GSJ: Volume 11, Issue 3, March 2023
ISSN 2320-9186

Global Scientific JOURNALS

Norbert Wirsiy Nyuyki (B.Ed, University of Buea, M.Ed, University of Bamenda, Ph.D Student, University of Yaoundé)

Is there a tool to enable Guidance Counsellors' bias more students into STEM related careers in Cameroon Grammar Schools?

BACKGROUND

It is part of the long term goals of the Republic of Cameroon to emerge to a middle income economy by 2035. Invariably, each and every sector of the state has to play a key role in bringing their own resources to table. Various ministries have their role to play. Developing to middle income economy entails among others, developing the industrial sectors and improving on the living conditions of its citizenry (Ansu et al, 2012).

Some primary sectors of concern include; agriculture sector, fisheries, livestock management, silvi-culture and fisheries. The secondary sector will include; mining, food industry, electricity, water, gas and construction. The tertiary sector includes; commerce, transport, banking and insurance. These sectors are primordial in materializing this objective; emerge to middle-income economy by 2035 (Wirsiy, 2022).

Table 1 paints a picture of the 2009 employment structure, for temporal and permanent employees from which an illustration is made. Livestock management, fisheries and mining represented the least of the subtotal populations overall. Observe secondly that women constituted just about a quarter of the population in this population segment (INIS, 2009). Furthermore, medium and large size enterprises represented less than 6% of the enterprises with more than 80% being in micro and small size enterprises (those with less than 20%) (Elder, 2014).

It was projected that by 2020 (from the 2009 statistics), there would be 800000 salaried employees in the formal sector (DSCE, 2009). There were only 386, 263 permanent employees and in the private sector in 2010, with about 281000 (73%) male and 105000 (27%) female. Furthermore, 73% of active force, mostly men were permanently employed and drawing a regular salary, reflecting the absorption capacity of the enterprises in Cameroon. Most of these were workers with no formal education or those who had not completed primary education working in agriculture and industry. And these were non-wage jobs. Those who earned wages were those with post-secondary education, not in technical, industrial, vocational and entrepreneurial training. It is supposed to be the nature of the school and purpose at university level of education that people socialize and differentiate into different life roles (Fonlon, 1969).

Observe that few employees with incomplete primary education worked in the public section. Those more likely in government were those with secondary and post-secondary education. Most of the workforce was in the informal sector and are underemployed. Most women did multiple jobs that were low paying and were in the informal sector, putting them in a more precarious situation. Most (87%) of these women had no professional address.

Table 1: Showing various sectors and distribution of men and women in Cameroon in 2009

		Permanent employees			Temporary employees		
Sector	Subsector	Men	Women	Total	Men	Women	Total
Primary	Agriculture	20,361	6,169	26,530	772	122	894
	Livestock management	405	144	549	42	36	78
	Silviculture	6,533	254	6,787	289	29	318
	Fisheries	30	9	39	9	3	12
	Subtotal	**27,329**	**6,576**	**33,905**	**1,112**	**190**	**1,302**
Secondary	Mining	953	209	1,162	25	3	28
	Food industry	15,208	4,239	19,447	6,604	123	6,727
	Other manufacturing industries	39,843	10,150	49,993	4,608	1,727	6,335
	Electricity, water, and gas	6,378	2,152	8,530	1,055	32	1,087
	Construction	7,389	1,368	8,757	2,383	238	2,621
	Subtotal	**69,771**	**18,118**	**87,889**	**14,675**	**2,123**	**16,798**
Tertiary	Commerce	84,907	20,551	105,458	3,756	1,382	5,138
	Transport	12,346	2,695	15,041	634	110	744
	Banking and insurance	7,072	5,512	12,584	257	290	547
	Other services	77,382	51,462	128,844	12,554	6,304	18,858
	Subtotal	**181,707**	**80,220**	**261,927**	**17,201**	**8,086**	**25,287**
Undeclared		2,184	358	2,542	90	18	108
Total		**280,991**	**105,272**	**386,263**	**33,078**	**10,417**	**43,495**

Sources: INS 2009b; World Bank 2009b.

Although there had been improvement from the past, the position of women, given that they represented just about a quarter of the workforce in these sectors was unsatisfactory (see table 1). Girls represented a majority of the student population in the school in Cameroon (Sosale & Majgaard, 2018). Therefore, their underrepresentation in the labour force was an important call for concern. There are many factors that could explain this. It was the concern of educational stakeholders given that this indicated wastage of human and material resources resulting from uneventful training (Wirsiy, 2023). Furthermore, even when the numbers increased as indicated between 2005 and 2010 by the NIS (NIS, 2009 & 2011), the ratio of boys to girls in STEM still showed a serious lag of girls. This therefore, partly reflected the ample difference between both sexes in STEM related career occupations in the various sectors.

STATEMENT OF THE PROBLEM

One way to materialize the Vision 2035; to emerge the economy of Cameroon to middle income, is to produce an annotated blueprint of determinant factors. By so doing, it would entail that various ministries and organs take charge of the determinants that fall in their auspices. The tax system, access to credit, corruption, bureaucracy, unfair competition, infrastructure, cost of financing, inadequacy of sector dialogue, energy and water, transportation, justice system, skills/training, labour legislation, supply of raw materials, are the major determinants which have been identified as affecting the nature of development in Cameroon (MINEFOP, 2009).

The skills factor, appearing just about 15/70 in the survey, is fundamental as its effects permeate the scope and spectrum of the other determinants. It is largely in the school that these skills and training aforementioned are acquired. Educational stake holders have the prerogative to imbue learners with knowledge, skills and attitudes that would enable them to socioeconomically insert into society when they leave school (ILO, 2010) The Guidance Counsellor is the main educational stakeholder in secondary school in Cameroon, who is mandated with the responsibility to carry out career counselling.

With the vision in mind, it is incumbent on the counsellor that career counselling reflects the realities of the contextual environment as well as the student traits. Therefore the guidance counsellor needs to understand the students and counsel them accordingly (De Bruin, 2001 & 2014). Accordingly here implies that in as much as the individual tendencies of the clients are important, the overall goal, producing more STEM related man power requirements should be a concerted effort by all stake holders. Counsellors need a mechanism in which they can identify and encourage students with STEM interest, those without a STEM interest as well as those who are undecided (Alison, 2006). The proposed tool can therefore serve as the basis for this segregation which is the first step in the algorithm.

Main research objective

To produce a reliable STEM Interest Survey for Cameroon (STEMISCAM) grammar schools

Specific objectives

1. To identify factors that significantly affect students' interest in STEM related careers in grammar schools?
2. To establish an acceptable reliability index for the STEMISCAM

Main research questions

Is the STEMISCAM reliable enough for use in Cameroon grammar schools?

Specific questions

1. What factors affect students' interest in STEM related careers in grammar schools?
2. Does the STEMISCAM have an acceptable reliability index?

