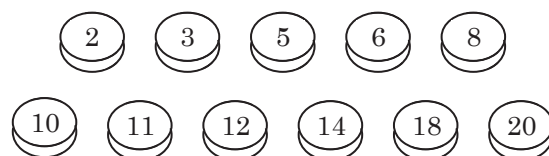
B. 5

C. 7

D. 8

E. 15

37. The eleven chips below are placed in a bag and mixed. Emmanuel draws one chip from the bag without looking. What is the probability that Emmanuel draws a chip with a number that is a multiple of three?



A. $\frac{1}{11}$

B. $\frac{1}{3}$

C. $\frac{4}{11}$

D. $\frac{3}{11}$

38. Here is the beginning of a pattern of tiles. If the pattern continues, how many tiles will be in Figure 6?



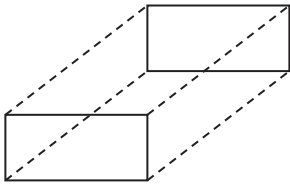
- A. 12 B. 15 C. 18 D. 36

39. How many Common Multiples of 2 and 3 are between 1 and 20?

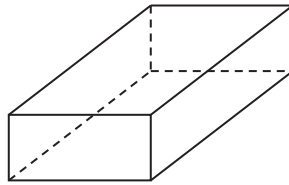
- A. 1 B. 3 C. 6 D. 10

40. Which of the dotted lines in the shapes drawn below show the hidden edges of the cuboid?

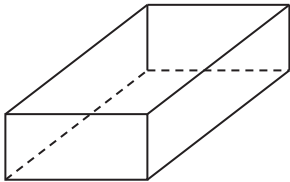
A.



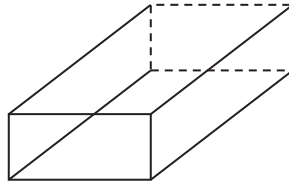
B.



C.



D.



JICA SIIQS Project
Maths Test for Secondary School Students (S4)

Name: _____
First name
Middle name
Family name

School: _____ Class: _____ Student Number: _____

***** **Sample** *****

Calculate $2 + 5 =$

- A. 0 B. 7 C. 10 D. 3

Circle or ✓ here.
Choose only one answer.

1. Multiply : 302×50

- A. 1600 B. 16000 C. 1510 D. 15100

2. Calculate : $4 + 4 \div 4 - 4$

- A. 0 B. 1 C. 7 D. 8

3. Simplify : $26 - 32 + 43$

- A. 29 B. 49 C. 37 D. 101

4. Simplify : $23 - (-42)$

- A. 29 B. 21 C. -19 D. 65

5. Find the remainder of the following : $489 \div 37$

- A. 5 B. 6 C. 7 D. 8

6. Multiply : $-12 \times (-25)$

- A. 120 B. -240 C. -300 D. 300

7. Subtract : $2.201 - 0.753$

- A. 1.448 B. 1.458 C. 1.548 D. 1.558

8. Divide : $24.6 \div 0.04$.

- A. 0.615 B. 6.15 C. 61.5 D. 615

9. Multiply 0.203 by 0.56

- A. 0.1288 B. 0.01288 C. 0.11368 D. 0.011368

10. Calculate the following : $\frac{3}{8} \div \frac{3}{4}$

- A. $\frac{9}{32}$ B. $\frac{1}{2}$ C. $\frac{3}{4}$ D. $-\frac{1}{2}$

11. Simplify : $\frac{3}{4} + \left(\frac{2}{3} \times \frac{1}{4}\right)$

- A. $\frac{1}{8}$ B. $\frac{5}{16}$ C. $\frac{5}{6}$ D. $\frac{11}{12}$

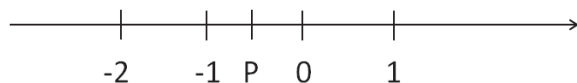
12. Which of the following fractions is the smallest? $\frac{1}{6}, \frac{2}{3}, \frac{1}{3}, \frac{1}{2}$.

- A. $\frac{1}{6}$ B. $\frac{2}{3}$ C. $\frac{1}{3}$ D. $\frac{1}{2}$

13. In which list of fractions are all of the fractions equivalent respectively?

- A. $\frac{1}{2}, \frac{2}{4}, \frac{4}{6}$ B. $\frac{2}{3}, \frac{4}{6}, \frac{8}{12}$ C. $\frac{2}{5}, \frac{4}{10}, \frac{8}{50}$ D. $\frac{3}{4}, \frac{2}{4}, \frac{4}{6}$ E. $\frac{3}{4}, \frac{4}{6}, \frac{6}{8}$

14. What number does the letter P represent on the number line below?



- A. $-\frac{3}{2}$ B. $-\frac{1}{2}$ C. $\frac{1}{2}$ D. $\frac{3}{2}$

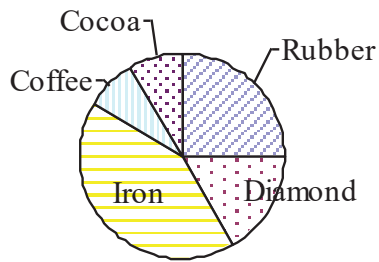
15. If the ratio 7 to 13 is the same as the ratio x to 52, what is the value of x ?

- A. 7 B. 13 C. 28 D. 364

16. Change 35% to the simplest fraction.

- A. $\frac{7}{2}$ B. $\frac{7}{20}$ C. $\frac{7}{200}$ D. $\frac{7}{2000}$

17. The pie graph below shows the main export of a country. What percentage of the shaded portion of the exports is rubber?



- A. 10% B. 15% C. 20% D. 25%

18. If a , b and c are different real numbers, then which of the following is true?

- A. $a - b = b - a$
B. $a(b - c) = b(c - a)$
C. $b - c = c - b$
D. $ab = ba$

19. Find the value of x , if $12x - 10 = 6x + 32$.

- A. 5 B. 6 C. 7 D. 8

20. An American tourist wants to change \$30.00 American dollars to Rwandan francs. How much Rwf will he receive if \$1.00 exchanges for 820 Rwf?

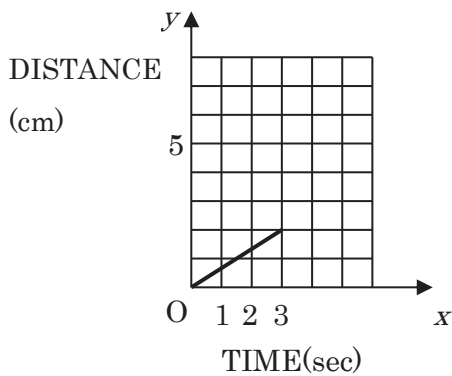
- A. 246 Rwf B. 2,460 Rwf C. 24,600 Rwf D. 820 Rwf

21. If x is proportional to y in the following table, find the value of p and q below.

x	3	6	q
y	7	p	35

- A. $p = 14, q = 31$ B. $p = 10, q = 14$
 C. $p = 10, q = 31$ D. $p = 14, q = 15$

22. This graph shows how fast an ant walks along the straight line. If this ant keeps walking at the same speed as ever, what is the distance that this ant walks in 30 seconds?



- A. 5cm B. 6cm C. 20cm D. 25cm

23. The table represents a relation between x and y . What is the missing number in the table?

- A. 9
 B. 10
 C. 11
 D. 12

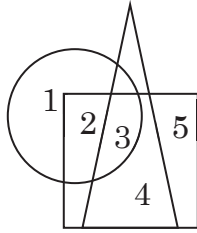
x	y
2	5
3	7
4	?
7	15

24. Calculate $\frac{1}{6}x^2 - \frac{1}{3}x - 1 = 0$

- A. ± 3 B. $1 + \sqrt{7}$ C. $1 \pm \sqrt{7}$ D. $1 \pm \sqrt{6}$

25. In the figure below, which number belongs to the square, the circle and not to the triangle?

- A. 1
- B. 2
- C. 3
- D. 4
- E. 5



26. Which is the smallest number among the following?

700mm, 6cm, 0.15m, 0.002km

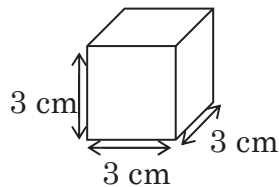
- A. 700mm
- B. 6cm
- C. 0.15m
- D. 0.002km

27. Which of the following is equivalent to $\frac{7}{6}\pi$

- A. 30°
- B. 70°
- C. 120°
- D. 210°

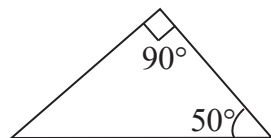
28. What is the volume of the cube below?

- A. 9 cm^3
- B. 18 cm^3
- C. 27 cm^3
- D. 64 cm^3

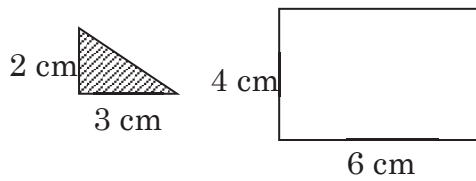


29. What is $\angle ABC$ in the triangle below?

- A. 20°
- B. 40°
- C. 50°
- D. 80°

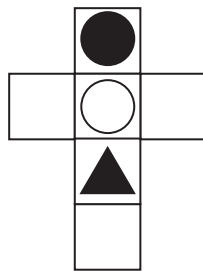


30. How many of the shaded right-angled triangles below are needed to cover exactly the surface of the given rectangle?



- A. Four
- B. Six
- C. Eight
- D. Ten

31. Which of the following cubes could be made by folding the figure below?

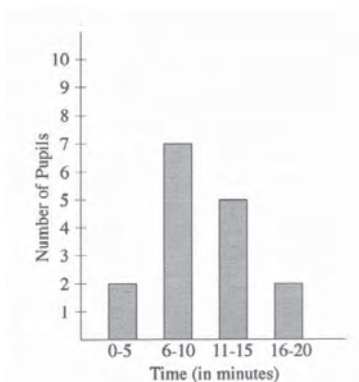


- A.
- B.
- C.
- D.

32. Find the highest common factor (HCF) and the least common multiple (LCM) of 12 and 18.

- A. HCF = 4, LCM = 36
- B. HCF = 6, LCM = 36
- C. HCF = 6, LCM = 48
- D. HCF = 8, LCM = 48

33. The graph shows the time of travel by students from home to school. How many students must travel for MORE THAN 10 minutes?



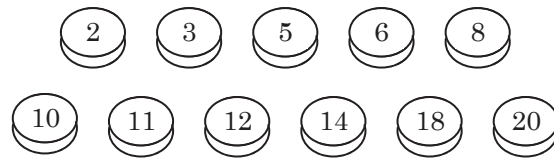
- A. 2
- B. 5
- C. 7
- D. 8
- E. 15

34. Here is the beginning of a pattern of tiles. If the pattern continues, how many tiles will be in Figure 6?



- A. 12 B. 15 C. 18 D. 36

35. The eleven chips below are placed in a bag and mixed. Emmanuel draws one chip from the bag without looking. What is the probability that Emmanuel draws a chip with a number that is a multiple of three?



- A. $\frac{1}{11}$ B. $\frac{1}{3}$ C. $\frac{4}{11}$ D. $\frac{3}{11}$

36. You are given the following sets;

$$A = \{x: x \text{ is a multiple of } 2 \text{ less than } 20\}, B = \{x: x \text{ is a multiple of } 3 \text{ less than } 20\}$$

How many elements are there in $A \cap B$?

- A. 1 B. 3 C. 6 D. 10

37. Factorise the following : $9x^2 - 25$

- A. $(3x + 5)^2$ B. $(3x - 5)^2$ C. $(3x + 5)(3x - 5)$ D. $x(9x - 25)$

38. Two vectors are such that $\mathbf{a} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} 3+k \\ 4+t \end{pmatrix}$.

If $\mathbf{a} = \mathbf{b}$, find the values of k and t .

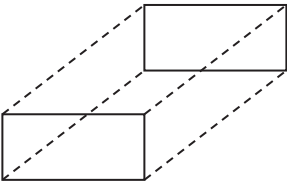
- A. $k = 0, t = 0$ B. $k = -1, t = 1$
 C. $k = 1, t = -1$ D. $k = 4, t = 3$

39. The three sides of a right-angled triangle are x , $x+1$ and 5. Find x , if the longest side is 5.

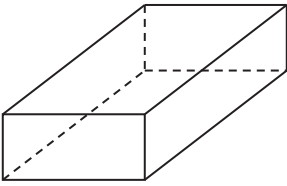
- A. $x = 5$ B. $x = -4, 3$ C. $x = 3$ D. $x = 1$

40. Which of the dotted lines in the shapes drawn below show the hidden edges of the cuboid?

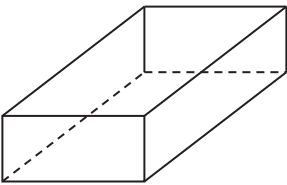
A.



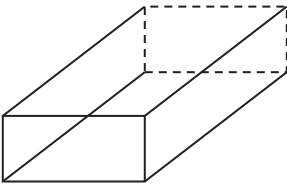
B.



C.



D.



JICA SIIQS Project

Science Test for Primary School Students (P4)

Name: _____
First name Middle name Last name

School: _____ Class: _____ Student Number: _____

Circle the letter of the best answer choice from A, B, C and D. (Choose Only ONE Answer)

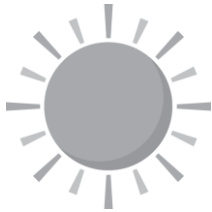
***** Sample *****

Calculate $2 + 5 =$

- A. 0
- B. 7
- C. 10
- D. 3

Circle or ✓ here.
Choose only one answer.

1. Which one is a living thing?



Sun
A.



Rock
B.



Tree
C.

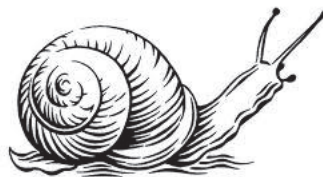


Water
D.

2. A snail is a living thing.

Which is a wrong explanation about it?

- A. A snail change its size.
- B. A snail moves.
- C. A snail does not reproduce its children.
- D. A snail needs food.



Snail

The diagram shows flowering plants.

3. What is the name of part ④?

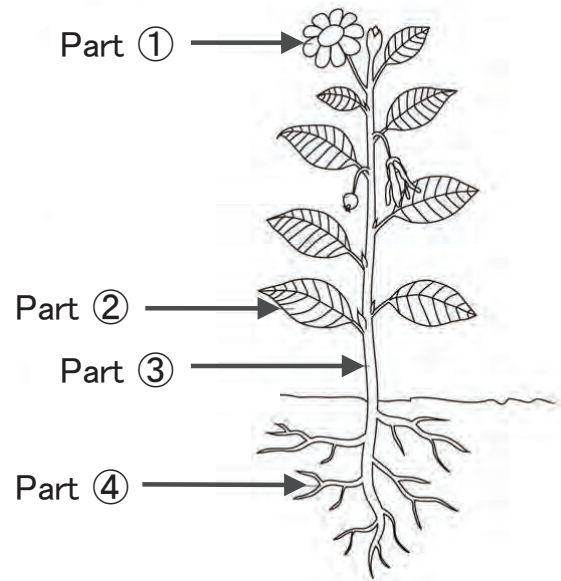
- A. Flower
- B. Stem
- C. Leaf
- D. Root

4. Which part absorbs water from the soil?

- A. part ①
- B. part ②
- C. part ③
- D. part ④

5. Which one is an important thing for plant growth?

- A. Electricity
- B. Sunlight
- C. Oil
- D. Salt

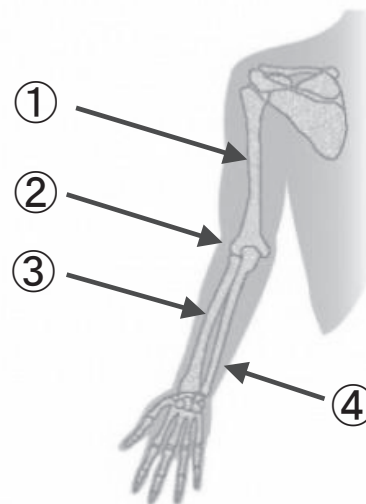


6. The diagram shows bones of right arm and hand.

You can bend your arm at the joint.

Which part is the joint of arm?

- A. ①
- B. ②
- C. ③
- D. ④



7. Which of the followings is **NOT Correct** on the explanation of Animals?

- A. Vertebrate has five categories namely fish, amphibian, reptiles, birds and mammal.
- B. Invertebrate animals do not have backbone.
- C. Mammals have udder.
- D. All domestic animals are mammals.

8. Which animal(s) belong to mammal?



① Rabbit



② Cow



③ Chicken

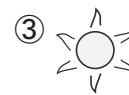
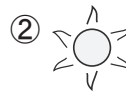
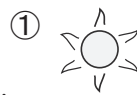


④ Snake

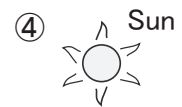
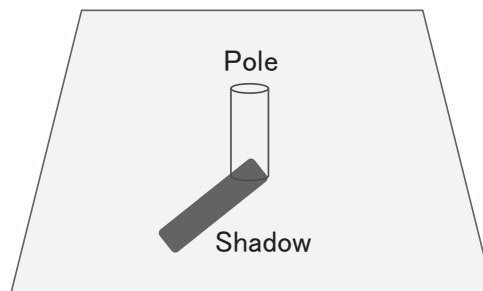
- A. ① is mammal.
- B. ① and ② are mammal.
- C. ①, ② and ③ are mammal.
- D. ①, ②, ③ and ④ are mammal.

9. Shadow of pole is formed on the ground.

Where does the Sun locate at?



- A. ①
- B. ②
- C. ③
- D. ④



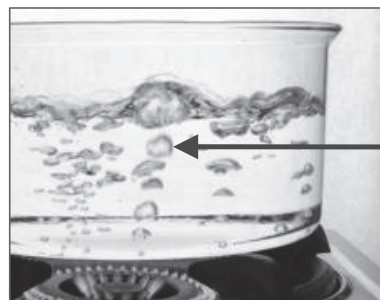
10. The moon does not give off its own light. Why can you see the Moon?

- A. It bends light from the Sun.
- B. It gets through light from the Sun.
- C. It takes in light from the Sun.
- D. It reflects light from the Sun.

11. In the photo, water is boiling.

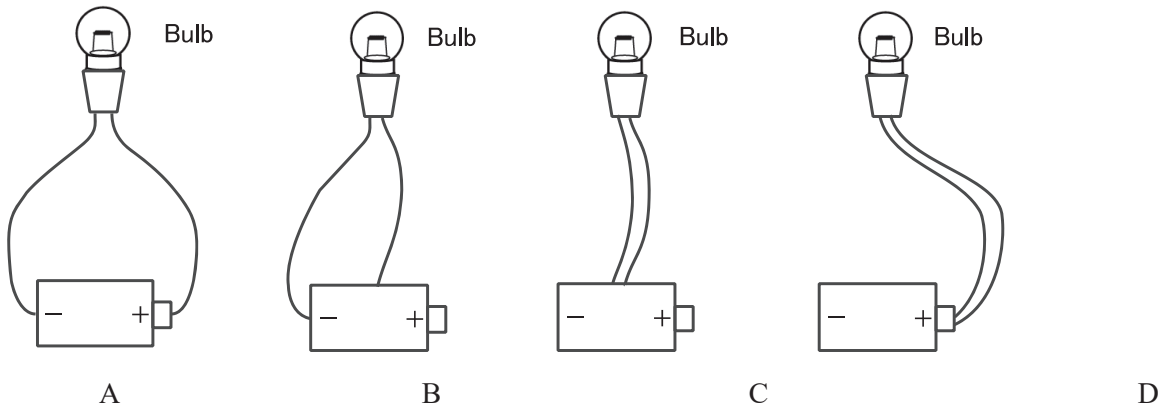
What is in the bubbles of boiling water?

- A. Air
- B. Ice
- C. Water vapour
- D. Glass



Bubbles in boiling water

12. Which diagram shows the connection that can make the bulb light?



13. Which one can conduct electricity?



Plastic bag

A.



Iron nail

B.



Glass bottle

C.



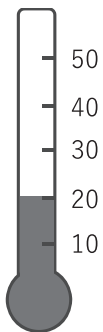
Wood ruler

D.

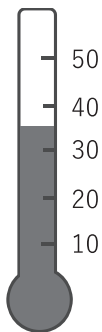
14. Which one is a **Wrong** explanation about sound?

- A. Sound does not travel through water.
- B. Sound travels through air.
- C. Sound travels through wall.
- D. Sound travels through human body.

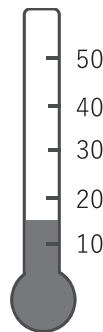
15. Which thermometer reading shows the hottest?



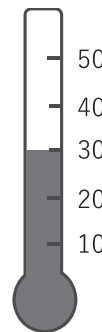
A.



B.



C.



D.

16. Which of the following is attracted by a magnet?

A. Aluminium foil



B. Paper bag



C. Pencil



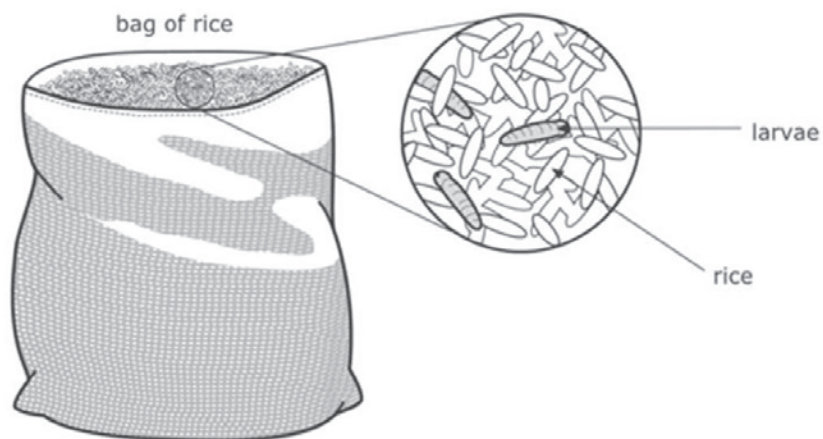
D. Iron nail



17. Which of the following statements is NOT correct about types of Food?

- A. Fruit and Vegetables keep us hungry.
- B. Dairy (milk) products make our bones strong.
- C. Grains (or cereals) give us energy.
- D. Meat helps us grow and makes us strong.

18. Larvae were found in a bag of rice. What best explains the larvae got there?



- A. They came from water in the bag.
- B. They came from air in the bag.
- C. They came from the rice itself.
- D. They came from eggs laid by insects.

END

JICA SHQS Project
Science Test for Secondary School Students (S1)

Name: _____
First name
Middle name
Family name

School: _____ Class: _____ Student Number: _____

PART A

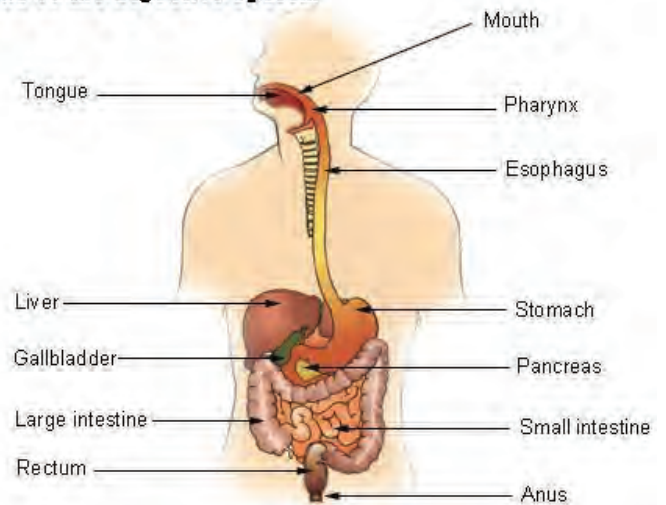
Circle the letter of the best answer choice from A, B, C and D. (Choose Only ONE Answer)

Question 1

Digestion is the process by which food is broken into simple substances which can be used by the body. It is an important process because it allows the body to get useful nutrients from the food that we eat. In which organ do we absorb important nutrition such as amino acids and glucose?

- A. stomach
- B. small intestine
- C. large intestine
- D. liver

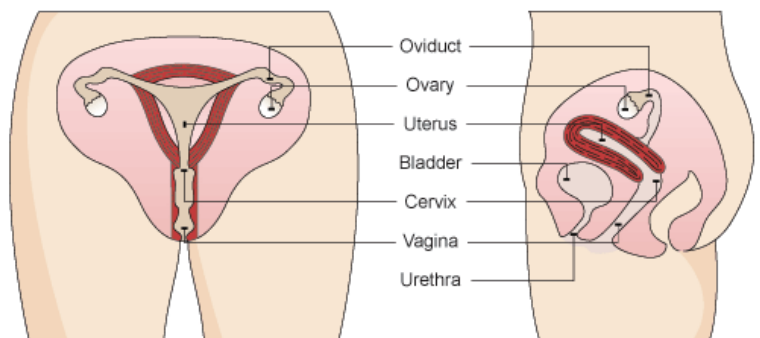
Organs of the Digestive System



Question 2

The figure below shows the female reproductive system. In which organ does fertilization take place?

- A. ovary
- B. oviduct
- C. uterus
- D. cervix



Question 3

Which of the following foods is correctly matched to its group?

- A. ground nuts → energy giving
- B. eggs → protective
- C. carrots → energy giving
- D. bananas → body building

Question 4

Which one of the following is the most effective preventive measure against the spread of sexually transmitted infections amongst the youth in schools?

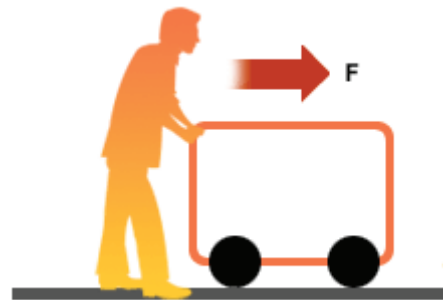
- A. seeking medical attention
- B. use of condoms
- C. circumcision
- D. taking a shower daily

Question 5

A force of 20N pushes a box 5m in the direction of the force.

Calculate the work done.

- A. 4 N/m
- B. 15 Nm
- C. 25 Nm
- D. 100 Nm



Question 6

When suspended freely, a magnet always faces

- A. Up-Down direction
- B. North-South direction
- C. West-East direction
- D. Free direction



Question 7

Below are some examples of second class levers. Which statement for the second class levers is correct?



- A. the load lies in between the effort and the fulcrum.
- B. the fulcrum is always between the load and the effort.
- C. the effort lies in between the load and the fulcrum.
- D. it can be categorized into wheel, screws and gears.

Question 8

If you have a mixture of iron filings and sand, how can you separate them?

- A. put them in water and boil them to remove sand
- B. use magnet to attract iron filings
- C. use filter to collect sand only
- D. burn them to remove iron filings and cool them down

Question 9

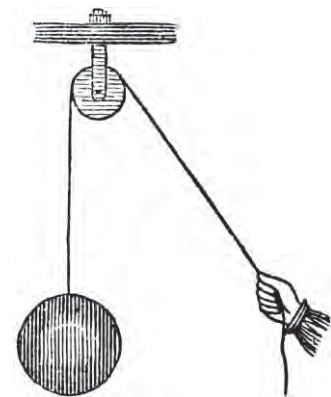
Which one of the following consists of only materials that are ALL non-magnetic?

- A. aluminium foil, piece of paper
- B. iron nails, plastic bottle
- C. piece of glass, sewing needle
- D. steel wool, water

Question 10

Which statement on the single fixed pulley is NOT correct?

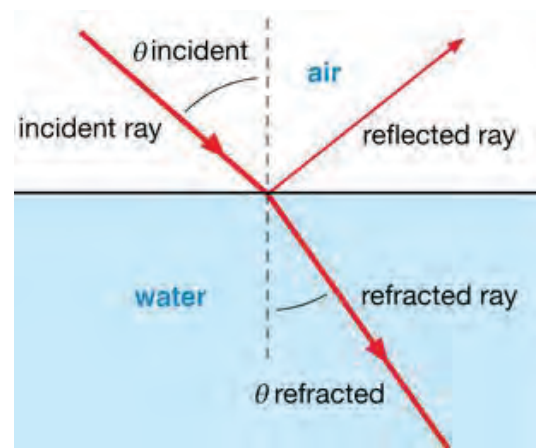
- A. it is made up of only one pulley which is fixed
- B. it reduces the effort needed and it changes the direction of the force
- C. effort distance is equal to the load distance
- D. it enables us to raise a load much higher than the person doing it



Question 11

Below is the diagram of incident ray, refracted ray and reflected ray at the boundary of air and water. Which statement is correct?

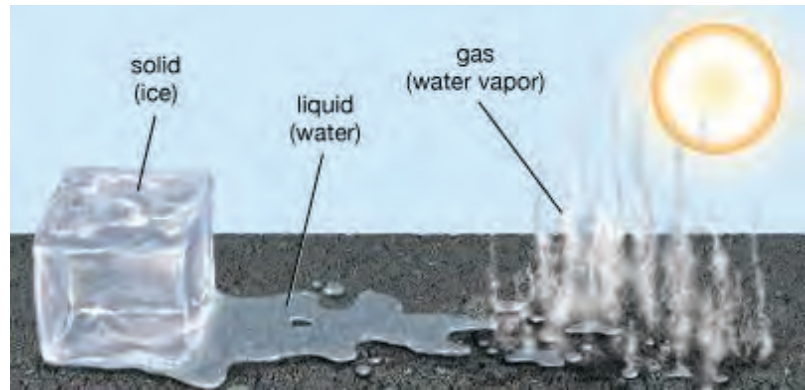
- A. angle of incident is equal to angle of refraction
- B. angle of incident is bigger than angle of refraction
- C. angle of incident is smaller than angle of refraction
- D. angle of reflection is equal to angle of refraction



Question 12

What do you call the process of the change of the states from gas to liquid?

- A. evaporation
- B. melting
- C. condensation
- D. sublimation



Question 13

Which statement on the inclined plane is NOT correct?

- A. it is also known as a slope
- B. the effort required to lift the brick when using an inclined plane is smaller than the effort required without the inclined plane
- C. a bigger force is required when using the steep inclined plane, and a smaller force is required when the inclined plane is gentle.
- D. it enables us to lift a plank of wood on a inclined plane by reducing the amount of work

End of Part A

PART B

Question 1

Bacteria that enter the body are destroyed by which type of cells?

- A. white blood cells
- B. red blood cells
- C. kidney cells
- D. lung cells

Question 2

Many seeds can germinate in the light or in the dark. State two conditions necessary for germination.

- A. Water and Air
- B. Soil and Water
- C. Sun light and Air
- D. Germ and Soil

Question 3

The following table shows the classification of some animals into two categories.

Category 1	Category 2
Rabbit	Frog
Giraffe	Spider
Elephant	Lion

Which of the following was used to classify these animals?

- A. organs used in breathing
- B. food source
- C. method of reproduction
- D. pattern of movement

Question 4

What happens to the particles (molecules) of a liquid when the liquid cools?

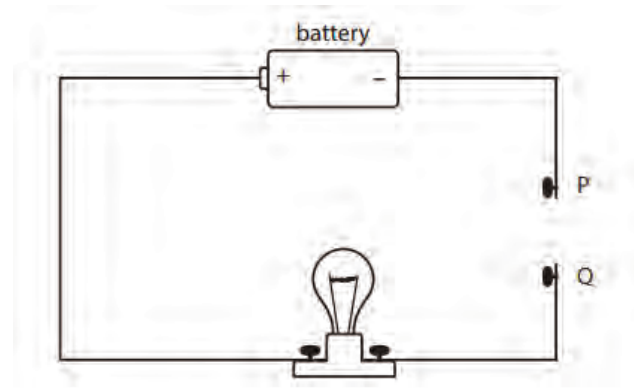
- A. They slow down.
- B. They speed up.
- C. They decrease in number.
- D. They decrease in size.

Question 5

Rods made of different materials are connected between points P and Q in the circuit diagram shown below.

Which rod would cause the bulb to light?

- A. copper rod
- B. wood rod
- C. glass rod
- D. plastic rod



Question 6

A student sets up an investigation to test the strength of magnets. He has several magnets of different sizes, shapes, and masses. He uses the magnets to lift metal paper clips. How is the strength of a magnet defined in the investigation?

- A. by the mass of the magnet lifting the metal paper clips
- B. by the size of the magnet lifting the metal paper clips
- C. by the number of metal paper clips lifted by the magnet
- D. by the time the metal paper clips stay on the magnet

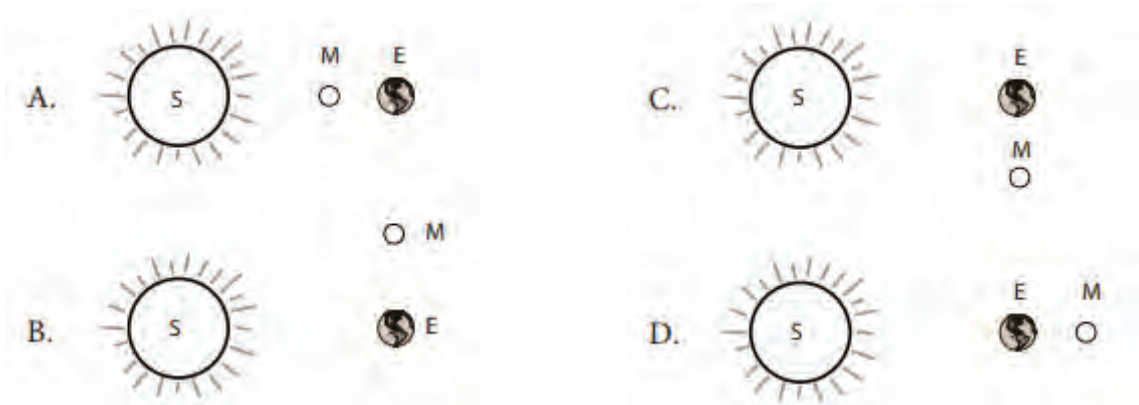
Question 7

An object has a density of 1.1 g/cm^3 . Liquid X, Y and Z have a density of 1.3 g/cm^3 , 0.9 g/cm^3 and 1.2 g/cm^3 , respectively. In which liquid would this object float?

- A. Liquid X
- B. Liquid Y
- C. Liquid Z
- D. Liquid X and Z

Question 8

Which diagram shows the position of the Sun (S), moon (M), and Earth (E) during an eclipse of the moon? (Not drawn to scale)

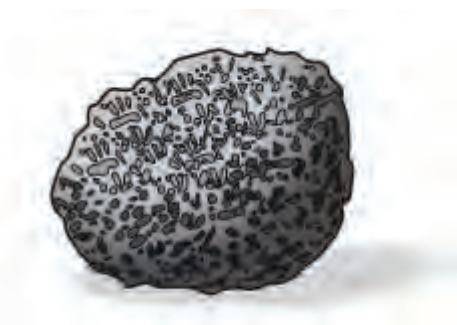


Question 9

Some volcanic rocks have many holes in them.

How were the holes made?

- A. Insects dug into the rock when it was soft.
- B. Gas bubbles were trapped in the rock when it cooled.
- C. Rain dropped on the rock when it was soft.
- D. Small stones fell out of the rock when it cooled.



Question 10

Which statement is NOT correct on how you can you make use of computer at school or at home?

- A. Writing documents
- B. Drawing pictures
- C. Cooking breakfast
- D. Searching information

Question 11

How often have you used laptop computers at your school or at home.

- A. Almost everyday
- B. Once in a week
- C. Once in a month
- D. Never used

Question 12

Calculate the volume of a body with 0.8 g/cm^3 and 240g.

- A. 192 cm^3
- B. 239.2 cm^3
- C. 240.8 cm^3
- D. 300 cm^3

END

JICA SIIQS Project
Science Test for Secondary School Students (S4)

Name: _____
First name
Middle name
Family name

School: _____ Class: _____ Student Number: _____

PART A

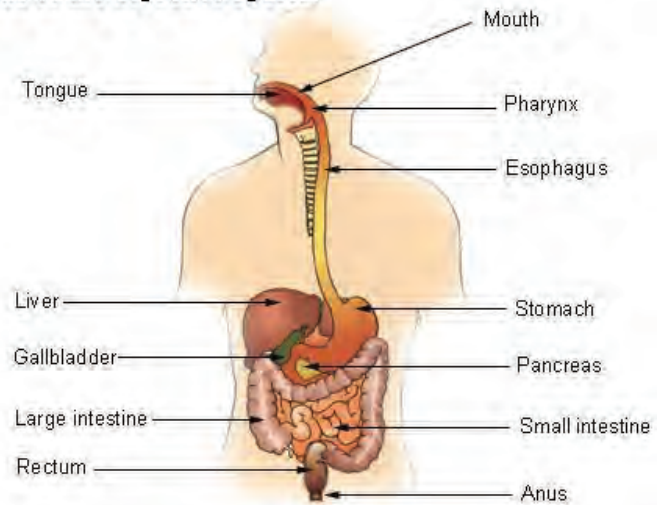
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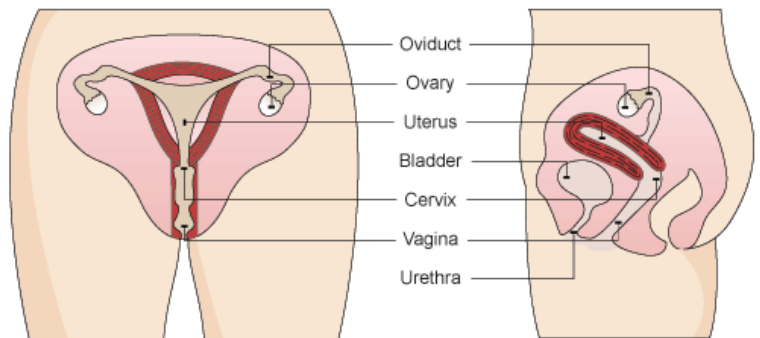
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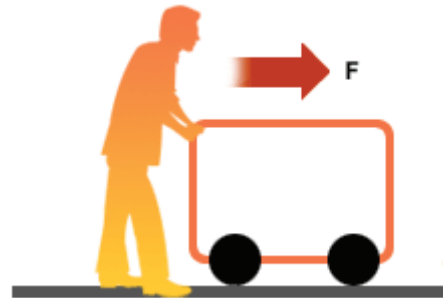
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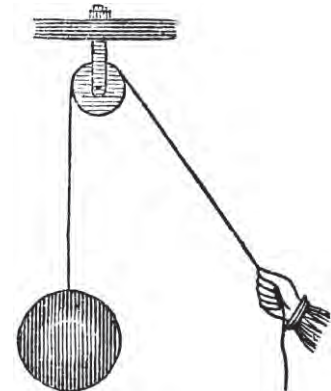
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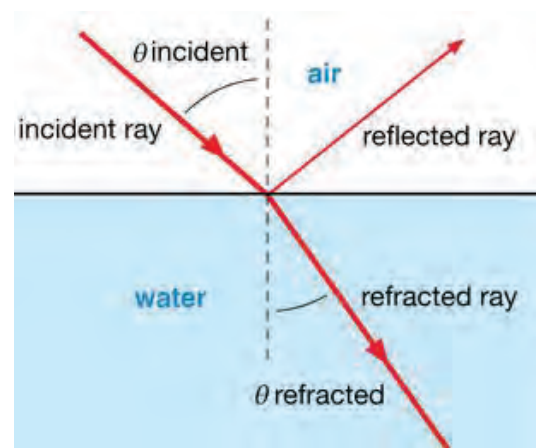
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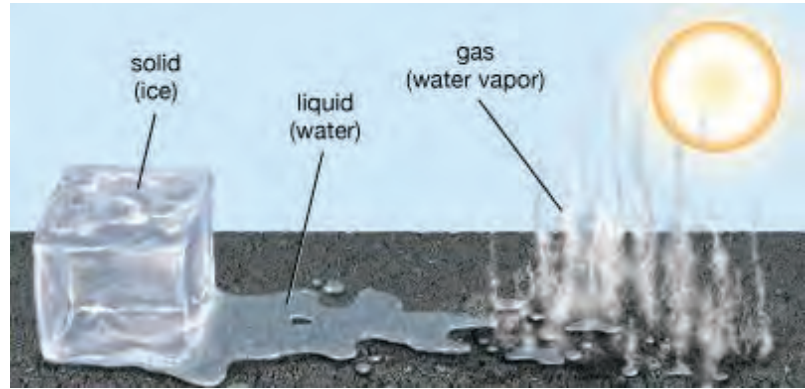
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End of Part A

PART C

Question 1

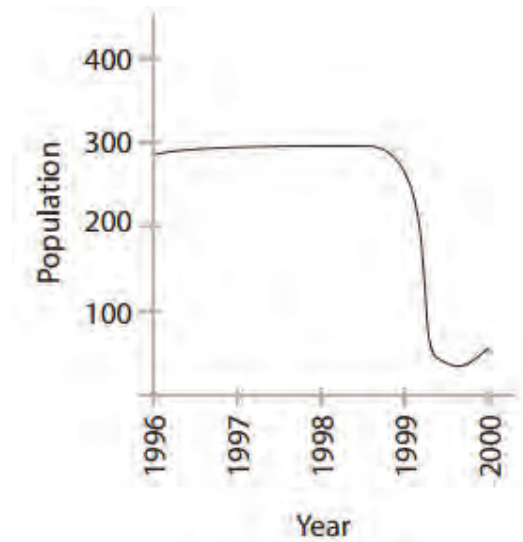
Which of the following can provide the human body with long-term immunity against some diseases?

- A. antibiotics
- B. vitamins
- C. vaccines
- D. red blood cells

Question 2

The graph indicates the number of antelopes in a certain area over a period of time. Which of the following factors is most likely to have caused the sudden change in population between 1999 and 2000?

- A. global warming
- B. absence of predators
- C. depletion of the ozone layer
- D. brush fires that destroyed the food supply



Question 3

Bacteria that enter the body are destroyed by which type of cells?

- A. white blood cells
- B. red blood cells
- C. kidney cells
- D. lung cells

Question 4

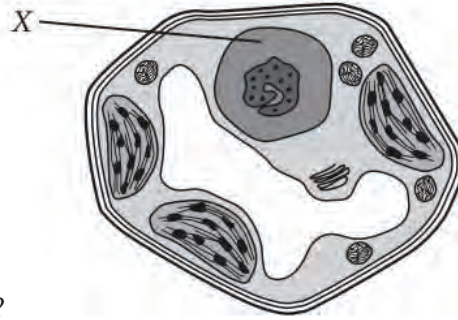
Kidneys are organs found in the human body. When he was young, a man had one of his two kidneys removed because it was diseased. He now has a son. How many kidneys did his son have at birth?

- A. 0
- B. 1
- C. 2
- D. 3

Question 5

The diagram shows a plant cell. What is the function of the part of the cell labeled X?

- A. It stores water.
- B. It makes food.
- C. It absorbs energy.
- D. It controls activities.



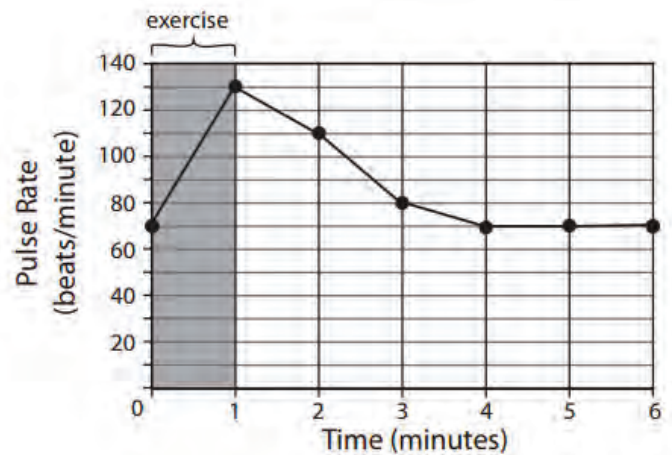
Question 6

Which equation summarizes the process of respiration?

- A. water + carbon dioxide + energy → sugar + oxygen
- B. oxygen + sugar → carbon dioxide + water + energy
- C. carbon dioxide + oxygen + water → sugar + energy
- D. sugar + carbon dioxide + energy → oxygen + water

Question 7

John measures his pulse rate before he exercises. It is 70 beats per minute. He exercises for one minute and measures his pulse rate again. He then measures it every minute for several minutes. He draws a graph to show his results.



What can be concluded from his results?

- A. His pulse rate increased by 50 beats per minute.
- B. His pulse rate took less time to slow down than to increase.
- C. His pulse rate after 4 minutes was 80 beats per minute.
- D. His pulse rate returned to normal in less than 6 minutes.

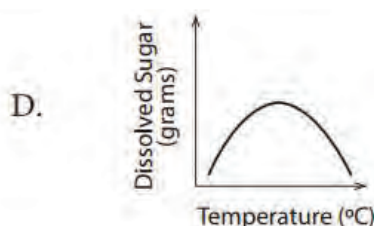
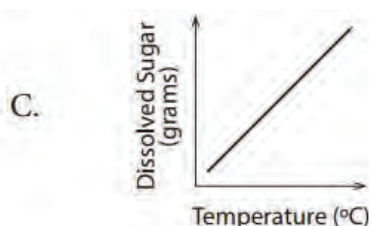
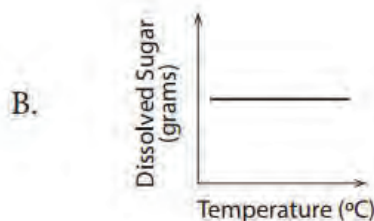
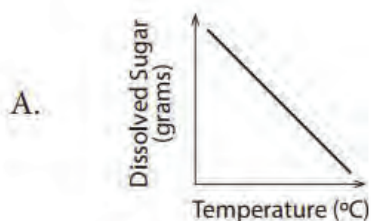
Question 8

Twins are born. One is a boy and one is a girl. Which statement is correct about their genetic makeup?

- A. The boy and the girl inherit genetic material from the father only.
- B. The boy and girl inherit genetic material from the mother only.
- C. The boy and girl inherit genetic material from both parents.
- D. The boy inherits genetic material from the father only and the girl inherits it from the mother only

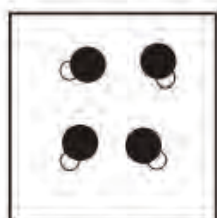
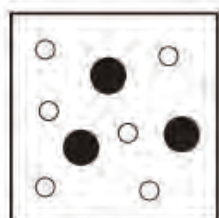
Question 9

Bob did an experiment to investigate the effect of temperature on the solubility of sugar in water by measuring the amount of sugar that would dissolve in 1 liter of water at different temperatures. He then plotted his results. Which of the following is likely to be the graph showing Bob's results?



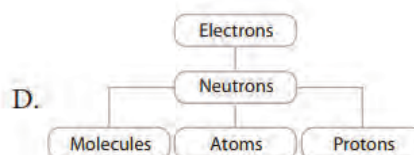
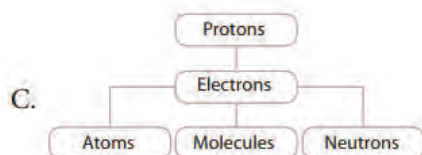
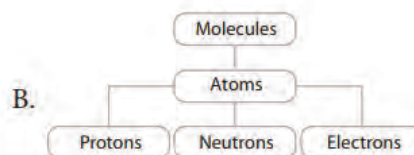
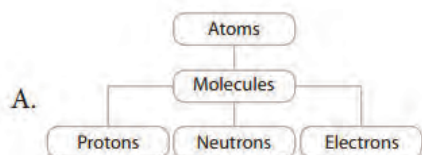
Question 10

In the diagrams below, hydrogen atoms are represented by white circles, and oxygen atoms are represented by black circles. Which of the diagrams best represents water?



Question 11

Which of these diagrams best represents the structure of matter, starting with the more complex particles at the top and ending with the more fundamental particles at the bottom?



Question 12

Some physical properties of five different substances (A, B, C, D, and E) are outlined in the table below.

	Substance A	Substance B	Substance C	Substance D	Substance E
Physical state at room temperature (20°C)	Solid	Solid	Liquid	Liquid	Gas
Appearance/ colour	Shiny grey	White	Silver	Colourless	Colourless
Conducts electricity	Yes	No	Yes	Yes	No

Which substances are metal?

- A. Substance A, B and C
- B. Substance A and B
- C. Substance C and D
- D. Substance A and C

Question 13

Which of the following energy conversions takes place in a battery-operated flashlight?

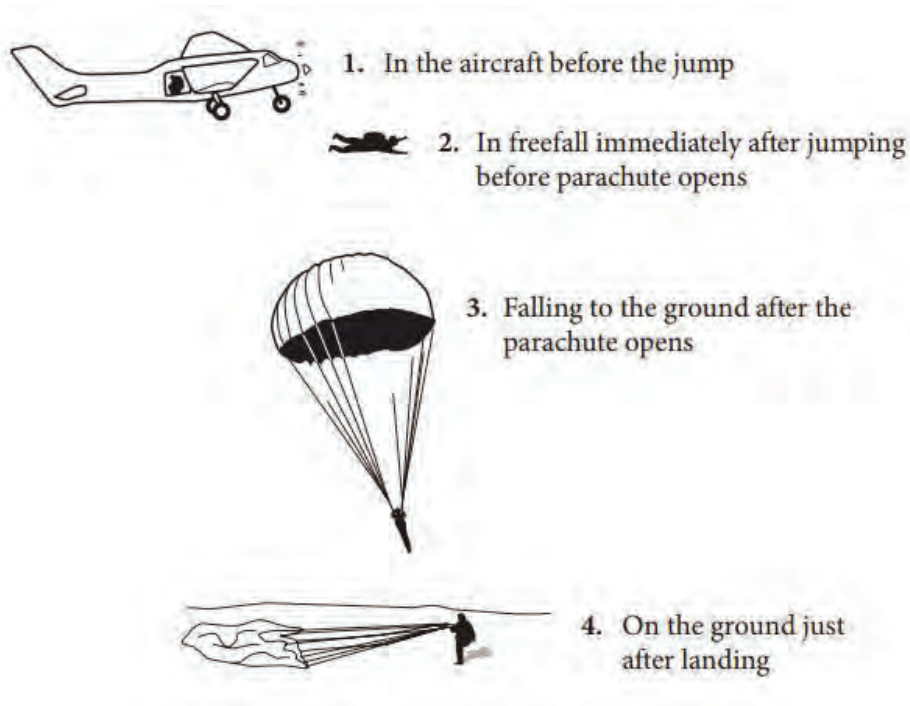
- A. electrical → mechanical → light
- B. chemical → mechanical → light
- C. chemical → electrical → light
- D. nuclear → electrical → light

Question 14

The figure shows a parachute jumper in four positions.

In which of the positions does the force of gravity act on the jumper?

- A. Position 2 only.
- B. Positions 2 and 3 only.
- C. Positions 1, 2 and 3 only.
- D. Positions 1, 2, 3, and 4.

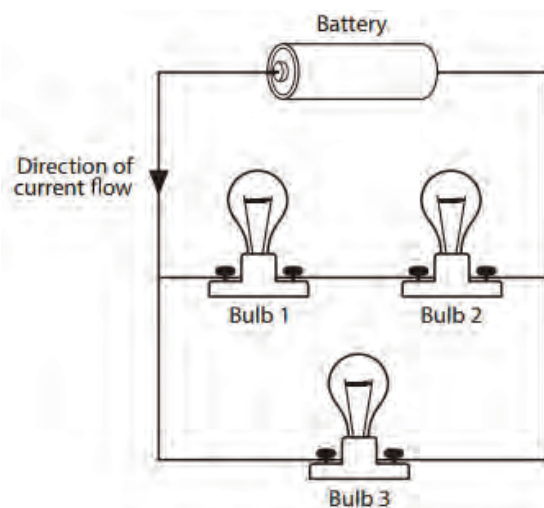


Question 15

Three identical light bulbs are connected to a battery as shown in the diagram. The arrow indicates the direction of the current flow.

Which statement is true?

- A. The current in Bulb 1 is greater than the current in Bulb 2.
- B. The current in Bulb 1 is greater than the current in Bulb 3.
- C. The current in Bulb 2 is the same as the current in Bulb 3.
- D. The current in Bulb 2 is the same as the current in Bulb 1.



Question 16

A man climbed to the top of a very high mountain. While on the mountain top, he drank all the water in his plastic water bottle and then put the cover back on. When he returned to camp in the valley, he discovered that the empty bottle had collapsed. Which of the following best explains why this happened?

- A. The temperature is lower in the valley than on the mountain top.
- B. The temperature is higher in the valley than on the mountain top.
- C. Air pressure in the valley is lower than on the mountain top.
- D. Air pressure in the valley is higher than on the mountain top.

Question 17

A student sets up an investigation to test the strength of magnets. He has several magnets of different sizes, shapes, and masses. He uses the magnets to lift metal paper clips. How is the strength of a magnet defined in the investigation?

