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Regional responses to Higher Education world-wide challenges

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Tuning Journal for Higher Education (TJHE), Tuning Journal in short, is an international peer-reviewed journal publishing in English original research studies and reviews in all aspects of competence-based, student-centred, and outcome-oriented education reforms at university level across the globe. It is a joint initiative of the University of Deusto (Spain) and the University of Groningen (The Netherlands) that is run by the Tuning International Academy (http://tuningacademy.org/): an international meeting point for fostering innovative teaching, learning, and research in higher education.

The main goal of the Journal is to promote quality research into the 'Tuning Methodology' for designing, implementing, and assessing context-sensitive degree programmes and to subject the tools developed during Tuning projects and other educational projects to full academic scrutiny and debate among students, teachers, policy makers, administrators, and academics across societies, cultures, professions, and academic disciplines. To this end, the Journal invites applications for thematic issues, conference proceedings or monographs from all stakeholders. Guidelines for the preparation and submission of manuscripts are appended to this Issue and available at the web of the Journal: http://www.tuningjournal.org/

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Editorial

Editorial: Regional responses to Higher Education world-wide challenges

Luigi F. Donà dalle Rose
Editor

Anna Serbati
Assistant Editor

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The world population is rich in diversity and represents a great value. Each of the several regions follows its own customs and traditions, diverse paths of development, adapts itself to quite different natural environments and builds socio-political institutions. Nevertheless, in a global world, the wind of innovation and the urge of reforms in general, and in higher education in particular, are now almost universal. The world-wide mobility of people regards – among many others – international students, both the students doing the entire degree abroad as well as – at a minor extent – the students spending abroad periods shorter than the degree legal duration. This student mobility has not only a great potential for immediate individual growth, but also a long-term effect of fostering dialogue and reciprocal enrichment between home and guest communities, in a perspective of abundant and positive multiplier effects. Finally, learning from others' experiences acts as a powerful motor for reforms.

More concretely, globalisation and the need/right for students of recognition of their studies, when earned in other countries or regions, challenge higher education institutions. These last decades brought everywhere the paradigm shift from input-centred to output-centred education, aimed at fostering in the huge and steadily increasing mass of students, at all levels, key competences which lead not only to an essential personal growth, but which can also favour the establishment of viable civil societies, where knowledge has a serving role towards progress, access to jobs and wellbeing of all citizens.

This main challenge, namely to build a truly alive "knowledge society", was inflected in several more specific ones: matching the graduates' preparation to the needs of the job market; shifting the existing content-based degree courses to competence-based programmes; granting recognition of

studies carried out abroad, identifying comparable learning outcomes for each programme or set of programmes and adopting a common and shared language (if not a common methodology); assessing the achievement of intended learning outcomes; and last but not least, the challenge of preparing higher education teachers to this epochal change in teaching. A common overarching challenge consists nowadays in identifying Quality Assurance (QA) Guidelines and assessment procedures for higher education institutions. In a global world, which calls for mass higher education and high levels of mobility, QA plays an unavoidable essential role to guarantee the monitoring, enhancing, and evaluation of systems.

In these years, some groups of dedicated people developed world-wide projects. The Tuning Academy and the huge AHELO (i.e. Assessment of Higher Education Learning Outcomes) project, launched years ago by the Organisation for Economic Co-operation and Development (OECD) and now concluded, are examples of good practices. Both initiatives brought awareness of the challenges to be faced as well as problems to be solved. Their actions often acted as incubators for new local initiatives.

In this Issue we present firstly the answers given so far by Latin America to the challenge of Quality Assurance, with an eye to the perspective involved in a possible forthcoming transition to a second generation of QA programs. We then present a "sub-regional" spinoff effect of the AHELO project, involving higher education institutions of Japan and Indonesia, willing to test, with an appropriate tool, the achieved learning outcomes of their students of mechanical engineering (master level). Finally, we present three articles from three African countries – Morocco, Ethiopia, and Tanzania – which deal with different facets of the complex challenge of the relationship between higher education and job market, here inflected in terms of job access, graduates' wages, employability and actual employment after a competence-based learning path. The last article in this Issue, focused on a specific aspect of the above landscape of answers to major challenges, investigates the relationship between algebraic competences with emotional intelligence.

The first article, proposed by Lemaitre, reviews firstly the socio-economical trends in the Latin American region and the specificity of that area, due to the strong sense of autonomy of the universities with respect to central governments and to the somewhat related lack of a national homogeneous university "system". On this basis, it gives an accurate description of the QA policies set up so far, at both country level and (sub-)regional level, reporting also the results of a study by CINDA-Centro Interuniversitario de Desarrollo, about the impact of QA practice on universities. Then, the article identifies the

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"challenges" for a new generation of QA practices in the area, which "taking into account the positive results of the first stage, is able to encourage and push institutions towards continuous improvement". Finally, the author makes suggestions, to the involved stakeholders, for policy actions aimed at setting up a "second generation of quality assurance processes".

The submission by Cross *et al*. reports about an application[1] of the AHELO feasibility study to masters' level degree programs in the field of mechanical engineering. The article reports on the development of a test for measuring learning outcomes of first semester master students in mechanical engineering. The development occurred in Japan, among engineering faculty members, and, "through the collaborative process of test item development, scoring, and sharing of results", it yielded a true staff-development experience, renovating a common understanding of engineering learning outcomes. This was one of the great fruits of the process, as underlined by the authors. The item was tested in several Japanese universities (with 348 students). Subsequently, translated into English and Indonesian, the test was tried by 37 students at the Indonesia's Institut Teknologi Bandung.

The following three articles regard the relationship "university education versus employability", job market access, and actual employment. The article by Abaida *et al*. points out that "developing countries, particularly African countries, must show commitment towards and be prepared for the knowledge economy transition. This is an important challenge facing Africans in higher education institutions and policymakers". This article, focused on graduates of a Moroccan university (University Hassan I), investigates which kind of competences lead to high, medium or low wages. The statistical analysis of the data shows that generic competences and methodological skills lead to some benefits, while specialised competences lead to a less important effect. Empirical findings also suggest that the labour market rewards less specialised competences, and unlikely methodological

[1] AHELO aimed at suggesting ways of "measuring" learning outcomes and focused on two subject areas (Economics and Engineering at Bachelor level) and on a third strand regarding Generic skills. Since its start, AHELO had strong links to Tuning, since the "*OECD secretariat contracted the Tuning Association to undertake initial development work on expected/intended learning outcomes in the two disciplines selected for the AHELO Feasibility Study*". This was "*achieved through a Tuning-AHELO project*", directly coordinated by the main Tuning experts. Japan participated in the engineering strand with its own expert (the first citation in the acknowledgements list accompanying this article). The feasibility of AHELO was then tested in 16 OECD countries as a whole, including Japan for civil engineering. There, the principal national coordinator was the third name in the present list of authors. Thus, the present article relies on quite a favourable background and on a fine group of AHELO original experts (also including the first name in the authors' list, who was an AHELO observer).

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and social competences are deemed more necessary compared to cognitive skills (theoretical knowledge). Finally, wages tend to decrease for those who are female and working in the private sector.

The article by Geressu examines an important aspect, i.e. the role of Technical and Vocational Education and Training (TVET) colleges in Ethiopia with regard to the extent at which their training approach is competence-based and to their effectiveness in preparing graduates for the labour market (employability) and in letting them enter the job market (employment). The research was based on: 1) questionnaire data collected among 461 respondents (instructors, automotive trainees, department heads, and graduates) and statistically analysed; 2) semi structured interviews and focus group discussion involving industry owners, college deans, competence-based process owners and industry trainers. The results unveil poor awareness, on the side of the TVET college system, of the job market needs, both in terms of skills as well as of number of graduates, and, consequently, poor effectiveness in the competence-based preparation of their graduates, thus causing unemployment. In positive, the study recommends to promote a (now weak) "collaborative work culture among TVET colleges and industries".

The article by Ishengoma analyses, on the basis of existing evidence, the strong gap between the graduates' skills and the job market skills (61% of graduates lack job skills according to a 2014 survey). The article suggests ways through which such a mismatch could be healed in the long-term, identifying in the Tuning methodology, as spread by Tuning Africa I & II, "part of" a potentially solid solution. The author puts his working hypothesis to full academic scrutiny and debate, through a case study at the University of Dar es Salaam (UDSM)'s School of Education. Literature review, documents, reports and data collected among teachers and graduate students of the School through a questionnaire allow a deep analysis of the USDM teaching & learning situation and – at large – of the situation regarding Tanzanian higher education. The role of Tuning methodology, as a most important driver for change/improvement, is confirmed, identifying as further challenges to be faced for a long-term solution the "poor teaching and learning conditions", the "shortage" of prepared senior teachers, the need for a "massive investment in teaching and learning resources".

The last article in the present Issue deals with algebraic competences, which are crucial in competence-based approaches and in knowledge societies. The study by Musonda investigates the relationship between the subject-specific "algebraic competences" with the "emotional intelligence" in a group of BSc first year students in Mathematics and Science Education

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at Copperbelt University in Zambia. The starting point of the study is that students performing well in mathematics at secondary school level, underperform in algebraic competences during the first university year. Among possible concurring factors, such as "learning resources, class sizes, lecturers' attitude, student's attitude, parental background" and even "cultural context", the author chooses to investigate the role of "emotional intelligence" as a possible positive factor in academic achievement, as suggested by some existing literature. The study does not find significant relationship between students' algebraic competences and their emotional intelligence in the sample of 107 involved students. Moreover, the study confirms that the emotional intelligence of female students has a much higher level than that of the male students.

As a conclusion, we like to underline the specificity and the added value, which are well illustrated by the above articles, of the regional and country level answers given to some of the main challenges facing global Higher Education nowadays. We welcome new contributions from other regions and countries on these very important challenges. We would like to share the certainty that reciprocal knowledge and fruitful comparisons, sharing and debates can yield further improvement at a global, regional, and country level.

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Articles

Quality assurance in Latin America: current situation and future challenges

Maria Jose Lemaitre*

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Abstract: Quality assurance processes have developed in Latin America since the beginning of the 1990s, trying to deal with the changes in higher education. This article is organized from two main perspectives: the first is mostly descriptive, and it focuses first on a brief outline of structural changes, that impact on the features of higher education in the region; the response from Latin America, in terms of national systems and subregional and regional arrangements; and then on the perceived effects of the implementation of quality assurance mechanisms on higher education institutions. Based on that information, the second part has a prospective approach: it identifies some of the main challenges, that have to do with the need not to do 'more of the same' but rather, to develop a second generation of quality assurance processes, and makes suggestions about possible actions for policy makers, higher education institutions and quality assurance agencies.

Keywords: higher education; quality; quality assurance; quality management; policy making.

I. The context for quality assurance in Latin America

Changes in higher education are never independent of the national characteristics and of the structural transformations of the social systems where higher education operates. It is necessary, therefore, to place higher education within the specific Latin American context.

Latin America is characterized by significant differences among countries (such as population size, where Brazil has almost seventy times more people than Panama, or per capita income, where Argentina has seven times the income of Nicaragua), but at the same time, by some

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common features. Probably one of the more visible commonalities is language. With the exception of Brazil, all countries speak Spanish, and even in that case, basic understanding is not an issue. On the dark side, Latin American countries are among the most unequal countries in the world, which can be seen in the distribution of income (most countries show a Gini coefficient over 0.40, and some, even over 0.50) and also in terms of educational results, where high income students are three times more likely to graduate from secondary education than their poorer counterparts.[1] Two other features are important from the point of view of higher education. The first refers to demographic changes, which show a clear increase of the adult population, and a decrease of the preschool and school cohorts. As a result, there is not only an increased demand for tertiary education, but it is also becoming more diversified. Secondly, social stratification in Latin America shows a strong increase of middle strata, as a result of the sustained economic growth most of the countries experienced between the mid-eighties to the end of the nineties. At the same time, many of this new arrivals to the middle class associate their mobility, and the possibility of maintaining that status, to access to education. The likelihood of overcoming the poverty threshold increases significantly with twelve years of schooling; in the case of Chile, thirteen or fourteen years of study (two more than secondary level) enable individuals to earn four times the income associated with the poverty level. Access to postsecondary education, therefore, has become a clear necessity for the middle classes.[2]

This relates to some studies that show that educational expectations have two different sources: one, more visible, is highly instrumental. As mentioned before, access to higher education is the threshold to improved occupational opportunities, and to effective social channels to mobility; the second is more symbolic, and has to do with educational goals, that is, vocational definitions and access to a different value system. This explains why, for a significant percentage of students, it is important to have the chance to 'live a university experience' even when it does not lead to a degree.[3] From this perspective, it is relevant to take into consideration the symbolic component of higher

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[1] Jose Joaquin Brunner and Daniel Miranda, *Educación Superior en Iberoamérica* (Santiago: CINDA, 2016), 111-115.

[2] Raul Atria, *Tendencias en la Educación Superior. El contexto del Aseguramiento e la calidad* (Santiago de Chile: Centro Interuniversitario de Desarrollo (CINDA) & Ril Editores, 2010), 28.

[3] Maria Jose Lemaitre and Francisco Durán, *Hacia una nueva arquitectura del sistema de educación superior: el régimen de lo público* (Santiago: Universidad San Sebastián, 2013), 35.

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education, perceived as a mechanism for social differentiation, for access to a style of living and of values identified with higher social strata and for meritocratic considerations to access better labour opportunities that will lead to social mobility. In this respect, the structure of employment shows that there is an increasing demand for 'soft' skills and competencies, as well as more specialized ones, an aspect still seldom taken into account in the design of study opportunities.

These features, so briefly outlined here, shed some light over the main trends affecting the higher education systems in Latin America. The first, clearly present in all countries, albeit with some differences mainly associated from each country's starting point, is the expansion of enrolment. Both the effect of the new demography in the region, and the need for the middle classes to strengthen their status press strongly over higher education. In fact, in some countries it is now possible not only to speak of mass higher education, but also of *universal* higher education, which is precisely what happens when higher education becomes indispensable for the middle classes.[4]

In all countries, most people from the higher income quintiles already have access to higher education. This means that the growth in enrolment tends to come from groups which have been traditionally excluded from higher education: students with lower income, different cultural capital, lower qualifications, and poorer secondary education; their interests and needs are probably also very different from those of the more traditional students.

This leads to the second trend; also clear in all Latin American countries: the diversification of higher education. Diversity is usually associated either to differences in quality. However, when higher education needs to accommodate a much wider and heterogeneous population of students, it is necessary to recognize that diversity is the only way to respond in an effective and relevant way to a wide range of demands. In Latin America it is possible to identify multiple dimensions of diversity: types of institutions, of programs offered, of modes of teaching and learning, of prestige, of institutional cultures – and, of course, also of quality. Quality is essential, but diversity requires that these differences are taken into account when defining quality or identifying quality criteria and indicators.

A third trend is that of privatization. There are different approaches in this respect, from the extreme privatization of the Chilean case, to the dominance of the public university in Uruguay. However, almost all countries

[4] QAA and British Council, *Cultures of Quality: an International Perspective* (2015).

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show a strong increase of the private sector, both in number of institutions and in enrolment.

These trends are not peculiar to Latin America. Countries in the region share them with the rest of the world, including also the other trends identified by the OECD in 2008: a diversification of sources of funding, the prioritization of quality assurance arrangements (which will be analysed further in the next section), new forms of institutional governance and the professionalization of management. But there are two features which are specific to the region.

The first has to do with the meaning of institutional autonomy, and especially, the autonomy of universities with regard to national governments. With very few exceptions, governments in LA do not have any say on the operation of higher education institutions; their role is limited to providing some guidance through incentives and specific funding schemes. Higher education policies are usually determined by the main national university or universities, which tend to cover the public sector, and to ignore the private institutions (which in some cases concentrate at least half the enrolment). This responds to a tradition deeply ingrained in the higher education culture, and prevents higher education systems to operate as such, since most the decisions depend on the specific interests of some stakeholders.

The second is probably a consequence of the first one, and refers to the absence of recognized national higher education 'areas' that cover the set of institutions operating in a given country. As an example, the public – private divide means that each sector responds to different policies or decisions; the division between universities and non-university institutions makes it almost impossible to move among different institutions, or have studies or degrees recognized; the distinction between research universities and teaching universities creates strong barriers and sets standards almost impossible to meet by many institutions. Consequently, it is almost impossible to even think of a Latin American higher education area, in spite of multiple efforts in that direction.

II. **Quality assurance processes in the region**

The trends briefly outlined in the above have contributed to an erosion of the social trust in higher education, mainly because of the diversification of providers and the increasing heterogeneity of the student population. Higher education has become for many stakeholders 'a wide and alien

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world',[5] characterized by the lack of relevant and understandable information. At the same time, they have placed higher education at the centre of social concerns, and of the public agenda in almost all Latin-American countries. Quality assurance schemes have been seen as an effective response to these concerns, and initiatives in this respect can be organized in three different categories: The establishment of national quality assurance systems; the search for sub regional arrangements; the creation of a regional network.

II.1. *National quality assurance systems*

Latin America is one of the regions in the world where quality assurance processes have been established longer, with the exception of the United States. Brazil has reviewed graduate programs for over forty years, and during the nineties, Argentina, Chile, Colombia and Mexico had already set up quality assurance mechanisms. Looking at the region, it is possible to see that "each country developed their own, by analysing what kinds of assessment or accreditation of institutions or programmes was more adequate to its needs and traditions, legal arrangements and academic practices. As a result, there is now a wide variety of national experiences, which are the basis for multiple processes of learning and exchange".[6]

This variety also refers to their level of development. Some are quite consolidated, as is the case in Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba or Mexico. Others – Paraguay, Ecuador, Panama, Peru, El Salvador – although created several years ago, have been revised and are currently having a second chance for effective operation. Other countries have developed special arrangements for specific groups of institutions but have not been able to consolidate national systems.

In general, most systems tend towards a range of quality assurance purposes, including quality control (licensing, initial authorization for institutions or programmes, the evaluation of threshold standards), together with accountability or institutional or programme accreditation, and some initiatives where the main focus is the promotion of continuing improvement. This is carried out by one national agency or by different agencies, both public and private.

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[5] *El mundo es ancho y ajeno* (The world is wide and alien) is the name of a novel by Alcides Arguedas, which depicts the cultural shock between white landowners and the indigenous population in Peru.

[6] CINDA, *Educación Superior en Iberoamérica* (Santiago: CINDA, 2007), 296.

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II.1.1. Ownership

Almost all QA processes in Latin America were initiated by governments, but they respond to a wide range of models. Some continue to be a part of the governmental structure, such as CONEAU in Argentina, some of the agencies in Colombia or in Bolivia, CEAACES in Ecuador, INEP in Brazil, or current initiatives in the Dominican Republic. Others are organized as public organizations, independent from the government, but with different degrees of autonomy (CNA and CNED in Chile, ANEAES in Paraguay), and still others belong to the main public university or universities in the country (SINAES in Costa Rica, CEUB in Bolivia). In Chile, Mexico and Argentina the national public agencies recognize private agencies, either belonging to associations of higher education institutions, to professional associations or to private groups, supervised by the national QA organization.

II.1.2. Focus

Most agencies focus either on programme or institutional accreditation. However, there are some initiatives that measure student learning: Colombia tests graduating students with an exit examination called SABER PRO, and Brazil applies ENADE (or National Test of Student Performance) twice during their period of study. Chile has a national test for graduates of medicine, as a requirement for access to specialization programmes, and for graduates of teacher training programmes. These tests have been strongly criticized, for mistrusting the institutions' capacity to reliably assess learning outcomes, for standardizing the curriculum and for reproducing the type of academic learning that should have been assessed during the formative process. At the same time, there is a clear need for professional certification, something that does not exist in Latin America, where HEI certify both academic and professional competencies.

A different focus is the assessment and recognition of accrediting agencies. Chile and Mexico evaluate and supervise the operation of private agencies, charged with programme accreditation in specific fields, and Argentina authorizes agencies for voluntary institutional assessment.

The following table shows the distribution of countries regarding the focus of their QA processes:

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Table

Distribution of Latin American countries by the focus of QA processes

Focus of QA processes	Countries
Undergraduate programmes	Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Mexico, Panama, Paraguay, Peru, Uruguay
Graduate programmes	Argentina, Brazil, Chile, Cuba, Mexico
Institutions	Argentina, Brazil, Chile, Colombia, Cuba, El Salvador, Panama
Students	Brazil, Colombia, Chile
QA agencies	Argentina, Chile, Mexico

II.2. *Sub regional arrangements*

There are two significant sub regional arrangements, both of which have tried to harmonize standards and procedures for quality assurance: that of the countries grouped under MERCOSUR – the common market of the South – and the initiatives in Central America.

II.2.1. ARCU-SUR:[7] an international agreement

In 1998, the Ministers of Education of Argentina, Brazil, Paraguay and Uruguay (the four member countries of MERCOSUR), plus Bolivia and Chile as observers, signed a Memorandum of Understanding leading to the organization of a regional accreditation mechanism. The main purposes of this initiative were to improve the quality of education in the region, contribute to the recognition of qualifications among countries and to student and professional mobility and, in general, to promote and support regional integration.

After a long period of negotiations and discussion, participating countries agreed on a set of shared quality standards for Medicine, Engineering and Agronomy, and common procedures to be applied by the national accrediting agencies. The arrangement was tested in the six countries, and officially approved by the Ministers of Education in 2008.

[7] "Sistema ARCU-SUR - Mercosur. s.f.," ARCU-SUL, last visited August 2017, http://edu.mercosur.int/arcusur/index.php/es/descripcion/127-sistema-arcu-sur-es.

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ARCU-SUR focuses on nationally recognized undergraduate programmes in selected areas,[8] and its processes are aligned with national legislation. It offers public assurance about the academic and scientific level of programmes, determined through their alignment with ARCUSUR core learning outcomes and quality criteria. Participating countries[9] have agreed to recognize degrees granted by accredited programmes, albeit only for academic purposes.

