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Highlights

- Growth of Ethiopian Inflation
- Perception towards Integration
- Learning Management System
- Dynamic Behavior over Time

Discovering Thoughts, Inventing Future

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Pre-Service Teachers' Perception towards Integration of Learning Management System to Instruction

By Omotunde Christopher Tayo
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Abstract- Learning Management Systems (LMS) are web-based systems which allow instructors and students to share materials and interact online. This study examines pre-service teachers' perception towards the integration of LMS into their instruction. The study adopted a descriptive research design using simple survey method. The samples were drawn from five faculties, totaling nine hundred and fifty-four (954) pre-service teachers of Adeyemi University of Education, Ondo. Data collected were analyzed using t-test and Pearson Correlation to determine relationship between variables and the level of significance set at 0.05.

Findings from the study based on the variables (gender, age level of study and department) has shown that pre-service teachers have a positive perception to the integration of LMS into their instruction and if it's used effectively, it will increase the efficiency of the educational process, decrease the amount face-to-face instruction and strengthen self-study and thus develop student's learning competences.

Keywords: learning management system, perception, pre-service teachers.

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PRESERVICETEACHERSPERCEPTIONTOWARDSINTEGRATIONOFLEARNINGMANAGEMENTSYSTEMTOINSTRUCTION

Strictly as per the compliance and regulations of:

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I. Introduction

Technology has inevitably become the most powerful tool in almost all aspect of human's daily life. It is regarded as a major revolution and it has a significant impact on education (Jegede, 2006). The present use of information communication technology (ICT) is the new paradigm shift in learning in the 21st century. This technological advancement allows people to easily access, gather, analyze and transfer data and knowledge. According to (Horton and Horton 2003), trends in technology influence education and knowledge management. In Nigeria and other Africa countries, the number of students enrolling for undergraduate level courses has been on a sharp rise. Lectures are being held in large lecture theatres as learning spaces is becoming less available and student-teacher interaction is on the decline. The need for the development of ICT, concomitant with the internet is a global resolution and has been a subject of great significance to all mankind (Olaofe, 2005). These technologies have however become an integral part of our daily activities, learning inclusive.

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The rapid development of ICT has led to its increased use in instruction and learning (Cappel and Hayen, 2004; Kim and Ong, 2005) and many Nigerian institutions are already implementing this as part of their academic program. Even if ICT has not revolutionized the classroom, it is changing the learning experience of students (Gambar and Okoli, 2007). Several studies have underscored the benefits of ICT in education. The computer-assisted-instruction was found more efficient in all educational level and with lower achieving students (kulik, 1983;Kulik and Cohen, 1980). Information and communication technology significantly improves learners' problem-solving skills, provide opportunity for learner-constructed learning, increase learners' cooperation on projects, enhance mastery of vocational and workforce skills, increase the preparation of learners for most careers and vocation and develop confidence and attitude of learners (Cradler and Bridgeforth, 2006).

In Nigeria, very few of our conventional higher institution are now carrying out their activities through one form of ICT. While the urge to embark on online instruction is still a dream to some because of weak ICT infrastructure, the rapid expansion of ICTs and Internet technologies offers an opportunity for some few institutions to embark on the use of Learning Management System (LMS) for instruction.

Laster (2005) defines learning management system as a self-contained web page embedded with instructional tools that permit academic staffs to organize academic content and engage students in their learning. Elis (2009) sees it as a software application for administration, documentation, tracking and reporting of training programmes, classroom and online events, e-learning programmes and training content. Learning management system ranges from systems for managing training and educational records, to software for distributing courses over the internet with features for online cooperation. The introduction of online instruction to teaching and learning process has afforded teachers and learners to carry out their responsibilities effectively. Teachers can now serve their ultimate functions of moderators and facilitators in the instructional process and learners also learn at their own convenience.

Baily (1993) presents the following general characteristic for an LMS in education:

- Instructional objectives are tied to individual lesson;
- Lessons are incorporated into the standardized curriculum;
- Courseware extends several grade levels in a consistent manner;
- A management system collects the results of student's performance; and
- Lessons are provided based on the individual students learning progress.

Furthermore, (Ellis, 2009) asserts that LMS should be able to do the following;

- Centralize and automate administration
- Use self-service and self-guided services
- Assemble and deliver learning content rapidly
- Consolidate training initiative on a scalable web-based platform
- Support portability and standard and
- Personalized content and enable knowledge reuse.

Lanny (2009) asserts "although the LMS needs to examine serving as an enterprise CMS (Course/Content Management System), it also needs to be a learner-centered application that gives learners greater control over content and learning. Hence, there is a continual demand for the LMS to utilize and integrate with many of the Web 2.0 tools that learners already use freely on the internet and that they expect to find in this kind of system". A learning Management system (LMS) is "an information system that administers instructor-led and e-learning courses and keeps track of student's progress.

II. Rationale

The state of quality education in Nigeria is quite worrisome. There is an estimated 26 million Nigerian youth who have little access to tertiary education (Yaradua Foundation Report 2013) and the difficulty in sustaining education through traditional means in higher education institutions prevails (Adu, Eze, Salako and Eyangechi, 2013). This situation can be attributed to a high population growth, increase in demand for education, inadequate funding and the difficulty in delivering education through traditional modes. Clark and Ausukuya (2013) state that the needed human resources (teacher student ratio as high as 1:356 in some cases) are inadequate, indicating the inability of existing structures (classrooms, learning and human resources) to cope with the growing population through traditional learning practices. These problems cut across all tertiary institutions in Nigeria including Colleges of Education who have the mandate to provide highly motivated, meticulous and efficient classroom teachers; and to further inspire the spirit of enquiry and creativity in teachers in order to help them fit into the public life of the community and society at large. (Kwache, 2007). For Nigeria to move forward in education there is the need for timely intervention by which the learning system in these institutions be appraised. Solution however lies in exploring the possibility of utilizing global knowledge to handle local problems through investing in human capital and appropriate integration of technology with a view to meet up with the globalized standard of learning.

This study therefore seeks to find out the perception of pre-service teachers to the integration of LMS to their learning experience.

III. Research Question

1. Is there a significant difference in the level of perception of the use of LMS between male and female students?
2. Is there a significant difference in the perception and readiness to the use of LMS based on age?
3. Is there a significant difference in the perception and readiness to the use of LMS based on level of study?
4. Is there a significant difference in the perception and readiness to the use of LMS based on department (Course of Study)?

IV. Hypothesis

1. There is no significant relationship between gender and perception to the use of LMS
2. There is no significant relationship between age and perception to the use of LMS.
3. There is no significant relationship between level of study and perception to the use of LMS.

V. Methodology

This study adopted a descriptive research design. Simple survey method was used to carry out the study. This is because the study seeks to determine the perception of students to the integration of learning management system (LMS) into teaching and learning. A total of 1200 copies of questionnaires were administered to 300 and 400 level students who had been randomly sampled from the Faculty of Languages, Arts and Socials, Vocation and Technology, Sciences and Education of Adeyemi University of Education. Only 954 copies were correctly filled out and considered fit for the analysis giving a 79.5% response rate.

VI. Research Instrument and Data Analysis

In order to identify pre-service teachers' perception to the integration of LMS for instruction, a questionnaire was used to collect data. The first section is on personal data of respondents, section B is on computer and internet usage, section C dwells on computer knowledge and skills while section D centres on pre-service teachers' perception to the integration of

LMS. The questionnaire was rated on four point Likert scale. Data collected was analyzed using t-test and Pearson Correlation to determine relationship between variables. The level of significance for the study is set at 0.05.

VII. RESULTS

Research Question 1: Is there a significant difference in the level of perception to the use of LMS between male and female students?

Table 1A

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Perception of the use of LMS	Female	460	.54	.309	.014
	Male	494	.75	.259	.012

Table 1B

Perception of the Use of LMS	Levene's Test for Equality of Variances		t-Test for Equality of Means			
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Equal variances assumed	94.506	0.000	-11.005	952	0.000	-0.203
Equal variances not assumed			-10.937	898.579	0.000	-0.203

Using the t-test for independent samples, a statistically significant difference was found in the level of perception of the use of LMS among male and female students ($t = -10.937$, $df = 898.579$, $p = 0.000$). The mean value of perception for male students was higher than that of female students ($0.75 > 0.54$). This implies that the male students have a better perception of the use of LMS than female students.

Research Question 2: Is there a significant difference in the level of perception to the use of LMS based on age?

Table 2A

Perception of the use of LMS	Age	N	Mean	Std. Deviation	Std. Error Mean
	15 - 24	457	.83	.175	.008
	Above 24	497	.48	.292	.013

Table 2B

Perception of the Use of LMS	Levene's Test for Equality of Variances		t-Test for Equality of Means			
	F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference
Equal variances assumed	332.005	0.000	22.675	952	0.000	0.357
Equal variances not assumed			23.128	822.669	0.000	0.357

A significant difference was found in the level of perception of the use of LMS based on age ($t = 23.128$, $df = 822.669$, $p = 0.000$). Students in the age range of 15 – 24 had a better perception than students above 24 years of age. Thus younger students have a better predisposition to LMS.

Research Question 3: Is there a significant difference in the level of perception to the use of LMS based on level of study?

Table 3A

Perception to the use of LMS	Level of Study	N	Mean	Std. Deviation	Std. Error Mean
	300L	506	0.68	.291	.013
	400L	448	0.61	.309	.015

Table 3B

Perception of the Use of LMS	Levene's Test for Equality of Variances		t-Test for Equality of Means			
	F	Sig.	T	df	Sig. (2-tailed)	Mean Difference
Equal variances assumed	9.563	0.002	3.775	952	0.000	0.73
Equal variances not assumed			3.762	921.411	0.000	0.73

Using the t-test for independent samples, a significant difference was found in the levels of perception to use LMS based on level of study (t = 3.762, df = 921.411, p = 0.000). 300L students had a better perception of LMS (0.68) than 400L students (0.61).

Research Question 4: Is there a significant difference in the level of perception to the use of LMS based on department (Course of Study)?

Table 4 : Perception to the use of LMS based on Department

Department	N	Mean	Standard Deviation
English	112	0.66	0.210
Yoruba	85	0.62	0.192
Economics	111	0.75	0.360
Guidance & Counselling	73	0.58	0.414
Agriculture	82	0.74	0.341
Home-Economics	108	0.75	0.306
Chemistry	83	0.74	0.098
Biology	110	0.53	0.194
History	93	0.52	0.316
Geography	97	0.59	0.341

Students in Chemistry Department had the best mean value (0.74) for the level of perception to the use of LMS, (the smaller the standard deviation, the better) while students in History department had the lowest mean value. Chemistry students have a very good perception of the use of LMS while, History students have a relatively low/poor perception to the use of LMS.

Hypothesis 1: There is no significant relationship between gender and perception of the use of LMS.

Table 5

		Gender
Perception of the use of LMS	Pearson Correlation	.336**
	Sig. (2-tailed)	.000
	N	954

The table above shows that gender has a positive significant correlation with perception of the use of LMS (r = 0.336, p = 0.000). The r value implies that gender explains 33.6% of variations in the perception to the use of LMS. On this basis, the null hypothesis stated above is rejected.

Hypothesis 2: There is no significant relationship between age and perception of the use of LMS.

Table 6

		Age
Perception of the use of LMS	Pearson Correlation	-.687**
	Sig. (2-tailed)	.000
	N	954

The result displayed in the table above shows that age has a negative significant correlation with perception of the use of LMS ($r = -0.687$, $p = 0.000$). This negative relationship implies that as age increases, perception LMS reduces. Age explains 68.7% of the variations in perception of the use of LMS. Based on the foregoing, the null hypothesis is rejected.

Hypothesis 3: There is no significant relationship between level of study and perception of the use of LMS

Table 7

		Gender
Perception of the use of LMS	Pearson Correlation	.695**
	Sig. (2-tailed)	.000
	N	954

The table above shows that level of study has a positive significant correlation with perception of the use of LMS ($r = 0.695$, $p = 0.000$). The r value implies that level of study explains 69.5% of variations in the perception to the use of LMS. It implies that as the level of study increases by a year, the perception to use LMS also increases. On this basis, the null hypothesis stated above is rejected.

VIII. Discussion and Conclusion

The integration of a Leaning Management System into teaching practices is increasing in higher education. Obadara (2014) noted that an average of 1.4 million Nigeria university students offers at least one online course during the outgone academic session; this is a 21 percent increase over the number reported in previous year. Researchers (Bates, 2008; Betts, 1998; and Wilson, 2003) concurs that perception and readiness is the key to a student's decision to learn and use technology, they emphasized that multimedia integration into the learning management material helps students to realize that learning requires different tools that can facilitate learning process. They concluded that students' acceptance of any new initiative such as LMS is critical to its success. Results revealed that there is a statistically significant difference in the level of perception of the use of LMS among male and female pre-service teachers. In agreement with previous research by lee (2003), who reported significant difference between sexes, relating to perceived roles in online learning in a campus environment still exists. Some researchers reiterate that perception of learners to technology adoption depends on shared negotiation of values, particularly on how the technology fits into existing social purposes and practices of the community (Wilson, Shery, Dobrovolny, Batty and Ryder, 2002; Fishman, 2000). Research spanning back over about 20 years shows females have traditionally lagged behind males in their willingness to learn about and use technology in schools (Schubert, 2001). However, recent studies indicates that the gender disparity have narrowed substantially (Omotunde, Fagun, Aderele and Abidoye 2014). It also indicates that there is a significant difference among the ages of respondents in their perception to the use of LMS to teaching. This is in deviance to Adedoja, Omotunde and Adelore (2010) who perceives ICT is an indispensable tool to perform task at every point of human life as such, both young and old requires some background in ICT to remain relevant in this 21st century. In an attempt to find a variation in the level of perception and course of study together with level of study, the results indicates that there is no significant difference. This can be explained by Chinwe (2010) who reported that students of the University of Ibadan compulsorily make use of the Internet to register for their courses, retrieve information for their assignments. When eventually the departments decide to go online with instructional delivery, students are compelled to use the platform irrespective of the department or level they belong. Although, one may be tempted to believe that science-based students would have higher level of readiness than the other, the fact remains that ICT knowledge is relevant to all field of endeavors. Students across subject combination need ICT background to embrace modern teaching-learning modes.

As a conclusion, LMS has become a common expression in higher institution of learning these day, Nigeria universities should not be exempted. The study has shown that pre-service teachers have a positive perception to the use of LMS for instruction and if it's used effectively, it will increase the efficiency of the educational process, decrease the amount face-to-face instruction and strengthen self-study and thus develop student's learning competences. Therefore, stakeholders which include the government, institutions, instructors, lectures should embrace and exploit the full benefit of learning management system for teaching and learning as these would bring in meaningful instruction and satisfaction.

References Références Referencias

1. Adedoja, G., Omotunde, C., and Adelore, O. (2010). Short Message Service (SMS) Application as a Learning Support Tool in a University-Sponsored Literacy Programme. International Journal of Literacy education, 7(2), 56-74.
2. Adu, E.O., Eze, I.R., Salako, E.T. and Nyangechi, J. M. (2013). E-learning and Distance Education in Nigeria. International Journal of Science and Technology, 2 (2), 203-210.
3. Bailey, A. (1993). Wanted: a road map for understanding integrated learning systems. Computer Based Integrated Learning Systems. 3-9p. Englewood Ciffs, NJ; Eduacational Technology publications.
4. Bates, A. W. (2000). Teaching, learning and the impact of multimedia technologies. Educause Review, 35(5), 38-44.
5. Betts, K. S. (1998). Factors influencing faculty participation in distance education in postsecondary education in the United States: An institutional study. Unpublished doctoral dissertation, George Washington University, Washington, DC.
6. Cappel J, Hayen R. (2004) . Evaluating E-Learning: A Case Study. The Journal of Computer Information Systems. 44 (4), 49-57.
7. Clark, N. and Ausukuya, C. (2013). An overview of education in Nigeria. World Education News and Reviews. [Online] Available: http://wenr.wes.org/2013/07/an-overview-of-education-in-nigeria.
8. Chinwe, V.A. (2006). Dynamics of internet usage; a case of students of federal university of Owerri, Nigeria. Eduactional Research and Reviews, 1 (6), 192-195p.
9. Cradler, G and Bridgeforth, H. (2006). Higher education faculty perceptions of technology integration and teaching. Teaching and Teacher Education: An international journal of research and studies, 25, (5), 690-696. Retrieved on January 15, 2012 from ERIC database.
10. Ellis A. (2009). Staff development for staff delievery: a collaborative, team base action learning model. Australian Journal of Educational Technology, 16 (1), 26-44p.
11. Fishman, B. J. (2000). How activity fosters CMC tool use in classrooms: Reinventing innovations in local contexts. Journal of Interactive Learning Research, 11(1), 3-27.
12. Gambari, A.I. and A. Okoli, (2007). Availability and utilization of information and communication technology (ICT) facilities in higher institutions in Niger State, Nigeria. Inform. Technol., 4: 34-46.
13. Horton. W. and Horton, K. (2003). E-learning tools and technologies: a consumer's guide for trainers, teachers, educators and instructional designers. Canada: Wiley, John and sons Inc.
14. Jegede, P.O. (2007) Computer attitudes as correlation of computer self-efficacy among south western Nigetia higher education teachers. Paper presented at sixth international internet educational conference, Cario, Egypt. Retrieved on March 10. 2015 from http://www.digitalopportunity.org/article/view/125462/1/
15. Kim, J.K. and Ong, C. (2003). Cross-cultural comparison of online collaboration. Journal of computer mediated communication, 8(1). www.westga.edu/%7E-distance/ojdla/fall.html
16. Kulik, J.A., Kulik, C. and Cohen P. (1980). Effectiveness of Computer-Based College Teaching: A Meta-Analysis of Findings. Review of Educational Research, Vol. 50, No. 4, pp. 525-544.
17. Kwache, P.Z. (2007). The imperative of information and communication technology for teachers in Nigeria higher education. Journal of Online Learning and Teaching, 3(4), 395-398.
18. Laster, S. (2005). Model-driven design: Systematically building integrated blended learning experiences. Journal of Asynchronous Learning Networks, 8(5), 23-40.
19. Lee, J. (2001). Instructional support for distance education and faculty motivation, commitment, satisfaction. British Journal of Education Technology, 32(2), 153-160.
20. Obadara O.E. (2014). Effect of Learning Management System (LMS) on Students' Academic Performance in University of Lagos, Nigeria. International Journal of Educational Foundations and Management, 2(1), 25-33. Retrieved 11 March 2015 from http://www.ijefm.com.
21. Olaofe, I.A., (2005). Nigerian educational emancipation: Roadmap from crisis to resurgence. Faculty of Education Seminar Series, No. 1. Ahmadu Bello University, Zaria.
22. Omotunde C.T., Fagun, K.O., Aderele, S.O., and Abidoye, S.O. (2014). Attitude and Usage of Blog as a Determinant to Pre-Service Teachers' Academic

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23. Wilson, B., Sherry, L., Dobrovolny, J., Batty, M., & Ryder, M. (2001). Adoption of learning technologies in schools and universities. In H.H. Adelsberger, B. Collis, & J.M.Pawlowski (Eds.), Handbook on information technologies for education and training. New York: Springer-Verlag.
24. Wilson, W. (2003). Faculty perceptions and uses of instructional technology: A study at one university system revealed the current state of technology and some steps that could improve it. Educause Quarterly, 2, 60-62.
25. Yaradua Foundation Report (2013). Mobile learning pilot project in Nigeria. [Online] Available: www.yaeaduacentre.org (August 23, 2013).

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Modeling the Growth of Ethiopian Inflation and Its Dynamic Behavior over Time

By Habtamu Getnet Altasseb
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Abstract- Since 2004, Ethiopian economy had been continually facing unprecedented and double digit inflation growth. Using annual data over the past three decades (1980 to 2012), the study identified short run and long run dynamic interactions among key macroeconomic indicators involving structural and or domestic, monetary and external factors. The empirical strategy combines two separate estimations: the VECM and a multi factor single-equation model. The study found that the effect of supply side, monetary and external factors are highly significant to explain price inflation through their long run co-integrating (equilibriums) relationships. In the short run, changes in inflation are highly sensitive to the change in money growth, the cost of capital, exchange rate and inertia. Policies that geared towards concurrently maximizing agricultural growth, and flourishing structural rigidities on the one hand and pursuing monetary tightening and stable exchange rate polices on the other hand would enable to ensure stable inflation.