Main research hypothesis

Ho: the STEMISCAM is not reliable enough for use in Cameroon grammar schools

Specific hypotheses

Ho1: 'Interest' factors do not significantly affect students' interest in STEM related careers in grammar schools

Ho2: the STEMISCAM does not have a significantly acceptable reliability index

Justification for the study

The educational objective in our schools in Cameroon has navigated from 3Rs to present day; acquisition of KSAs or competencies that can help students socioeconomically insert into society, participate in SDGs, enable students carry out life-long learning, and provide the man power requirements to emerge Cameroon to a middle income economy by 2035. As such, there has been need for a tilt and reflection on the protocols and procedures going on in our schools, in a bit to reaffirm that they can lead the overall aims to the intended results. It is partly in this regard that the area of career counselling was introduced in schools, in situ to the introduction of the counselling program in schools. This study therefore was intended to reinforce the potentials of counsellors by providing a procedure; through Trait and Factor career counselling or a tool that could enable them easily produce a data base as premise in their career counselling protocols.

The study was further sanctioned by the non-accessibility of easy to use tests that have been developed in Cameroon for use in Cameroon. When tests are developed elsewhere, they can be adopted for use in other contexts. However, the training that Cameroonian guidance counsellors receive may not permit some of them to modify these tests in ways that provide reliable information. It is partly for this reason that the STEMISCAM was developed. Consequently, the STEMISCAM is an attempt to digitize counselling service and provide a data base for further research. For instance, at a point in time, a school needs to have a data base of students' interest for various careers.

Scope and delimitation of the study

The purpose of the study was to develop a SCAI which can be used for the orientation of secondary school students in Cameroon, which has a face and construct validity, and which is reliable. The study therefore looked at one function of educational counselling in secondary schools in Cameroon, career counselling. In this career counselling, the study explored the function of testing by developing an instrument to supplement the efforts being made in this regard.

The research design that was employed was a cross sectional survey research design, in which the Delphi technique was used in a two cycle to design questionnaires which were used further to design the final instrument. Theories employed in the study are Vygotskys Socio-cultural Theory, as well as Item Response Theory (IRT), Reliability and Classical Test theory. These theories are explored to provide the background on which the testing practice is built (Petrin & Kithyo 2002). The study did not investigate the nature of counselling programs, but rather addressed the issue of testing in career counseling in secondary schools in Cameroon.

Significance of the study

The study is significant to the following stakeholders;

To researchers

Other researchers who are interested in addressing assessment issues in EGC will find the study important as it contributed theoretically and empirically to the literature base, providing a spring board in various domains for further research.

To counsellors

It provides a tool; the STEMISCAM, which empowers EGC as follows. It will help empower EGC to carry out basic research. By administering the STEMISCAM, the EGC is provided with a platform that allows them with a repertoire of information about students KSAs. As such they stand a better position to advice and counsel students from an empirical perspective.

Secondly, the STEMISCAM is a tool that can easily be administered to students, allowing EGC to give feedback that is evidence based. As such, the SCAI is an impetus that adds to the professionalization of career counselling. This is important when there is need to transfer a student and his or her records, as well as when students' progress to upper classes, as it provides their background information.

To students

Students will receive more credible advice from EGC. It will help gauge between students' aptitudes, achievements and motivation in relation to their present and past dispensations. The tool will reveal areas where the students' competencies tally to various realms of disciplines. Furthermore, the tendency for parents to impose on a student's career based on sentiments will be attenuated, given that there will be evidence to support the choices of both the student and the EGC.

PARENTS

The results from testing will engage both parents and their children on long term and short term planning for the career needs of the child. The tool to some extend should enable some predictions on the child's career pathway.

EDUCATORS/ADMINISTRATION

The study should help school educators to orient students in various walks of life in a concerted effort that requires information seeking about the labour market and placement of students as interns or partner-shipping with the community to provide modelling through field trips, projects, mentorship and motivational talks to boast students aspirations and make them more proficient in materializing their career dreams.

Theoretical Background

A SOCIAL LEARNING THEORY OF CAREER SELECTION (JOHN KRUMBOLTZ)

INTRODUCTION

Krumboltz et al (2016) developed the Social Learning Theory of Career Selection that aimed at responding to the problematic issues; the fact that people have different interests for different educational programs at different points in their lifetime. Preceding this question is the question as to why people enter particular educational programs or educational programs and not others. As such, the authors provide a series of testable hypotheses which serve as a yardstick to synthesizing a series of prepositions, providing a framework for existing empirical evidence. The theory therefore opts to explain how educational and occupational choices are made through specific skills, circumvented by; genetic factors, learning experiences, environmental factors, cognitive and emotional responses, as well as performance skills which smoothen movement along one career path and not the other (Ibarra & Barbulescu, 2010). Individuals have external and internal influencers which shape the nature of decision making. At one point in time, the decider feels that the occupations are so limitless and then is overwhelmed by the amount of decision to be taken, and anxious about the consequences.

According to the author, there are always options, even if it means not taking a decision. This, because taking an option, limits the number of decisions in the future. At times the decisions are irreversible (Nota & Rossier, 2015). A new decision becomes part of the environment and acts as a facilitator or constraint to other decisions.

DETERMINANTS OF CAREER DECISION MAKING (CDM)

Krumboltz identified four influencers to the decision making process.

1. Genetic endowment and special abilities

People are said to be born with some inherent characteristics which limit their skills, occupational preferences, education and selection. Examples include race, sex, physical appearance and defects. Although it is not clear to what extent genetic and environmental factors contribute to special abilities, it however is undoubted that some people are born with greater disposition to benefit from some kinds of learning. Examples include intelligence, musical coordination, artistic ability and muscular coordination.

2. Environmental conditions and events

Factors in the environment, usually out of the decider's control, usually affect decision making. Some of them are planned, whereas others are not planned. Due to human action (cultural, social, political and economic) or natural forces (disaster and location of resources), certain events foster or restrain the preferences, skills, plans and activities of the individuals.

3. Learning experiences

Learning experiences influence the decisions that people make. The motives and reinforces are so many that a single theory is inadequate to explain the infinite number of possible permutations. Krumboltz simplified the learning experiences into two that have an important bearing for career development.

CLASSICAL TEST THEORY (CTT)

One way through which we can gauge students learning, to understand their development in terms of learning, is through assessment. These learning abilities' according to Bloom (1956) fall into three main areas; cognitive, affective and psychomotor. The cognitive abilities look at learning in the mind, according to Jean Piaget, while the affective regard the learner's emotions, attitudes, interests, predispositions and so on. Lastly, the psychomotor look at the learner's ability in terms of dexterity, ability to manipulate motor skills and comport the physical self.

In order to know what students have learnt, assessments are usually carried out. An assessment entails gauging the learning in order to understand their abilities, aptitudes, achievements, predispositions, interests and so on. Generally speaking, people assume that assessment and tests are synonymous. However, a test is simply an instrument that is employed during assessment.

Other instruments that are used during assessment include; rating scales, questionnaires, observation, interviews, and psychological tests and so on. The type of instrument used, depends on the nature of the data to be collected or the nature of the research/assessment. An instrument is a tool that enables an assessor or researcher to solicit information or measure an attribute in the respondent.

An instrument however needs to be reliable and valid used, for it to serve its rightfully intended purpose. Reliability entails the ability for the instrument to give consistent results. On the other hand, validity entails

the trustworthiness, dependability, and truthfulness of the findings. In order words, validity is the ability for the instrument to measure what it says it measures accurately.