The end result has not been too encouraging in terms of mobility or recognition of qualifications. Intraregional mobility is not a priority for Latin American countries (only Argentina and Chile are significant destinations for Latin American students), and this agreement – signed by the Ministers of Education – carried little weight with universities which operate with almost total autonomy from their respective governments. However, the process had a strong impact on the strengthening of national agencies, and the development of harmonized standards in the region - a not negligible effect.

II.2.2. Central America

The Council for Higher Education in Central America (CSUCA), which groups the public universities in the region, started working on the development of a region wide assessment process for higher education with the support of German cooperation agencies in 1995. This process developed basic standards for university programmes, trained hundreds of academic staff and external reviewers and is currently operating mostly for the public universities in the region. Its main contribution has been the introduction of a continuing concern for quality and its regular assessment, and has been the basis for many further developments in the area of quality assurance.

Following this experience, in 2003 the Central American Council for Accreditation (CCA) was established, with the dual role of assessing quality assurance agencies in the region, and of promoting quality assurance initiatives. It brings together governments, public and private higher education institutions and professional associations, and has had a strong role in the development of assessment practices and capacity building.

In addition, specialized agencies with a regional focus have been established: ACAAI, for Engineering and Architecture; ACESAR for food

[8] ARCU- Sur added Veterinary Medicine, Dentistry, Nursing and Architecture to the three initial programmes.

[9] In addition to the original six countries, Venezuela, Peru, Ecuador and Colombia were also included in ARCU-Sur.

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and agricultural programmes; ACAP, for graduate programmes, and ACAFEM, which is in the process of developing standards for Medical Studies.

II.3. *The establishment of a regional network*

In 2003, national quality assurance agencies, representatives from governments involved in higher education and several university associations decided to set up a regional network dedicated to the promotion of quality assurance. This involved eighteen Latin American countries plus Spain, and evolved into the Iberoamerican Network for Quality Assurance in Higher Education (RIACES).

Its main purposes were the following:

- To promote the development of quality assurance agencies and of assessment and accreditation processes in member countries
- To support the development of accreditation mechanisms leading to the recognition of degrees, student, academic staff and professional mobility and to the educational integration of the region
- To involve national and international cooperation organizations in the promotion of quality assurance systems
- To analyse the development of higher education in order to make quality assurance an effective tool for the continuing improvement of higher education institutions

After almost a decade of operation, RIACES has made it possible to develop a regional community for quality assurance, and has contributed to capacity building at different levels: existing and emerging agencies, academic staff within higher education institutions, reviewers and policy makers. It has supported the establishment of new quality assurance mechanisms in several countries, and has worked with national agencies towards the harmonization of standards and procedures for the assessment of undergraduate and graduate programmes.

It also has established strong links with INQAAHE, the global quality assurance network; this association makes it possible to approach quality assurance from a double perspective: that of national and regional priorities and concerns, within a shared cultural context, and the global one, which helps put national and regional work in a much wider context and to work together with other regions of the world in matters of common interest.

III. **Impact of QA on universities – results from a study**

CINDA[10] conducted, with the support of the European Union, a study to learn about the perceived effect of quality assurance on higher education institutions.[11] It was conducted in countries with at least five years of experience in the operation of QA processes.[12] The study selected between six and eight universities in each country, and gathered information from policy makers and institutional stakeholders (academic vicerrectors, directors of planning, heads of department, academic staff, students and graduates), as well as representatives from professional associations. A mixture of surveys, focus groups and interviews were used, and data were analysed both at the country level and across countries, with a focus on institutional management and teaching and learning. Some information was also gathered regarding the role of quality assurance at the system level. The main results are summarized in the following section.[13]

III.1. *Higher education systems*

The importance of QA as an effective regulatory mechanism was recognized in all participating countries, although, in a context where governments have a relatively weak regulatory capacity regarding higher education, this operates through the provision of incentives. Institutions report that, although QA can mean a threat to their autonomy, in general these processes have been accepted and universities have adapted their organization better to address them. It was interesting to learn that most respondents valued the definition of quality criteria, thus making explicit the expectations about quality.

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[10] CINDA (Center for Interuniversity Development) is a network of prestigious universities in Latin America, Spain and Portugal, established in 1971, which focuses on the contribution of higher education to national and regional development. See www.cinda.cl for further information.

[11] Daniela Torre and Gonzalo Zapata, "Impacto de procesos de aseguramiento de la calidad sobre las instituciones de educación superior: un estudio en siete países", in *Aseguramiento de la Calidad en Iberoamérica*, ed. Maria Jose Lemaitre and Elisa Zenteno (Santiago: CINDA, 2012), 115-152.

[12] Argentina, Chile, Colombia, Costa Rica and Mexico. In addition, the study included two European countries: Spain and Portugal.

[13] Details of the study, as well as national reports can be found (in Spanish) in Lemaitre and Zenteno, *Aseguramiento de la Calidad en Iberoamérica* (2012).

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Maybe the most consistent result was the development or improvement of national information systems, with a strong emphasis on the role of the government: HEI expect the government to vouch for the reliability and validity of the information, and to regulate the information addressed to students and the general public, in order to control its use for marketing purposes.

III.2. *Institutional management*

Institutional leaders emphasized that the need to adapt to quality assurance processes has led higher education institutions to make important changes in their organizational structure. These changes are mostly aligned with an effort to institutionalize the design, control and planning of quality assurance processes, and have resulted in many cases in an increased centralization of decision making processes, which tend to be in the hands of professional managers. Academic staff saw in this an increasing risk of bureaucratization and the emergence of a managerial approach which would reduce the weight of academic considerations in university management.

At the same time, most respondents linked quality assurance processes with an increased recognition of teaching as a key function in universities; in many cases, this has begun to be translated into the development of new evaluation and promotion mechanisms for academic staff, although it is also clear that this is still in its very initial stages.

Respondents at different decision making levels reported that there is a clear improvement of information systems within universities, and that it is increasingly used as the underlying justification for most decisions. In many cases, the assumption was that more information would necessarily translate into better management, but this seems only to be true if there is a clear understanding of the type of information that is truly relevant for decision makers at the different institutional levels. In fact, academic staff complained that gathering and providing the required data was a very heavy load that fell mostly to them, and that, with few exceptions, the processed information did not find their way back for them to improve their work. This suggests that there is a need to identify what information is really needed to improve decision making processes, and the kind of processing and analysis that is necessary for it to be useful to different levels of decision makers.

Finally, most respondents mentioned that quality assurance had triggered changes in the criteria and practices for hiring academic staff; while these were an improvement over previous practices, they mostly focused on formal

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aspects (such as the level of qualifications, in response to the use of quantitative indicators) rather than on more substantive elements, better linked to the actual quality of teaching or research.

III.3. *Teaching and learning*

Academic staff reported significant changes in the formulation of expected learning outcomes, curricular design and updating of study plans as a result of participation in quality assurance processes. The increased availability of information on student progress and follow up of graduates – directly related to the demand for effectiveness in quality assurance standards and procedures – has contributed to a stronger concern about the relevance of programmes and the need to improve teaching strategies, methodologies and practices.

Internal stakeholders, particularly those directly involved in the teaching process – heads of department, lecturers, students – greatly valued the focus that quality assurance processes place on teaching and learning, but considered that they tend to focus mostly on formal aspects and indicators, without paying attention to more substantive issues, or to have a strongly prescriptive focus, emphasizing certain practices that may not be adequate in specific contexts.

With regard to teaching strategies and practices, academic staff saw a direct influence from quality assurance in basic changes, such as improved reading lists and materials, or updated and better teaching resources. At the same time, they report that the need to review teaching and learning within the context of programme accreditation has contributed to the introduction of innovative practices, such as the use of ICT, competency based teaching, and new assessment methods (even though they recognize that changes in the assessment of learning are still more of an expected outcome than actual practice).

IV. **The main challenges for quality assurance**

Maybe one of the main current challenges derives from the success in the implementation of quality assurance processes. These achieved a high degree of legitimacy and made significant progress in the development of a 'culture of quality', that is, in the increasing capacity of institutions to systematically analyse their processes.

But most quality assurance agencies continue carrying out review processes that focus on the same unit or units of analysis, with the same

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criteria, and little consideration of the institution's progress. As a result, both quality assurance agencies and higher education institutions have developed a more formal and bureaucratic approach to self-assessment and external review, which in turn makes them relatively irrelevant exercises from the point of view of institutional improvement.

A second challenge emerges from the social importance linked to accreditation: both governmental policies and the market have come to place a significant value on the accredited status of an institution or programme; therefore, accreditation has become the goal rather than the means to help institutions or programmes to improve.

It has become necessary, therefore, to explore how to move on to a second generation of quality assurance which, taking into account the positive results of the first stage, is able to encourage and push institutions towards continuing improvement.

One way of doing this is through a shift from the usual quality assurance approach based on a set of undifferentiated standards and criteria towards a focus on the systematic review of institutional priorities and purposes.

This would require re-defining quality as the combination of two main factors: internal consistency, and external consistency.

Internal consistency means the capacity of an institution or programme to identify and to analyse its significant environment based on its stated mission, or in other words, on its principles and priorities, in order to select the demands, it is able to take into consideration.

External consistency refers to the capacity of an institution to understand and take into account the needs and demands that emerge from decisions such as the balance of institutional functions, the areas of knowledge to be covered, the disciplinary or professional requirements linked to the programmes it offers, the type of students it will enrol, the needs and demands of the labour market.

Quality, in this approach, is measured on the basis of the capacity of an institution to adjust its resources, processes, products and outcomes to the requirements coming from the selected needs and demands. The main components of quality, in this approach, would be a combination of institutional identity and its effective and relevant operation.

To evaluate the degree in which institutional staff, processes and resources are effectively aligned both to institutional priorities and the needs and demands of their constituents would encourage institutions not just to meet external stipulations, but to plan for an improved response capacity.

This approach is normally associated with academic audit mechanisms, but it can also be effectively used in accreditation processes, where criteria and procedures focus on the institution's responsibility for its continuing

improvement, and where institutional or programmatic diversity play a significant role in the way in which quality is defined and reviewed.

If quality assurance processes focus on strengthening the institutional capacity for the management of quality – including the installation of effective tools, such as a function of institutional research – they could actively contribute to make institutions responsible for the quality of their actions and results, thus reducing the supervisory approach most quality assurance processes now have.

A third challenge, also linked to the success of quality assurance processes, is the trend – present in many countries – to use these processes essentially as regulatory mechanisms. In a context where one of the features of higher education is its independence from governmental action, the discovery that quality assurance processes are an effective way to steer higher education institutions have turned them into particularly attractive mechanisms for control and regulation. The importance of having in place quality control tools – such as licensing requirements or threshold standards – should not interfere with the need to have in place schemes for accountability or the support of institutional improvement.

Then there is the challenge posed by diversity. As mentioned above, one of the features of the region is its diversity – among and within countries and also among and within higher education systems and institutions. However, most quality assurance schemes use the same criteria for universities and non-university institutions, for public and private providers, for institutions large and small, for those focusing on research and those that are essentially teaching institutions. In a context of growing enrollment, and where the student population is increasingly heterogeneous, it has become necessary to find ways of defining criteria and indicators that are appropriate to the needs of diversity, in the terms already defined by Martin Trow in 1995:

> … the existence of distinct forms of post-secondary education, of institutions and groups of institutions within a state or nation that have different and distinctive missions, educate and train for different lives and careers, have different styles of instruction, are organized and funded differently and operate under different laws and relationships to government.[14]

This poses a challenge that goes beyond quality assurance, that is, the need to re-invent higher education. This means wondering whether in this context, is the university the best way to develop and transfer certain types of knowledge?

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[14] Martin Trow, "Diversity in higher education in the United States of America" (paper presented at the CVCP Seminar on Diversity in Higher Education. London, 14-15 September, 1995).

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If universities are the most prestigious and attractive institutions and students pay more attention to the type of institution they enroll in than to the degree or the achieved competencies, is it necessary to protect universities from diversification? Or rather, is it preferable to leave aside the traditional concept of university, and accept that its role is currently defined more in terms of social and economic returns? Probably the best answer is that both views are right, but the way in which this question is answered is key for the definition of quality, and by extension, for quality assurance. The problem is that there are questions that nobody is ready to consider, because they may lead to a new paradigm, which is hard to accept. Today, higher education institutions and quality assurance agencies operate in an ambiguous context, where new and diverse institutions uphold the new role for higher education, but at the same time, try to imitate their traditional colleagues. In spite of the rhetoric that insists on the need to focus quality assurance processes on institutional mission and purposes, there is still a strong influence of traditional models through the use of quantitative indicators or regulatory requirements.

Finally, there is a challenge that is linked to the professionalization of quality assurance processes. A set of scoping studies on quality assurance, commissioned by UNESCO in different regions of the world, concluded that ironically, while external quality assurance agencies actively work to generate quality assurance capacities in higher education institutions, they almost completely ignore the need to improve their own capacity to focus on quality and its improvement.[15] The study coordinated by CINDA on the impact of quality assurance on higher education institutions also came to similar conclusions. While many of the complaints focus on peer reviewers (possibly, because they are the visible face of the agency), these usually refer to flaws in the agencies' norms and procedures. Quality assurance has become a recognized professional field, with clearly established practices and agencies should take into consideration the training of their technical and policy making staff as one of their priority actions.

V. **Possible initiatives for the improvement of quality assurance in the region**

Based on the experience of these twenty something years of experience, it is possible to suggest specific actions for the main stakeholders in the

[15] UNESCO, *Summary report of the E-Forum on quality assurance in higher education* (Paris: UNESCO, 2015).

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higher education system which would make it easier to update quality assurance practices and to emphasize their role to enhance the quality of higher education offerings.

V.1. *Policy makers*

Quality assurance is clearly a policy instrument, and as such, it should develop within a framework of national purposes and priorities, aligned with other policy mechanisms. Some of them are listed below:

- The recognition and appreciation of the diversity of higher education institutions, programmes, teaching modes, and other related aspects in policies on access, funding, regulation and public information.
- The design, development and maintenance of valid and reliable information systems that clearly state the type of information that must be provided by higher education institutions. Information systems should increase the transparency of higher education offerings and take into account the needs of different users, including potential students, their families, employers and the general public.
- Quality assurance is a significant component of public policy. As such, it is frequently required to respond to a variety of purposes only loosely associated with quality; it is necessary to understand its limitations, and link quality assurance with other policy instruments in a consistent and effective manner.

V.2. *Higher education institutions*

The main quality assurance networks have insisted that quality is essentially the main responsibility of higher education institutions themselves, and this should be taken into account when designing standards and procedures for external quality assurance. Therefore, institutions, their leaders, academic and administrative staff and students also have a role to play in order to enhance quality and to contribute to the effectiveness of quality assurance. The main priorities are:

- Promoting the institutional capacity for the management of quality: the definition and use of information systems to support decision making; setting up an institutional research function, able to gather, process and

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analyse relevant information for the different levels of the institution; links between quality assurance processes and institutional planning; assessment of the effectiveness of actions resulting from institutional planning.

- Professionalizing institutional management, in order to establish an effective and efficient management system, while avoiding the risk of managerialism, or ignoring academic priorities.
- Recognizing quality as the responsibility of all institutional stakeholders; this requires their involvement in the quality improvement processes, a systematic evaluation of their work and the recognition of their contribution in the different instances of academic or professional development.

V.3. *Quality assurance agencies*

Agencies and other quality assurance organizations are responsible for the administration of assessment and accreditation processes. Evidence shows that higher education institutions are quite responsive to the criteria and procedures applied by the agencies. This means that quality assurance processes can either promote a culture of quality and self-assessment, or a culture of compliance, where the focus is on meeting prescriptive requirements; agencies can encourage institutions to develop their own assessment and improvement processes, or they can promote the formal compliance with demands not necessarily associated to the improvement of quality.

- It is therefore important to have in place mechanisms for the cyclic review of standards and procedures with the participation of representatives from higher education institutions and other relevant stakeholders. This would allow for a substantive discussion of quality criteria; it would also help to avoid the excessive formalization and bureaucratization of evaluation processes. Participation in the design and revision of norms, criteria and procedures generates ownership and increases their acceptance and legitimacy, as well as correcting unanticipated effects.
- As has been mentioned before, a key element in this revision is the consideration of the diversity of institutions, programmes, teaching modes, student needs and requirements. Many quality assurance systems use indicators that respond to a traditional university model,

which is not necessarily aligned with the purposes and characteristics of the institutions they accredit. To recognize the validity of institutions that *educate and train for different lives and careers* should be a central feature of effective quality assurance mechanisms.

- One of the significant contributions of quality assurance has been to highlight the central role of the teaching function in higher education. It is interesting to note that while everybody recognizes the importance of students in higher education, teaching has a definitely lower status than research, even in institutions whose main task is providing professional degrees. At the same time, quality assurance has failed to emphasize the more substantive aspects of teaching and learning, as it tends to focus on its formal and procedural aspects.
- Finally, it is necessary to emphasize the increased professionalization of quality assurance, and the need to apply the standards or guidelines of good practice that quality assurance networks have systematized. This requires discussing and analysing these guidelines, organize regular training processes and using them as the basis for self-assessment and external review of the agency. Examples of these materials can be found in the European Standards and Guidelines or ESG[16] and the Guidelines of Good Practice, GGP.[17]

VI. **Final comments**

Progress towards useful and relevant quality assurance processes requires constant review and monitoring of the characteristics of the social and educational systems where these processes operate. Quality assurance should not be an end in itself (although it is becoming this in many countries), but rather a means for the continuing improvement of higher education. Therefore, it must take into consideration the higher education environment, its changes, its emerging features, and, last but not least, the impact quality assurance can have over higher education institutions.

As most guidelines and standards of good practice never tire of repeating, quality is the main responsibility of higher education institutions themselves.

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[16] ENQA, *"Standards and guidelines for quality assurance in the european higher education area,"* 2015, http://www.enqa.eu/index.php/home/esg/.

[17] INQAAHE, "*Guidelines of Good Practice for Quality Assurance,"* http://www.inqaahe.org/admin/files/assets/subsites/1/documenten/1231430767_inqaahe---guidelines-of-good-practice[1].pdf, 2006.

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Quality assurance processes make expectations clear, define deadlines, make urgent what is important, but their main function should be to get higher education institutions to take the quality challenge seriously in their governance and management practices.

Finally, it is obvious that higher education is an essentially dynamic social system. It cannot improve as a result of quality assurance processes that are unable to learn about new ways to perform, and what is even more difficult, to un-learn.

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Development of a Mechanical Engineering Test Item Bank to promote learning outcomes-based education in Japanese and Indonesian higher education institutions

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Abstract: Following on the 2008-2012 OECD Assessment of Higher Education Learning Outcomes (AHELO) feasibility study of civil engineering, in Japan a mechanical engineering learning outcomes assessment working group was established within the National Institute of Education Research (NIER), which became the Tuning National Center for Japan. The purpose of the project is to develop among engineering faculty members, common understandings of engineering learning outcomes, through the collaborative process of test item development, scoring, and sharing of results. By substantiating abstract level learning outcomes into concrete level learning outcomes that are attainable and assessable, and through measuring and comparing the students' achievement of learning outcomes, it is anticipated that faculty members will be able to draw practical implications for educational improvement at the program and course levels. The development of a mechanical engineering test item bank began with test

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item development workshops, which led to a series of trial tests, and then to a large scale test implementation in 2016 of 348 first semester master's students in 9 institutions in Japan, using both multiple choice questions designed to measure the mastery of basic and engineering sciences, and a constructive response task designed to measure "how well students can think like an engineer." The same set of test items were translated from Japanese into to English and Indonesian, and used to measure achievement of learning outcomes at Indonesia's Institut Teknologi Bandung (ITB) on 37 rising fourth year undergraduate students. This paper highlights how learning outcomes assessment can effectively facilitate learning outcomes-based education, by documenting the experience of Japanese and Indonesian mechanical engineering faculty members engaged in the NIER Test Item Bank project.

Keywords: Learning Outcomes; Quality Assurance; Educational Improvement; Mechanical Engineering; Japan; Indonesia; Test Item Bank.

I. **Introduction**

The assessment of higher education learning outcomes is an issue of increasing importance to universities, as they strive to respond to contemporary social demands on higher education to educate knowledgeable and creative problem solvers who are actively engaged in society. As we become increasingly aware of the complexity of problems that we face every day as the result of technological developments and globalization, we cannot but become increasingly concerned about how well we are preparing our future generations for an increasingly complex world.

Such heightened social expectation has propelled the expansion of higher education, leading to steep increases in public and private expenditure on higher education. As a result, universities can no longer exist as elite institutions, where the value of higher education is unchallenged, but must demonstrate their effectiveness not only in terms of their contribution to the academia, but also in terms of what their graduates know, understand, and can do upon graduation for the sake of society.

The focus on higher education learning outcomes have led to the development of learning outcomes frameworks that describe the knowledge and skills graduates are expected to acquire as the result of their enrollment in a given educational program. Examples of learning outcomes frameworks for disciplinary areas include the UK Subject Benchmark Statements,[1] the

[1] Quality Assurance Agency (QAA), "The UK Quality Code for Higher Education Subject Benchmark Statements," http://www.qaa.ac.uk/assuring-standards-and-quality/the-quality-code/subject-benchmark-statements.

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Tuning Reference Points for the Design and Delivery of Degree Programs,[2] the USA Social Science Council Measuring College Learning Project's Essential Competencies,[3] and the Science Council of Japan's Benchmark Statements for Curriculum Design for Subject-Specific Quality Assurance in University Education *(Bunyabetsu-Sanshokijun),*[4] etc. Examples of learning outcomes frameworks for generic learning outcomes that describe the knowledge and skills graduates are expected to acquire regardless of their major include the Association of American Colleges and Universities' LEAP Essential Learning Outcomes,[5] the Lumina Foundation's Degree Qualifications Profile,[6] the Japanese Ministry of Education's Graduate Attributes (*Gakushiryoku*),[7] etc.