Keywords: agricultural goods market, inflation, inertia, money market, ppp, long run equilibrium, and vecm.

GJHSS-H Classification: FOR Code: 160808

MODELINGTHEGROWTHOFETHIOPIANINFLATIONANDITSDYNAMICBEHAVIOROVERTIME

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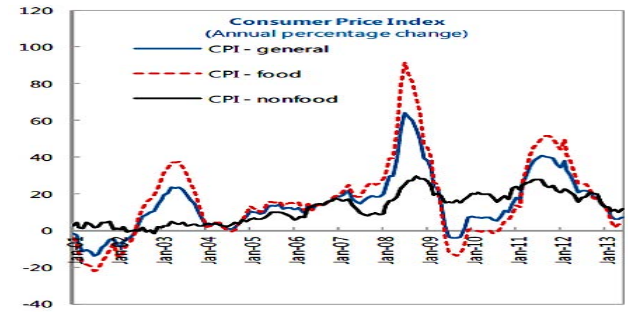
Keywords: agricultural goods market, inflation, inertia, money market, ppp, long run equilibrium, and vecm.

I. Introduction

In recent times, Ethiopia has experienced far-reaching economic growth and development changes. According to the World Bank report (2013), the country has achieved remarkable economic growth averaging 10.6 percent for almost half a decade since 2004, which is twice above the continental average (Mwanakatwe and Barrow 2010). According to the report, the expansion of the service sector and agricultural growth contributed most, while the contribution of the manufacturing sector was relatively modest.

Until recently, Agriculture is the most dominant sector in the Ethiopian economy and would remain to be the largest source of economic growth. The mounting infrastructural development supported by the increasing flow of external aid and growing domestic revenue enabled the economy to stimulate the outperforming growth. Despite the rapid economic growth and poverty reduction progress, sustained fiscal imbalances and macroeconomic instabilities mainly inflation, had been constantly limiting the bouncing economy (Desta 2008). According to Mwanakatwe & Barrow (2010), huge domestic borrowings financing the mounting public investment programs constitute the most challenging macroeconomic scenarios worsening inflation and deficits in the economy.



Source: IMF (2013)

Figure I: Inflation Trend and its volatility

The experience of sustained inflation rate in Ethiopia had begun since 2003. The overall inflation rate recorded for the year 2002 indicates below zero (i.e. Deflation). However, since2004 the country faced a constantly increasing rate of inflation, which is historically unprecedented as some commentators explained it. The average over all inflation rate in 2006 was 13.7 percent. This figure rose to 21 percent and 39.8 percent in 2007 and 2008 respectively (CSA 2009). In July 2008, inflation was at its peak of 64 percent, the biggest macroeconomic challenge in the history of the county (Loening et al. 2009). By the end of 2010, the rate has declined to 8.2 percent and then accelerated to 40.6 percent in 2011and started to decline afterwards. Its irregularity and volatility nature has conveyed diversified macroeconomic risks and uncertainties (Eden 2012). Firmly, the seriousness of the problem necessitates sound empirical investigations and policy responses. Thus, the main objective of the study is, thus, to identify the salient sources of the recent inflationary pressure and their dynamic interactions.

a) *Problem Justification*

Historically, Ethiopian inflationary experience was moderate and not considered as series as the issue of economic growth. Since 2004, however, the country has experienced high and persistent inflation growth. Several macro-economic stabilization measures and policies were implemented over the past and deemed to be completely failed. The booming economy has yet remained principally constrained by dual macroeconomic problems i.e. Price inflation and low international reserves (Mwanakatwe & Barrow 2010).

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Even if no one disputes over the highly volatile inflationary experience in the country except with slight differences in the exact figures, there are enormous disagreements about the real causes of inflation and their magnitude of effects. There existed a number of potential sources as explained by several scholars and researchers. For instance, Government bodies, while expressing their solutions to the prevailing high level of inflation, put certain factors as the basic sources of inflation. They have strong conviction that the sustained economic growth could generate upper price hike i.e. the demand pull inflation. Similarly, the World Bank report in (2013), declared that the main source of inflation in the country is the mounting aggregate demand due to the growth of Private consumption and public investment, out of which the latter has due importance in explaining the recent inflation.

Nevertheless, plenty writers have different views. According to Loening et al. (2009), a large fraction of the county's inflation is explained by foreign price and agricultural supply shocks and money growth. Hassan (2008) argued that the culprits behind the mounting inflation are neither the growing economy nor the Ethiopian peasantry getting richer than before. He rather pointed out a number of responsible factors, including money growth, lower interest rates, the soaring oil prices, war expenditures, declining foreign exchange reserves, budgets and current account deficits and so on.

The African Report posted in August (2003), presented Moller's argument explaining that Ethiopian inflation which was mainly attributed to the service sector expansion (the leading sector in the economy), mainly due to the injection of huge liquidity in the financial system. The writer stated that the country should continue to adopt tight monetary policy to effectively combat inflation. According to Loening et al. (2009), the loosed fiscal stance and external price shocks have left Ethiopia to be more vulnerable to price spikes. According to the IMF and World Bank (2013), fiscal mismanagement and excess government expenditure were found to be the most detrimental factors behind the soaring price inflation in the country.

So far, there is no strong consensus on the key sources of inflation in the country. Some argued that the principal sources of inflation are supply side and external factors; whereas others proclaimed the demand and monetary factors. One of the main reasons is that Ethiopian inflationary experiences are highly divergent over time and is very difficult to explain on the basis of specific macroeconomic approach. There are very few rigorous works that could empirically ascertain the relative importance of each of the external, domestic or structural factors contributing towards the soaring inflation. Most of existing studies did not have sound theoretical and empirical grounds enabling to draw justifiable outcomes and policy insights.

With this instance, this study intends to fill the aforementioned gap by virtue of applying key theoretical validities and empirical strategies. Therefore, the overall aim of this study is to identify all the key sources of inflation and their dynamic behavior over time (co-movements, interactions and dynamic responses). Specifically, the study intends to achieve the following objectives:

- To analyze inflation trends and related macroeconomic conditions
- To examine basic theoretical applications and their validity to explain Ethiopian inflation.
- To investigate into the causes and nature of short-run diverges from long-run trends in inflation.
- To evaluate the effect of the foregoing fiscal and monetary policy measures against inflation and to give some ways forward.

b) Research Hypothesis

1. The domestic agricultural goods market equilibrium substantially determines price inflation in Ethiopia.
2. The quantity theory of money (QTM) holds for explaining price inflation in the long run.
3. The purchasing power parity (PPP) hypothesis holds for explaining price inflation in the long run.

c) Basic Theoretical and Empirical Gaps

At the outset, quite many empirical evidences on Ethiopian inflation have rejected the Philips curve hypothesis (Girma 2011; Haji and Gelaw 2012; Loening et al. 2009; Eden 2012). One of the main reasons that makeup the Phillips curve hypothesis inapplicable is due to the existence of large informal markets and absence of well organized labor-market system. Thus, there should not have sound link and meaningful relationship among aggregate demand, unemployment and wage increases, which are the key subjects of inflation in this hypothesis.

Monetarists and Quantity theory of Money merely considered the role of money while explaining price inflation. Structuralists widely proclaimed that money should not be the only source of inflation, particularly in the developing world stating that monetary policy cannot be fully effective under structural rigidities. Apparently, numerous studies in the developing world, including the empirical evidences in Ethiopia, have given prior attention on the monetary theory and applied same while explaining inflation. On the other hand, contemporary studies (Loening et al. 2009; Haji and Gelaw 2012) have taken into considerations the role external sector on the domestic price inflation through exchange rate and imported goods channel. Despite the fact that food and agriculture prices remain to be the major constitutes of the overall price indices (Durevall and Ndung'u 2001), numerous evidences have neglected the role of agricultural markets and food supply while explaining price inflation in Ethiopia.

In the country where the lion's share of the household expenditure is vested on food items, food and agriculture are bound to affect the domestic price inflation to a large extent as the monetary factors do. Unlike most empirical investigations in the Ethiopian inflation scenario, the researcher has got consistent conviction that disequilibrium in the agricultural market has its own substantial impact on the general price of goods. Thus, the agricultural market equilibrium relationship is thoroughly investigated in this paper.

Overall, there are scanty studies which have got sound theoretical and empirical orientations on the causes and dynamics of price inflation in Ethiopia. Most do not have sound theoretical and empirical grounds. Conveniently, this study intends to explore key theoretical foundations in view of concurrently explaining the empirical results. On the basis of which, the Structuralists view, Money demand theory and imported inflation theses have had substantial explanations for this study. The empirical results are largely spontaneous and consistent enough to represent those economic theories by means of diverse empirical estimations. Noticeably, theories explaining the domestic agricultural, external market and money market scenarios are found to be very influential grounds for this study.

II. Inflation Models and its Applications To Ethiopia

Until recently literatures on the sources of inflation have got more diverse controversies. Large bodies of economic literature have a range of explanations on the possible sources of inflation and their remedies in diverse macroeconomic context. The foremost theoretical mainstreams emphasize that inflation is the result of continuous interactions in one or more of the monetary (or demand-side) shocks, real (cost or supply-side) shocks, price-adjustment (or inertial) factors and political processes and or factors with varying dynamics interims of the countries' institutional or economic structures.

a) *The Supply Side Inflation Model*

Ethiopian Inflation is largely connected with the dominant role of agriculture and food (Loening et. al 2009). As agriculture sector constitute the predominant source of food in the agricultural economy, analyzing the possible sources of inflation should feasibly begin with the cost-push inflation perspective (Klugman and Loening 2007). At the outset, agricultural products are broadly categorized in to tradable and non-tradable. Thus, the general prices of agricultural products are mainly composed of the weighted average price of tradable and non-tradable agricultural outputs.

$$P_t^{Ag} = \rho P_t^{TAg} + (1-\rho) P_t^{NTAg} \tag{1}$$

Tradable agricultural products are the main source of foreign exchange revenue through export, which is mainly, determined by the real exchange rate and the world market price. Mathematically,

$$P_t^{TAg} = \delta_1 e_t + \delta_2 P_t^{wP} \tag{2}$$

The non-tradable agricultural products are necessary to basically fulfill the demand for food and industrial inputs. In this regards, the domestic market for agricultural products is principally driven by the demand and supply conditions. Basically, the total agricultural supply (S_t) is composed of domestic production (Q_t), import (M_t) and food aid (A_t).

$$Ag_t^{ss} = Q_t + M_t + A_t \tag{3}$$

The total supply of agricultural outputs is predominantly determined by the productive capacity (productivity in technical terms) in the agricultural sector. Ethiopian agriculture is highly vulnerable to the exogenous shock by virtue of its dependence on the global sources of necessary agricultural inputs (Loening et. al 2009). The domestic market for agricultural products could affect inflation mainly through the supply shock. From the cost push inflation perspective, the general price of agricultural products is largely determined by the cost of agricultural inputs like fertilizer, labor and fuel (energy).

$$Q_t = f(P^{fer}, P^L, P^{oil}, P^{NA})$$

Where $P^{fer}, P^L, P^{oil}, P^{NA}$ refers to the price of fertilizer, price of agricultural labor, oil price, and the price of non-agricultural products respectively. In this case, Oil price is used as a proxy for the transportation and marketing cost of agricultural products.

$$Q_t = \gamma_1 P_t^{fer} + \gamma_2 P_t^L + \gamma_3 P_t^{oil} + \gamma_4 P_t^{NA} \tag{4}$$

The imports of agricultural products constitute the other prominent source of domestic supply when shortage exists. Thus, agricultural supply may also be affected by one or more of the determinants of import such as the relative price of agricultural products in the domestic and global market, import cost and exchange rate. Mathematically, $M_t = f(P^P, P^{Wp}, P^{oil}, e_t)$

Where, P^P and P^{WP} refer to the relative (domestic and world) price of the imported agricultural products respectively, refers to transportation cost of import proxy by the international oil price and exchange rate respectively. Thus, the standard linear equation representing the demand for import is

$$M_t = \alpha_1 P_t^P + \alpha_2 P_t^{Wp} + \alpha_3 P_t^{oil} + \alpha_4 e_t \quad (5)$$

Generally, the aggregate supply of agricultural products comprises of all the domestic supply, the demand for import and food aid. Hence, the standard linear equations representing the total supply of agricultural products reveal the following

$$Ag_t^{ss} = \gamma_1 P_t^{fer} + \gamma_2 P_t^L + \gamma_3 P_t^{oil} + \gamma_4 P_t^{NA} + \alpha_1 P_t^P + \alpha_2 P_t^{WP} + \alpha_3 P_t^{oil} + \alpha_4 e_t + \varphi_1 A_t \quad (6)$$

As the above total supply equation comprises of both the traded and non-traded agricultural products, thus the domestic supply is netted by deducting the traded over the total supply of agricultural products. Mathematically, $Ag_t^{ss} - X_t = Ag_{nt}^{SS}$

$$X_t = \emptyset_1 P_t^P + \emptyset_2 P_t^{Wp} + \emptyset_3 P_t^{oil} + \emptyset_4 e_t \quad (7)$$

Where, Xt refers to the export of agricultural products, P_t^P and P_t^{WP} refers to the domestic and world price of exported agricultural products P_t^{oil}, refers to the price of oil as a proxy for transpiration cost and e_t exchange rate. Hence, total domestic supply refers to

$$Ag_{nt}^{SS} = \left(\gamma_1 P_t^{fer} + \gamma_3 P_t^L + \gamma_4 P_t^{oil} + \gamma_6 P_t^{NA}\right) + \left[\left(\alpha_1 P_t^P + \alpha_2 P_t^{Wp} + \alpha_3 P_t^{oil} + \alpha_4 e_t\right) - \left(\emptyset_1 P_t^P + \emptyset_2 P_t^{WP} + \emptyset_3 P_t^{oil} + \emptyset_4 e_t\right)\right] \quad (8)$$

The last two terms with in the bracket in equation 8 represent the demand for food import and export of traded agricultural products.

$$\rho\left[\left(\alpha_1 P_t^P + \alpha_2 P_t^{Wp} + \alpha_3 P_t^{oil} + \alpha_4 e_t\right)\right] - (1-\rho)\left[\emptyset_1 P_t^P + \emptyset_2 P_t^{Wp} + \emptyset_3 P_t^{oil} + \emptyset_4 e_t\right](\rho\alpha_1 - (1-\rho)\emptyset_1) P_t^P + (\rho\alpha_2 - (1-\rho)\emptyset_2) P_t^{Wp} + (\rho\alpha_3 - (1-\rho)\emptyset_3) P_t^{oil} + (\rho\alpha_4 - (1-\rho)\emptyset_4) P_t^{oil}$$

On the basis of the purchasing power parity (PPP) assumptions and letting $(\rho\alpha_i - (1-\rho)\emptyset_i) = \varphi_i$, we can have the following external Market equilibrium relationship.

$$\varphi_1 e_t + \varphi_2 P_t^p + \varphi_3 P_t^{oil} + \varphi_4 P_t^{Wp} \quad (9)$$

By Substituting equation 9, instead of the last term in equation 8, we may have the following equation representing the aggregate supply of the agricultural products.

$$SS_t = (\gamma_1 P_t^{fer} + \gamma_2 P_t^L + \gamma_3 P_t^{oil} + \gamma_4 P_t^{NA}) + \varphi_1 P_t^p + \varphi_2 P_t^{Wp} + \varphi_3 P_t^{oil} + \varphi_4 e_t$$

b) The Money Demand Inflation Model

Monetarist proclaimed that excess money is the predominant factor for wider fluctuations in output and employment in the short run and price level in the long run. Accordingly, expansionary monetary policy aiming to boost output and employment may cause inflationary pressure in the long run. Mankiw (2003) stated that low money supply can be effective for stable output, employment and prices in the economy. It is also widely recognized that fiscal and monetary actions can be a source of macro-economic instability. For Monetarists, firm or industry specific cost increases cannot be inflationary unless it is accommodated by excess money supply (Kibritçioğlu 2002).

According to Mankiw (2003), the concept of money supply is fundamentally derived from the QTM. This theoretical framework enables one to explore the long-run relationship between real output/income, the price level and the money stock by means of determining the velocity Y- (M-P). The QTM attributed price changes to the changes in the stock of money. An increase in the stock of money generated excess money supply with the given prices level and interest rates, meaning excess demand for non-monetary assets (Bronfenbrenner & D. Holzman 1963).

In the agricultural economy like Ethiopia, where the largest share of the household expenditure is made on food items, the overall inflation is strongly associated with agriculture (food) supply shock (Loening et al. 2009). Thus, the demand for agricultural products is mainly determined by disposable (real) income, the price of food and non-food items and excess money supply. Mathematically, $D_t = f(Y_t, P_t^{nf}, P_t^{f}, M2_t)$

According to the quantity theory of money (QTM), the Money market equilibrium can be attained when the supply and demand for real money equates i.e. $M^{dd} = M^{ss}$. Accordingly, excess money supply in the economy would pressurize the demand for agricultural products thereby affect the general price level. Hence, disequilibrium in the money market reveals the change in the price of agricultural products. Mathematically,

$$P_t^{Ag} = \gamma\left[(M^{ss} - P) - M^{dd}\right]$$

Where, γ indicates the extent of disequilibrium in the money market or the change in the price of agricultural products in the domestic market. The general demand for real money balance is

$$M - P = \delta_0 + \delta_1 Y_t + \delta_3 r$$

The effect of excess money supply on the general price of agricultural products can be determined as follows.

$$P_t^{Ag} = \gamma\left[(M - P) - \delta_1 Y_t - \delta_2 r)\right]$$

An aggregate demand for agricultural goods in the domestic market is given as follows:

$$D_t = \left(\pi_1 Y_t + \pi_2 P_t^{nf}\right) + \pi_3\gamma[M - P) - \delta_1 Y_t + \delta_2 e_t)] - \pi_3 P_t^{f}$$

$$D_t = (\pi_1 - \pi_3\gamma\delta_1)Y_t + \pi_2 P_t^{nf} + \pi_3\gamma(M - P) - \pi_3 P_t^{f}$$

The domestic goods market equilibrium is determined by the long run relationship between the aggregate demand and supply of agricultural products.

$$\begin{aligned} P_t = {} & \left[(\pi_1 - \pi_3\gamma\delta_1)Y_t + \pi_3\gamma[(M - P) - r] + (\gamma_3 + \pi_2)P_t^{nf} - \pi_3 P_t^{f}\right] \\ & - \left[\gamma_1 P_t^{fer} + \gamma_2 P_t^{L} + (\gamma_4 + \varphi_3)P_t^{oil} + \varphi_1 P_t^{p} + \varphi_2 P_t^{Wp} \right. \\ & \left. + \varphi_4 e_t \right] \end{aligned}$$

III. Data and Methodology

The data used in this research paper comprises of annual time series data from 1980 till 2012. It is mainly composed of secondary and tertiary data. The country source of data includes Government and non-Governmental organizations, particularly the Ethiopian Central Statistical Agency (CSA), Ministry of Finance and Economic Development (MoFED), National Bank of Ethiopia (NBE), and Ethiopian Development Research Institute (EDRI). As the data collected in most of the government offices were not well organized and consistent over time, external sources of data such as IMF, EDRI, FAO and WWB databases had been prominently used.

a) Model Specifications and Empirical Strategy

Univariate time series analysis involves a single variable which is composed of past values of the variable itself and the current and past random error terms. Whereas, Multivariate time series technique consists of two or more variables through which the VAR framework is meant to explain the dynamic interactions and co-movements of variables. In this regard, co-integrated VAR and its associated analytical tools (IRF, FEVD) are known to be the powerful toolkits in time series analysis (Box et al. 2013). In the VAR framework, each of the underlying variables in a multivariate system is regressed by a constant, by its own lags and p lags of each of the other variables in the VAR system. The VAR model where case n>2 and k>1, that is a general VAR model containing K variables and p lags is

$$\mathbf{y_t} = \mathbf{v} + \mathbf{A_1 y_{t-1}} + \mathbf{A_2 y_{t-2}} \ldots + \mathbf{A_p y_{t-p}} + \boldsymbol{\varepsilon_t} \quad (4.1)$$

Where, $\mathbf{y_t}$ is a K x1 vector containing K variables in the system, $\mathbf{v}$ is a K x 1 vector of parameters, $\mathbf{A_1}$ to $\mathbf{A_p}$ are K x K matrices of parameters, and $\boldsymbol{\varepsilon_t}$ is a K x 1 vector of multivariate random errors (disturbances), having zero mean and covariance matrix $\sum$, which remain normal over time.