- A. by the mass of the magnet lifting the metal paper clips
- B. by the size of the magnet lifting the metal paper clips
- C. by the number of metal paper clips lifted by the magnet
- D. by the time the metal paper clips stay on the magnet

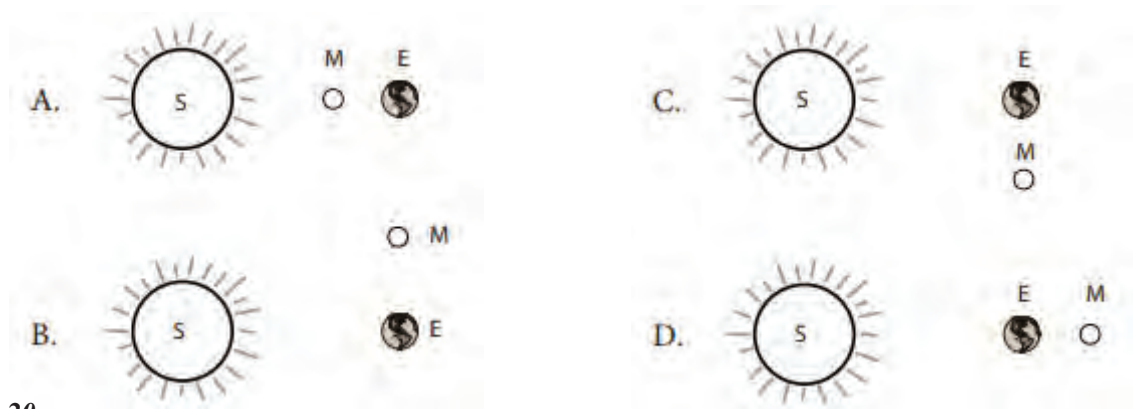
Question 18

Which of the following is the major cause of tides?

- A. heating of the oceans by the Sun
- B. gravitational pull of the Moon
- C. earthquakes on the ocean floor
- D. changes in wind direction

Question 19

Which diagram shows the position of the Sun (S), moon (M), and Earth (E) during an eclipse of the moon? (Not drawn to scale)



Question 20

Which statement is NOT correct on how you can make use of computer at school or at home?

- A. Writing documents
- B. Drawing pictures
- C. Cooking breakfast
- D. Searching information

Question 21

How often have you used laptop computers at your school or at home.

- A. Almost everyday
- B. Once in a week
- C. Once in a month
- D. Never used

Question 22

Calculate the volume of a body with 0.8 g/cm^3 and 240g .

- A. 192 cm^3
- B. 239.2 cm^3
- C. 240.8 cm^3
- D. 300 cm^3

END

Appendices F

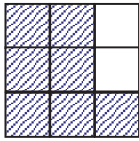
Result of Academic Achievement Test


Appendix F

Result of Academic Achievement Test


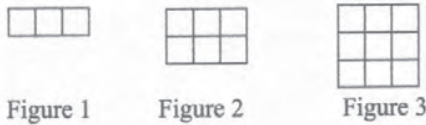
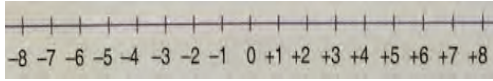
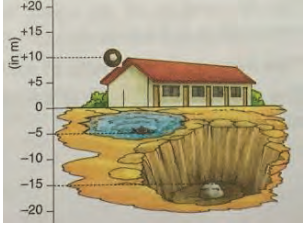
P4 Mathematics

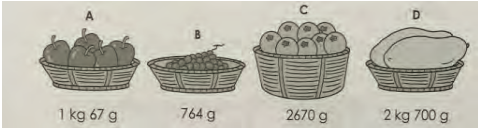
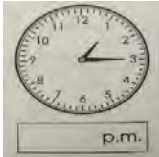
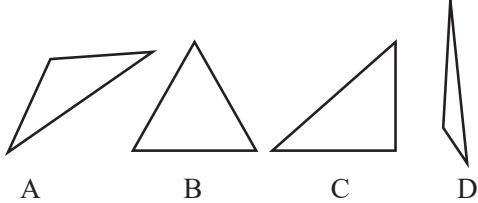
$7 + 2 = \square$ A. 5 B. 72 C. 9 D. 27	1 RCA: 69% - C TWA: B (12%) N/A (10%)
2. The digit in the thousand's place in 72081 is ... A. 7 B. 2 C. 0 D. 8	2 RCA: 14% - B TWA: D (28%) Misconception arises when counting from right to left side
3. Calculate : 8×7 A. 42 B. 49 C. 56 D. 15	3 RCA: 57% - C TWA: B (15%) N/A (12%)
$\begin{array}{r} 14 \\ + 7 \\ \hline \end{array}$ 4. Add : A. 7 B. 11 C. 21 D. 111	4 RCA: 36% - C TWA: B (21%) D (18%) Misconception on carrying out N/A (48%) at EP Buhande
5. Calculate: $10 - 2 + 5$ A. 3 B. 7 C. 13 D. 17	5 RCA: 40% - C TWA: D (21%) If TWA was A misconception would arise in MDAS law, if it was B misconception would arise in negative number concept. The reason for choosing D is not understandable.
6. Multiply : 302×50 A. 1600 B. 16000 C. 1510 D. 15100	6 RCA: 13% - D TWA: C (32%) N/A (67%) at EP Buhande

<p>7. Divide : $276 \div 4$</p> <p>A. 59 B. 69 C. 79 D. 64</p>	<p>7RCA: 21% - B TWA: C (34%) N/A (57%) at EP Buhande</p>
<p>8. Add: $597 + 236$</p> <p>A. 733 B. 833 C. 823 D. 723</p>	<p>8 RCA: 58% - B TWA: C (13%) N/A (48%) at EP Buhande</p>
<p>9. Subtract: $600 - 236$</p> <p>A. 264 B. 374 C. 464 D. 364</p>	<p>9 RCA: 34% - D TWA: C (31%) N/A (62%) at EP Buhande Misconception: Carrying out</p>
<p>10. What fraction of the diagram below is shaded?</p> <p>A. $\frac{7}{2}$ B. $\frac{9}{7}$ C. $\frac{7}{9}$ D. $\frac{2}{7}$</p> 	<p>10 RCA: 27% - C TWA: A (32%) N/A (62%) at EP Buhande Misconception: concept of fraction, meaning of denominator</p>
<p>11. Which of the following fractions is the smallest? $\frac{1}{6}, \frac{2}{3}, \frac{1}{3}, \frac{1}{2}$.</p> <p>A. $\frac{1}{6}$ B. $\frac{2}{3}$ C. $\frac{1}{3}$ D. $\frac{1}{2}$</p>	<p>11 RCA: 6% - A TWA: D (68%), N/A (19%) N/A (67%) at EP Buhande Fraction concept is still a problem in both schools</p>

<p>12. Calculate : $\frac{2}{7} + \frac{3}{7}$</p> <p>A. $\frac{6}{7}$ B. $\frac{5}{14}$ C. $\frac{5}{7}$</p> <p>D. $\frac{8}{7}$</p>	<p>12 RCA: 41% - C TWA: B (32%) N/A (19%)</p> <p>N/A (67%) at EP Buhande</p>
<p>13. Simplify : $\frac{2}{5} \times \frac{3}{4}$</p> <p>A. $\frac{3}{10}$ B. $\frac{3}{5}$ C. $\frac{5}{9}$</p> <p>D. $\frac{8}{15}$</p>	<p>13 RCA: 5% - A TWA: C (34%) D (32) N/A (20%)</p> <p>N/A (81%) at EP Buhande Fraction operation is problem in both schools. Rate of correct answer at EP Buhande is Zero.</p>
<p>14. $\frac{4}{6} - \frac{1}{6} = m$, m is ...</p> <p>A. $\frac{1}{3}$ B. $\frac{1}{9}$ C. $\frac{1}{18}$</p> <p>D. $\frac{1}{2}$</p>	<p>14 RCA: 12% - D TWA: A (29%), N/A (21%)</p> <p>N/A (76%) at EP Buhande</p> <p>Misconception: meaning of unknown value of "m"</p>
<p>15. Which of the following is equal to 0.4?</p> <p>A. 4 B. $\frac{4}{10}$ C. $\frac{4}{100}$</p> <p>D. $\frac{1}{4}$</p>	<p>15 RCA: 12% - B TWA: A (43%), N/A (16%)</p> <p>N/A (81%) and RCA: 0% at EP Buhande</p>
<p>16. Which decimal number does the following shaded part express?</p>  <p>A. 2.8 B. 0.5 C. 0.2</p> <p>D. 0.02</p>	<p>16 RCA: 24% - C TWA: A (41%)</p> <p>N/A (76%) EP Buhande</p>
<p>17. Change $\frac{123}{100}$ to a decimal number.</p> <p>A. 0.23 B. 1.023</p> <p>C. 1.23 D. 12.3</p>	<p>17 RCA: 24% - C TWA: D (32%)</p> <p>N/A (76%) EP Buhande</p>

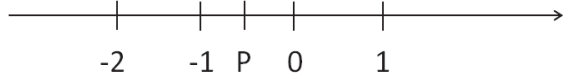
<p>18. Calculate: $0.23 + 1.37$</p> <p>A. 0.7 B. 1.7</p> <p>C. 1.6 D. 1.5</p>	<p>18 RCA: 45% - C</p> <p>TWA: A (20%) and N/A (17%)</p> <p>All EP Buhande pupils failed this question</p>
<p>19. Calculate: $19.82 - 5.28$</p> <p>A. 14.64 B. 14.54</p> <p>C. 14.66 D. 14</p>	<p>19 RCA: 35% - B</p> <p>TWA: C (34%)</p> <p>N/A (81%) EP Buhande</p>
<p>20. Change 1.25 metres to centimetres.</p> <p>A. 12.5 cm B. 125 cm</p> <p>C. 1250 cm D. 102.5 cm</p>	<p>20 RCA: 24% - B</p> <p>TWA: C (33%)</p> <p>N/A (81%) EP Buhande</p>
<p>21. Emmanuel gets 0.5 litres of tomato juice from 5 tomatoes. How many litres of the juice can he get from 15 tomatoes?</p> <p>A. 1.5 litres B. 2 litres</p> <p>C. 2.5 litres D. 3 litres</p>	<p>21 RCA: 31% - A</p> <p>TWA: C (27%)</p> <p>All EP Buhande pupils failed this question</p>
<p>22. A book contains 130 pages. Claudine read 78 pages of it. Which of the following shows the rest of the pages left?</p> <p>A. $130 + 78 = \square$</p> <p>B. $\square - 78 = 130$</p> <p>C. $130 \div 78 = \square$</p> <p>D. $130 - 78 = \square$</p>	<p>22 RCA: 8% - D</p> <p>TWA: N/A (67%)</p>

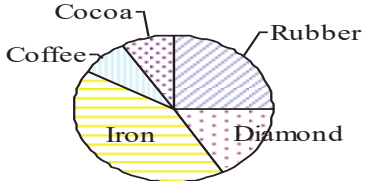
<p>23. About how long is this picture of a pencil?</p>  <p>A. 5 cm B. 10 cm C. 20 cm D. 30 cm</p>	<p>23 RCA: 44% - A TWA: B (26%)</p>
<p>24. Here is the beginning of a pattern of tiles. If the pattern continues, how many tiles will be in Figure 6?</p>  <p>A. 12 B. 15 C. 18 D. 21</p>	<p>24 RCA: 39% - C TWA: D (24%)</p>
<p>25. Find the collect sign to compare the following number.</p> <p>Seven hundred <input type="text"/> $617 + 83$</p> <p>A. = B. > C. < D. None of the above</p>	<p>25 RCA: 6% - A TWA: N/A (40%), C (29%), B (23%)</p>
<p>26. What is the distance between -3 and +6 on the number line?</p>  <p>A. 3 B. 9 C. -3 D. -9</p>	<p>26 RCA: 27% - B TWA: C (20%)</p>
<p>27. Study the diagram below and find the position of the top of the roof.</p> <p>A. -5 m B. 0 m C. +5 m D. +10 m</p> 	<p>27 RCA: 68% - D TWA: N/A (18%) RCA (67%) EP Buhande succeeded</p>

<p>28. Find the LCM of 12 and 15</p> <p>A. 3 B. 27 C. 60 D. 180</p>	<p>28 RCA: 17% - C TWA: B (28%)</p>
<p>29. Evaluate $\sqrt{16}$</p> <p>A. 3 B. 16 C. 4 D.</p>	<p>29 RCA: 21% - C TWA: B (25%), D (24%), N/A (23%)</p>
<p>30. Calculate 5 m 25 cm – 1 m 40 cm</p> <p>A. 4 m 15 cm B. 6 m 65 cm C. 4 m 65cm D. 3 m 85 cm</p>	<p>30 RCA: 24% - D TWA: N/A (28%), C (23%), B (18%)</p>
<p>31. Find the correct answer.</p>  <p>A. Basket A is the lightest. B. Basket C is the heaviest. C. Basket A is lighter than Basket B D. Basket D is heavier than Basket C</p>	<p>31 RCA: 11% - D TWA: N/A (67%)</p>
<p>32. What time is it?</p> <p>A. 1:15 B. 1:03 C. 3:01 D. 3:10</p> 	<p>32 RCA: 24% - A TWA: N/A (29%), B (25%)</p>
<p>33. Choose right angled triangle.</p> 	<p>33 RCA: 3% - C TWA: B (55%), N/A (30%)</p>

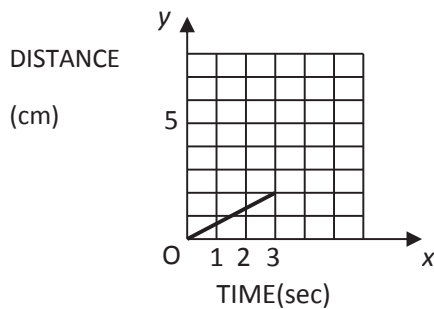
S1 Mathematics

<p>1. Calculate: 8×7</p> <p>A. 42 B. 49 C. 56 D. 15</p>	<p>1 RCA: 99% - C</p>
<p>2. Calculate : $4 + 4 \div 4 - 4$</p> <p>A. 0 B. 1 C. 7 D. 8</p>	<p>2 RCA: 39% - B TWA: C (29%)</p> <p>Most of students in all schools do not master MDAS rule</p>
<p>3. Simplify: $26 - 32 + 43$</p> <p>A. 29 B. 49 C. 37 D. 101</p>	<p>3 RCA: 58% - C TWA: B (31%)</p> <p>Meaning of negative number is lacking.</p>
<p>4. Simplify: $23 - (-42)$</p> <p>A. 29 B. 21 C. -19 D. 65</p>	<p>4 RCA: 72% - D TWA: C (23%)</p>
<p>5. Find the remainder of the following: $489 \div 37$</p> <p>A. 5 B. 6 C. 7 D. 8</p>	<p>5 RCA: 32% - D TWA: A (56%)</p> <p>Students did not calculate, they just chose without thinking, because there is nowhere to find 5 as a remainder, or it may be lack of understanding what remainder means.</p>
<p>6. The sum $691 + 208$ is closest to the following sum</p> <p>A. $600 + 200$ B. $700 + 200$ C. $700 + 300$</p> <p>D. $900 + 200$</p>	<p>6 RCA: 39% - B TWA: A (28%)</p> <p>Difficulty in approximation</p>
<p>7. Multiply : $-12 \times (-25)$</p> <p>A. 120 B. -240 C. -300 D. 300</p>	<p>7 RCA: 75% - D</p>
<p>8. Subtract: $2.201 - 0.753$</p> <p>A. 1.448 B. 1.458 C. 1.548 D. 1.558</p>	<p>8 RCA: 93% - A</p>
<p>9. Divide : $24.6 \div 0.04$</p> <p>A. 0.615 B. 6.15 C. 61.5 D. 615</p>	<p>9 RCA: 79% - D</p>

<p>10. Multiply: 0.203 by 0.56</p> <p>A. 0.1288 B. 0.01288 C. 0.11368</p> <p>D. 0.011368</p>	<p>10 RCA: 80% - C</p>
<p>11. Calculate the following : $\frac{3}{8} \div \frac{3}{4}$</p> <p>A. $\frac{9}{32}$ B. $\frac{1}{2}$ C. $\frac{3}{4}$ D. $-\frac{1}{2}$</p>	<p>11 RCA: 78% - B</p>
<p>12. Simplify : $\frac{3}{4} + \left(\frac{2}{3} \times \frac{1}{4}\right)$</p> <p>A. $\frac{1}{8}$ B. $\frac{5}{16}$ C. $\frac{5}{6}$ D. $\frac{11}{12}$</p>	<p>12 RCA: 61%- D TWA: N/A (15%)</p>
<p>13. Which of the following fractions is the smallest?</p> <p>$\frac{1}{6}, \frac{2}{3}, \frac{1}{3}, \frac{1}{2}$.</p> <p>A. $\frac{1}{6}$ B. $\frac{2}{3}$ C. $\frac{1}{3}$ D. $\frac{1}{2}$</p>	<p>13 RCA: 56% - A TWA: C (21%)</p>
<p>14. In which list of fractions are all of the fractions equivalent respectively?</p> <p>A. $\frac{1}{2}, \frac{2}{4}, \frac{4}{6}$ B. $\frac{2}{3}, \frac{4}{6}, \frac{8}{12}$</p> <p>C. $\frac{2}{5}, \frac{4}{10}, \frac{8}{50}$ D. $\frac{3}{4}, \frac{2}{4}, \frac{4}{6}$</p> <p>E. $\frac{3}{4}, \frac{4}{6}, \frac{6}{8}$</p>	<p>14 RCA: 28% - B TWA: N/A (25%), A (24%)</p> <p>Lack of meaning of fraction</p>
<p>15. What number does the letter P represent on the number line below?</p>  <p>A. $-\frac{3}{2}$ B. $-\frac{1}{2}$ C. $\frac{1}{2}$ D. $\frac{3}{2}$</p>	<p>15 RCA: 67% - B</p>
<p>16. Change 35% to the simplest fraction.</p> <p>A. $\frac{7}{2}$ B. $\frac{7}{20}$ C. $\frac{7}{200}$ D. $\frac{7}{2000}$</p>	<p>16 RCA: 71% - B</p>

<p>17. The pie graph below shows the main export of a country. What percentage of the shaded portion of the exports is rubber?</p>  <p>A. 10% B. 15% C. 20% D. 25%</p>	<p>17 RCA: 26% - D TWA: C (58%)</p> <p>Lack of meaning of relationship between percentage and 360° of cycle</p>								
<p>18. Find the value of x, if $12x - 10 = 6x + 32$</p> <p>A. 5 B. 6 C. 7 D. 8</p>	<p>18 RCA: 81% - C</p>								
<p>19. If the ratio 7 to 13 is the same as the ratio x to 52, what is the value of x?</p> <p>A. 7 B. 13 C. 28 D. 364</p>	<p>19 RCA: 46% - C TWA: B (20%), N/A (17%)</p> <p>Lack of proportionality skills</p>								
<p>20. An American tourist wants to change \$30.00 American dollars to Rwandan francs. How much Rwf will he receive if \$1.00 exchanges for 820 Rwf?</p> <p>A. 246 Rwf B. 2,460 Rwf C. 24,600 Rwf D. 820 Rwf</p>	<p>20 RCA: 70% - C</p>								
<p>21. If x is proportional to y in the following table, find the value of p and q below.</p> <table border="1"> <tbody> <tr> <td>x</td> <td>3</td> <td>6</td> <td>q</td> </tr> <tr> <td>y</td> <td>7</td> <td>p</td> <td>35</td> </tr> </tbody> </table> <p>A. $p = 14, q = 31$ B. $p = 10, q = 14$ C. $p = 10, q = 31$ D. $p = 14, q = 15$</p>	x	3	6	q	y	7	p	35	<p>21 RCA: 15% - D TWA: N/A (28%)</p> <p>Lack of proportionality skills</p>
x	3	6	q						
y	7	p	35						

22. This graph shows how fast an ant walks along the straight line. If this ant keeps walking at the same speed as ever, what is the distance that this ant walks in 30 seconds?



- A. 5cm B. 6cm C. 20cm
D. 25cm

22 RCA: 25% - C
TWA: B (35%)

Lack of Problem solving skills

23. The table represents a relation between x and y . What is the missing number in the table?

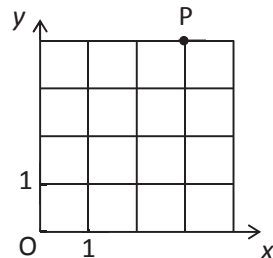
- A. 9
B. 10
C. 11
D. 12

x	y
2	5
3	7
4	?
7	15

23 RCA: 76% - A

24. What are the coordinates of point P?

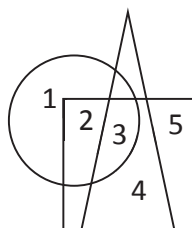
- A. (3, 4)
B. (4, 3)
C. (-3, 4)
D. (3, -4)



24 RCA: 59% - A
TWA: B (28%)

25. In the figure below, which number belongs to the square, the circle and not to the triangle?

- A. 1
B. 2
C. 3
D. 4
E. 5



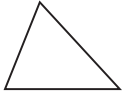



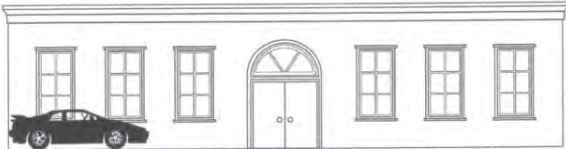
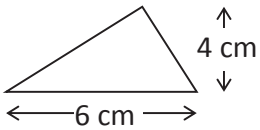
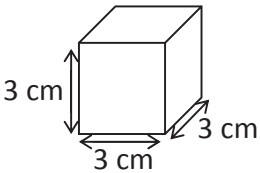
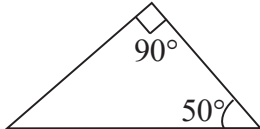
25 RCA: 51% - B
TWA: N/A (25%)

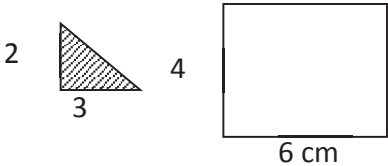
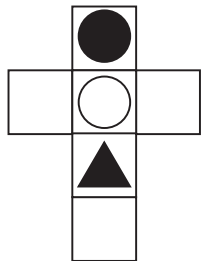


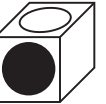
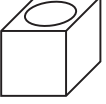
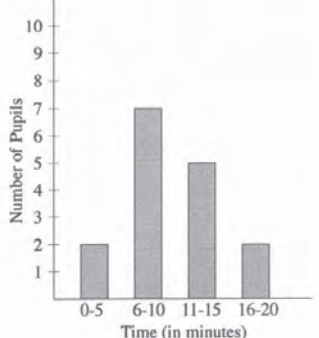
26. Which is the smallest number among the following?
700mm, 6cm, 0.15m, 0.002km

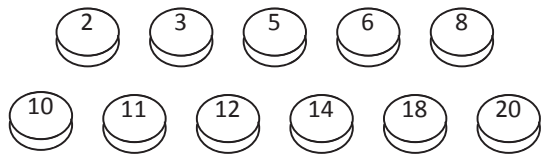
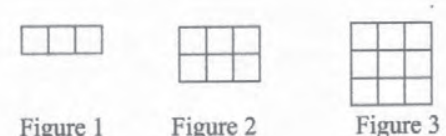
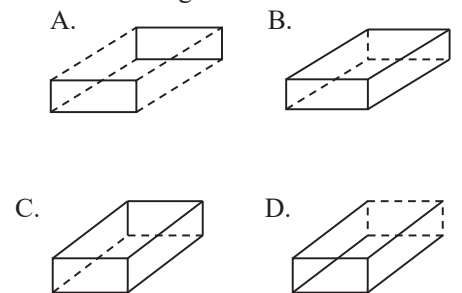
- A. 700mm B. 6cm C. 0.15m D. 0.002km

26 RCA: 23% - B
TWA: A (36%), D (30%)

Lack of measurement conversion skills


<p>27. Which of the following is the closest to the value of π : $\frac{\text{circumference}}{\text{diameter}}$?</p> <p>A. 1.5 B. 2.1 C. 3.1 D. 4.1</p>	<p>27 RCA: 37% - C TWA: N/A (20%)</p> <p>Lack of geometric skills</p>
<p>28. Which of the following is an isosceles triangle?</p> <p>A.  B.  C.  D. </p>	<p>28 RCA: 36% - C TWA: A (24%)</p> <p>Lack of geometric knowledge</p>
<p>29. The car is 3.5m long. About how long is the building?</p>  <p>A. 18m B. 14m C. 10m D. 4m</p>	<p>29 RCA: 31% - B TWA: C (26%)</p> <p>Lack of critical thinking</p>
<p>30. Which of the following is the area of a triangle whose base and height are 6 cm and 4 cm respectively?</p> <p>A. 10 cm² B. 12 cm² C. 24 cm² D. 10 cm</p> 	<p>30 RCA: 50% - B TWA: C (42%)</p>
<p>31. What is the volume of the cube below?</p> <p>A. 9 cm³ B. 18 cm³ C. 27 cm³ D. 64 cm³</p> 	<p>31 RCA: 78% - C</p>
<p>32. What is $\angle ABC$ in the triangle below?</p> <p>A. 20° B. 40° C. 50° D. 80°</p> 	<p>32 RCA: 69% - B</p>

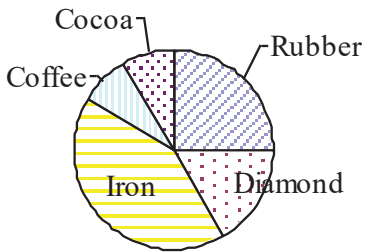
<p>33. How many of the shaded right-angled triangles below are needed to cover exactly the surface of the given rectangle?</p> <p>A. Four B. Six C. Eight D. Ten</p> 	<p>33 RCA: 17% - C TWA: A (36%), B (26%)</p> <p>Lack of geometric operation skills</p>
<p>34. Which of the following cubes could be made by folding the figure below?</p>  <p>A. </p> <p>B. </p> <p>C. </p> <p>D. </p>	<p>34 RCA: 8.3% - C TWA: A (33%), B (29%)</p> <p>Lack of analytical skills</p>
<p>35. Find the highest common factor (HCF) and the least common multiple (LCM) of 12 and 18.</p> <p>A. HCF = 4, LCM = 36 B. HCF = 6, LCM = 36 C. HCF = 6, LCM = 48 D. HCF = 8, LCM = 48</p>	<p>35 RCA: 48% - B TWA: N/A (20%)</p> <p>Lack of factor and multiples concept</p>
<p>36. The graph shows the time of travel by students from home to school. How many students must travel for MORE THAN 10 minutes?</p>  <p>A. 2 B. 5 C. 7 D. 8 E. 15</p>	<p>36 RCA: 37% - C TWA: N/A (24%)</p> <p>Lack of problem solving skills</p>

<p>37. The eleven chips below are placed in a bag and mixed. Emmanuel draws one chip from the bag without looking. What is the probability that Emmanuel draws a chip with a number that is a multiple of three?</p>  <p>A. $\frac{1}{11}$ B. $\frac{1}{3}$ C. $\frac{4}{11}$ D. $\frac{3}{11}$</p>	<p>37 RCA: 22% - D TWA: B (33%), N/A (22%)</p> <p>Lack of probability concept</p>
<p>38. Here is the beginning of a pattern of tiles. If the pattern continues, how many tiles will be in Figure 6?</p>  <p>A. 12 B. 15 C. 18 D. 36</p>	<p>38 RCA: 47% - C TWA: N/A (22%)</p> <p>Lack of critical thinking</p>
<p>39. How many Common Multiples of 2 and 3 are between 1 and 20?</p> <p>A. 1 B. 3 C. 6 D. 10</p>	<p>39 RCA: 24% - B TWA: C (33%), N/A (21%)</p> <p>Lack of factor and multiples concept</p>
<p>40. Which of the dotted lines in the shapes drawn below show the hidden edges of the cuboid?</p> 	<p>40 RCA: 29% - B TWA: N/A (24%), A (24%)</p> <p>Lack of observation, drawing and analytical skills</p>

S4 Mathematics

1. Multiply : 302×50 A. 1600 B. 16000 C. 1510 D. 15100	1 RCA: 89% - D TWA: C (8%) In LNDV, all students performed this item 100%.
2. Calculate: $4 + 4 \div 4 - 4$ A. 0 B. 1 C. 7 D. 8	2 RCA: 34% - B TWA: A (44%) D (11%) N/A (10%) Students fail due to lack of knowledge under mathematical properties A&D
3. Simplify: $26 - 32 + 43$ A. 29 B. 49 C. 37 D. 101	3 RCA: 70% - C TWA: B (26%)
4. Simplify: $23 - (-42)$ A. 29 B. 21 C. -19 D. 65	4 RCA: 93% - D
5. Find the remainder of the following: $489 \div 37$ A. 5 B. 6 C. 7 D. 8	5 RCA: 61% - D TWA: N/A (23%)
6. Multiply: $-12 \times (-25)$ A. 120 B. -240 C. -300 D. 300	6 RCA: 92% - D
7. Subtract: $2.201 - 0.753$ A. 1.448 B. 1.458 C. 1.548 D. 1.558	7 RCA: 92% - A
8. Divide: $24.6 \div 0.04$ A. 0.615 B. 6.15 C. 61.5 D. 615	8 RCA: 74% - D TWA: C (8%)

<p>9. Multiply: 0.203 by 0.56</p> <p>A. 0.1288 B. 0.01288</p> <p>C. 0.11368 D. 0.011368</p>	<p>9 RCA: 82%- C</p> <p>TWA: N/A (8%)</p>
<p>10. Calculate the following: $\frac{3}{8} \div \frac{3}{4}$</p> <p>A. $\frac{9}{32}$ B. $\frac{1}{2}$</p> <p>C. $\frac{3}{4}$ D. $-\frac{1}{2}$</p>	<p>10 RCA: 83%- B</p> <p>TWA: A (7%)</p>
<p>11. Simplify: $\frac{3}{4} + \left(\frac{2}{3} \times \frac{1}{4}\right)$</p> <p>A. $\frac{1}{8}$ B. $\frac{5}{16}$</p> <p>C. $\frac{5}{6}$ D. $\frac{11}{12}$</p>	<p>11 RCA: 81% - D</p> <p>TWA: A (5%) , B (5%)</p>
<p>12. Which of the following fractions is the smallest? $\frac{1}{6}, \frac{2}{3}, \frac{1}{3}, \frac{1}{2}$.</p> <p>A. $\frac{1}{6}$ B. $\frac{2}{3}$ C. $\frac{1}{3}$ D. $\frac{1}{2}$</p>	<p>12 RCA: 73% - A</p> <p>TWA: D (11%)</p>
<p>13. In which list of fractions are all of the fractions equivalent respectively?</p> <p>A. $\frac{1}{2}, \frac{2}{4}, \frac{4}{6}$ B. $\frac{2}{3}, \frac{4}{6}, \frac{8}{12}$</p> <p>C. $\frac{2}{5}, \frac{4}{10}, \frac{8}{50}$ D. $\frac{3}{4}, \frac{2}{4}, \frac{4}{6}$ E. $\frac{3}{4}, \frac{4}{6}, \frac{6}{8}$</p>	<p>13 RCA: 47% - B</p> <p>TWA: A (20%)</p> <p>N/A (19%)</p>
<p>14. What number does the letter P represent on the number line below?</p> <p>A. $-\frac{3}{2}$ B. $-\frac{1}{2}$</p> <p>C. $\frac{1}{2}$ D. $\frac{3}{2}$</p> 	<p>14 RCA: 81% - B</p> <p>TWA: A (8%)</p>

<p>15. If the ratio 7 to 13 is the same as the ratio x to 52, what is the value of x?</p> <p>A. 7 B. 13 C. 28 D. 364</p>	<p>15 RCA: 46% - C (Highest)</p> <p>TWA: B (16%)</p> <p>N/A (21%)</p>
<p>16. Change 35% to the simplest fraction.</p> <p>A. $\frac{7}{2}$ B. $\frac{7}{20}$</p> <p>C. $\frac{7}{200}$ D. $\frac{7}{2000}$</p>	<p>16 RCA: 81%</p> <p>TWA: C (9%)</p>
<p>17. The pie graph below shows the main export of a country. What percentage of the shaded portion of the exports is rubber?</p> <div style="text-align: center;">  </div> <p>A. 10% B. 15% C. 20% D. 25%</p>	<p>17 RCA: 34% -D</p> <p>TWA: C (45%)</p> <p>N/A (11%)</p>
<p>18. If a, b and c are different real numbers, then which of the following is true?</p> <p>A. $a - b = b - a$ B. $a(b - c) = b(c - a)$</p> <p>C. $b - c = c - b$ D. $ab = ba$</p>	<p>18 RCA: 52% - D</p> <p>TWA: B (28%)</p> <p>N/A (7%)</p>
<p>19. Find the value of x, if $12x - 10 = 6x + 32$.</p> <p>A. 5 B. 6 C. 7 D. 8</p>	<p>19 RCA: 91% - C</p>
<p>20. An American tourist wants to change \$30.00 American dollars to Rwandan francs. How much Rwf will he receive if \$1.00 exchanges for 820 Rwf?</p> <p>A. 246 Rwf B. 2,460 Rwf</p> <p>C. 24,600 Rwf D. 820 Rwf</p>	<p>20 RCA: 75% - C</p> <p>TWA: D (9%)</p> <p>N/A (7%)</p>

21. If x is proportional to y in the following table, find the value of p and q below.

x	3	6	q
y	7	p	35

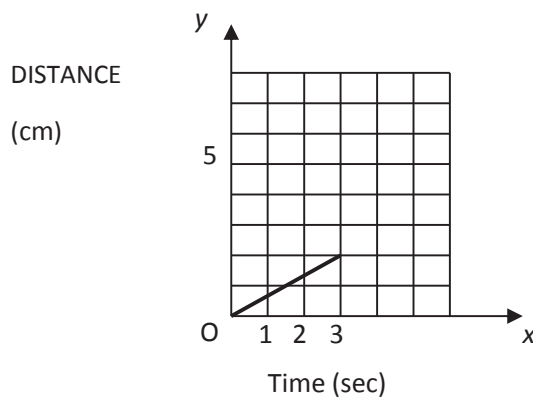
- A. $p = 14, q = 31$ B. $p = 10, q = 14$
 C. $p = 10, q = 31$ D. $p = 14, q = 15$

21 RCA: 35% - D

TWA: C (19%), B (13%), A (8%)

N/A (20%)

22. This graph shows how fast an ant walks along the straight line. If this ant keeps walking at the same speed as ever, what is the distance that this ant walks in 30 seconds?



- A. 5cm B. 6cm C. 20cm D. 25cm

23 RCA: 34% - C

TWA: B (24%), A (12%)

N/A (19%)

23. The table represents a relation between x and y . What is the missing number in the table?

- A. 9
 B. 10
 C. 11
 D. 12

x	y
2	5
3	7
4	?
7	15

23 RCA: 52% - A

TWA: C (19%), A (10%)

N/A (12%)

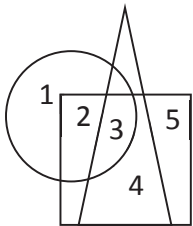
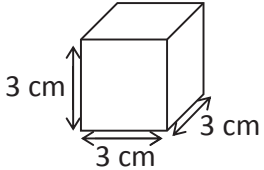
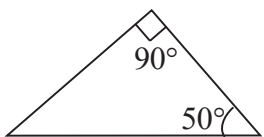
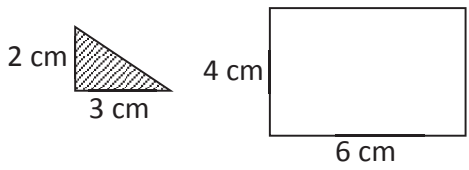
24. Calculate $\frac{1}{6}x^2 - \frac{1}{3}x - 1 = 0$

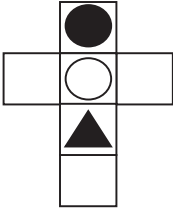



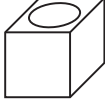
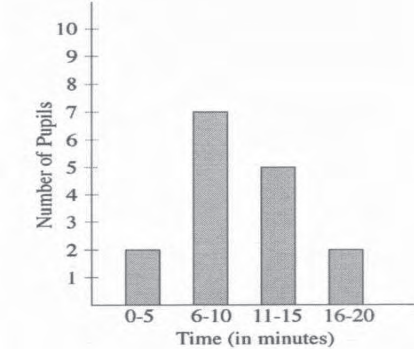
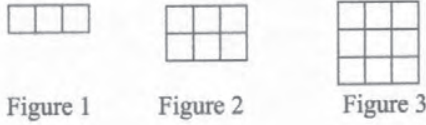
- A. ± 3 B. $1 + \sqrt{7}$ C. $1 \pm \sqrt{7}$ D. $1 \pm \sqrt{6}$

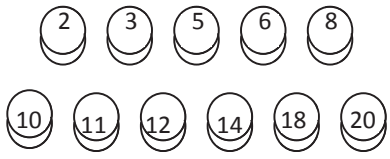
24 RCA: 18% - C

TWA: A (17%), B (14%), D (15%)

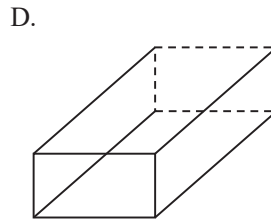
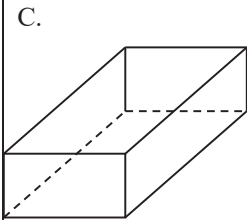
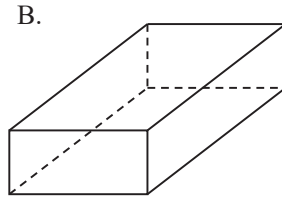
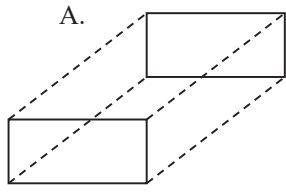
N/A (32%)

<p>25. In the figure below, which number belongs to the square, the circle and not to the triangle?</p> <p>A. 1 B. 2 C. 3 D. 4 E. 5</p> 	<p>25 RCA: 64% - B TWA: A (12%) N/A (4%)</p>
<p>26. Which is the smallest number among the following? 700mm, 6cm, 0.15m, 0.002km</p> <p>A. 700mm B. 6cm C. 0.15m D. 0.002km</p>	<p>26 RCA: 24% - B TWA: A (35%) D (21%) N/A (10%)</p>
<p>27. Which of the following is equivalent to $\frac{7}{6}\pi$</p> <p>A. 30° B. 70° C. 120° D. 210°</p>	<p>27 RCA: 37% - D TWA: C (17%) B (12%) and A (10%) N/A (22%)</p>
<p>28. What is the volume of the cube below?</p> <p>A. 9 cm^3 B. 18 cm^3 C. 27 cm^3 D. 64 cm^3</p> 	<p>28 RCA: 64% - C TWA: B (16%) N/A (10%)</p>
<p>29. What is $\angle ABC$ in the triangle below?</p> <p>A. 20° B. 40° C. 50° D. 80°</p> 	<p>29 RCA: 73% - B TWA: 5% -A, 4% -C, D N/A (10%)</p>
<p>30. How many of the shaded right-angled triangles below are needed to cover exactly the surface of the given rectangle?</p> <p>A. Four B. Six C. Eight D. Ten</p> 	<p>30 RCA: 16% - C TWA: A (38%) B (27%) N/A (13%)</p>

<p>31. Which of the following cubes could be made by folding the figure below?</p>  <p>A.  B.  C.  D. </p>	<p>31 RCA: 10% - C TWA: B (32%) A (30%) N/A (26%) This item was the poorest performed. They are confused by B and C as either choice or shape</p>
<p>32. Find the highest common factor (HCF) and the least common multiple (LCM) of 12 and 18.</p> <p>A. HCF = 4, LCM = 36 B. HCF = 6, LCM = 36 C. HCF = 6, LCM = 48 D. HCF = 8, LCM = 48</p>	<p>32 RCA: 44% - B TWA: A (12%) C (12%) N/A (24%)</p>
<p>33. The graph shows the time of travel by students from home to school. How many students must travel for MORE THAN 10 minutes?</p>  <p>A.2 B.5 C.7 D.8 E.15</p>	<p>33 RCA: 33% - C TWA: B (20%) A (10%) D (10%) N/A (20%)</p>
<p>34. Here is the beginning of a pattern of tiles. If the pattern continues, how many tiles will be in Figure 6?</p>  <p>A. 12 B. 15 C. 18 D. 36</p>	<p>34 RCA: 46% - C TWA: D (13%) , A (8%) , C (8%) N/A (22%)</p>

<p>35. The eleven chips below are placed in a bag and mixed. Emmanuel draws one chip from the bag without looking. What is the probability that Emmanuel draws a chip with a number that is a multiple of three?</p> <div style="text-align: center;">  </div> <p>A. $\frac{1}{11}$ B. $\frac{1}{3}$ C. $\frac{4}{11}$ D. $\frac{3}{11}$</p>	<p>35 RCA: 15% - C TWA: B (22%), D (16%), A (8%) N/A (38%)</p>
<p>36. You are given the following sets; $A = \{x: x \text{ is a multiple of 2 less than } 20\}$, $B = \{x: x \text{ is a multiple of 3 less than } 20\}$ How many elements are there in $A \cap B$?</p> <p>A. 1 B. 3 C. 6 D. 10</p>	<p>36 RCA: 20% - B TWA: C (28%), D (11%) N/A (32%)</p>
<p>37. Factorise the following: $9x^2 - 25$</p> <p>A. $(3x + 5)^2$ B. $(3x - 5)^2$ C. $(3x + 5)(3x - 5)$ D. $x(9x - 25)$</p>	<p>37 RCA: 47% - C TWA: B (15%) N/A (26%)</p>
<p>38. Two vectors are such that $\mathbf{a} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} 3+k \\ 4+t \end{pmatrix}$. If $a = b$, find the values of k and t.</p> <p>A. $k = 0, t = 0$ B. $k = -1, t = 1$ C. $k = 1, t = -1$ D. $k = 4, t = 3$</p>	<p>38 RCA: 33% - C TWA: B (11%) N/A (36%)</p>
<p>39. The three sides of a right-angled triangle are x, $x+1$ and 5. Find x, if the longest side is 5.</p> <p>A. $x = 5$ B. $x = -4, 3$ C. $x = 3$ D. $x = 1$</p>	<p>39 RCA: 25% - C TWA: B (13%) D (11%) N/A (43%)</p>

40. Which of the dotted lines in the shapes drawn below show the hidden edges of the cuboid?

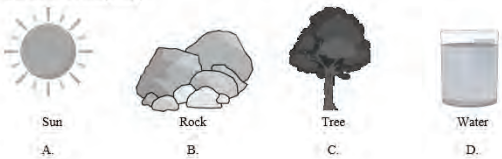

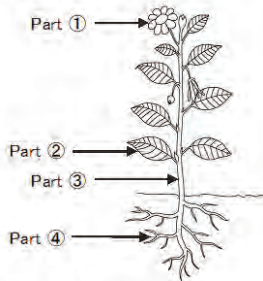
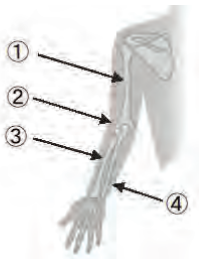









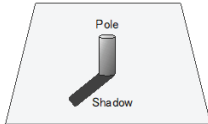

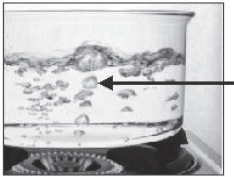








40 RCA: 26% - B

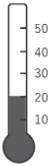
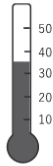






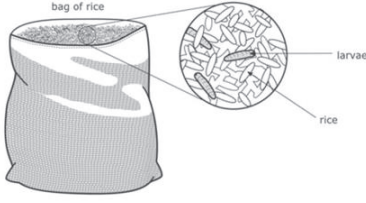
TWA: A (19%)

N/A (34%)

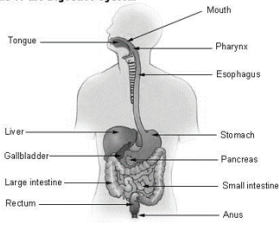
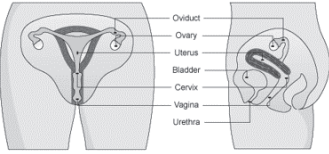
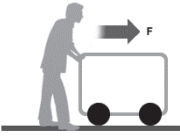


P4 Science

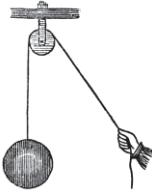
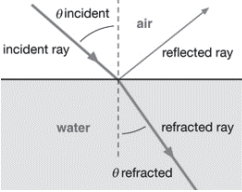
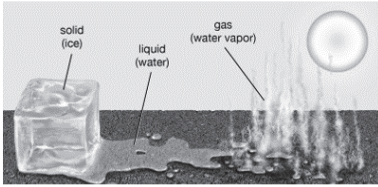
<p>1. Which one is a living thing?</p>  <p>A. Sun B. Rock C. Tree D. Water</p>	<p>1 RCA: 34% - C TWA: D (27%) EP Buhande records highest correct answer rate of 48%</p>
<p>2. A snail is a living thing. Which is a <u>wrong</u> explanation about it?</p> <p>A. A snail change its size. B. A snail moves. C. A snail does not reproduce its children. D. A snail needs food.</p>  <p>Snail</p>	<p>2 RCA: 13% - C TWA: M (More than One Answer) (32%), and B(22%) Generally, students performed poorly when they choose one <u>wrong</u> explanation.</p>
<p>The diagram shows flowering plants.</p> <p>3. What is the name of part ④?</p> <p>A. Flower B. Stem C. Leaf D. Root</p> <p>4. Which part absorbs water from the soil?</p> <p>A. part ① B. part ② C. part ③ D. part ④</p> 	<p>3 RCA: 43% - D TWA: N/A (19%) Question sentence was not well understood by students.</p>
<p>4. Which part absorbs water from the soil?</p> <p>A. part ① B. part ② C. part ③ D. part ④</p>	<p>4 RCA: 44% - D TWA: N/A (22%)</p>
<p>5. Which one is an important thing for plant growth?</p> <p>A. Electricity B. Sunlight C. Oil D. Salt</p>	<p>5 RCA: 52% - B TWA: N/A (12%)</p>
<p>6. The diagram shows bones of right arm and hand. You can bend your arm at the joint. Which part is the joint of arm?</p> <p>A. ① B. ② C. ③ D. ④</p> 	<p>6 RCA: 53% - B TWA: A (12%) EP Buhande records highest correct answer rate of 48%</p>
<p>7. Which of the followings is NOT Correct on the explanation of Animals?</p> <p>A. Vertebrate has five categories namely fish, amphibian, reptiles, birds and mammal. B. Invertebrate animals do not have backbone. C. Mammals have udder. D. All domestic animals are mammals.</p>	<p>7 RCA: 7% - D TWA: N/A (40%) Students performed Worst correct answer rate, in particular EP Buhande has 0%.</p>

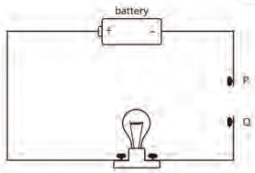
<p>8. Which animal(s) belong to mammal?</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  ① Rabbit </div> <div style="text-align: center;">  ② Cow </div> <div style="text-align: center;">  ③ Chicken </div> <div style="text-align: center;">  ④ Snake </div> </div> <p>A. ① is mammal. B. ① and ② are mammal. C. ①, ② and ③ are mammal. D. ①, ②, ③ and ④ are mammal.</p>	<p>8 RCA: 33% - B TWA: N/A (33%) Some students thought only cow belongs to mammal, then, they did not pick any choice. EP Buhande records highest correct answer rate of 48%</p>
<p>9. Shadow of pole is formed on the ground. Where does the Sun locate at?</p> <div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 20px;"> <p>① </p> <p>② </p> <p>③ </p> </div> <div style="text-align: center;">  </div> <div style="margin-left: 20px;"> <p>④ </p> </div> </div> <p>A. ① B. ② C. ③ D. ④</p>	<p>9 RCA: 15% - C TWA: D (33%)</p>
<p>10. The moon does <u>not</u> give off its own light. Why can you see the Moon?</p> <p>A. It bends light from the Sun. B. It gets through light from the Sun. C. It takes in light from the Sun. D. It reflects light from the Sun.</p>	<p>10 RCA: 31% - D TWA: N/A (25%), followed by A (16%)</p>
<p>11. In the photo, water is boiling. What is in the bubbles of boiling water?</p> <p>A. Air B. Ice C. Water vapour D. Glass</p> <div style="text-align: center;">  </div>	<p>11 RCA: 37% - C TWA: B (18%), followed by A (14%)</p>
<p>12. Which diagram shows the connection that can make the bulb light?</p> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  A </div> <div style="text-align: center;">  B </div> <div style="text-align: center;">  C </div> <div style="text-align: center;">  D </div> </div>	<p>12 RCA: 55% - A TWA: B (12%) In EP Buhande, choice of “No Answer” increased from this question.</p>
<p>13. Which one can conduct electricity?</p> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  A. Plastic bag </div> <div style="text-align: center;">  B. Iron nail </div> <div style="text-align: center;">  C. Glass bottle </div> <div style="text-align: center;">  D. Wood ruler </div> </div>	<p>13 RCA: 46% - B TWA: C (21%)</p>



<p>14. Which one is a Wrong explanation about sound?</p> <p>A. Sound does not travel through water.</p> <p>B. Sound travels through air.</p> <p>C. Sound travels through wall.</p> <p>D. Sound travels through human body.</p>	<p>14 RCA: 14% - A</p> <p>TWA: B (30%), followed by “No Answer” (27%)</p> <p>None of EP Buhande students scored.</p>
<p>15. Which thermometer reading shows the hottest?</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>A.</p> </div> <div style="text-align: center;">  <p>B.</p> </div> <div style="text-align: center;">  <p>C.</p> </div> <div style="text-align: center;">  <p>D.</p> </div> </div>	<p>15 RCA: 68% - B</p> <p>TWA: N/A (12%)</p>
<p>16. Which of the following is attracted by a magnet?</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>A. Aluminium foil</p>  </div> <div style="text-align: center;"> <p>B. Paper bag</p>  </div> <div style="text-align: center;"> <p>C. Pencil</p>  </div> <div style="text-align: center;"> <p>D. Iron nail</p>  </div> </div>	<p>16 RCA: 62% - D</p> <p>TWA: N/A (14%)</p> <p>EP Buhande performed poorly – score 19% only.</p>
<p>17. Which of the following statements is NOT correct about types of Food?</p> <p>A. Fruit and Vegetables keep us hungry.</p> <p>B. Dairy (milk) products make our bones strong.</p> <p>C. Grains (or cereals) give us energy.</p> <p>D. Meat helps us grow and makes us strong.</p>	<p>17 RCA: 18% - A</p> <p>TWA: N/A (25%) followed by “more than one choice” (22%)</p> <p>In particular, 76% of EP Buhande students did not write anything.</p>
<p>18. Larvae were found in a bag of rice. What best explains the larvae got there?</p> <div style="text-align: center;">  </div> <p>A. They came from water in the bag.</p> <p>B. They came from air in the bag.</p> <p>C. They came from the rice itself.</p> <p>D. They came from eggs laid by insects.</p>	<p>18 RCA: 25% - D</p> <p>TWA: N/A (22%)</p> <p>62% of EP Buhande students did not write anything.</p>

S1 Science

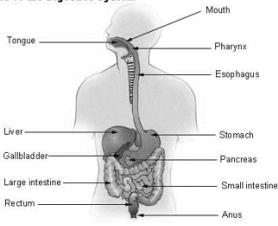
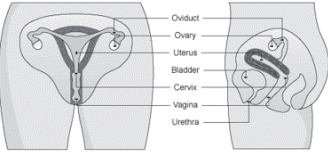
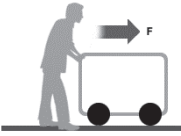


<p>Question 1</p> <p>Digestion is the process by which food is broken into simple substances which can be used by the body. It is an important process because it allows the body to get useful nutrients from the food that we eat. In which organ do we absorb important nutrition such as amino acids and glucose?</p> <p>A. stomach B. small intestine C. large intestine D. liver</p>	<p style="text-align: center;">Organs of the Digestive System</p> 	<p>1 RCA: 34% - B TWA: A (40%)</p>
<p>Question 2</p> <p>The figure below shows the female reproductive system. In which organ does fertilization take place?</p> <p>A. ovary B. oviduct C. uterus D. cervix</p>		<p>2 RCA: 42% - B TWA: C (36%)</p>
<p>Question 3</p> <p>Which of the following foods is correctly matched to its group?</p> <p>A. ground nuts → energy giving B. eggs → protective C. carrots → energy giving D. bananas → body building</p>	<p>3 RCA: 23% - A TWA: C (35%)</p>	
<p>Question 4</p> <p>Which one of the following is the most effective preventive measure against the spread of sexually transmitted infections amongst the youth in schools?</p> <p>A. seeking medical attention B. use of condoms C. circumcision D. taking a shower daily</p>	<p>4 RCA: 55% - B TWA: C (17%)</p>	
<p>Question 5</p> <p>A force of 20N pushes a box 5m in the direction of the force. Calculate the work done.</p> <p>A. 4 N/m B. 15 Nm C. 25 Nm D. 100 Nm</p>		<p>5 RCA: 61% - D TWA: A (31%)</p>
<p>Question 6</p> <p>When suspended freely, a magnet always faces</p> <p>A. Up-Down direction B. North-South direction C. West-East direction D. Free direction</p>		<p>6 RCA: 75% - B TWA: D (14%)</p>
<p>Question 7</p> <p>Below are some examples of second class levers. Which statement for the second class levers is correct?</p>  <p>Wheelbarrow Nut cracker Bottle opener</p> <p>A. the load lies in between the effort and the fulcrum. B. the fulcrum is always between the load and the effort. C. the effort lies in between the load and the fulcrum. D. it can be categorized into wheel, screws and gears.</p>	<p>7 RCA: 63% - A TWA: B (21%)</p>	