There are many factors that affect the reliability and validity of instruments. It is noted that validity lies somewhat on the use of the instrument. Meaning that, an instrument which is reliable becomes invalid if wrongly used. Therefore, reliability is a necessary and insufficient condition for validity. If an instrument is valid, therefore it is also reliable. Reliability and validity as indices are strongly rooted in CTT and Item Response Theories (IRT). These theories permeate the Test Development Process (TDP) in the field of Psychometrics.

In the early 20th century, psychologists and other educators became more interested in the measurement of individual differences. It was to this effort that CTT spurted in this emancipation. It simplifies in a model; how small errors can influence observed scores. Due to recognition; that errors exist in measurements, acknowledgement that errors are random variables and conception of correlation indexing, the CTT was formulated. It was Charles Spearman (1904), who derived a formula for obtaining coefficients of correlation in reliability estimates. CTT was considered to begin with Spearman's formulation. However; Truman, Lee Kelley, George Udny and Louis Guttman were heavily instrumental in making the Kuder-Richardson formula in 1937.

Meaning of CTT

CTT is a formulation that has been used to determine the reliability and characteristics of measurement instruments. The formula introduces three concepts; test or observed scores, true scores and the error scores. The classical test model is often presented mathematically as below;

$$\mathbf{X = T + E}$$

Where;

X = observable test score

T = True score

E = Error score

The formula links the observable score to the sum of the unobservable scores. The true score is not easy to observe. It is however then estimated from individual responses on test items. This equation hitherto cannot be resolved without some assumptions.

Assumptions of CTT

The first assumption of CTT is that true scores and error scores are not correlated. In brief, there can be three types of correlation. A correlation means that two things vary in a particular manner. A positive correlation entails that while the magnitude of variable X increases, that of variable Y also increases and vice versa. In a negative correlation, while the magnitude of variable X increases, that of Y decreases and vice versa. We say that they are directly proportional and inversely proportional in the first and second cases respectively.

The second assumption of CTT is that the average of the error scores of the examinees is zero. In other words, the error scores of individual examinees is not zero, but the average of their individual scores is zero. So there is a net cancelation effect on the error estimates. In other words, if you made a mistake by over rating

student A and another mistake by under rating student B, you have made two mistakes. However, if we consider that the mistakes are the same, then on average, you have not made an over rating of the students.

The third assumption of CTT is that error scores on parallel tests are uncorrelated. Parallel tests are separate instruments. It is expected that their errors scores are uncorrelated. Should this not be the case, then the error becomes a non-random error.

It is therefore formulated that if the measurement instruments were perfect, we could be able to obtain observed scores which are true, without any errors. As such, an error is said to be a random error variable and its distribution is normal.

Therefore, we can say that measurement instruments are always faulty. It is to say that with repeated application of the instrument on the examinee, the true score never changes. However, the observed score continuous to change. This is due to the constancy of change of the error score. It is to say that the nature of the error can cause an increase or a reduction in the observed score, but does not affect the true score.

The distribution of random errors is assumed to be the same for each test taker and tells us about the magnitude of the error in measurement. In CTT, the standard distribution of random errors is used as the basic measure of error. Using reliability of the test and the standard deviation of the observed scores, the standard error of measurement can be estimated. The standard error of measurement is directly proportional to the ratio between the individual (observed) and the true score. Meaning that if the standard error of measurement is large, the less certain is the accuracy with which the attribute in question is being measured.

$$\mathbf{SE_M = S_X \sqrt{1-R_{XX}} \ldots\ldots.2}$$

SE_M = standard error of measurement

S_X =standard deviation of test scores

R_{XX} =reliability coefficient

$SE_M$is directly proportional to the inverse of $R_{XX.}$ This implies that small SE_Mindicates high reliability.

The SE_M can be used to create a confidence interval around observed scores. The true score is approximated by the upper and lower boundaries of the confidence interval. Even though an error is usually said to be inherent in CTT, the goal during the TDP is to reduce this error. As such the test is made to be as reliable as possible. In case where the reliability coefficient is known, we can determine the error variance, whose square root is the standard error of measurement. Clearly defining the confidence interval with the help of SE_M allows more reliable estimations of the true score.

Split half method

If assumed that the items can be divided into two in terms of cumulative difficulty and content, then reliability can be estimated. One way would be by assigning odd numbered items on one group and even numbered items on the other. The other way could be by breaking the test into two taking the first half of the questions. Indeed, it is estimated that the mark of each testee on each half should resemble that on the other half. This is done by correlating using Pearson statistics and correcting for all items.

$$rxx = (2rhh)/(1+rhh) \ldots\ldots.5$$

rhh = correlation between the two halves of the test

In order to do this; the test is divided into two halves, the correlation between the two halves is then calculated. The Spearman-Brown formula can be used to get the reliability estimate. The formula gives an upper bound estimate of the reliability expected.

Kuder-Richardson-20 method

It was KR who determined a way to obtain homogeneity estimates of items. KR-20 is an index of homogeneity which is obtained by considering the proportion of correct and incorrect responses for each item.

$KR\text{-}_{20} = [(k/k\text{-}1)]\ [(s^2x\text{-}\Sigma pq)/(s^2x)]$

Where;

K = number of trials or items

s^2x = variance of scores

p = percent answering right

q = percentage answering wrong

Σpq = sum of pq products of all items

The KR-21 simplifies the formula by assuming that all the items are of the same difficulty.

$KR\text{-}_{21} = [(k*S^2)\ \text{-}(\ddot{X}*(K\text{-}\ddot{X})]/[(K\text{-}1)/(s^2)]$

Where;

K = number of trials or items on test

$S^{2\,=}$ variance of test

$\ddot{X}$ = mean of test

Research methods

This section describes the methods that were used to arrive at the findings.

Research design

The research design employed was the cross sectional survey. It was tailored in a much easier way to met the research objectives employing a simple questionnaire to obtain data (Amin, 2004)

Table 2: Operationalization of variables

Dependent Variable (effect)			**Independent Variable (cause)**
Guidance counselling program			Assessment (**for**, as, of)
Personal			
Academic			
Career/vocational			
Introductory phase	Working phase	Follow-up phase	

<table>
<tr><td rowspan="5">Introductory phase</td><td colspan="2">Assessment
Values
Interests
Aptitudes
Personality
(VIAPs)</td><td>Data collection/
measurement</td><td>Evaluation
/counselling</td></tr>
<tr><td colspan="4">measurement</td></tr>
<tr><td colspan="3">validity</td><td>reliability</td></tr>
<tr><td>face</td><td>Construct
VIAPs</td><td>Predictive
performance in
STEM fields</td><td>Split-halve
(inter/intra item
analysis)
Correlations</td></tr>
</table>

Source; researcher, 2019

The table describes by algorithm, at what stage of the counselling process the instrument comes in. Specifically, the instrument is introduced to measure the clients' interests, at the introductory stage of the career counselling process. Attributes or characters of the client are usually measured. It is at the stage of data collection that these attributes are collected or measured, and then evaluated. This summarizes the counselling process, which in essence is iterative.

THE STUDY AREA

The study was carried out in the metropolitan city of Yaoundé. This is the University of Yaoundé I host town and the capital of Cameroon. It is a city sited on seven hills in the Centre region of Cameroon. With above three million people (as of 2015 projections), it is the largest but one city in Cameroon after Douala; the economic capital of Cameroon. It is the capital of the Centre Region and is elevated to about 750meters (2500ft) above sea level. The city utilizes and covers an area of about 180km^s (70square miles), thus has about 18000 people per square kilometre. It was chosen because it represents the school nature of any other part of Cameroon.

