wrong. Don't you think?

There are also the absent-minded ones. Lost deep in thought, and looking straight ahead, no left nor right, they just walk and walk until some deafening noise appears to be falling upon them from nowhere. And then, guess what? You might say, 'Shock; they deserve it! No, not that. Instead, slowly they seem to come to their senses without changing their walking pace and then suddenly snap at the driver they consider damn crazy, 'Can't you see? It is zebra crossing– our territory! But the fact is, oh, no, jaywalker-you, yourself, can't you see that zebra crossing is not for monopoly?

Lastly, there are also those who always appear to be in a hurry. They come from nowhere and bang into the zebra zone, so swiftly, unwary of the condition of the zebra environment and then you start to wonder. What has happened? Is this doomsday? Is a call being made? Is it about earthquake? Is there a warning? These jaywalkers are a pain in the neck for the driver and the cautious pedestrian alike. Imagine of the swift right decision the driver is expected to make. Imagine also of the problem the jaywalkers expose the cautious pedestrians. It is too bad to suffer the consequences of someone else's wrongdoings. Look at you jaywalkers; you are calling for some kind of punishment. And you deserve that! Don't scatter yourselves like that wherever you go. Are you a scatterbrain or what? Quite often what is believed to be difficult is caring for others not for oneself. But jaywalkers fail at both ends. What is the matter with you, jaywalker? This is a call for you all jaywalkers to get engaged in self-examination. Please, do collect your habits and take caution for the safety of all of us.

How to do Mathematics Research

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Mathematics is about pattern and structure; it is about logical analysis, deduction, and calculation within these patterns and structures. When patterns are found, often in widely different areas of science and technology, mathematics of these patterns can be used to explain and control national happenings and situations. Mathematics, in general, has a pervasive influence on our every day lives and contributes to the wealth of a country.

Research in mathematics has two purposes. One to understand the nature of mathematical thinking, teaching and learning (pure) and the other to use such understandings to improve mathematics instruction (applied). (Alan H. Schenfeld)

In the Ethiopian context, most schools (booth graduate and undergraduate) include a research project as part of the graduation requirements for their mathematics majors. And many graduates of mathematics tend to conduct research in the area. But most are at a loss to create their own research questions, leaving this task to their advisors. It would be better if students come up with their own research question that involves significant mathematical investigation and the creation of original mathematics. This is a daunting task: most students are unable to do this, and rely on their advisors to frame a suitable area for investigation. The task is further complicated by the fact that many questions relating to undergraduate mathematics have "already been solved," while many of the unsolved questions require so much specialized background to understand or so much existing research to review that the preparation needs to tackle the problem by itself is a major project.

So how can students be guided to create a question that is non-trivial but amenable to investigation? One guide to the process of creating a question is to look at what mathematical research is. The vast majority of mathematical research falls into one of five (non-exclusive) categories which, after some thought, fit nicely into the acronym **PEACE**: **P**roof, **E**xtension, **A**pplication, **C**haracterization, and **E**xistence.

Proof: of course, every mathematical research project involves proof; in this context, proof is the focus of the project. For example,"prove Fermat's last theorem." More generally, though, we note that reproof is also a valid line of mathematical research: Gauss, for example, earned his doctoral dissertation by providing a new proof of the Fundamental Theorem of Algebra. It might be argued that no rigorous proof existed before Gauss, but clearly Gauss felt that proving a theorem once was insufficient: he eventually gave four proofs of the Fundamental Theorem of Algebra and six proofs of the Law of Quadratic Reciprocity.

Extension: This takes some existing concept and extends it. For example, Newton took the expansion of (a + b) n, where n is a whole number, and extended it to the expansion of (a + b)n where n was a positive or negative relational number. The Lebesgue integral is another example of an extension.

Application: We may have an existing idea and want to apply into a new area. This is frequently the focus of projects in applied mathematics, but it also can be used to originate new area of pure mathematics: the application of algebra to problems in geometry led to Descartes's creation of analytic geometry, while the application of power series techniques to problems in number theory led to Euler's creation of analytic number theory.

Characterization: we can try to characterize or classify a mathematical object or concept. For example, Cauhy's great contribution was to characterize what was really meant by continuity, differentiability, and integrability, while Cantor characterized the naïve notions of "infinity and the Enormous Theorem is a classification of finite simple groups."

Existence: Strictly speaking, this is part of "characterization," since one quality of an object is whether or not it exists. However, existence (or non-existence) theorems tend to be treated separately: this is reasonable, since unless the object exists, there is no point investigation its mathematics! Examples of existence results are Euclid's proof of the existence of an infinite number of primes or Gödel's incompleteness theorem (a non-existence proof).

With these five lines of research as a guide, one may find it easier to generate his/her own research question.

Access and Equity …

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Conclusion

resource, what matters most is how much strides made in one direction are supplemented with conscientious efforts to ensure that our initial success is maintained so that the disadvantaged stay the course. This, among others, demands planning in the long range and relentless follow up to ensure that the goals set are met. While what is happening in terms of creating access to the disadvantaged at Ethiopian HEIs is to be commended, there still remains a lot to be done.

References

ETP 1994. Education and Training Policy.

FDRE 2003. Higher Education Proclamation No. 351/2003

FDRE 2009. Higher Education Proclamation No. 650/2009

FDRE. 2010. Growth and Transformation Plan 2010/11-2014/15. Addis Ababa: MOFED

HERQA. 2008 (June). Haromaya University Institutional Quality Audit Report Addis Ababa: HERQA.

HERQA. 2008 (October) Arba Minch University Institutional Quality Audit Report Addis Ababa HERQA.

HERQA. 2008 (October). Gondar University Institutional Quality Audit Report Addis Ababa: HERQA

Institute of Gender Studies (IGS) 2010. "Female Students in Higher Education Institutions in Ethiopian: Challenges and Coping Strategies" In Strengthening Gender Research to mprove Girls' and Women's' Education in Africa. FAWE

Kassahun Tegegne. 2006. "Factors Affecting Gender Equality in Private Higher Education of Ethiopia: The case of North Gondar "In Proceedings of the 4th National Conference on Private Higher Education in Ethiopia. Addis Ababa: St. Mary's University College

MoE. 2000-2010 Educational Statistics Abstracts. Addis Ababa: MoE

MoE. 2010. Education Sector Development Program IV. Addis Ababa: MoE.

Tesfaye Semela. 2006 "Academic, Social and Psychological Correlates of Gender Disparity in Higher Education: The case of Debub University "In Proceedings of the 4th National Conference on Private Higher Education in Ethiopia. Addis Ababa: St. Mary's University College

Give a man a fish and you feed him for a day. Teach a man to fish and you feed him for a lifetime.

Chinese Proverb