<p>Question 8</p> <p>If you have a mixture of iron filings and sand, how can you separate them?</p> <p>A. put them in water and boil them to remove sand</p> <p>B. use magnet to attract iron filings</p> <p>C. use filter to collect sand only</p> <p>D. burn them to remove iron filings and cool them down</p>	<p>8 RCA: 76% - B</p> <p>TWA: C (12%)</p>
<p>Question 9</p> <p>Which one of the following consists of only materials that are ALL non-magnetic?</p> <p>A. aluminium foil, piece of paper</p> <p>B. iron nails, plastic bottle</p> <p>C. piece of glass, sewing needle</p> <p>D. steel wool, water</p>	<p>9 RCA: 28% - A</p> <p>TWA: D (45%)</p>
<p>Question 10</p> <p>Which statement on the single fixed pulley is NOT correct?</p> <p>A. it is made up of only one pulley which is fixed</p> <p>B. it reduces the effort needed and it changes the direction of the force</p> <p>C. effort distance is equal to the load distance</p> <p>D. it enables us to raise a load much higher than the person doing it</p>	<p>10 RCA: 21% - B</p> <p>TWA: C (35%)</p> 
<p>Question 11</p> <p>Below is the diagram of incident ray, refracted ray and reflected ray at the boundary of air and water. Which statement is correct?</p> <p>A. angle of incident is equal to angle of refraction</p> <p>B. angle of incident is bigger than angle of refraction</p> <p>C. angle of incident is smaller than angle of refraction</p> <p>D. angle of reflection is equal to angle of refraction</p>	<p>11 RCA: 22% - B</p> <p>TWA: A (57%)</p> 
<p>Question 12</p> <p>What do you call the process of the change of the states from gas to liquid?</p> <p>A. evaporation</p> <p>B. melting</p> <p>C. condensation</p> <p>D. sublimation</p>	<p>12 RCA: 68%- C</p> <p>TWA: A (14%)</p> 
<p>Question 13</p> <p>Which statement on the inclined plane is NOT correct?</p> <p>A. it is also known as a slope</p> <p>B. the effort required to lift the brick when using an inclined plane is smaller than the effort required without the inclined plane</p> <p>C. a bigger force is required when using the steep inclined plane, and a smaller force is required when the inclined plane is gentle.</p> <p>D. it enables us to lift a plank of wood on a inclined plane by reducing the amount of work</p>	<p>13 RCA: 23% - D</p> <p>TWA: C (32%)</p> <p>Secondary school students also perform poorly when identifying an incorrect answer.</p>

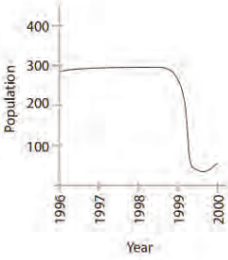
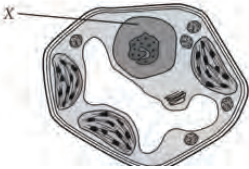
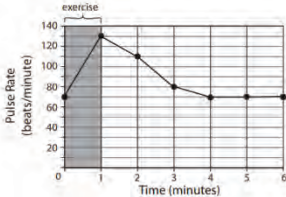
<p>Question 1</p> <p>Bacteria that enter the body are destroyed by which type of cells?</p> <p>A. white blood cells</p> <p>B. red blood cells</p> <p>C. kidney cells</p> <p>D. lung cells</p>	<p>14 (B1) RCA: 64% - A</p> <p>TWA: B (25%)</p> <p>Note: TIMSS 2011(G8) Avr. 61%</p>								
<p>Question 2</p> <p>Many seeds can germinate in the light or in the dark. State two conditions necessary for germination.</p> <p>A. Water and Air</p> <p>B. Soil and Water</p> <p>C. Sun light and Air</p> <p>D. Germ and Soil</p>	<p>15 (B2) RCA: 34% - B</p> <p>TWA: C (27%)</p> <p>Note: TIMSS 2011(G8) Avr. 21%</p> <p>Plants germination needs Water, Oxygen and suitable Temperature</p>								
<p>Question 3</p> <p>The following table shows the classification of some animals into two categories.</p> <table border="1"> <thead> <tr> <th>Category 1</th> <th>Category 2</th> </tr> </thead> <tbody> <tr> <td>Rabbit</td> <td>Frog</td> </tr> <tr> <td>Giraffe</td> <td>Spider</td> </tr> <tr> <td>Elephant</td> <td>Lion</td> </tr> </tbody> </table> <p>Which of the following was used to classify these animals?</p> <p>A. organs used in breathing</p> <p>B. food source</p> <p>C. method of reproduction</p> <p>D. pattern of movement</p>	Category 1	Category 2	Rabbit	Frog	Giraffe	Spider	Elephant	Lion	<p>16 (B3) RCA: 35% - B</p> <p>TWA: A (32%)</p> <p>Note: TIMSS 2011(G8) Avr. 49%</p>
Category 1	Category 2								
Rabbit	Frog								
Giraffe	Spider								
Elephant	Lion								
<p>Question 4</p> <p>What happens to the particles (molecules) of a liquid when the liquid cools?</p> <p>A. They slow down.</p> <p>B. They speed up.</p> <p>C. They decrease in number.</p> <p>D. They decrease in size.</p>	<p>17 (B4) RCA: 34% - A</p> <p>TWA: B (25%)</p> <p>Note: TIMSS 2011(G8) Avr. 58%</p>								
<p>Question 5</p> <p>Rods made of different materials are connected between points P and Q in the circuit diagram shown below.</p> <p>Which rod would cause the bulb to light?</p> <p>A. copper rod</p> <p>B. wood rod</p> <p>C. glass rod</p> <p>D. plastic rod</p> 	<p>18 (B5) RCA: 71% - A</p> <p>TWA: D (11%)</p> <p>Note: TIMSS 2011(G8) Avr. 88%</p>								
<p>Question 6</p> <p>A student sets up an investigation to test the strength of magnets. He has several magnets of different sizes, shapes, and masses. He uses the magnets to lift metal paper clips. How is the strength of a magnet defined in the investigation?</p> <p>A. by the mass of the magnet lifting the metal paper clips</p> <p>B. by the size of the magnet lifting the metal paper clips</p> <p>C. by the number of metal paper clips lifted by the magnet</p> <p>D. by the time the metal paper clips stay on the magnet</p>	<p>19 (B6) RCA: 23% - C</p> <p>TWA: A (26%), B (24%), D (23%)</p> <p>Note: TIMSS 2011(G8) Avr. 42%</p>								

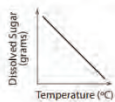
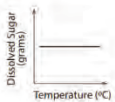
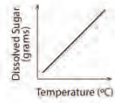
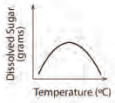


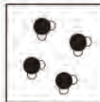

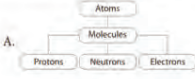
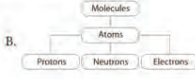
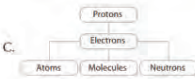
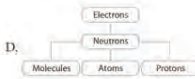
<p>Question 7</p> <p>An object has a density of 1.1 g/cm^3. Liquid X, Y and Z have a density of 1.3 g/cm^3, 0.9 g/cm^3 and 1.2 g/cm^3, respectively. In which liquid would this object float?</p> <p>A. Liquid X B. Liquid Y C. Liquid Z D. Liquid X and Z</p>	<p>20 (B7) RCA: 19% - D TWA: B (55%) Note: TIMSS 2011(G8) Avr. 31%</p>
<p>Question 8</p> <p>Which diagram shows the position of the Sun (S), moon (M), and Earth (E) during an eclipse of the moon? (Not drawn to scale)</p> 	<p>21 (B8) RCA: 31% - D TWA: A (52%) Note: TIMSS 2011(G8) Avr. 35%</p>
<p>Question 9</p> <p>Some volcanic rocks have many holes in them. How were the holes made?</p> <p>A. Insects dug into the rock when it was soft. B. Gas bubbles were trapped in the rock when it cooled. C. Rain dropped on the rock when it was soft. D. Small stones fell out of the rock when it cooled.</p> 	<p>22 (B9) RCA: 43% - B TWA: D (35%) Note: TIMSS 2011(G8) Avr. 57%</p>
<p>Question 10</p> <p>Which statement is NOT correct on how you can you make use of computer at school or at home?</p> <p>A. Writing documents B. Drawing pictures C. Cooking breakfast D. Searching information</p>	<p>23 (B10) RCA: 73% - C TWA: D (17%) This is an easy question if students have ever touched computers</p>
<p>Question 11</p> <p>How often have you used laptop computers at your school or at home.</p> <p>A. Almost everyday B. Once in a week C. Once in a month D. Never used</p>	<p>24 (B11) : 100% - ABCD A (21%), B (73%), C (4%), D (2%) This question is intended to know how often the students use computers and students got a mark as long as they answered. Positivo-Laptop PC (Windows) has been distributed in the three schools.</p>
<p>Question 12</p> <p>Calculate the volume of a body with 0.8 g/cm^3 and 240g.</p> <p>A. 192 cm^3 B. 239.2 cm^3 C. 240.8 cm^3 D. 300 cm^3</p>	<p>25 (B12) RCA: 53% - D TWA: A (35%) This is a question of Primary level mathematics.</p>

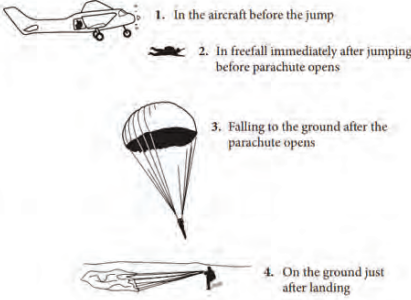
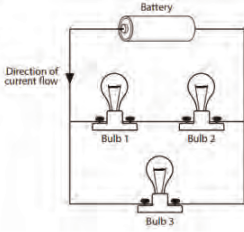
S4 Science

<p>Question 1</p> <p>Digestion is the process by which food is broken into simple substances which can be used by the body. It is an important process because it allows the body to get useful nutrients from the food that we eat. In which organ do we absorb important nutrition such as amino acids and glucose?</p> <p>A. stomach B. small intestine C. large intestine D. liver</p>	<p style="text-align: center;">Organs of the Digestive System</p> 	<p>1 RCA: 46% - B TWA: A (35%)</p>
<p>Question 2</p> <p>The figure below shows the female reproductive system. In which organ does fertilization take place?</p> <p>A. ovary B. oviduct C. uterus D. cervix</p>		<p>2 RCA: 52% - B TWA: C (25%)</p>
<p>Question 3</p> <p>Which of the following foods is correctly matched to its group?</p> <p>A. ground nuts → energy giving B. eggs → protective C. carrots → energy giving D. bananas → body building</p>	<p>3 RCA: 23% - A TWA: B (43%)</p>	
<p>Question 4</p> <p>Which one of the following is the most effective preventive measure against the spread of sexually transmitted infections amongst the youth in schools?</p> <p>A. seeking medical attention B. use of condoms C. circumcision D. taking a shower daily</p>	<p>4 RCA: 54% - B TWA: C (14%)</p>	
<p>Question 5</p> <p>A force of 20N pushes a box 5m in the direction of the force. Calculate the work done.</p> <p>A. 4 N/m B. 15 Nm C. 25 Nm D. 100 Nm</p>		<p>5 RCA: 74% - D TWA: A (18%)</p>
<p>Question 6</p> <p>When suspended freely, a magnet always faces</p> <p>A. Up-Down direction B. North-South direction C. West-East direction D. Free direction</p>		<p>6 RCA: 71% - B TWA: D (13%)</p>
<p>Question 7</p> <p>Below are some examples of second class levers. Which statement for the second class levers is correct?</p>  <p>Wheelbarrow Nut cracker Bottle opener</p> <p>A. the load lies in between the effort and the fulcrum. B. the fulcrum is always between the load and the effort. C. the effort lies in between the load and the fulcrum. D. it can be categorized into wheel, screws and gears.</p>	<p>7 RCA: 58% - A TWA: B (18%)</p>	

<p>Question 8</p> <p>If you have a mixture of iron filings and sand, how can you separate them?</p> <p>A. put them in water and boil them to remove sand</p> <p>B. use magnet to attract iron filings</p> <p>C. use filter to collect sand only</p> <p>D. burn them to remove iron filings and cool them down</p>	<p>8 RCA: 78% - B</p> <p>TWA: C (10%)</p>
<p>Question 9</p> <p>Which one of the following consists of only materials that are ALL non-magnetic?</p> <p>A. aluminium foil, piece of paper</p> <p>B. iron nails, plastic bottle</p> <p>C. piece of glass, sewing needle</p> <p>D. steel wool, water</p>	<p>9 RCA: 22% - A</p> <p>TWA: D (39%)</p>
<p>Question 10</p> <p>Which statement on the single fixed pulley is NOT correct?</p> <p>A. it is made up of only one pulley which is fixed</p> <p>B. it reduces the effort needed and it changes the direction of the force</p> <p>C. effort distance is equal to the load distance</p> <p>D. it enables us to raise a load much higher than the person doing it</p>	<p>10 RCA: 23% - B</p> <p>TWA: C (35%)</p>
<p>Question 11</p> <p>Below is the diagram of incident ray, refracted ray and reflected ray at the boundary of air and water. Which statement is correct?</p> <p>A. angle of incident is equal to angle of refraction</p> <p>B. angle of incident is bigger than angle of refraction</p> <p>C. angle of incident is smaller than angle of refraction</p> <p>D. angle of reflection is equal to angle of refraction</p>	<p>11 RCA: 50% - B</p> <p>TWA: A (34%)</p>
<p>Question 12</p> <p>What do you call the process of the change of the states from gas to liquid?</p> <p>A. evaporation</p> <p>B. melting</p> <p>C. condensation</p> <p>D. sublimation</p>	<p>12 RCA: 69%- C</p> <p>TWA: D (15%)</p>
<p>Question 13</p> <p>Which statement on the inclined plane is NOT correct?</p> <p>A. it is also known as a slope</p> <p>B. the effort required to lift the brick when using an inclined plane is smaller than the effort required without the inclined plane</p> <p>C. a bigger force is required when using the steep inclined plane, and a smaller force is required when the inclined plane is gentle.</p> <p>D. it enables us to lift a plank of wood on a inclined plane by reducing the amount of work</p>	<p>13 RCA: 11% - D</p> <p>TWA: C (31%)</p> <p>Poor performance when identifying one incorrect answer.</p>
<p>Question 1 (S4)</p> <p>Which of the following can provide the human body with long-term immunity against some diseases?</p> <p>A. antibiotics</p> <p>B. vitamins</p> <p>C. vaccines</p> <p>D. red blood cells</p>	<p>14 (C1) RCA: 41% - C</p> <p>TWA: B (22%)</p> <p>Note: TIMSS 2011(G8) Avr. 45%</p>

<p>Question 2 (S4)</p> <p>The graph indicates the number of antelopes in a certain area over a period of time. Which of the following factors is most likely to have caused the sudden change in population between 1999 and 2000?</p> <p>A. global warming B. absence of predators C. depletion of the ozone layer D. brush fires that destroyed the food supply</p> 	<p>15 (C2) RCA: 32% - D TWA: A (34%) Note: TIMSS 2011(G8) Avr. 48%</p>
<p>Question 3 (S4)</p> <p>Bacteria that enter the body are destroyed by which type of cells?</p> <p>A. white blood cells B. red blood cells C. kidney cells D. lung cells</p>	<p>16 (C3) RCA: 71% - A TWA: B (18%) Note: TIMSS 2011(G8) Avr. 61%</p>
<p>Question 4 (S4)</p> <p>Kidneys are organs found in the human body. When he was young, a man had one of his two kidneys removed because it was diseased. He now has a son. How many kidneys did his son have at birth?</p> <p>A. 0 B. 1 C. 2 D. 3</p>	<p>17 (C4) RCA: 83% - C TWA: B (8%) Note: TIMSS 2011(G8) Avr. 53%</p>
<p>Question 5</p> <p>The diagram shows a plant cell. What is the function of the part of the cell labeled X?</p> <p>A. It stores water. B. It makes food. C. It absorbs energy. D. It controls activities.</p> 	<p>18 (C5) RCA: 67% - D TWA: A (11%) Note: TIMSS 2011(G8) Avr. 36%</p>
<p>Question 6</p> <p>Which equation summarizes the process of respiration?</p> <p>A. water + carbon dioxide + energy → sugar + oxygen B. oxygen + sugar → carbon dioxide + water + energy C. carbon dioxide + oxygen + water → sugar + energy D. sugar + carbon dioxide + energy → oxygen + water</p>	<p>19 (C6) RCA: 50% - B TWA: C (21%) Note: TIMSS 2011(G8) Avr. 38%</p>
<p>Question 7</p> <p>John measures his pulse rate before he exercises. It is 70 beats per minute. He exercises for one minute and measures his pulse rate again. He then measures it every minute for several minutes. He draws a graph to show his results.</p> <p>What can be concluded from his results?</p> <p>A. His pulse rate increased by 50 beats per minute. B. His pulse rate took less time to slow down than to increase. C. His pulse rate after 4 minutes was 80 beats per minute. D. His pulse rate returned to normal in less than 6 minutes.</p> 	<p>20 (C7) RCA: 44% - D TWA: B (22%) Note: TIMSS 2011(G8) Avr. 57%</p>

<p>Question 8</p> <p>Twins are born. One is a boy and one is a girl. Which statement is correct about their genetic makeup?</p> <p>A. The boy and the girl inherit genetic material from the father only.</p> <p>B. The boy and girl inherit genetic material from the mother only.</p> <p>C. The boy and girl inherit genetic material from both parents.</p> <p>D. The boy inherits genetic material from the father only and the girl inherits it from the mother only</p>	<p>21 (C8) RCA: 89% - C</p> <p>TWA: N/A (6%)</p> <p>Note: TIMSS 2011(G8) Avr. 83%</p>																								
<p>Question 9</p> <p>Bob did an experiment to investigate the effect of temperature on the solubility of sugar in water by measuring the amount of sugar that would dissolve in 1 liter of water at different temperatures. He then plotted his results. Which of the following is likely to be the graph showing Bob's results?</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>A.</p>  </div> <div style="text-align: center;"> <p>B.</p>  </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;"> <p>C.</p>  </div> <div style="text-align: center;"> <p>D.</p>  </div> </div>	<p>22 (C9) RCA: 48% - C</p> <p>TWA: D (22%)</p> <p>Note: TIMSS 2011(G8) Avr. 45%</p>																								
<p>Question 10</p> <p>In the diagrams below, hydrogen atoms are represented by white circles, and oxygen atoms are represented by black circles. Which of the diagrams best represents water?</p> <div style="display: flex; justify-content: space-around; text-align: center;"> <div>  <p>A.</p> </div> <div>  <p>B.</p> </div> <div>  <p>C.</p> </div> <div>  <p>D.</p> </div> </div>	<p>23 (C10) RCA: 59% - C</p> <p>TWA: D (17%)</p> <p>Note: TIMSS 2011(G8) Avr. 46%</p>																								
<p>Question 11</p> <p>Which of these diagrams best represents the structure of matter, starting with the more complex particles at the top and ending with the more fundamental particles at the bottom?</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>A.</p>  </div> <div style="text-align: center;"> <p>B.</p>  </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;"> <p>C.</p>  </div> <div style="text-align: center;"> <p>D.</p>  </div> </div>	<p>24 (C11) RCA: 57% - B</p> <p>TWA: A (25%)</p> <p>Note: TIMSS 2011(G8) Avr. 41%</p>																								
<p>Question 12</p> <p>Some physical properties of five different substances (A, B, C, D, and E) are outlined in the table below.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th></th> <th>Substance A</th> <th>Substance B</th> <th>Substance C</th> <th>Substance D</th> <th>Substance E</th> </tr> </thead> <tbody> <tr> <td>Physical state at room temperature (20°C)</td> <td>Solid</td> <td>Solid</td> <td>Liquid</td> <td>Liquid</td> <td>Gas</td> </tr> <tr> <td>Appearance/ colour</td> <td>Shiny grey</td> <td>White</td> <td>Silver</td> <td>Colourless</td> <td>Colourless</td> </tr> <tr> <td>Conducts electricity</td> <td>Yes</td> <td>No</td> <td>Yes</td> <td>Yes</td> <td>No</td> </tr> </tbody> </table> <p>Which substances are metal?</p> <p>A. Substance A, B and C</p> <p>B. Substance A and B</p> <p>C. Substance C and D</p> <p>D. Substance A and C</p>		Substance A	Substance B	Substance C	Substance D	Substance E	Physical state at room temperature (20°C)	Solid	Solid	Liquid	Liquid	Gas	Appearance/ colour	Shiny grey	White	Silver	Colourless	Colourless	Conducts electricity	Yes	No	Yes	Yes	No	<p>25 (C12) RCA: 51% - D</p> <p>TWA: B (25%)</p> <p>Note: TIMSS 2011(G8) Avr. 44%</p>
	Substance A	Substance B	Substance C	Substance D	Substance E																				
Physical state at room temperature (20°C)	Solid	Solid	Liquid	Liquid	Gas																				
Appearance/ colour	Shiny grey	White	Silver	Colourless	Colourless																				
Conducts electricity	Yes	No	Yes	Yes	No																				

<p>Question 13</p> <p>Which of the following energy conversions takes place in a battery-operated flashlight?</p> <p>A. electrical → mechanical → light</p> <p>B. chemical → mechanical → light</p> <p>C. chemical → electrical → light</p> <p>D. nuclear → electrical → light</p>	<p>26 (C13) RCA: 52% - C</p> <p>TWA: A (16%)</p> <p>Note: TIMSS 2011(G8) Avr. 35%</p>
<p>Question 14</p> <p>The figure shows a parachute jumper in four positions.</p> <p>In which of the positions does the force of gravity act on the jumper?</p> <p>A. Position 2 only.</p> <p>B. Positions 2 and 3 only.</p> <p>C. Positions 1, 2 and 3 only.</p> <p>D. Positions 1, 2, 3, and 4.</p> 	<p>27 (C14) RCA: 30% - D</p> <p>TWA: B (24%)</p> <p>Note: TIMSS 2011(G8) Avr. 32%</p>
<p>Question 15/</p> <p>Three identical light bulbs are connected to a battery as shown in the diagram. The arrow indicates the direction of the current flow.</p> <p>Which statement is true?</p> <p>A. The current in Bulb 1 is greater than the current in Bulb 2.</p> <p>B. The current in Bulb 1 is greater than the current in Bulb 3.</p> <p>C. The current in Bulb 2 is the same as the current in Bulb 3.</p> <p>D. The current in Bulb 2 is the same as the current in Bulb 1.</p> 	<p>28 (C15) RCA: 58% - D</p> <p>TWA: A (14%)</p> <p>Note: TIMSS 2011(G8) Avr. 43%</p>
<p>Question 16</p> <p>A man climbed to the top of a very high mountain. While on the mountain top, he drank all the water in his plastic water bottle and then put the cover back on. When he returned to camp in the valley, he discovered that the empty bottle had collapsed. Which of the following best explains why this happened?</p> <p>A. The temperature is lower in the valley than on the mountain top.</p> <p>B. The temperature is higher in the valley than on the mountain top.</p> <p>C. Air pressure in the valley is lower than on the mountain top.</p> <p>D. Air pressure in the valley is higher than on the mountain top.</p>	<p>29 (C16) RCA: 21% - D</p> <p>TWA: B (23%)</p> <p>Note: TIMSS 2011(G8) Avr. 33%</p>
<p>Question 17</p> <p>A student sets up an investigation to test the strength of magnets. He has several magnets of different sizes, shapes, and masses. He uses the magnets to lift metal paper clips. How is the strength of a magnet defined in the investigation?</p> <p>A. by the mass of the magnet lifting the metal paper clips</p> <p>B. by the size of the magnet lifting the metal paper clips</p> <p>C. by the number of metal paper clips lifted by the magnet</p> <p>D. by the time the metal paper clips stay on the magnet</p>	<p>30 (C17) RCA: 26% - C</p> <p>TWA: B (20%)</p> <p>Note: TIMSS 2011(G8) Avr. 42%</p>
<p>Question 18</p> <p>Which of the following is the major cause of tides?</p> <p>A. heating of the oceans by the Sun</p> <p>B. gravitational pull of the Moon</p> <p>C. earthquakes on the ocean floor</p> <p>D. changes in wind direction</p>	<p>31 (C18) RCA: 13% - B</p> <p>TWA: D (30%)</p> <p>Note: TIMSS 2011(G8) Avr. 43%</p>

<p>Question 19</p> <p>Which diagram shows the position of the Sun (S), moon (M), and Earth (E) during an eclipse of the moon? (Not drawn to scale)</p> <p>A. </p> <p>B. </p> <p>C. </p> <p>D. </p>	<p>32 (C19) RCA: 34% - D</p> <p>TWA: A (39%)</p> <p>Note: TIMSS 2011(G8) Avr. 35%</p>
<p>Question 20</p> <p>Which statement is NOT correct on how you can you make use of computer at school or at home?</p> <p>A. Writing documents</p> <p>B. Drawing pictures</p> <p>C. Cooking breakfast</p> <p>D. Searching information</p>	<p>33 (C20) RCA: 73% - C</p> <p>TWA: D (13%)</p>
<p>Question 21</p> <p>How often have you used laptop computers at your school or at home.</p> <p>A. Almost everyday</p> <p>B. Once in a week</p> <p>C. Once in a month</p> <p>D. Never used</p>	<p>34 (C21) : 92% - ABCD</p> <p>A (36%), B (52%), C (2%), D (1%), N/A 8%</p> <p>This question is intended to know how often the students use computers and students got a mark as long as they answered.</p> <p>Positivo-Laptop PC (Windows) has been distributed in the three schools.</p>
<p>Question 22</p> <p>Calculate the volume of a body with 0.8 g/cm³ and 240g.</p> <p>A. 192 cm³</p> <p>B. 239.2 cm³</p> <p>C. 240.8 cm³</p> <p>D. 300 cm³</p>	<p>35 (C22) RCA: 65% - D</p> <p>This is a question of primary mathematics level</p> <p>TWA: A (13%)</p>

添付 7. エンドライン調査報告書

**RWANDA EDUCATION BOARD
REPUBLIC OF RWANDA**

**The Project for Supporting Institutionalizing
and Improving Quality of SBI Activity (SIIQS)**

Endline Survey Report

October 2019

JAPAN INTERNATIONAL COOPERATION AGENCY

PADECO Co., Ltd.



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Abbreviations and Acronyms

9/12 YBE	9 Years Basic Education School and 12 Years Basic Education School
AAT	Academic Achievement Test
BLS	Baseline Survey
CBC	Competence Based Curriculum
CPD	Continuous Professional Development
CTR	Control Group
DCC	District CPD Committee
DDE	District Director of Education
DEO	District Education Officer
DOS	Director of Study
ELS	Endline Survey
ESSP	Education Sector Strategic Plan
FGI	Focus Group Interview
GR	Graduation Rate
GS	Groupe Scolaire
HOT	Higher Order Thinking
HT	Head Teacher
INTV	Interview
JICA	Japan International Cooperation Agency
KPI	Key Performance Indicator
LCM	Learner-Centered Methodology
LS	Lower Secondary
PCR	Pupil Classroom Rate
PDM	Project Design Matrix
PISA	Programme for International Student Assessment
PR	Pass Rate
PS	Primary School
QNR	Questionnaire
REB	Rwanda Education Board
SBI	School-based In-service teacher training
SBM	School-based Mentor
SBMP	School-based Mentorship Program
SCC	Sector CPD Committee
SEO	Sector Education Officer
SET	Science and Elementary Technology
SIQS	Supporting Institutionalizing and Improving Quality of SBI Activity
SS	Secondary Schools
SSL	School Subject Leader
SWOT	Strengths, Weaknesses, Opportunities and Threats
TIMSS	Trends in International Mathematics and Science Study
TRT	Treatment Group
US	Upper Secondary

1. Introduction

The joint project between Rwanda Education Board (REB) and Japan International Cooperation Agency (JICA) has been supporting the Teacher Training Unit of Teacher Development & Management and Career Guidance & Counseling Department in REB since January 2017 to 1) improve teacher’s knowledge and skills on Competence-based Curriculum (CBC) and 2) strengthen Continuous Professional Development (CPD) mechanisms. As it will end December 2019, the project conducted the “Endline Survey (ELS)” to evaluate the contribution of Project activities. In this document, we report the findings of the ELS which draws on various data such as lesson videos, lesson plans, questionnaire responses from teachers and focus group interviews of key informants, as well as academic achievement tests for students administered in target schools.

1.1 Background

The introduction of CBC in 2016 called for a big paradigm shift on teaching to align with national aspirations and to ensure that the knowledge, skills, attitudes and values acquired in schools meet the challenges of the 21st century. CBC requires large-scale efforts to equip teachers with the new way of teaching which fits the new curriculum. As part of the effort, REB provided a three-year CBC induction training program for teachers from 2015/16 to 2017/18.

REB and JICA launched and implemented the three-year Project for Supporting Institutionalizing and Improving Quality of SBI (SIIQS Project) in January 2017. The project has two components:

- 1) Enhance teacher’s knowledge and skills on CBC
- 2) Establish coherent CPD mechanisms at the school, sector and district levels.

The Project has piloted “Lesson Study” as one of the effective CPD models which inherently engages teachers in a CPD nature. It has been practiced in Japan for about 100 years and is globally known as one of the pillars of Japanese quality education nowadays. Through the Lesson Study process, the Project has developed lesson video samples at six pilot schools. The lessons learned through this practice were also reflected in the CBC training materials, including paper-based and digital training manuals. They have been distributed to all schools across the country through CBC induction training Phase III. In addition, the Project has supported District and Sector CPD Committees (DCCs and SCCs) in the stages of establishment, planning, and monitoring and evaluation in order to strengthen CPD monitoring mechanisms. The Project aimed to harmonize these activities in order to have good learning achievements through quality lessons. The conceptual image of the Project design is shown in Figure 1-1.

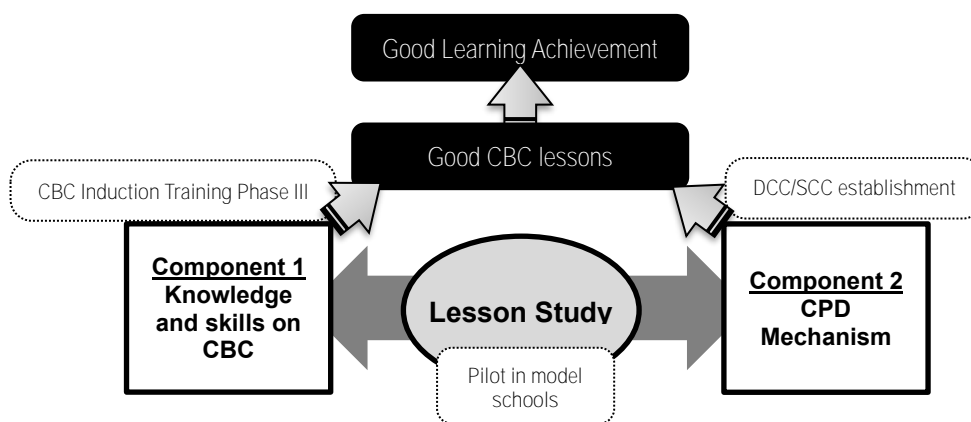


Figure 1-1 Conceptual Image of the Project

1.2 Objectives of ELS

1.2.1 Objectives

Now that the Project will come to end, measuring the extent of success and drawing lessons from findings is needed, in relation to the Baseline Survey (BLS) conducted in 2017. Therefore, the Project conducted ELS in June 2019 for evaluation purposes. The objectives of the ELS are summarized as follows;

- To understand the extent to which teachers understand and put CBC into practice in their teaching,
- To figure out how much CPD has been conducted at schools and its impact on academic performance,
- To identify challenges in operating DCCs and SCCs as part of the problem-solving cycle
- To draw recommendations for expansion of Lesson Study to all schools in Rwanda

1.2.2 Key Performance Indicators (KPIs)

The Project outline and its benchmarks (Key Performance Indicators: KPIs) are stipulated in a logical framework called the Project Design Matrix (PDM) as shown in Table 1-1.

Table 1-1: Indicators of PDM

Narrative Summary	Objectively Verifiable Indicators	Means of Verification
Overall Goal		
Students' learning process in classroom is improved.	<u>1) More students in a model school than those in a control school present relevant responses to an open question posed by a teacher.</u>	<u>1) Lesson observation in sampled schools</u>
	<u>2) Result of the academic achievement test developed by the Project improves more in model schools compared to control schools.</u>	<u>2) Results of the academic achievement test in sampled schools</u>
Project Purpose		
Implementation of CBC-based lesson in the classroom is strengthened through SBI ¹ activities.	<u>1) Lesson plans developed by teachers in model schools include all elements specified in Competence 2.1 of the National Teacher CPD Framework.</u>	<u>1) Lesson plans developed by Lesson Study in model schools</u>
	<u>2) Teachers give more open questions in model schools compared to control schools.</u>	<u>2) Lesson observation in sampled schools</u>
Outputs		
1. Teachers' understanding of CBC-based lesson implementation is enhanced.	<u>1) Post-test results of participants in trainings and workshops including an e-learning course exceed 70%.</u>	<u>1-1) Post questionnaire survey to participants in technical stream of CBC training</u> <u>1-2) Online CPD course assessments</u>
	<u>2) Self-evaluation of teachers' understanding of CBC-based lessons continues to be 90% or above.</u>	<u>2-1) Questionnaire survey in sampled schools</u> <u>2-2) Questionnaire survey to participants in technical stream of CBC training</u>
2. Problem-solving capacities are enhanced at school, sector, district, and national levels.	<u>1) All sectors implement sector-based CBC training.</u>	<u>1) Monitoring conducted by REB</u>
	<u>2) More than one good practice of school-based CPD is reported quarterly from all DCCs that have been established.</u>	<u>2-1) Monthly Monitoring Report submitted by DCCs and SCCs</u>
	<u>3) The rate of teachers' participation in school-based CPD increases from 75% (baseline) to 90%.</u>	<u>2-2) Quarterly Monitoring Report</u> <u>3-1) Questionnaire in sampled schools</u> <u>3-2) Monthly Monitoring Report submitted by DCCs</u>
	<u>4) More than 50% of DCCs and SCCs submit monitoring reports using a developed form on a monthly basis.</u>	<u>4) Monthly Monitoring Report submitted by DCCs and SCCs</u>

¹ SBI stands for "School-Based In-service training". This term was initially common when the Project was formulated. However, this has evolved into the broader concept named CPD and is no longer used nowadays.

The PDM was reviewed by REB and JICA to set out relevant indicators based on the latest situation and their expectation before the commencement of ELS, so that the Project team was able to objectively evaluate the achievement. Data needed to evaluate some indicators come from regular project activities, however, ELS aimed to conduct a field survey to gather additional data (indicated by underlined items in the below table).

1.3 Field Survey Design

1.3.1 Target Groups and Data Collection Methods

As Figure 1-1 highlights, the Project has been continuously providing the treatments (Lesson Study) at six model schools. Meanwhile, the Project has treated DCC and SCC so that they share CPD good practices with other schools in their area, too. The Project devised an experimental design of the treatment for the model schools and DCCs/SCCs which drew on standardized Academic Achievement Tests (AATs), lesson videos, lesson plans as well as questionnaire responses from the treatment and the control group. In addition, the Project planned a series of interviews with key informants to gather narrative evidences to consolidate findings. Thus, the field survey was designed for covering such various target groups to collect a wide range of data as shown in Table 1-2.

Table 1-2: Outline of ELS activities

Target Groups		Survey Items	Survey Instruments
<u>Component 1: Knowledge and skills of teachers on CBC implementation</u>			
School	Students	- Learning achievements - Behavior in lessons	- Test (AAT) - Lesson video recording
	Teachers	- Lesson preparation - Behavior in lessons - Awareness of CBC	- Lesson plan - Lesson video recording - Questionnaire
	Head Teachers	- Readiness of teachers for CBC	- Questionnaire - Interview
<u>Component 2: CPD Mechanism</u>			
School	Teachers	- Awareness of CPD - Engagement in CPD	- Questionnaire - Focus Group Interview (FGI)
	Head Teachers	- Awareness of CPD - engagement in CPD	- Questionnaire - Interview
DCC SCC	District Directors of Education (DDEs) District Education Officers (DEOs)	- Awareness of CPD - Good Examples	- Interview
	Sector Education Officers (SEOs)	- Awareness of CPD - Good Examples	- Interview

1.3.2 Selection of Target Schools, Sectors and Districts

To objectively verify the effects of experimental design, the Project selected schools which have similar attributes to the model schools from the list of schools we have visited in the BLS, and set them as a control group to compare with the treatment group. The composition of the treatment and the control group is shown in Table 1-3. Shortened school names in brackets are abbreviations used hereafter throughout this report.

Table 1-3: Composition of Treatment and Control Groups

Group	School	Type	Treated from	# of Lesson Study since 2017	DCC	SCC
TRT	EP Buhande	PS	2017	4	Rulindo	Bushoki
	GS Kabuye Catholique (GS Kabuye)	9YBE	2013	2	Gasabo	Jabana
	GS Mukarange Catholique (GS Mukarange)	12YBE	2018	3	Kayonza	Mukarange
	GS APAGIE Musha (GS APAGIE)	SS	2017	4	Rwamagana	Musha
	GS St Aloys Rwamagana (GS St Aloys R)	SS	2013	2	Rwamagana	Kigabiro
	GS Notre Dame des Apôtres Rwaza (GS NDA Rwaza)	SS (girls)	2018	3	Musanze	Remera
CTR	EP Bukinanyana ADEPR (EP Bukinanyana)	PS			Nyabihu	Jenda
	GS Gihogwe Catholique (GS Gihogwe)	12YBE			Gasabo	Gatsata
	GS Bubazi	9YBE			Karongi	Rubengera
	Lycée Notre Dame de la Visitation (LNDV)	SS (girls)	2017 only*	1	Rulindo	Bushoki
	GS Rambura Garçons (GS Rambura G)	SS			Nyabihu	Rambura

Legend: "TRT": Treatment group, "CTR": Control group, "PS": Primary School, "SS": Secondary School, "9YBE": 9 Year Basic Education School, "12YBE": 12 Year Basic Education School, "(girls)": Girls' school

*LNDV was once treated in 2017 and terminated after the first trial.

Table 1-4: Attributes of Schools in Treatment and Control Group (2018)

Level	TRT					CTR				
	School Name	Pupil total	PCR	PR (%)	GR (%)	School Name	Pupil total	PCR	PR (%)	GR (%)
PS	EP Buhande	531	37.9	57.9	54.7	GS Bubazi	603	76.5	76.9	72.2
	GS Mukarange	1,278	53.3	96.9	56.3	EP Bukinanyana	918**	60.3	71.7	70.8
	GS Kabuye	2,194	109.7	99.1	72.2	GS Gihogwe	1,614	70.2	99.0	97.1
	Average	1334.3	67.0	84.6	61.0	Average	1045.0	69.0	82.5	80.0
LS (O' level)	GS Kabuye	373	53.3	94.2	111.4	GS Bubazi	390	26.0	89.1	85.4
	GS Mukarange	889	80.8	76.9	64.9	GS Gihogwe	658	65.8	90.9	80.9
	GS APAGIE	285	35.6	100.0	100.0	GS Rambura G	321	35.7	100.0	100.0
	GS St Aloys R	431	47.9	100.0	93.2	LNDV*	216	43.2	100.0	100.0
	GS NDA Rwaza*	246	41.0	100.0	100.0	Average	396.3	42.7	95.0	91.6
	Average	444.8	51.7	94.2	93.9	Average	396.3	42.7	95.0	91.6
US (A' level)	GS Mukarange	491	44.6	82.1	78.71	GS Gihogwe	204	29.1	92.1	89.2
	GS APAGIE	280	31.1	99.0	99.0	GS Rambura G	469	33.5	97.8	97.8
	GS St Aloys R	652	43.5	100.0	100.4	LNDV*	175	21.9	100.0	100.0
	GS NDA Rwaza*	360	30.0	99.0	96.2	Average	282.7	28.2	96.6	95.7
	Average	445.8	37.3	95.0	93.6	Average	282.7	28.2	96.6	95.7

Legend: "Pupil total": Total number of students in each school, "PCR": Ratio of students against the number of classrooms, "PR (%)": Rate of students who passed the national exam (leaving exam) against the number of examinees. "GR (%)": Rate of students who passed the national exam against total number of students in the last grade.

*Girls school, **Data in 2019.

Table 1-4 shows the attributes of schools. The treatment and the control groups in the same line correspond to each other. We reviewed school size and performance at each school to verify if the treatment and the control groups have similar traits to compare. We computed Pupil

Classroom Rate (PCR), Pass Rate (PR) of national exam and Graduation Rate² (GR) from available data in 2018 as a proxy performance indicator. The table indicates that they had similar traits (or the treatment group is even worse) overall for ELS to objectively evaluate according to the experimental design.

1.4 Survey Instruments and Method

1.4.1 Administration of Academic Achievement Test (AAT)

Multiple-choice type mathematics and science tests developed by the Project experts during the BLS in 2017 were used (Appendix A-1 to A-6) as AATs for this survey. The 40-minute tests were designed for P4, S1 and S4 students and used in the model schools to assess the initial level of student achievement at the start of Lesson Study. Those students in the initial survey in 2017 theoretically advanced to P6, S3 and S6 respectively. Therefore, they should have benefitted from being in the treatment group during the project, and presumably should attain better AAT results than those in the control group. Hence learners in these grades were targeted for AAT comparison.

1.4.2 Video Recording and Lesson Plan Collection

Surveyors used a video camera and a tripod to record entire lessons and collected lesson plans for the recorded lessons. The Project conducted Lesson Study for the below subjects in the 2nd term 2019, just before ELS started. Thus, lesson video recording basically targeted these subjects to examine the treatment effects compared to lessons in the control group. If target schools could not arrange these lessons during the survey, the surveyors recorded lessons of a similar subject (e.g. physics as an alternative of chemistry) or the same subject in a different grade.

- Mathematics (P5/S2/S5)
- Science and Elementary Technology (SET) (P5)
- Biology (S2)
- Chemistry (S5)

1.4.3 Questionnaire for Teachers

The questionnaire for school teachers (Appendix B) was intended to evaluate teachers' understanding of CBC and implementation of CPD. It had some questions in common with the questionnaire in BLS. It included the following items:

- Basic information (name, experience, teaching subject, etc.)
- Self-evaluation about CBC teaching practice
- Understanding of CBC
- Participation in CPD
- Perception on school management

Teachers who teach either mathematics or science subjects were the target. Collected questionnaires were analyzed quantitatively and qualitatively.

1.4.4 Questionnaire for Head Teachers

To collect general information about schools and status of CBC and CPD, a questionnaire for head teachers (Appendix C) was designed based on the questionnaire in BLS. It covered the following items:

- Basic information (name, school type and facilities, etc.)
- Status of CBC and CPD
- Evaluation of CBC and CPD at the school

² We simply calculated GR as the total number of students who passed the national exam divided by the population in the last grade as of 1st term. It can exceed 100% if a school received transfers from other schools.

The Director of Study (DOS) was allowed to answer the questionnaire on behalf of the HT, when he or she was more familiar with CBC and CPD in the school. Collected questionnaires were analyzed quantitatively and qualitatively.

1.4.5 Interview with Teachers

The Focus Group Interview (FGI) with teachers was organized to collect detailed information about the items in the questionnaire. Those who answered the questionnaire and had time for an interview were requested to participate. The interview sheet (Appendix D) had the following items:

- Changes in teaching practice since the introduction of CBC
- Challenges in CBC
- Participation in CPD and types of activities
- Challenges in CPD at school

Surveyors recorded the interview with a video camera as long as the HT agreed, and took notes on the interview sheet at the same time. Collected information was used as evidence for analysis.

1.4.6 Interview with Head Teachers

An interview sheet for HTs (Appendix E) was designed to broaden information gathered from the questionnaire for HTs. It contained the following questions (but as a semi-structured interview, the surveyors had flexibility to modify questions during individual interviews according to the answers from HTs):

- Changes in teachers' practice since the introduction of CBC
- Challenges in CBC
- Participation in CPD and types of activities
- Evaluation of CPD at school and HT's responsibility in promotion of CPD

The interview was conducted in the same manner as that for teachers. Collected information was used as evidence for analysis. The questions were developed to understand the following:

- Comprehension of CBC concept by teachers, HTs and education officers
- Impact of the CBC induction program
- Needs and gaps in implementation

1.4.7 Interview with DDE, DEO and SEO

Interview sheets for SCCs (Appendix F) were designed based on those for DCC/SCC quarterly monitoring to understand the status of CPD and SCC activities in respective sectors. For DCCs, only interview questions were prepared. Interview sheets for SCCs included the following items:

- Planning, implementation, monitoring and evaluation of CPD activities
- Perception about Lesson Study
- Good practices
- Challenges in DCC/SCC operation

Customized questions were included in the interview sheets for some SCCs according to their answers in DCC/SCC needs assessment questionnaire conducted in July 2019. Interviewees were DDEs as representatives of DCCs, and SEOs as representatives of SCCs. The interviews were conducted in the same manner as that for teachers. Collected information was analyzed qualitatively. SWOT analysis was applied to examine any potential of Lesson Study expansion.

1.5 Data Collection

The targets of the field survey were separated into two affiliations: schools and DCCs/SCCs. Hence the field survey was divided into two phases.

1.5.1 School Visit

The survey was organized from 10th June to 9th July 2019 as shown in Table 1-5. The survey team visited the target schools for data collection. Since lesson video recording for model schools were planned for research lessons developed through the Lesson Study, these lessons were observed on separate days from the days for AAT, questionnaire and interviews at the schools.

Table 1-5: Survey Schedule for School Visits

Date	Day	District	School	Video	AAT	QNR/FGI (teachers)	QNR/INTV (HT)
10 June	Mon	Kayonza	GS Mukarange	√(PS)			
11 June	Tue						
12 June	Wed	Kayonza	GS Mukarange	√(LS)			
13 June	Thu	Rulindo	EP Buhande	√(PS)			
14 June	Fri	Musanze	GS NDA Rwaza	√ (US math)	√		
15 June	Sat						
16 June	Sun						
17 June	Mon	Rwamagana	GS APAGIE	√(LS)			
18 June	Tue	Gasabo	GS Kabuye	√(PS/LS)	√	√	√
19 June	Wed	Gasabo	GS Gihogwe	√(PS/LS/US)	√	√	√
20 June	Thu	Rwamagana	GS St Aloys R	√(LS/US)	√	√	√
21 June	Fri	Rulindo	LNDV	√(LS/US)	√	√	√
			EP Buhande		√	√	
22 June	Sat	Rwamagana	GS APAGIE	√ (US)			
23 June	Sun						
24 June	Mon	Kayonza	GS Mukarange	√(US)	√		√
25 June	Tue	Musanze	GS NDA Rwaza	√(LS)	√	√	√
26 June	Wed	Rwamagana	GS APAGIE		√	√	
		Nyabihu	GS Bukinanyana	√(PS)	√	√	√
27 June	Thu	Nyabihu	GS Rambura G	√(LS/US)	√	√	√
28 June	Fri	Karongi	GS Bubazi	√(PS/LS)	√	√	√
29 June	Sat						
30 June	Sun	Musanze	GS NDA Rwaza	√ (US science)	√		
1 July	Mon						
2 July	Tue						
3 July	Wed	Rwamagana	GS APAGIE				√
4 July	Thu						
5 July	Fri						
6 July	Sat						
7 July	Sun						
8 July	Mon						
9 July	Tue	Rulindo	EP Buhande				√

Legend: "Video": Lesson video recording, "AAT": Academic Achievement Test, "QNR": Questionnaire, "FGI": Focus Group Interview, "INTV": Interview

NB: Description in the brackets in Video indicates the target levels of lesson observation.

1.5.2 District/Sector Education Office Visit

The visits to DCCs/SCCs were organized as part of the 2nd quarter DCC/SCC monitoring in August to September 2019 as shown in Table 1-6.

Table 1-6: Survey Schedule for DCC/SCC Visit

Date	Day	District	Sector
27 August	Tue	Nyabihu	Jenda
			Rambura
		Rwamagana	Musha
			Kigabiro
28 August	Wed		
29 August	Thu	Musanze	Remera
30 August	Fri	Rulindo	Bushoki
31 August	Sat		
1 September	Sun		
2 September	Mon		
3 September	Tue	Kayonza	Mukarange
4 September	Wed	Gasabo	Gatsata
5 September	Thu		
6 September	Fri	Karongi	Rubengera

1.6 Sample Size

1.6.1 Lesson videos, Lesson Plans and AATs

Surveyors visited 11 schools and collected 41 lesson videos, 37 lesson plans and a total of 2,346 AATs. When the lessons of the target grade/subject did not take place on the day of survey, a similar grade/subject was observed instead. The sample size is shown in Table 1-7.

Table 1-7: Sample Size of Lesson videos, Lesson Plans and AATs

Group	School	Type	Survey item	PS		LS (O' Level)		US (A' Level)		
				Math	SET	Math	Science	Math	Science	
TRT	EP Buhande	PS	Video/LP	P5	P5					
			AAT	36	40					
	GS Kabuye	9YBE	Video/LP	P5	P5	n/a*	S2 (bio)			
			AAT	128	137	41	25			
	GS Mukarange	12YBE	Video/LP	P5	P5	S2	S2 (bio)	S5	S2 (phy)	
			AAT	39	42	45	45	57	14	
	GS St Aloys R	SS	Video/LP			S2	S3 (bio)	S4	S4 (che)	
			AAT			56	69	100	64	
	GS APAGIE Musha	SS	Video/LP			S2	S2 (bio)	S5	S4 (che)	
			AAT			47	48	54	37	
GS NDA Rwaza	SS (girls)	Video/LP			S2	S2 (bio)	S4	S4 (che)		
		AAT			35	38	39	77		
CTR	EP Bukinanyana	PS	Video/LP	P5	P5					
			AAT	61	69					
	GS Bubazi	9YBE	Video/LP	P5	P5	S2	S2 (che)			
			AAT	48	44	45	48			
	GS Gihogwe	12YBE	Video/LP	P5	P5	S2	S2 (bio)	n/a**	n/a**	
			AAT	137	140	78	73	n/a**	n/a**	
	GS Rambura G***	SS	Video/LP			S2	S2 (bio)	S5	S4 (che)	
			AAT			43	44	87	34	
	LNDV****	SS (girls)	Video/LP			S2	S2 (bio)	S5	S4 (phy)	
			AAT			22	21	19	20	
Total	# of Lesson Recorded			6	6	8	9	6	6	41
	# of Lesson Plans Collected			6	6	6	9	5	5	37
	# of Participants in AAT			449	472	412	411	356	246	2346

* LS mathematics lesson at GS Kabuye could not be observed because of the timetable.

** GS Gihogwe is a 12YBE, but it does not have mathematics and science subjects in upper secondary level. Therefore, no lessons were observed and no AATs were administered in upper secondary.

*** The lesson plans in S2 math, S5 math and S4 chemistry at GS Rambura were not collected.

**** The lesson plan in S2 math at LNDV had not been prepared.

1.6.2 Questionnaires and Interviews at Target Schools

Table 1-8 shows the sample size of questionnaires and interviews. The questionnaire and interview for HTs were conducted at all schools. The sample size of the questionnaire for teachers was 101, and the group interview was 94. Most teachers attended both questionnaire and interview surveys.

Table 1-8: Sample Size of Questionnaire and Interview at Schools

School	QNR (teachers)	FGI (teachers)	QNR & INTV (HT)
EP Buhande	9	9	1
GS Kabuye	12	13	1
GS Mukarange	14	11	1
GS APAGIE*	8	9	1
GS St Aloys R	8	8	1
GS NDA Rwaza	4	3	1
EP Bukinanyana*	5	6	1
GS Gihogwe	16	12	1
GS Bubazi	6	5	1
LNDV	5	4	1
GS Rambura G	14	14	1
Total	101	94	11

* In GS APAGIE and EP Bukinanyana, interviews were conducted before questionnaire due to teachers' timetables. Therefore, sample size of the interview was larger than that of questionnaire.

1.6.3 Questionnaires and Interviews at DCCs and SCCs

Interviews with DCCs and SCCs were conducted at districts and sectors where ELS target schools are located. Table 1-9 shows the sample size. Interviews with DDEs Gasabo, Musanze and Rulindo, and an interview with SEO Jabana were not conducted due to last minute time conflicts.

Table 1-9: Sample Size of Interview with DCCs and SCCs

DCC	INTV (DDE)	SCC	INTV (SEO)
Rwamagana	1	Musha	1
		Kigabiro	1
Gasabo	0	Jabana	0
		Gatsata	1
Nyabihu	1	Jenda	1
		Rambura	1
Musanze	0	Remera	1
Rulindo	0	Bushoki	1
Kayonza	1	Mukarange	1
Karongi	1	Rubengera	1
Total	4	Total	9

1.7 Limitation

The ELS was designed to evaluate the changes and influences which could have stemmed from Project at model schools, by comparing relevant data between the treatment group and the control group. Since schools in the control group were selected among target schools in the BLS, focusing solely on the similarity of attributes does not reflect geographical disparities when comparing. Furthermore, both the treatment and the control groups have received support from other DPs more or less in conducting CPD and improving teachers' competencies. The analysis did not eliminate changes and influences brought by such synergy effect.