The sample

The sample size of respondents was determined from the targeted population using Tara Yamane's formula (Lawshe, 1975):

$$n = \frac{N}{1+N\,(e)^2}$$

where N= targeted population, e = the desired level of confidence (95%) and n=sample size)

Table 3: The study sample

	Number	Private school 1	Public school 1	Denominational school

Boys	144	44	50	50
Girls	259	59	100	100
Total	403	103	150	150

Source; field survey, 2020

Validation Procedure

Normally, the word reliability appears before validity in most write ups. However, it is important for the reader to understand that an instrument can be reliable, but becomes invalid when poorly used. On the other hand, in order to have a reliable instrument in itself, the validation or build up process has to be scientifically construed.

This section considers questionnaire used as a questionnaire and the protocol that made them valid for the study. So we briefly see the need for questionnaires, the use of previously validated questionnaire items, other design features, ordering of questions, distribution techniques, maximisation of return rate, management of non-responses and the need for piloting.

Questionnaire categories can generally be subdivided to the traditional paper-and-pen and computer or web-based questionnaires. Although the web-based is cost effective on the part of the researcher, it is less cost effective on the part of the respondent. With the traditional type, the researcher had the opportunity to attend directly to the respondents and clarify their doubts or attend to them in other ways (Marshall, 2005). This reduced the tendency to skip some items due to non-comprehension of words or statements (Popham, 2007).

The issue of missing data impedes reliability coefficients (Nenty& Fetogang 2015). Scholars have argued that questionnaires are not good for respondents with poor literacy, or poor vision, which buttresses the point, which it was more appropriate to employ questionnaires given that the respondents were high school students which gave the opportunity to move synchronously at a similar pace and improve their concentration and reflection on their responses (Nkechi, 2015).

In the case of poor return rate, it could be difficult to validate transferability of research results, given that the respondents could be significantly different from the non-respondents. In order to ensure that non-response rate was low, the respondents were assured anonymity and confidentiality. Neither their responses nor the outcome of their responses was to be related in any way to them.

The questionnaires were personally administered because it is easier to distribute, handle, code and analyse personally administered questionnaires (Nkechi, 2015). Since the study acquired data from a large number of respondents in 3 different intervals, it was preferred to use traditional questionnaires since they are much easier to administer and handle.

The questionnaires were pilot tested among students as well as measurement experts to predict and rectify potential issues that would arise in the field. An online questionnaire ensures higher anonymity and confidentiality, but it is more cumbersome and time consuming with a longer ‘wait’ time. With multiple questions and rating scales as well as semantic differential scale type questions, an ‘open-ended’ section would have allowed more comments, but this was overlooked in other to reduce the time for the analysis which was multiple times (Hua, 2015).

Some instruments have been developed to study students; interests, motivations, abilities and values for science. These were reused were necessary while modifying some words to reflect daily use by Cameroonians. Again, by not developing all the items from scratch, it gave the study an advantage since it shortened the time for which the separate instruments would have had to be validated. As such, the prerogative of the study was to establish the synergy of the individual components in the questionnaire overall.

Research has it that when there is no 'respondent-friendliness', reliability and validity coefficients are undermined. In other to avoid this, the design was build in a way that was easier to complete, avoiding confusing questions to prevent respondents from staying neutral or as opposed to reacting to the questions positively or negatively. 'respondent-friendliness' has been put simply as the ability to make most respondents understand what is asked of them (Marshall, 2005).

Although web-based questionnaires do not pose the geographical limitations posed by on site questionnaires, the burden to get contact online given that in our culture most students do not check their emails is scary. The non-verbal clues picked from the face-to-face contact could not be underestimated. In this light, the questions were in straight forward language null of technical terms to make errors as infinitesimal as possible (Wirsiy, 2022).

The purpose of the pilot or pre-test was to sieve vague and indifferent words in the questionnaire. This would help also to improve the face and content validities. At each round of administration, this iterative process was continued until the coefficients indicated satisfactory indices. Researchers have recommended that a questionnaire section should handle one aspect since lack of uni-dimensionality would confuse the respondents.

Perceptions differ from person to person and meaning of specific questions to individual questions change with the individual. Since the questionnaires do not provide probing (Creswell, 2014), which some questions might have called for, the respondents were deemed to be of the same class which increased their homogenous precept. Easy and non-threatening questions were completely embraced.

Face Validity of the Questionnaires

The face validity entails a subjective assessment of the questionnaires, not necessarily by experts, in terms of their readability, feasibility, consistency, formatting, clarity and language (Oluwatayo, 2012). The face validity of the instrument was done by sharing the instrument for potential respondents, teachers, CGCs and other school administrators to participate. They were expected to say a yes or no as to whether each section was favourable or unfavourable. This generally indicated the number of sections that needed review. Each person was expected to indicate favourable or unfavourable to; readability, feasibility, consistency, formatting, clarity and language. This enabled reviewing of the sections and items which were 'unfavourable' in the instrument. The Cohen's Kappa Index (CKI) was used to ensure that the instrument had at least a face validity index with a Kappa above .6(DM. et al., 1975).

Content Validity of the Questionnaires

The content validity here entails 'the degree to which items in an instrument reflect the content universe to which the instrument will be generalized' (Straub, Boudreau et al. 2004). The content validity was insured by including plausible items in the questionnaire instruments and later on eliminating undesirable items from the list (Lewis et al., 1995, Boudreau et al., 2001).

The first thing was to have a thorough review of the literature to find out what others have done in getting information about the self and work environment. This allowed each of the sections to be developed as aggregates. The Self-Knowledge section investigated; abilities, interests, values and personality, while the

Work-Knowledge section investigated work knowledge; occupational information and classification systems. (only the STEM Interest Survey has been published in this article)

Secondly, the content validity survey was developed which allowed experts to rate the content as appropriate or requiring modification. This allowed the researcher to revise areas that were deemed by experts as inadequate in terms of the content presented. The content validity survey rated each item on a three point scale as 'not necessary, useful but not essential and essential'. This allowed each and every item possible reviews depending on the number of reviews proposed.

Thirdly, the content validity review survey was sent to experts in the field of psychometrics to give expert opinions. In this case, mailing the surveys was deemed more appropriate given that most of these experts were in other areas other than where the researcher was. Their acknowledgeable contributions were given serious attention and considerations for revision were implemented.

Fourthly, Lawshe's (1975) method was used to calculate the Content Validity Ratio (CVR) for each item. This enabled further review of the items in the instrument. Items that fell short of expectation were reviewed and revised.

Lastly, items that were not significant at the critical level for Lawshes's method were completely eliminated. The Lawshe's method is a linear transformation of the proportion of 'experts' that rate an item as 'essential'.

$$\mathrm{CVR} = \frac{n_e - \left(\frac{N}{2}\right)}{\frac{N}{2}}$$

It is given as

Where; CVR = Content Validity Ratio

n_e = number of panel members indicating essential

n = total number of panel members

Whether or not an item is finally retained depends on the number of panel.