Exposure to these learning outcomes frameworks has led to a general understanding and familiarity among faculty members to the concept of learning outcomes-based education. However, based on a survey and in-depth interviews at universities in the EU and USA, Birtwistle et al.[8] have pointed out that "the discourse about the shift of paradigm is taking place to various degrees, amongst management and to a lesser extent with academic staff, but much less amongst students" and that there is a disturbing "disconnect between the rhetoric, political ambitions and reality."

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[2] Tuning Educational Structures in Europe, "Subject Areas," http://www.unideusto.org/tuningeu/subject-areas.html.

[3] Richard Arum, Josipa Roksa, and Amanda Cook, *Improving Quality in American Higher Education: Learning Outcomes and Assessments for the 21st Century* (San Francisco, CA: Jossey-Bass, 2016).

[4] Science Council of Japan, "Benchmark Statements for Curriculum Design for Subject-Specific Quality Assurance in University Education," (Tokyo: Science Council of Japan, 2012); original title in Japanese「大学教育の分野別質保証のための教育課程編成上の参照基準につい」(pronounced as "Daigaku-kyoiku-no-bunyabetsu-shituhosho-no-tame-no-kyoiku-katei-henseijono-sanshokijun-ni-tsuite"), http://www.scj.go.jp/ja/member/iinkai/daigakuhosyo/daigakuhosyo.html.

[5] Association of American Colleges and Universities, "LEAP Essential Learning Outcomes," https://www.aacu.org/leap/essential-learning-outcomes (accessed 5 September, 2017).

[6] Lumina Foundation, "Degree Qualifications Profile," (Indianapolis, IN: Lumina Foundation, 2014) https://www.luminafoundation.org/files/resources/dqp.pdf.

[7] Ministry of Education, Culture, Sports, Science and Technology (MEXT) Central Council for Education, "Towards the Construction of Bachelor Degree Programs," (Tokyo: MEXT, 2008), original title in Japanese「学士課程教育の構築に向けて（答申）」(pronounced as follows: "Gakushikatei-kyoiku-no-kochiku-ni-mukete (Toshin)"), http://www.mext.go.jp/b_menu/shingi/chukyo/chukyo0/toushin/1217067.htm.

[8] Tim Birtwistle, Courtney Brown, and Robert Wagenaar, "A long way to go…A study on the implementation of the learning-outcomes based approach in the EU and USA," *Tuning Journal for Higher Education* 3, no. 2 (2016): 429-463, doi: 10.18543/tjhe-3(2)-2016pp429-463.

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Japan is not an exception. According to a survey conducted by the National Institution for Academic Degrees and University Evaluation,[9] very few universities and academic societies responded that their members/faculty were referencing the above mentioned Benchmark Statements proposed by the Science Council of Japan. Hirota[10] attributes this systemic obstinacy to three factors. There is a general tendency among academics to reject quality assurance initiatives firstly because they devalue indicators of quality introduced by external actors as partial, spurious, and irrelevant for measuring academic quality. Secondly, academics reject quality assurance initiatives because they see it as "a threat to academic freedom and autonomy." They see it as mechanism for strengthening the power of the government and institutional managerial teams, which invade faculty rights to determine what to teach and how to assess student learning. Thirdly, academics currently lack the expertise to collaborate effectively in systemic educational reform. Due to the over-fragmentation of the academic disciplines, faculty members do not necessarily have holistic understandings of their disciplines or their unique roles within the disciplines and in relation to other disciplines. Faculty members are also in general unfamiliar with educational theories and methods. This present condition of the academia has inhibited constructive discussion among faculty about learning outcomes and the pedagogical approaches applicable to learning outcomes-based education.

While such observations are to certain degrees persuasive, and sociologically interesting, they provide little practical implication to those seeking to provide a learning outcomes-based education. How can we facilitate learning outcomes-based education? What are the effective conditions for mobilizing faculty to engage in discussion about learning outcomes, and in the end, embrace learning outcomes based education? In particular, what is the role of learning outcomes assessment, and how can it be utilized to improve the quality of education?

We focus on learning outcomes assessment because it forces us to reach concrete level agreement about what we expect our students to know, understand, and be able to do, which is ultimately necessary to substantiate

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[9] National Institute for Academic Degrees and University Evaluation (NIAD-UE), "A Research on the Quality Assurance of Disciplinary Education in Japanese Universities," (Tokyo: NIAD-UE, 2016), original title in Japanese「我が国における大学教育の分野別質保証の在り方に関する調査研究報告書」(pronounced as: "Wagakuni-niokeru-daigaku-kyoiku-no-bunyabetsu-sanshokijun-no-arikata-ni-kansuru-chosa-kenkyu"), http://www.niad.ac.jp/n_shuppan/project/__icsFiles/afieldfile/2016/07/14/no09_nr16-0714.pdf.

[10] Teruyuki Hirota, "Why Front Line Academics Reject Reform-Towards Utilizing Subject Specific Benchmark Statements," *University Evaluation Studies* 15 (2016): 37-46.

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learning outcomes-based education. At the course level, faculty members are expected to clarify attainable and assessable learning outcomes to be achieved by the students, and then to plan and implement educational practices that will most effectively facilitate students' learning. This "backward design," as articulated by Wiggins and McTighe[11] applies also at the program level, where faculty teams are expected to clarify the learning outcomes to be achieved by completing the total set of courses that constitute the program. Learning outcomes defined at the program level are by design more abstract than at the course level, because they must be applicable to different courses that focus on different sets of disciplinary knowledge and skills. Nevertheless, program level learning outcomes must be grounded on concrete level understandings of how they will be articulated within relevant courses, if they are to become trusted indicators of quality. Learning outcomes assessment, when based on a learning outcomes framework can make explicit the connection between course/concrete level learning outcomes and program/abstract level learning outcomes. This substantive understanding of how a course can contribute to the learning goals of a program is of critical importance to those seeking to provide a quality learning outcomes-based education.

The purpose of this paper is to highlight how learning outcomes assessment can effectively facilitate learning outcomes-based education, by documenting the experience of Japanese and Indonesian mechanical engineering faculty members who have been engaged in a collaborative project aimed at developing a "test item bank" at the National Institute for Educational Policy Research (NIER),[12] the Tuning National Center for Japan.

The experience of engineers provides rich implications to other disciplines for two reasons. First, the engineers have been top runners in developing a shared understanding of disciplinary learning outcomes, endorsed by a global network of program accreditation agencies; i.e. the International Engineering Alliance (IEA)'s Graduate Attributes[13] , and the European Network for the Accreditation of Engineering Education

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[11] Grant Wiggins, and Jay McTighe, Understanding by Design, expanded 2th ed. (Alexander, Virginia: Association for Supervision & Curriculum, 2005).

[12] National Institute for Educational Policy Research (NIER), "Tuning Test Item Bank Project," http://www.nier.go.jp/tuning/centre/kikai.html.

[13] International Engineering Alliance, "Graduate Attributes and Professional Competencies," http://www.ieagreements.org/assets/Uploads/Documents/Policy/Graduate-Attributes-and-Professional-Competencies.pdf.

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(ENAEE)'s EUR-ACE.[14] Graduates of engineering programs that have been accredited by agencies within the network are considered to have acquired the learning outcomes defined in the frameworks, fulfilling the foundational requirement for those who wish to become a Professional Engineer in signatory countries. Much is to be learnt from what the engineers have already accomplished, and the challenged they are currently facing.

Secondly, while engineering is a highly structured discipline with specified sets of knowledge and skills graduates are expected to acquire, it is also a discipline that has traditionally placed strong focus on the application of knowledge and skills, and on higher order analytical and problem solving skills. Additionally, engineering programs are increasingly emphasizing the importance of being able to operate meta-cognitive knowledge necessary to deliberate the role of engineers in society. Such emphases are indeed central to the learning outcomes aspired by all disciplines in contemporary higher education.

This paper consists of five sections. Following this introduction, the paper will outline the background, purpose, and the methodology of the NIER Test Item Bank. In the third section, the paper will describe test item development, implementation, and preliminary analysis of test results in Japan and Indonesia. The fourth section will discuss implications drawn from international benchmarking. Finally, the fifth section will discuss the limitations and future directions of the NIER Test Item Bank project.

II. **The NIER Test Item Bank – background, purpose and methodology**

II.1. *Background and purpose – the Japanese perspective*

The NIER Test Item Bank is a spin-off project of the OECD-AHELO Feasibility Study, which was an international study conducted between 2009 and 2012. The study aimed to test whether or not it was practically and scientifically feasible to develop and conduct a test that assesses what university graduates know and can do upon completion of their bachelor

[14] European Network for the Accreditation of Engineering Education, "EUR-ACE Framework Standards and Guidelines (EAFSG)," (European Network for Engineering Accreditation, 2015) http://www.enaee.eu/wp-assets-enaee/uploads/2017/11/EAFSG-Doc-Full-status-8-Sept-15-on-web-fm.pdf.

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degree programs. The study was conducted in the strands of generic skills, economics, and engineering, involving 17 countries, 248 institutions, and over 23,000 students. Japan participated in the engineering strand, with the participation of 12 universities and 504 students.

In the engineering group, a learning outcomes framework was developed by an international team of engineering experts by extracting common elements of the IEA Graduate Attributes and ENAEE EUR-ACE frameworks, taking into account the career paths of engineering students and the expectations of stakeholders.[15] The abstract level learning outcomes defined in the framework were then articulated into concrete level measurable learning outcomes within the context (scenario) of each test item. After the test items and scoring guides were verified based on pilot implementations, they were implemented in large scale, and collectively scored by engineering experts.[16]

The OECD concluded the Feasibility Study by stating that it was in fact feasible to develop an international assessment of higher education learning outcomes.[17] The Japanese team, however decided to continue the project, focusing on the value of the endeavor. First, the team deliberated that the collaborative development of test items and joint scoring proved to be invaluable in generating a consensus among faculty members regarding what students are expected to know, understand, and be able to do, and in substantiating abstract level learning outcomes into attainable and assessable learning outcomes. Secondly, the team articulated that once faculty members reached consensus on the logic of scoring within a given scenario, they were able to apply the same logic to different scenarios, reaching high agreement in scoring results at accelerating speed. The implication that can be drawn from this experience is that occasional faculty participation in external learning outcomes assessment exercises may provide long lasting insights that will guide the design and delivery of courses and degree programs. A learning outcomes assessment exercise

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[15] Organization of Economic Cooperation and Development (OECD), "A Tuning-AHELO Conceptual Framework of Expected Desired/Learning Outcomes in Engineering," *OECD Education Working Papers* 60 (2011), http://dx.doi.org/10.1787/5kghtchn8mbn-en.

[16] Karine Tremblay, Dianne Lalancette, and Deborah Roseveare, "OECD-AHELO Feasibility Study Report Volume 1 - Design and Implementation" (Paris: OECD, 2012), http://www.oecd.org/edu/skills-beyond-school/AHELOFSReportVolume1.pdf.

[17] Organization of Economic Cooperation and Development (OECD), "OECD-AHELO Feasibility Study Report Volume 2 – Data Analysis and National Experiences" (Paris: OECD, 2013), http://www.oecd.org/edu/skills-beyond-school/AHELOFSReportVolume2.pdf.

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can be an effective faculty development model for encouraging the implementation of the learning outcomes-based approach.[18,19,20]

It is important to mention that in Japan, engineering program accreditation has not been adopted uniformly. Although there is an engineering accreditation body, the Japan Accreditation Board of Engineering Education (JABEE)[21] which is a signatory of the Washington Accord, engineering program accreditation is voluntary, and many of Japan's top research university's engineering programmes are in fact un-accredited. This is because graduating from an accredited engineering program is not necessarily required to find employment at Japan's leading multinational manufacturing corporations. However, countries from which Japan accepts international students, such as Malaysia do require their engineering students to graduate from accredited programs if they were to return and practice engineering as their profession. By not being accredited, Japanese engineering programs are under-serving their internationally mobile students, which is an issue that is becoming increasingly put to attention at high-level meetings.

In many engineering fields in Japan, there has been little incentive for graduates to pursue additional certificates such as a Professional Engineer. This is because most large manufacturing corporations offer lifetime employment opportunities. Once a graduate is hired, there are very few opportunities in which they are required to formally demonstrate their professional qualifications. Another reason may be the fact that major corporations[22] have traditionally had their own effective in-house training

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[18] National Institute for Educational Policy Research (NIER), "The National Institute for Educational Policy Research International Symposium for Educational Reform 2013: The TUNING-AHELO Global Quality Assurance through Sharing Competence Frameworks and Degree Level Specifications" (Tokyo: NIER, 2013), http://www.nier.go.jp/06_jigyou/symposium/i_sympo25/.

[19] Satoko Fukahori, ed., "An Analytical Report of the Results of AHELO Feasibility Study" (Tokyo: National Institute for Educational Policy Research, 2014); original title in Japanese: 「AHELO調査結果の分析に関する研究会（研究成果報告書）」(pronounced as follows:"AHELO Chosa-kekka-no-bunseki-ni-kansuru-kenkyukai (Kenkyu-seika-hokokusho)"), http://www.nier.go.jp/koutou/ahelo/2014/report.pdf.

[20] Satoko Fukahori, "Competence-based Quality Assurance of University Education - Lessons Learnt from the OECD-AHELO Feasibility Study," in *Educational Studies in Japan: International Yearbook* Vol. 8 (Japanese Educational Research Association, 2014), 49-61.

[21] Japan Accreditation Board of Engineering Education, http://www.jabee.org/english/ (accessed 5 September, 2017).

[22] National Research Council, *Engineering Tasks for the New Century: Japanese and U.S. Perspectives* (Washington, DC: The National Academies Press, 1999), https://doi.org/10.17226/9624.

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programmes for their new employees, which allowed them to be relatively unconcerned about what students actually learnt in their specialization of study at universities. Under these circumstances, it is not the case in Japan that all soon to be engineering graduates undergo standardized engineering examination. While the Japanese university entrance examination serves as the entry level screening device for admitting students of the highest academic aptitude to top-tier universities, there is no formal mechanism at the exit level for measuring and comparing the achievement of learning outcomes of engineering graduates across institutions.

It is also important to note that in Japan, unlike in the United States and European universities, the offering of faculty development programs are somewhat limited in scope. Many engineering faculty members actually learn how to teach from having been taught by their advisors, and in many cases follow this same approach when teaching their own students in their research laboratories and courses. There have been very few opportunities for faculty members from different institutions to engage in discussion about educational improvement.

However, globalization is forcing Japanese universities to change. For example, from the 1990s, there has been a growing consensus within the ASEAN region that engineers from a given country should be able to practice their profession in member countries. Furthermore, ASEAN countries and Japan, because of their proximity and interlinked economies related to manufacturing, share the common goal of developing highly skilled and innovative human resources in all fields of engineering. This has led to the strengthening of cooperation among engineering programs in leading universities in ASEAN countries and Japan.

The OECD-AHELO Feasibility Study coincided with growing recognition among engineering leadership regarding the necessity to embrace the learning outcomes-based approach in the face of globalization. Within this context, the NIER Test Item Bank project was launched in 2014 in the field of mechanical engineering, with the full support of the Japanese OECD-AHELO Feasibility Study team. The purpose of the project is to develop among engineering faculty members, common understandings of engineering learning outcomes, through the collaborative process of test item development, scoring, and sharing of results. By substantiating program/abstract level learning outcomes into attainable and assessable course/concrete level learning outcomes, and through measuring and comparing the students' achievement of learning outcomes, faculty members will be able to draw practical implications for educational improvement at the program and course levels. Only when we are able to convince faculty members of its

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effectiveness, will we be able to witness a systemic shift towards the adoption of the learning outcomes-based approach.

II.2. *Motivation for Test Item Bank participation at ITB in Indonesia*

Institut Teknologi Bandung (ITB) is one of the leading technical universities in Indonesia, especially in the fields of sciences and engineering. ITB plays a significant role in shaping the policies of higher education in Indonesia, and has become a benchmark for other universities in Indonesia for improving their curriculum.

Since 2013, ITB stated its commitment to developing the "Outcome Based Education (OBE)" for all its undergraduate programs. The programs responded to this policy by developing and implementing OBE in various stages, depending on their readiness. By 2017, international accreditation agencies, such as ABET, ASIIN, JABEE and KAAB had recognized the implementation of OBE in 25 ITB programs. These include the 2016 ASIIN accreditation for three undergraduate programs within the Faculty of Mechanical and Aerospace Engineering. These are the Mechanical Engineering Program (MEP-ITB), the Aeronautics and Astronautics Program and the Material Engineering Program.

The development and implementation of OBE is an ongoing process. Therefore, the Faculty of Mechanical and Aerospace Engineering is continuously developing their methods to assess the achievements of learning outcomes, to evaluate and to determine the required improvements in curriculum and relevant academic processes. Before 2012, these programs utilized the annual tracer studies to assess the achievements of learning outcomes based on their alumni performances in the workforce. Henceforth, the Mechanical engineering program also utilizes its own Comprehensive Tests for the same purpose. Since the Comprehensive Test directly evaluates the students' understandings of the scientific and engineering aspects of the respective programs, it is critically important to find a way to improve its accuracy and effectiveness.

The participation of MEP-ITB in NIER's Test Item Bank Project in 2015 was a valuable opportunity to assess the students' achievement of the program's learning outcomes in an international setting. The programs considered the project as a "calibrator/benchmark" for the Comprehensive Test at MEP-ITB. Results of the implementation of the large-scale implementation are summarized below. A preliminary comparison of the NIER Test Item Bank implementation results in Japan and at ITB are also discussed.

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II.3. *Methodology*

The basic methodology for the NIER Test Item Bank is based on the OECD-AHELO Feasibility Study model, as discussed earlier.[23]

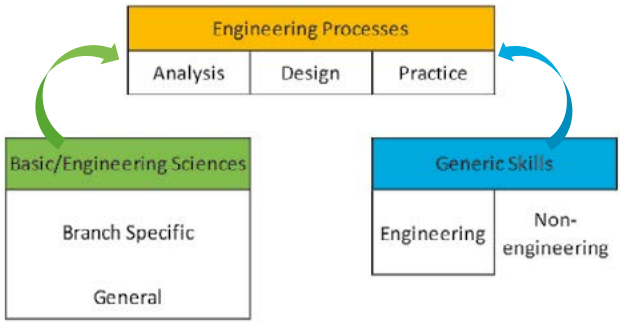

Figure 1

The Engineering Learning Outcomes Framework

The Engineering Learning Outcomes Framework as shown in Figure 1 and Table 1. consists of learning outcomes categorized into the following five areas: basic and engineering sciences, engineering generic skills, engineering analysis, engineering design, and engineering practice. As stated earlier, these learning outcomes were conceptualized based on the existing IEA Graduate Attributes and ENAEE EUR-ACE frameworks. Additionally, in order to reflect the organization of content areas taught in Japanese universities, basic and engineering sciences was categorized into the following seven areas: fundamental mathematics, fundamental physics, materials, motions, energy, informatics, and mechanical process. Multiple-choice questions (MCQ) were developed mainly to measure the mastery of basic and engineering sciences, whereas constructive response tasks (CRT) were developed to mainly measure "how well students can think like an engineer," or how well students can operate engineering generic skills, engineering analysis, engineering design, and engineering practice.

[23] Group of National Experts on the AHELO Feasibility Study. "Engineering Assessment Framework," (AHELO Feasibility Study 8th meeting of the AHELO GNE Paris, 18-19 November 2011), http://search.oecd.org/officialdocuments/displaydocumentpdf/?cote=edu/imhe/ahelo/gne(2011)19/ANN5/FINAL&doclanguage=en.

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Table 1

The Engineering Learning Outcomes Framework

Engineering Generic Skills	
EGS1	The ability to function effectively as an individual and as a member of a team.
EGS2	The ability to use diverse methods to communicate effectively with the engineering community and with society at large.
EGS3	The ability to recognise the need for and engage in independent life-long learning.
EGS4	The ability to demonstrate awareness of the wider multidisciplinary context of engineering.
Basic and Engineering Sciences	
BES1	The ability to demonstrate knowledge and understanding of the scientific and mathematical principles underlying their branch of engineering. The basics of mathematics include differential and integral calculus, linear algebra, and numerical methods.
BES2	The ability to demonstrate a systematic understanding of the key aspects and concepts of their branch of engineering.
BES3	The ability to demonstrate comprehensive knowledge of their branch of engineering including emerging issues: high-level programming; solid and fluid mechanics; material science and strength of materials; thermal science: thermodynamics and heat transfer; operation of common machines: pumps, ventilators, turbines, and engines.
Engineering Analysis	
EA1	The ability to apply their knowledge and understanding to identify, formulate and solve engineering problems using established methods.
EA2	The ability to apply knowledge and understanding to analyse engineering products, processes and methods.
EA3	The ability to select and apply relevant analytic and modelling methods.
EA4	The ability to conduct searches of literature, and to use data bases and other sources of information.
EA5	The ability to design and conduct appropriate experiments, interpret the data and draw conclusions.
EA6	The ability to analyse mass and energy balances, and efficiency of systems; hydraulic and pneumatic systems; machine elements.
Engineering Design	
ED1	The ability to apply their knowledge and understanding to develop designs to meet defined and specified requirements.
ED2	The ability to demonstrate an understanding of design methodologies, and an ability to use them.
ED3	The ability to carry out the design of elements of machines and mechanical systems using computer-aided design tools.
Engineering Practice	
EP1	The ability to select and use appropriate equipment, tools and methods.
EP2	The ability to combine theory and practice to solve engineering problems.
EP3	The ability to demonstrate understanding of applicable techniques and methods, and their limitations.
EP4	The ability to demonstrate understanding of the non-technical implications of engineering practice.
EP5	The ability to demonstrate workshop and laboratory skills.
EP6	The ability to demonstrate understanding of the health, safety and legal issues and responsibilities of engineering practice, the impact of engineering solutions in a societal and environmental context, and commit to professional ethics, responsibilities and norms of engineering practice.
EP7	The ability to demonstrate knowledge of project management and business practices, such as risk and change management, and be aware of their limitations.
EP8	The ability to select and use control and production systems.