Part I

Learning and Teaching at schools

2. CBC Practice in Lessons

The Project found the following changes in teaching practice.

- Lesson plans in the treatment group tended to be more detailed, embodying important elements provided in the National Teacher CPD Framework.
- Teachers in the treatment group used open questions more frequently than teachers in the control group. Their lessons have become more learner-centered in that they interacted with learners in a way that supports learning.
- Teachers in the treatment group demonstrated better understanding of the concepts of CBC.

In sum, lessons in the treatment group are transitioning to CBC more smoothly. This difference can be attributed to Lesson Study.

2.1 Lesson Planning

Lesson plan is a fundamental tool to “architect” a creative lesson. Lesson Study encourages teachers to spend adequate time (1-2 weeks) for developing and revising the research (demo) lesson plan. Currently, all lesson plans for observed lessons including the control group (except for four lessons) were available. Lesson plans developed in Lesson Study are attached as Appendix G-1 to G-12. The project attempted to review how the lesson plans have been changed since BLS and to evaluate the quality.

2.1.1 Evaluation of Lesson Plans

The National Teacher CPD Framework provides elements that should be included in a lesson plan in the description of *Competence 2.1 Plan learning outcomes and objectives*. We particularly focused on five among these elements during Lesson Study at model schools which were identified weak points at the onset of the Project (One element (No.1) is divided into two sub-elements for evaluation). And then, based on the description, we elaborated evaluation criteria for our comparative study and prepared the rubrics on a four-level scale: 0 (No description), 1 (Poor), 2 (Fair), 3 (Good) as shown in Table 2-1.

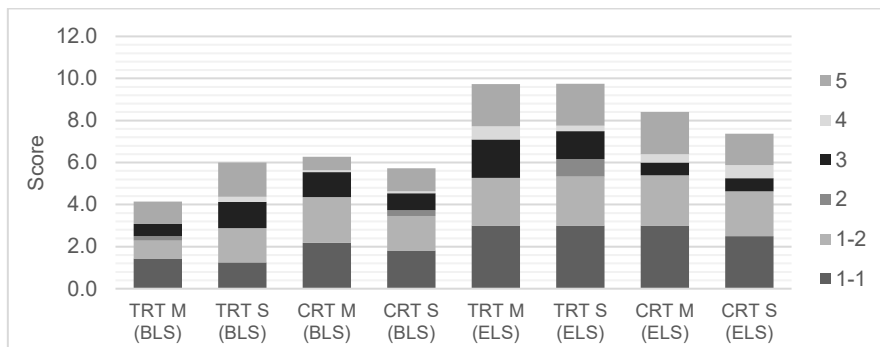
Table 2-1: Rubric for Lesson Plan Evaluation

Criteria		No description	Poor	Fair	Good
1. Clear and measurable outcomes and objectives and activities to achieve them.	1-1. Clear and measurable outcomes and objectives	0	1	2	3
	1-2. Attainableness of Activities	0	1	2	3
2. Learning outcomes and objectives support learners to move from simple and familiar to more complex and sophisticated knowledge and skills		0	1	2	3
3. Regular revision of learning and learning assessments.		0	1	2	3
4. Adaptions for specific learners.		0	1	2	3
5. Use a range of TLRs, vary interaction patterns		0	1	2	3

The average evaluation scores and supplementary stacked bar chart are shown in Table 2-2 and Figure 2-1 respectively; by survey type (BLS, ELS), school type (treatment, control) and subjects. Overall, the average scores of the treatment and the control groups in ELS were higher than those of BLS for each element. In addition, the average scores of the treatment group were higher than those of the control group in ELS, despite they tended to be lower in BLS. The facts implicate that teachers in Rwanda enhanced their lesson planning capacity in general, presumably because of CBC induction trainings, CPD and daily experience. However, Lesson Study did accelerate the lesson planning capacity in the treatment group more than in the control group.

Table 2-2: Evaluation Score Lesson Plan (Average)

Survey	Type	Subject	N	1-1	1-2	2	3	4	5
BLS	TRT	Math	14	1.4	0.9	0.2	0.6	0.0	1.1
		Science	8	1.3	1.6	0.0	1.3	0.3	1.6
	CTR	Math	11	2.2	2.2	0.0	1.2	0.1	0.6
		Science	11	1.8	1.6	0.3	0.8	0.1	1.1
ELS	TRT	Math	11	3.0	2.3	0.0	1.8	0.6	2.0
		Science	12	3.0	2.3	0.8	1.3	0.3	2.0
	CTR	Math	5	3.0	2.4	0.0	0.6	0.4	2.0
		Science	8	2.5	2.1	0.0	0.6	0.6	1.5

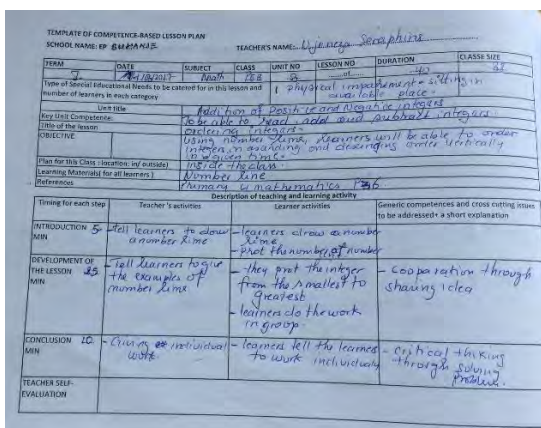


Legend: “M”: Mathematics, “S”: Science

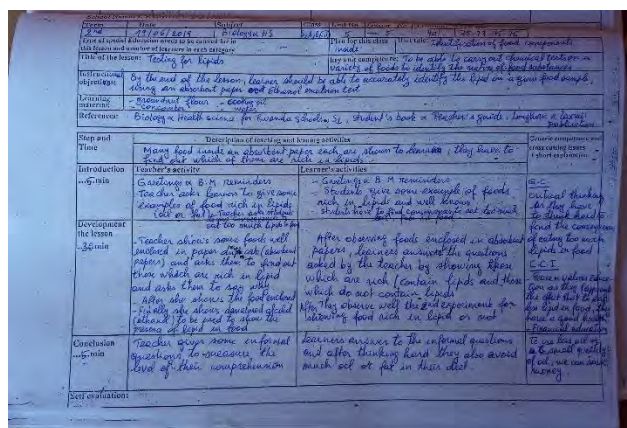
Figure 2-1: Evaluation Scores of Lesson Plan (Cumulation of Average Score of each Criterion)

2.1.2 Appearance of the Lesson Plans

The above trends were observed visually, too. During the BLS, we commonly found abstract lesson plans which simply outlined a lesson (i.e. “do group work”, “ask questions” etc.) as shown in Figure 2-2, example 1. To the contrary, now we can easily find more detailed lesson plans in many schools which describe details of activities, cross cutting issues, etc., as shown in Figure 2-2, example 2. Figure 2-2, example 3 shows the image of the lesson plan developed through Lesson Study in the treatment group³. As it can be seen at a glance, the lesson plan is more structured to specify the steps of the learning activity. It contains “expected (correct) answers of learners” so that both a teacher and observers can properly assess learning achievement timely during the lesson. Teaching aids are graphically illustrated in the plan.





Example 1: LP in TRT at BLS



Example 2: LP in CTR at ELS

³ The Project piloted a new lesson plan format proposed by Curriculum, Teaching & Learning Resources Department in REB.

Term	Date	Subject	Class	Unit No	Lesson No	Duration	Class size
II	11-06-2019	Math	P5A	7	3 out of 3	40 min	42
Type of Special Educational Needs to be catered for in this lesson and number of learners in each category Unit title: Solving problems involving measurement of length, capacity, and mass Key trait: Communication Competence: Finding of intervals on a closed line Title of the lesson: By using a chalkboard, pieces of chalk, ruler, tape measure and eraser, learners will be able to calculate the number of intervals on a closed line confidently in a given time Instructional Objective: To be able to solve problems involving measurement of length, capacity, and mass, learners will be able to calculate the number of intervals on a closed line confidently in a given time Plan for this lesson: Inside and outside Class (Location): In / outside Learning Materials (for all learners): Chalkboard, pieces of chalk, ruler, tape measure, eraser, and Manila paper References: Mathematics for 5th grade textbook (book no. 118-119, teacher's guide p. 162-163) Timing for each step:							
Description of teaching/learning activities Organizing a class, introducing the lesson, giving instruction, guiding learners' actions, presenting teaching aids, discuss the activity done, finding out the... Competences and skills issues to be addressed: - short explanation - Critical thinking developed through answering question							
1. Introduction (5min) Ask questions about the previous lesson A road is 2km long, how many poles are there from one side of the road at an interval of 2m was left at one end without a tree due to an existing shop, how many poles were planted along the road?		Learner's activities Answering questions Distance, Size Interval length, 2m Number of poles = $2000m/2m = 1000m/2m = 500$ poles		Teacher's activities Presenting teaching aids - ruler - eraser - tape measure Grouping learners in 4 groups Giving tasks		Learner's activities Observing teaching and learning materials Joining their groups Doing tasks - five groups draw and measure squares - other two groups draw and measured the rectangle - they fit the poles	
2.1 presentation learner's findings (10 min) Ask questions related to what they have done - What type of lines do we have? - How long is the distance for squares? - How long is one length? - How many intervals were left for squares? - How many intervals were left for a rectangle? - By considering the length of distance and length of one interval how can we calculate the number of intervals on a closed line?		2.2 explanation findings presentation (5 min) Tell pupils to enter a classroom Ask questions about what we have studied earlier Presenting Manila paper where written squares Ask questions about drawing - Is that figure open or closed? - What is its distance? - How long is one interval? - How many intervals and poles are there?		Answering questions Number of intervals on a closed line  Closed 2m 2m 2m 2m 8m 4 intervals and 5 poles Communication developed through answering questions Presenting Manila paper where written rectangle Ask questions about drawing - Is that figure open or closed? - What is its distance? - How long is one interval? - How many intervals and poles are there?  Closed 5m 2m 2m 2m 2m 14m 7 intervals and 8 poles			
3. assessment (5min) Giving individual activity for evaluation In a town, a square plot has sides of 50m. Poles were fixed to fence it at intervals of 2m, how many poles were used? - How many intervals were left there? Side = 50m Distance = $50 \times 4 = 200$ Interval length = 2m Number of poles = distance/length of interval Number of poles = $200/2m$ They are used 100 poles They left 100 intervals							
Observation of lesson							

Example 3: LP in TRT at ELS

Figure 2-2: Examples of Lesson Plans

The Project found the following similarities and differences between the two groups. Firstly, all lessons had the following flow as a structure: 1) Review of the previous lesson, 2) main learning activity of the lesson (e.g. group work), 3) presentation of findings/answers, 4) conclusion/summary, 5) assessment. This structure is embedded in the lesson plan template, hence it is natural that the structure of lessons was similar to each other to some extent.

Among important points in lesson planning, objectives were clearly written in the “Instructional Objectives” section on the whole. In the “Description of teaching and learning activity” section, activities of both the teacher and learners were arranged in sequence, which is easy for observers to follow. These activities, as well as those in the “Assessment” section were also consistent with the objectives of the lesson. Lesson plans of the treatment group were well written in terms of the quality of description of activities. The activities of learners were not written as mere turn-over of the action of the teacher in these lesson plans (e.g. the teacher “asks learners a question”. The learners “answer the question”). Instead, the way the teacher interacts with learners, and how he/she facilitates learning were specified. What learners do or expected answers from learners were described in detail.

2.2 Analysis of Lesson Delivery

Lesson Study provided teachers of the treatment group with the opportunity to improve teaching and learning by taking up a real lesson and planning it together during CPD. In order to evaluate the impact of Lesson Study on lessons, we observed and video-recorded lessons at the treatment and control schools. Observed lessons were: P5 Mathematics, P5 SET, S2 Biology, S2 Mathematics, S4 Chemistry, S5 mathematics. These grades and subjects were the target of the Lesson Study for the treatment group in the second term of 2019. The same grades and subjects were video recorded as much as possible to make a fair comparison with the control group in similar conditions.

2.2.1 Coding

Discourse analysis was conducted, building on an analytical framework developed by Ikeya (2009). Transcribed teachers’ and learners’ talks, as well as some actions such as gestures and writing were classified into codes shown in Table 2-3 and Table 2-4.

Table 2-3: Teacher Code List

Code	Acronym	Examples of talks
Explanation	Xpl	We are going to...
Closed Question	CQ	What is the topic? One times three is equal to? Who can tell us the content of this lesson? (one correct answer)
Open Question	OQ	Why? (invite diverse answers/thinking of learners)
Rephrase teacher	Rph-T	How can we sustain the environment?/What can we do to stop deforestation? (replace teacher's question or statement with simple/easy words the learners understand)
Rephrase student	Rph-S	Student: rain takes away soil. Teacher: rain causes soil erosion. (Teacher gives technical terms or generalize students' statement).
Call attention	Agr	Are we together?
Point student	Po	-
Confirmation	Cmf	Is it true? / Do you understand?
Instruction	Inst	You form the groups./ Write./ Do the exercise.
Encouragement	Enc	Clap for him./Very good./ Wonderful
Justification	Jst	Okay./ Not./ Here is the correct./
Clap	Cl	-
Impossible to listen	Imp	-
Others	Oth	Greeting, etc.

Table 2-4: Learner Code List

Code	Acronym	Examples of talks
Yes / No answer to teacher	Yn-T	Yes/No
Yes / No answer to another student	Yn-S	
One term answer to teacher	Num-T	One/ Integers/ -1 times -1/ ten point five.
One term answer to another student	Num-S	
Question to teacher	Qst-T	What is the meaning of R (Real number)?
Question to another student	Qst-S	
Opinion to teacher	Op-T	It divided by solidly.
Opinion to another student	Op-S	
Incomplete answer	Inc	Subt...
Repeating or just reading	Rd	Just repeat or read sentences or numbers
Silent to teacher	Na-T	You form the groups./ Write./ Do the exercise.
Silent to another student	Na-S	Clap for him./Very good./ Wonderful
Point student	Po	-
Presentation	Pr	(explanation on findings, solution, etc.)
Clap	Cl	-
Writing or gesture to teacher	Wri-T	(Write something on black board, Obey to instruction, Point out numbers or places)
Writing or gesture to another student	Writ-S	
Impossible to listen	Imp	-
Others	Oth	-

Figure 2-3 shows the image of coding for a certain lesson. Lesson videos were first transcribed by surveyors and the surveyors assigned initial codes according to the coding rules explained above. Then the secondary reviewers who have similar coding experience in Japan checked transcripts and codes. Ultimately, if there were still uncertain transcripts as to what codes should be assigned, the Project experts determined the code.

NOTE: The analysis in this section does not include the discourses in specific learning tasks such as group work and pair work in general, as these talks are inaudible in most cases. Therefore, the results basically described only entire classroom communications.

Time From	Time To	Duration	Transcript	Teachers Code	Symbol	Students Code	Symbol
00:09:40	00:11:52	00:02:12	T: twenty four, those who have a rectangle? the one written on rectangle, do you also have rectangle? Did measure anyway? Or, those who measured a square, put your hands up square? hands up, square: group three and group four, how long is the distance? "3 square? How long is the distance? What distance did you get? sixteen meters, how long is one interval?"		Exp		
00:11:33	00:11:34	00:01	S: two meter			One term answer to teacher	Num-T
00:11:34	00:11:38	00:04	T: two meters, how many poles were are fixed?		Closed Question	CQ	
00:11:38	00:11:39	00:01	S: eight trees			One term answer to teacher	Num-T
00:11:40	00:22:07	00:07	T: eight poles on eight trees, how many intervals were left there? How many? Haha that one, how many intervals? you have failed: those who have a rectangle, how long is the distance?		Closed Question	CQ	
00:22:07	00:22:09	00:02	S: twenty four meters.			One term answer to teacher	Num-T
00:22:09	00:22:14	00:05	T: twenty four meters, how many intervals were left there? Number of intervals.		Confirmation	Conf	
00:22:14	00:22:16	00:02	S: two meters			One term answer to teacher	Num-T
00:22:16	00:22:20	00:04	T: two meters, how many poles were fixed?		Closed Question	CQ	
00:22:21	00:22:22	00:01	S: twelve trees			One term answer to teacher	Num-T
00:22:22	00:22:28	00:06	T: twelve trees, how many intervals were left there? How long is one interval? The length of interval? How long is the length of interval?		Closed Question	CQ	
00:22:28	00:22:29	00:01	S: two meters			One term answer to teacher	Num-T
00:22:29	00:22:35	00:06	T: two meters, let us go on that group, that group have the distance of twenty four meters, are you all observing?		Closed Question	CQ	
00:22:35	00:22:35	00:00	S: yes			Yes / No answer to teacher	Yn-T
00:22:35	00:22:38	00:03	T: the interval length is two meters, number of interval is twelve, by considering that number, twenty four and two how can we find this one? how can we find that twelve? Your hands up, yes also?		Replace teacher	Rpl-T	
00:22:38	00:22:37	00:01	S: plus one			Yes / No answer to another	Yn-S
00:22:37	00:22:39	00:02	T: what can you take please, so long can you help us? We have twenty four and two		Closed Question	CQ	
00:22:39	00:22:31	00:02	S: twenty four meters divide by two meters.			One term answer to teacher	Num-T
00:22:31	00:22:35	00:04	T: divide by two, yes flowers to so long.		Encouragement	Enc	
00:22:35	00:22:37	00:02	S: flowers			Clap	Cl
00:22:38	00:22:31	00:07	T: flowers, I want the other who have a square, this is wrong: blue are done to enter in our class.		Call Attention	At	

Teacher Code			Learner Code		
Code	Frequency	%	Code	Frequency	%
Xpl	16	9.8%	Yn-T	8	9.5%
CQ	60	36.6%	Yn-S	1	1.2%
OQ	2	1.2%	Num-T	48	57.1%
Rph-T	14	8.5%	Num-S	0	0.0%
Rph-S	4	2.4%	Qst-T	0	0.0%
Agr	16	9.8%	Qst-S	0	0.0%
Po	6	3.7%	Op-T	8	9.5%
Cmf	12	7.3%	Op-S	0	0.0%
Inst	14	8.5%	Inc	0	0.0%
Enc	11	6.7%	Rd	3	3.6%
Jst	0	0.0%	Na-T	0	0.0%
Cl	0	0.0%	Na-S	0	0.0%
Imp	0	0.0%	Po	0	0.0%
Oth	9	5.5%	Pr	0	0.0%
Total	164	100.0%	Cl	1	1.2%
			Wri-T	0	0.0%
			Wri-S	0	0.0%
			Imp	1	1.2%
			Oth	14	16.7%
			Total	84	100.0%

Figure 2-3: Sample Coding Image of Discourse

2.2.2 Comparison of Open Questioning and its Responses

One of the objectives for the CBC induction is to develop Higher-Order Thinking (HOT) skills to create a knowledge-based society. Open questioning is considered one of the key techniques for HOT development. However, the Project rarely observed open questions during the BLS (REB & JICA, 2017). Therefore, REB and the Project developed the training program as part of the CBC induction training Phase III in order for teachers to enhance their open questioning techniques. Under the circumstances, the Project set out the following Key Performance Indicators (KPIs) to evaluate Project achievements as described in Section 1.2.2.

KPI for Project Purpose: Teachers give more open questions in model schools compared to the control schools.

KPI for Overall Goal: More students in a model school than those in a control school present relevant responses to an open question posed by a teacher.

To review how the open questioning techniques have been adopted by Rwandan teachers and the effectiveness of Lesson Study to the model schools, we analyzed the frequency of open questions and the responses.

(1) Open Questions by Teachers

Table 2-5 shows the average frequency of open questions by intervention (treatment and control), school levels and subjects. In comparison between frequency of the treatment and the control group, the higher one in each row is colored in grey.

Table 2-5: Frequency of Open Questions by Teachers (Average)

Level	Subject	TRT		CTR	
		<i>n</i>	Frequency (%)	<i>n</i>	Frequency (%)
PS	Math	3	1.0	3	0.5
	Science	3	9.3	3	4.5
LS (O' Level)	Math	4	2.2	4	0.2
	Science	5	6.3	4	5.5
US (A' Level)	Math	4	2.2	2	1.3
	Science	4	5.2	2	10.0

n: Number of lessons observed.

Higher values are indicated in grey in comparison of TRT and CTR.

Overall, teachers in Rwanda seemed to ask open questions more than previously. In addition, teachers in the treatment group used more open questions than those in the control group (as grey cells appeared more in the treatment group).

In the treatment group, for example, the following open questions appeared in the lessons.

“The square has fifty meters, this fifty meters has side, is 50m [*sic*]. How can we calculate the distance or the perimeters of that square?” (P5 math)

“How can you use to justify that PN is equal to NR?” (S2 math)

“Now, what is your conclusion? We got a case like this to the set s1 and s2? What is the conclusion here?” (S5 math)

“How can we sustain our environment?” (P5 SET)

“So, what is the function of this chlorophyll, in this process, chlorophyll, why do we put here, chlorophyll, what is the function of chlorophyll?” (S2 biology)

“Can you please give us the small reason why they are less reactive compare to group one element?” (S4 chemistry)

In addition, teachers in the treatment group often asked “why” when learners gave a certain answer, for example. They tried to stimulate learners to think more deeply.

Box 2-1: Why mathematics teachers use fewer open questions than science?

We found that teachers in science lessons tend to use more open questions than in mathematics. The reason is that there are various ways to describe the behavior of nature. To the contrary, mathematical answers are uniquely determined in general. Thus, teachers in mathematics classes may use more closed questions than open questions to reach intended solutions or answers.

(2) Responses by Students

Table 2-6 shows the average frequency of open-ended responses by intervention (the treatment and control), school levels and subjects. Although the KPI offers to argue frequency of responses against the open questions, we noticed that open-ended replies were given even with closed questions, rephrases or confirmations. Moreover, some teachers encouraged students to make presentations in explaining their findings. Therefore, we reviewed open-ended responses regardless of the teacher’s questioning/direction type. There are three types of open-ended responses in the coding rule; “Opinion to teacher (Op-T)”, “Opinion to another student (Op-S)”, and “Presentation (Pr)”. We added frequencies of them to find the average frequency of open-ended responses.

Table 2-6: Frequency of Open-ended Responses by Students (Average)

Level	Subject	TRT		CTR	
		<i>n</i>	Frequency (%)	<i>n</i>	Frequency (%)
PS	Math	3	11.1	3	16.3
	Science	3	14.3	3	9.1
LS (O' Level)	Math	4	20.6	4	15.5
	Science	5	20.6	4	15.5
US (A' Level)	Math	4	54.7	2	34.2
	Science	4	28.5	2	10.4

n: Number of lessons observed.

Higher values are indicated in grey in comparison of TRT and CTR.

Again, we highlighted the more frequent occurrence in grey. Similar to the previous sub-section, students in the treatment group were given more opportunities to express open-ended responses than those in the control group.

Examples of learners' responses that appeared in the lessons are as follows:

"I borrow one from seven and remains six. Ten minus five equals five. I put a dot. Six minus zero equals six. The answer is 6.5. Then 6.5 minus 0.5, five minus five equals zero, six minus zero equals six." (P5 math)

"Midpoint it help to build a house.[sic]" (S2 math)

"My conclusion is, a vector are spanning set, because, we have seen the value of unknown vector[sic]." (S5 math)

"Soil erosion, second one is flood, third one is deforestation, and forth one is the animals. They don't ha..., they don't have food. .[sic]" (P5 SET)

"So in this topic, it shows us that photosynthesis, it helps us to get the plant we use." (S2 biology)

"The reason is this. According to group two element, we have seen that there is a strong electrostatic or a strong bond which hold the mega and outer most electrons. This means that it will be difficult to bond with other element compare to group one element, which means that group two elements have strong electrostatic force compare to group one element." (S4 chemistry)

They tried to put their thoughts into words, in response to the teacher's facilitation.

All these facts imply that Lesson Study effectively changed lessons in model schools in the desired direction.

2.2.3 Comparison of Degree of Learner-Centered Methodology (LCM)

(1) Teachers' Facilitation

A teacher uses talks to support learning and for teaching. We assumed that a teacher who became familiar with Learner-Centered Methodology (LCM) through Lesson Study used more dialogues for supporting learning and less for teaching. To verify this assumption, we attempted to compare the degree of LCM by intervention (treatment and control), school levels and subjects. We classified teacher codes to create new "combined codes" as shown in Table 2-7. In our coding rules, "Explanation (Xpl)" is assigned when a teacher conveys a subject matter and "Justification (Jst)" is given when a teacher judges true or not true. We considered they were the codes assigned when a teacher directly taught a subject matter. Whereas, "Questioning" (Closed/Open Question), "Scaffolding" (Instruction, Rephrase) and "Indirect feedback" (Confirmation, Encouragement) appears when the teacher supports students' learning. We eliminated "Others" from this analysis to focus on essential classroom practice.

Table 2-7: Classification of Combined Teacher Codes

Major Category	Sub-Category	Code	Acronym
Learning support	Questioning	Closed Question	CQ
		Open Question	OQ
	Scaffolding	Instruction	Inst
		Rephrase Teacher/Students	Rph-T/S
	Indirect feedback	Confirmation	Cmf
		Encouragement	Enc
Teaching	Direct feedback	Justification	Jst
	Explanation	Explanation	Xpl
Others	Class Control	Call attention	Agr
		Point student	Po
		Clap	Cl
	Other	Impossible to listen	Imp
		Others	Oth

Table 2-8 and Table 2-9 show the rate of frequency for each combined teacher code for mathematics and science respectively.

Table 2-8: Frequency of Combined Teacher Code in Mathematics (Average in %)

Major Category	Sub-Category	PS		LS (O' Level)		US (A' Level)	
		TRT	CTR	TRT	CTR	TRT	CTR
Learning support	Questioning	36.6	24.8	18.1	18.4	28.4	17.4
	Scaffolding	22.2	24.0	25.5	17.0	31.2	16.5
	Indirect feedback	29.7	24.5	33.8	32.4	21.1	26.4
Teaching	Direct feedback	1.0	9.8	4.2	8.0	6.5	6.6
	Explanation	10.6	16.9	18.4	24.1	12.8	33.1
Learning support total		88.4	73.3	77.5	67.8	80.6	60.3
Teaching total		11.6	26.7	22.5	32.2	19.4	39.7

Table 2-9: Frequency of Combined Teacher Code in Science (Average in %)

Major Category	Sub-Category	PS		LS (O' Level)		US (A' Level)	
		TRT	CTR	TRT	CTR	TRT	CTR
Learning support	Questioning	28.8	25.2	25.0	25.7	23.8	39.1
	Scaffolding	27.6	20.6	20.2	22.7	23.8	10.9
	Indirect feedback	26.0	39.5	25.9	30.3	20.2	14.1
Teaching	Direct feedback	3.6	2.6	9.3	5.8	3.8	6.3
	Explanation	14.0	12.1	19.5	15.4	28.4	29.7
Learning support total		82.4	85.3	71.1	78.8	67.7	64.1
Teaching total		17.6	14.7	28.9	21.2	32.3	35.9

In mathematics, we found that the rate of “Teaching” code frequency in the control group is higher than that in the treatment group (conversely, the rate of “Learning support” code frequency is higher in the treatment group). This implies that teachers in the control group directly taught subject matters, whereas teachers in the treatment group used more dialogue to support learning. Unlike mathematics, we could not find such a trend in the rate of “Teaching” code frequency in science. Trends of the treatment and the control group were similar or even higher in the treatment group than the control group in primary and lower secondary levels. These trends are summarized in Figure 2-4 (Arrows in the graph highlight the places where the treatment group is higher).

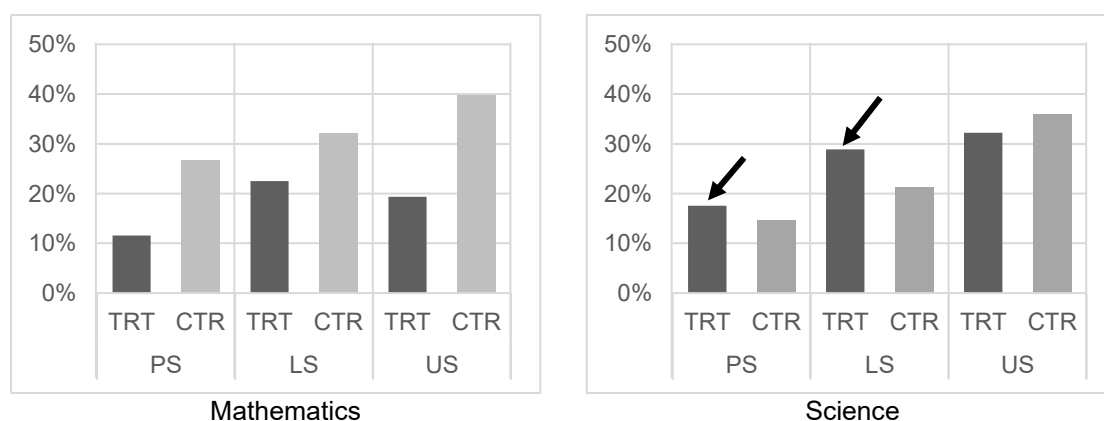


Figure 2-4: Rate of Teaching by Intervention and School Level

(2) Dialogues among students

We also assumed that LCM activates communication among students compared to “teacher-centered lesson” where students just respond to teachers. We thus, classified learner codes into “To teacher” and “To students” as shown in Table 2-10. We eliminated “Others” from this analysis to focus on essential classroom practice.

Table 2-10: Classification of Combined Learner Codes

Major Category	Sub-Category	Code	Acronym
To teacher	Reaction	Yes / No answer to teacher	Yn-T
		One term answer to teacher	Num-T
		Repeating or just reading	Rd
		Silent to teacher	Na-T
	Active response	Opinion to teacher	Op-T
		Question to teacher	Qst-T
Writing or Gesture to teacher		Wrt-T	
To students	Reaction	Yes / No answer to another student	Yn-S
		One term answer to another student	Num-S
		Silent to another student	Na-S
	Active response	Opinion to another student	Op-S
		Question to another student	Qst-S
		Writing or Gesture to another student	Wrt-S
Others	Class control	Presentation	Pr
		Point student	Po
	Other	Clap	Cl
		Incomplete answer	Inc
		Impossible to listen	Imp
	Others	Oth	

Table 2-11: Frequency of Combined Learner Codes in Mathematics (Average in %)

Major Category	Sub-Category	PS		LS (O' Level)		US (A' Level)	
		TRT	CTR	TRT	CTR	TRT	CTR
To teacher	Reactions	79.6	82.6	79.3	69.1	36.9	51.0
	Active response	13.2	15.9	14.0	29.0	28.5	46.9
To students	Reactions	1.8	0.0	0.7	0.6	1.5	0.0
	Active response	5.4	1.4	6.0	1.2	33.0	2.0
To teacher total		92.8	98.6	93.3	98.1	65.5	98.0
To students total		7.2	1.4	6.7	1.9	34.5	2.0

Table 2-12: Frequency of Combined Learner Codes in Science (Average in %)

Major Category	Sub-Category	PS		LS (O' Level)		US (A' Level)	
		TRT	CTR	TRT	CTR	TRT	CTR
To teacher	Reactions	68.5	83.9	65.6	73.0	60.8	81.3
	Active response	24.1	15.1	26.1	23.0	18.1	16.7
To students	Reactions	1.2	0.0	1.0	0.9	0.6	0.0
	Active response	6.2	1.0	7.2	3.2	20.5	2.1
To teacher total		92.6	99.0	91.8	95.9	78.9	97.9
To students total		7.4	1.0	8.2	4.1	21.1	2.1

We found similar trends both in mathematics and science. The rate of “To students” code frequency in the treatment group is higher than that in the control group at all levels (conversely, the rate of “To teacher” code frequency is higher in the control group). It implies that communication among students in the treatment group was more active, whereas students in the control group tended to communicate with the teacher. These trends are summarized in Figure 2-5.

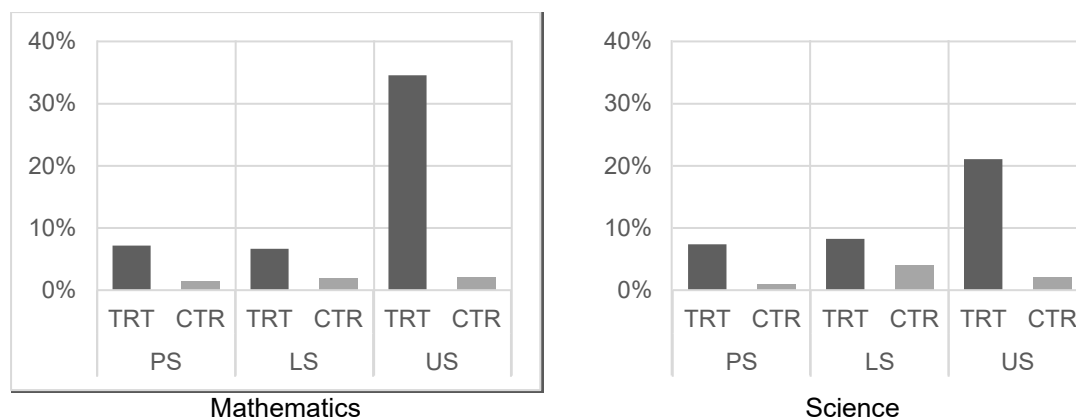


Figure 2-5: Rate of Interaction among Students by Intervention and School Level

2.3 Teachers’ Perception on CBC

As described in previous sub-sections, various evidence supports that lessons in the treatment group changed in a positive direction in relation to CBC, although there were some exceptional cases. Questionnaire responses also suggest the similar trend that teachers in the treatment group changed their perception or awareness of CBC in a desirable direction.

Table 2-13: Teachers’ Perception on Lesson Delivery

	Statement	TRT	CTR	
R	1. CBC should always include group work.	2.47	2.92	*
R	2. Lesson conclusion should be given by teacher.	2.40	2.68	
R	3. Blackboard writing should be erased when students solve assessment question at the end of a lesson.	2.33	2.74	+
R	4. When a student gives a wrong answer, teacher should call another student to get correct answer immediately.	2.09	2.13	
R	5. When students do not understand a concept, it is because students do not study harder.	1.76	1.92	
	6. When students do not understand a learning concept, it is because the teacher did not use effective L/T strategies.	2.58	2.68	
R	7. Teachers should rely on students’ oral responses than students’ face expressions and behaviors for formative assessment.	2.20	2.63	*
R	8. To treat learners equal, teachers should provide the same instruction to all learners regardless of their understanding.	3.04	2.95	
	9. Calling on students purposefully who make mistakes is good learning opportunities for the class.	2.91	2.87	
	10. I encourage my students to explain why they reached a certain answer in my class.	3.56	3.50	
	11. I give students enough time to think before they answer a question.	3.51	3.61	
R	12. Good questions should always have only one correct answer.	2.27	2.24	
R	13. Students should respond to questions immediately.	2.04	2.24	
R	14. Lesson should introduce one particular and standard solution only.	2.29	2.18	

* $p < .05$, + $p < .10$

Table 2-13 represents the average scores on how teachers in the treatment and the control groups understand specific teaching behaviors. Questions were prepared based on “misconceptions” confirmed by the Project throughout the project activities. Likert Scale questions (four-level grading; 1: strongly disagree, 2: disagree, 3: agree, 4: strongly agree) were given to teachers to rate their degree of agreement. “R” in the left column represents the “Reverse items” that “1: strongly disagree” is the preferable or expected response (meaning a lower score is desired). For example, CBC requires various learning activities according to the learning needs and “group work” is one of the symbolic LCMs, but not the only technique for CBC (thus we value a negative response for Q1). We also believe that assessment questions in CBC are not just ones recalling students’ prior knowledge, but ask them to apply what they learned to develop their HOT (hence Q3 expects a negative response, too).

T-test detected significant differences in Q1, Q3 and Q7. As the average scores of the treatment group are lower than those of the control group, teachers in the treatment group demonstrated better understanding particularly in these questions.

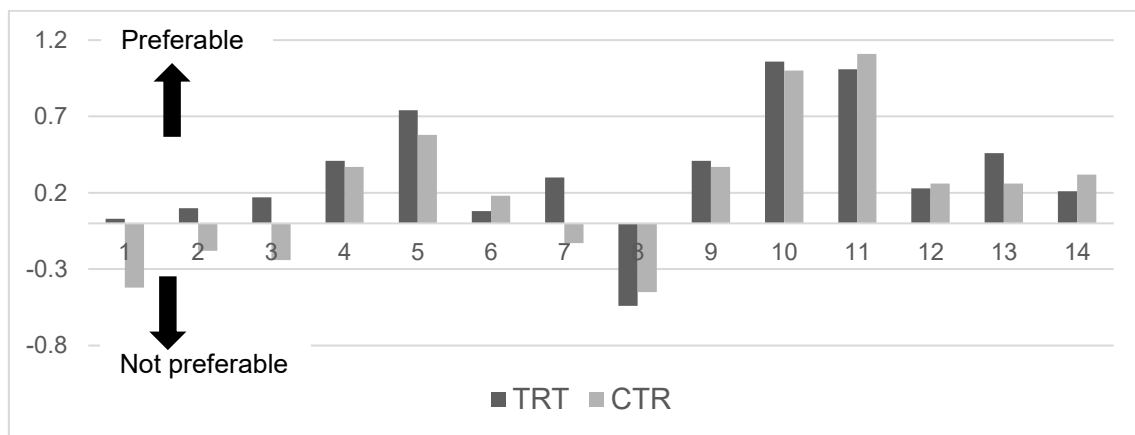


Figure 2-6: Degree of Preference by Question

As the grading scale ranges between 1 to 4, the boundary of positive and negative response is 2.5. Figure 2-6 represents the gaps between the average scores and 2.5 boundary for each question. We inverted scores for reverse items to make desirable answers positive for easy comparison. The average scores of the treatment group (except for Q8) are all positive, whereas scores for five questions are negative in the control group. This implies that the transition to CBC in the treatment group is much smoother than in the control group.

3. Learning Achievement

The “indirect teaching” in lessons of the treatment group seems to have made a positive impact on learners performance in the Academic Achievement Tests (AAT).

- Overall, the AAT results in the treatment group were better than those in the control group with a significant difference. Academic performance was higher in the treatment group.
- In most cases, the effect size in the treatment group was bigger than the control group, meaning the degree of academic improvements were higher in the treatment group.

Chapter 2 discusses the difference of lessons between the treatment and the control groups. The findings suggest that teachers in the treatment group attempted to teach the subject “indirectly”. They commonly used “questioning”, “rephrasing” “confirmation” and “encouragement” to prompt learners to think and avoided giving answers directly compared to teachers in the control group. In addition, open-ended questions and responses were observed more in the treatment group.

Flanders (1965) revealed that academic achievement of students who were taught in such an “indirect manner” was significantly higher than those who were taught with direct teaching. Various research also suggests that open questioning supports children’s acquisition of HOTS skills which are needed to solve complicated problems (i.e. Blosser, 2000).

Did the “indirect teaching” really improve academic achievement of Rwandan students, too? This chapter discusses the results of AAT administered in the treatment and the control groups.

3.1 Analysis of Academic Achievement Test (AAT) Results

When we designed this experiment, we reviewed Pupil Classroom Rate (PCR), Pass Rate (PR) of national exams and Graduation Rate (GR) in 2018 to compare performance of the treatment and the control groups as described in 1.3.2. We concluded that the last year’s performances were similar to each other so that we could assume AAT results theoretically would be the same.

3.1.1 Composition of AATs

Multiple-choice type mathematics and science tests were employed for ELS as described in section 1.4.1. They were designed by the Project experts for P4, S1 and S4 students at BLS to assess the initial level of learners before starting Lesson Study. Those students who sat for BLS at model schools in 2017 theoretically promoted to P6, S3 and S6 respectively. They should have fully received the treatment effects from teachers throughout the project period, and presumably, could attain better AAT results than those in the control group. Hence AATs targeted these grades for comparison.

The questions in the tests were basically chosen from new CBC-based textbooks authorized by REB, and some were selected from major international assessment tests such as Trends in International Mathematics and Science Study (TIMSS) and Programme for International Student Assessment (PISA). The questions covered content up to P4, S1 and S4 for primary, lower secondary and upper secondary level tests respectively. Considering the variety of combinations of majors in upper secondary level (A’ Level), most questions for the S4 test were set from what they learned by the end of lower (O’ Level) to fairly assess and compare essential mathematics and science achievement regardless of majors. Questions consist of two types: one is basic questions requiring knowledge, comprehension and operational skills (lower order thinking skills), and the other is applied questions⁴ requiring HOTS skills. Examples of questions for mathematics and science are shown in Table 3-1 and Table 3-2 (Entire test papers are available in Appendix H).

⁴ Applied questions are referred to as “Application” hereafter.

Table 3-1: Examples of Mathematics Questions

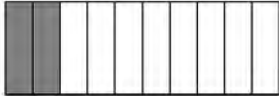
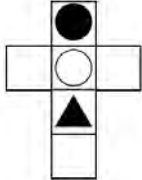





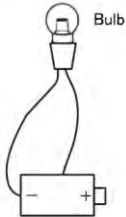
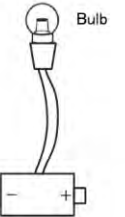

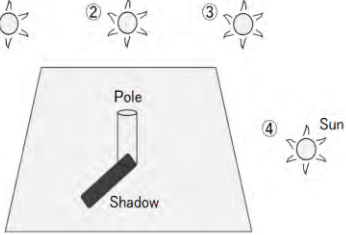
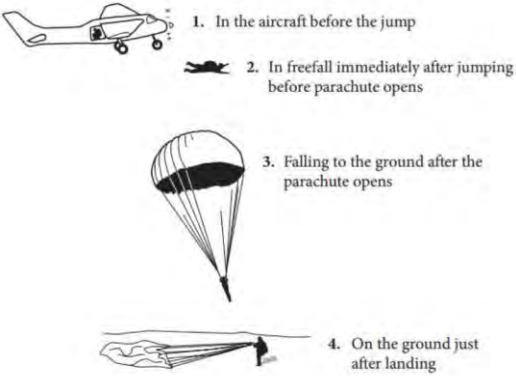
<p>Primary level (Basic)</p>	<p>19. Calculate/ Erekana igisubizo nyacyo: $19.82 - 5.28$</p> <p>A. 14.64 B. 14.54 C. 14.66 D. 14</p>
<p>Primary level (Application)</p>	<p>9. Divide : $24.6 \div 0.04$.</p> <p>A. 0.615 B. 6.15 C. 61.5 D. 615</p>
<p>Secondary level (Basic)</p>	<p>16. Which decimal number does the following shaded part express?/ Mu mibare y' ibice ikurikira ni uwuhe ungana n'ahasharuye mu mbonerahamwe ?</p> <div style="text-align: center;">  </div> <p>A. 2.8 B. 0.5 C. 0.2 D. 0.02</p>
<p>Secondary level (Application)</p>	<p>34. Which of the following cubes could be made by folding the figure below?</p> <div style="text-align: center;">  </div> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;"> <p>A.</p>  </div> <div style="text-align: center;"> <p>B.</p>  </div> <div style="text-align: center;"> <p>C.</p>  </div> <div style="text-align: center;"> <p>D.</p>  </div> </div>

Table 3-2: Examples of Science Questions

<p>Primary level (Basic)</p>	<p>12. Which diagram shows the connection that can make the bulb light?</p> <p>Ni ikihe gishushanyo cyerekana uburyo urumuri rwo mu itara ruboneka?</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>A</p> </div> <div style="text-align: center;">  <p>B</p> </div> <div style="text-align: center;">  <p>C</p> </div> <div style="text-align: center;">  <p>D</p> </div> </div>
<p>Primary level (Application)</p>	<p>Question 3</p> <p>Bacteria that enter the body are destroyed by which type of cells?</p> <p>A. white blood cells B. red blood cells C. kidney cells D. lung cells</p>

<p>Secondary level (Basic)</p>	<p>9. Shadow of the pole is formed on the ground. Where does the Sun locate at? Niba Igicucu cya Pole cyiremye hasi. Izuba rihereye he?</p> <p>A. ① B. ② C. ③ D. ④</p> 
<p>Secondary level (Application)</p>	<p>Question 14 The figure shows a parachute jumper in four positions. In which of the positions does the force of gravity act on the jumper?</p> <p>A. Position 2 only. B. Positions 2 and 3 only. C. Positions 1, 2 and 3 only. D. Positions 1, 2, 3, and 4.</p> 

3.1.2 Results of Analysis

Table 3-3 and Table 3-4 show descriptive statistics of AAT results by school levels and question type (basic/application) for mathematics and science respectively. In Rwanda, students who performed well in the national exam are promoted to Secondary Schools, and the rest are enrolled in 9/12-Year Basic Education Schools. Thus, Secondary Schools and 9/12-Year Basic Education Schools show quite different trends in terms of academic performance. We then decided to separately analyze Secondary Schools’ and 9/12-Year Basic Education Schools’ results. The survey could not administer AAT at GS Gihogwe which was the only 12-Year Basic Education school in the control group, so we eliminated comparative analysis for ‘12-Year Basic Education at upper secondary level’ from this survey.

Table 3-3: Comparison of AAT Results by Intervention and School Level (Mathematics)

Level	Question Type	TRT			CTR			
		<i>n</i>	<i>Ave.</i>	<i>SD</i>	<i>n</i>	<i>Ave.</i>	<i>SD</i>	
PS	Total (33)	203	14.8	4.5	246	13.1	4.1	**
	Basic (24)		12.4	3.6		10.9	3.3	**
	Application (9)		2.5	1.5		2.1	1.4	*
LS (SS) O’ Level	Total (40)	138	24.4	6.3	65	19.6	5.5	**
	Basic (24)		16.8	3.8		13.7	3.9	**
	Application (16)		7.6	3.1		6.0	2.6	**
LS (9/12) O’ Level	Total (40)	86	15.5	4.8	123	13.5	4.4	**
	Basic (24)		10.8	3.5		9.4	3.2	**
	Application (16)		4.7	2.3		4.1	2.3	*
US (SS) A’ Level	Total (40)	193	24.9	6.1	106	20.3	5.8	**
	Basic (24)		17.1	3.9		14.1	3.9	**
	Application (16)		7.9	2.8		6.2	2.5	**

** $p < .01$, * $p < .05$

Figures in parentheses for “Question Type” represents the number of questions given to students. Each question is worth one mark.

Higher scores are indicated in grey in comparison of TRT and CTR.

Table 3-4: Comparison of AAT Results by InterventSchool Level (Science)

Level	Question Type	TRT			CTR			
		<i>n</i>	<i>Ave.</i>	<i>SD</i>	<i>n</i>	<i>Ave.</i>	<i>SD</i>	
PS	Total (13)	219	7.4	2.4	253	6.0	2.5	**
	Basic (7)		5.2	1.4		4.3	1.7	**
	Application (6)		2.2	1.4		1.8	1.4	**
LS (SS) O' Level	Total (24)	155	12.6	3.4	65	12.5	3.0	
	Basic (15)		9.5	2.3		9.7	2.4	
	Application (9)		3.1	1.7		2.9	1.6	
LS (9/12) O' Level	Total (24)	70	8.7	2.8	121	7.7	2.3	*
	Basic (15)		6.3	2.1		5.7	2.2	+
	Application (9)		2.4	1.5		2.0	1.2	+
US (SS) A' Level	Total (40)	178	19.6	4.6	54	17.1	5.0	**
	Basic (24)		12.1	2.9		10.2	3.3	**
	Application (16)		7.3	2.3		6.9	2.2	+

** $p < .01$, * $p < .05$, + $p < .10$

Figures in parentheses for “Question Type” represents the number of questions given to students. Each question is worth one mark.

Higher scores are indicated in grey in comparison of TRT and CTR.

Figures in parentheses for “Question Type” represents the number of questions given to students. Each question gives one mark and thus, these figures are equal to the maximum scores (full marks) for each row. In comparing the average scores of the treatment and the control groups, the higher score in each row is colored in grey. If T-test detected a statistically significant difference, a specific symbol (“***”, “**” or “+”) was added.

In mathematics, the average scores of the treatment group were significantly higher than those of the control group in all question types at all levels. Thus, we can conclude that the overall academic performance was better in the treatment group than in the control group.

In science, the average scores of the treatment group were significantly higher than those of the control group in all question types at all levels except for secondary school’s lower secondary level. As described in 2.2.3 (1), the discourse analysis found the trend in science lessons that teachers in the treatment group still rely on “direct teaching” more than those in the control group at the lower secondary level. This may be the reason why the average score of the treatment group was lower only in science of lower secondary level.

Overall, the AAT results in the treatment group were better than those in the control group with a statistically significant difference. It implies that the “indirect teaching” induced by Lesson Study improved students’ performance in treatment group.

3.2 Extra Analysis – Improvement in three years

As mentioned, we administered the AATs for P4/S1/S4 students in June 2017 for BLS in model (treatment) schools to diagnose their weaknesses. BLS and ELS used the same tests so that we could assess the magnitude of improvement from P4/S1/S4 to P6/S3/S6 respectively in model schools⁵. We considered that the similar assessment in the control group might give us fruitful insights, and therefore, administered the same tests for P4/S1/S4 students in the control group in February 2019. Then, we compared the results. As the data collection timing is different between the groups, it is inappropriate to apply statistical test to this comparison. We computed the “effect size” to estimate the degree of improvement for each school instead.

⁵ GS Mukarange and GS NDA Rwaza joined the Project in 2018 and P4/S1/S4 data was collected in February 2019 together with the control group.

Box 3-1: What is Effect Size?

Effect size is a way of quantifying the size of the difference between two groups and can be applied to any measured outcome in education (Coe, 2002). It is particularly valuable for quantifying the effectiveness of a particular intervention. Effect size is symbolized by “*d*” and its magnitude is commonly represented with the scale shown in the table.

* Cohen. (1988). *Statistical Power Analysis for the Behavioral Sciences*.

** Sawilowsky. (2009). *New effect size rules of thumb*.

Effect Size	<i>d</i>
Very small*	0.01
Small**	0.20
Medium**	0.50
Large**	0.80
Very large*	1.20
Huge*	2.00

As the data collection timing is quite spread out between the groups, it is difficult to argue which group experienced better improvement. However, we assumed that the effect size for the control group was theoretically supposed to be bigger. The AATs for P4/S1/S4 for the control group were administered in February, which is four months earlier than the treatment group. Therefore, the scores were supposed to be lower than the treatment group, which took the tests in June.

The overall results are summarized in Table 3-5 and detailed results for each school by subject and school level are shown in Table 3-6 to Table 3-11 (effect sizes are presented in “*d*” in these tables).

Table 3-5: Comparison of Effect Size by Subject and School Level (Average)

Level	Subject	TRT			CTR		
		Total	Basic	Application	Total	Basic	Application
All	Math	1.009	0.837	0.804	0.693	0.559	0.503
	Science	1.091	1.071	0.693	0.905	0.910	0.618
PS	Math	1.857	1.834	1.035	1.503	1.502	0.795
	Science	1.752	1.639	1.187	1.413	1.427	0.819
LS	Math	0.945	0.703	0.855	0.622	0.362	0.550
	Science	0.670	0.681	0.300	0.917	0.977	0.580
US	Math	0.226	-0.026	0.522	-0.047	-0.186	0.166
	Science	0.850	0.892	0.594	0.386	0.325	0.456

Grey: Higher figures in comparison of TRT and CTR, Bold: Figures exceed 0.80

In Table 3-5, figures colored in grey represent the bigger effect size between the treatment and control groups. **Bold** figures indicate scores above 0.80 which represents the improvement is “Large” or more. Overall, the improvement from P4/S1/S4 to P6/S3/S6 tended to be bigger in the treatment group than in the control group except for lower secondary science. The trend is very similar to the previous analysis.

It implies that the treatment group provides a more effective education program than the control group and Lesson Study may contribute to enhancing that effectiveness.

We found a surprising trend here that, in mathematics at upper secondary level, the improvements are small or even both the treatment and the control groups indicate a negative effect size in basic questions, meaning the average scores of S6 students for basic questions became worse than those of S4. We are not sure what the reason behind this is as this is out of the scope of the ELS. However, we guess, as questions in the AATs for upper secondary level were mostly taken from primary and lower secondary textbooks to minimize the influence of combination of majors as described in 3.1.1, students may have forgot what they learned in the past. Even with this situation, the effect size for application questions in the treatment group is relatively high, so Lesson Study may have enhanced HOT skills of those students after all.