Generally the CVR should have a kappa or coefficient of .6.

Reliability of the questionnaires

Reliability is the consistency with which the instrument measures what it measures. The major prerogative of this work partly, was to document the career counselling process in a procedure that is simple for use by CGCs. By having a simple instrument at hand, it would facilitate the career counselling process and improve the reliability of counselling processes. In other words, as earlier mentioned, if a student visited counsellor A and then latter on counsellor B, the orientation given to that student by both counsellors should have a common ground. The reason for this is to reduce the confusion and improve the confidence that students have on their career counsellors. If the student had been advised towards a particular field of study, there should be some degree of consistency which should be backed up by evidence.

In order that the counselling procedure is reliable, the instruments and processes must be free from errors in measurement, as much as possible. Recall that whatever is done throughout this work is to ensure that at the end of it all, a model is proposed, which in simple language, should demystify career counselling. The developmental process of the instrument itself is the protocol that enables or improves the reliability of the instrument.

If the instrument is well construed, designed, developed and used, it is more likely to be reliable than if questions are randomly assembled, typed and administered to students. In such a case, the general trend in responses will continue to change upon every administration of the instrument. It is most likely, that if you ask about the Chelsea football club among football fans, their responses will be similar than when you ask the same question to non-football fans. The latter have a common background of knowledge, and are more likely to say the things that are true. However, if you ask about the particular football club to football fans, who do not like this particular club, the things they tell you, may more likely be due to sentiments and not facts. They will do bias reporting. Such things happen in all spheres of social sciences. Respondents would even answer 'yes' to please you. The following was done, to improve the reliability of the instrument.

According to Carmines and Zeller, (1979), reliability is the degree of consistency of test results. If the study is made under the same conditions, there should be repeatability of findings or results (Moser & Kalton, 2017). In order to ascertain reliability of the instrument, the internal consistency was checked to ensure that the various components or sections of the questionnaires were hanging together or measuring the same construct (Huck, 2007).

The reliability coefficients for the various components of the questionnaire for each questionnaire were correlated among themselves to find out the degree of consistency in measurement of the constructs. Take for instance, if a student values sciences, do we not expect that student to have interest in science. Again, if a student performs well in STEM, does it necessarily mean that the student is interested in STEM? The Cronbach Alpha Coefficient (CAC) was used to establish the internal consistency of the instrument, accepting values of at least .7 as reliable enough (Whitley, 2002, Robinson, 2009). Hinton et al. (2004) have suggested four cut-off points for reliability, which includes excellent reliability (0.90 and above), high reliability (0.70-0.90), moderate reliability (0.50-0.70) and low reliability (0.50 and below) (Hinton et al., 2004).

(Wilson, 2010) points to literature that although a test is reliable, it needs to be valid. That is, for a test to be reliable, it needs to be valid.

Questionnaire procedure

The questionnaire was self-delivered by the researcher. Clearance was solicited from the Dean, through the Head of Department to carry out this activity. The next thing was to contact various school principals in order to apply for scheduling on administering questionnaires. A cover letter stimulating that the research endeavour was purely an academic exercise was attached to the application and sent to the secondary schools. The schools were assured confidentiality on any information given.

Table 4: Return rate of questionnaires

	Issued	Number Returned	% of return
Boys	250	144	57.6

Girls	300	259	86.3
Total	550	403	73.3
%	100	73.3	

Source; researchers survey, 2019

Ethical considerations

The research methods were justified and presented to the Research Ethics Commission of the University of Yaoundé 1, such that they could review and make suggestions and recommendations on ways to improve protection of the participants and the researcher (Howe & Moses, 2016). All major documents consulted in the study were properly cited following the current APA citation model. As such, the researcher acknowledged the contributors to the work without claiming real estate of the research work. The data was collected such that no identity specific data was collected (anonymity) or presented (confidentiality) to avoid unjustified consequences on the research participants. Furthermore, no promises were made unjustly, ensuring that the participation was voluntary and that participants had the choice to back out if they willed without further consequences.

Presentation of findings

Table 5: Gender of Respondents

		Frequency	Percent
Valid	Male	129	32,0
	Female	259	64,3
	Total	389	96,5
Missing	System	14	3,5
Total		403	100,0

Source; Research field survey, 2021

Majority (64.3) of the respondents were female.

Table 6: Age range of respondents

	age	Frequency	Percent
Valid	10-13	72	17,9
	14-17	242	60,0
	18-21	60	14,9
	22-25	4	1,0
	25+	1	,2
	Total	380	94,3
Missing	System	23	5,7
Total		403	100,0

Note. Research field survey, 2021

Majority (60%) of the respondents were 14-17 of age. Those 10-13 constituted 17.9% while those 18-21 constituted 14.9%.

Table 7: STEM Interest Survey (STEMIS)