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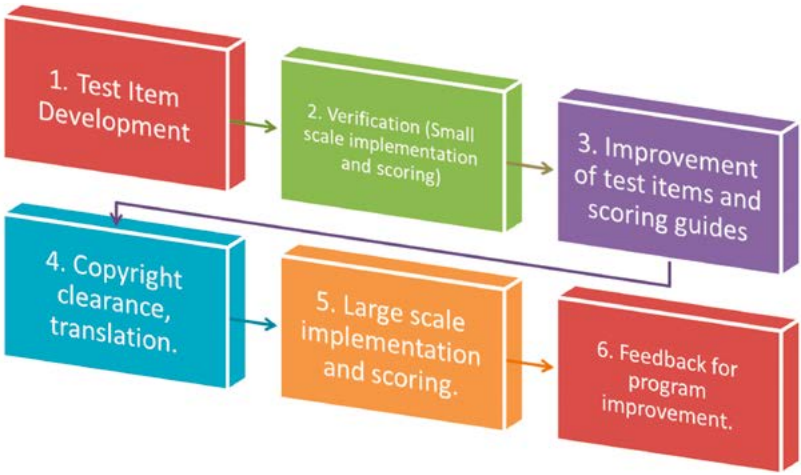

Figure 2

The Test Item Bank Development Process with Feedback for Improvement

The test item development follows the six-step Plan-Do-Check-Act (PDCA) approach shown in Figure 2. First, the test items and scoring guides proposed by members of the team were reviewed, discussed, and revised in face-to-face workshops. Second, the test items were tested in small-scale trials, to verify whether or not the test items made sense to the students, that it was tapping on the knowledge and skills intended to be measured, and that the tasks were not too difficult or too easy. The third step involved the improvement of test items and scoring guides, based on the results of the small-scale trial assessments. As the fourth step after verification, permissions were obtained to use photos, diagrams, charts, etc. protected by copyright licenses. Then, the test items were translated into English. The fifth step involved the large-scale implementation and scoring of the tests at universities in Japan and abroad. As the sixth step, feedback reports consisting of information meant to facilitate educational improvement were compiled and sent to the project team, participating universities, and participating students.

The operational model of the NIER Test Item Bank is shown in Figure 3. There is a central committee consisting of a total of 54 members at 22 institutions, and a secretariat at NIER. Members work in three regional hubs to propose test items, which are reviewed, discussed, and revised in the central committee held several times a year, and then brought back to the hubs for trial and full-scale implementation. This hub and spoke type of

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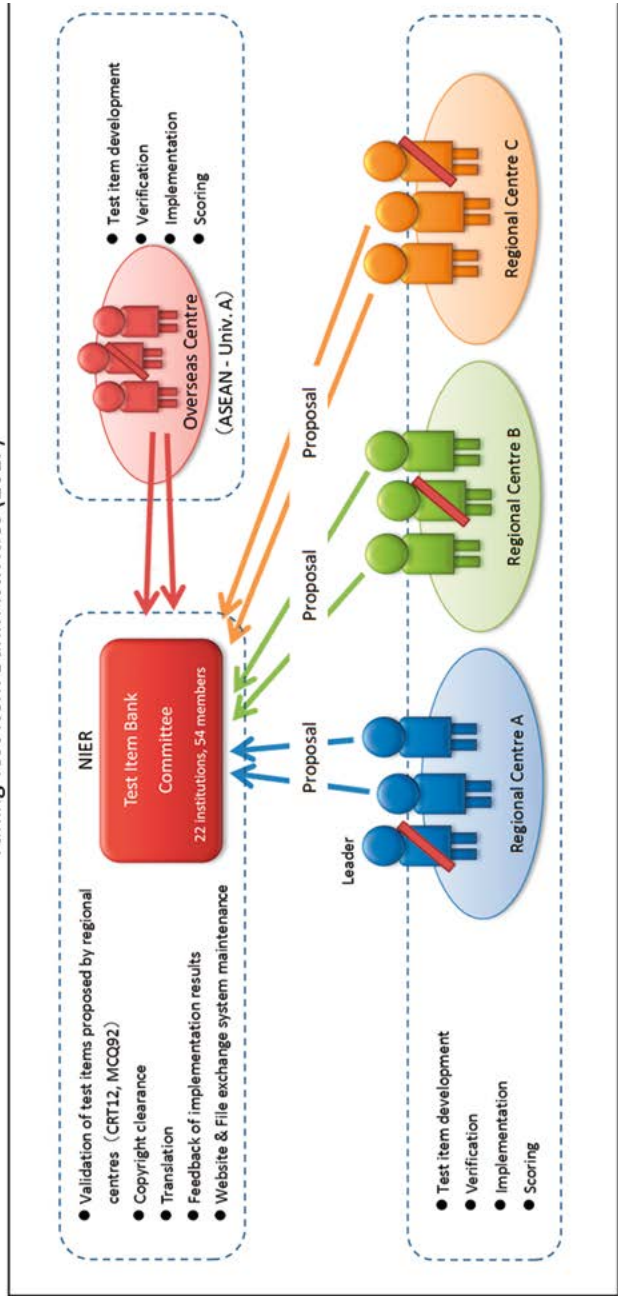

Figure 3

The Operational Model of the NIER Mechanical Engineering Test Item Bank within Japan and Indonesia

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model is also applied in the case of ITB in Indonesia. Figure 4 shows Japanese and Indonesian members engaged in test item development in a central committee meeting in September 2014 in Japan.

It should be noted that the core concept behind the test item bank is that faculty members who produce the test items will be able to use items from the test item bank for assessment in their universities, under the agreement that they will share the assessment results with the secretariat, who will compile a test item profile indicating the level of difficulty, the distribution of test scores, etc. As of March 2017, 94 MCQs and 12 CRTs are being shared among members using the "Direct Cloud Box" system. Participation in the test item bank is currently free of charge.

Figure 4

The Test Item Development Faculty Workshop
in Hayama, Kanagawa, Japan, September 2014

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III. **Test Item development, implementation, and analysis of results**

III.1. *Test item development – a sample item*

Figure 5

Wind Power Generation Sample Item showing a) wind farm,[24] b) wind turbine,[25] and c) wind mill[26]

Figure 5 from a sample constructive response task featuring "wind power generation" is shown in Figure 5 and the scoring guide for the first task is shown in Table 2 showing a wind farm, wind turbine for electrical power generation, and windmill for pumping water. In this example, photographs of a wind farm which generates electricity using wind turbines as well as the characteristics of a windmill and wind turbine are shown. There are pronounced differences between the turbine and mill related to their design, construction and functionally. Based on mechanical engineering education, it is expected that students would be able to:

[24] Otonrui Wind Farm, photograph courtesy of Horonobe City, Japan.
[25] http://sozai-free.com/sozai/01541.html.
[26] Martijn Roos, http://free photos.gatag.net/2014/11/07/040000.html.

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Table 2

The Scoring Guide for Wind Power Generation shown in Fig. 5

Learning outcomes to be assessed: The ability to analyze and to examine the function and efficiency of machines by applying basic knowledge of mechanical engineering by explanation of the locational condition of a wind farm.
Underlying competences: BES2: The ability to demonstrate a systematic understanding of the key aspects and concepts of their branch of engineering. EA2: The ability to apply knowledge and understanding to analyze engineering products, processes and methods. EA6: The ability to analyze mass and energy balances, and efficiency of systems.
Viewpoints: Lists two features out of three below or equivalent, and explains the reasons for each of them appropriately. (a) The wind farm is located on flat land along a seashore and hence there is no obstacle to block the wind from flowing around the wind turbines. • The wind kinetic energy can be utilized effectively with little loss because the wind directly blows against the wind turbines to a maximum degree. • The wind turbine blades rotate freely because the wind flows around the stationarily tower and against the turbines. (b) Many wind turbines are installed in one location. • All wind turbines can be manufactured to the same design requirements because the local environment for all turbines is basically the same. This reduces the manufacturing and design costs required in designing and producing the turbines. • The cost for installation and maintenance of wind turbines is reduced because many turbines are located adjacent to each other. • The cost for installation and maintenance of accompanying facilities to recover the electric energy generated by all turbines is reduced because such facilities can be also installed on-site. (c) No building or structure is located around the wind farm. • A wind turbine can be designed specifically for the wind conditions at the location because there is no limitation on size of the wind turbine. This increases the efficiency in generating the electric energy. • There is no possibility to cause damage to the neighboring buildings or structures in case of accidents such as the collapse of wind turbine column.

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1. By examining the locational condition or site of a wind farm for wind electrical power generation, explain two reasons why the picture shows a good location for a wind farm (Basic and engineering Sciences, Engineering Practice)
2. By comparing the shapes of the blades for a traditional windmill and a wind turbine, explain from a mechanical engineering point of view two features of blades that characterize wind turbines for wind power generation (Basic and engineering Sciences, Engineering Practice)
3. By examining the "number of blades" of a wind turbine for wind power generation, identify from a mechanical engineering point of view, three advantages of having many or few blades, and to explain why large scale wind turbines used for wind power generation often have three propeller type blades (Basic and engineering Sciences, Engineering Practice).
4. Explain the "responsibilities of a mechanical or power engineer" in designing wind turbines for wind power generation, under the following condition.

Only one year after the wind turbine was constructed, it became apparent that the wind velocity could be larger than assumed in the initial design. In order to prevent the collapse of wind turbine column due to strong wind, identify three potential countermeasures that are technically possible for different levels of risk. For each countermeasure, evaluate their advantages and/or disadvantages from a broad perspective, including the non-technical aspects (Engineering design, Engineering practice).

Following the six-step PDCA test item development and implementation cycle, this item was proposed by members of the Kanto hub, reviewed, discussed and revised by the central committee, pilot tested in multiple universities at each hub including Indonesia, and then revised based on the verification procedure.

III.2. *The 2016 test implementation in Japan and Indonesia*

The following sections describe the implementation procedures in the two countries, during the 2016 large-scale implementation, which involved 10 MCQs and one CRT (six tasks based on one scenario) featuring "mechanical process (machine tools)." The testing time was 30 minutes for the MCQs and 50 minutes for the CRT. Given that this test item is still kept confidential,

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details of the item will not be discussed in this paper. The learning outcomes assessed through this implementation are shown in Table 3.

Table 3

Learning Outcomes Assessed by the Test Items

	MCQ	CRT1	CRT2	CRT3	CRT4	CRT5	CRT6
Basic and Engineering Sciences	O	O		O	O	O	
Engineering Generic Skills							
Engineering Analysis		O	O	O	O	O	O
Engineering Design							O
Engineering Practice			O		o		o

The implementation guide compiled by the secretariat defined in detail the testing procedure to be followed at every university.

Each participating student received a test kit (envelope), which included the MCQ booklet, the CRT booklet, contextual survey (questionnaire), confidentiality agreement, and answer sheets. Each student was given an identification number so that test results and questionnaire responses could be matched and analyzed.

The first 5 minutes was spent for explaining the purpose of the project and for distributing the test kit. The coordinator at each university was requested to read the prescribed instructional text, and the students were asked to sign the non-disclosure confidentiality agreement. The next 30 minutes was spent for responding to the MCQs, followed by 50 minutes spent for the CRT.

After the test, students were asked to spend 10 minutes responding to a questionnaire consisting of a series of questions about educational experiences, which may influence students' performance on the test. The testing session was closed by a 10-minute discussion, focusing on the student perspective on the validity of the test items. The entire procedure took 105 minutes with no breaks taken in between. Students in Japan and Indonesia were actually familiar with this style of testing through their experience in the university entrance examination or the Comprehensive Test.

The scoring procedure was also defined by the secretariat. The MCQs were machine scored whereas the CRT was hand scored by the faculty members of participating institutions. In each university, scores were asked to calibrate their understanding of the scoring guides in advance. However, this procedure was not sufficiently defined, which may have led to several

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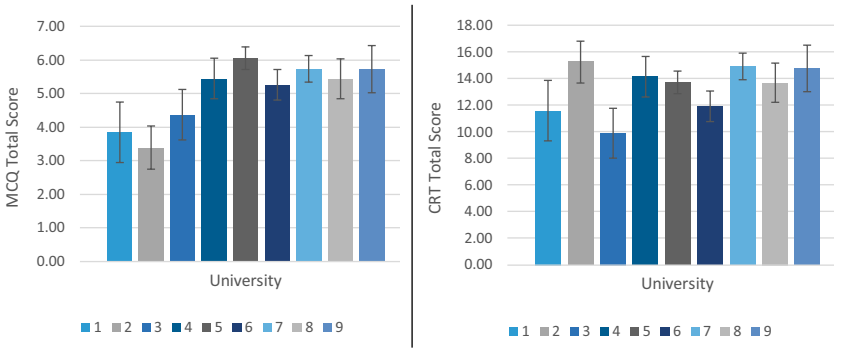
incidents of low inter-rater reliability scores, which is an issue which will be discussed in the later section. Then, in Japan, each student response was scored by two faculty members from the students' university and one faculty member from another university. At ITB, three ITB professors scored each student's response. The average of the three scores was taken to represent the score of the student. This procedure was undertaken to cancel out any individual level and institutional level bias.

Feedback reports were compiled by the secretariat and delivered to the project team, participating universities, and individual participating students.

III.2.1. Testing at Japanese universities

First semester master students who had just completed their bachelor degree programs in Mechanical Engineering in March 2016 were invited to participate. A total of 348 students in nine Japanese universities participated in the testing which took place between June and August, 2016. The number of participating students varied with institution from 22 to 98, with the average number of 39.

The test was administered only in Japanese. Students were not given any incentives for participation, but were informed that they would receive feedback reports on the test results.



Note: Error bars represent the 95% confidence interval.

Figure 6

MCQ and CRT Results for Japanese students

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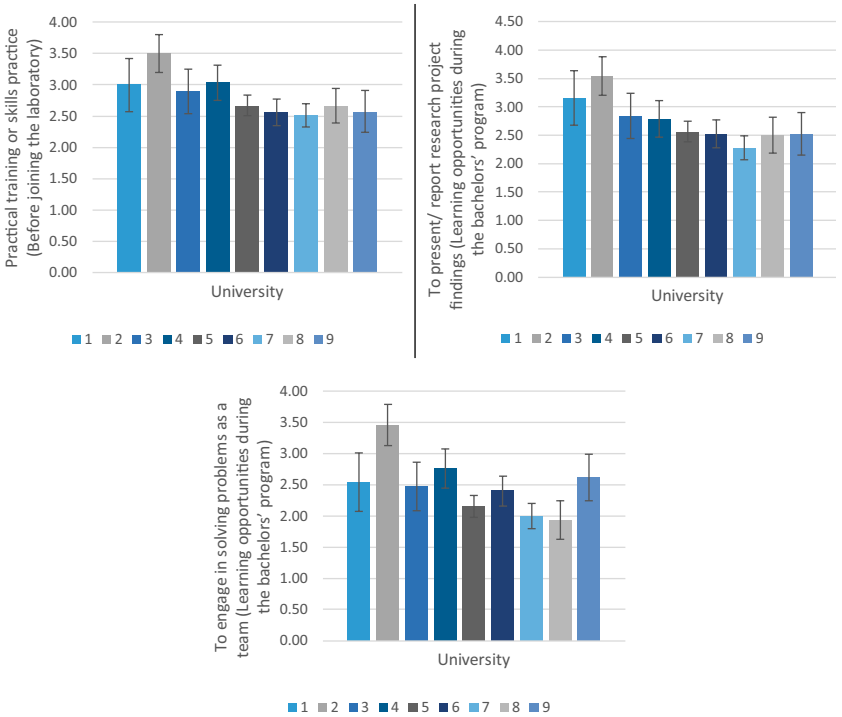
Total MCQ and CRT scores at the student level revealed to be only weakly correlated (r=0.173, p<.01), indicating that students with higher scores on MCQs do tend to have higher scores on CRTs, but not necessarily all the time. This implies that MCQs and CRTs were measuring different types of learning outcomes that may depend to different degrees on student aptitude, and that may be fostered to different degrees through educational experiences.

Figure 6 shows the total MCQ and CRT scores at the institutional level, or the average total scores of Japanese students at nine universities. Note that students in institution 2 did not perform well on the MCQs but performed exceedingly well on the CRTs. This result brings our attention to the unique educational experiences these students have experienced that may have fostered the ability to "think like an engineer."



Note: Error bars represent the 95% confidence interval.

Figure 7

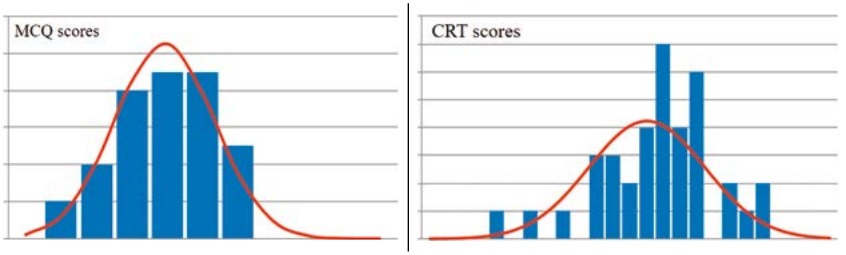
The Educational Experiences of Japanese Students

Figure 7 shows the students' educational experiences reported by the students in the questionnaire. Students in institution 2 responded more affirmatively that they committed themselves to "practical training or skills practice" before joining the laboratory to undertake research projects, and that they had opportunities "to present/ report research project findings" and "to engage in solving problems as a team" after joining the laboratory (Items with mean-difference effect size $d > 1.0$).

Results such as these have encouraged discussion on providing educational experiences that can be expected to enhance student performance, which is a necessary condition for educational reform to take action.

III.2.2. Testing in Indonesia at ITB

The test at ITB was conducted on September 3, 2016, at 13:00–15:00 (local time). Thirty-seven mechanical engineering students who had completed their third year (junior or sixth semester) participated in the test. Because the topic covered in the CRT was very specific to Mechanical Engineering fields, i.e. "machine tools" topic, aeronautics engineering student were not invited to participate. The test implementation was conducted only in English. All participants received a USB flash disk as a token of appreciation for their participation.



Note: Error bars represent the 95% confidence interval.

Figure 8

Distribution of MCQ and CRT Total Scores for ITB Students

The histogram of the MCQ scores for ITB students shown in Figure 8 fits well to its normalized curve. The deviation between the MCQ score histogram to its normalized curve is about 5.5%. This indicates that the number of students participated in the test was large enough resulting in the distribution

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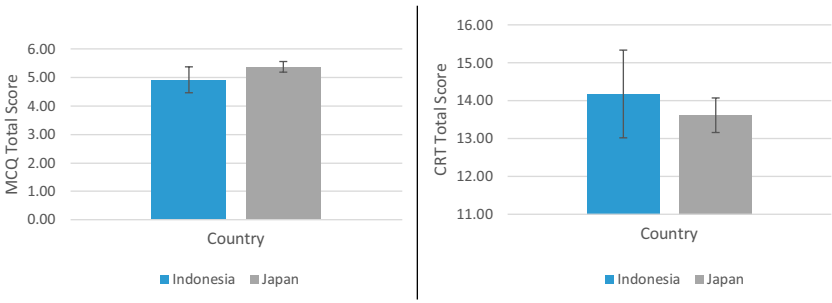
closer to a normal distribution. Moreover, Figure 8 shows the distribution of CRT total scores and its associated normalized curve, in which the deviation of CRT scores to its normalized curve is 8%.

The correlation coefficient between the ITB MCQ and CRT total scores was small at 0.0009. In other words, we may consider that the MCQ test assess completely different aspect of students' academic competencies in comparison to the CRT test items.

IV. **Implications drawn from international benchmarking**

This international collaboration in learning outcomes assessment is meaningful, most directly because it allowed for verification of the international validity of test items and the underlying learning outcomes. The implementation at ITB of test items developed by the Japanese team has allowed for engaging in an extremely stimulating and enriching international conversation about what learning outcomes that should be measured and how to do so.

International collaboration is meaningful also because it allowed for recognition of the learning outcome which may be taken for granted, in relation to how we organize our educational practices. It provided information that allows faculty time to stop and think about the strengths and weaknesses of our educational programs.



Note: Error bars represent the 95% confidence interval.

Figure 9

Total Average MCQ and CRT Scores for Japanese and ITB students

Figure 9 shows the total average MCQ and CRT scores for Japanese and ITB students. While Japanese students score slightly higher on MCQs

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(Welch's t test t (49.74) =-1.84, d=-0.26, p=0.07) and ITB students slightly higher on CRTs (Welch's t test t (47.83) =0.89, d=0.13, p=0.38) the differences are small, cautioning us from over-interpreting these results. A closer examination on the other hand, of how the students in the two countries responded to each test item stirs attention to similarities and differences in educational experiences, curriculum content coverage, sequence, and emphasis.

There were also striking differences in the questionnaire results. When focusing on activities that the students reported to have committed themselves to before joining the laboratory to undertake research projects, significantly more ITB students indicated "foreign language," "general education subjects" and "co-curricular engineering projects," while significantly more Japanese students indicated "paid part time job." After joining the laboratory, significantly more Japanese students responded that they committed themselves to "writing their graduation thesis." With regard to learning opportunities, significantly more ITB students responded that they had opportunities "to engage in solving problems as a team," "to engage in solving real life engineering problems," and "to engage in solving problems that require knowledge beyond engineering (society, economy, politics, etc.)" (Items with mean-difference effect size d >0.5).

Although these are preliminary analysis of the test results, they illuminate the possibilities of a faculty developed learning outcomes assessment in facilitating learning outcomes-based education. Because faculty members have deep understandings of what learning outcomes the assessment tools intend to measure, they are alerted by the reality of that they reveal, and search for clues on how to make improvements. By combining carefully designed MCQs, CRTs, and questionnaires, assessment can become a powerful tool for faculty-led educational improvement.

V. **Discussion – limitations and future directions**

The 2016 large-scale implementation of the test items confirmed that the NIER test items designed to measure mechanical engineering learning outcomes were valid in Japan and Indonesia, and that the MCQs and the CRT complemented each other by assessing different aspects of engineering learning outcomes. The implementation also revealed critical problems that will need to be addressed in order to achieve robust results that can be utilized for the improvement of learning outcomes-based education.