The very importance of applying co-integrated VAR framework is to interrogate the short run dynamics of a set of integrated series with the long run equilibrium (ibid). In this system, the presence of a co-integrating vector is regarded as long-run equilibrium relationship. The short run dynamics are usually determined by means of discarding existing trend in the variable using differencing approach. The bad side of this approach is that important information regarding the long run association of the variable (which economic theories have a lot to say) can be discarded while losing the trend. Stock and Watson (1990) recommend against differencing even if the variables contain a unit root. The main argument against differencing is that it "throws away" information concerning the co-movements in the data, such as the possibility of co integrating relationships. This paper is, thus, highly concerned to overcome this problem of a simple VAR framework by means of employing co-integrated VAR model in the form of Error correction representation.

b) The Multivariate VECM Specification

A vector error correction (VEC) model is a restricted VAR framework designed for use in a non-stationary series that are known to be co-integrated (ibid). The VECM has co-integration relations which are built into a specification so that it restricts the long-run behavior of the endogenous variables to converge to their co-integrating relationships while allowing for short-run adjustments (Stock 1997). The co-integrating term is also known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments.

Generally, the VECM relates the change in the dependent variable to the change in independent variables and the long-run relationship. If variables are co-integrated i.e. I (o), all terms in the VECM are stationary. When the variables are co-integrated, the corresponding error correction must be included in the system (ibid). By doing so, one can avoid misspecification and omission of important constraints. Based on the Engle and Granger procedure, a vector of $\mathbf{y_t}$ (as specified in equation 4.2) can be represented in a VEC form as follows;

$$\Delta y_t = \pi y_{t-1} + \pi_1 \Delta y_{t-1} + \pi_2 \Delta y_{t-2} + \ldots + \pi_p \Delta y_{t-p} + \varepsilon_t \quad (4.2)$$

Where: π_j are n x n coefficient matrices with elements π_{jk}, π is a matrix with elements such that one or more of the $\pi_{jk} \neq 0$ and εt is an n x 1 vector with elements ε_{ij}. Using some algebra, we can rewrite

$$\Delta y_t = v + \prod y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \varepsilon_t \quad (4.3)$$

Engle and Granger (1987) show that if the variables yt are I (1) the matrix $\prod$ in (4.3) has rank 0 <= r < K, where r is the number of linearly independent co-integrating vectors. If the variables are co-integrated, 0 < r < K and (4.3) shows that a VAR in first differences is mis-specified because it omits the lagged level term, $\prod \mathbf{y_{t-1}}$. Despite various alternative frameworks are developed for estimation and inference in a co-integrated VAR analysis, the Johansen framework (1988 and 1995) has got an immense importance particularly in comparative studies. He could overcome some limitations of the Engle and Granger procedure in the aforementioned representations (equation 4.3) and is based on the maximum likelihood estimation as follows.

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$$\Delta y_t = v + \alpha\beta' y_{t-1} + \Gamma_1 \Delta y_{t-1} + \Gamma_2 \Delta y_{t-2} + \Gamma_3 \Delta y_{t-3} + \varepsilon_t$$

The matrix Π can be decomposed as Π=αβ' where α is nxr matrix of speed of adjustment terms, and β is an nxr matrix of parameters which determines the co-integrating relationships matrix of long- run coefficients. The columns of β are interpreted as long-run equilibrium relationships between variables. The matrix α determines the speed of adjustment towards this equilibrium. Values of α close to zero imply slow convergence and r, 0≤r≤n is the rank of the matrix Π and represents the co-integrating vectors in the system which can be determined using the Johansen Maximum Likelihood method.

Johansen defines the two matrices α and β, both of dimensions n x r, where r is the rank of. They tell us the extent to which each of the variables in xt adjusts to a shock in order to revert to the equilibrium relationship. Like most other empirical studies on the sources of inflation in sub Saharan African context (Fielding et al. 2004), and in the Ethiopian context (Eden 2012; Loening et al. 2009; Haji and Gelaw 2012; Girma 2012; Loening 2007), the study adopted VECM for identifying pertinent theoretical frameworks explaining the dynamic relationship among the variables in to consideration. In doing so, the empirical strategy in this paper combines two separate estimation methods: the vector error correction model (VECM) and a multi factor single-equation model.

As most macroeconomic indicators are non-stationary and are I(1), an error correction representation is the most appropriate model in order to explore the short run and long run impacts, responses and co-integrating adjustments of each integrated variable in the system. It is also an important tool for policy analysis. Specifically, following Johansen and Juselius (1990) and Johansen (1995), a vector of I(1) endogenous variables that are integrated of order r=1 were explicitly estimated on the basis of the three fundamental theoretical frameworks discussed in chapter II. On the basis of which, the models were meant to identify the three possible long run co-integrating equilibrium relationships as hypothesized by the structural theory, money demand theory and PPP theory.

Structuralists fundamentally prescribe the role of supply side constraints in determining the domestic agricultural market disequilibrium. This hypothesis is precisely presented in the first VECM comprising of Rain fall (Rf), cost of capital (K), fertilizer price index (FPI), oil price index (OPI) and non-food price index (Pnf) (see also Haji & Gelaw 2012; Loening et al. 2009). The agricultural system in Ethiopia is mainly dominated by smallholder farming system which is predominantly undertaken by the use of family labor. Hence, wage has no real importance to be included in the model. While we consider wage in the model, the Johanson co-integration test reveals no co-integration in the Agricultural market equilibrium relationship. Hence, using wage as one of the supply side factors would entail meaningless result. Alternatively, as rural finance is the decisive factor for agricultural production and productivity in Ethiopia, the cost of capital is the lending rate of rural financial institutions which is supposed to show us a clear picture of the effect of financial constraint on agricultural supply shock and price inflation.

$$\begin{aligned} \mathbf{ECM_1} &= \boldsymbol{\delta_1 P - \delta_2 Rf - \delta_3 FPI - \delta_4 K - \delta_5 Opi - \delta_6 Pnf} \\ \mathbf{ECM_2} &= \mathbf{(M-P) - \emptyset_1 Y - \emptyset_2 R} \qquad (4.5) \\ \mathbf{ECM_3} &= \boldsymbol{\omega_1 \ln xe + \omega_2 \ln WP - \ln P} \end{aligned}$$

The role of money supply and demand has also been clearly represented in the second VEC model, which is fundamentally derived from the QTM, where (M-P) refers to real money stock, Y is output and R is the real interest rate, which is also regarded as the cost of holding money (inflation).The long run Equilibrium relationship is maintained by the time an aggregate money demand equates the aggregate supply. Hence, inflation is regarded as the result of any disequilibrium adjustment towards the change in real money growth, income and interest ratein the long run.

The third VECM is meant to represent validity of the PPP in explaining the impact of real exchange rate (REER) on the domestic inflation. In this regards, Structuralists explicitly verified that external disequilibria cannot be removed through exchange devaluations alone. Hence, imported inflation (captured by the relative price differences) is considered to evaluate the impact of imported input cost on the domestic inflation and BOP (Cardoso 1981), which is mathematically represented in the form of ECM3, where lnxe, lnWP and lnP indicate the logarithmic nominal exchange rate, foreign price and domestic price indices.

Even if, it is not theoretically justifiable, but there are some econometric technical reasons to combine all the variables and estimate a multiple factor single equation Model. Principally, most macroeconomic indicators are strongly interrelated and have significant

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effects on inflation. Understandably, this estimation has got meaningful interpretation from the broader macro-economic point of view (see also Loening et al. 2009; Haji and Gelaw 2012). The main purpose of this estimation is, therefore, to examine the relative importance of each of the long run co-integrating relationship as justified by theory in determining price. Thus, a multiple factor single equation model augmented with error correction terms is estimated as follows.

$$
\begin{aligned}
\Delta P_t = \alpha_0 &+ \sum_{i=1}^{k} \alpha_{1_i}\Delta P_{t-i} + \sum_{i=0}^{k} \alpha_{2_i}\Delta PF_{t-i} + \sum_{i=0}^{k} \alpha_{3_i}\Delta PNF_{t-i} + \sum_{+i=0}^{k} \alpha_{4_i}\Delta Y_{t-i} \\
&+ \sum_{i=0}^{k} \alpha_{5_i}\Delta M2_{t-i} + \sum_{i=0}^{k} \alpha_{6_i}\Delta XE_{t-i} + \sum_{i=0}^{k} \alpha_{7_i}\Delta Rf_{t-i} \\
&+ \sum_{i=0}^{k} 8_i \Delta K_{t-i} + \sum_{i=0}^{k} 9_i API_{t-i} + \sum_{i=0}^{k} \alpha_{10_i} FPI_{t-i} + \sum_{i=0}^{k} \alpha_{11_i} OPI_{t-i} \\
&+ \sum_{i=0}^{k} \alpha_{12_i}\Delta WFP_{t-i} + \sum_{i=0}^{k} \alpha_{13_i} IMP_{t-i} + \alpha_1[(M-P) - \beta_1 Y - \beta_2 R] \\
&+ \alpha_2[XE + \beta_3 Wp - \beta_4 P] \\
&+ \alpha_3[P - \beta_5 Rf - \beta_6 FPI - \beta_7 K - \beta_8 OPI - \beta_9 PNF] + \varepsilon_t
\end{aligned}
$$

Where, P, PF and PNF refer to the overall, food and non-food consumer price indices in the domestic economy. Y is the growth rate of GDP (real output), M2 is the growth rate of excess money supply, XE is the nominal exchange rate, RF is an annual rain fall in Millimeter, K is the cost of capital, API I an agricultural production index, FPI is the fertilizer price index, OPI is the global oil price index, IMP is an intermediate import price, R is the real interest rate, WFP and WP refer to the world food and consumer price indices and M-P is the growth rate of real money stock.

The terms in brackets represent the error-correction terms and its parameter α_{1-3} shows the speed at which price inflation adjusts for any disequilibrium in the goods market, the money market and external market respectively i.e. the amount of disequilibrium transmitted in each period into the rate of inflation. The parameters of the variables ($\alpha 1i$ – $\alpha 8i$) reveal the short run dynamic relationships among the variables. A significant and positive sign on a lagged current inflation α_{1_i} indicates the presence of inflation inertia, owing to indexation and or expectations i.e. when past inflation positively affects the current one. The estimate of the parameter β_i reveals the long run relationship towards the goods market, money market and external market disequilibrium.

IV. Empirical Results and Interpretations

a) *Descriptive Analysis*

The statistical analysis as shown in table I reveals 33 total observations with significantly varying mean and standard deviation across each variable. Food and non-food consumer prices, real money stock growth, real interest rate, oil price index and Fertilizer price index have shown a relatively larger mean and higher dispersion. Particularly, the growth rate of output and real money stock and interest rate exhibit higher dispersion larger than their mean value. It may give us some intuitive clue justifying the existence unstable macro-economic environment, particularly in the monetary conditions.

Table I: The Result of the Descriptive Statistics

Variables	N	Mean	Std. Dev	Min	Max
P	33	100.02	69.53	32.81	306.32
PF	33	124.21	62.97	79.71	330.37
PNF	33	96.39	64.93	47.63	268.72
Y	33	4.935	6.83	-11.41	13.87
XE	33	6.412	4.42	2.07	17.71
Rf	33	1156.25	242.41	140.6	1567.9
IMP	33	93.20	26.21	52.47	152.15

K	33	12.56	3.23	7.25	22.00
R	33	1.79	10.59	-17.67	17.64
OPI	33	69.09	51.84	19.54	196.31
FPI	33	102.85	60.23	55.67	340.65
WFP	33	115.52	26.97	85.66	175.43
WP	33	132.29	31.49	89.8	202.2
M-P	33	6.09	9.72	-13.6	26.25

Note: P, PF and PNF refer to the overall, food and non-food consumer price indices in the domestic economy. Y is the growth rate of GDP (real output), XE is the nominal exchange rate, RF is an annual rain fall in Millimeter, IMP is an intermediate import price index, K is the cost of capital, R is the real interest rate, OPI is the global oil price index, FPI is the fertilizer price index, WFP and WP refer to the world food and consumer price indices and M-P is the growth rate of real money stock.

Supply side factors seem to be stable except the highly volatile oil and fertilizer price shock. The intermediate import price index, total annual rainfall and the cost of capital typically reveal lower dispersion from their mean. Apparently, the average growth rate of the real money stock reveals significantly higher than the real output growth. This may be an indication of excess money supply beyond the economic capacity to offset at a normal economic circumstance.

b) Augmented Dickey-Fuller Unit Root Test

Table II : Stationarity Test for the Explanatory Variables

Explanatory Variables	Stationarity in Level		Stationarity in First Difference	
	Test Stat.	**P-Value**	**Test Stat.**	**P-Value**
Consumer Price	1.089	1.0000	-5.447***	0.0000
Food Price Index	1.462	1.0000	-3.581**	0.0315
Non-Food Price	2.113	1.0000	-8.534***	0.0000
Real Output Growth	-3.071	0.1133	-8.495***	0.0000
Real Interest Rate	-1.660	0.7682	-6.310***	0.0000
Cost of Capital	-0.111	0.9483	-6.389***	0.0000
Annual Rain Fall (MM)	-3.478	0.0418	-6.755***	0.0000
Excess Money Growth	-0.055	0.9936	-10.157***	0.0000
Nominal Exchange Rate	-0.943	0.8226	-3.013***	0.0029
Real Money Stock	-5.356	0.0000	-9.232***	0.0000
World Fertilizer Price	-1.575	0.8022	-6.651***	0.0000
Intermediate Import Price	-1.196	0.6754	-5.151***	0.0000
World Oil Price	1.258	0.9964	-9.857***	0.0000
World Food Price	-0.060	0.4763	-5.606***	0.0000
Foreign Price Index	2.297	0.9851	-4.610***	0.0000

*Note: *, ** and *** indicates rejection of the null hypothesis of non - Stationarity at the 10 percent, 5 percent and 1 percent significance level respectively.*
Source: Model Output

According to the Augmented Dickey-Fuller unit root test, the null hypothesis for a unit root test is stated as a given series is I (1) against the alternative I (0). In other words, the series contains unit root against the alternative, which does not contain unit root respectively. On the basis of which, one can definitely proclaim that all the series in levels has failed to reject the presence of unit root hypothesis. Precisely speaking, the ADF test for the entire series in level exhibits insignificant even at 10 percent significance level, which indicate all the variables contain unit root in their level. After first differencing, the ADF test reveals highly significant for all the variables and hence clearly rejects unit roots suggesting that all the series in first difference are stationary.

c) The Johansen Co-integration Analysis

Since our empirical investigation consists of I(1) variables that are modeled in three separate dynamic system, we used the Johansen co-integration analysis to test for the presence of long run co-integration in the domestic agricultural market, money demand and external market scenarios. The result of the analysis revealed that each market could have at most one co-integrating relationships. According to Stock and Watson (1988), the co-integrating rank (r) refers to the number of common trends, or co-integrating relationships in some or a combination of all of the series in the system.

Identification of lags is the first and foremost task while performing co-integration analysis or fitting co-integrating VECM. In this context, Akaike information criteria (AIC) and Schwarz information criteria (SBIC) were found to be more robust. Accordingly, the number of lags identifying the order of each co-integration is three in the agricultural market, one lags in the money and external market equilibrium. Following lags specification for the order of co-integration, it is necessary to determine the number of co-integrating equations in the system so as to correctly specify the VAR model (i.e. a VAR in levels, VAR in first differences or VECM) fitting a given set of data. This can be done by using the Johansen multiple trace test procedure and a method based on minimizing either of the two different information criteria. On the basis of which, the co-integration test was made separately, representing equilibriums in the three markets and the results are presented along with the co-integrating vector in table 6, 7 and 8.

According to the results of all the co-integration tests, we strongly reject the null hypothesis of no co-integration (Ho: r = 0 against the alternative hypothesis, H1: r = 1, 2, and 3) and fail to reject the null hypothesis of at most one co-integrating relationship. Thus, the Johanson co-integration analysis asserted that there could have a total of three co-integrating equations in the entire system. In this respect, we can firmly conclude that the Ethiopian inflation scenario can be worth explained through the three long run co-integrating vectors. Hence, neither a VAR in level nor indifference are appropriate for estimating inflation model. The main problem associated with VAR in difference is it discards (filters out) the relevant information on the long- run relationship (co-movements) of the variables. Having determined that there is at most one co-integrating equations in each market, we proceed to estimate the parameters of each co-integrating relationships in light of the three pertinent theoretical grounds-cost push theory, money demand theory and PPP theory.

i. *The Agricultural Market Equilibrium*

As shown in Table III, the result of the Johanson co-integration test affirmed that there is strong evidence for one co-integrating vector in the system. Evidence found that the domestic price is highly sensitive towards the long run agricultural supply shock. There is positive and highly significant relationship between price inflation and the supply side factors. This implies that price goes high in the long run whenever a shock occurred in those factors of production. The coefficient for the cost of capital reveal very large, meaning that agricultural finance is the major bottleneck of the agricultural production and productivity and price shock in Ethiopia.

Table III : Co-integration Analysis in the Domestic Agricultural Market

		Rank Test			
Null Hypothesis	r = 0	r ≤ 1	r ≤ 2	r ≤ 3	r ≤ 3
Eigen Values	-	0.740	0.486	0.471	0.36358
Trace statistics	107.29	**65.50***	44.88	47.21	11.1596
5% Critical Value	94.15	68.52	47.21	29.68	15.41
		Standardized Eigenvector β_i			
P	FPI	Rf	K	OPI	PNF
1.00	.268132***	.208045***	6.8588***	2.3834***	3.7218***
-	(.1130837)	(.0099464)	(.919198)	(.1689979)	(.1241675)
		Standardized adjustment coefficient α_i			
.0952309	-.0099386	-10.45591	.0177774	-.1231737	.1072613*
(.0623426)	(.2711041)	(1.475695)	(.0156976)	(.1929297)	(.0588873)

*Note: The VEC includes three lags on each variable. Standard errors are in parenthesis. *** indicates significant at 1 percent, ** significant at 5 percent and * significant at 10 percent.*

As Ethiopian economy is highly vulnerable to external shocks (Loening et al. 2009), the mounting cost of agricultural production (mainly global oil and fertilizer price) has been limiting agricultural supply thereby, trapped reasonable price formation in the domestic market. Those external shocks have had long run disequilibrium effects in the domestic market through which the short run price adjustment significantly affects price inflation. That is why the adjustment parameter- $\boldsymbol{\alpha_i}$ matrix (the amount of disequilibrium transmitted in to inflation), reveal negative, explicitly attesting the need to reduce the cost push factors in order to maintain stable long run price inflation. Wage is not found to be a viable indicator for the reason that Ethiopian Agriculture is largely dominated by smallholder farming system, which is prominently undertaken by the use of family labor. Our model indicates existence of long run co-integration if and only if wage is eliminated from the system. Instead, the cost of capital is found to be the most decisive factor.