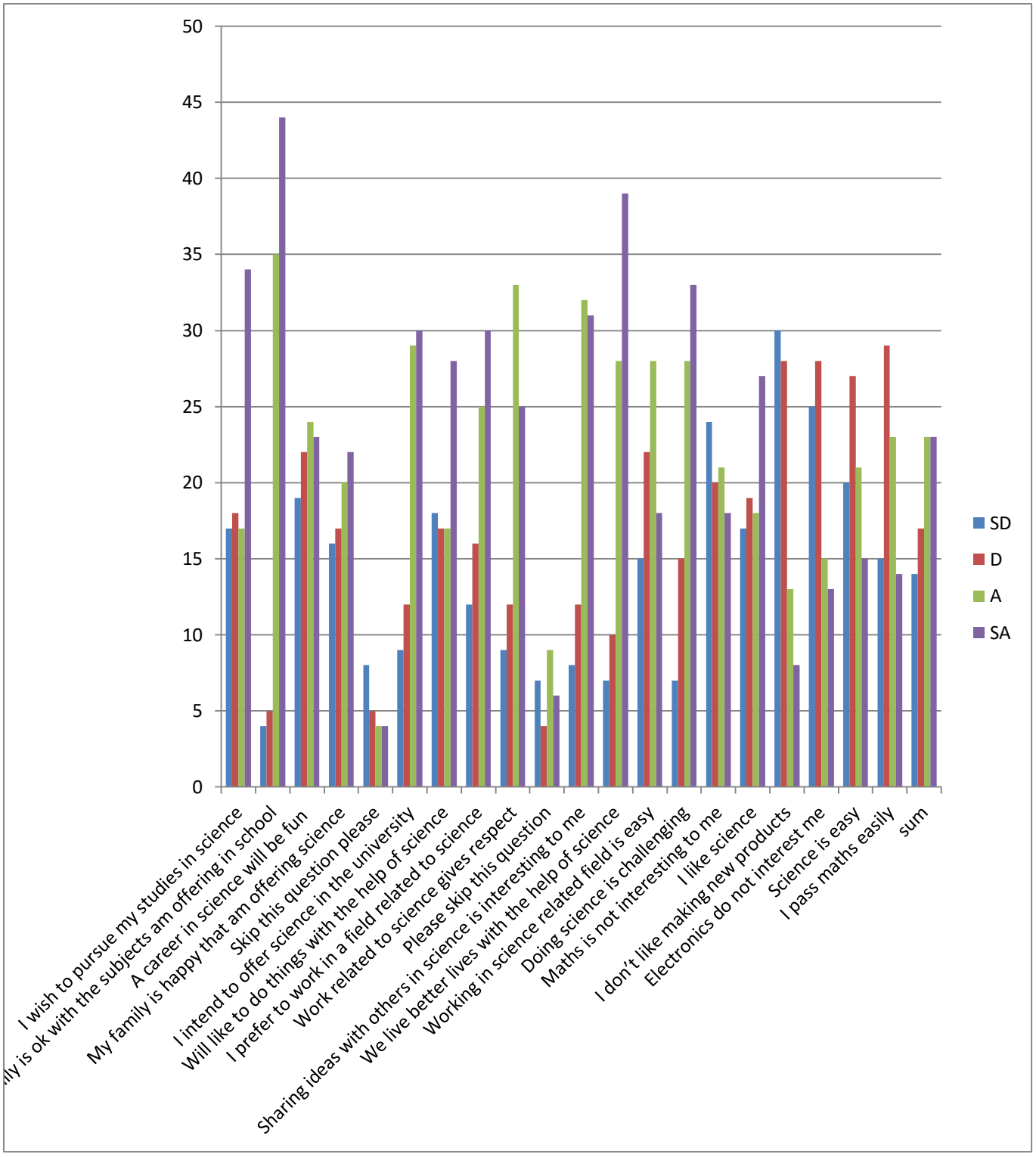
S/N	Item	SD	D	A	SA	Invalid
1.	I wish to pursue my studies in science	16.9	18.1	17.1	34	13.9
2.	My family is ok with the subjects am offering in school	3.5	5	35	43.9	12.6
3.	A career in science will be fun	12.9	22.1	24.1	22.8	18.1
4.	My family is happy that am offering science	16.1	17.4	19.9	22.1	24.5
5.	Skip this question please	7.7	5.2	4.5	4	78.6
6.	I intend to offer science in the university	8.7	12.4	28.8	30.5	19.6
7.	Will like to do things with the help of science	17.9	16.9	16.9	28.3	20
8.	I prefer to work in a field related to science	12.4	15.9	24.6	29.8	17.3
9.	Work related to science gives respect	8.7	12.2	33.0	25.3	20.8
10.	Please skip this question	6.5	4.2	9.2	6.2	73.9
11.	Sharing ideas with others in science is interesting to me	7.9	11.9	32	30.8	17.4
12.	We live better lives with the help of science	6.9	10.4	28.3	38.7	16.0
13.	Working in science related field is easy	14.9	21.6	27.5	18.4	17.6
14.	Doing science is challenging	7.4	15.4	27.5	32.8	13.7
15.	Maths is not interesting to me	23.8	19.6	20.6	17.6	18.4
16.	I like science	17.4	18.9	18.9	27	17.8
17.	I don’t like making new products	30.3	28.3	13.4	8.2	119.8

18.	Electronics do not interest me	25.1	27.8	14.9	12.7	119.5
19.	Science is easy	19.6	27.0	20.8	15.4	17.2
20.	I pass maths easily	15.9	29	23.1	13.9	18.1
	sum	14.1	16.9	22.5	23.1	23.4

Source; Research survey, 2021

An average of 45.6% agreed to the statements in the questionnaires, whereas 31% disagreed. Whether or not students agreed or disagreed was not of as much consequence as would be their consistency to make the same meaning in different ways.

Figure 1: STEMIS wave sequence



Source; Research survey, 2021

The crests represent the general response pattern of the respondents. The longest crests represent the strongly agree while the longer crests represent agree. The pattern is not uniform but generally consistent.

Table 8; STEM Interest Survey reliability

Reliability Statistics			
Cronbach's Alpha	Part 1	Value	,415
		N of Items	10[a]
	Part 2	Value	,697[b]
		N of Items	10[c]
	Total N of Items		20
Correlation Between Forms			,401
Spearman-Brown Coefficient	Equal Length		,572
	Unequal Length		,572
Guttman Split-Half Coefficient			,526
a. The items are; items 1-10			
c. The items are: items 11-20			

The reliability values .4 and .7 for split parts one and two respectively fall within acceptable reliability indices. These are corroborated by Spearman-Brown and Guttman Split-Half indices of .5.

Table 9; Item total statistics

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
I wish to pursue my studies in science	50,7179	26,260	,857	,280
My family is ok with the subjects am offering in school	50,6667	28,175	,753	,320
A career in science will be fun	51,2821	24,418	,686	,230
My family is happy that am offering science	51,4359	27,621	,914	,332
I intend to offer science in the university	51,4615	22,939	,893	,181
Will like to do things with the help of science	50,5897	30,564	,857	,381
I prefer to work in a field related to science	50,7692	25,077	,839	,243
Work related to science gives respect	50,5897	29,933	,764	,367
Sharing ideas with others in science is interesting to me	50,8718	27,062	,519	,297
We live better lives with the help of science	50,7949	29,062	,748	,354
Working in science related field is easy	51,4359	26,673	,916	,295
Doing science is challenging	50,6667	31,649	,786	,401

Maths is not interesting to me	51,3846	33,559	,712	,452
I like science	50,9744	26,973	,839	,312
I don't like making new products	51,7436	30,985	,607	,399
Electronics do not interest me	51,4872	36,204	,836	,501
Science is easy	51,3077	28,482	,882	,338
I pass maths easily	51,2564	25,248	,913	,242

The range of squared multiple correlations; from .5 (Sharing ideas with others in science is interesting to me) to .9 (Working in science related field is easy), represented satisfactory squared multiple correlation indices.

Discussion

The item analysis for any test normally entails that the items are checked to see the extent to which they comply to detractor, difficulty, discrimination indices and so on. This is especially important in the case where the testing is norm referenced. However, in criterion referencing such as the status quo, the emphasis doesn't place accent on separating the test takers to two different groups, but rather on the need to comprehensively describe the traits of the test taker. In as much as this is the need, the fulcrum is on the ability of the test to be reliable.

It is important to recall that the development of the instrument was characterized implicitly by 6 stages; conduct a literature review to help identify relevant test items, create a broad pool of items that will test the target aspect, do a preliminary pilot testing of the items, conduct a structural analysis to determine which of the items were to be eliminated from the pool, perform reliability analysis and create subscale reliability indices.

The r value for the STEMIS scale was done by conducting a split-halve reliability analysis for the 20 items on the scale. The first set of items ranging from 'i wish to pursue my studies in science' to 'work related to science gives respect' were correlated to the second half ranging from 'sharing ideas with others in science is interesting to me' to ' i pass maths easily'. The value of .4 $p<0.05$ for Chronbach's Alpha entailed satisfactory condition for accepting the r value. This value when complemented by correlation between forms that were conducted was an affirmation to using the STEMIS in our local contexts. Correlation between forms for the spearman-Brown coefficient of .6 and Guttman split-half coefficient of .5 were strong correlation coefficients.