Table 3-6: Comparison of P4 and P6 Achievement by School (Mathematics)

Group	School	Grade	n	Total (33)			Basic (24)			Application (9)		
				Ave.	SD	d	Ave.	SD	d	Ave.	SD	d
TRT	GS Kabuye	P4	171	9.5	3.3	2.257	7.8	3.0	2.244	1.6	1.2	1.221
		P6	128	15.8	4.3		13.0	3.3		2.8	1.5	
	EP Buhande	P4	21	7.8	2.6	1.057	7.2	2.1	0.822	0.6	0.9	1.126
		P6	36	11.8	4.7		9.7	3.8		2.1	1.5	
CTR	GS Mukarange	P4	36	6.0	3.6	2.257	5.3	3.1	2.436	0.7	0.9	0.759
		P6	39	14.5	3.9		12.8	3.2		1.7	1.1	
CTR	GS Gihogwe	P4	64	8.9	3.9	1.341	7.6	3.3	1.273	1.3	1.1	0.871
		P6	137	13.9	3.6		11.5	2.8		2.4	1.4	
	GS Bubazi	P4	35	4.5	3.1	2.218	3.9	2.3	2.387	0.6	1.2	0.761
		P6	48	12.9	5.1		11.3	4.1		1.6	1.4	
CTR	EP Bukinyanya	P4	56	7.6	3.1	0.949	6.7	2.6	0.845	1.0	0.9	0.752
		P6	61	11.2	3.5		9.3	3.0		1.9	1.4	

Table 3-7: Comparison of S1 and S3 Achievement by School (Mathematics)

Group	School	Type	Grade	n	Total (40)			Basic (24)			Application (16)		
					Ave.	SD	d	Ave.	SD	d	Ave.	SD	d
TRT	GS St Aloys R	SS	S1	66	20.7	5.4	0.919	14.0	4.3	0.598	5.6	2.1	0.936
			S3	56	25.7	6.1		16.2	4.3		7.8	3.3	
	GS APAGIE	SS	S1	64	20.7	5.4	1.045	14.8	3.5	0.830	5.9	2.6	0.972
			S3	47	25.7	6.1		17.6	3.6		8.1	3.1	
	GS NDA Rwaza	SS (girls)	S1	34	17.1	3.9	1.138	12.8	3.1	0.792	4.3	1.7	1.100
			S3	35	23.6	4.7		16.7	3.0		6.8	2.6	
GS Mukarange	9/12	S1	98	10.3	4.6	0.679	6.9	3.3	0.592	3.4	2.1	0.410	
		S3	45	13.5	3.6		9.3	2.8		4.2	1.7		
GS Kabuye ⁶	9/12	S1	-	-	-	-	-	-	-	-	-	-	
		S3	41	17.7	5.0	-	12.5	3.4	-	5.2	2.7	-	
CTR	GS Rambura G	SS	S1	49	15.9	6.0	0.304	11.2	4.2	0.283	4.8	2.5	0.222
			S3	43	17.4	4.9		12.1	3.7		5.3	2.4	
	LNDV	SS (girls)	S1	25	21.5	3.8	0.729	16.0	3.0	0.313	5.5	1.9	1.062
			S3	22	24.0	3.8		16.7	2.2		7.3	2.3	
	GS Gihogwe	9/12	S1	161	9.3	3.6	1.035	6.2	2.6	0.454	3.1	1.8	0.507
			S3	78	14.2	4.8		9.9	3.5		4.3	2.4	
GS Bubazi	9/12	S1	98	10.3	3.6	0.420	7.3	2.7	0.396	3.0	2.0	0.410	
		S3	45	12.3	3.3		8.6	2.5		3.7	2.0		

Table 3-8: Comparison of S4 and S6 Achievement by School (Mathematics)

Group	School	Type	Grade	n	Total (40)			Basic (24)			Application (16)		
					Ave.	SD	d	Ave.	SD	d	Ave.	SD	d
TRT	GS St Aloys R	SS	S4	125	21.9	5.2	0.906	15.0	3.2	0.824	6.9	2.8	0.760
			S6	100	26.6	5.3		17.9	3.3		8.7	2.6	
	GS APAGIE	SS	S4	45	21.4	5.8	0.731	15.8	4.0	0.355	5.6	2.4	1.060
			S6	54	24.2	5.8		16.7	4.1		7.5	2.4	
	GS NDA Rwaza	SS (girls)	S4	51	20.1	4.9	0.322	15.0	3.0	0.141	5.1	2.4	0.491
			S6	39	21.7	6.9		15.5	4.6		6.3	2.8	
GS Mukarange	9/12	S4	80	17.7	3.5	1.057	13.6	2.5	1.422	4.1	1.7	0.223	
		S6	57	12.2	4.1		▼	8.6		3.4	▼		3.5
CTR	GS Rambura G	SS	S4	90	18.9	5.1	0.375	13.9	3.5	0.144	5.0	2.4	0.598
			S6	87	20.8	5.9		14.4	4.0		6.5	2.5	
	LNDV	SS (girls)	S4	28	20.1	4.2	0.469	14.7	3.2	0.515	5.4	1.9	0.267
			S6	19	17.7	4.5		▼	12.9		3.6	▼	
	GS Gihogwe ⁷	9/12	S4	24	16.3	3.8	-	12.5	2.7	-	3.8	1.8	-
			S6	-	-	-		-	-		-	-	

⁶ GS Kabuye's lower secondary level joined Lesson Study in 2018 and thus no baseline data available for S1.⁷ We could not administer AAT for S6 in ELS.

Table 3-9: Comparison of P4 and P6 Achievement by School (Science)

Group	School	Grade	n	Total (33)			Basic (24)			Application (9)		
				Ave.	SD	d	Ave.	SD	d	Ave.	SD	d
TRT	GS Kabuye	P4	170	4.8	2.2	1.834	3.6	1.6	1.706	1.2	1.0	1.254
		P6	137	7.9	2.1		5.6	1.2		2.3	1.3	
	EP Buhande	P4	21	2.8	2.5	1.631	2.2	2.0	1.373	0.6	0.8	1.303
		P6	40	6.5	3.0		4.3	1.8		2.2	1.7	
	GS Mukarange	P4	36	2.6	1.7	1.792	2.1	1.4	1.839	0.4	0.7	1.003
		P6	42	6.6	2.2		5.0	1.2		1.6	1.4	
CTR	GS Gihogwe	P4	66	3.2	2.4	1.538	2.6	1.9	1.312	0.6	0.8	1.206
		P6	44	5.8	2.5		4.1	1.8		1.7	1.3	
	GS Bubazi	P4	36	2.3	1.8	1.571	1.6	1.5	1.604	0.6	0.6	0.889
		P6	44	5.8	2.5		4.1	1.8		1.7	1.3	
	EP Bukinanyana	P4	53	2.2	2.0	1.129	1.5	1.4	1.365	0.7	1.0	0.363
		P6	69	4.8	2.6		3.7	1.8		1.2	1.3	

Table 3-10: Comparison of S1 and S3 Achievement by School (Science)

Group	School	Type	Grade	n	Total (40)			Basic (24)			Application (16)		
					Ave.	SD	d	Ave.	SD	d	Ave.	SD	d
TRT	GS St Aloys R	SS	S1	71	12.1	3.3	0.337	9.0	2.4	0.268	3.1	1.6	0.265
			S3	69	13.0	4.1		9.6	2.7		3.4	1.8	
	GS APAGIE	SS	S1	53	10.3	2.6	0.567	8.1	2.2	0.648	2.2	1.5	0.145
			S3	48	11.9	2.8		9.5	2.0		2.4	1.5	
	GS NDA Rwaza	SS (girls)	S1	44	9.4	2.5	1.229	7.1	1.7	1.079	2.3	1.5	0.810
			S3	38	12.8	2.6		9.4	2.1		3.4	1.4	
GS Mukarange	9/12	S1	154	6.4	2.5	0.546	4.3	2.1	0.730	2.1	1.3	0.021	
		S3	45	7.9	2.7		5.9	2.1		2.0	1.5		▼
GS Kabuye ⁸	9/12	S1	-	-	-	-	-	-	-	-	-	-	
		S3	25	10.1	2.4	-	-	-	-	3.0	1.3	-	
CTR	GS Rambura G	SS	S1	62	10.7	2.6	0.554	8.6	2.1	0.963	2.2	1.3	0.466
			S3	44	13.5	2.4		10.6	1.8		2.8	1.5	
	LNDV	SS (girls)	S1	22	7.7	2.4	1.403	6.1	2.0	0.988	1.6	1.0	1.293
			S3	21	10.6	3.4		7.7	2.4		3.0	1.8	
	GS Gihogwe	9/12	S1	68	5.8	2.5	0.698	4.0	2.0	0.839	1.8	1.3	0.238
			S3	73	7.8	2.2		5.8	2.1		2.0	1.1	
GS Bubazi	9/12	S1	92	4.8	3.1	1.014	3.2	2.1	1.119	1.6	1.4	0.321	
		S3	48	7.6	2.5		5.6	2.0		2.1	1.2		

Table 3-11: Comparison of S4 and S6 Achievement by School (Science)

Group	School	Type	Grade	n	Total (40)			Basic (24)			Application (16)		
					Ave.	SD	d	Ave.	SD	d	Ave.	SD	d
TRT	GS St Aloys R	SS	S4	78	19.9	3.8	0.770	12.1	2.6	0.733	7.9	2.0	0.544
			S6	64	22.3	4.1		13.6	2.7		8.7	2.2	
	GS APAGIE	SS	S4	52	14.8	4.9	0.888	9.4	3.4	0.662	5.4	2.3	0.702
			S6	37	18.1	4.8		11.2	3.2		6.9	2.2	
	GS NDA Rwaza	SS (girls)	S4	50	13.7	4.2	0.750	8.1	2.8	1.167	5.6	2.1	0.509
			S6	77	18.0	3.6		11.3	2.4		6.7	1.9	
GS Mukarange	9/12	S4	34	10.6	3.0	0.992	6.2	2.0	1.005	4.4	1.7	0.619	
		S6	14	14.7	2.9		9.0	2.0		5.7	1.9		
CTR	GS Rambura G	SS	S4	60	16.8	4.5	0.635	10.6	3.3	0.440	6.2	2.2	0.668
			S6	34	19.4	4.0		11.9	2.7		7.6	1.9	
	LNDV	SS (girls)	S4	28	12.5	4.7	0.137	7.4	3.3	0.210	5.1	2.1	0.243
			S6	20	13.1	3.8		7.5	2.2		5.7	2.1	

⁸ GS Kabuye joined lower secondary level Lesson Study in 2018 and thus no baseline data available for S1.

4. Other Findings

In addition to the quantitatively assessed changes discussed in the previous chapters, the Project observed various changes in the lessons.

- Teachers demonstrated improvement in teaching with Lesson Study (see 4.1 Case Studies)
- Many good practices which were not observed in the BLS were seen, while some challenges remained.


4.1 Case Studies

We picked two lessons (P5 math and S2 physics) from the treatment group as case studies to describe details of the Project intervention and improvements as outputs.

Table 4-1 is the case study of P5 math lesson at EP Buhande in the Rulindo district. Evidence of improvements as results of a Lesson Study is displayed after general information such as teacher profile, key advice from the Project and outlines of the lesson.

Table 4-1: Case Study of EP Buhande P5 Math

School name	EP Buhande (Rulindo District)
Teacher	Ujeneza Seraphine
Teacher profile	The demo teacher, Ms. Ujeneza Seraphine, has been involved in Mathematics Lesson Study group at Buhande primary school since the Project commenced in 2017. She is one of the biggest beneficiaries who received a lot of advice from the Project.
General issues on lessons	National exam pass rate for P6 is around 60% in this school. Main challenge of teachers here was to support “slow learners”. Teachers overall struggled to harmonize lesson objectives and learners’ traits such as learning needs, understanding level, English skills and personalities. When teachers pay much attention on learning needs, teachers tend to fail achieving lesson objectives and vice versa.
Key advice from the Project	To overcome the above challenges the Project gave the following advice; <ul style="list-style-type: none"> - Structure lesson content from simple example to complex problems to scaffold learners. - Give sufficient time for individual work prior to groupwork to address learning needs of each student. - Ask students for not only answers but also the process to reach answers so that the teacher can identify each student’s way of thinking to guide. When students give wrong answers, the teacher should clarify the reasons for mistakes and errors. - Guide students to copy any important information on notebooks as slow learners generally copy answers only. - Give more opportunities for students to read and write in English. Even in teaching mathematics, it should be the time for most slow learners to learn English. At the same time, explain important mathematics concept both in English and Kinyarwanda in order to guide all student to achieve objectives.
Grade/Subject	P5 Mathematics
Unit	Solving problems involving measurements of lengths, capacity, and mass
Topic	Finding intervals on a closed line
Objective	Learners will be able to calculate the number of intervals on a closed line confidently in a given time.


<p>Key Strategy</p>	<p>Use real objects (stones) and put on a school yard to clarify the relationships between number of objects and intervals.</p> 
<p>Evidence of improvement areas observed in the lesson</p>	<p><u>Evidence 1: Devising teaching and learning aids</u></p> <p>The lesson was carefully structured from simple to complex problems. In order to have learners understand the lesson objective that the number of intervals is equal to the number of objects in a closed line (perimeter of a pond and a field, etc.), the teacher delivered the lesson by:</p> <ul style="list-style-type: none"> - Incorporating a hands-on activity (to measure perimeter and put stones at equal intervals - Using a poster explaining a question with illustration - Presenting materials sequentially from simple ones (the poster of a question with illustration) to complex (the poster of a questions in texts) - Preparing enough teaching and learning aids for groups in advance such as tape measures, stones, worksheets and markers. <p>Besides, she showed careful consideration about learners by adjusting the position of a poster on the chalkboard to make sure that it is visible even for learners sitting in the back row, after walking around the class to check their activity.</p> <p><u>Remaining issues</u></p> <p>The teacher should have explained the procedure of the activity and ensured that learners understand it before letting them go outside, but they went out because they were not used to such a way. They were confused about what to do, and what and where to write in the worksheet. This resulted in their failure to present the results using the worksheet.</p> <p><u>Evidence 2: Confirmation of understanding of the important concept</u></p> <p>After substituting figures into formulas to find the number of intervals or the number of trees, he teacher repeatedly asked learners what the figures substituted such as perimeter, interval, the number of intervals and the number of trees. She had found that some learners did not understand the concept well while she was monitoring their calculation before. She used to explain all important concepts herself before, but she tried to wait patiently for learners to reach the answers by themselves.</p> <p><u>Remaining issues</u></p> <p>The teacher did not have learners explain or ask them for the reasons when they gave wrong answers in the lesson. Her colleague who observed the lesson advised in the post-lesson reflection conference that she should have asked learners for the reason in such a situation. To make the most of learners' wrong answers for deepening their understanding is part of key advice which the Project has highlighted.</p> <p><u>Evidence 3: Consideration of learners' English level and flexible code switching</u></p> <p>The following actions by the teacher indicate her consideration of learners' English level:</p> <ul style="list-style-type: none"> - She asked learners for the date and the lesson title, and wrote them on the chalkboard, while pronouncing them at the beginning of the lesson. - Subsequently, she put on the chalkboard a manila paper with the following review questions were written: <p style="margin-left: 40px;">Intervals on an open line: A road is 2 km long. Trees were planted 2m apart alongside of the road. An interval of 2m was left at an end without a tree due to an existing shop. How many trees were planted along the road?</p> <p>After reading out the question, she had them solve in pairs. She used to jump into groupwork before.</p>

	<ul style="list-style-type: none"> - She let learners read aloud the questions before they solve them on the chalkboard. She seemed to incorporate the Project's advice that teachers should consider improving learners' English level even in mathematics lessons. - She used gestures to explain open or closed lines well, which had not been seen before. She used code switching flexibly both in mass teaching and in monitoring individual learners' work, according to their reaction. She used to regard code switching as inappropriate before. <p><u>Remaining issues</u></p> <p>The level of English in exercise questions is by far high compared to the learners' level. It would have been much better if the teacher had read out questions together with learners, pointing from one word to another on the chalkboard, and had confirmed their understanding of the questions and the meaning of some important words before moving to individual work. It is recommended that, when supplementing in Kinyarwanda, she should also rephrase it in plain English so that they understand the correspondence between the two languages.</p>
Overall Comments	<p>On the day of the lesson observation, learners were so nervous that some of them could not fully concentrate on the lesson because there were a lot of visitors including video-shooting staff. Cameras and microphones often disturbed classroom communication. In spite of such difficult conditions, the teacher paid much attention on learners' learning and used various effective techniques to support them according to their learning needs.</p> <p>If the Lesson Study group had studied the content more deeply during Lesson Study, the lesson would have been delivered differently. The learning objective of the lesson is to understand the relationship between the number of intervals and the number of trees on a closed line, with attention to the difference between an open line in the previous lesson. In this lesson, the teacher was not able to let learners notice the relationship because of extra task of finding the perimeter of a square or a rectangle, which was guided in the textbook. When discussing what would have been appropriate during the post-lesson reflection conference, the demonstrator pointed out that finding the perimeter of shapes had become the objective against the original purpose. This can be regarded as an important statement considering the lesson objective. Indeed, giving the length of perimeter of a round pond might have worked better in this lesson. It is desirable that the Lesson Study group study contents, taking into consideration what they should focus on and what exercise questions would be appropriate to achieve lesson objectives, not just following the content in the textbook.</p>

Table 4-2 is the case study of S2 physics lesson at GS Mukarange Catholique in Kayonza district. The information is structured in the same manner as above.

Table 4-2: Case Study of GS Mukarange Catholique S2 Physics

School name	GS Mukarange Catholique (Kayonza District)
Teacher	Uwineza Emmanuel
Teacher profile	This school joined model schools in 2018 and conducted Lesson Study in primary level. Secondary level started Lesson Study in 2019. On the day of the survey, the demo teacher did not prepare the lesson plan and did it after the lesson. He had participated in the Lesson Study though this lesson was not the one that the Project supported.
General issues on lessons	National exam pass rate for S3 is around 75% in this school. Main challenge of teachers was to manage large classes. Teachers have been eager to develop their teaching skills through Lesson Study.
Key advice from the Project	The learning objectives in science lessons are to get learners interested in natural phenomena around them, have them think why and solve it through scientific experiments and critical thinking according to their developmental stage. The Project gave the following advice;

	<ul style="list-style-type: none"> - Plan experiments using locally available materials as much as possible to develop skills and attitudes required for experiments and equip them with scientific thinking process (assumption, experiment/observation, recording, consideration and conclusion) through experience. - Encourage them to discover important points and explain them, not do it as teacher. <p>Regardless of the repeated advice, the Project had never observed lessons where learners conduct experiments at lower secondary level because of insufficiency of teaching and learning materials and difficulty in letting many learners conduct experiments in a crowded classroom, not in a laboratory, which the school did not have.</p>
Grade/Subject	S2 Physics
Unit	Archimedes' principle and atmospheric pressure
Topic	Principle of Archimedes
Objective	After the lesson, each learner should be able to verify and explain Archimedes' principle very well
Key Strategy	<p>Encourage learners to discover Archimedes' principle through an experiment.</p> 
Evidence of improvement areas observed in the lesson	<p><u>Evidence 1: Experiment in groups</u></p> <p>The lesson objective was to let learners confirm and understand the Archimedes' principle that a body immersed in a fluid is subjected to an upwards force equal to the weight of the displaced fluid. The teacher distributed a spring balance, a weight, a beaker, water to each group and put a poster of experimental procedures on the chalkboard. Then they moved to the experiment in groups. The teacher had learners record the results of observation as to gravity of the weight, its gravity under the water, difference of the gravity and how much volume the water increased when the weight was put under water.</p> <p>It should be highly appreciated that the teacher tried to get learners to understand the principle through an experiment, considering that teachers generally tend to just teach definition and formula in textbooks so that learners memorize them.</p> <p><u>Remaining issues</u></p> <p>Although learners were interested in the experiment, it took too much time and there were experimental errors among groups, because not all learners fully understood the experimental procedures and they were not used to experiments in terms of how to read the scale and how to use the spring balance. Given the 40-minute lesson for an experiment, more time should have been allocated without the review of the previous lesson. It is desirable to give two periods (80 minutes) for an experiment. Scientific experimental process includes assumption, experiment/observation, recording, consideration and conclusion. Learners should make it a habit to record results of observation individually, even in a group experiment. To do so, a worksheet should be carefully considered so that they can copy it on their notebook and write down on it.</p> <p><u>Evidence 2: Comparison of results by groups on the chalkboard</u></p> <p>The teacher had every group record results of the experiment on a piece of paper and write on the chalkboard. He added explanation, comparing the results of the groups.</p> <p><u>Remaining issues</u></p> <p>Due to running short of time, the teacher rushed into conclusion that a body immersed in a fluid</p>

	<p>is subjected to an upwards force equal to the weight of the displaced fluid by himself, though it should have been discovered by learners. Besides, the volume of the weight equaled to 30ml, but the most spring balances indicated 0.2N. It would be unreasonable to conclude that the Archimedes' principle was proved from the two figures. Failure and errors are inevitable in experiments, as a mismatch between the buoyancy and the volume in this experiment. The teacher could have let learners think the reason of the mismatch, apart from rushing into conclusion.</p>
Overall Comments	<p>Pupils' English level is likely to prevent them from explaining their ideas in primary education. In spite of improvement as they go up to next grades, they are not given opportunities to think and explain by themselves, contrary to the Project's advice. Science lessons can more easily lead to deeper learning because there can be many opportunities for them to think, such as to describe assumption based on their experience and explain what can be led from the results of the experiment.</p> <p>Ideally, more experiments could be conducted in the future, but teachers should experience them ahead of learners. It is not easy to include experiments in every lesson and there are topics where experiments are not suitable.</p> <p>They may borrow ideas from videos of experiments on Youtube. They can increase ideas of experiments and share them as common assets among colleagues. If teachers can collaboratively develop a collection of scientific experiments including templates of worksheets, experiments can become familiar for themselves as well.</p>

4.2 Good Practices and Challenges

During the ELS, the Project found good points and challenges that are common in the lessons. Good points indicate teachers' efforts in improving teaching, which can contribute to improved learning, but some challenges observed in BLS remained.

Table 4-3 lists good teaching practices at schools where we observed, organized according to the flow of lessons.

Table 4-3: Improvements in Teaching

Stage	Improvements
1) Review of the previous lesson	<p>The teacher:</p> <ul style="list-style-type: none"> - reviewed what learners studied in the previous lessons, and explained the relationship between them and the current lesson (EP Buhande, P5 SET; GS Kabuye, S2 Biology; GS Mukarange, S2 Biology; GS Mukarange, S5 Math) - explained the relationship between the current lesson and what learners learned in earlier grades (GS St Aloys R, S3 Biology; GS St Aloys R, S4 Chemistry) - let learners have time to look at their notebooks to reflect the previous lesson, without instructing it (GS APAGIE, S5 Biology) - asked learners not only to give terms that they studied before, but also to explain their definitions (GS Kabuye, P5 SET)
2) Main learning activity of the lesson	<p>The teacher:</p> <ul style="list-style-type: none"> - led learners to the main theme of the lesson step by step through logical guided instruction, not through one-way instruction or lecturing (GS APAGIE, S2 Math) <p><u>In group work</u></p> <p>The teacher:</p> <ul style="list-style-type: none"> - chose an appropriate activity for group work, which can deepen individual learning through group discussion (Buhande, P5 SET; St Aloys R, S3 Biology) - gave a question or activity of a new topic which can be solved by learners by employing what they learned before (EP Buhande, P5 SET; GS St Aloys R, S2 Math; GS St Aloys R, S3 Biology; GS NDA Rwaza, S5 Math) - asked for the reason why the learner reach the answer, monitoring individual

Stage	Improvements
	<p>learners' work (GS Mukarange P5 SET)</p> <ul style="list-style-type: none"> - gave additional support for slow learners or groups with slow learners, walking around the class (GS NDA Rwaza, S5 Math) - had all group members (not only one representative) write their findings in their notebooks (GS St Aloys R, S2 Biology) - gave different questions to different groups, and had group members explain their answers to other group' members (GS Kabuye, P5 Math) - had learners exchange their notebooks and mark answers each other (GS Kabuye, P5 Math; GS Gihogwe, P5 Math) <p><u>In science experiments</u></p> <p>The teacher:</p> <ul style="list-style-type: none"> - moved to experiments after clarifying the its objective and methods (GS Saint Aloy R, S3 Biology; GS St Aloys R, S4 Chemistry) - had all group learners write their findings from the experiment in their notebook (GS St Aloys R, S3 Biology; GS St Aloys R, S4 Chemistry) - made sure that learners would find something new from the experiment (the teacher did not explain the results before the experiment) (GS Gihogwe, S2 Biology; GS Mukarange, S2 Physics, GS St Aloys R, S3 Biology; Gs St Aloys R, S4 Chemistry)
3) Presentation of findings/answers	<p>The teacher:</p> <ul style="list-style-type: none"> - purposefully pointed a learner who did not raise a hand (LNDV, S2 Math) - assisted learners who had difficulty in explaining in English so that they can construct sentences (EP Buhande, P5 SET) - facilitated all learners' learning by rephrasing their presentations, adding explanation when necessary, asking for the reasons why they thought so, and asking other learners to correct wrong answers (EP Buhande, P5 SET; GS Mukarange, P5 SET; GS Kabuye, P5 SET; GS Mukarange, S2 Biology; GS Kabuye, S2 Biology; GS Gihogwe, S2 Math; LNDV, S2 Physics; GS St Aloys R, S3 Biology; GS APAGIE, S5 Math; GS Mukarange, S5 Math; LNDV, S5 Math)
4) Conclusion/summary	<p>The teacher:</p> <ul style="list-style-type: none"> - summarized the lesson by quoting what learners spoke (GS Mukarange, P5 SET) - had learners take notes of important content (GS Mukarange, P5 SET; GS APAGIE, S2 Biology; GS St Aloys R, S3 Biology) - linked mathematical or scientific content with real life (GS NDA Rwaza, S5 Math)
5) Assessment	<p>The teacher:</p> <ul style="list-style-type: none"> - gave applied assessment questions requiring higher order thinking based on what learners learned, as well as basic assessment questions (GS Mukarange, S2 Biology) - had individual learners solve questions and collected the piece of paper to mark later (GS NDA Rwaza, S2 Biology; GS St Aloys R, S3 Biology)

4.3 Remaining Challenges

Remaining challenges are listed anonymously according to the flow of lessons in Table 4-4. These should be addressed in future training programs.

Table 4-4: Remaining Challenges in Teaching

Phase	Challenges
1) Review of the previous lesson	<p>The teacher:</p> <ul style="list-style-type: none"> - reviewed what learners studied in the previous lessons just for formality and did not explain or imply the links between them and the current lesson

Phase	Challenges
2) Main learning activity of the lesson	<p>The main learning activity was done by group work in almost all lessons, regardless of subjects and grades. Teachers are advised to use different methods depending on the advantages, such as individual work, solve an example question as a whole class with the teacher's guided instruction, as well as group work. Below is current status of group work and areas for improvement.</p> <p><u>Activity in group work</u></p> <ul style="list-style-type: none"> - Activities were not well organized because they mixed what learners know from experience, what they acquired as knowledge, and what they have to examine scientifically. - Many activities did not go beyond finding the definition or explanation of a term from the textbooks. Individual work can enhance learning more than group work in such a case if it does not entail further discussion. - Besides, it is better to facilitate learning a new topic by using what learners studied before in math lessons or developing scientific thinking through experiments and observations in science lessons, rather than to have them find from textbooks. In this way, the teacher can lead to discovery of a new thing at the end. Such an activity can be done by group work. <p><u>Typical group work in math lessons</u></p> <ul style="list-style-type: none"> - Calculation exercises as main activities were done by group work, but they should have been done as individual work to develop individual learners' thinking and skills. If the activities in groups were for "communication", which was prescribed in the curriculum, the teacher could allocate time to communicate with others not in calculation exercises but in finding a new formula or marking answers each other. This can deepen individual learners' thinking. <p><u>The way of conducting group work</u></p> <ul style="list-style-type: none"> - Group work started without proper instruction. In spite of a new topic, groups were told to work on the experiments/observations or math problems, which caused their confusion. There were many cases where the teacher ended up explaining methods group by group, as learners asked many questions because of little prior instruction. Lessons cannot be effective unless clear objectives and methods have been clarified in advance, especially in experiments. - Learners' work was not carefully monitored though the teacher walked around in the class. <p><u>The way of learners' taking notes</u></p> <ul style="list-style-type: none"> - Only representatives of groups wrote down answers on papers, but all learners should have taken notes of answers and findings on their notebooks not only in calculation exercises but also in experiments.
3) Presentation of findings/answers	<p>The teacher:</p> <ul style="list-style-type: none"> - explained unilaterally without quoting or referring to the answers of groups presented on the chalkboard - repeated the same questions such as "do you understand?" meaninglessly - uttered the beginning part of an answer to let learners say the following part - did not give the time for asking the teacher questions - had groups present their answers always in the same order, though it should have been carefully planned by monitoring group work before, in order to stimulate learning
4) Conclusion/summary	<p>The teacher:</p> <ul style="list-style-type: none"> - lectured and did not have time for interaction - did not give learners time to take notes
5) Assessment	<p>The teacher:</p> <ul style="list-style-type: none"> - gave assessment questions requiring recalling of a definition or a formula only - gave assessment questions as group work for just confirming learners' understanding

Part II

CPD at school, Sector and District

5. CPD at School

The CPD activities at the school level are analyzed in terms of the schools' arrangement, effectiveness, and teacher participation.

- Schools regularly organized CPD activities, once a term or more and almost all teachers attended them.
- Availability of resource materials has improved, but is not yet sufficient.
- Lesson Study embraces features of effective professional development.
- Lesson Study and the degree of participation in school-based CPD had a positive correlation with teachers' perception about school circumstances
- Teachers' self-evaluation on their understanding of CBC philosophy was high.

This chapter also drew on responses of a similar survey on a national scale to generalize challenges recognized by teachers and education officers.

5.1 Overview

Concerning school-based CPD, the Project organized questionnaires and interviews with stakeholders, which are teachers themselves and HTs as school leaders at the target schools. Additionally, the analysis of these surveys is supplemented by analyzing a large-sample survey questionnaire conducted for CBC needs assessment in February 2019 which targeted teachers, HTs and education officers.

For evaluation of CPD at the school level, a model of effective professional development proposed by Darling-Hammond, Hylar and Gardner (2017) is referred to below. They identified seven characteristics of effective professional development as follows:

1. Is content focused
2. Incorporates active learning utilizing adult learning theory
3. Supports collaboration, typically in job-embedded contexts
4. Uses models and modeling of effective practice
5. Provides coaching and expert support
6. Offers opportunities for feedback and reflection
7. Is of sustained duration

The status of CPD taking place at schools is assessed according to these elements, using narrative data from questionnaires and interviews with teachers and HTs.

5.2 Implementation of School-based CPD

5.2.1 CPD Setting at Schools

As a result of the concerted effort by the education sector in promoting CPD, all target schools were aware of CPD. According to the questionnaire for HTs, nine out of eleven schools allocated dedicated CPD time in teachers' timetable and the number of periods for CPD per week is either one or two. It should be noted that the understanding of CPD time is different between the HT and teachers, or among teachers. Even though a HT answered that there was CPD time in the timetable, some teachers answered that they did not have CPD time in their timetable. However, it can be said that CPD is conducted regularly at all schools, once a term or more and teachers participate in it.

The teachers' work seems overloaded. A third of teachers (most of whom taught primary level) have more than 40 periods to teach per week. In this situation, securing time when colleagues gather for CPD activities would be difficult. This was evident in the interviews with teachers too; in more than half of the schools, teachers recognized that the 'time' was a challenge. Interestingly,

however, only a few HTs mentioned this problem. This shows a gap between teachers and school leaders.

5.2.2 Resource Materials

Resource materials are important references used during CPD at the school level. The questionnaire for teachers asked about the materials that they referred to when preparing lessons. Figure 5-1 shows the rate of teachers who referred to each document by category of school, regardless of intervention (treatment and control). Almost all teachers used CBC textbooks authorized by REB. Considering that the rate was less than 40% as of BLS in March 2017⁹, availability of textbooks and teachers’ readiness to use textbook have improved. The curriculum and syllabus were also referred to by many teachers, if not all. The problem is that it does not necessarily mean that teachers have been given enough materials. The questionnaire for HTs revealed that these materials were available for some teachers or subjects, or even for a few teachers or subjects, which means that teachers share the resources as shown in Figure 5-2.

When it comes to teachers’ use of reference materials (softcopy) and information on internet, there is a gap between secondary school teachers and primary school teachers (Figure 5-1). Many primary school teachers did not access these materials, which may reflect low accessibility to computers and internet, and/or teachers’ low IT skills.

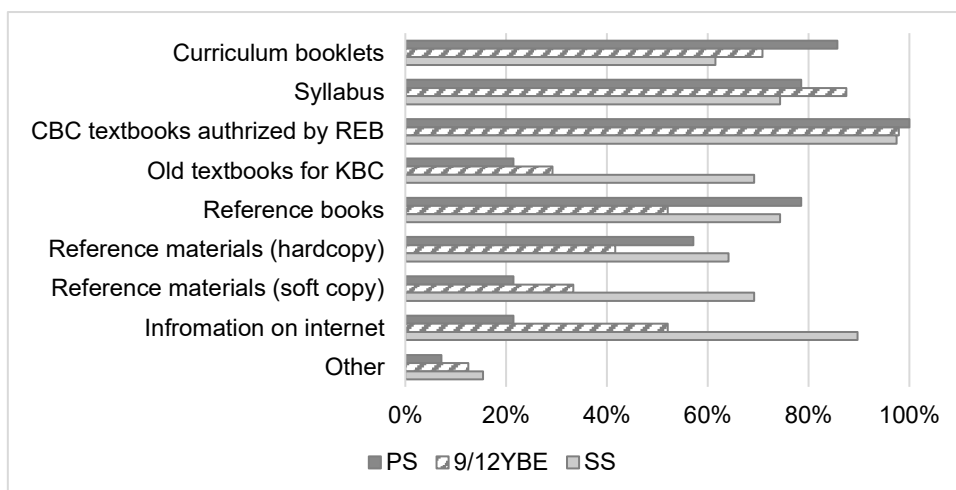


Figure 5-1: Resource Materials Used by Teachers

⁹ The low rate of textbook use in 2017 may be partly because CBC had not been introduced in P3, P6, S3 and S6 at that time.

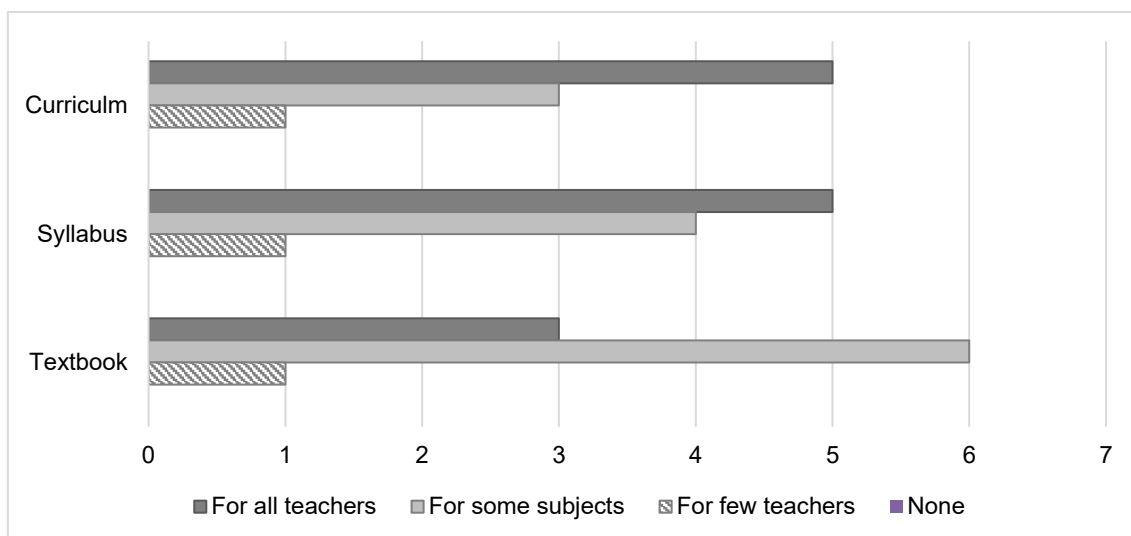


Figure 5-2: Available Resources at School Level

5.2.3 Effectiveness of CPD

(1) Evaluation of Effectiveness of School-based CPD

Darling-Hammond et al. (2017) proposed seven features of effective teacher professional development from review of studies on professional development demonstrating a positive relationship between teacher professional development, teachers’ practices and learners’ performances. Lesson Study has all these features as explained in Table 5-1.

Table 5-1: Seven Effective Features of Teacher Professional Development

Feature	Description	Interpretation in Lesson Study
1: Is content focused	Focuses on teaching strategies associated with specific curriculum content within teachers’ classroom contexts.	Picks up a specific lesson and develops a lesson plan
2: Incorporates active learning	Engages teachers directly in designing and trying out teaching strategies, providing them an opportunity to engage in the same style of learning they are designing for their students.	Demonstrates the lesson in micro-teaching in front of other teachers to confirm the practicability of the developed lesson plan.
3: Supports collaboration	Creates space for teachers to share ideas and collaborate in their learning, often in job-embedded contexts	Encourages teachers to discuss and collaborate to develop a lesson together.
4: Uses models of effective practice	Provides teachers with a clear vision of what best practices look like.	Is a study to develop a model lesson.
5: Provides coaching and expert support	Shares expertise about content and evidence-based practices, focused directly on teachers’ individual needs.	Incorporates evidence-based practices given from experts or literature.
6: Offers feedback and reflection	Provides built-in time for teachers to think about, receive input on, and make changes to their practice by facilitating reflection and soliciting feedback	Ensures the time for reflection and revision of the lesson plan both after micro teaching and at the end of the program
7: Is of sustained duration	Provides teachers with adequate time to learn, practice, implement, and reflect upon new strategies that facilitate changes in their practice.	Is conducted in steps, normally taking a few months to a year to complete.

Source: Created by the Project by referring to Darling-Hammond et al. (2017). Effective Teacher Professional Development, pp. v-vi

As shown in Table 5-2, we examined CPD activities in the schools from the perspective of these features, referring to information provided by each school. For the treatment group, Lesson Study is evaluated as a CPD activity. Due to limited information from questionnaires and interviews from the control group, the CPD activities are evaluated on whether they have the features or not. The CPD activities in the control group did not have all the features.

Table 5-2: Evaluation of CPD from Effectiveness Perspective

Category	School	Feature						
		1	2	3	4	5	6	7
TRT	EP Buhande, GS Kabuye, GS Mukarange, GS APAGIE, GS St Aloys R, GS NDA Rwaza	✓	✓	✓	✓	✓	✓	✓
CTR	EP Bukinanyana	✓	✓	✓				✓
	GS Gihogwe	✓		✓	✓	✓		✓
	GS Bubazi	✓	✓	✓				✓
	LNDV	✓		✓				✓
	GS Rambura G	✓	✓	✓				✓

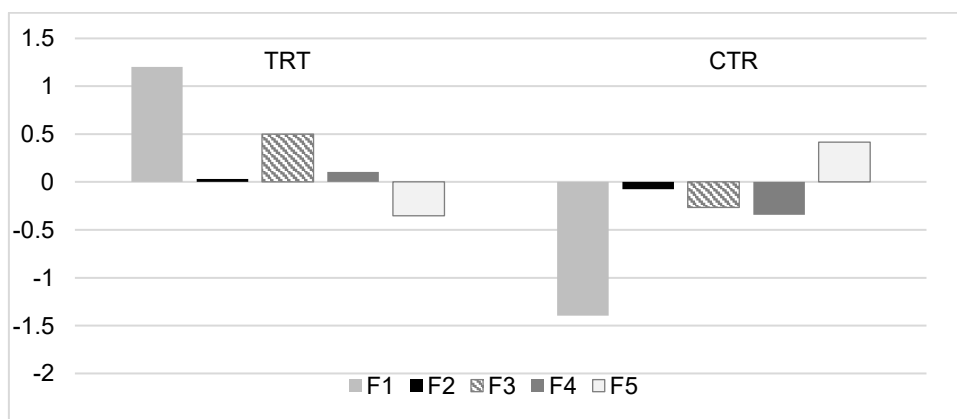
Note: It does not necessarily mean that CPD activities in CTR do not actually have the features, even if such information was not found from the questionnaire and interviews.

(2) Relationship Between CPD and Teachers’ Perception About School Circumstances

The BLS report did an exploratory factor analysis to investigate characteristics of teachers who did not attend trainings. It presented five factors and highlighted the importance of supporting an environment that encourages teacher participation in CPD.

ELS also conducted an exploratory analysis. Figure 5-3 shows the factor scores by intervention (treatment and control), using teachers’ responses to questions related to school circumstances. The treatment group’s scores for factor 1 (shared school vision) and 3 (collegiality for lesson improvement) were positive in contrast to the control group’s scores, while the score for factor 5 (resource persons) was negative. Lesson Study may have contributed in transforming school visions into clear missions about teaching practices. Undoubtedly, it also promoted collegiality through collaboration. This result verifies the effectiveness of Lesson Study.

Regarding factor 5, however, it implies that SBMs and SSLs had less of a chance to play a leading role in CPD because the project members served as resource persons in Lesson Study. This should be carefully considered in future CPD programs.



Note: Factor 1: shared school vision, Factor 2: participatory school management, Factor 3: collegiality for lesson improvement, Factor 4: evidence-based school planning, and Factor 5: resource persons

Figure 5-3: Factor Scores by Type of Schools

5.2.4 Influence of School Management

School leadership definitely plays a key role in creating a supporting environment for CPD. According to the responses in the questionnaire and interview with HTs, “support” can be classified into technical, administrative and financial support. Technical support for example, is to develop training materials and to give advice or feedback to teachers. Administrative support is to facilitate CPD activities such as allocation of CPD time in timetables, assignment of resource persons such as SBMs, and monitoring of teachers’ participation. Financial support is to provide necessary expenses for activities including teachers’ transportation expenses on the weekends, and training material cost.

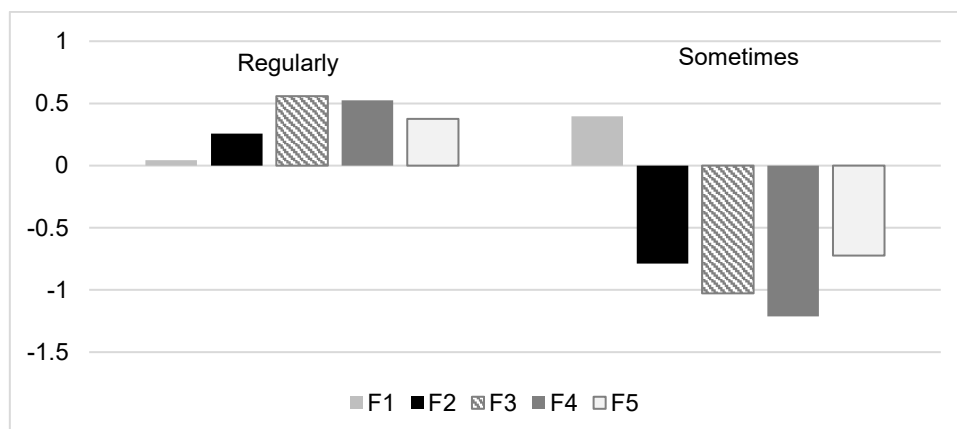
In the questionnaire and interview, all school leaders mentioned these three types of support more or less. As to technical support, some school leaders observed teachers’ lessons to give feedback and to identify CPD needs. For example, in GS St Aloys R, the DOS identified CPD is needed in lesson planning. Teachers were not able to differentiate cross-cutting issues and generic competencies. Therefore, he developed training material on his own and planned training. After the training, teachers were grouped by departments and were requested to develop a lesson plan. Developed lesson plans were presented and discussed about on another occasion for CPD. The DOS of GS Gihogwe conducted lesson observation together with the SBM and planned CPD activities. Administrative support is the type of support which most school leaders focused on. The HT of EP Buhande allocated two periods on Thursday afternoon for CPD activities. At EP Bukinanyana, the HT provided time for CPD, while pupils cleaned the school. The DOS of GS APAGIE monitored CPD activities. Financial support was basically given in non-monetary forms. Lunch was provided at GS Mukarange and GS St Aloys R when CPD was conducted on weekends. Provision of necessary materials were mentioned by many school leaders including EP Buhande, GS Kabuye, GS APAGIE, GS St Aloys R and LNDV. The HT of GS NDA Rwaza emphasized the importance of enhancing teachers’ intrinsic motivation, not extrinsic motivation such as monetary incentives.

5.2.5 Teachers’ Participation in School-based CPD

The Education Sector Strategic Plan (ESSP) 2018/19- 2023/24 sets out to strengthen teacher CPD across all levels of education as one of its nine priorities, and the improvement of teachers’ competencies to deliver the new curriculum appropriately as one of the outcomes under this priority. Participation in CPD is regarded as a teachers’ duty.

Among valid responses in the questionnaire for teachers at the target schools, all teachers attended CPD activities at school level except for two teachers who answered CPD was never conducted. In other words, 98% of teachers attended CPD. More than 70% of them attended regularly. This is significant progress since BLS in 2017, where 25% of teachers did not attend school-based CPD at all.

Furthermore, the degree of participation seems to be correlated with teachers’ perception about school circumstances. An exploratory factor analysis of the questionnaire for teachers found that those who regularly attended CPD tend to have more positive views about school circumstances such as school management, collegiality, school planning and resource persons. However, the factor of school vision negatively affected the degree of participation. This reason should be further investigated.



Note: Factor 1: shared school vision, Factor 2: participatory school management, Factor 3: collegiality for lesson improvement, Factor 4: evidence-based school planning, and Factor 5: resource persons

Figure 5-4: Factor Scores by Degree of Participation in CPD

5.2.6 Teachers’ Self-evaluation on CBC

As CPD activities have been conducted at the school level and lessons have been transforming in a good direction, teachers’ self-evaluation on CBC is also deemed to have improved. Guskey (2002) proposed a model of teacher change, which states that the teachers’ practice in the classroom following professional development brings about positive learning outcomes, which eventually leads to change in the teachers’ belief and attitude.

The analysis of valid responses of the ELS questionnaire for teachers found that 97.9% of them agreed or strongly agreed that they understand the philosophy of CBC. Similarly, 97.9% agreed or strongly agreed that they are confident in conducting CBC lessons. As for the improvement in the understanding of CBC since its introduction, the rate was 89.6%. This positive change in teachers’ understanding was acknowledged by almost all HTs (DOS). They answered that teachers’ practice has changed since the introduction of CBC “moderately” or “very much”, except for one DOS who did not answer the question. The changes reported during the interview with HTs were about teaching style. Teachers used to deliver lessons in lecture style, where the teacher speaks more than learners do. Nowadays, they try to engage learners by preparing lesson plans well, and using teaching aids.

5.3 Findings and Lessons from a Similar Survey

A nationwide, sampling online survey was administered by REB in cooperation with the Project and British Council in February 2019. The online survey was designed to identify issues and challenges with CBC as well as CPD implementation. Its targets were teachers, HTs, SEOs and DDEs/DEOs. The sample size is shown in Table 5-3. The overall coverage was 6.4% of total population.

Table 5-3: Sample Size of Nationwide Survey

Category	Number of respondents	Coverage against all population
Teachers	4,178	6.0%
HTs	497	11.2%
SEOs	87	20.9%
DDEs/DEOs	22	24.4%
Total	4,784	6.4%

Note: “Coverage against all population” for teachers and head teachers are based on number of teachers (69,602) and head teachers (4,412) in 2017 Education Statistics (Ministry of Education, 2018)

The objectives and target group were quite similar to our ELS. Hence it should be fruitful to review the data again and analyze it independently in order to consolidate our understanding about the issues of CPD, though it is not a part of the ELS. So therefore, we focused much attention on analyzing narrative (open-ended) answers which were not intensively reviewed in the original analysis because of their difficult-to-aggregate nature. We applied a “text mining” method which uses a software called KH Coder¹⁰.

5.3.1 Challenges of Teachers’ Attendance to CPD

In the nationwide survey, primary and secondary teachers who never attended school-based CPD this year (N=414) described the reasons. Among them, 389 valid responses were analyzed. 39 morphemes with high frequency (more than four appearances) were used to draw a co-occurrence network diagram (Figure 5-5). Morphemes with higher frequencies are depicted by a bigger circle. Words were automatically grouped and separated by color. Eight groups were extracted which can be named: 1) Time/timetable, trainers, 2) head teacher/school leadership, 3) new teacher, 4) awareness 1 (no knowledge), 5) awareness 2 (first time to hear), 6) not planned, 7) organized or introduced, and 8) attended last year.

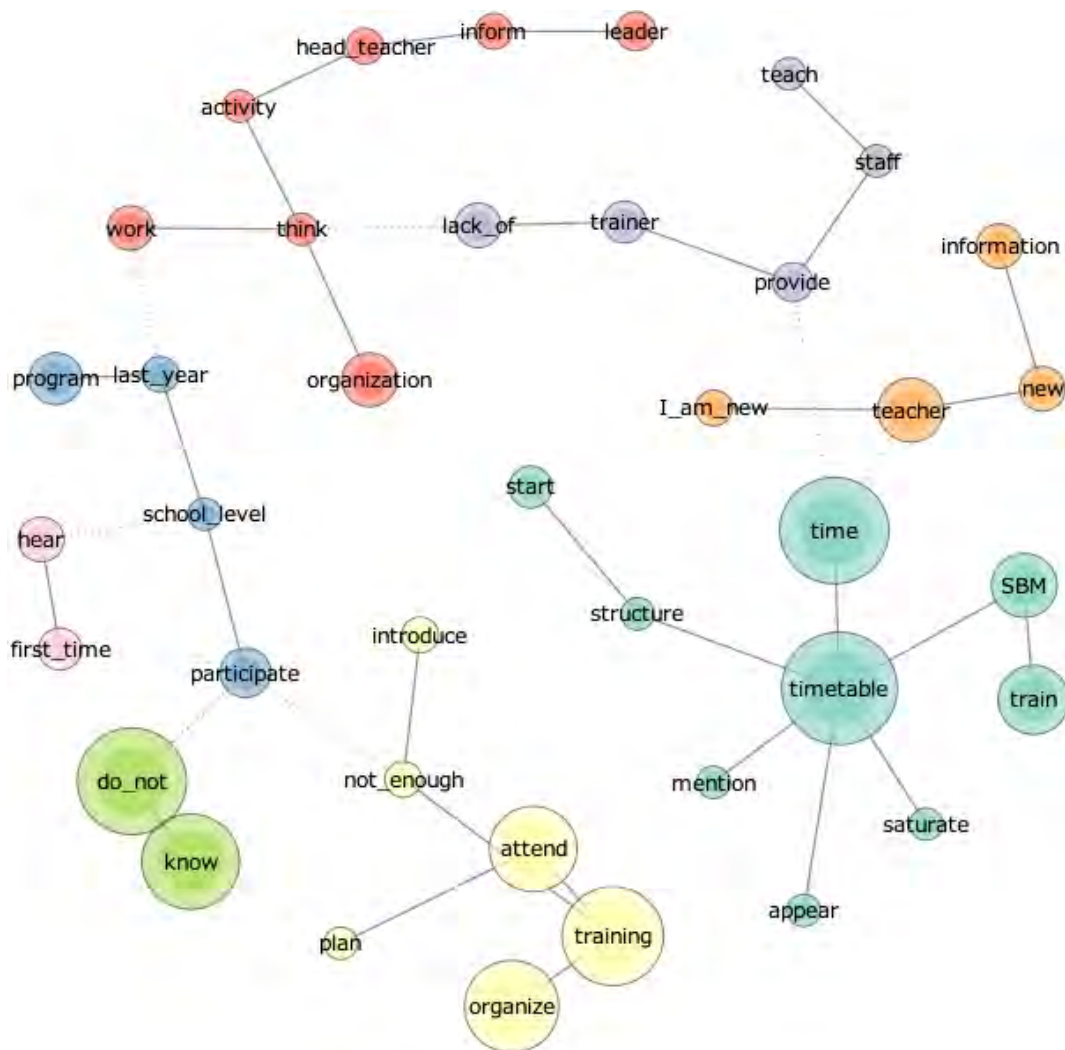


Figure 5-5: Text Mining of Challenges of CPD from Teacher’ Point of View

¹⁰ Text mining by KH Coder identifies “morphemes” (the smallest meaningful unit of language) by their frequency of appearance and visualizes the intensity of their relationship by classifying them into groups (“communities”).

5.3.2 Challenges of Teachers' CPD Observed by Education Officers

After the initial screening, 120 valid responses from SEOs, DDEs and DEOs were used for this analysis. 30 morphemes with high frequency (more than four appearance) were used to draw co-occurrence network diagrams. Morphemes with higher frequencies are indicated by a bigger circle. Words were automatically grouped and separated by color. Eight groups were extracted which can be named: 1) Time and budget, 2) financial means, 3) head teacher, 4) resource persons' timetable, 5) difficulties of monitoring school-based activity, 6) lack of material and facility, 7) transport fee, and 8) availability of committee members.