Apparently, Figure II provides an evidence of the existence of stable, long run equilibrium relationship between the domestic price and the supply side factors. Until 2005, it is highly likely that the supply side factors could work properly to explain the Ethiopian inflation scenario, yet the puzzle seems very different after that. As the co-integrating vector has appeared unstable since 2006, it seems the recent inflation trajectory emanates not only from the supply side factors, but might also be provoked by the monetary and external factors.

$$\boldsymbol{P - 0.27\,FPI - 0.2\,\mathrm{Rf} - 6.86\,K - 2.38\,OPI - 3.72PNF.}$$

Source: Model Output

Figure II : The Predicted Agricultural Market Equilibrium Equation

Apparently, this evidence strengthens the fact that the recent inflation episodes differs from the past as it was occurring during the period of bumper harvest and progressive agricultural growth (Loening et al. 2008; IMF 2008). Therefore, we have strong evidence to conclude that price inflation in the long run is significantly explained by the agricultural market disequilibrium. Thus, we reject the null hypothesis in favor of the alternative stating that agricultural supply and demand relationship in the domestic agricultural market significantly determines price inflation in Ethiopia.

ii. *The Money Market Equilibrium*

Most economic theories (Monetarists, QTM and Heterodoxies) proclaimed that price inflation is widely attributed to excess money stock growth. In view of that, several studies proved that monetary factors are highly workable in the Ethiopian context (IMF 2008 and 2013; Durevall and Ndung'u 2001; Haji and Gelaw 2012; Desta 2008; Durevall, D. and B. Sjö2012 and Simpasa et al. 2011).

Table IV presents the long-run relationship between the price level, real income and the real money stock (M−P) as justified by the QTM. The Johanson co-co-integration analysis reveals that income and the real interest rate are integrated with money growth thereby affect prices in the long run. In this case, evidence proved that the error correction terms or the disequilibrium adjustment parameters for real income proved that the error correction terms or the disequilibrium adjustment parameters for real income and interest rate requires negative feedback necessary to adjust towards the long run equilibrium, but remains to be statistically insignificant. However, the adjustment parameter for real money stock is highly significant, which can be firmly regarded as endogenous. Thus, the co-integrating vector is well exemplified for valid interpretation of the long-run money demand equilibrium relationship.

Table IV : Co-integration Analysis in the Monetary Sector (Money Market)

	Rank Test		
Null Hypothesis	**r = 0**	**r ≤ 1**	**r ≤ 2**
Eigen Values	-	0.52949	0.30967
Trace statistics	32.6347	10.7702*	0.0234
5% critical value	29.68	15.41	3.76
	Standardized Eigenvector_ β_i		
M-P	**Y**	**R**[1]	
1.00	-.0027299***	-.4864705***	
-	(.00103536)	(.091538)	
	Standardized Adjustment Coefficient _α_i		
-1.479455***	-14.79138	-.2596104	
(.1593436)	(12.4589)	(.2082483)	

*Note: The VAR includes one lags on each variable. Standard errors are in parenthesis. *** indicates Significant at 1percent, ** at 5 percent and * at 10 percent significance.*
Source: Model Output

Similarly, our findings revealed that the coefficient on income is 0.003, which is highly consistent with economic theory (QTM) suggesting that the velocity of money and real output remains zero (unchangeable) in the long run through which the growth of money supply results proportionate increase in the level of price inflation or deflation. In this case, the growth rate of real money stock revealed significantly higher than real output growth, meaning that too much money is chasing fewer goods in the economy. Hence, it is possible to infer that inflation has been growing proportionately with the growth rate of the real money stock. In addition, as the adjustment parameter for real output do not have significant disequilibrium adjustment, it may clearly undermine the role of demand pull inflation in explaining the recent price inflation in Ethiopia (see also Haji and Gelaw 2012).

Figure III, reveals very strong evidence for the existence of stationary and robust long run equilibrium relationship in the money market. The stationary money demand relationship reveals no change in the velocity of money. Hence, we can possibly infer that the quantity theory of money strongly holds, meaning that the growth rate of money supply is same as the growth rate of inflation. Apparently, Structuralists did not deny the fact that sustained inflation is inescapable only under the condition of monetary expansion (Nell 2004).

[1] From the theoretical point of view, R is meant for the cost of holding money, which is used to represent the growth rate of inflation.

Source: Model Output

Figure III : The predicted Money Demand Equilibrium Relationship $(\mathbf{M}-\mathbf{P})-\mathbf{0.003Y}-0.49\mathrm{R}$

According to Fisher and Easterly (1990), rapid inflation is always a fiscal phenomenon which is virtually impossible to get well managed or stabilized without reducing the persistent budget deficit. Apparently, the money supply endogeneity may demonstrate the likelihood that the large fiscal deficit and aggressive credit expansions could drive the excessive money supply growth (Saleh and Harvie 2005). According to Nell (2004), inflation may also be driven by the external shocks in foreign prices or the exchange rate depreciation while money supply is partly endogenous. Hence, the monetary transmission mechanism may principally work through the exchange rate channel.

iii. *The External Market Equilibrium*

The result of the Johanson co-integration test affirmed that there is strong evidence for the existence of one co-integrating vector in the system. The long run co-integrating vector revealed external prices have a significant and positive relationship with the REER and the domestic price. The disequilibrium adjustment parameter reveals highly significant and negative, commending the need to appreciate nominal exchange rate in order to maintain stable long run inflation.

Table V : Co-integration Analysis of the External sector (PPP)

Rank Test			
Null Hypothesis	r = 0	r ≤ 1	r ≤ 2
Eigen Values	-	0.63351	0.19620
Trace statistics	39.0610	8.9478*	2.3957
5% Critical Value	29.68	15.41	3.76

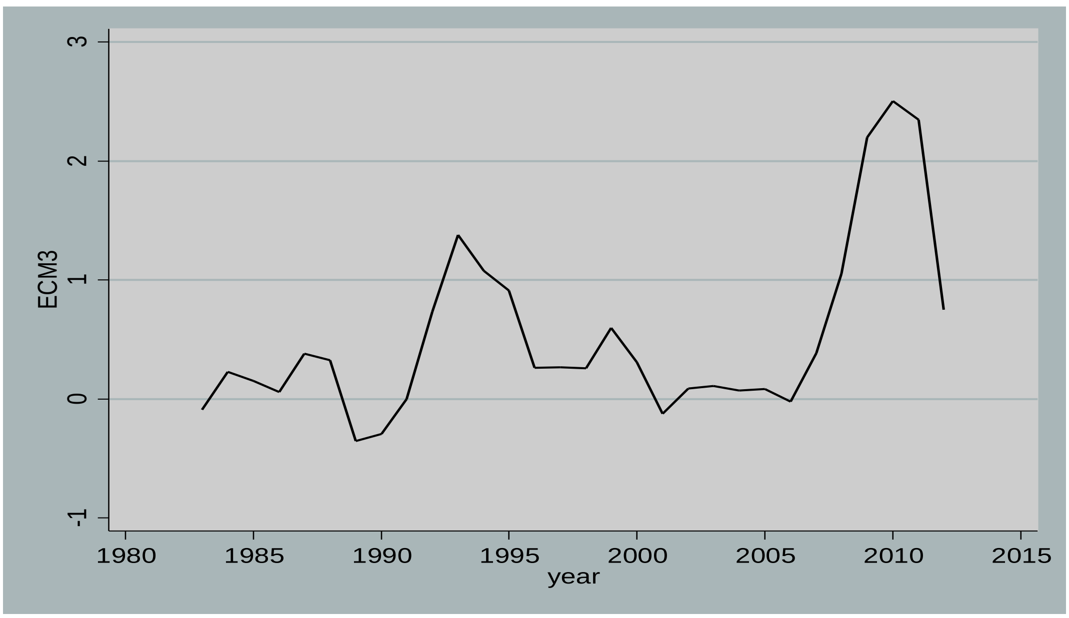
Standardized Eigenvector β_i		
lnXE	lnWP	lnP
1.00	8.326776***	-.154018***
-	(1.053294)	(.380116)

Standardized Adjustment Coefficient α_i		
-.1232031***	-.0004999	.1284246***
(.0368616)	(.0139268)	(.0327619)

Note:
PPP hypothesis strongly recommend variables to be converted in to logarithmic form. Thus, lnXE, lnWP and lnP refer to the logarithmic nominal exchange rate, the foreign and domestic price indices respectively. The co-integrating vector identified in this estimation is r=1.
**** indicates significant at 1percent, ** at 5 percent and * at 10 percent significance level. Values in parenthesis are robust standard errors.*

For the reason that Ethiopia is one among the non-oil producing county, but also fundamentally due to non-competitiveness of the economy, foreign price shocks revealed highly exogenous. Evidence indicated that Ethiopia has been adopting floating exchange rate and the economy is highly vulnerable to external price shock (Loening et al. 2009). According to Bleaney and Fielding (2002), adopting a floating exchange rate in the developing economy would result about 10 percent higher inflation growth. Apparently, the highly significant disequilibrium adjustment averred that the domestic price hike may possibly emanate through the exchange rate transmission mechanism in response to the exogenous price shocks.

As shown in figure IV, the test for validity of the PPP hypothesis has shown by analyzing stationarity of the series of the REER, which measures the deviation from PPP. It appears that the REER has converged towards its mean, suggesting that purchasing power parity hypothesis seems to be partly maintained in the long run. The necessary condition to hold the PPP hypothesis is that it must display reversion towards its own means (Menzie 2005). Hence, there is some evidence rejecting the null hypothesis of non-mean reversion against the alternative of mean reversion. Hence, we can possibly reject the null hypothesis in favor of the alternative stating that PPP holds, meaning that real effective exchange rate has substantial effect on the domestic price inflation.



Source: Model Output

Figure IV : The Predicted External Market Equilibrium Relationship $\boldsymbol{XER + 8.33WP - 0.15P}$

iv. *The Short Run Dynamic Multivariate Analysis*

In this section, we develop a multi-factor single equation model for food, non-food and overall price inflation. The model consists of the agricultural market, money market and external market error correction terms. As inflation is affected by several factors in the short run, it would be more valuable to explicitly consider all the pertinent factors in the model (see also Loening et al. 2009; Haji and Gelaw 2012). Hence, the multivariate error correction model explicitly addressed the effect of the supply side factors, monetary and external factors.

The three column presents outcome of the dynamic model in which the dependent variable is overall price, food and non-food price inflation. In both cases, the sign of the variables and their level of significance are similar. However, there are notable differences in the magnitude of the coefficients of each variable across the three price inflations. Most coefficients are statistically significant and larger for the food price index. Moreover, the existence of higher inflation inertia (0.18) hints that the non-food price level adjusts slowly back to equilibrium when a shock occurred, whereas food prices immediately overshoots and react much stronger to the shocks(see also Loening et al. 2009). Hence, food price remains to be very vital component of the overall price index.

Table VI : The Dynamic Short Run Relationship[2]

Lagged Explanatory Variables	Overall CPI	Food Price	Non-Food Price
Consumer Price	.1990483*** (.0704615)	-	-
Food Price Index	-	.0823039 (.1123407)	-
Non-Food Price	-	-	.1861729** (.0883595)
Output Growth	.3169462 (.6556175)	.4806353 (.6705263)	.3118665 (.2502094)
Cost of Capital	6.9814*** (2.66809)	6.807059** (2.728762)	2.187625** (1.018248)
Annual Rain Fall (MM)	-.0295946* (.0158293)	-.0172018* (.0161892)	-.0117962* (.0060411)
Nominal Exchange Rate	-2.793473** (3.174557)	-6.804015 (3.246747)	-.5545398** (1.211536)
Excess Money Stock	3.460043*** (.9521303)	.0111472*** (.9737819)	.5360621*** (.3633703)
Fertilizer Price Index	.3349849** (.2131399)	.8235923*** (.2179867)	.2669651*** (.0813425)
Intermediate Import Price Index	.0564665*** (.2424207)	.0223275*** (.2479334)	.1861927*** (.0925173)
Oil Price Index	.109185** (.2514456)	.6985354*** (.2571635)	.5324492*** (.0959615)
World Food Price Index	-.1701222 (.4054021)	-.7245421* (.414621)	-.3895503** (.1547174)
Foreign Price Index	1.548174** (.7725674)	.0646383 (.7901357)	.6662553** (.2948421)
ECM1	-1.143312*** (.3429858)	-.9161571*** (.3507853)	-.2402604* (.1308968)
ECM2	2.258849*** (.4289167)	.5163286 *** (.4386703)	.713123*** (.1636914)
ECM3	-2.740281** (.1239972)	-.8111887** (.1268169)	-.2545166** (.4732221)

*Note: Values in parenthesis are Standard errors. *** indicates Significant at 1percent, ** at 5 percent and * at 10 percent significance level.*

Source: Model Output

The degree of inertia is another crucial factor for the rise of price inflation. Lagged price inflation parameters are used to capture inflation expectations related to new news, policy changes and sudden shocks in the supply side factors (Ng and Ruge-Murcia 2000). On the basis of which, the lagged coefficients in the overall, and non-food price reveal robustly significant meaning that inflation inertia is highly observed and the degree of its effect is relatively very large for the overall price inflation. A one percent increase in the overall, food and non-food prices in the previous year will increase the price of same in the following year by 0.2, 0.1 and 0.19 percent respectively. We can possibly infer that in the short run, a change in the price inflation is highly sensitive to the changes in indexation or expectation. Several evidences also depict that inflation inertia are highly workable in Ethiopia (IMF 2008; Loening 2007; Haji & Gelaw 2012; Loening et al. 2009). Credible measures and stabilization policies would have an immense importance to dampen the growing risk of inflation expectations.

As far as the supply side factors are concerned, the evidence reveals that fertilizer and oil prices could have very strong and significant effect on food and non-food price. As they constitute the two major external supply side factors, the effect of agricultural supply shock is mainly originated through these factors and also through the exchange rate pass through effect (Loening et al. 2007). Noticeably, the cost of capital is highly significant and effective in all the price indices. This evidence certainly proved that high cost of capital (indicator for the shortage of agricultural finance) has a

[2] Incorporating agricultural production index (API) in the model is not a good idea as it concurrently affects income and then the demand for goods (see also Loening et al. 2009). Hence, it is must to exclude in the model for the sake of eliminating multicollinearity problem.

substantial obstacle in the Ethiopian agricultural production and price inflation. On the other hand, evidence reveals that rainfall does not have a significant effect on price inflation because either its effect may not be realized in the short run or have a long run effect through the agricultural supply shock, that is why the error correction term for the agricultural supply shock becomes strongly significant. In sum, except rain fall all the supply side factors are highly significant in the domestic price inflation.

There is strong evidence stating that intermediate import and foreign price indices have a strongly significant effect on the domestic price inflation. This may certainly justify the fact that Ethiopian economy has been highly dependent on the intermediate goods import. Contrarily, the world food price does not have a significant effect on the overall inflation. The main reason is that the progressive agricultural growth has possibly undermined the effect of world food price shock. This is also consistent with the findings of Loening et al. (2007). As far as the effect of real output growth is concerned, our evidence strongly asserted that it does not have a significant effect on price inflation. The positive sign may simply indicate the fact that the major inflationary episodes has occurred during the period of drastic economic growth. This evidence certainly rejects the government's claim to explain the cause of recent inflation in favor of the demand pull inflation hypothesis (see also Girma 2012; Desta 2008; Haji and Gelaw 2012) as it is also proved in the money market equilibrium relationship.

The coefficient on excess money growth reveal larger and highly significant in the overall price inflation. Money growth seems to matter a great deal of all the possible sources of price inflation. Both inflation theories (monetarist and Structuralists) have got a strong conviction that monetary expansion is part and parcel of most inflationary episodes, particularly, when the money stock become partly endogenous (Pinga and Nelso 2001; Yeldan 1993).Prevailing evidences verified that Ethiopian inflationary pressure is predominantly affected by monetary expansion (Simpasa et al. 2011; Loening et al. 2009, IMF 2013 and Haji and Gelaw 2012).

Ethiopia followed an accommodative monetary policy during high inflation episodes (Loening et al. 2009). Hence, the accommodative monetary policy can be one of the reasonable factors for inflation. The main reason to find that excess money did not cause food inflation is that monetary policy may not be effective due to market inefficiency in the oligopolistic agricultural market structure (Klugman and loaning 2007); perhaps the undergoing agricultural reforms and structural constraints may also exert pervasive hindrances behind reasonable price formation in the agricultural market, which would have blocked the effect of ongoing monetary policy to combat the rising price inflation. This is also theoretically consistent from the Structuralists point of view.

As far as the long run relationship is concerned, the error correction terms in the agricultural supply shock and real money stock growth rate are highly significant. The highly significant parameters of the error correction term in the supply side and monetary factors may possibly indicate price overshooting meaning that an exogenous shock on the supply side and monetary factors determinedly enforce the domestic price to respond above its long-run equilibrium level (see also Haji and Gelaw 2012). This strengthens the evidence in favor of the supply side and monetary factors as the main determinant of domestic long run price inflation. On the other hand, the error correction representation for the external sector also reveals significant effect on the domestic price inflation. This implies that the imported inflation thesis is also highly workable to explain the long run price inflation through the exchange rate pass through effect.

V. Conclusion and Policy Remarks

Ethiopia has experienced unprecedented and highly volatile inflation growth for longer than two decades. National and international reports pronounced that the country's inflationary pressure had been over the continental average. Until recently, the high level of uncertainty and volatility nature has brought unreserved attention among several writers and researchers. In view of that, the study found three basic theoretical approaches that could feasibly explain the sources of inflation in Ethiopia i.e. Structuralists, Money demand and PPP hypotheses. Based on those theoretical insights, the analysis included several macro-economic determinants particularly the supply side factors, policy variables (Monetary, fiscal and exchange rate policies) and external factors as well. By using annual data over the past three decades, VECM was estimated to identify the salient sources of inflation and their dynamic behavior over time. The pre-estimation and post estimation specifications asserted that our models are highly parsimonious and appear to be reasonably well specified.

The results reveal that Changes in the average inflation rate are highly sensitive to the changes in indexation or inflation expectation and largely to the changes in money supply growth. The response of inflation from its own shock is positive and strongly significant, meaning that inertial factors remain largely workable in Ethiopia. The credibility of putting money as a stock of wealth had been considerably declined. The share of Currency in circulation and money growth had been substantially increasing over time, thereby adding extra pressure on the general price level. In this regards, the NBE and commercial banks need a strong commitment to build public reputation by means of adopting credible monetary policy and fiscal stances pertinent to combat the growing risk of inflation expectation. Monetary policy plays an important role beside structural rigidities are profoundly affecting its effectiveness. Thus, further measures to stabilize the domestic agricultural goods market through flourishing the distribution channel (transport and communication) could have paramount importance to have well managed price shocks.

The study found that the three inflation theories (the agricultural goods market, the Quantity Theory of Money and the Purchasing Power Parity) have given principal inference for explaining the Ethiopian inflation scenario. The results evidently rejected the null hypothesis in favor of the alternative stating that those theories are highly workable and have strongly explanatory power on the long run inflation. However, the insignificant effect of real output growth and the present-day developments in agricultural performance could markedly undermine the role of the demand pull hypothesis in explaining the recent inflationary pressure.

As similar as the findings in South Africa (Nell 2004), in Kenya (Durevall and Ndung'u 2001) and Uganda (Simpasa et al. 2011), our empirical evidence reveals that money supply is endogenously determined. Hence, under the conditions of structural rigidities, the effect of tight monetary policy and financial development alone may not help much to stabilize the recent price inflation. For this reason, even if the Government of Ethiopia frequently adopted monetary tightening and strict price regulation, inflation has yet remained to be unresolved. Flourishing structural rigidities and institutional pitfalls can have paramount importance not only for tackling supply side problems, but also enable to activate the effectiveness of monetary policy as well.

In sum, a large fraction of Ethiopia's inflation is explained by the supply side and monetary factors. Virtually, money supply growth, owing to the prevailing public credit expansion has a large and significant effect on inflation for the reason that the money growth continually eroded the value of the nation's currency. External shocks have also had a detrimental effect on the domestic price through the exchange rate pass through effect. The growing trade imbalances due to high foreign price shock had been profoundly affected the macro economic stability via imported price inflation. The external shock transmission mechanism is also prominently provoked by the effect of exchange rate depreciation. Hence, carefully designed monetary and stable exchange rate policies can promptly improve the balance of trade; thereby enable to manage the domestic price shock. Moreover, the malfunctioning oligopolistic market, fiscal mismanagement and monetization of the fiscal deficit could also have concurrent effects on inflation. To conclude, our results markedly asserted the need to apply the aforementioned multimodal approaches to successfully combat the recent inflation in Ethiopia.