These findings are similar in their indexes to those of Albert et al (2013), who developed the STEM Career Interest Survey. These two groups, the current and the one to which the original STEMIS was developed corroborate closely, in spite of the variability in background between the two populations. The two groups although divergent in terms of their cultural, religious, socioeconomic backgrounds still validate the instrument. In part, the students were compelled to think about their including questions 5 and 10, of course of which not all respected. This indicates some classical measurement error, to mean that some students may have ticked without reading closely. The power of the scale p=1-b generally refers to the strength of the scale. If p were equal to 1, that indicated the most powerful scale. However, p=1-0.05=0.95 which reflects the confidence level. Of course, p would hardly be up to 1 in real life, as it would be an ideal scale. Actually, the consideration for the construction of the scale in terms of construct and content account for the power, as it relates to reliability indices.

The summary item statistics for part 1 of .6 and part 2 of .6 were strong reliability indices for the STEMIS scale. The items strongly inter correlated with each other in the responses. Since all the items had acceptable r values with $p < 0.05$, there is no need reproducing them here. However, made mention is the fact that the items with the least mean if scale deleted was 'will like to do things with the help of science', 'work related to sciences gives respect'.

The Item-Total statistic; the corrected Item-Total correlation for the least was .2 'science is easy' while that with the highest r was .6, ' i intend to offer science in the university'. It is most likely to forget that these students' perceptions are not on whether they will offer sciences or not, but as to whether they have interest in science. Of course, students may be interested in a subject, but due to other contingences, they are impeded from taking up the subject. As mentioned earlier, this is out of the scope of the study, which rather produced an instrument which can say if or not the students have an interest in sciences.

Logically, there is of course a high correlation between interest in science and willingness to continue science studies in the university .6. But then, if the students are very willing to study science in the university, whether or not this happens, depends on the available accommodations and opportunities presented to them. These will normally be presented to them during career sessions and the explanation that they make. However, it is supposed to be a deliberated consensus effort to weigh lay the students into sciences.

Like literature has it, many countries have difficulty recruiting more individuals into STEM (Hil et al, 2010, Regisford, 2012). Austria, France, Germany, Honduras, Mexico, The Netherlands and Switzerland struggled at projecting the expansion of STEM fields by 2020. The US alone projected the creation of 3 million new jobs in STEM by 2020 (US Bureau of Labour Statistics, 2020). At that time, only 16% of US students, largely men, were obtaining degrees in STEM related fields. Many reasons suggest why there is difficulty in acquiring STEM backgrounds in mathematics to; lack of access to money and technology, lack of guidance from adults knowledgeable in STEM fields and psychological barriers (like the belief that math is difficult) and lack of models in those fields (STEM Connect, 2012).

Implications of the study

We cannot afford to have people stay in school and study 'what they want', but rather, through a concerted effort, we need to have people in school studying what we need. The 'we' here is a systems kind of thinking, in which the education sector is the processes, while the various occupations are the products of such processes. Most importantly, the inputs should include having a look at the nature of programs we are 'encouraging' students to go in for.

It is clear by now, that the GC program is at the epicentre of the endeavour to have students in the right programs in school. It is however important to understand that the counsellors cannot advise students to take up courses that do not exist in the first place. As such, it is important for them to work with other educational stake holders to put in place the right programs in the first place.

Recommendations

The Trait and Factor Theory approach to career counselling is at the core of this study. The study recommends strongly that career counsellors employ more conventional and classical means to gather evidence about the traits of learners and other factors that are commensurate to their career aspirations. By so doing, it will be possible to recommend to clients, based on objective than subjective analysis.

First and foremost, it is recommended that career counsellor, during the introductory stage of the counselling process; identify the traits of the students and factors that can lead to their success. In the same lamb light,

there is need to identify the factors that are deterrent or a hindrance to the career aspirations of the students or clients.

There are many ways to identify these factors. Testing is one important of such ways. By testing, the counsellors can gain a lot of time as compared to intimate dialogues, which although may throw deeper insight, but may not be able to consistently probe and prompt into the same direction. Various tests exist, which can be used, but this one is strongly recommended, given that it has been validated in our context. The test is very friendly, and although as a whole it may take up considerable time, made mention should be the fact that they are not necessarily to be administered in situ.

Furthermore, an easy way to gain time, and allow an ecological setting for the student, is to sometimes have them take the test at home and then return with it to the counsellor at their convenience. In this case, the counsellor should explain the purpose of the test to the client, explain to them what they are supposed to do in other to take the test, and show them the way to score themselves at the end of each section. When they do this, they can now bring their final score alongside the test. There is however need to always cross check to see that the student has done what was expected of them.

During the counselling process, the tests should suggest traits about the client, without undermining the need for the counsellor to infer from the client themselves to attest to the results from such testing. If the client rejects the outcome of the test, there is no need for alarm, but it provides an opportunity to ask them to through more insight as to why they think so.

The results of the test are not much more important than the interpretations that are made of them. And as such, the counsellor should endeavour at all cost to get the client fully involved in the interpretations that are made. If there are any recommendations based on these, the client should also take the lead, given that they are the ones to implement them.

To policy makers

There are many reasons why more students enrol into arts; ranging from enrolment opportunities to cost and spacing or infrastructure. Schools logically will enrol less number of students in science due to extra accommodations that are required, such as laboratory spaces. If you ask many schools, they would usually begin to run arts series' in high school prior to running the sciences. As such, the students leaving form five or secondary school therefore already have more chances and choices which often than not, help to sway students away from the sciences.

To teachers and counsellors

Furthermore, there has been a classical reasons why the performance in math reading and science is the way it is. The methods that are being employed in the sciences and math may not be appropriate enough. For this reason, the CGC should have particular precedence on the results of students in math and science or STEM, and should go an extra mile to provide intervention programs in synergy with the school stakeholders.

The STEM refers to practical subjects and students who love practice will not excel if the subjects are kept at theoretical level. Therefore, the schools should endeavour that in spite of the scarce resources; they should make demonstrations more regular, and have to dissuade the mindset that the classroom is made up of a bench and blackboard, and seek other a venues for learning. These could include; parks, workshops, garages and so on.

Policy makers should consider public funding of the GCE exam or it should cost the same for arts and science, so that science students should not be tasked with the extra expenses to offer science, which gives students

unfair advantage. This should allow more students to enrol into the sciences. Furthermore, there should be an accent on career fairs. Schools and the industry should work together to advertise science spheres. They should allocate resources to give prices, sponsorships, scholarships and so on to meritorious students. Companies should be encouraged to give special recruitment to students graduating with distinction. As such, the students should see the need and the advantage involved in pursuing careers in the sciences and math.

Limitations of the study

The research design could have employed triangulation to employ both split halve and parallel forms to ascertain the reliability indices.

A comparative study between Grammar and Technical schools should have allowed insight into the career options of the students. This should have underlined the extent to which lodging of the students in particular career fields affects their career choices.

Furthermore, a stratified sampling to include technical schools would have allowed a t-test to verify if there was a significant mean difference between the scores of the scores of the groups.

Suggestion for further research

The research design to replicate this study and triangulate to employ both split halve and parallel forms should be conducted to ascertain that there are no methodological differences

A comparative study between Grammar and Technical schools should be carried out to allow insight into the career options of the students. This will underline the extent to which lodging of the students in particular career fields affects their career choices.

Furthermore, a stratified sampling to include technical schools should be carried out to allow a t-test to verify if there is a significant mean difference between the scores of the groups.