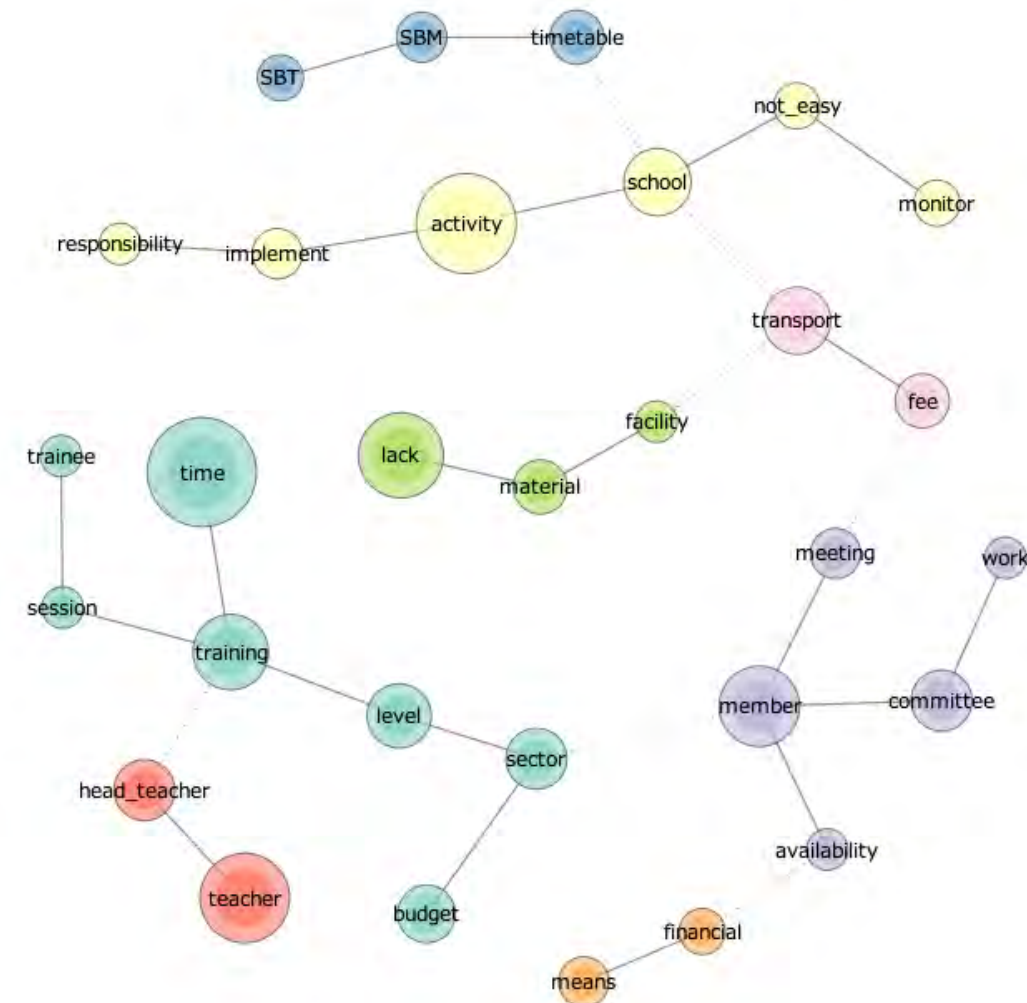


Figure 5-6: Text Mining of Challenges of CPD from Education Officers' Point of View

5.3.3 Commonly Recognized Challenges in CPD

The text mining revealed that there were challenges commonly recognized by teachers and education officers. They are *lack of time*, *unavailability* and *insufficient capacity of resource persons*, and *unsupportive school leadership*. Indeed, these are important factors for effective CPD too, as discussed earlier. Challenges of budget and lack of monitoring systems were raised by the education officers only. Budget may not be an obstacle for CPD as long as CPD takes place at the school level with minimal costs.

6. Potential for Nation-wide CPD mechanism

SEOs of the sectors where the treatment schools are located are willing to expand Lesson Study to other schools. DCCs and SCCs have had challenges including commitment of stakeholders, budget and time. Now that REB officially requested districts to include CPD in districts' performance contracts, DCCs and SCCs should be activated. For expansion of Lesson Study, DCCs and SCCs should ensure that schools allocate sufficient time for CPD in teachers timetables. In addition, CPD monitoring mechanisms from school to national levels must be strengthened.

6.1 Overview

Lesson Study was continuously conducted at six schools and there has been an impact in teaching and learning as discussed before. It is important to disseminate lessons learned or scale up the model to other schools. DCC and SCCs are expected to play a key role in sharing such information or knowledge among neighboring schools. Thus, we investigated the possibility of Lesson Study expansion by reviewing functionality of DCC/SCCs and analyzing their internal and external environments.

6.2 Status and Activity of DCCs and SCCs

The interview with DDEs revealed that DCCs did not meet so often, although the Project confirmed that DCCs had been established in the districts. SCCs also existed but the status varied from one sector to another. In some sectors, SCCs have become a platform where members plan, conduct and monitor CPD activities at the sector or school level. In other sectors, SEOs have coordinated similar tasks independently of SCCs, because of difficulty in gathering all members at one time. These days, Mentor trainers were tasked with conducting training for SBMs at each sector on a monthly basis, using CPD manuals. Many sectors have conducted this CPD activity successfully. SCCs are more likely to work well than DCCs, given the smaller coverage of schools and geographical areas. On the other hand, both DCCs and SCCs were struggling to raise awareness of key persons such as vice mayors and executive secretaries, arrange time for meetings, and secure budget for operation.

6.3 Potential of Lesson Study Expansion

6.3.1 Education Officer's View about Expansion of Lesson Study

Out of five SEOs from the sectors where the treatment schools are located, and who we could visit, four were familiar with Lesson Study, but one (SEO of Kigabiro), was not aware of it. This may be attributed to the degree of support provided by the Project. The Project team has supported the model schools in the four sectors more intensively than St Aloys R in the Kigabiro sector. They had chance to visit another model school to observe and learn from a research lesson with model school teachers. However, GS St Aloys R was given less support because the school was mature enough to conduct Lesson Study by teachers themselves.

The four SEOs took Lesson Study as a beneficial CPD program and pointed to improvement of teachers' skills in lesson plan development and assessment, and positive change in teachers' confidence, for example.

They were willing to expand this experience to other schools in their sector. SEO Mukarange has already taken action by including it in the sector performance contracts (Imihigo). Teachers from GS APAGIE Musha in Musha sector visited other schools to train teachers on various areas, not just Lesson Study.

As for possible strategies to share with other schools, they mentioned the following:

- Introducing Lesson Study to HTs
- Introducing Lesson Study in a sector level CPD activity
- Conducting an Open Day to demonstrate an outcome of Lesson Study
- Including Lesson Study in the sector action plan or performance contract (Imihigo)

The key for SCCs to make them happen seems to depend on whether they can link their work with the existing resources (training materials, resource persons, allocated budget, etc.).

6.3.2 SWOT Analysis

Basically, the SEOs appreciated the impact of Lesson Study, but there are challenges that may hinder the expansion of Lesson Study through DCCs and SCCs. In order to understand the current situation more comprehensively, the Project conducted a SWOT analysis for Lesson Study expansion in those sectors as shown in Table 6-1. While there are strengths and opportunities for expansion, the weaknesses and threats are serious problems in Lesson Study. Some weaknesses such as overloaded timetables and no follow-up from SCC are common regardless of type of CPD.

Table 6-1: SWOT Analysis for Lesson Study Expansion

Strengths	Weaknesses
<ul style="list-style-type: none"> - Teachers in the treatment group to serve as trainers on Lesson Study - Direct contribution to improvements in actual lesson delivery - Low cost at school level - Positive impact on collegiality and teachers' confidence 	<ul style="list-style-type: none"> - Many steps to be taken to complete - Teachers' overloaded timetables - Lack of experienced resource persons - No constructive follow up system by SCC
Opportunities	Threats
<ul style="list-style-type: none"> - Increasing teacher's awareness about Lesson Study - Sector CPD training as an opportunity to introduce Lesson Study - Possible inclusion of Lesson Study in the performance contract - CPD to be included in districts' performance contracts (Imihigo) 	<ul style="list-style-type: none"> - Time conflict with other forms of CPD activities both at school and sector levels

6.3.3 Way Forward

In September 2019, REB issued a letter to Mayors requesting inclusion of CPD in their performance contracts (Imihigo). In response to this, districts are required to allocate budget for CPD as well. This is likely to grow the momentum toward planning and implementation of CPD at district, sector and school levels. In these circumstances, weaknesses listed in the SWOT analysis should also be tackled to expand Lesson Study to more schools. The following measures should be taken by different stakeholders.

(1) Arrange Timetables

As recommended in the National Teacher CPD Framework, HTs should include CPD time in the school timetable for all teachers. If finding the time for all teachers to meet is difficult, HTs may start with allocating CPD time by department levels to promote collaboration among teachers who teach the same subjects. In doing so, teachers may be able to plan ahead for Lesson Study activities throughout the term, for example.

(2) Foster CPD Monitoring Mechanism from School to National levels

Teachers should be able to get feedback and support from experts to continuously improve their competences. Monitoring from SCCs can serve as an opportunity for teachers to gain objective feedback from external experts. It would also motivate them to continue CPD. To enable such monitoring, schools and the SCC of the sector should closely communicate their activity plans with each other. Furthermore, the communication between SCCs and DCC of the district should be also strengthened so that information such as good practices, challenges and activity plans are shared for continuous improvement in activities. REB should eventually monitor CPD at different levels through this mechanism. The education sector is going to launch online monitoring tools for DCCs and SCCs to report their activities on a termly basis. The online monitoring is expected to strengthen the mechanism.

Part III

Conclusion

7. Conclusion

7.1 Findings and Discussion

The SIIQS Project has worked on improving teachers' understanding and skills in CBC and learners' HOT skills through Lesson Study. It also has raised awareness of education stakeholders and conducted monitoring to enhance conducive CPD environments which enable teachers to continuously improve lessons.

In Part I, we examined changes in lessons in the treatment group in comparison with those in the control group. The analysis revealed that teachers' understanding of CBC in the treatment group was higher and lesson plans improved much more than in the control group. Teachers in the treatment group improved facilitation skills and applied "indirect teaching", the ideal pedagogy in CBC. Learners in the treatment schools were more likely to enjoy more opportunities to interact with each other and construct knowledge by themselves than in the control schools. The overall results of AATs in the treatment group was significantly higher than in the control group and implied that HOT skills especially improved. These findings suggest that teachers' proficiency in CBC can improve by continuing Lesson Study, which can lead to improvement in academic performance and development of HOT skills.

In Part II, we investigated supporting mechanisms which could enable sustainable implementation of Lesson Study or CPD by teachers. Lesson Study satisfies all of the features of effective teacher professional development identified by Darling-Hammond et al. (2017). Teachers' perception towards school circumstances including school management and collegiality was positive in the treatment schools where Lesson Study was implemented. In fact, CPD had been implemented in all schools in some form, and teachers who participated in CPD regularly had more positive views towards school circumstances than those who participated here and there. In short, Lesson Study and frequent participation in CPD had a positive correlation with teachers' perception about school circumstances. On the other hand, teachers and local education officers recognized obstacles for CPD such as lack of time, unavailability and insufficient capacity of resource persons, and unsupportive school leadership. These are among the features of effective professional development and should be addressed by DCCs and SCCs in order to expand Lesson Study at Rwandan schools. SEOs of the sectors where the treatment schools are located were willing to disseminate Lesson Study to other schools in their areas, and even had ideas to make it happen.

7.2 Achievement of PDM

To sum it up, most KPIs stipulated in the PDM have been achieved and we can conclude that the SIIQS Project has been successfully implemented.

Table 7-1 summarized the achievement of each KPI with findings from the ELS underlined. Positive changes were seen across all KPIs, and Lesson Study is likely to have contributed to them. As to regards with implementation of CPD and sustainability of Lesson Study, however, the following challenges were often reported from various stakeholders.

Challenges of CPD

- Lack of time
- Unavailability and insufficient quality of resource persons
- Insufficient support from school leadership
- Lack of budget

Table 7-1: Achievement of the KPIs in the PDM

Narrative Summary	Objectively Verifiable Indicators	Achievement
Overall Goal		
Students' learning process in classroom is improved.	<u>1) More students in a model school than those in a control school present relevant responses to an open question posed by a teacher.</u>	<u>Students in the model (treatment) schools were given more opportunities to present open-ended responses.</u>
	<u>2) Result of the academic achievement test developed by the Project improves more in model schools compared to control schools.</u>	<u>The overall results of AATs in the treatment group was significantly higher than in the control group and implied that HOT skills especially improved.</u>
Project Purpose		
Implementation of CBC-based lesson in the classroom is strengthened through SBI ¹¹ activities.	<u>1) Lesson plans developed by teachers in model schools include all elements specified in Competence 2.1 of the National Teacher CPD Framework.</u>	<u>Lesson plans of the treatment group became more detailed and included most elements stipulated in the National Teacher CPD Framework.</u>
	<u>2) Teachers give more open questions in model schools compared to control schools.</u>	<u>Teachers in the treatment group gave more open questions than those in the control group.</u>
Outputs		
1. Teachers' understanding of CBC-based lesson implementation is enhanced.	1) Post-test results of participants in trainings and workshops including an e-learning course exceed 70%.	Not evaluated in the ELS
	<u>2) Self-evaluation of teachers' understanding of CBC-based lessons continues to be 90% or above.</u>	<u>Teachers understanding of CBC was nearly 98%.</u>
2. Problem-solving capacities are enhanced at school, sector, district, and national level.	1) All sectors implement sector-based CBC training.	Not evaluated in the ELS
	2) More than one good practice of school-based CPD is reported quarterly from all DCCs that have been established.	Not evaluated in the ELS
	<u>3) The rate of teachers' participation in school-based CPD increases from 75% (baseline) to 90%.</u>	<u>98% of teachers participated in CPD in the sampled schools (treatment and control groups).</u>
	4) More than 50% of DCCs and SCCs submit monitoring reports using a developed form on monthly basis.	Not evaluated in the ELS

Now that REB requested districts to include CPD in their district performance contract (Imihigo) and the momentum towards CPD keeps growing. The solutions are to secure CPD time for teachers and to operationalize DCC/SCC activities in order to support schools in their locality. The following actions should be taken by stakeholders.

- Strengthen school leadership so that HTs fully understand the importance and benefit of CPD, and allocate time for CPD in teachers' timetables
- Assess capacity of resource persons regularly and provide training based on their needs to develop their skills effectively and efficiently
- Build capacity of DCCs and SCCs by raising awareness of stakeholders such as vice mayors and executive secretaries of sectors
- Establish effective monitoring mechanisms from school to national levels

¹¹ SBI stands for "School-Based In-service training". The terminology was common when the Project was formulated. However, the idea has evolved into the broader concept named CPD and is no longer used nowadays.

Reference

- Blosser, P. E. (2000). *How to ask the right questions*. Washington, DC: National Science Teachers Association.
- Coe, R. (2002, September), *It's the effect size, stupid: What effect size is and why it is important*. Paper presented at the Annual Conference of the British Educational Research Association, University of Exeter, England.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences (2nd ed.)*. New York: Routledge.
- Darling-Hammond, L., Hyster, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Palo Alto, CA: Learning Policy Institute.
- Flanders, N. A. (1965). *Teacher influence, pupil attitudes and achievement*. Washington, DC: United States. Dept. of Health, Education and Welfare.
- Ikeya, T. (2009). Zambia kouki kiso kyouiku ni okeru sugakuka jugyo bunseki no kenkyu: Kyoushi • seito no gengo katsudou wo chushin ni [Lesson analysis of mathematics at upper basic education in Zambia: focusing on verbal interaction between teacher and students]. *Journal of International Development and Cooperation*, 15(1/2), 125-140.
- Ministry of Education. (2018). *2017 education statistics*. Kigali, Rwanda. Retrieved from http://mineduc.gov.rw/fileadmin/user_upload/pdf_files/Rwanda_Education_Statistics_2017.pdf
- Rwanda Education Board & Japan International Cooperation Agency. (2017). *Baseline survey report: The project for supporting institutionalizing and improving quality of SBI activity (SIIQS)*. Kigali, Rwanda: Authors.
- Sawilowsky, S. (2009). New effect size rules of thumb. *Journal of Modern Applied Statistical Methods*, 8 (2): 467-474. doi:10.22237/jmasm/1257035100.

Appendices

Appendix A

Academic Achievement Test

A-1: P4 level math

A-2: P4 level science

A-3: S1 level math

A-4: S1 level science

A-5: S4 level math

A-6: S4 level science

JICA SIIQS Project

Mathematics Test for Primary School Pupils

Names/ Amazina: _____

School/ Ikigo: _____ Class/ Umwaka: _____

Student Number/ Numero y'umunyenshuri: _____

**** Sample/ Urugero ****

Calculate/Erekana igisubizo nyacyo $2 + 5 =$

- A. 0 ✓B. 7 C. 10 D. 3

Circle or ✓ here. Choose only one answer.

Koresha akaziga cg ushyireho aka kamenyetso: ✓ kugisubizo nyacyo

1. $7 + 2 =$

- A. 5 B. 72 C. 9 D. 27

2. The digit in the thousand's place in 72081 is ... Umubare uri mu mwanya w'ibinyagihumbi muri 72081 ni...

- A. 7 B. 2 C. 0 D. 8

3. Calculate/ Erekana igisubizo nyacyo : 8×7

- A. 42 B. 49 C. 56 D. 15

4. Add/ **Erekana igisubizo gihwanye na** :
$$\begin{array}{r} 14 \\ + 7 \\ \hline \end{array}$$

- A. 7 B. 11 C. 21 D. 111

5. Calculate/ **Erekana igisubizo nyacyo** : $10 - 2 + 5$

- A. 3 B. 7 C. 13 D. 17

6. Multiply / **Erekana igisubizo nyacyo**: 302×50

- A. 1600 B. 16000 C. 1510 D. 15100

7. Divide/ **Erekana igisubizo nyacyo** : $276 \div 4$

- A. 59 B. 69 C. 79 D. 64

8. Add / **Erekana igisubizo nyacyo**: $597 + 236$

- A. 733 B. 833 C. 823 D. 723

9. Subtract/ **Erekana igisubizo nyacyo** : $600 - 236$

- A. 264 B. 374 C. 464 D. 364

10. What fraction of the diagram below is shaded?/ **Ni uwuhe mugabane ungana n 'ahasharuye muri iki gishushanyo?**

A. $\frac{7}{2}$

B. $\frac{9}{7}$

C. $\frac{7}{9}$

D. $\frac{2}{7}$



11. Which of the following fractions is the smallest?/ **Mu migabane ikurikira ni uwuhe muto kurusha iyindi?**

$$\frac{1}{6}, \frac{2}{3}, \frac{1}{3}, \frac{1}{2}$$

- A. $\frac{1}{6}$ B. $\frac{2}{3}$ C. $\frac{1}{3}$ D. $\frac{1}{2}$

12. Calculate/ **Erekana igisubizo nyacyo :** $\frac{2}{7} + \frac{3}{7}$

- A. $\frac{6}{7}$ B. $\frac{5}{14}$ C. $\frac{5}{7}$ D. $\frac{8}{7}$

13. Simplify/ **Erekana igisubizo nyacyo :** $\frac{2}{5} \times \frac{3}{4}$

- A. $\frac{3}{10}$ B. $\frac{3}{5}$ C. $\frac{5}{9}$ D. $\frac{8}{15}$

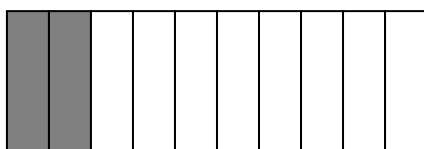
14. $\frac{4}{6} - \frac{1}{6} = m$, m is ...

- A. $\frac{1}{3}$ B. $\frac{1}{9}$ C. $\frac{1}{18}$ D. $\frac{1}{2}$

15. Which of the following is equal to 0.4? / **Mu mibare ikurikira ni uwuhe ungana na 0.4?**

- A. 4 B. $\frac{4}{10}$ C. $\frac{4}{100}$ D. $\frac{1}{4}$

16. Which decimal number does the following shaded part express?/ **Mu mibare y' ibice ikurikira ni uwuhe ungana n'ahasharuye mu mbonerahamwe ?**



- A. 2.8 B. 0.5 C. 0.2 D. 0.02

17. Change $\frac{123}{100}$ to a decimal number. / **Ni uwuhe mubare ungana na $\frac{123}{100}$ uwuhinduye mbibice?**

- A. 0.23 B. 1.023 C. 1.23 D. 12.3

18. Calculate/ **Erekana igisubizo nyacyo: $0.23 + 1.37$**

- A. 0.7 B. 1.7 C. 1.6 D. 1.5

19. Calculate/ **Erekana igisubizo nyacyo: $19.82 - 5.28$**

- A. 14.64 B. 14.54 C. 14.66 D. 14

20. Change 1.25 metres to centimetres. / **Uhinduye metero 1.25 muri centimetero, nikihe gisubizi bingana?**

- A. 12.5 cm B. 125 cm C. 1250 cm D. 102.5 cm

21. Emmanuel gets 0.5 litres of tomato juice from 5 tomatoes. How many litres of the juice can he get from 15 tomatoes? / **Manweli akura 0.5 litiro z'umutobe mu nyanya 5. Azakura litiro z'umutobe zingahe mu nyanya 15?**

- A. 1.5 litres B. 2 litres C. 2.5 litres D. 3 litres

22. A book contains 130 pages. Claudine read 78 pages of it. Which of the following shows the rest of the pages left? / **Igitabo gifite impapuro 130. Kolodina amaze gusoma impapuro 78 zacyo. Ni ikihe kigereranyo k'impapuro asigaje gusoma mu bigereranyo biri hasi?**

A. $130 + 78 = \square$

B. $\square - 78 = 130$

C. $130 \div 78 = \square$

D. $130 - 78 = \square$

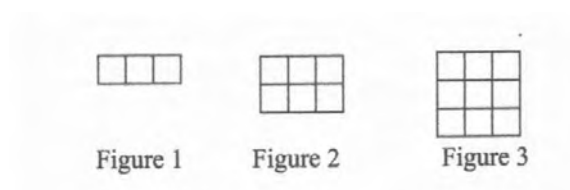
23. About how long is this picture of a pencil? / Ugereranyije, iyi karamu ifite uburebure bungana bute?



- A. 5 cm B. 10 cm C. 20 cm D. 30 cm

24. Here is the beginning of a pattern of tiles. If the pattern continues, how many tiles will be in Figure 6? /

Aha ni intangiriro y'igishushanyo cy'amabati. Iki gishushanyo nigikomeza, kizaba kiriho amabati angana ate?



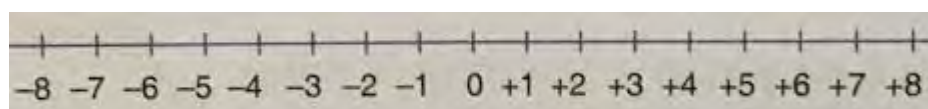
- A. 12 B. 15 C. 18 D. 21

25. Find the collect sign to compare the following number. / shyiramo ikimenyetso gikwiye mu kugereranya imibare ikurikira

Seven hundred/Magana arindwi $617 + 83$

- A. =
B. >
C. <
D. None of the above/ nta na kimwe muri ibyo gihari

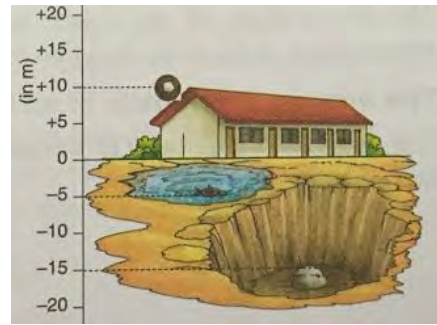
26. What is the distance between -3 and +6 on the number line? Ni iyihe ntera iri hagati ya -3 na +6



- A. 3 B. 9 C. -3 D. -9

27. Study the diagram below and find the position of the top of the roof./ **reba kugishushanyo gikurikira maze werekane aho igisenge cy'iyi nzu kuri**

- A. -5 m
- B. 0 m
- C. +5 m
- D. +10 m



28. Find the LCM of 12 and 15 / **Niyihe LCM ya 12 na 15**

- A. 3
- B. 27
- C. 60
- D. 180

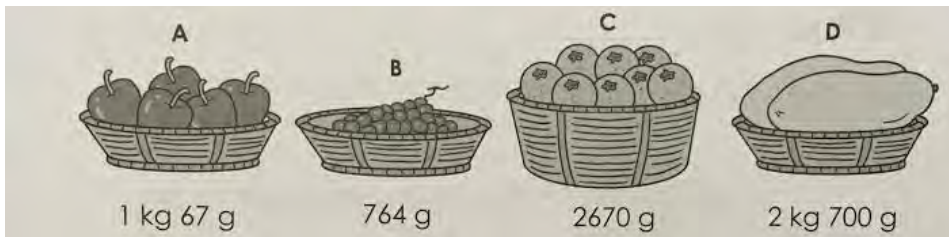
29. Evaluate/ **Erekana igisubizo nyacyo** $\sqrt{16}$

- A. 3
- B. 16
- C. 4
- D. 8

30. Calculate/ **Erekana igisubizo nyacyo.** $5\text{ m }25\text{ cm} - 1\text{ m }40\text{ cm}$

- A. 4 m 15 cm
- B. 6 m 65 cm
- C. 4 m 65cm
- D. 3 m 85 cm

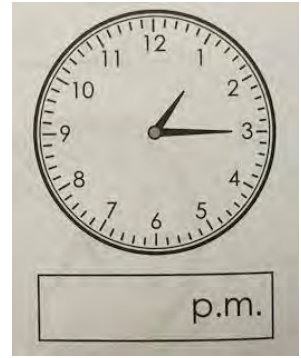
31. Find the correct answer./ **Erekana igisubizo nyacyo:**



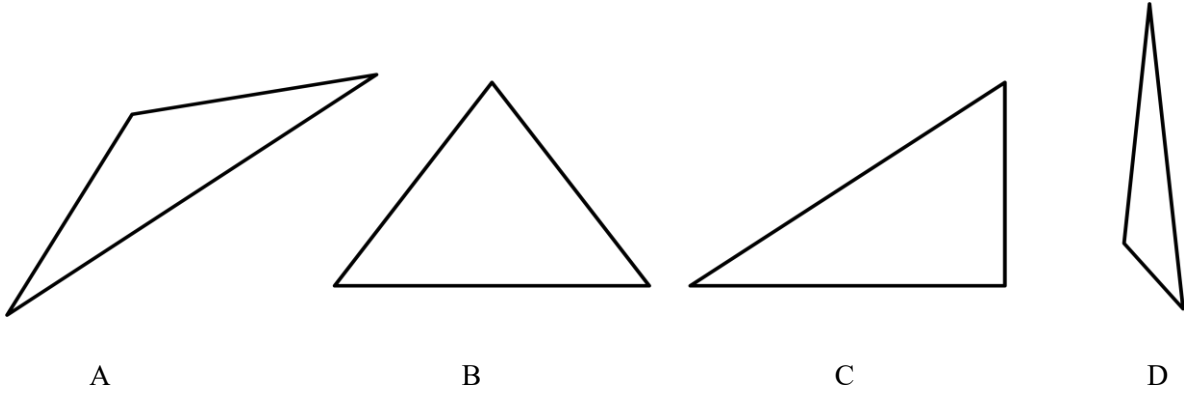
- A. Basket A is the lightest./ **Igiseke A nicyo cyoroshye kurusha ibindi**
- B. Basket C is the heaviest./ **Igiseke C nicyo kiremereye kurusha ibindi**
- C. Basket A is lighter than Basket B /**Igiseke A cyoroshye kurusha igiseke B**
- D. Basket D is heavier than Basket C / **Igiseke cya D kiremereye kurusha igiseke cya C**

32. What time is it? / **Hitamo igisubizo cyerekana isaha kuri iki gishushanyo**

- A. 1:15 B. 1:03
C. 3:01 D. 3:10



33. Choose right angled triangle. / **Hitamo ishusho ya mpandeshatu igororotse**



Appendix A-2

JICA SIIQS Project

Science Test for Primary School Pupils

Name (Amazina): _____

School (Ikigo): _____ Class (Umwaka): _____

Circle or tick only ONE letter of the best answer from A, B, C and D

(Shyira akamenyetso kugisubizo kimwe cy'ukuri hagati y'ibisubizo A, B, C na D)

*****Sample/ Urugero*****

Calculate / Kora iyi mibare: $2 + 5 =$

A. 0

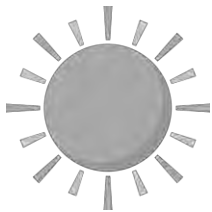
B. 7

C. 10

D. 3

Circle or ✓ here.
Caho akaziga cg ushyire
akamenyetso ka ✓

1. Which one is a living thing? Muri ibi bintu bikurikira ni ikihe gifite ubuzima?



Sun/ Izuba

A.



Rock/ Urutare

B.



Tree/ Igit

C.



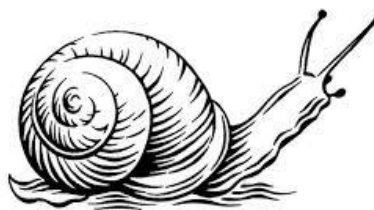
Water/ Amazi

D.

2. A snail is a living thing./ **Ikinyamunjongo ni ikinyabuzima**

Which is a wrong explanation about it? / **Mu bisobanuro bikurikira ni ikihe kitari ukuri?**

- A. A snail change its size.
Ikinyamunjongo gihindura ingano yacyo
- B. A snail moves.
Ikinyamunjongo kiragenda
- C. A snail does not reproduce its children.
Ikinyamunjongo ntikibyara
- D. A snail needs food.
Ikinyamunjongo gikenera kurya

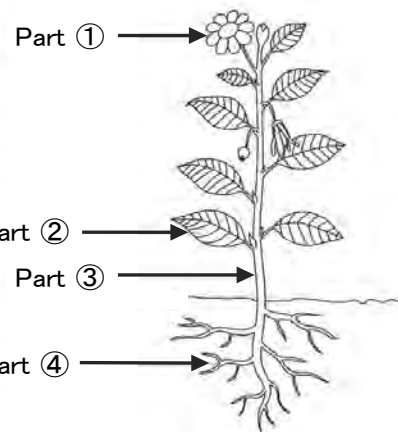


Snail

The diagram shows flowering plants/ **Iki gishushanyo kiragaragaza ibice by'ikimera gifite indabyo**

3. What is the name of part ④? **Igice cya ④ cy' icyo gishushanyo kitwa ngo iki?**

- A. Flower/ **Ururabyo**
- B. Stem/ **Igihimba**
- C. Leaf/ **Ikibabi**
- D. Root/ **Umuzi**



4. Which part absorbs water from the soil?

Ni ikihe gice cy'ikimera gikurura amazi mu butaka?

- A. part ① / **Igice cya ①**
- B. part ②/ **Igice cya ②**
- C. part ③/ **Igice cya ③**
- D. part ④/ **Igice cya ④**

5. Which one is an important thing for plant growth? /

Muri ibi bintu bikurikira ni ikihe gifite akamaro kanini mu gukura kw'ikimera?

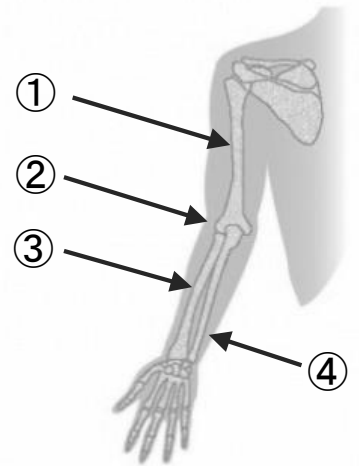
- A. Electricity/ **Amashanyarazi**
- B. Sunlight/ **urumuri rw'izuba**
- C. Oil/ **Amavuta**
- D. Salt/ **Umunyu**

6. The diagram shows bones of the right arm and hand.
Iki gishushanyo kirerekana amagufa y' ukuboko kw'iburyo n'ikigan za cyakwo.

You can bend your arm at the joint.

Ushobora guhinira ukuboko munkokora

Which part is the joint of the arm? **Ni ikihe gice kiri mu ifatanyirizo ry' ukuboko?**



- A. ①
 B. ②
 C. ③
 D. ④

7. Which of the followings is **NOT Correct** on the explanation of Animals?

Mu bisobanuro bikurikira ni ikihe kitari ukuri ?

- A. Vertebrate has five categories namely fish, amphibian, reptiles, birds and mammal / **Ibinyabuzima bigira urutirigongo birimo amoko atanu (5): amafi, ibikeri, ibikururanda, ibiguruka, n'ibinyamabere**
 B. Invertebrate animals do not have backbone/ **Ibinyabuzima bitagira urutirigongo**
 C. Mammals have udder/ **ibinyamabere bifite icebe**
 D. All domestic animals are mammals/ **Amatungo aba mu rugo yose ni inyamabere**

8. Which animal(s) belong to mammal? **Mu nyamaswa zikurikira , inyamabere ni izihe?**



① Rabbit/ **Urukwavu**

② Cow/**Inka**

③ Chicken/**Inkoko**

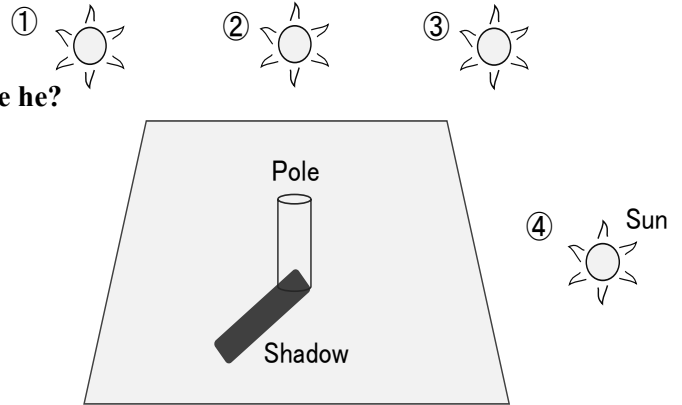
④ Snake/**Inzoka**

- A. ① is mammal. / ① ni inyamabere
 B. ① and ② are mammal. / ① na ② ni inyamabere
 C. ①, ② and ③ are mammal. / ①, ② na ③ inyamabere
 D. ①, ②, ③ and ④ are mammal. / ①, ②, ③ na ④ ni inyamabere

9. Shadow of the pole is formed on the ground.
Where does the Sun locate at?

Niba Igicucu cya Pole cyiremye hasi. Izuba rihereye he?

- A. ①
B. ②
C. ③
D. ④



10. The moon does not give off its own light. Why can you see the Moon?

Ukwezi ntikumurikisha urumuri rwakwo. Kuki tukubona?

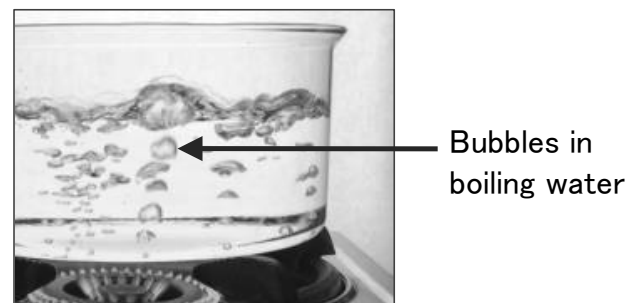
- A. It bends light from the Sun / **kugonda urumuli ruva mu zuba**
B. It gets through light from the Sun / **gufatira urumuli ruva ku zuba**
C. It takes in light from the Sun / **kwihereza ku rumuli rw'izuba**
D. It reflects light from the Sun / **kumurikisha urumuli ruturutse ku zuba**

11. In the photo, water is boiling.
What is in the bubbles of boiling water?

Iyi foto irereka amazi abira.

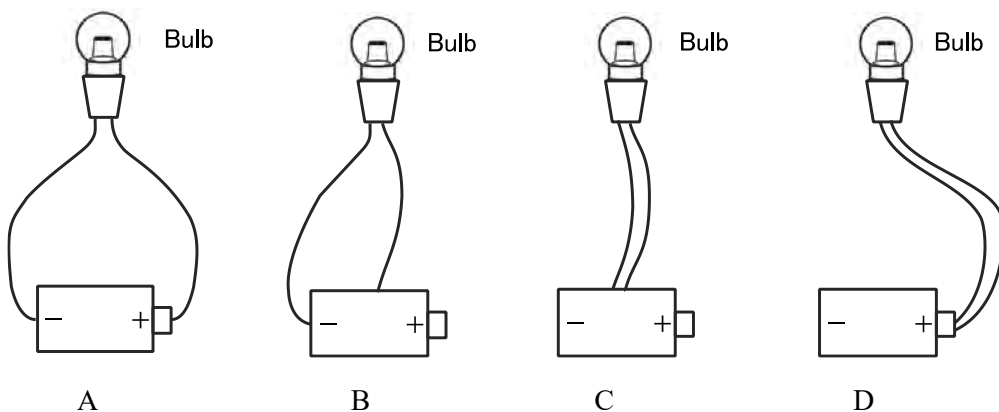
Ni iki kiri muri turiya tubumbe tugaragara mu mazi ari kubira?

- A. Air / **Umwuka usanzwe**
B. Ice / **Barafu**
C. Water vapour/ **Umwuka w'amazi**
D. Glass / **Ikirahure**



12. Which diagram shows the connection that can make the bulb light?

Ni ikihe gishushanyo cyerekana uburyo urumuri rwo mu itara ruboneka?



13. Which one can conduct electricity?

Ni ikihe muri ibi bintu gishobora gutwara umuriro w'amashanyarazi?



Plastic bag/ **ishashi**

A.



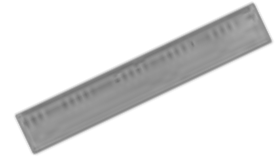
Iron nail/ **umusumari**

B.



Glass bottle/ **icupa ry'ikirahure**

C.



Wood ruler/ **ilati y'igiti**

D.

14. Which one is a **Wrong** explanation about sound? / Mu bisobanuro bikurikira ni ikihe **kitari cyo kubijyanye n' ijwi**?

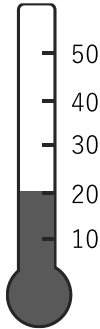
A. Sound does not travel through water./ **Ijwi ntirishobora kwambukiranya amazi**

B. Sound travels through the air./ **Ijwi rishobora kwambukiranya umwuka**

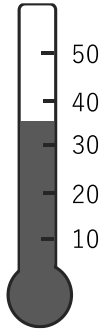
C. Sound travels through the wall./ **Ijwi rishobora kwambukiranya igikuta**

D. Sound travels through the human body./ **Ijwi rishobora kwambukiranya umubiri w'umuntu**

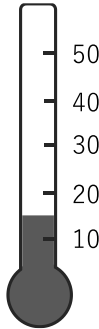
15. Which thermometer reading shows the hottest?/ Ni ikihe gipimo cy'ubushyuhe kerekana ubushyuhe bwinshi muri ibi bikurikira?



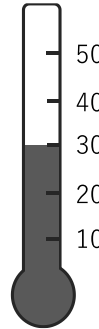
A.



B.



C.



D.

16. Which of the following is attracted by a magnet?

Ni ikihe muri ibi bikurikira gifatwa na rukuruzi?

A. Aluminium foil./

Ishashi ya

Aluminiyumu



B. Paper bag/

Urupapuro rwo gutwaramo ibintu



C. Pencil/ **ikaramu**

y'igiti



D. Iron nail/

Umusumari

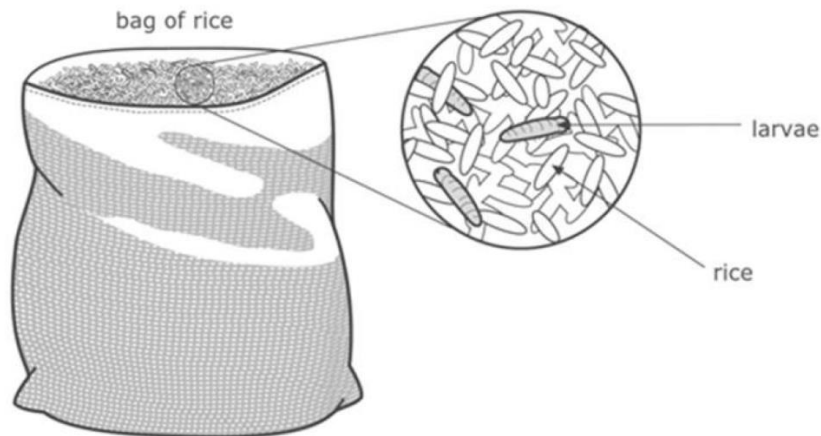


17. Which of the following statements is NOT correct about types of Food?

Ni iyihe ngingo muri izi zikurikira ITAVUGA ukuri kuri ubu bwoko bw'ibiryo?

- A. Fruit and Vegetables keep us hungry. / **Imbuto n'imboga zituma dusionza**
- B. Dairy (milk) products make our bones strong./**Amata n'ibiyakomokaho bituma amagufa yacu akomera**
- C. Grains (or cereals) give us energy./ **ibinyampeke bitwongerera imbaraga**
- D. Meat helps us grow and makes us strong./ **Inyama zituma dukura tukanakomera**

18. Larvae were found in a bag of rice. What best explains the larvae got there? / **Udusimba twabonetse mu mufuka w'umuceli. Ni ikihe gisobanuro cyagaragaza neza aho twaturutse?**



- A. They came from water in the bag./ **Twaje mu mazi yari mu mufuka**
- B. They came from the air in the bag. / **Twaje mu mwuka wari mu mufuka**
- C. They came from the rice itself./ **Twaje mu muceri ubwawo**
- D. They came from eggs laid by insects./ **Twaturutse mu magi yatewe n'utundi dusimba**

END

Appendix A-3

JICA SHQS Project

Maths Test for Secondary School Students (Lower Secondary)

Name: _____
 First name Middle name Family name

School: _____ Class: _____ Student Number: _____

***** **Sample** *****

Calculate $2 + 5 =$

- A. 0 B. 7 C. 10 D. 3

Circle or ✓ here.

Choose only one answer.

1. Calculate : 8×7

- A. 42 B. 49 C. 56 D. 15

2. Calculate : $4 + 4 \div 4 - 4$

- A. 0 B. 1 C. -2 D. 8

3. Simplify : $26 - 32 + 43$

- A. 29 B. 49 C. 37 D. 101

4. Simplify : $23 - (-42)$

- A. 29 B. 21 C. -19 D. 65

5. Find the remainder of the following : $489 \div 37$

- A. 13 B. 6 C. 7 D. 8

6. The sum $691 + 208$ is closest to the following sum

- A. $600 + 200$ B. $700 + 200$ C. $700 + 300$ D. $900 + 200$

7. Multiply : $-12 \times (-25)$

- A. 120 B. -240 C. -300 D. 300

8. Subtract : $2.201 - 0.753$

- A. 1.448 B. 1.458 C. 1.548 D. 1.558

9. Divide : $24.6 \div 0.04$

- A. 0.615 B. 6.15 C. 61.5 D. 615

10. Multiply 0.203 by 0.56

- A. 0.1288 B. 0.01288 C. 0.11368 D. 0.011368

11. Calculate the following : $\frac{3}{8} \div \frac{3}{4}$

- A. $\frac{9}{32}$ B. $\frac{1}{2}$ C. $\frac{3}{4}$ D. $-\frac{1}{2}$

12. Simplify : $\frac{3}{4} + \left(\frac{2}{3} \times \frac{1}{4} \right)$

- A. $\frac{1}{8}$ B. $\frac{5}{16}$ C. $\frac{5}{6}$ D. $\frac{11}{12}$

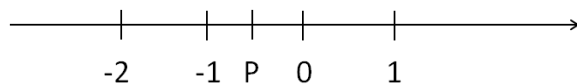
13. Which of the following fractions is the smallest? $\frac{1}{6}, \frac{2}{3}, \frac{1}{3}, \frac{1}{2}$.

- A. $\frac{1}{6}$ B. $\frac{2}{3}$ C. $\frac{1}{3}$ D. $\frac{1}{2}$

14. In which list of fractions are all of the fractions equivalent respectively?

- A. $\frac{1}{2}, \frac{2}{4}, \frac{4}{6}$ B. $\frac{2}{3}, \frac{4}{6}, \frac{8}{12}$ C. $\frac{2}{5}, \frac{4}{10}, \frac{8}{50}$ D. $\frac{3}{4}, \frac{2}{4}, \frac{4}{6}$ E. $\frac{3}{4}, \frac{4}{6}, \frac{6}{8}$

15. What number does the letter P represent on the number line below?

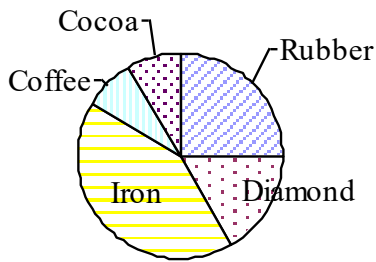


- A. $-\frac{3}{2}$ B. $-\frac{1}{2}$ C. $\frac{1}{2}$ D. $\frac{3}{2}$

16. Change 35% to the simplest fraction.

- A. $\frac{7}{2}$ B. $\frac{7}{20}$ C. $\frac{7}{200}$ D. $\frac{7}{2000}$

17. The pie graph below shows the main export of a country. What percentage of the shaded portion of the exports is rubber?



- A. 10% B. 15% C. 20% D. 25%

18. Find the value of x , if $12x - 10 = 6x + 32$.

- A. 5 B. 6 C. 7 D. 8

19. If the ratio 7 to 13 is the same as the ratio x to 52, what is the value of x ?

- A. 7 B. 13 C. 28 D. 364

20. An American tourist wants to change \$30.00 American dollars to Rwandan francs. How much Frw will he receive if \$1.00 exchanges for 820 Rwf?

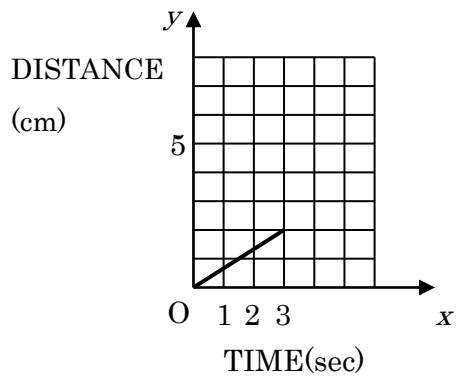
- A. 246 Rwf B. 2,460 Rwf C. 24,600 Rwf D. 820 Rwf

21. If x is proportional to y in the following table, find the value of p and q below.

x	3	6	q
y	7	p	35

- A. $p = 14$, $q = 31$ B. $p = 10$, $q = 14$
C. $p = 10$, $q = 31$ D. $p = 14$, $q = 15$

22. This graph shows how fast an ant walks along the straight line. If this ant keeps walking at the same speed as ever, what is the distance that this ant walks in 30 seconds?



- A. 5cm B. 6cm C. 20cm D. 25cm

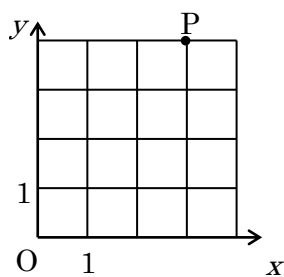
23. The table represents a relation between x and y . What is the missing number in the table?

- A. 9
B. 10
C. 11
D. 12

x	y
2	5
3	7
4	?
7	15

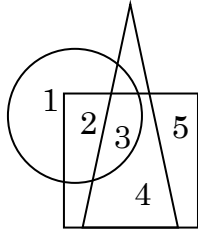
24. What are the coordinates of point P?

- A. (3, 4)
B. (4, 3)
C. (-3, 4)
D. (3, -4)



25. In the figure below, which number belongs to the square, the circle and not to the triangle?

- A. 1
- B. 2
- C. 3
- D. 4
- E. 5



26. Which is the smallest number among the following?

700mm, 6cm, 0.15m, 0.002km

- A. 700mm
- B. 6cm
- C. 0.15m
- D. 0.002km

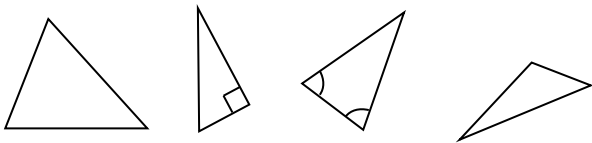
27. Which of the following is the closest to the value of

$$\pi : \frac{\text{circumference}}{\text{diameter}} ?$$

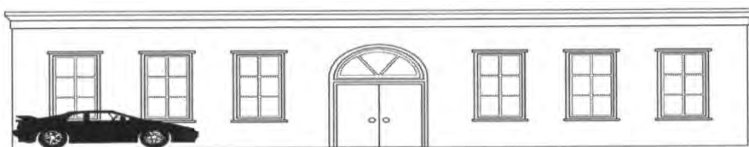
- A. 1.5
- B. 2.1
- C. 3.1
- D. 4.1

28. Which of the following is an isosceles triangle?

- A.
- B.
- C.
- D.



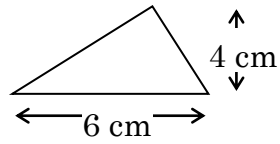
29. The car is 3.5m long. About how long is the building?



- A. 18m
- B. 14m
- C. 10m
- D. 4m

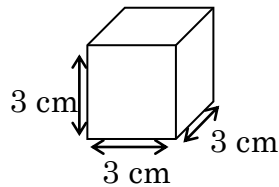
30. Which of the following is the area of a triangle whose base and height are 6 cm and 4 cm respectively?

- A. 10 cm^2
- B. 12 cm^2
- C. 24 cm^2
- D. 10 cm



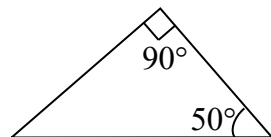
31. What is the volume of the cube below?

- A. 9 cm^3
- B. 18 cm^3
- C. 27 cm^3
- D. 64 cm^3

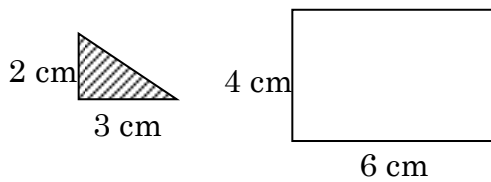


32. What is $\angle ABC$ in the triangle below?

- A. 20°
- B. 40°
- C. 50°
- D. 80°

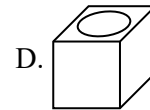
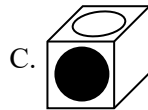
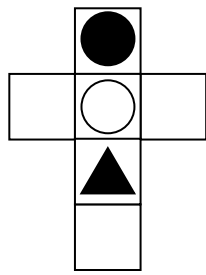


33. How many of the shaded right-angled triangles below are needed to cover exactly the surface of the given rectangle?



- A. Four
- B. Six
- C. Eight
- D. Ten

34. Which of the following cubes could be made by folding the figure below?



35. Find the highest common factor (HCF) and the least common multiple (LCM) of 12 and 18.

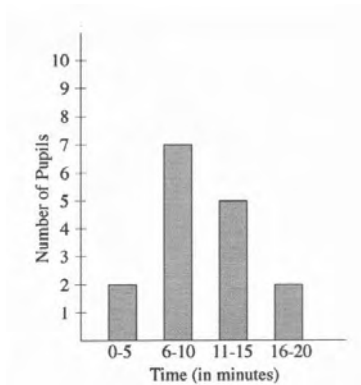
A. HCF = 4, LCM = 36

B. HCF = 6, LCM = 36

C. HCF = 6, LCM = 48

D. HCF = 8, LCM = 48

36. The graph shows the time of travel by students from home to school. How many pupils must travel for MORE THAN 10 minutes?



A. 2

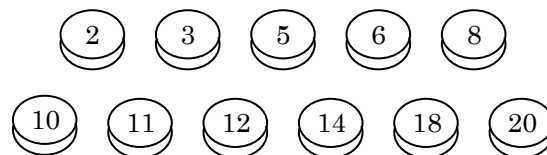
B. 5

C. 7

D. 8

E. 15

37. The eleven chips below are placed in a bag and mixed. Emmanuel draws one chip from the bag without looking. What is the probability that Emmanuel draws a chip with a number that is a multiple of three?



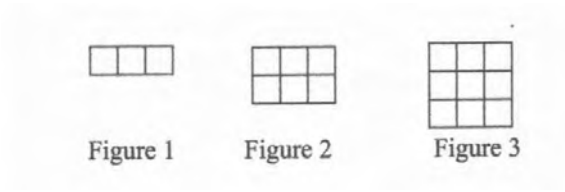
A. $\frac{1}{11}$

B. $\frac{1}{3}$

C. $\frac{4}{11}$

D. $\frac{3}{11}$

38. Here is the beginning of a pattern of tiles. If the pattern continues, how many tiles will be in Figure 6?



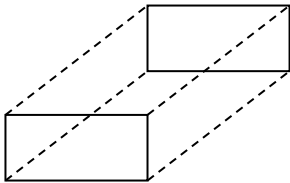
- A. 12 B. 15 C. 18 D. 36

39. How many Common Multiples of 2 and 3 are between 1 and 20?

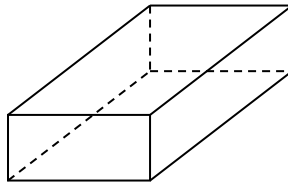
- A. 1 B. 3 C. 6 D. 10

40. Which of the dotted lines in the shapes drawn below show the hidden edges of the cuboid?

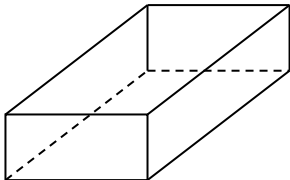
A.



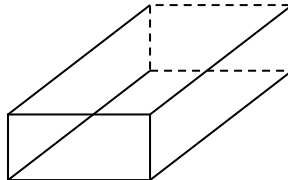
B.



C.



D.