References Références Referencias

1. Bleaney, M., & Fielding, D. (2002).Exchange rate regimes, inflation and output volatility in developing countries. Journal of development economics, 68(1), 233-245.
2. Box, G.E., G.M. Jenkins and G.C. Reinsel (2013) Time Series Analysis: Forecasting and Control. John Wiley & Sons.
3. Bronfenbrenner, M. and F.D. Holzman (1963) 'Survey of Inflation Theory',The American Economic Review: 593-661.
4. CSA (2009). 'Country and regional level consumer price Indices', Monthly report on consumer price index, various months.
5. Desta, A. (2008) 'Economic Growth for Inflation: The Ethiopian Dilemma'. Dominican University of California.
6. Durevall, D. and B. Sjö (2012) 'The Dynamics of Inflation in Ethiopia and Kenya. African Development Bank Group.
7. Durevall, D. and N.S. Ndung'u (2001) 'A Dynamic Model of Inflation of Kenya, 1974-96', Journal of African Economies 10(1): 92-125.
8. Eden, S. (2012) 'Modeling Inflation Volatility and its Effect on Economic Growth in Ethiopia'.
9. Fischer, S., & Easterly, W. (1990). The economics of the government budget constraint. The World Bank Research Observer, 5(2), 127-142.
10. Girma, F.D. (2012) 'Relationship between Inflation and Economic Growth in Ethiopia: An Empirical Analysis, 1980-2011'.
11. Haji, J. and F. Gelaw (2012) 'Determinants of the Recent Soaring Food Inflation in Ethiopia', Universal Journal of Education and General Studies 1(8): 225-233.
12. Hassan, S. (2008) 'The Causes of the Current Ethiopian Soaring Inflation Rate: A Non-Technical Analysis', Sudan Tribune.
13. IMF (2008) 'Federal Democratic Republic of Ethiopia: Selected Issues'. IMF Country Report 08/259." Washington DC: International Monetary Fund.
14. IMF (2013) 'Federal Democratic Republic of Ethiopia: Key Issues: IMF Country Report No. 13/308'. Washington, D.C: International Monetary Fund.
15. Johansen, S. (1988) 'Statistical Analysis of Co-integration Vectors', Journal of Economic Dynamics and Control 12(2): 231-254.
16. Johansen, S. (1995) 'Likelihood-Based Inference in Nonintegrated Vector Autoregressive Models', OUP Catalogue.
17. Johansen, S., & Juselius, K. (1990).Maximum likelihood estimation and inference on co-integration—with applications to the demand for

money.Oxford Bulletin of Economics and statistics, 52(2), 169-210.

18. Kibritçioğlu, A. (2002) Causes of Inflation in Turkey: A Literature Survey with Special Reference to Theories of Inflation. University of Illinois at Urbana-Champaign.
19. Klugman, J and J. Loening, (2007) 'Welfare Impacts of Food Price Inflation in Ethiopia'. Policy Note, Poverty Reduction and Economic Management Unit, Africa Region, Vol. Report, (15):pp. 34-41.
20. Loening, J. (2007) 'Inflationary Expectations in Ethiopia', Background paper for the Food Price Inflation Policy Note.
21. Loening, J. and H. Takada (2008) 'Inflationary Expectations in Ethiopia: Some Preliminary Results', Applied Econometrics and International Development 8(2): 159-176.
22. Loening, J.L., D. Durevall and Y. Ayalew Birru (2009) 'Inflation Dynamics and Food Prices in an Agricultural Economy: The Case of Ethiopia', rapport nr: Working Papers in Economics 347.
23. Mankiw, N. G., Reis, R., &Wolfers, J. (2003). Disagreement about inflation expectations (No. w9796). National Bureau of Economic Research.
24. Mankiw, N.G. and R. Reis (2003) 'What Measure of Inflation should a Central Bank Target?', Journal of the European Economic Association 1(5): 1058-1086.
25. Mwanakatwe, P. and L. Barrow (2010) 'Ethiopia's Economic Growth Performance: Current Situation and Challenges', The African Development Bank Group, Economic Brief 1(5).
26. Nell, K. S. (2004). The Structuralists theory of imported inflation: an application to South Africa. Applied Economics, 36(13), 1431-1444.
27. Ng, S., & Ruge-Murcia, F. J. (2000). Explaining the persistence of commodity prices. Computational Economics, 16(1-2), 149-171.
28. Saleh, A. S., &Harvie, C. (2005). The budget deficit and economic performance: A survey. The Singapore Economic Review, 50(02), 211-243.
29. Simpasa, A., D. Gurara, A. Shimeles, D. Vencatachellum and M. Ncube (2011) 'Inflation Dynamics in Selected East African Countries: Ethiopia, Kenya, Tanzania and Uganda', AfDB Policy Brief.
30. Stock, J. H. (1997). Co-integration, long-run co-movements, and long-horizon forecasting. Econometric Society Monographs, 28, 34-60.
31. Stock, J.H. and M.W. Watson (1988) 'Testing for Common Trends', Journal of the American statistical Association 83(404): 1097-1107.
32. World Bank report (2013) 'Economic Overview of Ethiopia' available at http://www.worldbank.org/en/country/ethiopia/overview

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Pre-Service STEM Majors' Understanding of Slope According to Common Core Mathematics Standards: An Exploratory Study

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Abstract- Common Core Mathematics Standards (CCMS) is a major effort at revamping the U.S. K-12 mathematics education in order to improve American students' mathematical performance and international competitiveness. To ensure the successful implementation of CCMS, there have been calls for both recruiting from those with the strongest quantitative backgrounds (e.g., STEM majors) and offering rigorous mathematics training in teacher preparation. Missing from the literature are questions of whether STEM majors who arguably represent the strongest candidates for the teaching force have the depth of content understanding in order to teach mathematical topics at the rigorous level that CCMS expects, and whether future mathematics teachers need the opportunities to learn rigorously the K-12 mathematical topics they are expected to teach down the road. Our paper addresses the knowledge gap in these two areas through investigating the understanding of the concept of slope among a group STEM majors who were enrolled in an undergraduate experimental teacher preparation program. We found that even among these students, there are holes in their conceptual understanding of slope and of the connection between linear equation and its graph. These weaknesses could pose challenges for their preparedness to teach the slope concept consistent with the rigor that CCMS calls for. Taking courses that specifically address the K-12 math topics is helpful. We discuss implications of these findings for the content preparation of mathematics teachers.

Keywords: common core mathematics standards, STEM majors, content preparation, slope concept.

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PRESERVICESTEMMAJORSUNDERSTANDINGOFSLOPEACCORDINGTOCOMMONCOREMATHEMATICSSTANDARDSANEXPLORATORYSTUDY

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Xiaoxia A. Newton [α] & Rebecca C. Poon [σ]

Abstract- Common Core Mathematics Standards (CCMS) is a major effort at revamping the U.S. K-12 mathematics education in order to improve American students' mathematical performance and international competitiveness. To ensure the successful implementation of CCMS, there have been calls for both recruiting from those with the strongest quantitative backgrounds (e.g., STEM majors) and offering rigorous mathematics training in teacher preparation. Missing from the literature are questions of whether STEM majors who arguably represent the strongest candidates for the teaching force have the depth of content understanding in order to teach mathematical topics at the rigorous level that CCMS expects, and whether future mathematics teachers need the opportunities to learn rigorously the K-12 mathematical topics they are expected to teach down the road. Our paper addresses the knowledge gap in these two areas through investigating the understanding of the concept of slope among a group STEM majors who were enrolled in an undergraduate experimental teacher preparation program. We found that even among these students, there are holes in their conceptual understanding of slope and of the connection between linear equation and its graph. These weaknesses could pose challenges for their preparedness to teach the slope concept consistent with the rigor that CCMS calls for. Taking courses that specifically address the K-12 math topics is helpful. We discuss implications of these findings for the content preparation of mathematics teachers.

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I. Introduction

Improving American students' opportunities to learn and performance in mathematics and science has been of major concern for several decades. Despite waves of reform, student mathematical performance in the U.S. remains lackluster in international comparisons (Loveless, 2013; OECD, 2014). Common Core Mathematics Standards (CCMS), characterized by its focus, coherence, and rigor, are believed by many to have potential for improving students' mathematical learning, if well implemented (Schmidt & Houang, 2012). The success of CCMS on student learning in part depends on teachers who are capable of teaching CCMS. Consequently, there have been calls for both recruiting from those with the strongest quantitative backgrounds (e.g., STEM majors) and offering rigorous mathematics training in teacher preparation (Schmidt, Houang, & Cogan, 2011).

Despite such calls, existing literature is void in two areas. First, to the best of our knowledge, there has been no empirical evidence on whether these STEM majors who arguably represent the strongest candidates for the teaching force have the depth of content understanding in order to teach mathematical topics at the rigorous level that CCMS expects. Secondly, it is not clear from the existing literature what counts as rigorous mathematics training. Should rigorous training in mathematics mean more advanced college mathematics courses (e.g., taking more upper division math courses)? Or should rigorous training mean future mathematics teachers need the opportunities to learn rigorously the K-12 mathematical topics they are expected to teach down the road?

Our paper is an attempt to address the knowledge gap in these two areas through investigating the understanding of the concept of slope among a group STEM majors who were enrolled in an undergraduate experimental teacher preparation program. Though we could have chosen any topic, slope concept provides an ideal platform for investigating the question of whether teacher candidates are adequately prepared to teach mathematics at the level of rigor that is required by CCMS for the following reasons. First, slope of a line features prominently in algebra and is a foundational concept in functions. Despite its importance, research has well documented the difficulties both students and teachers (pre- and in-service) have in terms of understanding the concept of slope (Stump, 2001a, 2001b; Teuscher & Reys, 2010; Zaslavsky, Sela, & Leron, 2002). Secondly, this difficulty will likely increase with the adoption of Common Core Mathematics Standards (CCMS), because CCMS approaches the concept of slope in significantly different ways.

To begin with, CCMS makes the distinction between the slope of a line and the slope of two chosen points on the line. In contrast, most existing textbooks conflate the two. Furthermore, CCMS emphasizes reasoning and proof. Therefore, CCMS requires that students be able to prove that slope of a line can be defined by *any* two distinctive points on the line. The proof invokes the concept of similar triangles and

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therefore, according to CCMS, students will be exposed to the concept of similar triangles before learning the concept of slope. This also means that students are expected to have a much stronger grasp of the connection between linear equations and their graphs than expected in the past. This logical sequence of topics and the emphasis on the connection between equations and graphs are absent in the current curriculum and textbooks (Wu, 2014). Given the significant departure of CCMS from the old ways of teaching and learning of slope, the question naturally arises: How prepared are pre-service teachers in terms of their own understanding of slope according to CCMS?

We focused on STEM majors who were part of the undergraduate mathematics and science teacher preparation program at one of the research universities in the west coast of the United States. Focusing on STEM majors provides an opportunity to assess content understanding among those who arguably possess the strongest mathematical and quantitative backgrounds. There have been sustained efforts at recruiting undergraduate STEM majors into teaching through programs such as 100k10 in New York, UTeach in Texas, and UTeach replication sites across the country. The undergraduate teacher preparation program we focused on offers a unique opportunity to examine the mathematical understanding of prospective teachers, because the mathematics department offers a three-course sequence coursework focusing on grades 6 through 12 mathematics topics for mathematics majors who intend to pursue teaching as a career. The content of these courses aligns well with the CCMS. Consequently, we ask the question: Is there any qualitative difference in the understanding of slope concept between those who took the course versus those who did not?

This paper is structured as follows. We first provide an overview of how slope is typically conceptualized in previous research, state content standards, and textbooks, highlighting the problematic aspects of how slope is typically conceptualized and contrasting this with how CCMS intends to overcome these problems. We then review the literature on characteristics of mathematical understanding as a basis on which to build a framework for examining the mathematical content understanding of slope according to the CCMS. After this, we describe various aspects of the inquiry methods. Following this, we present our findings and discuss their implications for mathematics teachers' content training in order to teach K-12 mathematics topics that meet the expectations of CCMS.

II. Conceptualization of Slope: Pre-Common Core Vs. Common Core

a) *Previous Research, State Standards, and Textbooks*

The conceptualization of slope in various research studies shares some similarities. Common definitions of slope include geometric ratio, algebraic ratio, physical property, functional property, parametric coefficient, trigonometric conception, calculus conception, and real world representations (Moore-Russo, Conner, & Rugg, 2011; Stump, 1999). While comprehensive, these definitions can potentially pose difficulties for the purpose of teaching and learning because not only is the list long, but it is not clear from existing literature how these different categories are related to one another (i.e., mathematical coherence), for what purposes (i.e., purposefulness), and under what context to use which definition (i.e., connectedness).

State standards and textbooks (e.g., Burger et al., 2007; Collins et al., 1998; Larson et al., 2004a, 2004b), on the other hand, tend to define slope in terms of the ratio, in particular, what is considered as geometric ratio in terms of "*rise over run*" (Stanton & Moore-Russo, 2012). This definition is problematic. To begin with, the focus on "rise over run" orient learners' attention on the algorithm for calculation instead of conceptual understanding of what slope is. Secondly, the definition conflates the slope calculated using two points on the line with the slope of the line. In other words, if we were to take two different points, how do we know the ratio will be the same? Further, are we confident that two pairs of points (i.e., four points) are enough to say that any two points will give the same ratio since there are infinite numbers of points on the line? Finally, the definition assumes teachers and students will know *why* the ratio (of vertical change per unit of horizontal change) is always the same without given an explanation. These problems make it difficult for the intended users (i.e., teachers and students) to make sense of what slope is. The likely consequence of over-relying on the formulaic definition of slope is that learners will know the formula without understanding what the formula means or why it works. As Walter and Gerson (2007) observed that:

> "In virtually every classroom in the U.S., students are taught the phrase 'rise over run' as a mnemonic for the algorithm for calculating slope 'change in y, over the change in x,' for an arbitrary pair of points in a coordinate plane. The result of this instrumental device is an instrumental understanding (Skemp, 1976/[2006]) of slope as a fraction, with the change in y as the numerator and the change in x as the denominator. Students with this understanding are poorly equipped to make the cognitive leap which seems necessary in order to move from local

calculation-based understanding to global understanding of the quotient's meaning for the way a line is positioned in the plane or to make connections with the idea of rate of change." (p. 204).

Consistent with Walter and Gerson's observations, studies have shown that students have difficulties identifying slope of a line from its graph (Postelnicu & Greens, 2012), computing slope of a line, or relating slope to the measure of steepness (Postelnicu, 2011; Postelnicu & Greens, 2012; Stump, 2001b). These difficulties point to the importance of helping students understand why taking any two points on the line will give the same answer and that how the slope being the same along the graph controls its shape. The implication is that in order to have a firm understanding of slope, one must understand explicitly the connection between linear equation and its graph. Indeed the concept of slope brings forth the need to connect the algebraic aspect of linear equation and the geometric aspect of its graph.

b) CCMS Approach to Slope

To remedy how slope has been treated in previous state standards and textbooks, CCMS presents a coherent learning progression on the topic. CCMS provides 8th graders with an intuitive approach to congruence and similarity by getting them comfortable with the angel-angle criterion for similar triangles. Following this, CCMS requires that 8th graders use similar triangles to explain why the slope of a non-vertical line can be calculated using any two distinctive points on the line. Teaching similarity to help students make sense of the concept of slope equips them with a powerful tool to solve all sorts of linear equation problems without having to resort to memorizing different forms of linear equations (two-point, point-slope, slope-intercept, and standard), because now students are provided with the explicit knowledge and understanding that slope can be calculated using any two points on the line that suit one's purpose (for examples, see Newton & Poon, 2015).

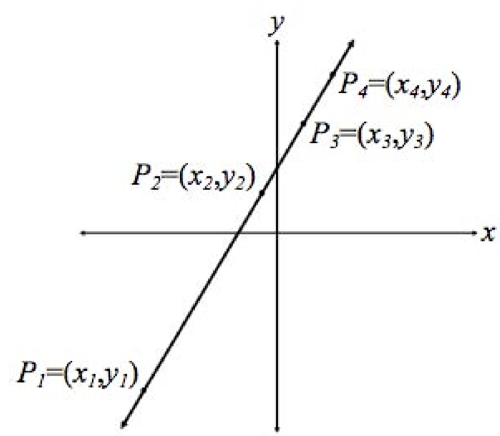
Furthermore, CCMS' approach to slope connects the algebra of the linear equation and the geometry of the slope. This interconnectedness helps students see how slope being the same all along the graph controls its shape (Wu, 2010b, 2014, forthcoming). Finally, understanding similarity helps students to build a foundation for learning high school geometry. And a solid understanding of slope is foundational for studying other advanced topics involving slope such as functions. CCMS's effort at maintaining grade-to-grade mathematical continuity and coherence represents a significant departure from old curriculum that is characterized as "a mile wide but an inch deep" (Schmidt et al., 2001). The rationale for CCMS' effort at promoting and emphasizing content understanding is best captured by the following paragraph:

"Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, apply the mathematics to practical situations, use technology mindfully to work with the mathematics, explain the mathematics accurately to other students, step back for an overview, or deviate from a known procedure to find a shortcut. In short, a lack of understanding effectively prevents a student from engaging in the mathematical practices" (CCMS).

c) Our Scenario Question

Consistent with the emphasis of CCMS, we used the following scenario question to investigate pre-service STEM majors' understanding of the concept of slope and the connection between linear equation and its graph:

How would you help *eighth graders* understand that the slope of a non-vertical line can be calculated using any two distinct points on the line (e.g., the slope of the line below can be calculated with points P_1 and P_2 or points P_3 and P_4)?



Characteristics Exemplify Content Understanding According to CCMS

Several characteristics of content understanding central to teaching are common emphasis in the seminar work by leading scholars in education and mathematics community. These characteristics tend to cluster around coherence (e.g., connectedness among mathematical concepts), reasoning (e.g., using definitions as a basis for logical reasoning), and purposefulness and/or key ideas (e.g., mindful of why to study a concept and how the concept might be related to prior or later topics). These central characteristics are the basis of our framework for examining our study participants' content understanding of the slope concept according to CCMS. This section reviews the key ideas proposed by prior researchers and shows how they informed the conception of our framework.

d) Education and Mathematics Scholars' Work on Content Understanding

In his 1985 presidential address at the annual meeting of the American Educational Research Association, Lee Shulman (1986) described content as "the missing paradigm" in research on teaching and proposed "pedagogical content knowledge" (PCK) as one of the several types of knowledge teachers need in order to teach. Since then, scholars have attempted to elaborate what PCK may entail and link it to student learning (e.g., Ball, 1990; Ball, Hill, & Bass, 2005; Ball, Hoover, & Phelps, 2008; Baumert et al., 2010; Schoenfeld & Kilpatrick, 2008).

One theoretical framework of proficiency in teaching mathematics came from Schoenfeld and Kilpatrick (2008). Schoenfeld and Kilpatrick (2008) argue that proficient teachers' knowledge of school mathematics is both broad and deep. The breadth focuses on teachers' ability to have multiple ways of conceptualizing the content, represent the content in various ways, understand key mathematical ideas, and make connections among mathematical topics. The depth, on the other hand, refers to teachers' understanding of how the mathematical ideas grow conceptually from one grade to another.

The characteristics of content understanding outlined in Schoenfeld and Kilpatrick's framework are similar to the ideas rooted in a series of work by Deborah Ball and her colleagues (Ball, 1990; Ball, Hill, & Bass, 2005; Ball, Hoover, & Phelps, 2008) and to those outlined in the book of Liping Ma (1999) on "profound understanding of fundamental mathematics (PUFM)". Ball and her colleagues call the kind of content understanding described by Schoenfeld and Kilpatrick, "mathematical content knowledge for teaching" (Ball, Hill, & Bass, 2005; Ball, Hoover, & Phelps, 2008). In her earlier work, Ball (1990) proposed four dimensions of subject matter knowledge for teaching that mathematics teachers need to have, including: (1) possessing correct knowledge of concepts and procedures; (2) understanding the underlying principles and meanings; (3) knowing the connections among mathematical ideas, and (4) understanding the nature of mathematical knowledge and mathematics as a field (e.g., being able to determine what counts as an "answer" in mathematics? What establishes the validity of an answer? etc.).