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First, because measuring cognitive processes, or assessing how well a student can "think" is difficult, the scope of learning outcomes that the "machine tools" item was able to address with multiple tasks, as show in Table 3 was limited to Basic Engineering Science, Engineering Analysis, and Engineering Practice. The item was unable to measure Engineering Generic Skills, and was able to measure Engineering Design with only one task. This limitation did not allow for identifying or benchmarking achievement levels of learning outcomes in the five areas, which is the kind of information necessary to highlight the strengths and weaknesses of a program based on the learning outcomes-based approach. Ideally, feedback reports should include information on how well students in a program on average scored in the five learning outcomes areas, benchmarked against their local and international peers, as shown in Figure 10. Hence, one future direction of test item development would be to develop sophisticated and effective approaches to measuring all areas of learning outcomes, and to more intentionally and explicitly map the tasks so that a fuller coverage of the learning outcomes can be achieved.

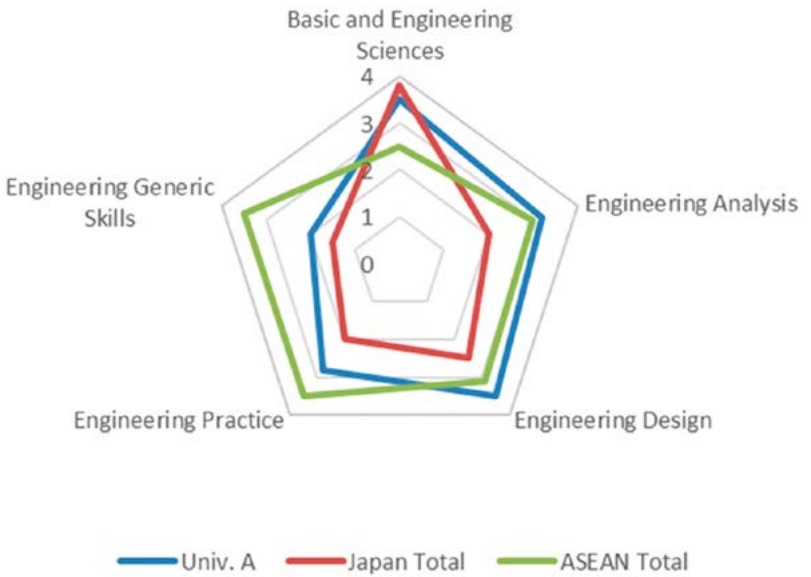

Figure 10

Hypothetical Comparison of the Average Achievement Level of University A, Japan Total, and ASEAN Total

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Sophistication of measurement approaches include disaggregating the multiple learning outcomes measured in each task. The correlation coefficients between the five tasks in the "machine tools" item indicate that there are relatively high and statistically significant correlation between all pairs of tasks, implying that the tasks were measuring the same learning outcome or outcomes.

This result led to the realization of an issue in the design of our scoring guide, in which one score was assigned for each task, despite the fact that multiple learning outcomes were being assessed with each task. For example, Task 6 (CRT6) was designed to measure Engineering Analysis, Engineering Design, and Engineering Practice, while the scoring guide was written to assess the level of "integrated" performance supported by the three learning outcomes (one score). A better assessment would have been to write three separate scoring guides to measure the achievement of the three learning outcomes (three scores). Hence, another future direction of test item development would be to develop tasks that more directly target the learning outcomes to be measured, and to develop separate scoring guides for each learning outcome to be measured in each task. This requires more systematic categorization and clearer specification of the learning outcomes, modeled on theories of learning objectives such as those proposed Anderson and Krathwhol.[27]

Secondly, calibration among scorers (raters) proved to be more difficult than anticipated. Although scorers were asked to calibrate their understanding of the scoring guides in advance, the calibration procedure was not sufficiently defined, which may have led to several incidents of low inter-rater reliability scores. The inter-rater reliability score varied greatly by institution and task, ranging from .29 to .98 (average .79).

Note that the average score of the three scorers were taken to represent the score of the student, in the attempt to cancel out any individual level and institutional level bias. We believe that his approach is basically effective. However, measures must be taken to prevent large discrepancy in the scores, as low inter-rate reliability will challenge to the reliability of the overall result. Hence, one future direction of test implementation is to define in detail the calibration procedure, so that scorers will indeed be able to score the test based on common understandings of the scoring guides.

Thirdly, because knowledge and understanding of Basic and Engineering Sciences encompass an extremely vast area, we must reserve from conceptualizing as if Basic and Engineering Sciences is a single robust construct. The correlation coefficients analysis between the ten MCQs

[27] Lorin W. Anderson, and David Krathwhol, *A Taxonomy for Learning, Teaching, and Assessing* (New York, NY: Addison Wesley Longman, Inc., 2001).

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indicate that the correlation between pairs of questions are weak overall, and some are negative, indicating that the questions may be measuring different constructs. This observation is also supported by results from a categorical factor analysis. Further investigation is necessary to understand the behavior of MCQs, and in the meanwhile, caution is required to aggregate or construct composite scores. Hence, another future direction of test implementation is to, in order to better understand the nature and structure of the Basic and Engineering Sciences learning outcomes, include multiple items from the same content areas (fundamental mathematics, fundamental physics, materials, motions, energy, informatics, and mechanical process), which will inevitably increase the number of MCQs to be administered.

While the 2016 large-scale implementation of the NIER Test Item Bank tests posed many challenges, it has unmistakably led the engineering team to reach a deeper and more substantive understanding of the learning outcomes that we are trying to help our students achieve, as well as a more critical understanding of the complexities of assessment. Preliminary analysis of the test results has invited faculty to engage in discussion about the students' curricular and extra-curricular educational experiences that may affect the achievement of learning outcomes. The experience of Japanese and Indonesian engineering faculty members engaged in the NIER Test Item Bank project is indeed proof of how learning outcomes assessment can effectively facilitate learning outcomes-based education.

In the 2017 large-scale implementation, scheduled for this winter will involve 15 MCQs and one CRT, the "new machine tools" item, revised based on lessons learnt from the 2016 implementation. We anticipate to further deepen our understanding of engineering learning outcomes and to upgrade our expertise in test item development.

As the test item bank continues to grow, and more quality MCQs and CRTs that allow meaningful analysis and feedback are made available to a wider community of engineering faculty not only in Japan and Indonesia but throughout East Asia and beyond, we aspire to make the "shift of paradigm" amongst faculty and students, the critical actors of a learning outcomes-based education.

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An examination of the relationship between competences and wages of higher education graduates: Evidence from Morocco*

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Abstract: To provide research insights in line with the Tuning project approach, we estimate the effects of competences on wages of higher education graduates with work experience. Using the conventional earnings regressions methods (Mincer equation) on data from a survey of graduates, we investigate the way in which the labour market reacts and rewards competences. The results show small significant evidence for an effect of competences on wages in our dataset; however, methodological and social skills display positive payoff returns. Our empirical findings also suggest that the labour market rewards less specialised competences, and unlikely methodological and social competences are deemed more necessary compared to cognitive skills (theoretical knowledge). Finally, wages tend to decrease for those who are female and working in the private sector. Overall, the findings of the study are highly related to the specification and structure of the Moroccan labour markets.

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Keywords: Tuning approach; competences and skills; Mincer equation; Higher education; Human capital; wages; labour market.

I. Introduction

Many economists and sociologists in the modern economy have argued that competences of the labour force are becoming more relevant in obtaining higher wages. Recent studies have found evidence of the labour economy trend moving into competence-based roles, and there are an increasing the number of people with higher levels of education and more skilled occupations in the labour force.[1] In developed economies, the knowledge economy is shifting labour market demands for competences, providing a key engine for economic growth.[2] Although there is strong agreement on that, there is far less consensus on the kinds of competences most likely needed through the effect of technological change. In that context, developing countries, particularly African countries, must show commitment towards and be prepared for the knowledge economy transition. This is an important challenge facing Africans in higher education institutions and policymakers. Fortunately, the Tuning Africa project[3] is the first to address those challenges by implementing the competence-based approach in different universities, which shows the commitment of Africans universities to build best competences quality needed in the labour market.

The main goal of this study is to examine the kinds of competences that lead to high, medium or low wages. It is interesting to investigate how different competences performed by higher education graduates are evaluated in the Moroccan labour market. No study on this topic has been carried out yet in the country. The core question that we attempt to address using graduates' self-assessment on competences required in their current work is as follows: "Which competences of graduates are most important to the labour market in explaining income differences?" We also investigate the hypothesis that generic or specific competences of graduates are the key determinants of all levels of wages in more competitive markets compared to

[1] Francis Green, *Skills and Skilled Work : An Economic and Social Analysis*, 1st ed. (Oxford University Press, 2013): 58.

[2] Barbara Sianesi and John V. Reenen, "The Returns to Education: Macroeconomics," *Journal of Economic Surveys* 17, no. 2 (April 2003): 157–200, https://doi:10.1111/1467-6419.00192.

[3] The description and more information on Tuning Africa project can be found at the website <http://tuningafrica.org/en/#>.

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less competitive ones. Moreover, we focus on the economic returns across different fields of study (economics, accounting, engineering, etc.) of higher education graduates. We challenge the standard arguments by using a new dataset from a survey on the employability of higher education graduates in a Moroccan university.

A long debate in the literature emerged over the effect of competences on wages in labour markets. The fundamental well-known human capital theory[4],[5] became the backbone of a scientific pattern that attempted to give an explanation for the relationship that exists between level of competences and wages. We were inspired by the work of Green et al.,[6] using a model where competences are essentially divided into either generic or specific. In addition to this model, we attempt to adapt the Mincer equation to the Green model, which provides an estimation of the average payoff returns of two categories of competences through wages.

The first step is the identification of competences that are more relevant to graduates.[7] To do that, we use data from the Longitudinal Graduates' Employability Survey, which was completed by 1,177 graduates of the cohorts 2011/2012 to 2013/2014. The survey is carried out each year by the University Hassan 1st in partnership with the Moroccan Superior Council of Education. The survey gathers information on many aspects, including the level and kinds of competences and wages of graduates three years after graduation. Our analysis is based on the self-assessment of competences by these graduates. The concept of competences used in the survey is specified through two main elements: generic competences (general knowledge: cross-disciplinary knowledge, critical thinking) composed of motivations, methodological skills and social skills; the second is on specific competences (field-specific: theoretical knowledge, knowledge of methods). The following appropriate model was used: conventional ordinary least square (OLS) regression model containing indicators of wages level and competences, with

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[4] Jacob Mincer, and Solomon Polachek, "Family Investment in Human Capital: Earnings of Women," *Journal of Political Economy* 82, no. 2 (1974): 76–110, https://doi.org/10.1086/260293.

[5] Gary S. Becker, *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*, 2ed ed. (New York: National Bureau of Economic Research, 1964): 45.

[6] Francis Green, "The Value of Skills" (Department of Economics Discussion Paper, no. 9819, University of Kent,,1998): 15, http://hdl.handle.net/10419/105517.

[7] Busato V. Vittorio et al., "Intellectual Ability, Learning Style, Personality, Achievement Motivation and Academic Success of Psychology Students in Higher Education," *Personality and Individual Differences* 29, no. 6 (2000): 68, https://doi:10.1016/S0191-8869(99)00253-6.

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control variables, such as personal characteristics, occupation characteristics, fields of study, and dummies variables on each institution of the university.

According to our results, we find some evidence in favour of a positive effect of generic competences and methodological skills on wages, with specialised competences having a less important effect. However, education returns (monetary payoff) and work experience seem to correspond with increasing income. We also show that females earn much lower wages than males. These results are very sensitive to the assessment method used in the survey (self-assessment). We consider that self-assessment of graduates' competences (also considered as employees) can lead to biased measures in a certain way, especially for the competences related directly to their work or tasks. On the other side, the employers' assessment can also be biased because they cannot assess graduates' competences that are unrelated to the work (in most cases). Only graduates can provide unbiased measures of these non-work-related competences. This situation suggests that the study should also take into account the employers' assessment of graduates' competences and combine both assessments to achieve a better competences evaluation.[8]

The paper is organised as follows: the next section (2) provides the theoretical approach to the linkage between wages and competences, focusing on the Mincer equation. Section (3) describes data sources and outlines estimation methods. Section (4) presents the results for the estimation model. Finally, section (5) summarises and provides policy implications.

II. **Competences and wages: related literature**

II.1. *Theoretical approach: theory of human capital*

The competences and wages in labour markets have been widely debated, as many empirical studies find different and sometimes conflicting results. The theoretical literature itself prescribes different effects that competences have on the wages of higher education graduates. The theoretical difference is related to various studies with different backgrounds; for instance, psychologists, sociologists and the human capital theory view competences in different ways. In particular, we focus our attention on the human capital theory, which treats competences as personal attributes leading to the ability to successfully perform the job requirements.

[8] The start of the survey, the study was generally on the graduates, and unfortunately there wasn't any budget to pursue other targets.

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Becker[9] and Mincer[10] found that the degree of competences has a significant effect on wages and earnings. Thus, competences are essentially divided into either general or specific. Becker and Mincer argued that higher levels of education correlate with higher return earnings. The first formulation was made by Mincer: a framework model that clearly associates income (or wages) and years of education and experience. The model takes a standard specification form as follows:

$$\ln(w_i) = \alpha_0 + \beta_1 educ_i + \beta_2 exp_i + \beta_3 exp_i^2 + \varepsilon_i, \quad (1)$$

where $ln(w_i)$ represents the logarithm of wages including bonuses of the individual $\boldsymbol{i}$, $educ_i$ is years of education, exp_i is years of work experience (measured in years), and ε_i is the error term. The development of this research later focused on different types of skills and competences that impact wages.[11]

Several studies included competence variables in the Mincer equation to measure both the effect of education and competences or skills, particularly after the increased enrolment in higher education, which raised doubt about possible negative effects of the overeducation on wages.[12], [13],[14] Higher education graduates are facing critical changes in the labour market; years of education undertaken are no longer enough to find a job matching their degree (and in term of wages). Indeed, general and specific competences are the key element for productivity and professional success for graduates.[15] The empirical relation between skills and wages can be expressed by Mincerian wage equation as follows:

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[9] Becker, *Human Capital*, 45.

[10] Mincer, and Polachek, "Family Investment in Human Capital: Earnings of Women," 76–110.

[11] Francis Green and Nicholas Tsitsianis, "Can the Changing Nature of Jobs Account for National Trends in Job Satisfaction?," *British Journal of Industrial Relations* 43, no. 3 (2005): 29.

[12] Richard B. Freeman, *The Overeducated American*, no 186 (New York: Academic Press, 1976), 120.

[13] Rumberger W. Russell, "The Rising Incidence of Overeducation in the U.S. Labor Market," *Economics of Education Review* 1, no. 3 (June 1981): 296–297, https://doi:10.1016/0272-7757(81)90001-7.

[14] David B. Bills, "Credentials, Signals, and Screens: Explaining the Relationship between Schooling and Job Assignment," *Review of Educational Research* 73, no. 4 (2003): 449, https://www.jstor.org/stable/3515999?seq=1#page_scan_tab_contents.

[15] Rolf D. Velden, and Ineke Bijlsma, "College Wage Premiums and Skills : A Cross-Country Analysis," *Oxford Review of Economic Policy* 32, no. 4 (2016): 507, https://doi:10.1093/oxrep/grw027.

$$\ln(w_i) = \alpha_0 + \beta_1 educ_i + \beta_2 exp_i + \beta_3 exp_i^2 + \beta_4 com_{i1} \ldots \ldots + \beta_n com_{in} + \varepsilon_i, \qquad (2)$$

The specification includes a measure of *n* competences (com_{in}) to identify which competences are most valuable in monetary payoff terms. We contribute to this literature, which has mostly focused on developed countries[16], [17], [18], [19] by estimating the impact of competences on wages of higher education graduates – an issue that, to the best of our knowledge, has not yet been investigated thoroughly in the case of Morocco.

II.2. *Categories of competences in the literature*

Our analysis is related to various other studies on how human capital skills and competences are rewarded in the labour market.[20],[21] In particular, Becker[22] classified competences into specific to generic competences required from the firm (well-known as "*Becker's classification*"). Green[23] examined the impact of different competences on wages using a principal component analysis, identifying groups of competences such as verbal, manual, problem solving and checking, numerical, and professional communication. Escrig and Bou[24] highlighted that competences can be

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[16] Authors used the dataset from Program of the International Assessment of Adult Competencies (PIAAC) developed by OECD to assess the effect of skills on wages. OECD, *OECD Skills Outlook 2013: First Results from the Survey of Adult Skills* (OECD Publishing, 2013), 141-77, http://dx.doi.org/10.1787/9789264204256-en.

[17] Green, "The Value of Skills," 15.

[18] Mark Levels, Rolf D. Velden, and Jim Allen, "Educational Mismatches and Skills: New Empirical Tests of Old Hypotheses," *Oxford Economic Papers* 66, no. 4 (October 2014): 976, https://doi:10.1093/oep/gpu024.

[19] Eric A. Hanushek et al., "Returns to Skills around the World: Evidence from PIAAC," *European Economic Review* 73 (January 2015): 120–124, https://doi:10.1016/j.euroecorev.2014.10.006.

[20] Richard Arum and Yossi Shavit, "Secondary Vocational Education and the Transition from School to Work," *Sociology of Education* 68, no. 3 (July 1995): 187, https://doi:10.2307/2112684.

[21] Dominique S. Rychen and Laura H. Salganik, *Key Competencies for a Successful Life and a Well-Functioning Society* (Hogrefe & Huber, 2003): 180, https://books.google.co.ma/books?id=GK63AAAAIAAJ.

[22] Becker, *Human Capital*, 65.

[23] Francis Green, *Skills and Skilled Work*, 25.

[24] Escrig-Tena A. B, and Bou-Llusar J. C., "A Model for Evaluating Organizational Competencies: An Application in the Context of a Quality Management Initiative," *Decision Sciences* 36, no. 2 (May 2005): 248, https://doi:10.1111/j.1540-5414.2005.00072.x.

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empirically classified into four main clusters; the researchers assembled competences into categories, which simplify the estimation of the impact of competences. The categories were managerial, input-based, transformation-based, and output-based, and we find that cognitive competences and general knowledge tend to accelerate the process of acquisition of target competences.

Kellermann[25] showed that competences are listed in five dimensions that are required for productivity at work: (1) general-academic, (2) scientific-operative, (3) personal-professional, (4) social-reflexive, and (5) physiological-handicraft. Aracil and Velden[26] distinguished the competences into six categories using principal components analysis (PCA) for 32 listed competences. The six factors were labelled by organisational, specialised, methodological, generic, participative, and socio-emotional competences. All things considered, it seems reasonable to assume that in theory, there is no overall consensus on the classification of competences. Therefore, available data are used to determine the categories of competences in each study.

Inspired by the literature on the classification of competences above and the available data in our sample, we categorise the 19 competences (based on the literature and the context of Moroccan labour markets) cited in our survey into 3 main categories. It is a common practice to remove the problem of multicollinearity among competences. Table (1) gives an overview of the competences aggregated in categories.

Table 1

Classification of competences

Categories	List of Competences
Generic	Knowledge Cross fields and discipline
	Critical and reflective thinking
	Communication skills
	Coordinating and planning
	Written communications skills

[25] Kellermann Paul, "Acquired Competences and Job Requirements," in *Careers of University Graduates*, ed. Springer, Dordrech (U. Teichler, vol 17, 2007), 120-23.

[26] Adela G. Aracil and Rolf D. Velden, "Competencies for Young European Higher Education Graduates: Labor Market Mismatches and Their Payoffs," *Higher Education* 55, no. 2 (2008): 229, https: doi:10.1007/s10734-006-9050-4.

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Categories	List of Competences
Methodological skills	Adaptability
	Performs well under pressure
	Time management
	Computer skills
	Problem-solving ability
	Documenting ideas or reporting to an audience
	Foreign language proficiency
Social skills	Leadership
	Ability to negotiate
	Working in a team
	Ability to mobilise the capacities of others
Specialised	Own field or discipline (theoretical knowledge)
	Own field or discipline (knowledge of methods)
	Learning abilities- Methods

Source: Authors.

III. **Data and methodology**

In this section, we briefly describe the data we used and the broad steps of our estimation method. Readers interested in the complete details of our estimations are referred to the extensive appendices at the end of the paper. Our data were obtained from the Longitudinal Graduates' Employability Survey,[27] which was carried out each year by the University Hassan I in partnership with the Moroccan Superior Council of Education. Each subsequent year since 2012, the cohort graduates from 2010/2011, 2012/2013, and 2014/2015 were surveyed 3 years after their graduation. We excluded graduates without working experience from this dataset since we are focusing only on competences and wages. Table (2) provides summary statistics for the competences listed in the previous table (1) of 1,177 graduates with paid

[27] Annex A provides information on the size of the sample in each survey.

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work experience. Graduates were asked to assess their competences on a ranking scale from 1 (very low) to 4 (very high).