References

Ansu, Yaw, and Jee-Peng Tan. 2012. “Skills Development for Economic Growth in SubSaharan Africa: A Pragmatic Perspective.” In *Good Growth and Governance in Africa: Rethinking Development Strategies*, edited by Akbar Noman, Kwesi Botchwey, Howard Stein, and Joseph E. Stiglitz. Oxford Scholarshi. http://doi.org/10.1093/acprof:oso/9780199698561.001.000

2009. “Strategy Document for Growth and Employment.” Yaoundé, Cameroon.

Sosale, S. & Majgaard, K. (2018). Fostering Skills in Cameroon: *Inclusive Workforce Development, Competitiveness, and Growth.* World Bank Group

ILO (International Labour Organization). 2010. “Global Employment Trends for Youth.” Special Issue on the Impact of the Global Economic Crisis on Youth. ILO, Geneva.

MINEFOP (Ministry of Employment, Vocational Education, and Training), ILO (International Labour Organization) Bureau Sous Régional pour l’Afrique centrale avec Ministère de l’Enseignement de la Formation et Professionnelle, and BIT/BSR. 2009. *Étude sur la filière porteuse d’Emploi* “Le Tourisme.” Projet d’Appui à la Promotion de l’Emploi et à la Réduction de la Pauvreté. Rapport définitif par Zacharie Ewolo Onana. Yaoundé, Cameroon.

De Bruin, G. P. (2001). Career counselling assessment. In C., Foxcroft & G., Roodt

De Bruin, G. P. (2014). The effects of test interpretation styles and the status of tests in career SA Journal of Industrial Psychology

Alison, C. (2006). 'Sound, presence and power' 'students voice' in Educational Research and Reform. Winter Inquiry (Eds.). An introduction to psychological assessment in the South African context. Oxford: University Press.

Wirsiy, N. W. (2022). The perceptions of teachers and students about assessment for learning in some selected high schools in Bui Division. Global Scientific Journals, Volume 10 issue 7.

Elder, Sara, and Koko Siaka Koné. 2014. "Labour Market Transitions of Young Women and Men in Sub-Saharan Africa." International Labour Organization, Geneva

Fonlon, B. (1969) *To Every African Freshman or The Nature, End and Purpose of University Studies*. Cameroon Times Press Victoria.

Wirsiy, N. W. (2023). The 'cone effect' and its implication for an emerging economy: The case of Cameroon. Global Scientific Journals, Volume 11 issue 1.

National Institute of Statistics (NIS) (2009). Recensement général des entreprises 2009, principaux. Yaounde : NIS

National Institute of Statistics (NIS) (2011). Statistics Year Book 2010: Yaounde : NIS

Kithyo, I. M. & Petrina, S. (2002). Gender in school-toschool transitions: How students choose career programs in technical colleges in Kenya. Journal of Industrial Teacher Education, 39.

Ibarra, H. & Barbulescu, R. (2010). Identity as narrative: Prevalence, effectiveness, and consequences of narrative identity work in macro work role transitions. *The Academy of Management Review, (35(1), 135-154*

Krumboltz J. D, Mitchel M. A & Jones, B. (2016). A social learning theory of career selection. The counselling psychologist, volume 6, issue 1

Rossier, J. (2015). Career adaptability and life designing. In L. Nota & J. Rossier (Eds), Handbook of life Design: From practice to theory to practice (pp. 153-167). Hogrefe.

Bloom, B. S. (Ed) (1956). *Taxonomy of Educational Objectives,* Handbook 1: Cognitive Domain. New York: Mckay.

Spearman . C (1904). General Intelligence, Objectively Determined and Measured. The American Journal of Pschology. http://doi.org/10.2307/1412107

Kuder, G. F. & Richardson, M. W. (1937).The theory of estimation of test reliability.
Yamane, Taro. (1967). Statistics: An introductory analysis, 2nd Edition, New York: Harper and Row

Popham, W. J (2007). 'A test is a test Is a test-not? Educational leadership.

Nenty, H. J., &Fetogang, B. E. (2015).Classroom practices and the validity of teaching mathematics in Botswana senior secondary schools.*African Journal of Theory and Practice of Education Assessment (*EARNiA Journal), 55-75

Marshall, G. (2005). The purpose, design and administration for data collection, Radiography

Nkechi, E. E. N. (2015). Competency level of fresh graduates of Nigerian universities in employment survival skill .*African Journal of Theory and Practice of Education Assessment (*EARNiA Journal), 38-54

Hua, M. T. (2015). Using the Biggs' study process questionnaire as a diagnostic tool to identify 'at-risk' students: a preliminary study. Retrieved from http://www.learnerstogether.net/wp-content/uploads/2006/07/identifying-at-risk-students-with-spq-pdf July 2017

Amin, E. M. (2004) *Foundations of Statistical Inference for Social Science Research* Makerere University Printery, Kampala Uganda

Arksey and Knight (1999, as cited in Gray, 2009).

Creswell, J. W. (2014). Research Design : Qualitative, Quantitative and Mixed Methods Approaches (4th ed.). Thousand Oaks, CA: Sage.

Oluwatayo, J. (2012). Validity and Reliability issues in Educational Research. Journal of Education and Social Research 2m 391-400

Straub, D., Boudreau, M., & Gefen, D. (2004). Validation Guidelines for IS Positivist Research. Communications of the Association for Information Systems, 13, pp-pp https://doi.org/10.17705/1CAIS.01324

Lewis et al., (1995). An Emperical Assessment of the Information Resources Management Construct. Journal of Management in Information Systems, 12, 199-223

Lawshe's C. H. (1975). A quantitative approach to content validity. Personael pscychology. https://doi.org/10.1111/j.1744-6570.1975.tb01393.x

Carmines, E. G. & Zeller, R. A., (1979). Reliability and Validity Assessment. Quantitative Applications in the Social Sciences. https://dx.doi.org/10.4135/9781412985642.

Moser, C. A. & Kalton, G. (2017). Survey Methods in Social investigations. Taylo

Huck, S. W. (2007). Reform in statistical education: Psychology in the schools. https://doi.org/10.1002/pits.20244

Whitley, B. E. Jr. & Keith-Spiegel, P. (2002). Academic dishonesty: An educatior's guide. Lawrence Erlbaum Associate Publishers.

Hinton, P. R., McMurray, I., Brownlow, C. (2004) . SPSS Explained. Behavioural science research methods. https://doi.org/10.4324/97802036425

Wilson, T. D. (2010). Fifty years of information research. https://doi.org/10.1002/bult.2010.1720360308

Howe, K. & Moses, M.(1999). Ethics in educational research. Review of research in education, vol 24, pp, 21-60

Albert, D., Chein, J., & Steinberg, L. (2013). Peer influences on adolescent decision making. Current Directions in Psychological Science, 22.2, 114-120 https://doi:org/10.1177/0963721412471347

Hill, E. J., Erickson, J. J., Holmes, E. K., & Ferris, M. (2010). Workplace flexibility, work hours, and work-life conflict: Finding an extra day or two. Journal of Family Psychology, 24(3), 349-358. https://doi.org/10.10037/a0019282

Regisford, (2012). The development of STEM career Interest Survey (STEM-CIS)

US Bureau of Labour Statistics, 2020

STEM Connect, (2012). Reimagining the role of school libraries in STEM education. Creating hybrid spaces for exploration