In the work that followed, Ball and her colleagues (Ball, Hill, & Bass, 2005) defined "mathematical content knowledge for teaching" as being composed of two key elements: "common" knowledge of mathematics that any well-educated adult should have and mathematical knowledge that is "specialized" to the work of teaching and that only teachers need know." (p. 22). The notion that there is content knowledge unique to teaching was further expanded in their most recent work. Ball and her colleagues (Ball, Thames, & Phelps, 2008) proposed a sub-domain of "pure" content knowledge unique to the work of teaching, called *specialized content knowledge*. *Specialized content knowledge* is needed by teachers for specific tasks of teaching (e.g., responding to students' why questions), which in principle seems similar to Liping Ma's proposed concept of "profound understanding of fundamental mathematics" (PUFM) (1999).

Ma proposed the concept of PUFM in her much celebrated work on teachers' understanding of four standard topics in elementary school mathematics between a group of Chinese and American teachers. Ma specified four properties of understanding that characterize PUFM, namely, basic ideas, connectedness, multiple representations, and longitudinal coherence. Shulman (1999) calls these four properties of understanding "a powerful framework for grasping the mathematical content necessary to understand and instruct the thinking of schoolchildren" (p. xi).

The characteristics of content understanding outlined by education scholars are in-sync with the ones proposed by Wu. Wu is one of the few mathematicians who have devoted decades of effort at delineating mathematical content knowledge that teachers need to have in order to teach at K-12 level (Wu, 2010b, 2011b, forthcoming). Wu proposed five basic characteristics capturing the essence of mathematics that is important for K-12 mathematics teaching (2010a, 2011a, 2011b):

- Precision: Mathematical statements are clear and unambiguous. At any moment, it is clear what is known and what is not known.
- Definitions: They are the bedrock of the mathematical structure. They are the platform that supports reasoning. No definitions, no mathematics.
- Reasoning: The lifeblood of mathematics. The engine that drives problem solving. Its absence is the root cause of teaching and learning by rote.
- Coherence: Mathematics is a tapestry in which all the concepts and skills are interwoven. It is all of a piece.
- Purposefulness: Mathematics is goal-oriented, and every concept or skill is there for a purpose. Mathematics is not just fun and games.

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e) Our Framework of Mathematical Content Understanding

Integrating the emphasis of CCMS on reasoning and understanding, the key ideas proposed by education researchers (e.g., Ball, Hoover, & Phelps, 2008; Ma, 1999; Schoenfeld & Kilpatrick, 2008), and Wu's five characteristics of mathematics (Wu, 2010a, 2011a, 2011b), we propose three characteristics that exemplify the mathematical content understanding. Our framework of mathematical content understanding is centrally concerned with delineating characteristics of knowledge that demonstrate a relational understanding of a mathematical topic (i.e., knowing what to do and why) (Wu, 2011e), as opposed to an instrumental understanding which Skemp (1976) regarded as knowing the "rules without reasons". Table 1 lists the three characteristics, what each characteristic means, and prior scholars' work that contributed to our conception of each characteristic.

Table 1 : Characteristics Exemplify Mathematical Content Understanding

Characteristics	Descriptions	Link to Other Scholars' Ideas
Precision	-Be explicit about precise definitions (e.g., use definitions as a basis for logical reasoning); -Pay attention to precise statements (e.g., present mathematical ideas clearly)	-Wu (2010a, 2011a, 2011b): precision; definition; reasoning -Ball (1990): possessing correct knowledge of concepts and procedures; understanding the nature of mathematical knowledge and mathematics as a field (e.g., what establishes the validity of an answer?)
Coherence	- Demonstrate interconnectedness of mathematical ideas (e.g., show the algebraic and geometric representations of a mathematical concept and idea, where appropriate); -Show logical/sequential progression of mathematical ideas (e.g., show a deliberate effort at scaffolding mathematical ideas from simple to complex, specific to general)	-Wu (2010a, 2011a, 2011b): coherence; purposefulness -Ball (1990): knowing the connections among mathematical ideas -Ma (1999): connectedness; multiple representations; longitudinal coherence -Schoenfeld & Kilpatrick (2008): breadth; depth
Purposefulness	- Emphasize key or big mathematical ideas; - Provide rationale for why key mathematical ideas are relevant to the teaching of a particular mathematical topic at hand	-Wu (2010a, 2011a, 2011b): purposefulness; reasoning -Ball (1990): understanding the underlying principles and meanings -Ma (1999): basic ideas -Schoenfeld & Kilpatrick (2008): breadth

As Table 1 indicates, these characteristics of content understanding are consistent with and reflect the mathematics education community's call for a profound understanding of school mathematics for teaching (e.g., Ball, 1990; Ma, 1999; Schoenfeld & Kilpatrick, 2008). One point we want to emphasize is that we describe some of the relevant knowledge, acknowledging that there are various ways to conceptualize the content, and more than one way to approach the teaching of it (Cochran-Smith & Lytle, 1999). In addition, we want to point out that the characteristics of content understanding in our framework emphasize aspects of mathematical understanding "most likely to contribute to a teacher's ability to explain important mathematical ideas to students" (Shulman, 1999, xi).

III. Methods

a) Research Site and Study Sample

The present paper is based on a broader study of pre-service STEM teachers' content understanding of three foundational algebra topics at a west coast research university in the United States (Newton & Poon, 2015). Study participants were recruited from undergraduate courses that focus on K-12 mathematics and on mathematics teaching and learning. We used a series of scenario questions (roughly 3-4 questions per topic) like the slope one shown above to probe study participants' content understanding. Of the 46 students who responded to the scenario questions, 32 (70%) gave active consent to use their responses for research. Of these 32 study participants, 5 (16%) were science majors, 4 (13%) were engineering majors, 16 (50%) were mathematics majors, and 7 (22%) were humanities majors; 8 (25%) were transfer students from two-year colleges. The 14 students who did not give active consent were all STEM (Science, Technology, Engineering, and Mathematics) majors, of which 9 (69%) were mathematics majors. Their score distributions did not differ significantly from those of the study sample.

b) Data Collection

We collected two rounds of data, in spring 2010 and spring 2011. At each data collection occasion, one of the researchers visited the study participants' classes. The research member explained the purpose of the study and distributed the form containing the scenario questions. In fall 2010, respondents were given about two weeks to finish the form. Based on the preliminary analysis of data collected in fall 2010, we reduced the number of scenario questions (without sacrificing the opportunity to assess respondents' understanding of key mathematical concepts) and collected additional data in spring 2011. At the spring 2011 occasion, respondents answered the scenario questions during a 2-hour class period. Data for this paper came from spring 2010 where the slope scenario question was asked and included 16 STEM majors (out of 30 total respondents) who gave active consent to use their responses for research purposes.

c) *Data Analysis*

The authors (co-constructers of the scoring rubrics) independently coded all students' responses. Initial agreement between the two researchers was close to 80%. In cases where there was a disagreement (mostly within 1-point difference), we compared the rationale for the score in order to reach an agreement for the final score. In scoring a respondent's responses to a scenario question, we focus on the quality of the reasoning process. Specifically, the quality of the reasoning process is judged by the three characteristics that exemplify content understanding outlined in Table 1. These three criteria are the basis for the scoring rubric as shown in Table 2.

Table 2: Rubrics for Scoring Mathematical Content Understanding

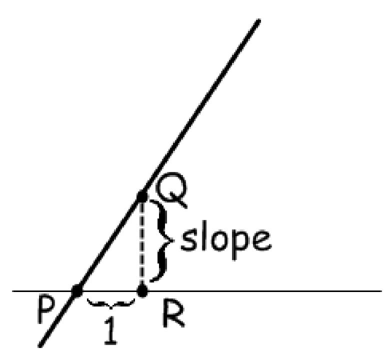
Levels	Descriptions
1-little understanding	Responses completely lack precision, coherence, and purposefulness. For instance, responses are too vague, irrelevant, incomplete, fragmented, inaccurate, or incorrect.
2-instrumental understanding	Responses do not meet the criteria of precision, coherence, and purposefulness. However, responses address the questions and have minimal mathematical errors. Mathematical understanding tends to focus knowledge at the surface, or mechanical level.
3-transitional understanding	Responses show some elements of precision, coherence, and purposefulness. For instance, there is evidence of an attempt or effort to emphasize the key mathematical idea, its rationale, the logical progression of mathematical concepts, and the connectedness among different mathematical concepts, procedures, and ideas. In addition, responses show an attempt to scaffold mathematical ideas for students.
4-relational understanding	Responses exemplify precision, coherence, and purposefulness. There is consistent (or substantial) evidence of an attempt or effort to emphasize the key mathematical idea, its rationale, the logical progression of mathematical concepts, and the connectedness among different mathematical concepts, procedures, and ideas. In addition, responses show attention to how to scaffold mathematical ideas to students (e.g., from simple to complex; from specific to general).

Using this rubric, responses to the scenario question were scored on a scale of 1 to 4 (blank responses were categorized as missing data and no one in the sample scored 4). Quantitatively, we examined the frequency distributions of scores for each of the questions by college major. For the qualitative content analysis, we first describe several key patterns that reveal students' understanding of slope. We then compare the quality of reasoning between the observed students' responses and the level-4 response (described below) based on the three criteria described above. In addition, we compare the quality of the responses between those who took the three-course sequence coursework focusing on grades 6 through 12 mathematics topics versus those who did not.

d) *A Sample Response Exhibiting Deep Understanding of Slope*

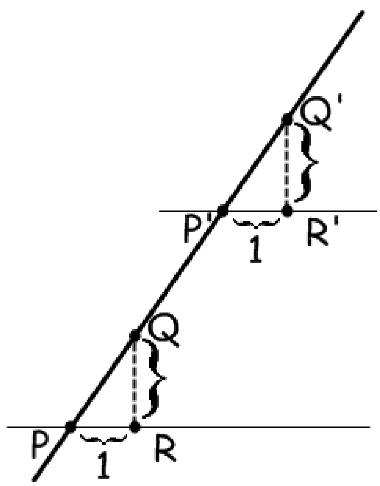
A response representing deep understanding of slope (i.e., level-4 response) begins with the definition of the slope of a line:

The key mathematical idea underlying this question is that the slope of a line can be calculated using any two points on the line (i.e., independence of any two distinct points on the line). So how can we help students learn this key idea? Before I use P_1, P_2, P_3, P_4 *as shown in the picture, I would first review with students how the slope of a line is defined: given a line and assuming it slants upward (as the picture shows), let's take a point P on the line, go 1 unit horizontally to point R, then go upward (or vertically) and let the vertical line from R intersect the given line at point Q. Then the definition of slope is the length of segment QR (i.e., |QR|).*



Here the respondent is laying a foundation for what comes next by precisely defining the slope of a line and showing this on the graph. Note how the respondent expands the definition and stretches students' thinking by posing the next question:

But how are we certain that this vertical length |QR| is the same for any point P we choose on the line? In other words: if we take another point P' on the line, go 1 unit horizontally to point R' and then go upward to intersect the line at point Q', how do we know that |QR| = |Q'R'|)?



To answer this question, students need to invoke their knowledge of similar triangle. This is an important step towards defining the slope precisely and completely, as the respondent points out:

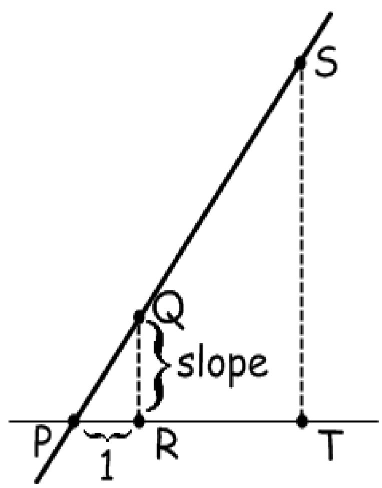
I would expect the following explanation from students:

$$|\angle PQR| = |\angle P'Q'R'|, |\angle QPR| = |\angle Q'P'R'|$$

(corresponding angles on parallel lines) and |PR| = |P'R'| = 1, so by the angle-angle-side criterion, $\Delta PQR \cong \Delta P'Q'R'$ *and, thus, |QR| = |Q'R'|. Therefore, the slope is independent of the point P and it makes sense to talk about the slope of the line.*

With the definition complete, the respondent adds complexity by posing the following question: *"Can we find another, more flexible way of finding the slope of a line, without having to measure 1 unit horizontally from a point on the line and then the vertical distance up?"* This step builds on the previous step of defining the slope of the line but uses similar ideas (i.e., similar triangle), as shown below:

To answer this question, let's do the following: let P, Q, R be as before (i.e., P is any point on the line used to define the slope of the line) and now suppose we take any other point on the line, call it S. From S, draw a vertical line and let it meet the horizontal line PR at point T.



So now look at the two triangles, ΔPQR and ΔPST. What can we say about them? Hopefully students would recognize that they are similar triangles; if not, I'd tell them but ask them to prove (explain) why the triangles are similar (by the angle-angle criterion: right angles formed by perpendicular lines and corresponding angles on parallel lines).

After establishing the fact that $\Delta PQR \sim \Delta PST$*, I would then ask: what can we say about the relationship between the sides of the triangles? One of the things I would expect students to mention would be:*

$$\frac{|QR|}{|ST|} = \frac{|PR|}{|PT|}$$

Then I would guide them to manipulate the above equation into the following:

$$\frac{|QR|}{|ST|} = \frac{|PR|}{|PT|} \Rightarrow |QR| = \frac{|PR| \cdot |ST|}{|PT|} \Rightarrow \frac{|QR|}{|PR|} = \frac{|ST|}{|PT|}$$

At this point, I would ask students what they observe. Hopefully they would recognize that, since $|PR|=1$, the left side of the equation is equal to line segment $|QR|$, which is the slope of the line. In other words:

$$slope = \frac{|ST|}{|PT|}$$

Of course, the respondent is very purposeful about why they are doing this exercise:

From this exercise, I would hope students reached the following conclusions:

1. *The slope of the line can be calculated using points P (the point we used to define the slope) and S (any other point on the line).*
2. *We can calculate the slope of a line by dividing the length of the vertical line segment by the length of the horizontal line segment of ΔPST.*

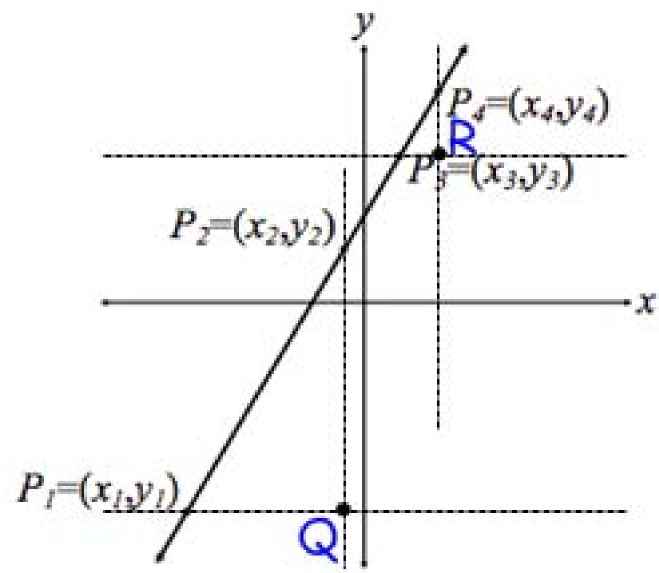
Because we had shown earlier that the point P used to define the slope is arbitrary (i.e., can be any point on the line) and we had defined S to be another arbitrary point on the line, then the conclusions above can be generalized into the following:

1. *The slope of the line can be calculated using any two distinct points, P and S, on the line.*
2. *We can calculate the slope of a line by dividing the length of the vertical line segment by the length of the horizontal line segment of ΔPST.*

This purposefulness brings mathematical closure to students and we see how the respondent is very deliberate in scaffolding key ideas throughout the process. Having shown the underlying key ideas, the respondent then goes back to the original question (i.e., using P1, P2, P3, and P4) and has students work out the proof on their own:

To reinforce these main ideas, I would have students work in groups or pairs to prove (using similar triangle properties) that the slope of the line calculated by P_1,P_2 (in the original graph above) is the same as the slope calculated by P_3,P_4. Once they finish working in groups, I'd have a whole-class discussion and ask students to show how they did the proof. Below is an example of what I'd expect:

Draw in the horizontal and vertical lines through points P_1,P_2,P_3,P_4 and let them intersect at points Q and R as shown below:



We claim that the two triangles formed, ΔP_1P_2Q and $\Delta\ P_3P_4R$, are similar. The reason is: $|\angle P_1QP_2|=|\angle P_3RP_4|$ because both equal $90°$ and $|\angle P_1P_2Q|=|\angle P_3P_4R|$ because they are corresponding angles on parallel lines. Then, by the angle-angle criterion, $\Delta P_1P_2Q \sim \Delta P_3P_4R$. By the key triangle similarity theorem, we can then say $\frac{|P_2Q|}{|P_4R|}=\frac{|P_1Q|}{|P_3R|}$, and by multiplying both sides of the equation by $|P_4R|$ and $\frac{1}{|P_1Q|}$, we get $\frac{|P_2Q|}{|P_1Q|}=\frac{|P_4R|}{|P_3R|}$. That means the slope calculated by P_1,P_2 is the same as the slope calculated by P_3,P_4. Therefore, the slope can be calculated by any two distinct points on the line.

Looking at this level-4 response overall, we see that the respondent is mindful of the purpose of each activity, focuses on the key ideas and scaffolds these key ideas in a coherent way, starting with the definition, using it as a basis for subsequent logical reasoning, and leading students from simple ideas to more complex ones, from specific examples to general cases.

To what extent do the sampled students in our study exhibit such understanding? What does their current understanding of slope look like? We address these questions in the following sections.

IV. Findings

We first present some quantitative data to show the distribution of students' rating scores. We then describe the patterns emerged in their responses to demonstrate the characteristics of their understanding of slope.

a) Frequency Distribution of Students' Scores

Table 3 displays the frequency distribution of students' scores.

Table 3 : Frequency Distribution of Study Participants' Scores

Levels of Content Understanding	Percentage
1: little understanding	65%
2: instrumental understanding	12%
3: transitional understanding	23%
4: relational understanding	0%

As shown in Table 3, close to two-thirds of the students scored 1 whereas the rest scored 2 or 3 and none scored 4. This means that the majority of the students' understanding of slope was inaccurate, fragmented, and incomplete, lacking precision, coherence, and purposefulness (i.e., scoring 1). Those who scored 3 took *Mathematics of the Secondary School Curriculum*, a 3-semester course sequence designed to teach grades 6-12 content to math majors interested in pursuing teaching as a career. Content analysis of students' responses revealed several key patterns with regards to their understanding of slope. We describe these patterns and discuss insights derived from them in the following sections.

b) Defining Slope Formulaically as Consistent with the K-12 Textbooks (Rise over Run)

As mentioned in the previous section, the frequency distribution of students' responses shows that only a handful of students scored at the level 3 while the rest at levels 1 and 2 and no one at level 4 (the highest level). Regardless of their scoring levels, all of the students in the study sample exhibit one qualitative characteristic in their responses which is to define slope formulaically in one way or another, consistent with how slope is defined in the K-12 textbooks (i.e., rise over run) as shown in the following example:

You know that slop $= \frac{rise}{run}$

Change in y, tells you the rise

Change in x, tells you the run

So slop $= \frac{y_{2-}y,}{x_{2-}x,}$

It dosen't matter which point you choose to subtract from, you just need to make Sure x and y correspond to each other. For example, if you subtract y from y_2 then You also need to subtract x from x_2.

Students' responses such as this example show how deeply entrenched students' K-12 learning is. It signals the tendency of these STEM majors to resort to what they have learned as K-12 students to teach the concept as they were taught themselves.