Appendix A-4
JICA SIIQS Project

Science Test for Secondary School Students (Lower Secondary)

Name: _____

First name
Middle name
Family name

School: _____ Class: _____ Student Number: _____

PART A

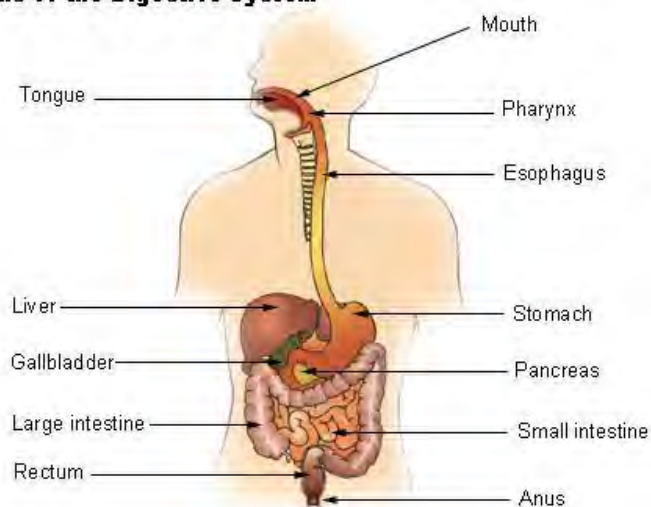
Circle the letter of the best answer choice from A, B, C and D. (Choose Only ONE Answer)

Question 1

Digestion is the process by which food is broken into simple substances which can be used by the body. It is an important process because it allows the body to get useful nutrients from the food that we eat. In which organ do we absorb important nutrition such as amino acids and glucose?

- A. stomach
- B. small intestine
- C. large intestine
- D. liver

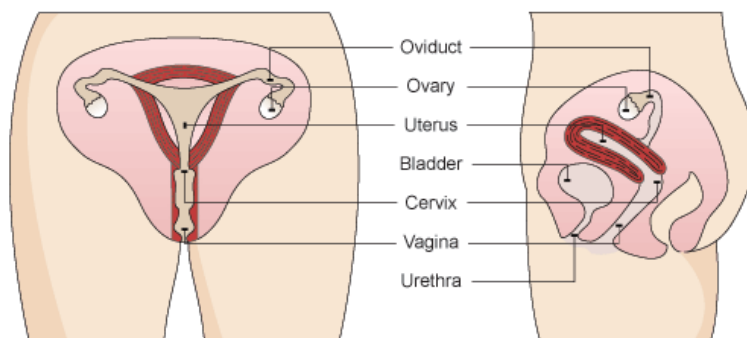
Organs of the Digestive System



Question 2

The figure below shows the female reproductive system. In which organ does fertilization take place?

- A. ovary
- B. oviduct
- C. uterus
- D. cervix



Question 3

Which of the following foods is correctly matched to its group?

- A. ground nuts → energy giving
- B. eggs → protective
- C. carrots → energy giving
- D. bananas → body building

Question 4

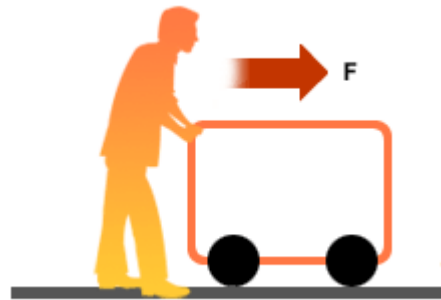
Which one of the following is the most effective preventive measure against the spread of sexually transmitted infections amongst the youth in schools?

- A. seeking medical attention
- B. use of condoms
- C. circumcision
- D. taking a shower daily

Question 5

A force of 20N pushes a box 5m in the direction of the force. Calculate the work done.

- A. 4 N/m
- B. 15 Nm
- C. 25 Nm
- D. 100 Nm



Question 6

When suspended freely, a magnet always faces

- A. Up-Down direction
- B. North-South direction
- C. West-East direction
- D. Free direction



Question 7

Below are some examples of second class levers. Which statement for the second class levers is correct?



- A. the load lies in between the effort and the fulcrum.
- B. the fulcrum is always between the load and the effort.
- C. the effort lies in between the load and the fulcrum.
- D. it can be categorized into wheel, screws and gears.

Question 8

If you have a mixture of iron filings and sand, how can you separate them?

- A. put them in water and boil them to remove sand
- B. use magnet to attract iron filings
- C. use filter to collect sand only
- D. burn them to remove iron filings and cool them down

Question 9

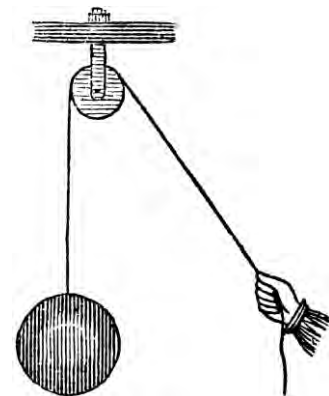
Which one of the following consists of only materials that are ALL non-magnetic?

- A. aluminium foil, piece of paper
- B. iron nails, plastic bottle
- C. piece of glass, sewing needle
- D. steel wool, water

Question 10

Which statement on the single fixed pulley is NOT correct?

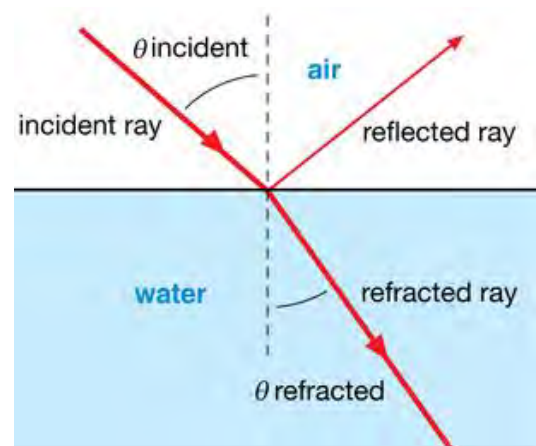
- A. it is made up of only one pulley which is fixed
- B. it reduces the effort needed and it changes the direction of the force
- C. effort distance is equal to the load distance
- D. it enables us to raise a load much higher than the person doing it



Question 11

Below is the diagram of incident ray, refracted ray and reflected ray at the boundary of air and water. Which statement is correct?

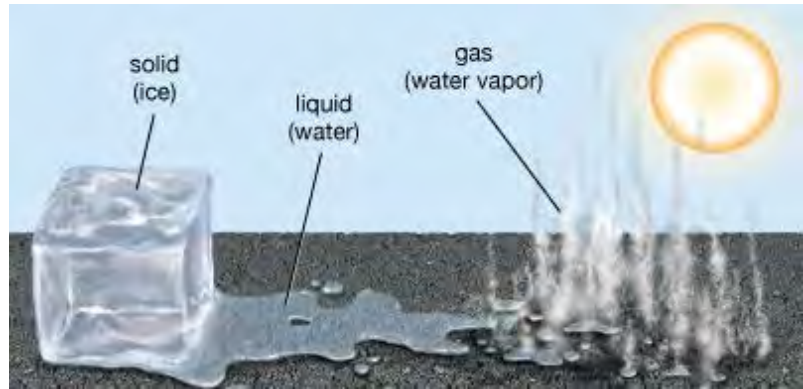
- A. angle of incident is equal to angle of refraction
- B. angle of incident is bigger than angle of refraction
- C. angle of incident is smaller than angle of refraction
- D. angle of reflection is equal to angle of refraction



Question 12

What do you call the process of the change of the states from gas to liquid?

- A. evaporation
- B. melting
- C. condensation
- D. sublimation



Question 13

Which statement on the inclined plane is NOT correct?

- A. it is also known as a slope
- B. the effort required to lift the brick when using an inclined plane is smaller than the effort required without the inclined plane
- C. a bigger force is required when using the steep inclined plane, and a smaller force is required when the inclined plane is gentle.
- D. it enables us to lift a plank of wood on a inclined plane by reducing the amount of work

End of Part A

PART B

Question 1

Bacteria that enter the body are destroyed by which type of cells?

- A. white blood cells
- B. red blood cells
- C. kidney cells
- D. lung cells

Question 2

Many seeds can germinate in the light or in the dark. State two conditions necessary for germination.

- A. Water and Air
- B. Soil and Water
- C. Sun light and Air
- D. Germ and Soil

Question 3

The following table shows the classification of some animals into two categories.

Category 1	Category 2
Rabbit	Frog
Giraffe	Spider
Elephant	Lion

Which of the following was used to classify these animals?

- A. organs used in breathing
- B. food source
- C. method of reproduction
- D. pattern of movement

Question 4

What happens to the particles (molecules) of a liquid when the liquid cools?

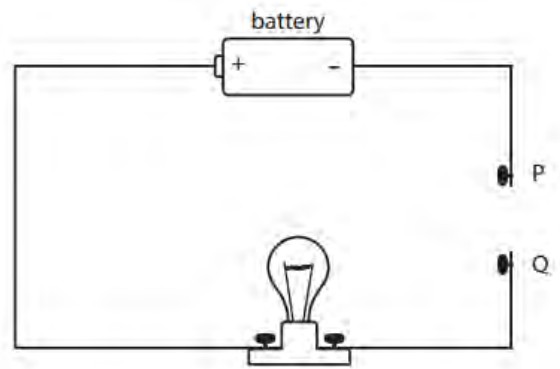
- A. They slow down.
- B. They speed up.
- C. They decrease in number.
- D. They decrease in size.

Question 5

Rods made of different materials are connected between points P and Q in the circuit diagram shown below.

Which rod would cause the bulb to light?

- A. copper rod
- B. wood rod
- C. glass rod
- D. plastic rod



Question 6

A student sets up an investigation to test the strength of magnets. He has several magnets of different sizes, shapes, and masses. He uses the magnets to lift metal paper clips. How is the strength of a magnet defined in the investigation?

- A. by the mass of the magnet lifting the metal paper clips
- B. by the size of the magnet lifting the metal paper clips
- C. by the number of metal paper clips lifted by the magnet
- D. by the time the metal paper clips stay on the magnet

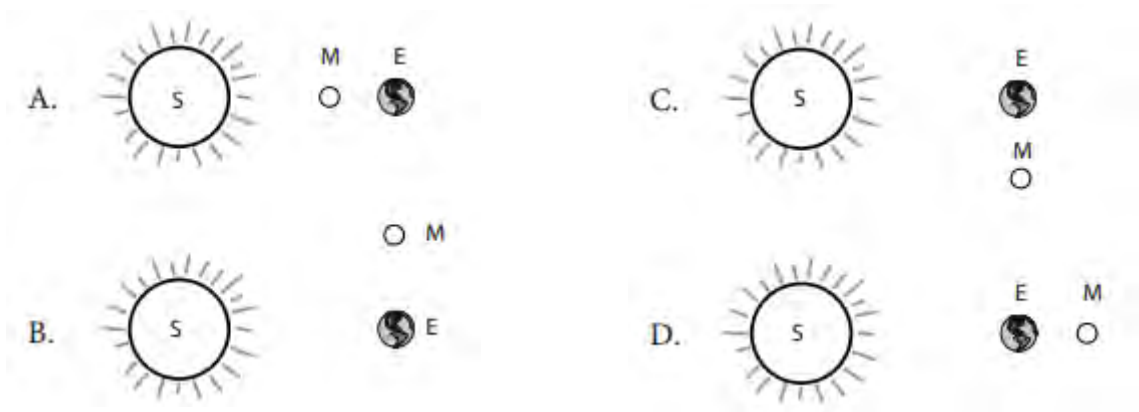
Question 7

An object has a density of 1.1 g/cm^3 . Liquid X, Y and Z have a density of 1.3 g/cm^3 , 0.9 g/cm^3 and 1.2 g/cm^3 , respectively. In which liquid would this object float?

- A. Liquid X
- B. Liquid Y
- C. Liquid Z
- D. Liquid X and Z

Question 8

Which diagram shows the position of the Sun (S), moon (M), and Earth (E) during an eclipse of the moon? (Not drawn to scale)



Question 9

Some volcanic rocks have many holes in them.

How were the holes made?

- A. Insects dug into the rock when it was soft.
- B. Gas bubbles were trapped in the rock when it cooled.
- C. Rain dropped on the rock when it was soft.
- D. Small stones fell out of the rock when it cooled.



Question 10

Which statement is NOT correct on how you can you make use of computer at school or at home?

- A. Writing documents
- B. Drawing pictures
- C. Cooking breakfast
- D. Searching information

Question 11

How often have you used laptop computers at your school or at home.

- A. Almost everyday
- B. Once in a week
- C. Once in a month
- D. Never used

Question 12

Calculate the volume of a body with 0.8 g/cm^3 and 240g.

- A. 192 cm^3
- B. 239.2 cm^3
- C. 240.8 cm^3
- D. 300 cm^3

END

Appendix A-5
JICA SIIQS Project

Maths Test for Secondary School Students (Upper Secondary)

Name: _____
First name Middle name Family name

School: _____ Class: _____ Student Number: _____

***** Sample *****

Calculate $2 + 5 =$

- A. 0 B. 7 C. 10 D. 3

Circle or ✓ here.

Choose only one answer.

1. Multiply : 302×50

- A. 1600 B. 16000 C. 1510 D. 15100

2. Calculate : $4 + 4 \div 4 - 4$

- A. 0 B. 1 C. 7 D. 8

3. Simplify : $26 - 32 + 43$

- A. 29 B. 49 C. 37 D. 101

4. Simplify : $23 - (-42)$

- A. 29 B. 21 C. -19 D. 65

5. Find the remainder of the following : $489 \div 37$

- A. 5 B. 6 C. 7 D. 8

6. Multiply : $-12 \times (-25)$

- A. 120 B. -240 C. -300 D. 300

7. Subtract : $2.201 - 0.753$

- A. 1.448 B. 1.458 C. 1.548 D. 1.558

8. Divide : $24.6 \div 0.04$.

- A. 0.615 B. 6.15 C. 61.5 D. 615

9. Multiply 0.203 by 0.56

- A. 0.1288 B. 0.01288 C. 0.11368 D. 0.011368

10. Calculate the following : $\frac{3}{8} \div \frac{3}{4}$

- A. $\frac{9}{32}$ B. $\frac{1}{2}$ C. $\frac{3}{4}$ D. $-\frac{1}{2}$

11. Simplify : $\frac{3}{4} + \left(\frac{2}{3} \times \frac{1}{4}\right)$

- A. $\frac{1}{8}$ B. $\frac{5}{16}$ C. $\frac{5}{6}$ D. $\frac{11}{12}$

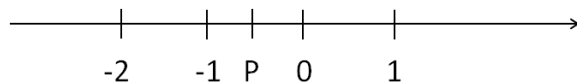
12. Which of the following fractions is the smallest? $\frac{1}{6}, \frac{2}{3}, \frac{1}{3}, \frac{1}{2}$.

- A. $\frac{1}{6}$ B. $\frac{2}{3}$ C. $\frac{1}{3}$ D. $\frac{1}{2}$

13. In which list of fractions are all of the fractions equivalent respectively?

- A. $\frac{1}{2}, \frac{2}{4}, \frac{4}{6}$ B. $\frac{2}{3}, \frac{4}{6}, \frac{8}{12}$ C. $\frac{2}{5}, \frac{4}{10}, \frac{8}{50}$ D. $\frac{3}{4}, \frac{2}{4}, \frac{4}{6}$ E. $\frac{3}{4}, \frac{4}{6}, \frac{6}{8}$

14. What number does the letter P represent on the number line below?



- A. $-\frac{3}{2}$ B. $-\frac{1}{2}$ C. $\frac{1}{2}$ D. $\frac{3}{2}$

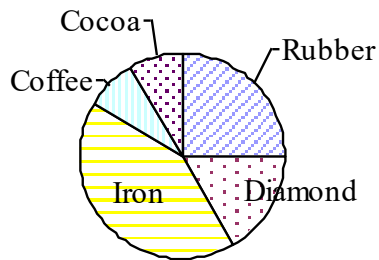
15. 20. If the ratio 7 to 13 is the same as the ratio x to 52, what is the value of x ?

- A. 7 B. 13 C. 28 D. 364

16. Change 35% to the simplest fraction.

- A. $\frac{7}{2}$ B. $\frac{7}{20}$ C. $\frac{7}{200}$ D. $\frac{7}{2000}$

17. The pie graph below shows the main export of a country. What percentage of the shaded portion of the exports is rubber?



- A. 10% B. 15% C. 20% D. 25%

18. If a , b and c are different real numbers, then which of the following is true?

- A. $a - b = b - a$
B. $a(b - c) = b(c - a)$
C. $b - c = c - b$
D. $ab = ba$

19. Find the value of x , if $12x - 10 = 6x + 32$.

- A. 5 B. 6 C. 7 D. 8

20. An American tourist wants to change \$30.00 American dollars to Rwandan francs. How much Rwf will he receive if \$1.00 exchanges for 820 Rwf?

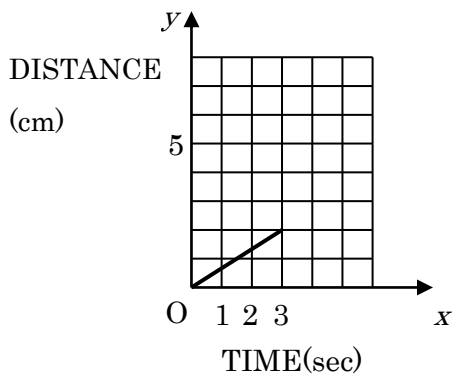
- A. 246 Rwf B. 2,460 Rwf C. 24,600 Rwf D. 820 Rwf

21. If x is proportional to y in the following table, find the value of p and q below.

x	3	6	q
y	7	p	35

- A. $p = 14, q = 31$ B. $p = 10, q = 14$
 C. $p = 10, q = 31$ D. $p = 14, q = 15$

22. This graph shows how fast an ant walks along the straight line. If this ant keeps walking at the same speed as ever, what is the distance that this ant walks in 30 seconds?



- A. 5cm B. 6cm C. 20cm D. 25cm

23. The table represents a relation between x and y . What is the missing number in the table?

- A. 9
 B. 10
 C. 11
 D. 12

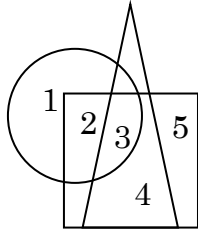
x	y
2	5
3	7
4	?
7	15

24. Calculate $\frac{1}{6}x^2 - \frac{1}{3}x - 1 = 0$

- A. ± 3 B. $1 + \sqrt{7}$ C. $1 \pm \sqrt{7}$ D. $1 \pm \sqrt{6}$

25. In the figure below, which number belongs to the square, the circle and not to the triangle?

- A. 1
- B. 2
- C. 3
- D. 4
- E. 5



26. Which is the smallest number among the following?

700mm, 6cm, 0.15m, 0.002km

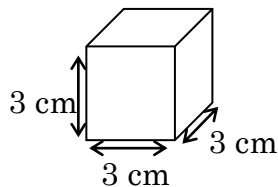
- A. 700mm
- B. 6cm
- C. 0.15m
- D. 0.002km

27. Which of the following is equivalent to $\frac{7}{6}\pi$

- A. 30°
- B. 70°
- C. 120°
- D. 210°

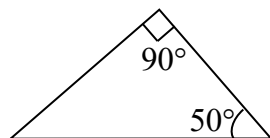
28. What is the volume of the cube below?

- A. 9 cm^3
- B. 18 cm^3
- C. 27 cm^3
- D. 64 cm^3

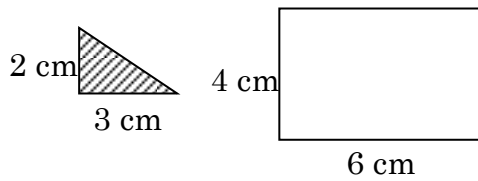


29. What is $\angle ABC$ in the triangle below?

- A. 20°
- B. 40°
- C. 50°
- D. 80°

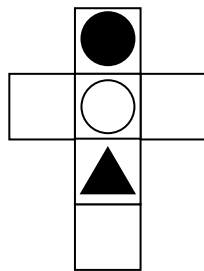


30. How many of the shaded right-angled triangles below are needed to cover exactly the surface of the given rectangle?



- A. Four
- B. Six
- C. Eight
- D. Ten

31. Which of the following cubes could be made by folding the figure below?

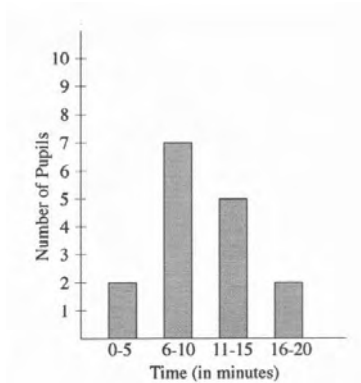


- A.
- B.
- C.
- D.

32. Find the highest common factor (HCF) and the least common multiple (LCM) of 12 and 18.

- A. HCF = 4, LCM = 36
- B. HCF = 6, LCM = 36
- C. HCF = 6, LCM = 48
- D. HCF = 8, LCM = 48

33. The graph shows the time of travel by students from home to school. How many students must travel for MORE THAN 10 minutes?



- A. 2
- B. 5
- C. 7
- D. 8
- E. 15

34. Here is the beginning of a pattern of tiles. If the pattern continues, how many tiles will be in Figure 6?



Figure 1



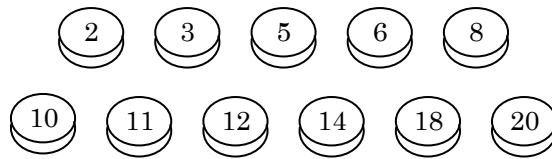
Figure 2



Figure 3

- A. 12 B. 15 C. 18 D. 36

35. The eleven chips below are placed in a bag and mixed. Emmanuel draws one chip from the bag without looking. What is the probability that Emmanuel draws a chip with a number that is a multiple of three?



- A. $\frac{1}{11}$ B. $\frac{1}{3}$ C. $\frac{4}{11}$ D. $\frac{3}{11}$

36. You are given the following sets;

$$A = \{x: x \text{ is a multiple of } 2 \text{ less than } 20\}, B = \{x: x \text{ is a multiple of } 3 \text{ less than } 20\}$$

How many elements are there in $A \cap B$?

- A. 1 B. 3 C. 6 D. 10

37. Factorise the following : $9x^2 - 25$

- A. $(3x + 5)^2$ B. $(3x - 5)^2$ C. $(3x + 5)(3x - 5)$ D. $x(9x - 25)$

38. Two vectors are such that $\mathbf{a} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} 3+k \\ 4+t \end{pmatrix}$.

If $\mathbf{a} = \mathbf{b}$, find the values of k and t .

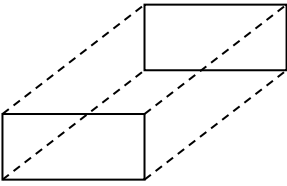
- A. $k = 0, t = 0$ B. $k = -1, t = 1$
 C. $k = 1, t = -1$ D. $k = 4, t = 3$

39. The three sides of a right-angled triangle are x , $x+1$ and 5. Find x , if the longest side is 5.

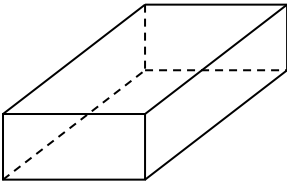
- A. $x = 5$ B. $x = -4, 3$ C. $x = 3$ D. $x = 1$

40. Which of the dotted lines in the shapes drawn below show the hidden edges of the cuboid?

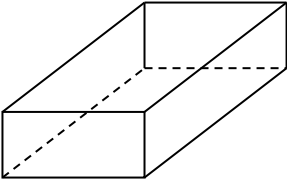
A.



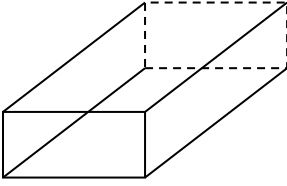
B.



C.



D.



Appendix A-6
JICA SIIQS Project

Science Test for Secondary School Students (Upper Secondary)

Name: _____
First name
Middle name
Family name

School: _____ Class: _____ Student Number: _____

PART A

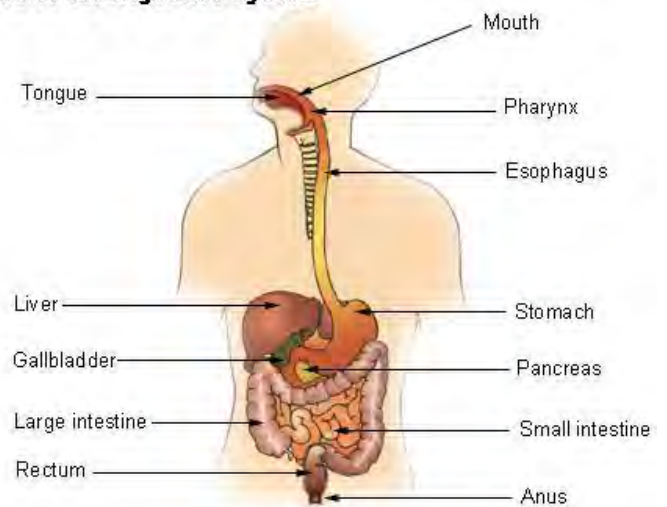
Circle the letter of the best answer choice from A, B, C and D. (Choose Only ONE Answer)

Question 1

Digestion is the process by which food is broken into simple substances which can be used by the body. It is an important process because it allows the body to get useful nutrients from the food that we eat. In which organ do we absorb important nutrition such as amino acids and glucose?

- A. stomach
- B. small intestine
- C. large intestine
- D. liver

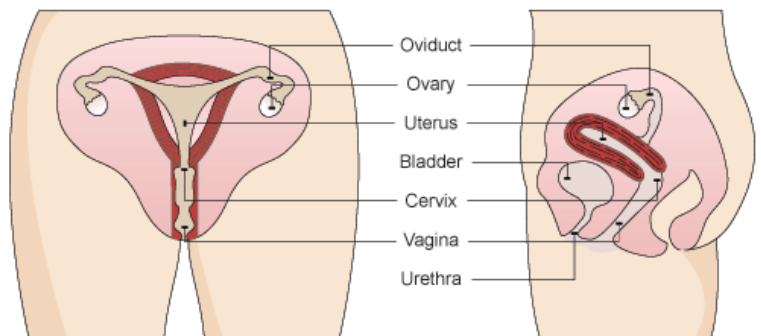
Organs of the Digestive System



Question 2

The figure below shows the female reproductive system. In which organ does fertilization take place?

- A. ovary
- B. oviduct
- C. uterus
- D. cervix



Question 3

Which of the following foods is correctly matched to its group?

- A. ground nuts → energy giving
- B. eggs → protective
- C. carrots → energy giving
- D. bananas → body building

Question 4

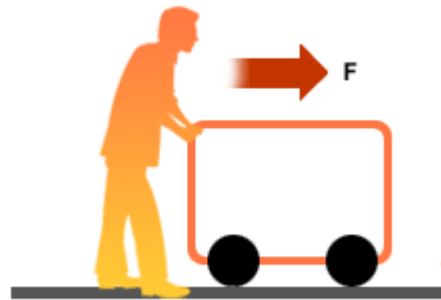
Which one of the following is the most effective preventive measure against the spread of sexually transmitted infections amongst the youth in schools?

- A. seeking medical attention
- B. use of condoms
- C. circumcision
- D. taking a shower daily

Question 5

A force of 20N pushes a box 5m in the direction of the force. Calculate the work done.

- A. 4 N/m
- B. 15 Nm
- C. 25 Nm
- D. 100 Nm



Question 6

When suspended freely, a magnet always faces

- A. Up-Down direction
- B. North-South direction
- C. West-East direction
- D. Free direction



Question 7

Below are some examples of second class levers. Which statement for the second class levers is correct?



- A. the load lies in between the effort and the fulcrum.
- B. the fulcrum is always between the load and the effort.
- C. the effort lies in between the load and the fulcrum.
- D. it can be categorized into wheel, screws and gears.

Question 8

If you have a mixture of iron filings and sand, how can you separate them?

- A. put them in water and boil them to remove sand
- B. use magnet to attract iron filings
- C. use filter to collect sand only
- D. burn them to remove iron filings and cool them down

Question 9

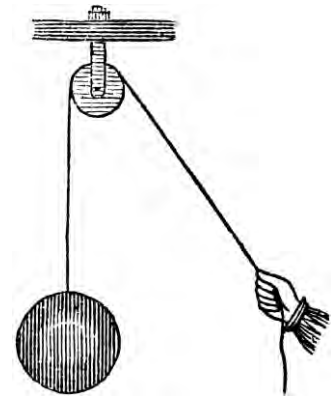
Which one of the following consists of only materials that are ALL non-magnetic?

- A. aluminium foil, piece of paper
- B. iron nails, plastic bottle
- C. piece of glass, sewing needle
- D. steel wool, water

Question 10

Which statement on the single fixed pulley is NOT correct?

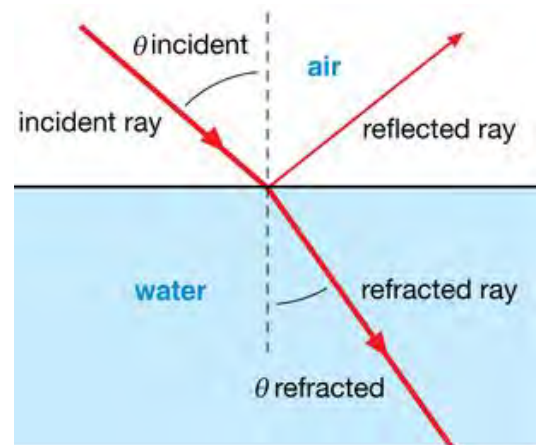
- A. it is made up of only one pulley which is fixed
- B. it reduces the effort needed and it changes the direction of the force
- C. effort distance is equal to the load distance
- D. it enables us to raise a load much higher than the person doing it



Question 11

Below is the diagram of incident ray, refracted ray and reflected ray at the boundary of air and water. Which statement is correct?

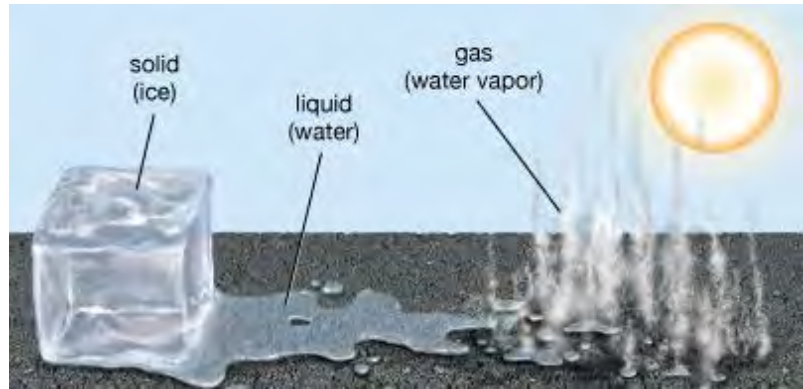
- A. angle of incident is equal to angle of refraction
- B. angle of incident is bigger than angle of refraction
- C. angle of incident is smaller than angle of refraction
- D. angle of reflection is equal to angle of refraction



Question 12

What do you call the process of the change of the states from gas to liquid?

- A. evaporation
- B. melting
- C. condensation
- D. sublimation



Question 13

Which statement on the inclined plane is NOT correct?

- A. it is also known as a slope
- B. the effort required to lift the brick when using an inclined plane is smaller than the effort required without the inclined plane
- C. a bigger force is required when using the steep inclined plane, and a smaller force is required when the inclined plane is gentle.
- D. it enables us to lift a plank of wood on a inclined plane by reducing the amount of work

End of Part A

PART B

Question 1

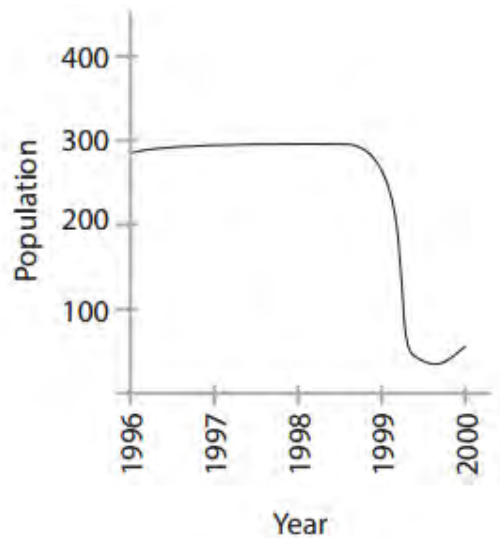
Which of the following can provide the human body with long-term immunity against some diseases?

- A. antibiotics
- B. vitamins
- C. vaccines
- D. red blood cells

Question 2

The graph indicates the number of antelopes in a certain area over a period of time. Which of the following factors is most likely to have caused the sudden change in population between 1999 and 2000?

- A. global warming
- B. absence of predators
- C. depletion of the ozone layer
- D. brush fires that destroyed the food supply



Question 3

Bacteria that enter the body are destroyed by which type of cells?

- A. white blood cells
- B. red blood cells
- C. kidney cells
- D. lung cells

Question 4

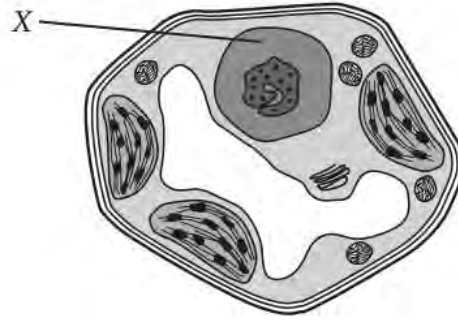
Kidneys are organs found in the human body. When he was young, a man had one of his two kidneys removed because it was diseased. He now has a son. How many kidneys did his son have at birth?

- A. 0
- B. 1
- C. 2
- D. 3

Question 5

The diagram shows a plant cell. What is the function of the part of the cell labeled X?

- A. It stores water.
- B. It makes food.
- C. It absorbs energy.
- D. It controls activities.



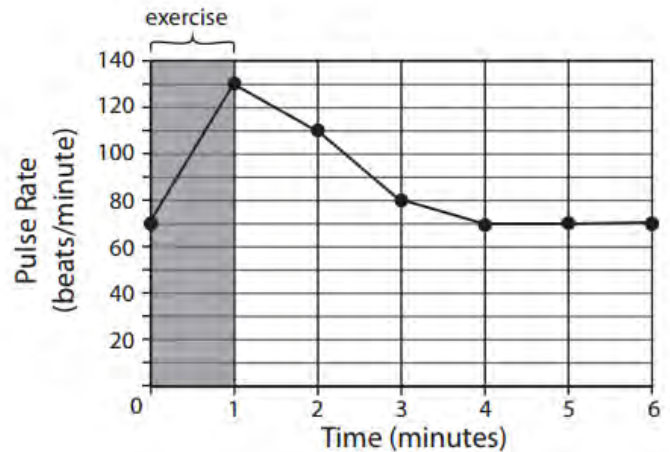
Question 6

Which equation summarizes the process of respiration?

- A. water + carbon dioxide + energy → sugar + oxygen
- B. oxygen + sugar → carbon dioxide + water + energy
- C. carbon dioxide + oxygen + water → sugar + energy
- D. sugar + carbon dioxide + energy → oxygen + water

Question 7

John measures his pulse rate before he exercises. It is 70 beats per minute. He exercises for one minute and measures his pulse rate again. He then measures it every minute for several minutes. He draws a graph to show his results.



What can be concluded from his results?

- A. His pulse rate increased by 50 beats per minute.
- B. His pulse rate took less time to slow down than to increase.
- C. His pulse rate after 4 minutes was 80 beats per minute.
- D. His pulse rate returned to normal in less than 6 minutes.

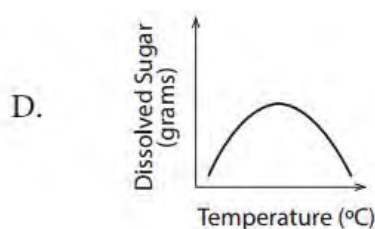
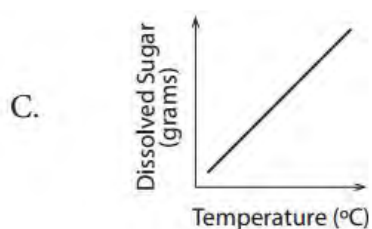
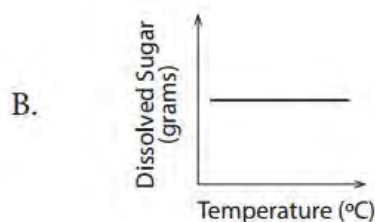
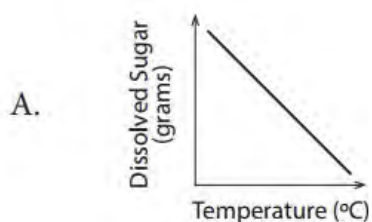
Question 8

Twins are born. One is a boy and one is a girl. Which statement is correct about their genetic makeup?

- A. The boy and the girl inherit genetic material from the father only.
- B. The boy and girl inherit genetic material from the mother only.
- C. The boy and girl inherit genetic material from both parents.
- D. The boy inherits genetic material from the father only and the girl inherits it from the mother only

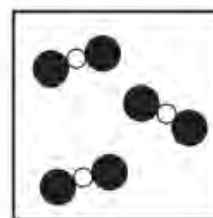
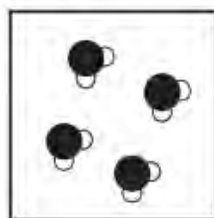
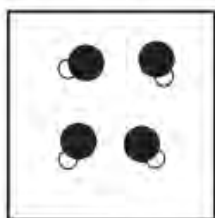
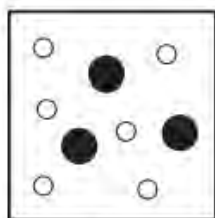
Question 9

Bob did an experiment to investigate the effect of temperature on the solubility of sugar in water by measuring the amount of sugar that would dissolve in 1 liter of water at different temperatures. He then plotted his results. Which of the following is likely to be the graph showing Bob's results?



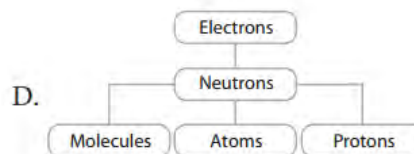
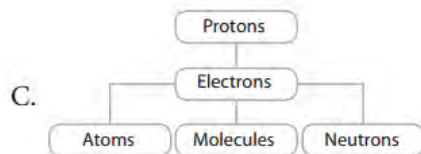
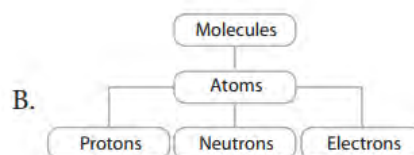
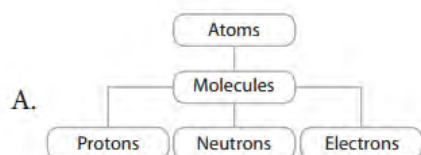
Question 10

In the diagrams below, hydrogen atoms are represented by white circles, and oxygen atoms are represented by black circles. Which of the diagrams best represents water?



Question 11

Which of these diagrams best represents the structure of matter, starting with the more complex particles at the top and ending with the more fundamental particles at the bottom?



Question 12

Some physical properties of five different substances (A, B, C, D, and E) are outlined in the table below.

	Substance A	Substance B	Substance C	Substance D	Substance E
Physical state at room temperature (20°C)	Solid	Solid	Liquid	Liquid	Gas
Appearance/ colour	Shiny grey	White	Silver	Colourless	Colourless
Conducts electricity	Yes	No	Yes	Yes	No

Which substances are metal?

- A. Substance A, B and C
- B. Substance A and B
- C. Substance C and D
- D. Substance A and C

Question 13

Which of the following energy conversions takes place in a battery-operated flashlight?

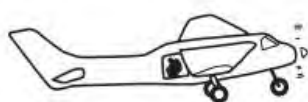
- A. electrical → mechanical → light
- B. chemical → mechanical → light
- C. chemical → electrical → light
- D. nuclear → electrical → light

Question 14

The figure shows a parachute jumper in four positions.

In which of the positions does the force of gravity act on the jumper?

- A. Position 2 only.
- B. Positions 2 and 3 only.
- C. Positions 1, 2 and 3 only.
- D. Positions 1, 2, 3, and 4.



1. In the aircraft before the jump



2. In freefall immediately after jumping before parachute opens



3. Falling to the ground after the parachute opens



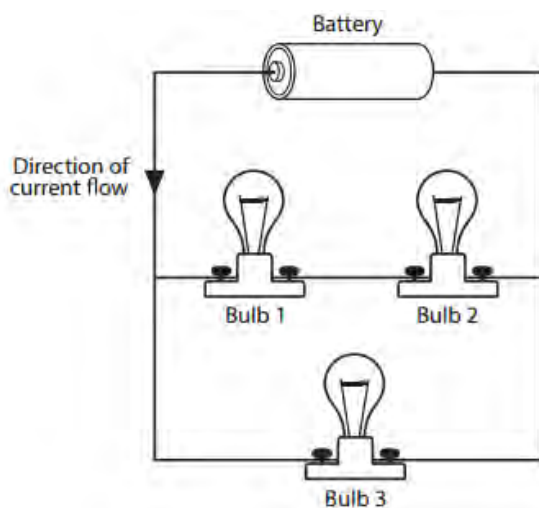
4. On the ground just after landing

Question 15

Three identical light bulbs are connected to a battery as shown in the diagram. The arrow indicates the direction of the current flow.

Which statement is true?

- A. The current in Bulb 1 is greater than the current in Bulb 2.
- B. The current in Bulb 1 is greater than the current in Bulb 3.
- C. The current in Bulb 2 is the same as the current in Bulb 3.
- D. The current in Bulb 2 is the same as the current in Bulb 1.



Question 16

A man climbed to the top of a very high mountain. While on the mountain top, he drank all the water in his plastic water bottle and then put the cover back on. When he returned to camp in the valley, he discovered that the empty bottle had collapsed. Which of the following best explains why this happened?

- A. The temperature is lower in the valley than on the mountain top.
- B. The temperature is higher in the valley than on the mountain top.
- C. Air pressure in the valley is lower than on the mountain top.
- D. Air pressure in the valley is higher than on the mountain top.

Question 17

A student sets up an investigation to test the strength of magnets. He has several magnets of different sizes, shapes, and masses. He uses the magnets to lift metal paper clips. How is the strength of a magnet defined in the investigation?

- A. by the mass of the magnet lifting the metal paper clips
- B. by the size of the magnet lifting the metal paper clips
- C. by the number of metal paper clips lifted by the magnet
- D. by the time the metal paper clips stay on the magnet

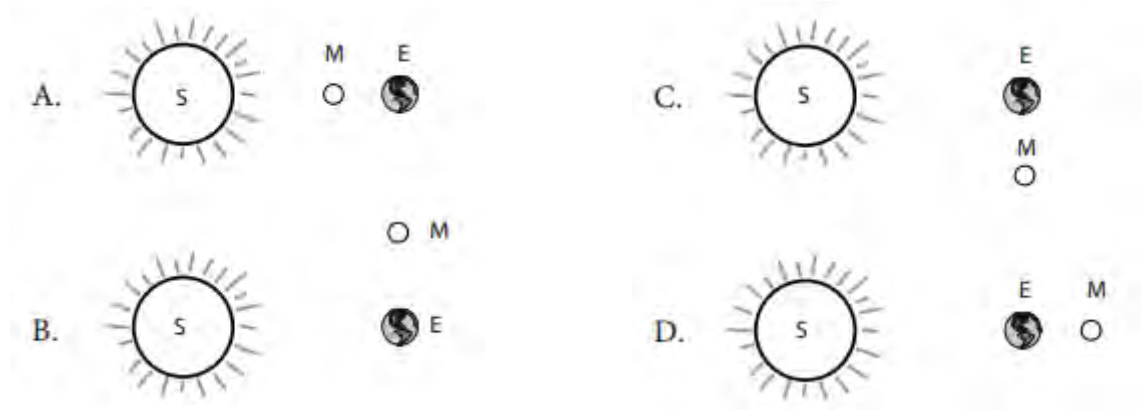
Question 18

Which of the following is the major cause of tides?

- A. heating of the oceans by the Sun
- B. gravitational pull of the Moon
- C. earthquakes on the ocean floor
- D. changes in wind direction

Question 19

Which diagram shows the position of the Sun (S), moon (M), and Earth (E) during an eclipse of the moon? (Not drawn to scale)



Question 20

Which statement is NOT correct on how you can you make use of computer at school or at home?

- A. Writing documents
- B. Drawing pictures
- C. Cooking breakfast
- D. Searching information

Question 21

How often have you used laptop computers at your school or at home.

- A. Almost everyday
- B. Once in a week
- C. Once in a month
- D. Never used

Question 22

Calculate the volume of a body with 0.8 g/cm^3 and 240g.

- A. 192 cm^3
- B. 239.2 cm^3
- C. 240.8 cm^3
- D. 300 cm^3

END

Appendix B
Questionnaire to School Teachers



Appendix B

Questionnaire to School Teachers

This is the questionnaire for the endline survey of the JICA SIIQS Project. The Project aims at strengthening training program for in-service teachers.

1. Basic Information

- 1.1 School Name: _____
- 1.2 Sector: _____ 1.3 District: _____
- 1.4 Your Name: _____
- 1.5 Male or Female: M F 1.6 Age: _____ years old
- 1.7 Tel: _____ 1.8 E-mail: _____
- 1.9 Teaching Experience: (a) In this school: _____ years (b) In total: _____ years
- 1.10 Qualification: A0 / A1 / A2 / Others
- 1.11 Level of students you are teaching this term (multiple choices are allowed)
P1 / P2 / P3 / P4 / P5/ P6/ S1 / S2 / S3 / S4 / S5/ S6
- 1.12 Subjects you are teaching this year: _____
- 1.13 Your department in school: _____
- 1.14 (a) Are you a School-based Mentor (SBM)? Yes / No
(b) Are you a School Subject Leader (SSL)? Yes / No
(c) Are you a Sector-based Mentor Trainer (SBMT, MT) Yes / No
(d) Are you a Sector-based Trainer (SBT)? Yes / No
- 1.15 How many periods do you teach **per week** in this term? _____ periods/week

2. Competence-Based Curriculum (CBC)

2.1 When you prepare lessons, what document(s) do you normally* use? (multiple choices are allowed). **please tell about your ordinally situation in your daily work*

0. None 1. Curriculum booklets 2. Syllabus 3. CBC textbooks authorized by REB
 4. Old textbooks (for KBC) 5. Reference books 6. Reference materials (hard copy)
 7. Reference materials (soft copy) 8. Information on Internet
 9. Others – Please specify: _____

2.2 Please circle the number from 1 to 4 which most fits you.

	Strongly disagree	Disagree	Agree	Strongly agree
(a) I understand the philosophy of CBC.	1	2	3	4
(b) I am confident in conducting CBC lessons	1	2	3	4
(c) My understanding of CBC has improved since the introduction of CBC.	1	2	3	4

2.3 When you evaluate another teacher’s lesson, what point(s) do you observe in particular?

2.4 Please circle the number from 1 to 4 which most fits your opinion.

	Strongly disagree	Disagree	Agree	Strongly agree
(a) CBC should always include groupwork.	1	2	3	4
(b) Lesson conclusion should be given by teacher.	1	2	3	4
(c) Blackboard writing should be erased when students solve assessment question at the end of a lesson.	1	2	3	4
(d) When a student gives a wrong answer, teacher should call another student to get correct answer immediately.	1	2	3	4
(e) When students do not understand a concept, it is because students do not study harder.	1	2	3	4
(f) When students do not understand a concept, it is because the teacher did not use effective strategies.	1	2	3	4
(g) Teachers should rely on students’ oral responses than students’ face expressions and behaviors for formative assessment.	1	2	3	4
(h) To treat learners equal, teachers should provide the same instruction to all learners regardless of their understanding.	1	2	3	4
(i) Calling on students purposefully who make mistakes is good learning opportunities for the class.	1	2	3	4
(j) I encourage my students to explain why they reached a certain answer in my class.	1	2	3	4
(k) I give students enough time to think before they answer a question.	1	2	3	4
(l) I encourage my students to apply their learning to real life situations.	1	2	3	4
(m) Good questions should have only one correct answer.	1	2	3	4
(n) Students should respond to questions immediately.	1	2	3	4
(o) Lesson should introduce one particular and standard solution only.	1	2	3	4

2.5 What challenges do you have in delivering lessons expected in CBC?

3. Continuous Professional Development (CPD)

3.1 Does your school have CPD time in your timetable?

0. No 1. Yes (How many periods?) _____ periods

3.2 Does your school conduct CPD regularly?

0. never 1. once a term 2. twice a term 3. three times or more a term

3.3 How frequently do you attend CPD activities at your school?

1. Regularly 2. Sometimes 3. Never 4. We don't have CPD at school.

4. Perception on School Management

4.1 Please circle the number from 1 to 5 which most fits your opinion.

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	My head teacher is supportive in improving teaching and learning in my school.	1	2	3	4	5
2	School-based Mentor (SBM) in my school helps me improve my lesson.	1	2	3	4	5
3	School Subject Leader (SSL) in my school helps me improve my lesson.	1	2	3	4	5
4	I often receive advice/consultation from my colleagues to improve my teaching.	1	2	3	4	5
5	I often give advice/consultation to my colleagues to improve their teaching.	1	2	3	4	5
6	I am willing to share my good lesson practice with my colleagues.	1	2	3	4	5
7	I use the feedback/advice given by my colleague to improve my teaching and learning process.	1	2	3	4	5
8	School activities are proceeded as planned in my school.	1	2	3	4	5
9	Results from national examination are analyzed by all teachers together.	1	2	3	4	5
10	I usually contact to my students' parents/guardians from my side to talk about students' performance.	1	2	3	4	5
11	My students' parents/guardians contact me from their side to talk about students' performance.	1	2	3	4	5
12	The vision/mission of my school is/are clearly stated.	1	2	3	4	5
13	The vision/mission of my school is shared within school community members.	1	2	3	4	5
14	I make my effort to attain the vision/mission of my school.	1	2	3	4	5
15	There are clear aims or objectives in my school.	1	2	3	4	5
16	The objectives and plans are achieved successfully in my school.	1	2	3	4	5
17	Objectives and plans are developed based on evidence and data in my school.	1	2	3	4	5

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
18	The school leaders encourage us to give some comments/ ideas to contribute school improvement.	1	2	3	4	5
19	There is cooperative system among different subjects in my school.	1	2	3	4	5
20	My opinions often contribute to the process of making decision in my school.	1	2	3	4	5

Thank you for your cooperation.

Appendix C
Questionnaire to Head Teachers

Appendix C

Questionnaire to Head Teachers

This is the questionnaire for end line survey for JICA SIIQS Project. The Project aims at strengthening training program for in-service teachers.

1. Basic Information

1.1 School Name: _____

1.2 Sector: _____ 1.3 District: _____

1.4 Type of School: Primary / 9YBES / 12YBES / SS

1.5 Type of ownership: Public / Government-aided / Private

1.6 Your Name: _____

1.7 Male or Female: M F 1.8 Age: _____ years old

1.9 Tel: _____ 1.10 E-mail: _____

1.11 Experience: (a) Head teacher: _____ years (b) In total: _____ years

1.12 Qualification: A0 / A1 / A2 / Others

1.13 Number of teachers in your school

		Male	Female	Total
Primary	Qualified			
	Non qualified			
Secondary	Qualified			
	Non qualified			

1.14 Number of mathematics and science teachers in your school

		Male	Female	Total
Mathematics	Qualified			
	Non qualified			
Science	Qualified			
	Non qualified			

1.15 Number of students

Grade	Classes	No of Students			No of repeaters			No of drop-outs		
		Boy	Girl	Total	Boy	Girl	Total	Boy	Girl	Total
P1										
P2										
P3										
P4										
P5										
P6										
S1										
S2										
S3										
S4										
S5										
S6										
Total										

1.16 Do you have the following resources? How many do you have?

a. Curriculum book	1. <u>for all teachers</u>	2. <u>for some teachers</u>	3. <u>for few teachers</u>	4. <u>none</u>
b. Syllabus	1. <u>for all subjects</u>	2. <u>for some subjects</u>	3. <u>for few subjects</u>	4. <u>none</u>
c. Textbooks	1. <u>for all subjects</u>	2. <u>for some subjects</u>	3. <u>for few subjects</u>	4. <u>none</u>

2. Competence-Based Curriculum (CBC)

2.1 To what extent has teachers' practice changed since the introduction of CBC?

0. Not at all 1. Slightly 2. Moderately 3. Very much

2.2 Do teachers have challenges in delivering lessons expected in CBC?

3. Continuous Professional Development (CPD)

3.1 Does your school have CPD time in teachers' timetable?

0. No 1. Yes (How many periods?) _____ periods

3.2 How frequently does your school conduct CPD?

0. never 1. once a term 2. twice a term 3. three times or more a term

3.3 Do all teachers in your school attend CPD?

1. Yes, all of them attend. 2. Yes, most of them attend.
 3. Yes, a few of them attend. 4. We don't conduct CPD at school.

3.4 What support do you give to promote CPD in your school?

3.5 Please evaluate CPD at your school. (Tick one per row)

	Very poor	Poor	Good	Excellent	Not applicable
Preparation					
Active participation of teachers					
Trainer/Facilitator's skills					
Time management					
Facilities					
Materials					

3.6 If your school have conducted CPD in this term, please specify the theme/topic.

3.7 If your school did not conduct CPD in this term, please specify the reason.

Appendix D
Interview Record Sheet
for Semi-Structured Interview
for Group of Teachers

Appendix D

Interview Record Sheet for Semi-Structured Interview for Group of Teachers

Date	
School Name	
Type of School (Circle one)	Primary 9YBES 12YBES SS
Name of the Interviewer	
Name of the Recorder	
Number of Participants	

Topic 1: Implementation of CBC

- (1) Do you think you understand CBC well and you are able to teach in the way expected in CBC? What are the important components/elements of CBC? How is CBC different from previous Curriculum (KBC)? Assessing your current teaching against CBC you have defined above, what marks out of 100 do you give to your teaching? Why?