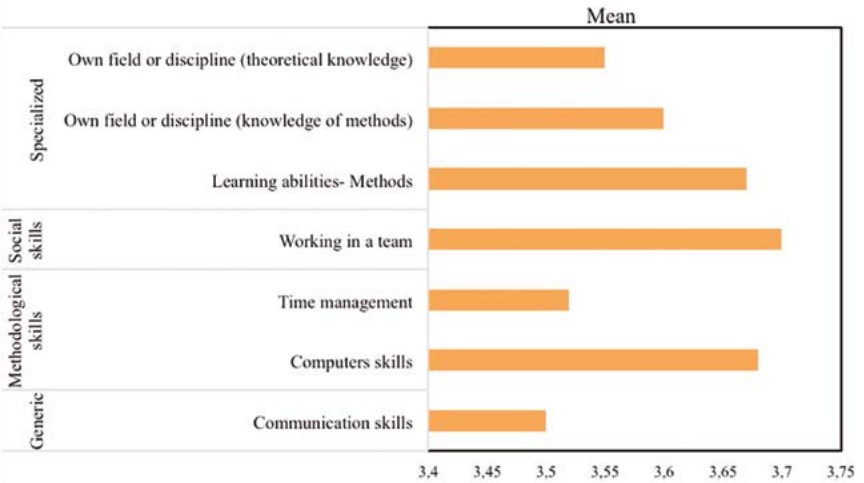
Table 2

Descriptive statistics

Categories	List of Competences	Mean	Standard deviation
Generic	Knowledge cross fields and discipline	3.27	0.69
	Critical and reflective thinking	3.29	0.77
	Communication skills	3.50	0.72
	Coordinating and planning	3.49	0.71
	Written communications skills	3.45	0.75
Methodological skills	Adaptability	3.13	0.85
	Performs well under pressure	3.44	0.72
	Time management	3.52	0.65
	Computer skills	3.68	0.62
	Problem-solving ability	3.46	0.71
	Documenting ideas or reporting to an audience	3.38	0.78
	Foreign language proficiency	3.35	0.72
Social skills	Leadership	3.28	0.76
	Ability to negotiate	3.28	0.80
	Working in a team	3.70	0.59
	Ability to mobilise the capacities of others	3.29	0.81
Specialised	Own field or discipline (theoretical knowledge)	3.55	0.62
	Own field or discipline (knowledge of methods)	3.60	0.61
	Learning abilities- Methods	3.67	0.60

Source: Authors' estimations.

The mean test of competence categories shows that three specialised competences scored more than 3.5, a high value, which represent those competences for higher education graduates. However, generic competences appear with one competence scoring more than the previous average score. Methodological competences have just two competences greater than 3.5. The only elements among social competences scored more than a mean of 3.5 was working in a team. The resulting values are displayed in figure (1).



Source: Authors' estimations.

Figure 1

Competences classification by mean score

Since many conventional studies on competences using regression models revealed the existence of the multicollinearity problem[28] among competences[29]; [30]; [31], we applied a factor analysis to the 19 competences, and

[28] Strong multicollinearity may generate misleading inferences, especially in the interpretation of coefficients of the model.

[29] Green, "The Value of Skills," 25.

[30] Levels, Velden, and Allen, "Educational Mismatches and Skills," 973.

[31] Andrés F. García-suaza, Juan C. Guataquí, and José Alberto, "Beyond the Mincer Equation : The Internal Rate of Return to Higher Education in Colombia," *Education Economics* 22, no. 3 (2014): 337, https://doi:10.1080/09645292.2011.595579.

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we used the orthogonal factor scores which are uncorrelated (for a detailed description, see Annexes table B and C). As noted before, economists have no consensus theory for evaluating monetary payoff effects of competences, leaving the question open for empirical study. To assess the empirical effects, we need control variables, such as personal characteristics, occupation characteristics, fields of study, and dummy variables on each institution of the university. The choice of those control variables in our regression is based on human capital theory and most commonly used in empirical regressions. The employed control variables are described below with their meanings and statistics (Table 3).

Table 3

Control variables and summary statistics

Variables	Description	Mean	St. Dev	Min	Max
Wages	Logarithm of salary	5891.84	85.27	400	28800
Personal characteristics					
Female	1: if female. and 0 otherwise	44.01%	—	0	1
Married	1: if married. and 0 otherwise	23.36%	—	0	1
Age	In years	29.91	0.19	19	58
Education	Number of years in higher education	3.86	1.11	2	9
Occupation characteristics					
Experience work	Work experience in years	2.14	1.12	0.08	4.33
Private sector	1: employed in the private sector	65.25%	—	0	1
Public sector	1: employed public sector	34.75%	—	0	1
City	1: large city. and 0 otherwise	78.75%	—	0	1
Major field					
Social science. business and law	1: graduate in the field. and 0 otherwise	58.62%	—	0	1
Science & engineering	1: graduate in field. and 0 otherwise	41.37%	—	0	1

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Variables	Description	Mean	St. Dev	Min	Max
Institutions characteristics					
Open institutions	1: open access. and 0 otherwise	48.08%	—	0	1
Limited entry institution	1: limited access. and 0 otherwise	51.91%	—	0	1
Observations	1,177 with work experience	—	—	—	—

Source: Authors' estimations.

We add the initial (log) level of the wages to be in line with the linearity assumption of Mincer's equation. The list of dependent variables containing indicators on control variables for personal characteristics, job characteristics, major field of study, occupation in own domain, and for the distinction between university institutions (limited or open access).

IV. **Model and estimation results**

IV.1. *Model*

In this section, we develop a model using ordinary least squares (OLS) regression to analyse the effects of competences and other variables on wages of higher education graduates. To do that, we adopt an extended version of the Mincer equation developed in the literature section. The dependent variables listed in Table (3) are used in the following equation estimation:

$$\ln(W_i) = \alpha_0 + \beta_1 Educ_i + \beta_2 Exp_i + \beta_n \sum_{F=1}^{9} Com_{in} + \\ + \beta_3 Pel_i + \beta_4 Job_i + \beta_5 Field_i + \beta_6 Insti_i + \varepsilon_i, \quad (3)$$

We use the 9 factors scores generated by the PCA results for competence variables Com_{in}. $Educ_i$ and Exp_i denote education and work experience in years, respectively. The rest of the variables are binary dummies controlling for personnel and occupation characteristics, and institutions attended. As outlined in the introduction, we formulate some questions on competences and wages for higher education graduates, and

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in the line with human capital theory, we would expect the responses of the coefficients to be those shown in table (4).

Table 4

Expected and estimated responses of model

Variables	Expected responses	Estimated responses
Competences	(+)	(+)
Education	(+)	(+)
Field (Social vs science)	?	(+)
Experience	(+)	(+)
Female	(-)	(-)
Private vs Public	(-)	(-)
Open vs limited institutions	(-)	(-)
Married	?	No effect
Age	(+)	No effect
City (large vs small)	**(+)**	**No effect**

Additionally, we expect the wages to be driven by competences; thus, we assume the following hypotheses. (*H1*) The wages are partly explained by the higher proficiency in specified competences of higher-educated graduates compared to generic competences. (*H2*) Sector differences in wages are partly explained by differences in labour market institutions: wages are higher in the public sector than in the private sector. (*H3*) Wages are partly explained by personal characteristics and the types of institutions (graduates of limited institutions tend to have higher wages than those from open institutions).

IV.2. *Empirical findings*

Table (5) presents the estimation results of the Mincer wage equation. For each model, we provide two sets of results: one for the model (I) with all variables, and the other (II) is where we keep the variables with significant variables. The estimation results are consistent with some previous studies exploring the relationships among wages, education and experience.

Table 5
Estimation of wages equation

Variables	Model I	Model II		Model I	Model II
F1	0.02896*** (0.0001)	0.03073** (0.0001)	ddl	1158	1158
F2	0.02811* (0.0183)	0.030** (0.0115)	R^2 adjusted	0.25	0.2575
F3	0.01218 (0.3206)		MCE	0.205	0.2050
F4	0.00038 (0.9764)		RMCE	0.4542	0.4528
F5	0.0033 (0.8048)		DW	1.8462	1.8423
F6	-0.01675 (0.2441)				
F7	0.0136* (0.0840)	0.01570* (0.0830)			
F8	-0.01441 (0.3569)				
F9	0.02946* (0.0634)	0.030*** (0.054)			
Education	0.12030*** (0.0001)	0.1491*** (0.0001)			
Age	0.000843 (0.7054)				
Experience work	0.07644*** (0.0001)	0.0842*** (0.0001)			
Female	-0.10724*** (0.0001)	-0.0935*** (0.0001)			
Married	0.01950 (0.5956)				
Private vs Public	-0.15174*** (0.0001)	-0.1087*** (0.0001)			

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Variables	Model I	Model II		Model I	Model II
City	0.04481 (0.18165)				
Field (Social vs science)	0.12453*** (0.0002)	0.12453*** (0.0002)			
Institutions (open vs limited)	-0.17023*** (0.0001)	-0.17023*** (0.0001)			
Constant	8.0157*** (0.0001)	7.9097*** (0.0001)			
Observations	1,177	1,177			
R-squared	0.2675	0.2675			

Notes: The dependent variable is the *log* of month salary including bonuses. The first Model I contain all listed explanatory variables. The second Model II contain only significant variables from the first model I. The *P*-values are in parentheses. * p < 0.1. ** p < 0.05. *** p < 0.01.

Source: Authors' estimations.

We find a weak significant effect of some competences on wages among higher education graduates; however, the model shows that 12 out of 19 competences have a positive impact. Those competences are as follows:

– (*Specialised*)
  Learning abilities
– (*Generic*)
  Critical and reflective thinking
  Written communications skills
  Coordinating and planning
– (*Methodological skills*)
  Computer skills
  Adaptability
  Documenting ideas or reporting to an audience
  Foreign language proficiency
  Performs well under pressure
– (*Social skills*)
  Ability to negotiate
  Leadership
  Ability to mobilise the capacities of others

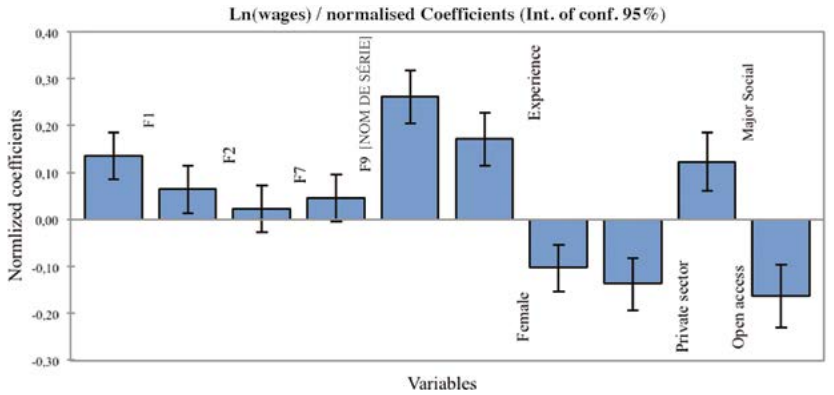
Table 6

Coefficients of competencies in the model

Categories	Competences	Model II	P-values
Specialised	Learning abilities- Methods	0.03073**	(0.0001)
Generic	Critical and reflective thinking	0.03073**	(0.0001)
	Coordinating and planning	0.03073**	(0.0001)
	Written communications skills	0.030**	(0.0115)
Methodological skills	Adaptability	0.03073**	(0.0001)
	Documenting ideas	0.030**	(0.0115)
	Foreign language proficiency	0.030**	(0.0115)
	Computer skills	0.01570*	(0.0830)
	Performs well under pressure	0.030***	(0.054)
Social skills	Ability to negotiate	0.01570*	(0.0830)
	Leadership	0.030***	(0.054)
	Ability to mobilise capacities of others	0.030***	(0.054)
Observations			1,177
R-squared			0.2675

Notes: The dependent variable is the log of month salary including bonuses. The second Model II contain only significant variables from the first model I. *P*-values are in parentheses. * p < 0.1. ** p < 0.05. *** p < 0.01.

Source: Authors' estimations.



Source: Authors' estimations.

Figure 2

Estimated coefficients of the model

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According to the results of table (6), we could accept hypothesis (*H1*); thus, the generic competences are more important in explaining the wages variance in our sample, leading us to reject (*H1*). As expected, the (*H2*) is valid, which means that graduates working in the private sector are rewarded less compared to those in the public sector. We conclude that working in the private sector can adversely affect wages. The estimations show a good validation of (*H3*), even though the social field was expected to have a negative effect. Based on these outcomes, we can highlight that our results show a similar negative effect for female graduates as shown in other studies.[32],,[33],,[34] Figure (2) allows us to directly compare the relative influence and significance of the explanatory variables on the wages.

V. **Concluding remarks**

In this paper, we analyse the empirical relationship between competences and wages of higher education graduates. Using survey data from the University Hassan I, we find some evidence supporting a positive effect of generic competences and methodological skills, with the less important effect of specialised competences. This result can lead to some questions regarding the assessment method. By contrast, personal and job characteristics lead to a closer expected effect.

Nevertheless, it suffers from the problem measurement of competences, because the empirical model shows that the variation in low wages can be explained by the competences, which are scored on a scale from low to high. This problem occurs when graduates give an arbitrary choice of three to four modalities. In this context, the measurement scale developed in many studies report a low coefficient of determination (R^2=0.27). In this sense, the recommendation for further empirical studies, especially at the moment of the elaboration of the survey, is to use a simple scale percentage measurement instrument instead of modalities to assess competences among graduates. This method will enable us to have a more accurate measurement instrument, but these results were very sensitive to the

[32] Garcia, Guataquí, and Alberto, "Beyond the Mincer Equation," 229.

[33] Paul Koshy, Richard Seymour, and Mike Dockery, "Are There Institutional Differences in the Earnings of Australian Higher Education Graduates ?," *Economic Analysis and Policy* 51 (2016): 08, https://doi:10.1016/j.eap.2016.05.004.

[34] Hanol Lee, Jong-wha Lee, and Eunbi Song, "Effects of Educational Mistmatch on Wages in the Korean Labor Market," *East Asian Economic Association and John Wiley & Sons Australia*, 30, no. 4, (2016): 381–390.

assessment method used to measure competences in the survey (self-assessment).

We suggest that the reason behind the low values of competence coefficients is that the labour market of the study has not yet been polled using these levels of competence; in contrast, the market is still dominated by education and work experience factors. We also showed that females earn far less than males in term of wages. Our empirical findings also suggest that the labour market rewards less specialised competences than other competencies; this finding provides a valuable insight and indicates that we should continue to study such results.

Many African academics and policymakers remain ambiguous about graduate competences and skills that match well with labour market requirements. We aimed to develop assessments and indicators of competences that would have an influence in the labour market and provide baseline information needs in terms of knowledge, skills and competences for policymakers. Our Mincerian model results can help practitioners and policy-makers to make better decisions. For instance, the private sector appears to attribute fewer rewards to graduates' competences than the public sector is doing. Additionally, the study reports the existence of a gap in wages between female and male graduates. Hence, policymakers need to make more efforts to ensure equal wages for both genders.

The dynamic of the labour market and the overeducation effect have to change the traditional situation into a new one, in which methodological and social competences are deemed more necessary than cognitive skills (theoretical knowledge). This finding prompted a re-thinking of key competences and skills required of higher education graduates.[35]

Finally, our study is far from being free of limitations. We have attempted to reduce the limitations in our empirical analysis; however, additional questions still remain unsolved and should therefore be addressed in future research. For example, our study relies on graduates' assessment of competences. It would be interesting to replicate this research by exploring the competences required by employers and analysing the causal effects of both acquired and required competences.

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[35] This results are in line with the findings reported in a recent study of the Hamilton project: Diane Whitmore Schanzenbach et al., 2017. 'Seven Facts on Noncognitive Skills from Education to the Labour Market'. It is in fact a new evolution: while cognitive skills (like English or mathematics) have long been used to match job requirements, the non-cognitive skills (communication, teamwork, leadership, self-motivated, etc.) are becoming increasingly important and more integral to the labour market.

<http://www.hamiltonproject.org/assets/files/seven_facts_noncognitive_skills_education_labor_market.pdf>

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Annexes

A) *Choice of the theoretical survey sample*

To ensure a better representation of the sample, we determined the size by the following formula:

$$n = \frac{Z^2 \quad P(1-P)}{\alpha^2}$$

where Z (= 1.96) represents the value of Gauss law with a confident level of 95%, α is the sampling error (5%) and P represents the probability of achievement of the measured variable "unemployment rate". After five surveys conducted each year since 2012, we choose graduates with work experience among all five surveys to have in total 1,177 graduates in our study.

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B) *Rotated factor matrix*

Competences	F1	F2	F3	F4	F5	F6	F7	F8	F9
Own field or discipline (theoretical knowledge)	0.2236	0.0531	0.0035	0.2258	0.4930	0.0784	0.2702	0.1450	0.3314
Own field or discipline (knowledge of methods)	0.2464	0.1065	-0.1281	-0.0116	0.3919	-0.2071	-0.0645	-0.3785	-0.0688
Leadership	0.2092	-0.3075	-0.1644	-0.2955	-0.0158	-0.2054	-0.0218	-0.3665	0.2714
Knowledge cross fields and discipline	0.1977	-0.1872	-0.1324	-0.2789	0.2827	-0.2462	0.2585	0.6580	0.2679
Learning abilities	0.2540	0.0621	-0.1628	-0.0318	0.2003	0.0988	0.0254	0.2236	-0.1075
Ability of negotiating	0.2101	-0.2236	-0.2010	0.1670	-0.2794	-0.3013	0.5277	-0.1314	-0.3040
Computer skills	0.1975	0.2388	-0.0769	0.3471	0.2836	0.3570	0.4717	-0.0669	0.1417
Problem—solving ability	0.2594	0.1333	-0.3011	0.2771	-0.0147	0.1899	-0.1387	-0.0317	0.1381
Critical and reflective thinking	0.2643	0.0142	-0.2467	0.2361	-0.1260	0.0512	-0.4319	0.1789	0.0256
Adaptability	0.2381	-0.1022	-0.3246	0.2318	-0.2919	-0.2157	-0.1576	0.0907	-0.1194
Performs well under pressure	0.1466	-0.1605	0.4282	0.4360	0.0919	-0.3348	-0.1420	-0.1212	0.4665
Time management	0.1865	-0.2817	0.4365	0.2053	0.1565	-0.0734	0.0852	0.0907	-0.2346

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Competences	F1	F2	F3	F4	F5	F6	F7	F8	F9
Working in a team	0.2261	-0.2107	0.3013	0.1323	-0.0228	0.2968	-0.1359	0.2289	-0.2594
Ability to mobilize the capacities of others	0.2417	-0.2262	0.0873	-0.3038	-0.2086	0.2913	-0.0481	-0.0521	0.3016
Communication skills	0.2547	-0.1763	-0.0041	-0.1448	-0.0738	0.3503	-0.0308	-0.0938	0.1272
Coordinating and planning	0.2591	-0.0776	0.1715	-0.1740	-0.1358	0.2160	0.1848	-0.2117	-0.2046
Documenting ideas or reporting to an audience	0.2514	0.3174	0.2041	-0.1686	-0.2965	-0.2040	-0.0318	0.0461	-0.1315
Written communications skills	0.2462	0.4185	0.2093	-0.1528	-0.1545	-0.1787	-0.0665	0.1393	-0.0462
Foreign language proficiency	0.2081	0.4509	0.1490	-0.0549	-0.1031	-0.0395	0.1856	-0.0469	0.2715

Source: Authors' estimations.

C) *Overall variance by factors*

	F1	F2	F3	F4	F5	F6	F7	F8	F9
Eigenvalue	6.0226	1.3248	1.1695	1.0933	0.9859	0.8745	0.7585	0.7223	0.7121
Variance (%)	31.6979	6.9729	6.1554	5.7544	5.1889	4.6028	3.9921	3.8017	3.7477
% Overall variance	31.6979	38.6708	44.8261	50.5806	55.7694	60.3722	64.3644	68.1661	71.9138

Source: Authors' estimations.

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D) *Factors and their corresponding competences*

Factor	Competences			
F1	Learning abilities	Critical and reflective thinking	Adaptability	Coordinating and planning
F2	Documenting ideas or reporting to an audience	Written communications skills	Foreign language proficiency	
F3	Time management	Working in a team		
F4	Problem-solving ability			
F5	Own field or discipline (theoretical knowledge)	Own field or discipline (knowledge of methods)		
F6	Communication skills			
F7	Ability to negotiate	Computer skills		
F8	Knowledge cross fields and discipline			
F9	Leadership	Performs well under pressure	Ability to mobilise the capacities of others	

Source: Authors' estimations.

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E) *Summary statistics (variables of the model)*

Variable	Observations	Min	Max	Mean	St. Dev
Ln(wages)	1,177	5.99	10.27	8.55	0.52
F1	1,177	-15.10	3.36	0	2.45
F2	1,177	-4.80	4.29	0	1.15
F3	1,177	-6.82	4.77	0	1.08
F4	1,177	-4.08	3.80	0	1.05
F5	1,177	-5.13	3.82	0	0.99
F6	1,177	-3.60	3.27	0	0.94
F7	1,177	-3.79	3.04	0	0.87
F8	1,177	-3.04	4.08	0	0.85
F9	1,177	-3.99	3.57	0	0.84
Education in years	1,177	2.00	9.00	3.87	1.11
Age	1,177	19.00	58.00	29.91	6.47
Experience years	1,177	0.08	4.33	2.15	1.12
Female	1,177	0	1	0.44	0.50
Married	1,177	0	1	0.23	0.42
Private sector	1,177	0	1	0.65	0.48
City work	1,177	0	1	0.79	0.41
Major Social	1,177	0	1	0.59	0.49
Open access	1,177	0	1	0.48	0.50

Source: Authors' estimations.

F) *Coloration matrix (Pearson (n))*

Variables	Ln(wi)	F1	F2	F3	F4	F5	F6	F7	F8	F9	Edu	Age	Exp	Female	Married	Private sector	City	Major Social	Open access
Ln(wages)	**1**																		
F1	0,22	**1**																	
F2	0,08	0,00	**1**																
F3	0,01	0,00	0,00	**1**															
F4	0,00	0,00	0,00	0,00	**1**														
F5	0,01	0,00	0,00	0,00	0,00	**1**													
F6	-0,08	0,00	0,00	0,00	0,00	0,00	**1**												
F7	0,02	0,00	0,00	0,00	0,00	0,00	0,00	**1**											
F8	-0,03	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**1**										
F9	0,04	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	**1**									
Edu	0,40	0,16	0,14	-0,01	0,06	0,03	-0,06	0,00	-0,01	0,02	**1**								
Age	0,12	0,07	-0,05	-0,07	-0,06	0,00	-0,11	-0,07	0,08	-0,07	0,11	**1**							
Exp	0,31	0,14	-0,08	-0,01	-0,07	-0,03	-0,09	0,02	-0,02	-0,05	0,26	0,23	**1**						
Female	-0,13	-0,01	0,01	0,03	0,01	0,03	0,04	0,02	0,00	-0,05	-0,06	-0,12	-0,07	**1**					
Married	0,19	0,15	-0,04	0,00	-0,11	0,00	-0,06	0,00	0,04	-0,06	0,18	0,31	0,43	-0,04	**1**				
Private sector	-0,15	-0,05	0,14	0,04	0,21	0,01	0,07	0,09	-0,03	0,08	0,01	-0,27	-0,33	0,03	-0,34	**1**			
City	0,09	0,01	0,11	-0,03	0,05	0,01	-0,04	0,02	-0,05	-0,01	0,15	-0,02	0,01	0,00	-0,01	0,17	**1**		
Major Social	0,11	0,03	-0,13	-0,01	-0,03	-0,07	-0,13	-0,05	0,02	-0,11	0,09	0,14	0,26	0,05	0,15	-0,13	0,06	**1**	
Open access	-0,13	-0,07	-0,18	0,01	-0,17	-0,07	-0,10	-0,08	0,04	-0,11	-0,27	0,15	0,14	-0,03	0,15	-0,32	-0,12	0,53	**1**

Source: Authors' estimations.