Further examinations of some students' responses reveal a bit of ambiguity on their part as to what rise over run really means. For instance, one student said slope is "how much a graph goes in the x-axis and how far a graph goes on the y-axis"; another student stated, "I would explain that the slope is the change between two points. This "rise" of the "run" that happens to get from one point to another"; and a third student described, "The slope of a line is just the ratio of the change in the y-values to the change in x values". It is not clear what it means for a graph to go both in x-axis and y-axis. And it is not accurate to say slope moves point A to point B (how and where) or slope is change in the y-values to the change in x-values (which y's and x's). The inaccuracy in these responses suggests that students are not making a connection between a linear equation and its graph (i.e., the graph of a linear equation is a collection of all points of ordered pairs (x, y) that satisfy the linear equation). To some extent, this finding is not surprising, since the graph of a linear equation is not defined for them when they first learned the topic as K-12 students. Without connecting a linear equation with its graph, students will not be able to see the connections between: (1) how slope of a line is defined (using their language, how much 'rise' given 1-unit 'run' in the Cartesian plane), (2) the formula used to calculate the slope using two distinctive points on the line, and (3) why the calculation does not depend on which two distinctive points one uses (i.e., they will always give the same answer).

c) Taking What Needs to Be Proven as Given (i.e., Circular Reasoning)

The scenario asked for the proof that the slope of the line can be calculated using *any* two distinctive points on the line. The majority of the responses (scores 1 and 2) took what needs to be proven as given as shown in this typical example:

The slop of the line $= \frac{rise}{run} = \frac{\Delta y}{\Delta x}$, therefore you can
Take any two points on the graph and find the slop,
Because the ratio $\frac{\Delta y}{\Delta x}$, is constant and straight line.
With points P_1 and P_2, you can calculate the slop from
P_1 (x, y) P_2 (x_2, y_2) $= \frac{y_2 - y,}{x_2 - x,}$ = the same can be done
With points p_3 and p_4. With P_3 (x_3, y_3) and P_4 (x_4, y_4)= slop $= \frac{y^4 - y^3}{x_4 - x_3}$.

The reasoning process goes that since the slope is constant, the formula using the two pairs of points shown to calculate slope will be the same. Slight variation to this sample response is that some students referenced m, as demonstrated in this example:

First we calculate one of the slop, say P_1 & P_2, and the result of
Slop is m_1 then we can find the y intersect b using P_1 or P_2 (in this case we use p_1)
and slop M_1, which is $y_1 = m_1 x_1 + b$. Then we take another pain of points on the line,
say P_3 & P_4, and calculate the slop $= m_2$. Hence these point's is on the some line
as P_1 & P_2 because the line certain all P_1, P_2, P_3 & P_4. So m_1 must equal to m_2.

As shown in the above example, the student reasoned that using P1 and P2 will give slope m1 and using P3 and P4 will give slope m2. Since the four points are on the same line, m1 must be equal to m2. But what the question is asking for is *why* the slope is the same and *why ANY* two distinctive points will give the same answer.

Some students conflate demonstrating with a few examples with proofing, as shown in this example:

$$m = \frac{y_2 - y_1,}{x_2 - x_1,} = \frac{y_3 - y_1,}{x_3 - x_1,}$$

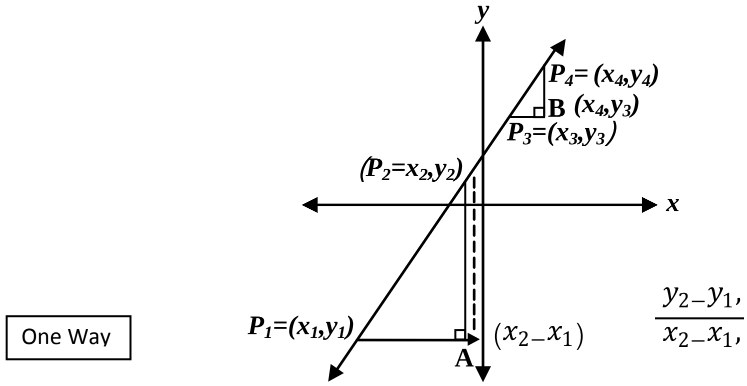
I would give students the slop formula and to test Themselves that any two points work for finding slop.

It is a good pedagogical practice to use exploration and draw tentative hypothesis based on a few examples. But it is not good to equate demonstrating with a few examples with what proof means. How do we know that all points beyond the few examples will work in the same way? This is the focus question that we expect K-12 students to be able to show through proof. Consequently we expect future mathematics teachers to be able to do the proof themselves as well.

d) When Similar Triangle Is Mentioned, How Was It Used and For What Purpose?

A few students mentioned similar triangle in their responses but were vague about why the concept of similar triangle is relevant in this context. For instance, one student mentioned that, "first I would make sure students understand the concept of similarity of triangles and then from this non-vertical line, construct a relationship of slopes and triangles, and that the idea of slopes is basically an idea that follows from similar triangles and the ratios of their hypotenuse". It was not clear what this student meant by "constructing a relationship of slopes and triangles". On the other hand, the term "slopes" suggests there are more than one slopes (of the non-vertical line). Also it is incorrect to say that, "slopes…are ratios of their hypotenuse". Examples like this call into question whether students really know why similar triangle concept is the key to understanding the independence of points when calculating the slope of a line using two distinctive points on the line. Furthermore, the responses showed inaccuracy (ratio of their hypotenuse).

A few students explained why similar triangles are relevant, but even these students relied on slope=m=rise over run, showing on the graph which line segment is rise and which is run, and then jumping directly to rise/run (line segment) is the same due to similar triangles, as demonstrated by this example.



Let A be the point s.t. $\Delta P_1 P_2 A$ is a right Triangle. (i.e. $A = x_2, y_1$)

Let B be the point s.t. $\Delta P_1 P_2 B$ is a right Triangle. (i.e. $A = x_4, y_3$)

We will show that $\Delta P_1 P_2 A \sim \Delta P_1 P_2 B$

[There were different ways to show this, using parallel lines and ASA or SAS]

Since $\Delta P_1 P_2 A \sim \Delta P_1 P_2 B$

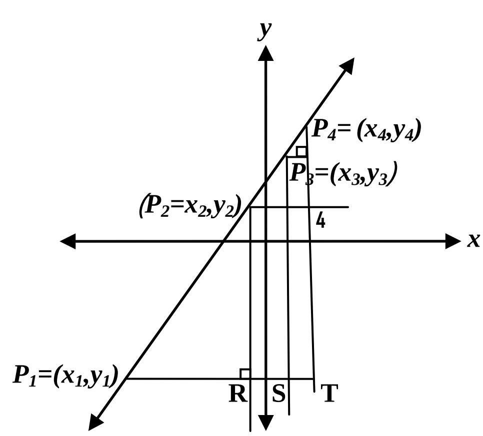
We know [take for granted that student know similarity]

We have

$$\text{Slop} = m = \frac{rise}{run} = \underset{\text{in } \Delta P_3 P_4 B}{\frac{|P_4 - B|}{|P_3 - B|}} = \underset{\text{in } \Delta P_1 P_2 A}{\frac{|P_2 - A|}{|P_1 - A|}}$$

There were some inaccuracy here because similar triangles only tell us $|P_4B|/|P_2A|=|P_3B|/|P_1A|$. There were interim steps that are needed in order to go from $|P_4B|/|P_2A|=|P_3B|/|P_1A|$ to $|P_4B|/|P_3B|=|P_2A|/|P_1A|$ (which happens to be the slope or 'rise/run" as the student wrote). It seems the student knew what the final answer would be but did not show the process of how one could get to the final answer.

In addition to inaccurately articulating the ratios of which pairs of lines were equivalent to each other, other inaccuracies included locating the position of a point incorrectly in the Cartesian plane using the two coordinates (i.e., x-coordinate and y-coordinate) or calculating the length of a segment of a line using the coordinates. In the following example, parallel and perpendicular lines from the points given (i.e., P_1, P_2, P_3, and P_4) were drawn to form two right triangles; however, the points at which the lines intersect were wrongly defined.



In the above graph, the position of points V and R defined by x and y coordinates should be $V(X_4, Y_3)$ and $R(X_2, Y_1)$ respectively, and not $V(X_3, Y_4)$ and $R(X_1, Y_2)$ as the student stated. And the length of the line segment $|P_1R|$ should be $|X_1|-|X_2|$ and not $X_2- X_1$ straight out according to this student (a few others did the same). It seems students who did this were trying to get at the slope formula ($m= Y_2- Y_1/ X_2- X_1$). But the reasoning for why $|X_1|-|X_2|$ is equivalent to $X_2- X_1$ is missing. This calls into question whether students really understood the connection between linear equation and its graph and other mathematical concepts such as absolute values.

e) How Did Those Scored 3's Compare to Those Scored 1's or 2's?

Though none of the students in the study sample scored 4's and only about half a dozen students scored 3's, there is distinctive variation in the quality of their understanding. Specifically, those who scored 3's all referenced similar triangles where none of the 1's and 2's did. Furthermore, all but one of these study participants (i.e., those scoring 3's) showed the reasoning process of why similar triangle is important in understanding the independence of points used to calculate slope. In contrast, those scoring 1's and 2's mostly invoked the formula of slope calculation and engaged in circular reasoning. In general, attempts to emphasize the key mathematical idea, its rationale, the logical progression of mathematical concepts, and the connectedness among different mathematical concepts, procedures, and ideas are fairly consistent among the highest scoring respondents (i.e., those scored 3's) but notably absent among the lowest scoring respondents (those scored 1's). In addition, attention to scaffolding ideas in a systematic and coherent way is present in some responses that scored 3's but missing in responses that scored 1's or 2's. Interestingly, participants who scored 3's were the ones that had taken the math course sequence that deals with mathematical tops at secondary level.

[Note: Even among those who scored 3's, there was a lack of inaccuracy here and there. For instance, miss-identification of which ratios of pairs of legs were equivalent to each other in similar right triangles is common. In addition, all of them defined slope formulaically.]

f) What Do We Observe Comparing Students' Responses to the Level-4 Response?

Several key differences emerged when we compare these STEM majors' responses to the level-4 one. First, all respondents defined slope formulaically as rise over run using two points on the line (or symbolically as y2-y1/x2-x1). Defining slope in this way in our view creates several conceptual difficulties for learners. To begin with, how do we know any two points will work? Secondly, what does it really mean slope is change in y with unit change in x (where in the formula did unit come into play)? Thirdly, what is the connection between the algebraic expression of slope and its graphical/geometric representation? In contrast, the level-4 response defines the slope by directly using the graph of the linear equation and shows on the graph what it means slope is the rise of y over 1-unit x *and* that this definition of slope is independent of the point one chooses. Once the definition of slope is complete, the response builds on the definition and scaffolds students through a purposeful and coherent process to derive the key ideas that slope of a line *can be calculated using any two distinct points, for example P and S, on the line and that we can calculate the slope of a line by dividing the length of the vertical line segment by the length of the horizontal line segment of* ΔPST (see Figure 1). This purposefulness brings mathematical closure to students.

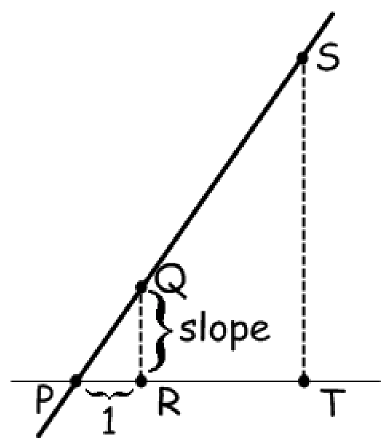


Figure 1 : Calculating Slope of a Line

Second, a majority of respondents took what needs to be proven as given and engaged in circular reasoning. In other words, instead of proving that the slope of a line can be calculated using any two distinctive points on the line, they started with the premise that the slope is constant and therefore the formula definition of slope using the two pairs of points shown on the graph is the same. A few considered using a good pedagogical practice of exploration (i.e., try a few points and observe); however, they conflated demonstration through a few examples with mathematical proof. In other words, there are infinite numbers of points on a line, how do we know beyond the sampled points, the rest will work the same way as the sampled ones?

Finally, we observed inaccuracies in terms of articulating the ratios of which pairs of lines were equivalent to each other in similar triangles, locating the position of a point correctly in the Cartesian plane using the two coordinates (i.e., x-coordinate and y-coordinate), or calculating the length of a segment of the horizontal (or vertical) line using the coordinates. These inaccuracies left us wonder if the difficulties were caused by not having the opportunity to learn the connection between linear equation and its graph or by a lack of understanding of what the meaning of a line is (i.e., definition of a line).

These weaknesses in responses showed holes in these STEM majors' conceptual understanding of slope and of the connection between linear equation and its graph. These students were STEM majors at one of the research universities. They represent the strongest pool of candidates for future mathematics teachers. Even these students struggled with proving that the slope of a line can be calculated by using *any* two distinctive points on the line. It is important to emphasize that our intention is not to criticize their lack of conceptual understanding of slope. Rather our results signal how important it is to lay a strong foundation of mathematics topics at K-12 level, because that is where future mathematics teachers learn topics that they will teach one day (given the current mathematics education system). We will discuss this issue further in the conclusion section.

V. Summary and Discussion

The concept of slope occupies a significant part of the early algebra curriculum and has wide applications in real world problems (e.g., studying the relationship between supply/demand and price of goods in economics) and is foundational for studying more advanced mathematical topics such as functions. Despite its importance, extensive research has documented difficulties both pre-service teacher candidates and in-service teachers had encountered in terms of understanding the concept of slope. This situation is likely to be exacerbated with the implementation of CCMS, because the new standards approach the slope concept in significantly different ways. One question naturally arises is how prepared pre-service teachers are in terms of meeting the expectation of CCMS. Our study investigates this question among a group of undergraduate STEM majors who are enrolled in an experimental teacher preparation program in one of the research universities. Though our study sample is relatively small and restricted to undergraduate STEM majors who self-selected themselves into the Cal Teach courses at one research university, key insights derived from studying these participants are nonetheless significant. These undergraduates represent some of the strongest candidates for the teaching force. Studying the nature of their mathematical understanding of slope according to the CCMS is important in and of itself.

We found that the STEM majors in our study sample do not possess the deep understanding of the slope concept. Specifically, among the study participants, most of them scored 1's and only a small number of participants scored 3. This suggests that even though these STEM majors might be strong in their disciplinary knowledge, they do not necessarily have the depth of understanding of slope in order to teach at the level that is required by the new CCMS.

Furthermore, the small number of participants who scored 3's are math majors who were taking *Mathematics of the Secondary School Curriculum*, a 3-semester course sequence designed to teach grades 6-12 content to math majors interested in pursuing teaching as a career. The principles underlying this course sequence reflect and are consistent with CCMS's emphasis on reasoning and conceptual understanding. Non-math majors or math majors who were not taking *Mathematics of the Secondary School Curriculum* mostly scored 1's or 1's and 2's and none scored 3's. These results signal the importance of explicitly teaching future math teachers the content knowledge that they will be teaching to their students down the road.

In addition to these quantitative results, qualitative analysis of the characteristics of study participants' understanding of slope concept revealed holes in their conceptual understanding of slope and of the connection between linear equation and its graph. These students were STEM majors at one of the research universities. Even these students struggled with proving that the slope of a line can be calculated by using *any* two distinctive points on the line.

Taken together, these findings have important implications for the content training of future math teachers in the era of CCMS in order to increase the quality of the teaching force in terms of their content preparation. Our focus on STEM majors is significant, because they represent the strongest pool of future mathematics teachers. In both research and practice, a college major in mathematics is used to signal a candidate's content knowledge for teaching K-12 students, assuming that mathematics majors have the deep understanding of the K-12 topics to teach well at that level. This assumption is manifested to some extent in the recent efforts at recruiting undergraduate STEM majors into teaching through programs such as 100k10 in New York, UTeach in Texas, and UTeach replication sites across the country.

What has not been brought to the forefront is the fact that the content focus of typical college mathematics courses serves a different purpose from content needed for teaching at the K-12 level (Askey, 1999; Wu, 2011a). Consequently the most direct resource for mathematics teachers, whether math major or not, to learn what they are supposed to teach is the mathematics they learned as K-12 students as shown in our study of their understanding of slope. Interestingly, one of the strongest oppositions to states adopting

CCMS is the push against the federal government shoveling down a set of national standards onto local states. What these opponents failed to realize is the fact that there has been a de facto national mathematics curriculum at work, which is regarded as textbook school mathematics (TSM) (Wu, 2011c, 2011d; 2014; 2015). TSM lacks the mathematical rigor, focus, and coherence that CCMS calls for. It is therefore reasonable to assume that students who went through TSM will not be adequately prepared to teach mathematics at the level that CCMS calls for, as supported by the findings of this study.

Our study is set within a broader investigation of STEM majors' mathematical content understanding of three critical early algebra topics (Newton & Poon, 2015). The findings on students' understanding of slope mirror those from the broader study. In closing, we would like to discuss the broader implications of our studying findings for mathematics teachers' content training.

Subject matter knowledge plays a central role in teaching (Ball, Hill, & Bass, 2005; Buchmann, 1984). In both research and practice, a college major in mathematics is used to signal a candidate's content knowledge for teaching K-12 students, assuming that math majors have the deep understanding of the K-12 topics to teach well at that level. What has not been brought to the forefront is the fact that the content focus of typical college mathematics courses serves a different purpose from content needed for teaching at the K-12 level (Askey, 1999; Wu, 2011a). Though efforts at recruiting undergraduate STEM majors to improve the quality of the teaching force in mathematics are commendable, we need to provide recruits with explicit content training of mathematics topics that they are expected to teach at the K-12 level. Otherwise, STEM majors will resort to the way they were taught as K-12 students when they become teachers one day. For example, the UC Berkeley Department of Mathematics is one of the few that offer courses specifically focusing on grades 6-12 content for mathematics majors who are interested in pursuing teaching as a career. We need policies that promote college mathematics departments' involvement in the training of future mathematics teachers.

On the other hand, the fact that even mathematics majors who had gone through the course sequence in our study sample did not achieve a level-4 score signals the need for a synergistic training between content and pedagogy, and how the two (i.e., content and pedagogy) can become alive in the context of real world teaching and learning. As we emphasized earlier, our level-4 response was written to exemplify the three characteristics of content understanding and the level of standards (i.e., what level-4 could look like) is primarily based on normative and theoretical metric. We did, however, bring our own extensive teaching or research experiences of actual classroom instruction in K-12 classrooms when writing the level-4 response (e.g., how to scaffold ideas from simple to complex; from a specific example to a general case, etc. as opposed to just demonstrating our own ability to prove). In contrast, our study sample has limited exposures to real world K-12 classroom teaching and learning. The fact that programs such as UTeach emphasizes the integration of content and pedagogy on the one hand, and the integration of university learning and K-12 classroom placement on the other hand, points to a promising way to train future mathematics teachers. We need empirical studies to validate what we conceptualize as a level-4 response (e.g., do those who scored highest do better in terms of classroom practices and student learning than those who do not?) and to investigate how content, pedagogy, and actual classroom practice come together to impact students' mathematical learning (e.g., studying the relationship between the qualify of program implementation and its impact).

Our findings also have implications for using teachers' college mathematics coursework as a proxy measure of their content knowledge as many empirical studies have done. Empirical studies on the relationship between teachers' college mathematics coursework and their students' mathematical performance have yielded mixed results. One possible explanation might be that having advanced mathematical knowledge at college level does not necessarily equate having deep understanding of K-12 content, which is necessary in order to translate this deep understanding into effective classroom practices in terms of engaging K-12 students around substantive mathematics. Therefore, instead of using proxy measures such as college mathematics coursework, directly measuring teachers' understanding of K-12 content they teach may help to produce consistent results on the relationship between teacher mathematical knowledge and students' achievement.

Finally, our study findings could have potential implications for the professional development of in-service teachers in order to teach CCMS. Since most teachers did not have the opportunities to learn the content knowledge they need to teach from their college mathematics courses, they typically resort to the way they were taught as K-12 students (Adams & Krockover, 1997; Lortie, 1975). To improve the quality of teachers' content understanding according to CCMS, we need in-service professional development activities that focus explicitly on the content knowledge they are teaching and at the level of rigor that is required by CCMS.

References Références Referencias

1. Adams, P. E., & Krockover, G. H. (1997). Beginning science teacher cognition and its origins in the pre-service secondary science teacher program. *Journal of Research in Science Teaching, 34*(6), 633-653.