- (2) Do you think you have changed the way you teach since the introduction of CBC? What are the major changes/differences in your teaching before and after the introduction of CBC?

- (3) What made such changes happen? (CBC training, CPD activities at school, etc.?)

(4) What are the major problems on implementation of CBC (Particularly in math and science)?**Topic 2: CPD****(1) Does your school conduct CPD? If yes, what kind of activities do you do? If not, what is the reason?**

If yes:

- Is CPD time fixed? If yes, when and how often (day of the week/month, time duration)?
- Who facilitates the CPD meetings?
- What do you do in CPD meetings? What was the topic of the most recent CPD?
- Do you use any materials?
- Do you keep record of CPD meetings? (If yes, a photo is appreciated)

(2) Are there any challenges in conducting CPD? Do you think CPD is sustainable in your school?

Appendix E
Interview Record Sheet
for Semi-Structured Interview
for Head Teachers

Appendix E

Interview Record Sheet for Semi-Structured Interview for *HT*

Date	
School Name	
Type of School (Circle one)	Primary 9YBES 12YBES SS
Name of the Interviewer	
Name of the Recorder	

Topic 1: Implementation of CBC

(1) What changes have you found in the way teachers teach since the introduction of CBC? Do you think teachers have delivered lessons as expected in CBC?

(2) What are the major problems on implementation of CBC at your school (Particularly in math and science)?

Topic 2: CPD**(1) Does your school conduct CPD? If yes, what kind of activities do teachers do? If not, what is the reason?**

If yes:

- Is CPD time fixed? If yes, when and how often (day of the week/month, time duration)?
- Who facilitates the CPD meetings?
- What do you do in CPD meetings? What was the topic of the most recent CPD?
- Do you use any materials?
- Do you keep record of CPD meetings? (If yes, a photo is appreciated)

(2) Do you participate in CPD meetings? In what way do you support CPD?**(3) What do you think is your role as HT to promote CPD? Is it easy or difficult to perform?**

(4) Do you think CPD is effective in improving teaching and learning? Do you think CPD is sustainable in your school? Why do you think so?

(5) Are there any challenges in conducting CPD? Have you ever reported the challenges to SEO to solve?

Appendix F
Interview Record Sheet
for Semi-Structured Interview
for SCCs of sectors
where model schools are located

Appendix F

Interview Record Sheet for Semi-Structured Interview for SCCs of sectors where model schools are located

Date	
District/Sector	District: _____ Sector: _____
Interviewee's Name	
Position	
Name of the Interviewer	
Name of the Recorder	

(1) Is the SCC established in this sector? Do you have SCC plan? (check if it is available), What is the main objective? Who participated in the development of SCC plan? Did you refer to DCC plan when making SCC plan?

(2) How frequently do SCC member meet? Who organizes the meeting? who chair the meeting? Who attended Do you make meeting minutes? (check if they are filed if yes)

(3) From the last SCC meeting, what are the key action points taken? Are those action points being implemented? Who is making the follow up? What have been achieved so far?

(4) What are issues/ or challenges resolved through SCC meeting and or activities

(5) Does SCC plan and organize CPD activities? If so, what kind of activities does it organize?

(6) In what way does SCC monitor and review CPD activities taking place at each school? (ex. School visit, review of CPD report submitted by schools) Do you provide advice/recommendation for HTs?

(7) Your sector is one of sectors having JICA's model schools where Lesson Study has been piloted.... Was lesson study helpful in improving teaching practices in the model school? Do you have a plan to disseminate it in other schools as well?

(8) What are the measures to sustain Lesson Study program?

(9) Do you have any SCC good practices in your sector to share?

(10) How does your SCC collaborate with DCC? Is there any communication /reporting channel between DCC and SCC? In what way, can it be improved?

(11) What support do you need to effectively implement SCC activities? What are the suggestion for improvement? (What is needed to make SCC more active?)

Appendix G

Lesson Plans Developed in Lesson Study

G-1: EP Buhande P5 math

G-2: Mukarange Catholique P5 math

G-3: EP Buhande P5 SET

G-4: GS Mukarange Catholique P5 SET

G-5: GS Mukarange Catholique S2 math

G-6: GS APAGIE Musha S2 math

G-7: GS Mukarange Catholique S2 biology

G-8: GS APAGIE Musha S2 biology

G-9: GS APAGIE Musha S5 math

G-10: GS NDA Rwaza S5 math

G-11: GS APAGIE Musha S4 chemistry

G-12: GS NDA Rwaza S4 chemistry

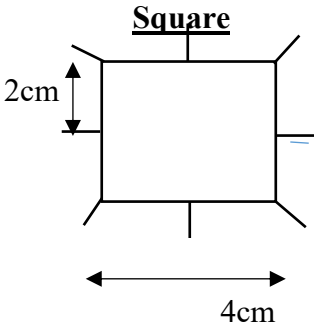
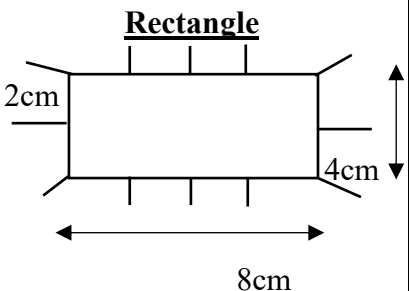
Appendix G-1

LESSON PLAN

School name: BUHANDE primary school

Teacher's name. Ujeneza Seraphine

Term	Date	Subject	Class	Unit N ^o	Lesson N ^o	Duration	Class size	
II	12-06-2019	Math	P5A	7	3 out of 3	40 min	45	
Type of Special Educational Needs to be catered for in this lesson and number of learners in each category								
Unit title		Solving problems involving measurements of lengths, capacity, and mass						
Key Unit Competence		To be able to solve problems involving measurements of length, learners will be able to calculate the number of intervals						
Title of the lesson		Finding of intervals on a closed line						
Instructional Objective		By using a chalkboard, pieces of chalk, ruler, tape measure and stones, learners will be able to calculate the number of intervals on a closed line confidently in a given time						
Plan for this Class (location: in / outside)		Inside and outside						
Learning Materials (for all learners)		Chalkboard, pieces of chalk, ruler, tape measure, stones, and manila paper						
References		Mathematics for Rwanda schools textbook p 118-119, teacher's guide p 162-163						
Timing for each step		Description of teaching/learning activities				Generic competences and rule. issues to be addressed +		
		Organizing a class, introducing the lesson, giving instruction, guiding learners outside, presenting teaching aids, discuss the activity done, finding out the.....						
		Teacher's activities		Learner's activities		a short explanation		
1. Introduction (5min)		Ask questions about the previous lesson A road is 2km long, trees were planted 2m apart from one side of the road an interval of 2m was left at one end without a tree due to an existing shop, how many trees were planted along the road?		Answering questions Distance; 8km Interval length; 2m Number of trees= $2\text{km}/2\text{m}$ $=2000\text{m}/2\text{m}$ $=1000$ trees		Critical thinking developed through answering question		
Development of the lesson (30 min)	2.1 discovery activities (10 min)		Giving instructions Going out politely without documents Presenting teaching aids - ruler - stones - tape measure Grouping learners in 4 groups Giving tasks		Follow instructions Observing teaching and learning materials Joining their groups Doing tasks - two groups draw and measure square - other two groups draw and measured the rectangle		Communication developed through working together in their groups	

		<ul style="list-style-type: none"> - they fix the poles - they record and measure the intervals found on the drawings 	
<p>2.2 presentation learners' findings production (10 min)</p>	<p>Ask questions related to what they have done</p> <ul style="list-style-type: none"> - What types of lines do we have? - How long is the distance for squares? - How long is one length? <ul style="list-style-type: none"> - How many intervals were left for square? - How many were left for a rectangle? <ul style="list-style-type: none"> - By considering the length of distance and length of one interval how can we calculate the number of interval on a closed line? 	<p>Answering question</p> <p>Closed line</p> <p>Distance for square is 16m</p> <p>Distance for the rectangle is 24m</p> <p>One interval is 2m</p> <p>8 intervals</p> <p>12 intervals</p> <p>Number of intervals on a closed line = distance divide by interval length</p>	<p>Gender enhance through measuring question both girls and boys</p>
<p>2.3 exploitation findings production (5 min)</p>	<p>Tell pupils to enter a classroom</p> <p>Ask questions about what we have studied outside</p> <p>Presenting manila paper where written square</p> <p>Ask questions about drawing</p> <ul style="list-style-type: none"> - Is that figure open or closed? - What is its distance? - How long is one interval? - How many intervals and poles are there? <p>Presenting manila paper where written rectangle</p>	<p>Answering questions</p> <p>Number of intervals on a closed line</p> <p style="text-align: center;">Square</p>  <p style="text-align: center;">Closed</p> <p>16m</p> <p>2cm</p> <p>8 intervals and 8 poles</p> <p style="text-align: center;">Rectangle</p> 	<p>Communication developed through answering questions</p>

	<p>Ask questions about the rectangle</p> <ul style="list-style-type: none"> - How is the distance? - How long is one interval? - How many intervals are there? - Finding the number of poles are there 	<p>Distance = 24cm One interval = 2cm</p> <p>They are 12 poles</p>	
2.4 conclusion/summary (5min)	Taking summary with learners	<p>Taking notes On every closed line or field Number of intervals = number of poles</p> <p>Distance = number of intervals x interval length</p> <p>Number of intervals = distance divide by interval length</p>	Communication through answering the asked question
3. assessment (5min)	Giving individual activity for evaluation	<p>Answering in their exercises notebook</p> <ul style="list-style-type: none"> - In a town, a square plot has sides of 50m. Poles were fixed to fence it at intervals of 2m, how many poles were used? - How many intervals were left there? <p>Side = 50m Distance = $50 \times 4 = 200$ Interval length = 2m</p> <p>Number of poles = distance/length of interval Number of poles = $200\text{m}/2\text{m}$</p> <p>They are used 100 poles They left 100 intervals</p>	Critical thinking developed Through think and answer the asked question
Observation of lesson			


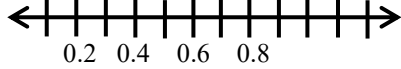
Appendix G-2

LESSON PLAN

School name: G.S Mukarange Catholique

Teacher's name. Mukankwaya Beata

Term	Date	Subject	Class	Unit N°	Lesson N°	Duration	Class size
II	10-06-2019	Maths	P5B	5	3 of 8	40 min	68
Type of Special Educational Needs to be catered for in this lesson and number of learners in each category							
Unit title		Multiplication and division of decimal numbers					
Key Unit Competence		To be able to multiply, divide, and compare decimal numbers up to 3 decimal places					
Title of the lesson		Comparing decimal numbers					
Instructional Objective		By using a number line and decimal place, the learners should be able to compare 2 or more decimal number $<$, $>$, or $=$ correctly					
Plan for this Class (location: in / outside)		In this class by sitting in a u-shaped arrangement					
Learning Materials (for all learners)		Place value chart, chalk board, comparison, terms in manila paper					
References		Mathematics for Rwandan primary school, pupils book page 91-92					
Timing for each step		Description of teaching/learning activities					Generic competences and Cross-cutting issues to be addressed + a short explanation
		Teacher's activities		Learner's activities			
1. Introduction (10min)		Greeting and asking questions which are revising what the learners learn to decimal numbers. Q1) Present the place value of the digit 3. a)0.023 b)35.964 c)925.37 d)4.034		Greeting and answering questions asked by their teacher. Answer a)0.023, the place value of 3 is thousandths. b)35.964, the place value of is tens. c)925.37, the place value of 3 is tenths. d)4.034, the place value of 3 is hundredths.		Communication is developed And, answering questions	
2. Development of the lesson (20 min)		- Asking the individual learner to compare decimal numbers Looking around the students who are struggling and note their mistake and errors		- Answering questions		-gender -cooperation -communication	

	<ul style="list-style-type: none"> - Arrange groups based on the observation (mixing slower and good performers to repeat the activity) - Record time for activity <p>Q1) Use $<$, $>$ or $=$, to fill the blanks.</p> <p>a) $0.005 \dots 0.007$ b) $0.9 \dots 0.8$ c) $0.77 \dots 0.770$ d) $3.40 \dots 3.040$</p> <p>Q2) Asks learners to copy and complete the number line below.</p>  <ul style="list-style-type: none"> - Checks the progress of slow learners understanding in group 	<ul style="list-style-type: none"> - Forming groups and do questions <p>Answer</p> <p>a) $0.005 < 0.007$ b) $0.9 > 0.8$ c) $0.77 = 0.770$ d) $3.40 > 3.040$</p> <p>Copy and complete the number line</p>  <p>Helping each other</p>	-critical thinking
3. conclusion/ summary (10min)	Together with learners, summarizes the lesson and gives them the homework.	Summarizes the lesson and copy the homework to the exercises book.	Problem-solving
Observation on lesson delivery (to be completed by the teacher)			

Appendix G-3

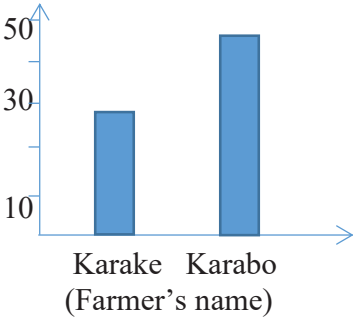


LESSON PLAN

School Name: EP Buhande

Teacher's name: Mwiseneza Bernard

Term	Date	Subject	Class	Unit N°	Lesson N°	Duration	Class size
II	13/06/2019	SET	P5A	9	6 of 8	40min	46
Type of Special Educational Needs to be catered for in this lesson and number of learners in each category				Take care of slow learners			
Unit title		Soil					
Key Unit Competence		To be able to prepare soil cultivation and use of fertilizers					
Title of the lesson		Importance of fertilizers					
Instructional Objective		By observing various plants such as beans and sorghum, learners Primary 5 will be able to give importance of fertilizers in a given time					
Plan for this Class (location: in / outside)		In classroom					
Learning Materials (for all learners)		Beans, sorghum, sweet potatoes, cabbage, soil					
References		Pupils book, page 205					
Timing for each step	Description of teaching/learning activities						Generic competences and Cross-cutting issues to be addressed + a short explanation
	With various teaching aids (plants) learners will understand the importance of fertilizers with respective size and colour.						
	Teacher's activities			Learner's activities			
1. Introduction (5min)	Asking questions about the previous lesson - What did we study last time? - What are the steps of soil preparation of cultivation? - Give two types of fertilizers.			Answering questions - Fertilization - Land clearing - Primary cultivation - Secondary cultivation - Leveling soil - Organic fertilizer - Chemical fertilizer			- Communication through answering questions

<p>2. Development of the lesson (22min)</p> <p>2.1 Discovery activities (2min)</p>	<p>Presenting plants: beans, sorghum and asking questions about size and color</p> <p>- Why do you think the plants are different in color and size?</p> <p>- Is it important to use fertilizers?</p> <p>- What is the importance of fertilizer?</p> <p>Grouping learners in 7 groups and give them a task for each group</p> <p>Distributing teaching aids and guide learners.</p> <p>Group 1 Group 2 Group 3 Group 4 Group 5 Group 6 Group 7</p>	<p>Observing</p> <p>Answering questions:</p> <p>Some plant grows on the land where fertilizer was not used and others grow on the land where fertilizer was added</p> <p>Yes</p> <p>????</p> <p>Sitting in groups Discuss in groups</p> <p>Discuss soil Discuss leaves' color Discuss plant size Discuss holes on the leaves Discuss production Discuss size Discuss about color</p>	<p>- Communication developed through discussion</p>
<p>2.2 Presentation learners' findings production (...min)</p>	<p>Guiding learners discussion Rewarding learners</p>	<p>Presenting their findings from Group 1 to 7 Follow the presentation</p>	<p>- Gender balance by the presenter both girls and boys - Communication developed through presentation</p>
<p>2.3 Exploitation findings production (...min)</p>	<p>Ask presenter according to what he/she presented and asking also members of the group</p> <p>Rewarding good answer and disagree to a false answer</p> <p>Writing the best answers on the blackboard</p>	<p>Answering Follow the teacher explanation</p> <p>- It improves soil fertility - It provides nutrition to plants - It improves the growth of plants - It increases agricultural fertility - It increases productivity</p>	<p>- Environment and sustainability by giving importance of fertilizers</p>

2.4 Conclusion/ summary (5min)	<p>Asking the learners to read the importance of fertilizers</p> <p>Help the learners by repetition</p> <p>Request learners to write notes</p>	<p>- Reading</p> <p>- Repeating</p> <p>- Writing notes in their notebook</p>	<p>- Communication</p>						
3. Assessment (5min)	<p>Asking questions individually</p> <p>1. Amount of potato harvested (in Kg)</p>  <table border="1"> <thead> <tr> <th>Farmer's name</th> <th>Amount of potato harvested (in Kg)</th> </tr> </thead> <tbody> <tr> <td>Karake</td> <td>25</td> </tr> <tr> <td>Karabo</td> <td>45</td> </tr> </tbody> </table> <p>a) Which farm did use fertilizer properly?</p> <p>b) Why?</p> <p>c) What Karake do to increase his production?</p> <p>2. What did happen to the cabbage A?</p> <p>A.</p>  <p>B.</p> 	Farmer's name	Amount of potato harvested (in Kg)	Karake	25	Karabo	45	<p>Learners perform test individually</p> <p>a) Karabo</p> <p>b) She harvested more potatoes than Karake</p> <p>c) Uses fertilizers</p> <p>2. No fertilizers added</p>	<p>- Critical thinking through answering questions</p>
Farmer's name	Amount of potato harvested (in Kg)								
Karake	25								
Karabo	45								
Observation on lesson delivery									

Appendix G-4

LESSON PLAN

School Name: G.S MUKARANGE CATHOLIQUE

Teacher's Name: Gasana Jean Pierre

Term	Date	Subject	Class	Unit N ^o	Lesson N ^o	Duration	Class size
II	10/06/2019	SET	P5C	9	4 of 7	40min	55
Type of special education needs to be catered for in this lesson and the number of learners in each category				-			
Unit title	Soil						
Key Unit competence	To be able to prepare the soil for cultivation and use fertilizers						
Title of the lesson	Rules for applying Fertilisers						
Instructional objectives	By using gloves, fertile soil, moist soil, bottle cover of Fanta, and dry soil, learners will be able to identify the rules of applying fertilizers correctly.						
Plan for this class(location in or outside)	Inside the classroom, learners sit in U-shape						
Learning Materials(for all learners)	Gloves, moist soil, artificial fertilizers, fertile soil, dry soil, bottle cover of Fanta						
References	Science and elementary technology for Rwandan school						
Timing for each step	Description of teaching and learning activity					Generic competence and crosscutting issues to be addressed + a short explanation	
	Inside the class, by using gloves and individual work, learners will perform activity provided by the teacher.						
	Teacher activities			Learner activities			
1. Introduction (5min)	To greet learners and show class rules. Ask learners in the previous lesson: “What is the importance of fertilizer?”			Greet teacher and read class rules Learners answer the teacher' questions. <i>Expected answers:</i> - It provides the nutrients to the plants - It increases agriculture productivity		Communication skills Operation	
2. Development of the lesson (30min) 2.1 discovery activities (5min)	Invite the learners to observe carefully the teaching aids and discuss the rules of applying fertilizers.			Learners in their groups, observe teaching aids and discuss the rules of applying fertilizers.		Cooperation Critical thinking	

	Ask the learners to present their findings on the rules of applying fertilizers.	Learners present their findings. <i>Expected findings:</i> - Respect the dose - Wear the gloves when handling fertilizers - Apply fertilizers in the moist soil - Use organic fertilizers before inorganic fertilizers	Communication skills and Gender education
2.2 presentation learners' findings production (10min)	To remark learners findings.	Learners follow the teacher's remarks on the chalkboard.	Communication
2.3 exploitation findings production (10min)	To summarize the lesson. Teacher gives short notes about the lesson to the learners.	Learners take notes about the rules of applying fertilizers.	Cooperation Gender
2.4 conclusion/ summary (5min)	Teacher ask the learners about the lesson 1) list down 2 rules of applying fertilizers 2) list down 2 steps of using fertilizers	Learners answer the questions asked. The rules for applying fertilizers are: - Respect the dose - Wear the gloves - Apply fertilizers in the moist soil	Cooperation Gender
3. assessment (5min)			
Observation on lesson delivery (to be completed by the teacher)			

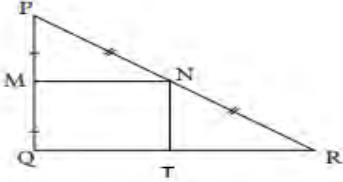
Appendix G-5

LESSON PLAN

School Name: G.S Mukarange Catholic

Teacher's Name: Umugwaneza Jeanne Françoise

Term	Date	Subject	Class	Unit N ⁰	Lesson N ⁰	Duration	Class Size
II	12/6/2019	Math	S2c	5	3 out of 6	80 min	71
Types of special educational needs to be catered for in this lesson and the number of learners in each category					None		
Unit title		Thales' Theorem					
Key unit competence		Use Thales' theorem to solve problems related to similar shapes and determine their lengths and areas					
Title of the lesson		Midpoint theorem					
Instruction objective		By using a pencil, a ruler and T-square learner will be able to apply midpoint theorem to determine the lengths of the triangle accurately.					
Plan for this class (location in /outside)		In classroom, learners are sitting in U-form					
Learning materials (for all learners)		Exercise book, pencil, pen, and geometrical instruments					
References		Ordinary level mathematics for Rwandan school learner's book 2					
Timing for each step	Description of teaching and learning activity						Generic competences and Cross-cutting issues to be addressed+ a short explanation
	The lesson takes place inside the class by using individual and group work as learner-centered approach method						
	Teacher's activities			Learner's activities			
Introduction 10 min	1. Ask the learners to remind us of the previous lesson. 2. I will assess the prior knowledge - parallel line - transversal line 3. Ask the learners to draw three parallel lines and a transversal line on their exercise book. 4. What are the necessary conditions for parallel lines to be equidistant?			- Remind us the previous lesson intercept theorem. - Learner draws parallel lines and transversal lines. <div style="text-align: center;"> </div>			- Critical thinking is developed by drawing a parallel line.

<p>Development of the lesson STEP 1: 10 min STEP 2: 30 min</p> <p>STEP 3: 15min</p>	<ul style="list-style-type: none"> - Ask the learners to form the groups by counting - Request learners to do an activity <p>A) Given the triangles of different measure, mark M, the midpoint of PQ .</p> <p>B) What can you say about PM and MQ?</p> <p>C) Draw MN parallel to QR meeting PR at N.</p> <p>D) What can you say about PN and NR?</p> <p>E) Comment on the triangles PMN and QPR.</p> <p>F) Let T be the midpoint of QR, what can you say about NT and PQ.</p> <p>G) Name the figure QTNM and give reasons why.</p> <p>H) Comment on MN and QT and on MN and QR.</p> <p>I) From the result in (h), what can you deduce about NT and PQ, MT and PR?</p> <p>J) Differentiate the functions of midpoint theorem in real life.</p> <ul style="list-style-type: none"> - Allow the learners to represent their work on the chalkboard. 	<ul style="list-style-type: none"> - Form the group - Do an activity given in their respective e groups  <p>B) $PM=MQ$</p> <p>D) $PN=NR$</p> <p>E) The triangle PMN and QPR are similar.</p> <p>F) $NT=\frac{1}{2}PQ$</p> <p>G) Parallelogram, because opposite sides are parallel and equal.</p> <p>H) $MN=QT$ and $MN=\frac{1}{2}QR$ $NT=\frac{1}{2}PQ$ and $MT=\frac{1}{2}PR$</p> <p>J) Learners apply midpoint theorem in real life.</p> <ul style="list-style-type: none"> - They represent their work. 	<ul style="list-style-type: none"> - Cooperation - Self-confidence - Critical thinking - Gender education is addressed by giving equal opportunity to boys and girls. - Environment and sustainability are addressed by applying midpoint theorem in real life.
<p>Conclusion 15 min</p>	<ul style="list-style-type: none"> - Give the summary to the learners and write exercise on the chalkboard. - Allow the learner on the chalkboard to answer the question 6 page no 136. 	<p>Learners correct some mistakes and do exercise on a chalkboard</p> <p>$AC=\frac{1}{2}$, $QR=5\text{cm}$, $AB=\frac{1}{2}$ $PR=5.5\text{cm}$ $BC=\frac{1}{2}$, $PQ=4.5\text{cm}$</p>	<p>Critical thinking is developed by doing exercise.</p>
<p>Teacher's self evaluation</p>			

Appendix G-6

LESSON PLAN

School name: G.S APAGIE MUSHA.

Teacher's name. Mulondari Wasso

Term	Date	Subject	Class	Unit N°	Lesson N°	Duration	Class size	
2	22 /6/ 2018	Math	S2A	5	1 of 3	80 min	
Type of Special Educational Needs to be catered for in this lesson and number of learners in each category								
Unit title	Thales theorem							
Key Unit Competence	Use Thales theorem to solve problems related to similar shapes and determine their lengths and areas							
Title of the lesson	Midpoint theorem in a triangle							
Instructional Objective	Using a ball pen and a sheet of paper learners should be able to find the lengths of a side of the triangle gives the length of a segment joining midpoint of two sides and vice versa							
Plan for this Class (location: in / outside)	Inside and outside the class							
Learning Materials (for all learners)	Ball pen, a sheet of paper, a ruler, protector, compass, chalk, and blackboard							
References	Mathematics for Rwanda schools S2							
Timing for each step	Description of teaching/learning activities					Generic competences and Cross-cutting issues to be addressed + a short explanation		
	Teacher's activities			Learner's activities				
1. Introduction (10min)	To ask questions about the midpoint of a line segment, similar triangles, and parallel by a triangle line.			To answers to questions about the midpoint, similar triangles, and parallel cut by a triangle line.		Critical thinking through remembering previous lesson and communication		
2. Development of the lesson (40 min)	2.1 discovery activities (20min)	To ask learners to form group works. To provide the manila paper with activity contained clear instructions on midpoint and parallel segment. Guide learners in groups.			Learners form group works. Learners work in groups using textbooks on the given activity to discover the Thales midpoint theorem.		Inclusive education based on gender balance and special educational needs Communication through discussion, Cooperation through interacting research through given activity	
	2.2 presentation learners' findings production (10 min)	To ask learners, randomly to present and share findings of his/her group work			The chosen learner presents and shares with the class the group findings		Communication through the presentation , lifelong learning, promotes skill development of higher-order thinking skills in how group members assist representative	

	2.3 exploitation findings production (10 min)	Ask learners to evaluate the findings of other groups and guide them in order to get the statement of Thales midpoint theorem.	Give comments on the evaluation. Follow comments of other learners and of the teacher. Ask for classification.	Critical thinking Through judging findings
	2.4 conclusion/ summary (10min)	Requesting learners to state Thales theorem of the midpoint in a triangle Give the suggestions by the searcher and learners take notes.	Ask questions. Take notes.	Creating and innovation through summarizing
3. assessment (20 min)		Ask learners to work in a group of questions. Find the length of another side of a triangle gives the length of a segment joining midpoints of two sides and vice versa.	Learners do exercises by drawing triangles and explain all steps.	Problem-solving through thinking from midpoint theorem statements
Observation on lesson delivery (to be completed by the teacher)				

Appendix G-7

LESSON PLAN

School Name: GS Mukarange Catholic

Teacher's Name: UWAMARIYA Valentine

Term	Date	Subject	Class	Unit N ^o	Lesson N ^o	Duration	Class size
2	12/06/2019	Biology and health sciences	S2B	6	8 of 8	40min	70
Type of special education needs to be catered for in this lesson and the number of learners in each category				-			
Unit title		Enzymes					
Key Unit competence		To be able to explain the roles of enzymes in living organisms and how they are affected by temperature and ph.					
Title of the lesson		Mode of enzymes action					
Instructional objectives		Through manipulating different keys and padlocks learners will be able to use the key and lock mechanism to explain how enzymes catalyse reactions accurately.					
Plan for this class(location in or outside)		Inside classroom					
Learning Materials(for all learners)		10 padlock and 15 keys and different textbooks for senior two and paper handout					
References		Achievers, comprehensive and longhorn biology and health sciences for senior two and book two teacher guide					
Timing for each step	Description of teaching and learning activity					Generic competence and crosscutting issues to be addressed + a short explanation	
	Using different padlocks and keys learners will realize the action of an enzyme to a particular reaction.						
	Teacher activities			Learner activities			
1. Introduction (5min)	Starting the lesson by making a brief summary of the previous lesson by asking them probing questions: 1. Distinguish between enzyme and another catalyst. 2. Explain the following terms in the enzymes function context. a) Denaturation			Refreshing their minds about the previous lesson and engaged in the lesson of the day equipped with information about the lesson. 1. Enzymes are protein in nature and unlike other catalyst enzymes are specific. 2. a) To alter the original chemical structure of an enzyme. This means that the shape of the active site is changed and the enzyme is completely destroyed		Comprehensive skills are addressed as they trying to remember what they have been studied previously Critical thinking is addressed as they are trying to answer the posed questions	

	b) Inactivation	b) Enzymes whose configuration is not as intended; for example, the active site is not exposed due to factors such as low temperature	
2. Development of the lesson (30min) 2.1 discovery activities (5min)	Distribute to the learners the printout of the learning activity and guiding learners to carry out the activity 6.5 on learner's book 2 pages 92 in groups of 10 members. Guide and monitor the learner's discussion process, organizational, participatory of each learner in the group. Each group is given different padlocks and keys.	Learners in groups receiving the printout and work upon the activity 6.5. Expected answers Refer to the learning activity 6.5 in the teacher's guide.	Analytical skills are addressed as they are analyzing the activity and providing the answers to the activity. Communication skills are enhanced through presenting to the rest of the class.
2.2 presentation learners' findings production (10min)	After the discussion, the teacher allows learners to present their findings to the rest of the class. Teacher monitors presentations and check groups which have difficulties.	Learners present their finding group by group.	Communication and critical thinking developed through discussion and observation respectively.
2.3 exploitation findings production (10min)	The teacher allows learners to ask questions and give the opportunity to answer each other. Teacher views all presented findings while asking learners to provide and confirm the correct and wrong answers The teacher asks who has difficulty (slow learners) and request students who understood to explain their classmates.	Learners ask for clarification. Learners answer their classmate's questions. Learners help the teacher to confirm the correct answer and identify the key of the lesson. Learners help their classmates.	Communication and interpersonal skills developed through interaction. Critical thinking developed through harmonizing the learner's findings.
2.4 conclusion/ summary (5min)	Sums up the lesson by providing a summary of the content that harmonizes the work the students discussed. Complements the learner's findings and makes an appropriate conclusive summary of the lesson.	Listening and noting down the main points. Giving comments	Listening and writing skills are addressed through listening to the brief summary and writing them down.

3. assessment (5min)	Writing an exercise on the blackboard to be done individually. The sample questions include the following: 1. Discuss key and lock hypothesis with the aid of diagrams 2. Think about another example that can act as an enzyme	Learners perform the exercise in exercises notebook. 	Creativity through using what learned to apply it.
Observation on lesson delivery (to be completed by the teacher)			

Appendix G-8

LESSON PLAN

School Name: APAGIE Musha

Teacher's name: Mayuru Jean Claude

Term	Date	Subject	Class	Unit N ^o	Lesson N ^o	Duration	Class size
2	17/06/2019	Biology	S2A	6	3 of 6	80min	50
Type of Special Educational Needs to be catered for in this lesson and number of learners in each category				Take care of slow learners			
Unit title	Enzymes						
Key Unit Competence	To be able to explain the roles of enzymes in living organisms and how they are affected by temperature and pH.						
Title of the lesson	Characteristics of enzymes						
Instructional Objective	By using textbooks, learners should accurately describe the characteristics of enzymes based on enzymes made of substances and substrates						
Plan for this Class (location: in / outside)	Computer laboratory						
Learning Materials (for all learners)	Student's books, manila paper, and marks						
References	Student's book						
Timing for each step	Description of teaching/learning activities					Generic competences and Cross-cutting issues to be addressed + a short explanation	
	Teacher's activities			Learner's activities			
1. Introduction (10min)	Asking some questions - What is an enzyme? - What is a catalyst? - What are the types of enzymes?			Answer teacher's questions		- Critical thinking through remembering the previous lessons - Communication through talk	
2. Development of the lesson (50 min)	2.1 discovery activities (20min) - Ask students to form groups of 6 pupils - Provide materials (student's book) - Ask learners to open the book on page 86 and 87 and ask learners to search for characteristics of enzymes - Monitor the students and help them - Ask learners to record their findings (note down) and steps undergone			Form groups of 6 pupils and share responsibility - Learners listen to instructions-Students make research on characteristics of enzymes through student's books - Learners record their findings (note down) and steps have undergone		- Inclusive Education through the involvement of girls and boys - Communication developed through discussion - Cooperation developed through interaction - Research and problem solving developed through search engine activity	

<p>2.2 presentation learners' findings production (10 min)</p>	<ul style="list-style-type: none"> - Invite representatives of the group to present their findings (one among the group members will be randomly chosen to present) - Request the rest of the class to write down whatever other groups are presenting - Give time to learners to ask for clarifications 	<ul style="list-style-type: none"> - Representatives of groups present their findings * Enzymes are protein in nature * Enzymes are affected by temperature * Enzymes work best at specific pH * Enzymes remain unchanged after catalyzing a reaction * Enzymes catalyze reversibly <p>Reactions</p> <ul style="list-style-type: none"> * Enzymes are substrate-specific * Enzymes work rapidly * Enzymes are efficient <p>Other students follow the presentations</p> <ul style="list-style-type: none"> - Learners write down questions and comments for clarification - Learners ask and comments on each group presentation 	<ul style="list-style-type: none"> - Communication developed through presentation - Interpersonal relations and life skills - Lifelong learning promotes the development of higher-order thinking skills (the way group members assist representative)
<p>2.3 exploitation findings production (10 min)</p>	<ul style="list-style-type: none"> - Ask students to evaluate presentation which one among the characteristics given are correct <p>The teacher helps learners to judge the student findings. Put apart correct and wrong answers in order to clarify the intention of the lesson</p> <ul style="list-style-type: none"> - Check if all characteristics have been covered (*) 	<ul style="list-style-type: none"> - Give comments on the production - Follow to the correction of teacher - Learners ask for clarifications and are comfortable with all the presented findings 	<ul style="list-style-type: none"> - Critical thinking developed through judging information
<p>2.4 conclusion/ summary (10min)</p>	<ul style="list-style-type: none"> - Requesting learners to summarize the characteristics of enzymes by clarifying the characteristics given by themselves - Give time to take notes (summary) 	<ul style="list-style-type: none"> - Participating actively in summarizing the contents - Make short notes 	<ul style="list-style-type: none"> - Creativity and innovation developed by putting information together

3. assessment (20 min)	Engage students to work individually on questions that follow: - State any 6 characteristics of enzymes - Explain the specificity of enzymes - What do you think is the role of enzymes?	Do exercise as indicated Learners should clarify: - What are enzymes made of? - What factors affect enzyme action? - Do enzymes act on all substrates? - Do enzymes change after a reaction?	- Critical thinking developed through linking learners' findings and the next lesson
Observation on lesson delivery (to be completed by the teacher)			

Appendix G-9

LESSON PLAN

School Name: APAGIE Musha

Teacher's name: Mulondani Wasso

Term	Date	Subject	Class	Unit N ^o	Lesson N ^o	Duration	Class size
2	22/06/2019	MATHS	S5MCB	6	1 of 3	80min	
Type of special education needs to be catered for in this lesson and the number of learners in each category							
Unit title	Vector space of real numbers						
Key Unit competence	Study linear dependence of vector of \mathbb{R}^3 solve problems of angles using scalar and vector or product						
Title of the lesson	Basis of vector space \mathbb{R}^3						
Instructional objectives	Using a ball pen and sheet of paper learners should be able to show accurately whether a given set is the basis of \mathbb{R}^3 or not						
Plan for this class (location in or outside)	Inside of the classroom						
Learning Materials (for all learners)	Ball pen, a sheet of paper, chalks and blackboard						
References	Mathematics for Rwanda schools S5						
Timing for each step	Description of teaching and learning activity					Generic competence and crosscutting issues to be addressed + a short explanation	
	Teacher activities			Learner activities			
1. Introduction (5min)	To ask questions of the definition of linear combination dependence and independence and spanning set			To define a linear combination of vectors dependent and independent vector spanning a set of vector		- Communication through talk and Critical thinking through remembering	
2. Development of the lesson (30min) 2.1 Discovery activities (...min)	<ul style="list-style-type: none"> - To provide the manila paper with two sets of vectors to be discussed by linear in groups about dependence independence and spanning set - To ask a question about the basis - To guide learners in their group work 			<ul style="list-style-type: none"> - Learners work in groups using textbooks Learners discuss linearly sets of vector and spanning between the two given sets 		<ul style="list-style-type: none"> - Communication developed through discussion - Cooperation developed through interaction - Research and problem solving through engine activity 	

2.2 Presentation learners' findings production (...min)	- To ask learners chosen randomly through group works to present and share findings of their groups with the classmate	Learners chosen randomly present and share the findings of the group with the other groups	- Communication developed through presentation - Interpersonal relations and life skills - Lifelong learning promotes the development of higher-order thinking skills (the way group members assist representative)
2.3 Exploitation findings production (...min)	Ask learners to comment about findings of others and guide them in finding properties of the two given sets	Give answers to comments of classmates Give the properties of the two sets of vectors	- Critical thinking developed through judging information
2.4 Conclusion/ summary (5min)	To require learners in the definition of a basis of \mathbb{R}^3 To ask them to give as well as possible that definition	Learners give as precisely as possible the definition of a basis of a vector space	- Creativity and innovation developed by putting information together
3. Assessment (5min)	Engage learners to discuss in groups about given sets whether they are bases or not of \mathbb{R}^3	Do exercise on the blackboard after discussing in groups Explain to classmates the main steps of reasoning	- Critical thinking developed through linking learners' findings and the next lesson
Observation on lesson delivery (to be completed by the teacher)			

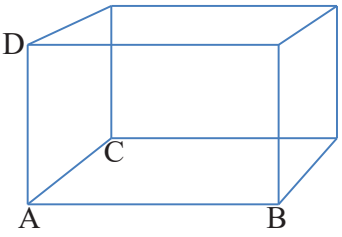
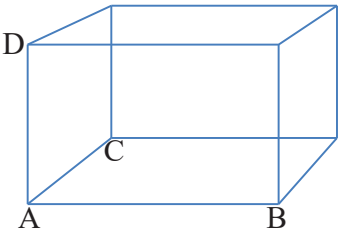
Appendix G-10

COMPETENT-BASED LESSON PLAN

School Name: ...GSNDA RWAZA

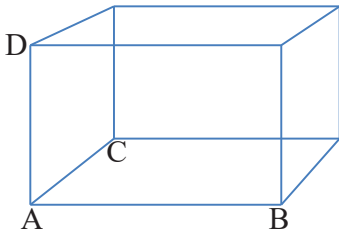
Teacher's name: KWIZERA Félicien

Term	Date	Subject	Class	Unit N°	Lesson N°	Duration	Class size
II	4/06/2019	MATH	S5MPG	6	12	80 Minutes	21
Type of Special Educational Needs to be catered for in this lesson and number of learners in each category				None			
Unit title		Vector space of real numbers.					
Key Unit Competence		➤ Study linear dependence of vector of IR^3 , solve problems related to angles using the scalar product in and use the vector product to solve mensuration problems in.					
Title of the lesson		The Application of box product in the calculation of the volume of parallelepiped, triangular prism and tetrahedral triangle.					
Instructional Objective		At the end of this lesson, each learner will be able to calculate: ➤ The box product and the volume of parallelepiped, triangular prism and tetrahedral triangle.					
Plan for this Class (location: in / outside)		In class					
Skills		Explain the properties of the vector product.					
Attitude and Values		<ul style="list-style-type: none"> ➤ Respect for each other during the presentation. ➤ Listen to each other explanations critically. 					
-Learning Materials (for all learners)		<ul style="list-style-type: none"> ➤ Blackboard ➤ Chalks ➤ Books ➤ Another syllabus 					
References		<ul style="list-style-type: none"> ➤ Advanced level Mathematics Book (Learners' book S5) page 207 ➤ Understanding pure Mathematics, page 409 ➤ Internet 					
Timing for each step		Description of teaching and learning activity				Generic competences and Cross-cutting issues to be addressed + a short explanation	
		<ul style="list-style-type: none"> ➤ The activities will be prepared and it will be written on the blackboard. ➤ I write the activities on board. ➤ The activity will be concerned with the concretization of theories. ➤ The activities will be based on Bloom's taxonomy levels. ➤ The activity will be done during teaching and learning and at the end of the lesson. ➤ The activities will be done in class. 					
		Teacher activities		Learner activities			
Introduction		Excite/ Engage phase <ul style="list-style-type: none"> ➤ What is to find of shape do we have? ➤ Teacher draw that graph on chalkboard: 		<ul style="list-style-type: none"> ➤ The learners observe and answer the question. ➤ The learners discuss between them about the dispose of the graph. 		<ul style="list-style-type: none"> ➤ Critical thinking ➤ Communication ➤ Cooperation and interpersonal skills ➤ To see the numbers or pictures and think 	
20''							

	 <p>➤ What is the relationship between \vec{w} and \vec{u}, \vec{w} and \vec{v}.</p>		critically about the situation
50''	<p>(10 minutes) EXPLORE phase</p> <p>➤ The teacher writes the vectors</p>  <p>$\vec{AB} = \vec{u}, \vec{AC} = \vec{v}$ and $\vec{AD} = \vec{w}$</p> <p>$\vec{v} = (2, 1, -3)$ and $\vec{w} = (-3, 1, 2)$ and $\vec{w} = (1, -2, 3)$</p> <p>➤ Find $\vec{u} \cdot (\vec{v} \times \vec{w})$ and $\vec{v} \cdot (\vec{u} \times \vec{w})$ and $\vec{w} \cdot (\vec{u} \times \vec{v})$</p> <p>And $\det(\vec{u}, \vec{v}, \vec{w})$</p>	<p>➤ Each learner works the activities.</p> <p>➤ Present the findings on the blackboard</p>	<p>➤ Critical thinking</p> <p>➤ Creativity</p> <p>➤ Communication</p> <p>➤ Cooperation and life skills</p> <p>➤ Lifelong learning</p>
	<p>(20 minutes) EXPLAIN phase</p> <p>The teacher tells the learners that:</p> <p>$\vec{u} \cdot (\vec{v} \times \vec{w})$ Presents the volume of a parallelepiped.</p>	<p>➤ Each student takes/writes the explanations.</p>	<p>➤ Critical thinking</p> <p>➤ Creativity</p> <p>➤ Communication</p> <p>➤ Cooperation and life skills</p> <p>➤ Lifelong learning</p>
	<p>(20 minutes) ELABORATE phase</p> <p>Teacher gives the learners a new challenge:</p> <p>Determine $\det(\vec{u}, \vec{v}, \vec{w})$</p> <p>If $\vec{u} = (2, -3, 1)$ and $\vec{v} = (3, 2, -3)$ and $\vec{w} = (-2, 3, 4)$</p>	<p>➤ Each student tries to subdivide a parallelogram into two equilateral triangles.</p> <p>➤ Each student tries to calculate the area of triangles by using area of a parallelogram.</p>	<p>➤ Use the model reasons given by the teacher to explain/get the answers</p> <p>➤ Think critically.</p> <p>➤ Communication</p> <p>➤ Lifelong learning</p> <p>➤ Interpersonal skills</p>
10''	<p>EVALUATE phase</p> <p>➤ Guide the learners during making decision/conclusion</p> <p>➤ Write the conclusions given by the learners.</p>	<p>➤ Present their observations</p> <p>➤ Write the global conclusion in their notebook.</p>	<p>➤ Think critically</p> <p>➤ Communication</p> <p>➤ Lifelong learning</p> <p>➤ Interpersonal skills</p>

	<ul style="list-style-type: none"> ➤ Add the other interesting points. ➤ Write an evaluation of a chalkboard. 	<ul style="list-style-type: none"> ➤ Each student does an evaluation below: 	
Teacher self-evaluation			

THE ACTIVITIES



$$\overrightarrow{AB} = \vec{u}, \overrightarrow{AC} = \vec{v} \text{ and } \overrightarrow{AD} = \vec{w}$$

$$\vec{v} = (2, 1, -3) \text{ and } \vec{v} = (-3, 1, 2) \text{ and } \vec{w} = (1, -2, 3)$$

Find

- $\vec{u} \cdot (\vec{v} \times \vec{w})$ (Group A&D)
- $\vec{v} \cdot (\vec{u} \times \vec{w})$ (Group B&E)
- $\vec{w} \cdot (\vec{u} \times \vec{v})$ (Group C&D)
- $\det(\vec{u}, \vec{v}, \vec{w})$ (All Groups)

The team leaders present the findings of their groups and the learners compare the solutions and make a conclusion.

Teacher add comments to the learners' findings and tell them other important applications.

Appendix G-11

LESSON PLAN

School Name: APAGIE Musha

Teacher's Name: Hakorimana Godfroid

Term	Date	Subject	Class	Unit N ^o	Lesson N ^o	Duration	Class size
II	22/06/2019	Chemistry	S ₄ MCB	6	5 of 7	80 min	48
Type of special education needs to be catered for in this lesson and the number of learners in each category				Take care of slow learners			
Unit title		Trends in chemical properties of group I and their compounds					
Key Unit competence		The learners should be able to compare and contrast the chemical properties of group 1 elements and their compounds in relation to their position in the periodic table.					
Title of the lesson		The solubility of Group I compounds					
Instructional objectives		Using laboratory equipment, learners will be able to explain and understand the trends in the solubility of group I compounds					
Plan for this class(location in or outside)		In Laboratory					
Learning Materials(for all learners)		LiCl, KCl, conductometer, the beakers.					
References		Internet, S ₄ books from REB					
Timing for each step		Description of teaching and learning activity				Generic competence and crosscutting issues to be addressed + a short explanation	
		In the laboratory, learners will perform experiments on the solubility of group I compounds					
		Teacher activities		Learner activities			
Introduction: 5min		- Ask the students how the trends in the solubility of group I compounds.		Learners will answer: - The solubility of group I compounds increases from up to down due to increase in ionic character.		- Critical thinking through thinking on previous lessons - Communication	
Development of the lesson (30min) .Discovery activities (...min)		I will ask students to join groups and provide all required materials for conduction of Group experiment. - Verify if they have all available materials as mentioned in the protocol. I will distribute protocol and clarify the instructions including laboratory rules.		- Students have to join their respective groups. - Listen to teacher's instructions. - Exchange ideas about protocol.		- Critical thinking through the solubility following steps - Problem-solving as they will analyse their finding - Creativity as they will do report - Cooperation as they will work in a group for one activity	

	I will guide the increase in doing the experiments, requesting them to record their findings and must submit their reports to the teacher.	<ul style="list-style-type: none"> - Put conductometer in KCl and LiCl solution respectively and register their respective conductivities values. - They will use the conductivities values to do a report of the experiment. 	
Presentation learners' findings production (15min)	<p>I will invite randomly one from three groups to present what they have observed and recorded.</p> <p>I will tell the other groups to write down what the presenter is presenting.</p>	<p>Expected content from the presentation:</p> <p>The solution of KCl has more conductivity than that of LiCl because:</p> <ul style="list-style-type: none"> - K^+ ion moves very fast than Li^+ Ion because it is not hydrated by more molecules of water which in turn may reduce its mobility in aqueous solution. - Lithium-ion is very small in size and more hydrated - K^+ has greater ionic mobility. <p>The solution of KCl has greater conductivity than that of LiCl because:</p> <ul style="list-style-type: none"> - Lithium chloride is covalent while KCl ionic. - KCl more soluble than LiCl. - The solution of KCl has more conductivity than that of LiCl because LiCl has covalent character. 	<ul style="list-style-type: none"> - Communication through interactive talk - Cooperation through presentation
Exploitation findings production (10min)	<p>I will give the opportunity to learners to judge where wrong or right or give critics on presented works.</p> <p>I will help them to exchange the true answers between the groups by identifying the wrong answers.</p>	<ul style="list-style-type: none"> - The learners from other groups will judge by putting apart the right and wrong answers: - They will ask also the questions for clarifications and will have the opportunity to answer each other. 	<ul style="list-style-type: none"> - Critical thinking through analysing their findings - Communication, cooperation and interpersonal management and life skills as they will be judging each other through thinking and talk in harmony

Conclusion/ summary (10min)	<p>I will present the complementary explanation or clarification of any asked question:</p> <p>Potassium ion has greater conductivity than Li^+ because descending down the group, ionic radius increases and the charge density decrease like polarizing power decreases. Due to this, the ion moves very fast and the conductivity increases because of less hydration.</p>	<p>Learners listen to teacher's complementary explanation and use them with their findings to summarize the lesson:</p> <p>"Li^+ is highly solvated than K^+ due to its smallest size and mobility decreases, thus conductivity decreases. They then take summary notes.</p>	<p>- Creativity and innovation by putting information together</p>
Assessment (10min)	<p>I will ask questions :</p> <ol style="list-style-type: none"> 1. Explain the trends in conductivity of Group I chloride solutions. 2. Is KCl more soluble than LiCl in pure water? Explain this according to the position the metals (K and Li) on the periodic table. 	<p>Their answer would comprise:</p> <ol style="list-style-type: none"> 1. The conductivity increases from up to down due to increase of ionic mobility. 2. KCl is more soluble than LiCl because Li^+ ion has greater polarizing power that provides LiCl more covalent character than KCl. 	<p>Critical thinking developed through linking learners' findings and the next lesson</p>
Observation of lesson			

Appendix G-12

LESSON PLAN

School name: GS Notre Dame de Apotres RWAZA

Teacher's name: NSANZIMANA Emmanuel

Term	Date	Subject	Class	Unit N°	Lesson N°	Duration	Class size
II	30/06/2019	CHEMISTRY	S4PCM	6	8 of 9	80min	22
Type of Special Educational Needs to be catered for in this lesson and number of learners in each category				Learners with low skills in handling laboratory materials.			
Unit title		Trends in chemical properties of group I and their compounds					
Key Unit Competence		The learners should be able to compare and contrast the chemical properties of group I elements and their compounds in relation to their relation in the periodic table.					
Title of the lesson		Effect of acid on the group I carbonates					
Instructional Objective		Given laboratory apparatuses and chemicals, learners should be able to explain the effect of acids on the group I carbonates.					
Plan for this Class (location: in / outside)		In Laboratory					
Learning Materials (for all learners)		<ul style="list-style-type: none"> • Chemicals (Sodium carbonate, Na₂CO₃, Hydrochloric acid, HCl, Lime water, Potassium hydrogen carbonate, Distilled water) • Apparatuses (Beakers, test tubes, test tube holder, Measuring cylinders) 					
References		Fountain S4 Pg. , Pearson S4 Pg. .					
Timing for each step		Description of teaching/learning activities					Generic competences and Cross-cutting issues to be addressed + a short explanation Teacher's activities
		In the laboratory, learners will be given activities to perform experiments on the effect of heat on the group I carbonates. Learners will do activities in groups. The evaluation will be done individually.					
		Teacher's activities		Learner's activities			
Introduction 10min		Asks the learners to write the examples of group I carbonates and hydrogen carbonates. Asks learners to write the reaction between Na ₂ CO ₃ and HCl	Expected answers: • NaCO ₃ , Na ₂ CO ₃ , K ₂ CO ₃ , NaCO ₃ ²⁻ , KCO ₃ , NaHCO ₃ , KHCO ₃ , K ₂ HCO ₃ , LiHCO ₃ . Expected answers: • Na ₂ CO ₃ +HCl→NaCl+H ₂ O+CO ₂ • Na ₂ CO ₃ +HCl→NaHCO ₃ +NaCl • NaHCO ₃ +HCl→NaCl+H ₂ O+CO ₂			<ul style="list-style-type: none"> • Communication between teacher and students. • Peace and values education. 	
Development 50min	Discovery activities	Distributes all required materials and chemicals for the experiment. Distributes worksheet for activities. Guides learners when doing experiments.	Learners conduct experiments.			<ul style="list-style-type: none"> • Communication between learners. • Critical thinking through discussion between learners. • Cooperation with others as a team in whatever task assigned. 	
	Presentation of learners findings production:	Invites the learners randomly to present what they have observed and recorded. I will tell the other groups to compare their findings with theirs	Explain their findings. Compare the findings in different groups. Expected findings: • Group one carbonates react with acids to form a salt, water and carbon dioxide released. Na ₂ CO ₃ +2HCl→2NaCl+H ₂ O+CO ₂ • Group one hydrogen carbonates react with acids to form a salt, water and carbon dioxide released. NaHCO ₃ +HCl→NaCl+H ₂ O+CO ₂ Carbon dioxide gas turns milky lime water. Ca(OH) _{2(aq)} +CO _{2(g)} →CaCO _{3(s)} +H ₂ O(l) CaCO _{3(s)} is a white precipitate				