Impact of competence-based training on employability of Technical and Vocational graduates in Ethiopia

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Abstract: The purpose of this study is to critically examine the impact of competence based training on employability of technical and vocational college graduates in Ethiopia. Mixed methods of research design, predominantly concurrent nested strategy were employed to conduct the study. The study involved 162 instructors, 123 Level III automotive technology trainees, 87 department heads and 89 graduates, a total of 461 respondents as a sample. Moreover, 24 respondents (6 industry owners, 6 TVET college deans, 6 competence-based process owners and 6 industry trainers' leaders) were purposely selected for interview and focus group discussion. Under the study, the researcher used employability of graduates as dependent variable and competency based training as independent variable. Descriptive and inferential statistics were employed for data analysis. The study result showed that technical and vocational education and training (TVET) colleges in Ethiopia have been performing below expectations in developing demand-based curriculum and implementing competence-based training in TVET colleges and industries. As a result, among the graduates nearly 50 percent are not employed in the past two years. Hence, it is recommended that constantly consulting and involving relevant stakeholders in setting study profile, identifying intended learning outcomes and strengthening competence based learning style are vital for graduates to demonstrate employability skill, knowledge and attitude into the job that consequentially lead to graduate employment.

Keywords: Impact; competences; employability; employment; graduates; training; TVET.

I. Introduction

The concept of competence has a wide variety of meanings. Such perception has been changing overtime depending on the developments in

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the society and changes in contents of schooling. Accordingly, different authorities explained the meaning of competence from different perspectives. For instance, Colline, explains competence as it is a learning outcome that enables graduates to perform activities to the set standards required in employment, using appropriate mix of knowledge, skills and attitude.[1] The concept also comprises knowledge, skills, and the know-how of their application mastered in a specific context.[2,3] To capture the extent, it embraces knowledge, understanding, practical and operational application of knowledge to certain situations, and living with others in different social context.[4]

Similarly, Biemans describes competence as it is one of many side issues. In broad outline, according to the writers' view, competencies are the sum of interrelated abilities, application of knowledge, behavioural patterns and skills. At the very least, therefore, they presented the six common characteristics of the conceptual word competence that help to understand it more. On this account, thus, competence is 1) context- bound; 2) indivisible (knowledge, skills and attitudes are integrated); 3) subjected to change; 4) connected to activities and tasks; 5) required learning and development process, and 6) interrelated.[5]

The question of competence is an important issue in technical education programmes. The concept is broad and comprises the possession and application of a set of skills, knowledge and attitudes which are necessary to enable graduates successfully compete for jobs in the labour market.[6] For Goncizi, it is an inescapable component of the intellectual capital required for any meaningful effort aimed at enhancing employability of graduate in the labour market.[7] It encompasses the capacity to perform a certain tasks

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[1] Colline Michael, *Competence in Adult Education: A New Perspective* (London: Oxford University Press, 1987), 10-17.

[2] Kudwadi and Suryadi, *Development framework of evaluation model based on skill competency standard in high school technology and vocational education* (Ban dung: JPIS FPTKUPI, 2011), 22-30.

[3] 3. Sandra Karka, *Competency based education and training. Myths and realitie* (England: Eric Publications,1998), 1-4.

[4] Dicbois & Rithwell, *Competence–based human resource management* (Palo Alto, CA: Davis Black publishing. 2004), 34-43.

[5] Biemans Harm, "Vocation and Business Education and Training in Europe: Qualification and the World of Work." no.7 (2004): 17-22.

[6] Kathleen Santopietro, *Competency based education and content standards* (Colorado: Northern Colorado Literacy Resource Centre, 2006), 7-8.

[7] Goncizi Andrew, "*Re-conceptualizing competency based education and training"* (PhD, diss., Sydney University of Technology, 1996), 16-32.

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that correspond to relevant workplace requirements and other vocational needs.

Competences are described in Occupational Standards (NOS) and developed by people knowledgeable on and experienced in the world of work. From this view point, National Occupational Standards of Ethiopia define competence as the outcome of all training and learning and forms the benchmark of all quality management within the TVET system.[8]

According to Ethiopian TVET strategy document, competence based training in TVET falls under the following four (4) basic components:

Occupational Standards (OS): indicate the level of performance required for the successful achievement of work expectations.[9] Occupational standards are defined in terms of the activities (duties and tasks) performed by a person in a selected occupation and are intended to specify best practice in a particular employment sector and need for new occupations as well as indicating the need for revision and adaptation of existing national standards, once technological and/or economic developments bring about changes to the qualification needs.[10] Moreover, it constitutes an industry-determined specification of performance, which sets out the skills, knowledge and attitude required to operate effectively in employment.

Competence Based Curriculum (CBC): is a framework or guide for the subsequent detailed development of curriculum and associated methodologies, training, assessment and resources. Besides, it specifies outcomes which are consistent with the requirements of the workplace as agreed through the industry or community consultations. Where competence standard exist, it is used to develop the competence based curriculum and where standard do not exist, curriculum developers need to clearly identify workplace standards and requirements as a basis for identifying the outcomes of the competence-based curriculum.[11]

In the competence based TVET system, TVET institutions have to develop curricula that consider specific needs of the target groups and local labour market requirements. Thus, each TVET provider may find their own curricular solutions to provide high quality TVET to their specific target groups. Putting the curriculum into operation requires an implementing

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[8] Ministry of Education, *Cooperative training guideline* (Addis Ababa, 2007), 7-10.

[9] Ministry of Education, *TVET Leaders' and Trainers' Qualifications Framework* (Addis Ababa, 2010b), 13-15.

[10] Ministry of Education, *National TVET Strategy* (Addis Ababa, 2008), 28-37.

[11] Ministry of Education, *Guideline on curriculum development* (Addis Ababa, 2006b), 5-7.

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agent. In this regard, Ministry of Education identifies trainers as the agent in the curriculum implementation process. According to the document, teachers have roles to create high level of interaction and increasing understanding, monitoring each trainees work, determining what skills and tasks each student has mastered and provide feedbacks.

Modularization in competence based training: should be organized in a modular fashion to meet the requirements as defined in the occupational standards. In this way, each module or combination of modules describes an employable set of competences. Successful completion of each training module shall be dependent on assessment and certification in conjunction with the assessment specifications stipulated in the occupational standards. The modularization of TVET has been a central mechanism of making TVET delivery flexible and providing for flexible entry and exit points.

On the other hand, individual modules or a number of modules may also be delivered in short programs. In this case, trainees acquire an important set of competences (equivalent to a partial qualification) valuable in the labour market, and achieve the first steps of a potentially longer TVET career that may eventually lead to a comprehensive occupational competence. In the course of their individual career, trainees may attend different TVET modules over time, if necessary by different providers, to finally master a comprehensive competence.

Cooperative training as competence based learning approach: is a mode of training provided in partnership between enterprises and TVET institutions. It is directed toward the attainment of a skilled and versatile workforce adaptable to a changing technology to meet industry's current and future manpower needs. Under this system, industries and TVET institutions share the responsibility of providing the trainee with the best possible job qualifications, the former essentially through practical training and the latter by securing an adequate level of specific, general and occupation-related theoretical instruction. As mentioned in cooperative training guideline, cooperative training depends on the willingness of enterprises to supply human resources and materials for enterprise-based training. Besides, it requires a common understanding among partners about rules, commitment to framework conditions, training schedules as well as other issues of regulation.

There is no doubt that the proper development of technical and vocational skills is vital to the economic development of every country especially to the developing ones. Moreover, in today's knowledge driven and competitive global economy, TVET is considered as a fundamental element in the development of knowledge, skill and ability that enable TVET graduates to

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adapt to the changes in the dynamic world.[12] However, the quality and relevance of training is handicapped by a number of limitations like shrinking or stagnant wage employment opportunities, especially in the industrial sector; poor quality in the delivery of TVET programs; weak monitoring and evaluation mechanisms, lack of stakeholder's participation, and inefficient leadership and management.[13] Besides, the base line date obtained from Oromia Education Bureau (2008) indicated that between 2002-2007 due to weak implementation of cooperative training only 17.5% graduate got employment opportunities in government, private, and cooperatives and as self-employees. Hence, the intention of this study is to ascertain the impact of competences based student centred approach on the employability of TVET college graduates in Ethiopia.

To this effect, therefore, the study has attempted to answer the following basic questions.

1. What are the current practices of competence based training student centred approach in TVET colleges in Ethiopia?
2. Is there any significant relationship between competences based approach and employability of graduates in Ethiopia?

II. **Methodology**

Research design: the empirical investigation is based on the mixed methods (quantitative and qualitative) research design, predominantly on the concurrent nested strategy.

The study site: it would have been more appropriate to include all TVET colleges in the country, Ethiopia. To make the study manageable, the researcher decided to conduct the study in Oromia region for a number of reasons. First and perhaps for most, it would be time taking and expensive endeavour. In the second instance, as compared to other regions Oromia took the lion's share both in the number of trainees and institutions. The study was further delimited to 6 (33.3%) government TVET colleges established before 20 years, those who have relatively experienced teachers and leaders and 6 cooperative training offering firms in the Region.

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[12] UNEVOC, "Technical and vocational education and training for sustainable development: The challenges of implementation," no. 10 (2005): 1-4.

[13] African Union, "The proceedings of the conference of the African Ministers of Education on TVET in Africa," (Meeting of the Bureau of the Conference of Ministers of Education of the African Union, add day and month, 2007): 29-31.

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Data type and sources: the researcher used both qualitative and quantitative data type through primary source using survey, interview and focus group discussion.

Sample design and data collection instruments: multiple tools of data collection instruments were used to allow triangulation of responses. Data were collected through survey of self-administered questionnaire from 162 (26.04%) instructors, 123 (22.2%) Level III 2016/17 automotive trainees, 87(100%) department heads and 89 (19.14%) (2014/15) graduates, a total of 461 informants. To select sample respondents simple random sampling technique has been used for trainers, department heads and trainees and snow-ball sampling technique for graduates. Besides, 6 industry owners , 6 college deans, 6 competence-based process owners and 6 industry trainers were purposely selected to provide qualitative data through semi structured interview and focus group discussion.

Data processing procedures: after collecting the necessary data, the researcher used data processing procedures like editing, coding, classification and tabulation to make the data amenable for analysis.

Methods of data analysis: the collected data after data processing is analysed using descriptive statistics (i.e., mean, standard deviation) and inferential statistics such as one way ANOVA, Pearson Momentum Correlation coefficient and Multiple Regression Analysis to see the relationship between learning outcomes acquired as the result of competence based training approach and employability of graduates. Besides, the qualitative analytical process lasted from the coding to the categorising of concepts/themes, through to the contextualising, linking and interpretation thereof. In this connection, from the relevant documents, important information has been considered to substantiate the quantitative data analysis results.

III. **Results and discussion**

III.1. *Implementing competence-based learning approaches: existing practices*

A) Readiness for implementation

In the Table 1, an attempt was made to assess readiness made by TVET colleges before actual implementation of competence based training. An assessment has been made by using a five point Likert scale ranging from once in a while to frequently. Accordingly, respondents rate their response on each item as follows.

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Table 1

Preparation made for implementation

No.	Items	Mean	SD	F	Sig
1	Up-to-date labour market information has been collected	1.84	0.46	2.66	0.03
2	Skill gaps have been identified	1.94	0.52	13.13	0.000
3	Competences to be achieved known by trainees	1.38	0.49	6.46	0.002
4	TVET industry partnership have been established	1.50	1.08	2.45	0.08
5	Stakeholders agreed upon study profiles	1.81	0.39	0.34	0.85
6	Full collaboration of industries ensured	1.63	0.48	1.02	0.36
7	Non - threatening images created	1.19	0.40	2.19	0.000
8	Training modules describes set of competences	1.80	0.54	12.5	0.000
9	Adequate resource granted	1.70	0.46	7.71	.001
10	Relevant teaching, learning and assessment method identified	1.90	.49	19.7	.000
11	Sustainability of program granted	1.62	.48	1.08	.34

N= 461; df=2; $P < 0.05$.

Source: Output of SPSS Version-20.

The prevailing condition finds its expression in a dynamic changing world with complex industrial and occupational structure that necessitates the training for institutions to seek labour market information.[14] Connected with this, the first issue raised for respondents was the availability of up-to-date labor market information and the data shows as it has not been adequately collected (Mean= 1.84). Result of items 2 and 3, in the Table 1, also, shows that TVET colleges have no adequate information about skill gaps of graduates (M= 1.94 ; 1.38). Trainees were not adequately informed about the competences to be achieved (M=1.50). Similarly, in focus group discussion, participants agreed that TVET colleges lack information about training needs by skill category that may help them for human resource planning that in turn

[14] Herschbach Zidrman, *VET management in the United States* (Geneva: ILO, 1995), 42-45.

affects the implementation of competence based training and producing competent graduates with employable skills, knowledge and ability.

Technical education operates in a complex environment owing to the multiplicity of stakeholders, primarily the users and providers of technical education. It requires a close linkage between the providers and the end users, who are the employers of graduates from technical education institutions. The need for such linkage between these two players are made more imperative because of the fast technological changes affecting the relevance of programme curricula, facilities and other components of technical education. This is just some of the many critical concerns that need to be considered in technical education.

Based on the stated fact, the researcher examined the relationship TVET colleges have with industries. Accordingly, items 4, 5 and 6 show that, TVET colleges didn't work out and establish full collaboration with potential partner industrial sectors and other relevant stakeholders. Also study profiles did not jointly studied before implementation of competence based learning. Overall, the practices are inconsistent with tuning methodologies that magnifies the importance of consulting stakeholders on identifying competences, setting study profile, specifying the result and outcomes of the learning process.[15] ANOVA test result (Table 1) shows that out of eleven items insignificant perception difference occurred only in item 4, 5,6 and 11 ($P < 0.05$). Tukey's HSD post Hoc test result showed the perception difference occurred between trainers and trainees and no statistically significant difference between trainer and department heads, therefore, it implies that trainers and department heads have common idea on TVET- industry partnership.

Moreover, respondents were asked to rate the extent to which non-threatening perceptions has been created before implementation of competence based learning. In this case, the results show low response rate with grand mean 0.92. Furthermore, as per the data in Table 1, items 8, 9,10 and 11 revealed training modules moderately describes set of competences (M=0.1.80); TVET colleges were not granted adequate resources for implementation of competence based learning approach (M=1.70). Besides, relevant teaching, learning and assessment method were not adequately identified (M=1.90), there fairly set strategies for sustainability of programs (M=1.62).

However, they frequently monitor programs delivery. This was supported by interviews held with competence based process owners. The unanimity of the informants indicates that measurement criterion and standards set to

[15] Tuning Africa, *Tuning and harmonization of higher education: the African Experience* (2014).

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measure competence based learning approach were found weak. The ANOVA test result reveals that there was a statistically significant perception difference among the respondents on items 8, 9 and 10. The result of multiple mean comparisons using Tukey's HSD shows that perception difference occurred between trainers, on the one hand, and graduates and trainees, on the other. As the data obtained from key respondents through FGD, the dissimilarity might be lack of information of trainees and graduates about state of readiness made by TVET Colleges before the implementation of competence based learning.

B) Implementation process

The relevance of any training and its curriculum is determined heavily by the extent it meets the ultimate educational and training objectives and the degree it gears towards the socio-economic needs of the country.[16,17,18] Specifically, a competence based curriculum is a framework or guide that specifies outcomes which are consistent with the requirements of the workplace as agreed through the industry or community consultations.[19,20] Connected with item 1 of Table 2 asks about the relevance of curriculum to local labour market needs and national occupational standards. As can be seen from table it was fair (M=2.83).

Item 2 deals with delivery of training program. Accordingly, respondents replied that the training delivery was not fully student centred (M=1.53) because due to lack of sufficient industries for cooperative training, trainees did not spent much time in their industry (M=2.75). Moreover, learning outcomes/competences are measurable (M=2.81) and assessment is moderately based on actual demonstration of competences (M=1.00). The ANOVA test result for item 2 and 3 indicates that the non-existence of perception differences between groups of respondents on training strategies and place of learning. However, for item 1, 4 and 5 shows statistical significant

[16] ILO, "Implementing Competency-Based Training (CBT) in Bangladesh," Bangladesh, 2012, 3-5.

[17] Dyson and Jack, "Skills, Knowledge and Employability," Geneva, 2005, 22-27.

[18] Deibinger Mannhiem, "Structures and Functions of Competence- based Education and Training : A Comparative Perspective," Inwent (2005), 3-4.

[19] Frere Cathryn, *Developing a Competency Based Curriculum* (Virginia: New Jersey: Pearson, 2010), 5-7.

[20] Wakington, "Curriculum change in engineering," *European journal of engineering education* no.27 (2002), 135-139.

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Table 2

Implementation process

No.	Items	N=461			
		Mean	SD	F	Sig.
A	**Responsibilities executed by TVET colleges**				
1	Curricula considered local labour market	2.83	.93	3.263	.040
2	Training strategies are student centred	1.53	.83	.915	.455
3	The bulk of practical training takes place in an enterprise	2.75	1.07	8.08	.000
4	Learning outcomes/competences are measurable	2.81	.86	8.74	.000
5	Assessment is based on actual demonstration of competences	1.00	0.02	12.3	.000
B	**Responsibilities executed by Enterprises**				
6	Industries accommodate trainees for cooperative training	1.09	.03	36.51	.05
7	Industrial trainers follow unit of competences	1.77	.76	1.351	.292
8	Enterprises provide supervision to train the trainees	2.01	.82	3.11	.007
9	Enterprises offer facilities to train the trainees	2.13	.79	2.61	.032
10	Enterprises afford range of work to train the trainees	2.35	.78	1.563	.256
11	Industry trainer evaluates the trainee's progress	2.44	.33	6.201	.000
12	Industry trainer daily observes and provides feedback	2.22	.81	4.15	.006

N= 461; df=4; P <0.05 ;Mean = 0.5- 1.49 once in a while; 1.5-2.5 sometimes; 2.51-3.5 fairly often; 3.51-4.00 frequently, if not always; 4.01-5 always

Source: Output of SPSS Version-20.

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difference between respondents on relevance of curriculum to the labour market, measurability of learning outcomes (competences) and on assessments approaches that are based on actual demonstration of competences.

Items 6 to 12, in the Table 2, have been intended to know role played by industry trainer and commitment of enterprises in the implementation of competence based learning approach. To all items, group of respondents affirmed that as competence based learning was not frequently done.

Specifically, as can be seen from item 6, industries were not adequately accepting trainees for cooperative training. The interviews conducted with six competence based core process owners also reflect similar opinion about the lack of willingness of enterprises to accommodate trainees for cooperative training. The common idea was that TVET collages were not regularly visiting industries before and during cooperative training.

Item 7, requested respondents to rate their level of agreement or disagreement on the extent of the industrial trainers following the unit of competences, motivate and encourage trainees to experience the real world of work. On top of this it also raises the degree of their willingness to help trainees whenever problem occurred during cooperative training. Moreover, the item also hints on how they keep control over work place safety rules, the extent he/she knows unit of competence on the occupational standards for the occupation, follow trainees during the cooperative training, evaluate the trainee's progress and provide feedback. Even though items were differently rated by respondents, for all the above question items respondents gave negative responses. This low level of mean score indicates that industries and industry trainers are discharging their responsibility below the expectation.

Supporting this, one college Dean during FGD said that "To meet the major challenge in the implementation of competence based training is the willingness of enterprises to accept the trainees. Mostly, the trainees are not assigned in their proper occupation. Besides, industrial trainers were not performing the training duties as expected". Supporting this, three competence-based process owners said that they attach the units of competencies with the list of trainees when they send trainees to cooperative training providers. But, industrial trainers do not check the integrity of TVET training and cooperative training. One of competence based process owner says, in this regard, that "Cooperative training is not properly implemented according to cooperative training guidelines. The availability of training contract and training plan was at a lower level. In this respect, the practice of using these documents for competence-based training was not satisfactory"

According to Regional TVET agency representative "… in TVET colleges there exists the annual plan to send trainees to industries together with

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performance data which indicates the number of trainees sent for cooperative training increased in number from time to time, even completed and signed performance evaluation formats are available. But nothing is attached to indicate trainees were trained in line with required unit of competencies".

C) Acquired competence, graduate employability skills and employment

This sub title presents the outputs of competence based student centred approach (getting graduates completion certificate and occupational assessment results) and the impact of competence based student centred approach (employability of graduate and degree of their satisfaction). To this end, trainees, graduates, department heads, and trainers have been considered.

i. *Employability Skills of Graduates*

In the Table 3, an attempt has been made to assess the extent that TVET graduates possess skill and knowledge which are relevant with the current job.