2. Askey, R. (1999). Knowing and teaching elementary mathematics. *American Educator*. 1-8.
3. Ball, D. L. (1990). The mathematical understanding that prospective teachers bring to teacher education. *Elementary School Journal, 90*, 449-466.
4. Ball, D. L., Hill, H. C., & Bass, H. (2005). Knowing mathematics for teaching: Who knows mathematics well enough to teach third grade, and how can we decide? *American Educator*, *29*(3), 14.
5. Ball, D. L., Hoover, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special. *Journal of Teacher Education, 59*(5), 389-407.
6. Baumert, J., Kunter, M., Blum, W., Brunner, M., Voss, T., Jordan, A., & Klusmann, U. (2010). Teachers' Mathematical Knowledge, Cognitive Activation in the Classroom, and Student Progress. *American Educational Research Journal*, *47*(1), 133-180.
7. Buchmann, M. (1984). The priority of knowledge and understanding in teaching. In J. Raths and L. Katz (Eds.), Advances in teacher education (Vol. 1, pp. 29-48). Norwood, NJ:Ablex.
8. Burger, E. B., Chard, D. J., Hall, E. J., Kennedy, P. A., Leinwand, S. J., Renfro, F. L., Waits, B. K. (2007). *Algebra 1*. Orlando: Holt, Rinehart and Winston.
9. Cochran-Smith, M. & Lytle, S. L. (1999). Relationships of knowledge and practice: Teacher learning in communities. *Review of Research in Education, 24*, 249-305.
10. Collins, W., Foster, A. G., Winters, L. J., Swart, W. L., Cuevas, G. J., Rath, J., Gordon, B. (1998). *Algebra 1: Integration Applications Connections*. New York: Glencoe/McGraw-Hill.
11. Larson, R., Boswell, L., Kanold, T. D., & Stiff, L. (2004). *Algebra 1.* Evanston, IL: McDougal Littell.
12. Larson, R., Boswell, L., Kanold, T. D., & Stiff, L. (2004). *Algebra 1: Concepts and skills*. Evanston, IL: McDougal Littell.
13. Lortie, D. (1975). *Schoolteacher: A sociological study.* Chicago: University of Chicago Press.
14. Loveless, T. (2013). The 2013 Brown Center Report on American Education: How well are American students learning? With sections on the latest international tests, tracking and ability grouping, and advanced math in 8th grade. Accessible at: http://www.brookings.edu/~/media/research/files/reports/2013/03/18-brown-center-loveless/2013-brown-center-report-web.pdf.
15. Ma, L. (1999). *Knowing and teaching elementary mathematics: Teachers' understanding of fundamental mathematics in China and the United States.* Mahwah, NJ: Lawrence Erlbaum Assoc.
16. Moore-Russon, D., Conner, A., & Rugg, K. I. (2011). can slope be negative in 2-space? Studying concept image of slope through collective definition construction. Educational Studies in Mathematics, 76(`1), 3-21.
17. Newton, X. & Poon, R. (2015). Mathematical Content Understanding for Teaching: A Study of Undergraduate STEM Majors. Creative Education, 6, 998-1031. doi: 10.4236/ce.2015.610101.
18. OECD (2014). PISA 2012 Results in Focus: What 15-year-olds know and what they can do with what they know. Accessible at: http://www.oecd.org/pisa/keyfindings/pisa-2012results-overview.pdf.
19. Postelnicu, V. (2011). *Student difficulties with linearity and linear functions and teachers' understanding of student difficulties* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses.
20. Postelnicu, V. and Greenes, C. (2012). Do teachers know what their students know? National Council of Supervisors of Mathematics Newsletter, 42 (3), 14-15.
21. Schmidt, W.H. & Houang, R. (2012). Curricular coherence and the Common Core State Standards for Mathematics. *Educational Researcher*, *41* (8), 294-308.
22. Schmidt, W. H., Houang, R. & Cogan, L. S. (2011). Preparing future math teachers. Education Forum, *Science*, *332*, 1266-1267.
23. Schmidt, W. H., McKnight, C. C., Houang, R. T., Wang, H., Wiley, D. E., Cogan, L. S., & Wolfe, R. G. (2001). Why schools matter: A cross-national comparison of curriculum and learning. San Francisco: Jossey-Bass.
24. Schoenfeld, A. H. & Kilpatrick, J. (2008). Toward a theory of proficiency in teaching mathematics. *International handbook of mathematics teacher education, 2, 1-35.*
25. Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, *15*(2), 4–14.
26. Shulman, L. S. (1999). Forward. In *Knowing and teaching elementary mathematics: Teachers' understanding of fundamental mathematics in China and the United States* (Liping Ma). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
27. Skemp, R. R. (1976/2006). Relational understanding and instrumental understanding. *Mathematics Teaching in the Middle School*, 12(2), 88–95. Originally published in *Mathematics Teaching*.
28. Stanton, M. & Moore-Russo, D. (2012). Conceptualizations of slope: A review of state standards. *School Science and Mathematics*, *112*(5), 270-277.
29. Stump, S. L. (1999). Secondary mathematics teachers' knowledge of slope. *Mathematics Education Research Journal*, *11*(2), 124-144.

30. Stump, S. L. (2001a). Developing preservice teachers' pedagogical content knowledge of slope. *Journal of Mathematical Behavior*, *20*, 207-227.
31. Stump, S. L. (2001b). High school precalculus students' understanding of slope as measure. *School Science and Mathematics*, *101*(2), 81-89.
32. Teuscher, D., & Reys, R. E. (2010). Slope, rate of change, and steepness: Do students understand these concepts? *Mathematics Teacher*, *103*(7), 519-524.
33. Walter, J. G., & Gerson, H. (2007). Teachers' personal agency: Making sense of slope through additive structures. *Educational Studies in Mathematics*, *65*(2), 205–233.
34. Wu, H. S. (2010a). The mathematics teachers should know. Talk given at Lisbon, Portugal, on January 29, 2010. Accessible at: http://math.berkeley.edu/~wu/Lisbon2010_2.pdf.
35. Wu, H. S. (2010b). Introduction to school algebra. Accessible at: http://math.berkeley.edu/~wu/Algebrasummary.pdf.
36. Wu, H. S. (2011a). The miss-education of mathematics teachers. *Notices of the American Mathematical Society*, *58*(3), 372-384.
37. Wu, H. S. (2011b). *Understanding numbers in elementary school mathematics*. Providence, Rhode Island: American Mathematical Society.
38. Wu, H. S. (2011c). Professional development and Textbook school mathematics. Accessible at: http://math.berkeley.edu/~wu/AMS COE 2011.pdf.
39. Wu, H. S. (2011d). Phoenix rising. Bringing the Common Core State Mathematics Standards to life. American Educator, 35(3), 3-13. Accessible at: http://www.aft.org/pdfs/americaneducator/fall2011/Wu.pdf.
40. Wu, H.S. (2011e). The Mathematics Early Grade Teachers Need to Know| and What It Means to Know It. Talk given at Rio de Janeiro. Accessible at: https://math.berkeley.edu/~wu/Brazil2.pdf.
41. Wu, H. S. (2014). Potential Impact of the Common Core Mathematics Standards on the American Curriculum. In Y. Li and G. Lappan (eds.) (2014) *Mathematics Curriculum in School Education: Advances in Mathematics Education* (pp. 119-142), Dordrecht: Springer.
42. Wu, H.S. (2015). Textbook School Mathematics and the preparation of mathematics teachers. Accessible at: https://math.berkeley.edu/~wu/Stony_Brook_2014.pdf.
43. Wu, H. S. (forthcoming). From Pre-Algebra to Algebra, Volumes I and II.
44. Zaslavsky, O., Sela, H., & Leron, U. (2002). Being sloppy about slope: The effect of changing the scale. *Educational Studies in Mathematics, 49*(1), 119-140.

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Factors Leading to Adoloscence Stress among School Children

By Dr. J. Jasmine
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Abstract- A study to assess the common factors leading to stress among adolescents in selected schools, Puducherry. A descriptive study was conducted and the objective of the study were to assess the level of stress among adolescent school-children, to identify common factors leading to stress among adolescents and to identify the association between demographic variables and stress. With assumption "Adolescent students will have stress" and the investigator proceeded on with the study. The study was conducted at various Government Higher Secondary Schools in and around Puducherry. Convenience sampling technique was used to obtain sample. The sample comprised of 500 adolescent students from eighth, ninth and tenth standard (boys and girls) of Government Higher Secondary Schools 'during the study period'. "The tool which was used for the study was Modified adolescent adjustment scale. The major findings of the study are many of the students were girls 69.6% (348). Majority of parents were unskilled workers 96.0% (480). 80.0% (400) student's parent income was above 2000 per month. 50.6% (253) of the student belongs rural area and 49.4% (247) were belongs to urban area. The overall stress score among adolescent school children was 58.63%. 56.0% (280) had moderate level of stress. The adolescent students had more stress score in school and teacher related than other aspects of stress i.e., 72.88% and 62.50% respectively.

Keywords: *stress, factors leading to stress, school children, adolescence.*

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"Healthy Adolescents for a Wealthy Nation"

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The Feelings of inferior to others was the first factor for stress among adolescent students in general stress i.e., 72.4 % (362) rank one. Parental irritation was the first factor i.e., 68 % (340) and parent's interference with every affair was the second factor for stress in home related stress. In school related stress, 67.2 % (336) students perceived that the school was a burden to them and they belonged to rank one category and 67 % (335) of students did not have sufficient freedom in the class room and they belong to rank two category. Regarding teacher related stress, the first factor on stress was that their teacher did not teach the subject content according to their understanding level i.e., 66.2% (331). Second factor for stress was that their teachers extract lot of other works from them at the school i.e., 61.4% (307). The first factor for stress in peer related stress was that they were not maintaining friendship with their companions. i.e., 74.4 % (372) and the second factor for stress was that they did not like their friends at all i.e., 74.2 % (371). Since, the nurses holding pivotal role in the health-care delivery system, it is needless to say that they can actively take part in alleviating stress of school children and to avoid stress related problems.

Keywords: stress, factors leading to stress, school children, adolescence.

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I. Introduction

Today's world is highly advanced by means of tremendous development in science, economics, politics, education, technology, etc., and these profoundly influence not only locally but also globally. People started living with maximum facilities, with minimum strain. So life is too mechanical and people are subjected to a high degree of stress that predisposes them to many problems.

Young adolescents have greater risk of developing stress due to various factors, because adolescent period is very crucial, since these are the formative years in life of an individual when enormous physical, physiological and psychological changes take place and are marked by changes in behavior, expectations and relationships with both parents and peers.

During the early adolescence, the tasks normally accomplished are physical maturation, membership in the peer group and heterosexual relationship. During later adolescence, the tasks include autonomy from parents, sex role identity, morality and choice of career. If these tasks are not achieved and properly resolved, role-confusion results, which may cause problems like mood changes, personality disorders and inability to take on mature roles in society.

The adolescent years are associated with numerous biological, psychological, and social changes. The family, school, peers, and other interpersonal domains can all be sources of stress (Compass, 1987). Stressful events encountered by adolescents have been shown to be related to psychological as well as physical problems (Johnson, 1986). It has been suggested that frequent minor stresses, such as daily hassles, may be better predictors of mental and physical difficulties than are major but more infrequent life events, such as the death of a loved one (Kanner, Coyne, Schafer & Lazarus, 1981; DeLongis, Coyne, Dakof, Folkman & Lazrus 1982.

II. Background of the Study

Stress may interfere with a person's abilities to meet basic needs, function on the job, or solve daily problems. Negative stress can become excessive and cumulative. It can build up over time, spanning several different events or problems and become overwhelming to the individual and reach a crisis stage. Such unresolved negative stress can adversely affect individuals both physically and emotionally. It can contribute to serious illness such as hypertension, coronary artery disease, and peptic ulcer, in addition to unpleasant feelings of powerlessness, helplessness or fear. In worst cases, unresolved negative stress can lead to dependency, depression or even suicide.

Education plays a major role in each individual life. The society also believes that it is an important status and parents want their children be the best. Mostly now-a-days parents have one or two children in their family, and joint family system is also declining while interaction between others is getting minimized. Moreover, the present educational system places emphasis on book reading and the curriculum depends upon only examination for evaluating a student. Other talents/potential/interests of the students are not given much weight age, including extracurricular activities. Government also encourages pre-K.G system of schools where oral and play activities play a major role as the parents expect more. In early stage itself the bitter experiences registered in the mind of the child create an aversion towards studies. Parents make their children to learn more by imposing their own wishes. Parental compulsion and lack of supervision influences a lot in the children, though the students are intelligent enough to get good marks, she/he finds it difficult to concentrate Adults commonly tell young people that the teenage years are the "best years of your life". Adolescence is a sensitive and important phase in an individual's life during which a multidisciplinary approach must be taken to both understanding and solving his/her problems. An estimated 25% of India's population of 138 million is aged 15-25 years. A wide range of issues and concerns face adolescents in India, including nutritional deficiencies, reproductive health problems and stress-related problems.

a) Statement of the Problem

A study to assess the stress among adolescents in selected schools, Puducherry.

b) Objectives

1. To assess the level of stress among adolescent school-children.
2. To identify common factors leading to stress among adolescents.
3. To identify the association between demo-mographic variables and stress.

c) Hypotheses

H_1: There is a significant impact of demographic variables on stress among adolescent school children.

III. Materials and Methods

A descriptive and exploratory design was selected. The independent variables used for the study and stress of adolescent students. The setting selected for this study was Government higher secondary schools of Puducherry.

The sample consists of 500 adolescent students between the age group between 13 to 17 years, studying from eighth to tenth standard at selected Government Higher Secondary School, Puducherry. Simple random and convenience sampling technique was followed to select the sample. The tool developed for the study are questionnaire for demographic data, questionnaire to assess the level of stress that is adolescent adjustment scale.

For this scale, adjustment is defined by the authors as the individual's orientation towards his parents, peers, school and himself in terms of the satisfaction he derives from his interactional relationship with significant other and himself. This scale measures the adjustment of self towards home school, peers, teachers and general matters. It is a scale developed by the Thurtone's method of equal appearing intervals using 190 judges.

This scale consists of 40 items: home (9), School (8), teacher (8), peers (8) and general (7). For each area of adjustment a separate score is obtained. The total of 5 scores gives the score of total adjustment. In each subscale the sign should be used while adding the sum at the end. High positive scores indicate high adjustment and high negative scores indicate mild or mal-adjustment. In this study, for the purpose of accuracy the scores.

IV. Results and Discussion

A descriptive study on the assessment of common factor leading to stress among adolescence .Majority of students were in the age group of below13-15 years i.e., 65.0% (325).Gender of students were girls i.e., 69.6% (348).154 (30.8%) students, 37.2% (186) students and 32.0% (160) students were belongs to eighth, ninth and tenth standard respectively. 80.0% (400) of students parents income were unskilled workers. About 80.0% (400) students parents income were > Rs.2000/month.50.6% (253) students belonged to rural area and 49.4% (247) students to urban area.

Frequency and percentage of most important factors leading to stress
N=500

Measurement Factors	Frequency (f)	(%)	Rank
GENERAL STRESS			
I feel inferior to others	362	72.4	1
I like frivolous jokes	250	50.0	2
I get angry easily	227	45.4	3
HOME RELATED STRESS			
My parents get annoyed with me easily	340	68.0	1
My parents interfere with me in every affair	336	67.2	2
My neighbors are not good people	330	66.0	3
SCHOOL-RELATED STRESS			
The School is burden for me	336	67.2	1
We don't have sufficient freedom in the class	335	67.0	2
I hesitate to speak before others in the class	329	65.8	3
TEACHER-RELATED STRESS			
My teacher does not make me understand anything properly	331	66.2	1
The teacher takes lot of work from us in the school	307	61.4	2
I get frightened in the presence of my teacher	263	52.6	3
PEER-RELATED STRESS			
I am not friendly with my companions	372	74.4	1
I don't like my friends at all	371	74.2	2
My friends in the school tease me	343	68.6	3

The Feelings of inferior to others was the first factor for stress among adolescent students in general stress i.e., 72.4 % (362) rank one. Parental irritation was the first factor i.e., 68 % (340) and parent's interference with every affair was the second factor for stress in home related stress. In school related stress, 67.2 % (336) students perceived that the school was a burden to them and they belonged to rank one category and 67 % (335) of students did not have sufficient freedom in the class room and they belong to rand two category. Regarding teacher related stress, the first factor on stress was that their teacher did not teach the subject content according to their understanding level i.e., 66.2% (331). Second factor for stress was that their teachers extract lot of other works from them at the school i.e., 61.4% (307).

The first factor for stress in peer related stress was that they were not maintaining friendship with their companions. i.e., 74.4 % (372) and the second factor for stress was that they did not like their friends at all i.e., 74.2 % (371).

V. Conclusion

From the nutshell of this study it has been proven that majority of student possess moderate level of stress. Moderate level of stress is eustress which is challenging and it is essential for school going student but when analyzed the factors for stress it shows that the student were highly sensitive to stress. If the adolescent are handled properly by the teachers and parent it paves a way to come out from stress happily.

Bibliography

1. Richard E.Behrman.Neleon: TB of pediatrics. 2nd ed. Prusin Books Pvt. Ltd.; Bangalore: p 10-14.1993.
2. Fuller J. Health Assessment: A Nursing approach. 3rd edition. LW&W;Philadelphia: p.478-480. 2000.
3. Giannotta F, Settanni M et al, J Adolesc.Results of an Italian school-based expressive writing intervention trial focused on peer problems. Dec;32(6):1377-89. Epub; 2009 Jul 31.
4. Torsheim T, Wold B, J Adolesc. School-related stress, support, and subjective health complaints among early adolescents: a multilevel approach.24(6):701-13. 2001 Dec.
5. Arun P, Chavan BS. Stress and suicidal ideas in adolescent students in Chandigarh. Indian J Med Sci; 63(7):281-7. 2009 Jul.
6. Louise Rebraca, ShivesBasu. Concepts of Psychiatry Mental Health Nuring. 7thed.Wolterskluvu India (Pvt) Ltd; New Delhi: p 549. 2009.
7. Myers D.G. Social psychology. 8th edition. India: Tata McGraw Hill;p.64. 2005.
8. Pantette D. Rollanit, Joyee J. Hamlin. Mcosloy's Review series: Pediatric Nursing. Mosby; USA, p 2.1996.
9. Judith Haber, Pamela Puie Hoskins. Comprehensive Psychiatry Nursing. 3rded. MC Craw Hill Book

Global Journal of Human-Social Science (H) Volume XV Issue VII Version I Year 2015

Company; New York: p 447, 44, 112, 920, 921, 1053. 1987.
10. K.Lalitha. Mental Health Psychiatry Nursing. I ed. VMD Book House; Bangalore: p 588.
11. Karan chung, RobutaK.Nelson. The Lippinott Review series Pediatric nursing. 2nd ed. J.B. Lipinincottcompany; Philadelphia: p 75-91. 1992.
12. KP Neeraja. Text Book of Growth &devt. For Nursing Students. I ed.Jayee Medical Publishers (Pvt) Ltd; p 201-242. 2006.
13. Laurence C.Kolb, H.KeithH.Brodie. Modern Clinical Psychiatry.X ed. with Saunders Company; Tokyo: p 74,695-696. 1982.
14. Lippincott, William and Wilkins. Health Assessment: A Nursing Approach. 3rd Ed. Fuller (J); Philadelphia: 2000.
15. Louise Rebraca Shivers. Basic Concepts of Psychiatry: Mental Health Nursing. 2nd ed. J.B. Lippincott company; New York: Pp: 499. 1990.

Website

16. 172 Journal of early adolescence/ may 2003 from
17. Family transaction and adjustment during early adolescence fromhttp://jea.sagepub.com
18. www.currentnursing.com
19. www.google.com
20. www.nursingtimes.com
21. www.nursingzone.com
22. www.pondicherry.org
23. www.puducherrycensus.om

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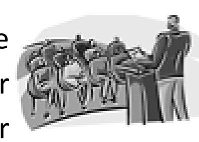

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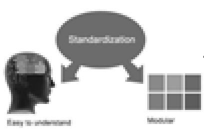

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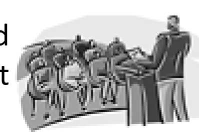

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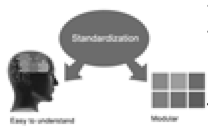

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1. General,

2. Ethical Guidelines,

3. Submission of Manuscripts,

4. Manuscript’s Category,

5. Structure and Format of Manuscript,

6. After Acceptance.

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The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

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- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

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Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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