Table 3

Demonstrated competence

No.	TVET graduates have skill	Mean	SD	F	Sig
1	Needed for the job	1.68	0.47	4.67	.01
2	To use appropriate technologies	1.85	.50	16.00	.000
3	To use standard operating procedures	1.84	.44	4.48	.002
4	To solve work related problems	1.68	.47	5.61	.004
5	To work in an intercultural context	2.46	1.24	5.67	.000
6	To handle stress and pressure on the job	1.16	0.37	5.95	.000

N=461; df=4; $P < 0.05$.

Source: Output of SPSS Version-20.

As can be observed from the analysis of Table 3, in all items, except item 3, respondents rated as low with grand mean below 2.5. Open-ended questionnaire data analysis also depicted that TVET graduate's lack skill to minimize wastage, improve the quality of product and productivity. During focus group discussion two TVET college Deans disclosed that there has been always complaints from graduates' side on mismatch between

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knowledge and skill acquired in their respective TVET colleges and current technologies they have been using in the labour market. Besides, they are weak in solving work related problems; handling stress and pressure on the job and fail in finding relevant job in different intercultural context. Therefore, it can be concluded that graduate competences in using skill and knowledge acquired in their respective TVET colleges have been found to be weak.

The ANOVA test result revealed that there has been statistically significant difference in all items. That is, in all the cases P-value is less than 0.05 implying the existence of perception difference between graduates on one hand and department heads on the other hand. These perception differences might occur due to dissimilarities among groups of respondents in assessing the capacity that graduates have related to the work.

ii. *Occupational assessment results and graduate employment*

The effectiveness of TVET is the comparison between the objectives set from the outset and the actual results attained at the end of the day. In the delivery of TVET, the objective to be addressed through the training delivery is basically to raise the quantitative and qualitative dimensions of the skills, knowledge and attitude of students thereby driving them for greater productivity and income. In Table 4, an attempt has been made to see results of occupational assessment and rate of graduate employment.

Table 4

Output of training

No.	Colleges	Assessment results	Total No. of graduate (Auto)	Number of Employed TVET graduates				% of employed graduates
				Public sectors	Medium Industry	Self-employed	Organized in MSE	
1	C-A	37	66		5	7	26	38 (57.6%)
2	C-B	42	61		11	8	24	43 (70.5%)
3	C-C	27	58			5	19	24 (41.4%)
4	C-D	35	55			6	21	27 (49.1%)
5	C-E	27	45			2	19	21(46.7%)
6	C-F	25	40		5	8	17	30 (70%)
Total number		193 (59.4%)	325		33	36	126	183 (56.3%)

Source: Sample TVET colleges (CA college1), Documents analysis(2014/15), Own calculation.

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With regard to the quantitative dimension of effectiveness, the data obtained from TVET colleges show, there was gross mismatch between the demand for and the supply of middle level skilled labour force. Supporting these, in the open ended questionnaire, respondents replied that there is wide spread unemployment among the TVET graduates, on one hand, while there is also a wide market vacancy for TVET graduates, on the other hand. The results also show that only 183 (56.3%) level III automotive technology TVET graduates got employment opportunity in the past two years.

Another indicator for internal inefficiency is the result of the occupational assessment undertaken and the degree of graduates' satisfaction. In this regard and in accordance with the 2014/15 assessment result, it was only 193 (59.4%) out of the 325 TVET graduates assessed were found competent and 132 (40.6 %) were found not yet competent which shows that the training provided was below the minimum quality required. The implication of this all is that the delivery of TVET in Ethiopia in general and Oromia Region in particular is still not fully demand driven.

Table 5

Impacts: graduate satisfaction

No.	Extent of satisfaction with	Graduates (89)					
		Not satisfied		Undecided		Satisfied	
		F	%	f	%	f	%
1	Relevance of current occupation	47	52.81	0	0	42	47.19
2	Job searching time after graduation	77	86.52	0	0	12	13.48
3	Utilization of skills acquired	56	62.92	0	0	33	37.08
4	Utilization of knowledge acquired	49	55.06	0	0	40	44.94
5	Training outcomes of each module	64	71.91	0	0	25	28.09
6	Type of assessment in relation to training outcomes	62	69.66	0	0	27	30.34
7	Earning their living through self-employment	59	66.29	0	0	30	33.71
8	Occupational assessment results	45	50.56	0	0	44	49.44

Source: Output of SPSS Version-20.

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In order to examine the impact of competence based training the paradigm shift of student centred approach, it is better to see into the satisfaction level of graduates and access to employment. Further, its impact can be seen in terms of utilization of knowledge and skills acquired or gained through cooperative mode of training in their current job and level of income. By way of contrast, the finding reveals that graduates were not satisfied with skill and knowledge acquired during training program. As it can be observed from the Table 5, employed TVET graduates were asked to indicate their degree of satisfaction in searching and getting relevant job. Accordingly, the majority of the TVET graduate respondents declared that the searching of appropriate job was very difficult therefore, they are dissatisfied. In the open ended questionnaire graduates replied that the reason for working in the area outside their field of study might be the interest they have toward the job. Others connected themselves with lack of appropriate job in their area of training. Also, as it was indicated in item two, majority of the respondents show that trainees did not get job just after graduation. For open ended questionnaires, they replied that the probability of getting appropriate job related to their field of training was below expectation. As a result, the rates of satisfaction of the graduates in their current job were also very low.

Generally, the finding reveals that the difficulty to get job, the job searching period, the less relevance of job to their area of training makes the graduates unsatisfied and forces them to work outside their field of study with low payment.

iii. *Relationship between competence-based learning and graduate employment*

Before running multiple regression analysis to address the questions, inspection of variables was made in line with assumptions of multiple regression analysis. For instance, the study examined residual plots and then verified whether assumptions of regression were satisfied. The suitability of the regression analysis was also examined for multi-collinearity by checking tolerance. The result of analysis showed that the tolerance value for each independent variable ranges from 0.000 to 1.00. Hence, multiple regression analysis was conducted to examine the variation accounted by implementation of competence based student centred learning approach in TVET colleges to employability of graduates in the labour market, regression Analysis with CBT Implementation as Dependent Variable and readiness for implementation as independent variable.

Table 6

Model Summary[b]

Model	R	R Square	Adjusted R	Std. Error
1	.870[a]	0.285	0.285	3.61522

a. Predictors: (Constant), Readiness for implementation.
b. Dependent Variable: CBT Implementation.

Source: Output of SPSS Version-20.

Regression analysis was conducted to investigate the relationship between CBT and graduate satisfaction (training, teaching, learning, assessment). The R –square was 0.230 which means that only 23 % of the variances of graduate satisfaction were explained by CBT implementation.

Table 7

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error
1	.487[a]	.230	.187	

a. Predictors: (Constant), CBT implementation.
b. Dependent Variable: graduate Satisfaction.

Source: Output of SPSS Version-20.

IV. **Conclusions**

Based on the international best practices, the Ethiopian Government has reformed the TVET system in 2008. The result of a study made on the impact of competence based learning on employability of graduates revealed that TVET colleges have tried to use the needs of the labour market and occupational requirements from the world of work for TVET delivery. However, as per the result of the detailed data analysis, inadequate allocation of relevant resource (shortage of teaching materials especially in occupational standards newly developed); scarcity of quality academic and support staff; increased enrolment and insufficient industrial internship bases have affected the successful implementation of competence-based training. These situations also affect TVET colleges not to produce competent graduates who have required employability skill, knowledge and ability that consequentially lead

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to graduate unemployment and dissatisfaction of different categories of stakeholders. Moreover, qualitative data revealed that some employed graduates were not able to demonstrate employability skill, knowledge into the job. Furthermore, the low competence of TVET colleges to measure the actual skills needed in the labour market and predicting the number of graduates required from TVET colleges in terms of occupational categories, hinders the effective utilization of market opportunities and causes fragile implementation of competence based learning. The study also identified that the weak collaborative work culture among TVET colleges and that of industries limits the opportunity of exploiting the potential of all stakeholders that enables them to be successful in bringing about the expected output to meet the expectation of respective stakeholders and win their commitment in its real sense.

V. **Recommendations**

Revealing problems alone does not suggest and/or indicate corresponding solution by itself. Hence, in light of the findings of this study and the conclusion made, the following possible recommendations have been forwarded.

TVET programs should meet the current and future labour market needs. Therefore, to provide higher quality TVET to specific target groups and to design flexible need based TVET curricula, it is recommended that TVET colleges' should constantly consult students, employers, teachers and graduates in setting study profile and learning outcomes, determining teaching, learning, assessment and in monitoring process.

The participation pattern of TVET differs from those in other programs of education, possibly because they require trainees to be employed. However, weak collaborative learning style has created problems and introduced inefficiencies in the system. Therefore, to prepare trainees for employment, TVET colleges need to revise the existing competence based learning approach and strengthen partnership with enterprises. Besides, to maximize their respective participation, TVET colleges should develop corresponding strategies that could produce mutual efforts and benefits.

The study result also showed that some graduates were not satisfied with training approach and competences acquired. They were not employed in the occupation that they have graduated in. Besides, majority of graduates reported that they were dissatisfied with current occupation and earning. Hence, to improve employment opportunity and wage, TVET colleges

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should collect evidences on labour market performance of graduateand are supposed to ascertain sound generic and subject specific competences accompanied with relevant curriculum development, courses delivery, assessment and quality assurance.

Finally, the researcher initiates future researchers to conduct further research on the impact of Tuning methodologies on graduate employment in Africa. Because continued study on the issue will support generalization and enhance the implementation of tuning methodology.

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Incorporating the Tuning Approach in Higher Education curricular reforms and course design in Tanzania for enhancing graduates' competencies: stakeholders' views*

Johnson Muchunguzi Ishengoma**

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Abstract: Available documentary and research evidences reveal that the majority of Tanzania universities' graduates (public and private universities) lack competencies or technical skills (employability skills) required for the job market and by potential employers, despite massive curricular reforms implemented in the public higher education sector since the early 1990s. Lack of employability skills which consequently leads to graduate unemployment or un-employability is attributable to the fact that curricular reforms and design in Tanzania public universities undertaken by lecturers and professors do not incorporate basic Tuning principles of competence-based teaching and learning which puts emphasis on competencies and skills by identifying generic and specific competencies during course design or curriculum reform. This study using the University of Dar es Salaam (UDSM)'s School of Education sought to: (1) explore faculty and students' views on the application of the Tuning approach in curricular reforms and degree/course design as a mitigation of university graduates' unemployment and un-employability, (2) solicit stakeholders'(academic staff and students) perceptions of Tuning approach and its relevance in higher education curriculum reforms and design to make higher education more competence-based, and (3) find out students perceived causes of graduate unemployment and un-employability and whether the application of Tuning approach in curriculum reforms and design in universities can be a solution to graduate unemployment. Findings from the study reveal that both faculty and students concur that application of Tuning approach in

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higher education reforms and curricular design could enhance graduates competences and skills and reduce graduate unemployment.

Keywords: Tuning approach; graduate' unemployment; graduates'un-employability; market-driven degree courses; and graduate competencies.

I. **Introduction**

The public higher education sector in Tanzania has undergone a plethora of curricular reforms[1] mainly as a response to the changing labor market demands and globalization; but also as a logical response to the declining government's budgetary allocations to public universities, since the early 1990s. Public universities have aggressively introduced the so-called market driven degrees and non-degree courses as an economic survival strategy to mitigate inadequate government budgetary allocations. Despite the introduction of massive curricular reforms[2] university education in Tanzania (particularly the social sciences and humanities), remains largely theoretical and graduates leave universities without adequate requisite competencies[3] to make them employable or self-employed.[4] A recent (2014) survey of employers' opinions of university graduates competencies and skills in the East African region (conducted by the Inter University Council of East

[1] The conceptualization of curricular reform (in the context of this paper) is adopted from Maria Slowey and Kozina Ekaterina, "New Knowledge-New Learning? Curriculum Change in Higher Education and Academic Engagement in the Bologna Process in Ireland," to mean curriculum changes or redesigning of new courses in universities as a result of interplay of national, global and institutional factors.

[2] Curricular reforms in universities have been mainly characterized by re-designing or repacking courses, introduction of new courses perceived to be marketable and phasing out departments deemed to be unproductive in terms of generating extra income from part-time students

[3] Although there are several definitions of the concept of 'competence', in this paper, *competence* simply refers to applied skills and knowledge derived from an academic program that enable a university graduate to effectively and successfully perform or function in work organizations and society. In the context of the University of Dar es Salaam's vision and mission, graduate 'competence' mean a skilled graduate who can create jobs as opposed to seeking a job.

[4] This view is also shared by the Tanzania Private Sector Foundation (TPSF). During a workshop on internship training for recent graduates (February 2017), the Executive Director of the Foundation observed that the majority of Tanzanian university graduates, among other skills lacked problem solving ability and innovation prompting employers to hire foreign professionals/graduates. His major recommendation is that universities should equip students with more practical skills and competencies rather than being theoretical.

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Africa)[5] revealed that over 50 percent of the graduates lacked job market skills and were unfit for jobs. In specific terms, the survey revealed that in Tanzania 61 per cent of university graduates lacked job skills; while in Uganda 63 per cent of the new graduates lacked requisite job skills.

The survey cited above generally concluded that graduates from the East African universities lacked employability skills, i.e. technical mastery and basic work-related capabilities. The study mainly attributed graduates lack of skills and competencies to massive enrolment expansion in universities without corresponding availability of adequate infrastructure, teachers, teaching and learning resources and inadequate funding. However, the crux of the matter is that higher education reforms and design of new courses do not apply Tuning approach which advocates design of new courses using the basic Tuning principles of generic and specific competencies. Tuning approach has been instrumental in designing competence and skill based degree programs in other parts of the world (e.g. Central and Latin America, Europe and China) through developing generic and specific competencies preferred by employers from university graduates.[6] In my view, the application of Tuning principles in curricular reforms/design is a part of the long-term solutions for graduates' unemployment[7] in the East African region and also an instrument for harmonization of higher education system in the region. Harmonization of higher education, is one the objectives for introducing the Tuning approach in Europe, Central and Latin America, China and recently (2012) in Africa through the Tuning Project (Phases I & II)[8] Harmonization of higher education has been one of the main but un-implementable agenda of the Inter University Council of East Africa (IUCEA)[9] because of partisan nationalist interests of

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[5] The results of this survey are reported in "The East African" newspaper of June 12, 2014. See http;//www.the eastafrican.co.ke/Over-50-percent-of-graduates-of East-African-graduates-half-baked-2558-2345578.

[6] Karola Hahn and Damtew Teferra, "Tuning as Instrument of Systematic Higher Education Reform and Quality Enhancement: The African Experience," *Tuning Journal for Higher Education* 1, no. 1 (2013): 127-163.

[7] Empirical data on graduate unemployment in the East Africa region is lacking; although the report cited above admits that graduate unemployment is "a time-bomb" because universities were producing "theoretical graduates" who apart from "lacking technical mastery required in the jobs they were seeking" also lacked self-confidence and could not express themselves clearly in English, a medium of instruction in universities.

[8] Hahn and Teferra, "Tuning as Instrument of Systematic Higher Education Reform and Quality Enhancement: The African Experience."

[9] The Inter University Council of East Africa is an intergovernmental higher education organ, which among other functions, facilitates internationally comparable higher education standards in East Africa in order to promote the region's competitiveness in higher education.

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each partner state to keep a distinct "national" higher education system aligned to the nations' strategic interests and development objectives. Partisan nationalist interests make harmonization of the higher education systems through Tuning approach in the East African region impossible, although one of the major objectives of IUCEA is to facilitate internationally comparable higher education standards, which can be achieved through the application of Tuning approach.

The major rationale for curricular reform and new course design in public universities in Tanzania is to make university education more competence and skill-based to enable graduates effectively function in the labor market and in the society at large, but apparently this objective is unachievable because of the wrong approach to curricular/course design and absence of competence-based learning (CBL) in our universities. CBL, as Aurelio Villa Sanchez and Manuel Poblete Ruiz[10] argue, "is valued by employers because it better enables students to apply their knowledge". They further argue that "today more than ever, higher education is expected to develop abilities and skills that can be applied to situations at work and in society that students will encounter when they finish their studies".[11] Competence and skill-based higher education is of critical importance in the current era of knowledge economy where as Mushi observe, employers have shifted from using certificate (grades) for recruitment of graduates and are now "looking for capabilities beyond a list of subjects defined in the certificates".[12] Mushi also cites graduates' unemployment as one of the rationale for curricular reforms in higher education in Tanzania.[13] The above rationales for curricular reforms in higher education makes the Tuning approach (the world-wide acknowledged approach for competence and skill based curriculum design and implementation an indispensable instrument to tackle graduate unemployment in Tanzania, which as the survey cited earlier revealed) is mainly caused by lack of employable skills. Graduate unemployment in Tanzania although not widely acknowledged in research and not specifically captured in the national employment and labor force surveys remain a challenge. As Ndyali[14] observes, there is a mismatch between what is taught/

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[10] Aurelio Villa Sanchez and Manuel Poblete Ruiz. "Competence-based learning," in *Competence-Based Learning: A Proposal for Assessment,* ed. Aurelio Villa Sanchez and Manuel Poblete Ruiz (Bilbao: University of Deusto, 2008), 31-62..

[11] Villa Sanchez and Poblete Ruiz, "Competence-based learning."

[12] Mushi, Paul Sawaya Dominic, "Capacity Plunder in the Educational Reform Processes in the Regional Africa: The Need for Intersession in Curriculum" (paper presented at PGDCDD, Dar es Salaam, 2009), 5.

[13] Mushi, "Capacity Plunder in the Educational Reform Processes in Regional Africa. The Need for Intersession in Curriculum."

[14] Lyata Ndyali."Higher Education System and Jobless Graduates in Tanzania." *Journal of Education and Practice* 7, no. 4 (2016): 116-121.

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learned in Tanzania higher education institutions and the labor market demands, hence graduate unemployment. This article is organized as follows: section one is an introduction, section two describes objectives of the study and research questions, section three describes research design and methodology, while section four presents literature review, section five present findings and analysis. The last section (six) presents conclusions based on findings.

II. **Objectives of the study and research questions**

II.1. *The study was guided by the following objectives and questions:*

- Find out UDSM's academic staff's general understanding and awareness of the Tuning methodology and its significance in higher curricular reforms and course design.
- Explore UDSM's academic staff's views on the application of the Tuning approach in curricular reforms/design as a strategy of making university education competence/skill based and relevant to reduce graduates' unemployment and enhance graduates' employability
- Find out academic staff views on market-driven degree programs introduced in public universities in terms of being competence/skilled-based, relevant and their contribution to national development, and their potentiality of enhancing graduates employability.
- Solicit students' views on the application of the Tuning approach in curriculum design in universities to make university education more competence-based to enhance graduates' employability

II.2. *Research questions*

Four research questions derived from the above objectives guided the study:

1. What is the level of understanding and awareness of the Tuning approach among academic staff at the University of Dar es Salaam, particularly in the School of Education?[15]
2. What are the views of the academic staff about graduates unemployment and potential application of the Tuning approach in curricular reforms/ design as a strategy of making higher education more competence/

[15] The University of Dar es Salaam has participated in both Tuning Africa Phases I & II.

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skill-based to enhance graduates' competencies and skills and reduce graduates' unemployment?[16]

3. What are the academic staff's views on market-driven degree programs introduced in public universities in Tanzania since the late 1980s in terms of being competence/skill based, relevant to national development and likelihood of enhancing graduates' employability?

4. What are the students' views concerning causes of graduates unemployment, solutions and application of Tuning approach and competence-based teaching and learning to enhance graduates' employability?[17]

III. **Research design and methodology**

This study employed a case study design, using the University of Dar es Salaam (UDSM), School of Education as a case. The choice of the UDSM is based on the fact that the University is Tanzania's oldest public university and has been implementing several curriculum reforms through the Institutional Transformation Program (ITP). The choice of the School of Education was influenced by the fact that, the School is one of the oldest at the UDSM, its history dating back to the 1960s when it started as a department of the University College of Dar es Salaam. Furthermore, the School is well-versed in matters related to curriculum design and evaluation and has trained several professional teachers, curriculum designers and developers.

Respondents (composed of academic staff and masters students and a Director of Undergraduate Studies) were strategically and purposely selected from the School of Education of the University of Dar es Salaam because of their solid experiences in curriculum design and reforms as professional teachers/educators. A total of 110 respondents (21[18] faculty and 89 graduate students) from two academic departments and one unit (Department of

[16] Tuning approach has been introduced and explained to members of the academic staff at departmental meetings since 2015. Furthermore, Tuning Africa Project and Tuning approach were explained to the School of Education staff and the members of the University of Dar es Salaam through the UDSM Research Week in March 2017 where a poster describing the Tuning Project was displayed to the public.

[17] Students in the School of Education participated in Tuning's students' workload study where they initially interacted with the concept of Tuning. The concept of Tuning was explained to them before filling out students' questionnaire.

[18] This number of faculty represented about 31.3% of faculty in the School, while students represented about 25.4% of all graduate students enrolled in the School.

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Educational Foundations, Management and Lifelong Learning; Department of Educational Psychology and Curriculum Studies, and the Physical Education, Sports and Culture Unit) volunteered to participate in the study.

Data were mainly collected through questionnaire (composed of closed and open items) and desk review of documents such as: *University Prospectuses* (to determine the trend in the introduction of new courses in various academic units), *Report of the School of Education Curricular Review,* and the University of Dar es Salaam Institutional Transformation Program, the document which justifies curricular reforms and designing of the new courses at the University of Dar es Salaam, as well as the *UDSM Annual Reports*. Quantitative data were analyzed using Microsoft excel to make relevant calculations, e.g. average weighted ranking of graduate competencies and presented as tables, graphs and figures where necessary. Content analysis was also used to analyze and interpret faculty and students' responses from open-ended questions in the questionnaire.

IV. **Literature review**

IV.1. *The state of quality of university education in Tanzania: implications for competence-based university education and process of curricular reforms in Higher Education*

University education in Tanzania is regulated by the Tanzania Commission for Universities (TCU), established in 2005 under the Universities Act 2005, to replace the Higher Education Accreditation Council (HEAC). TCU, among other functions, regulates university education by setting admission criteria into universities and criteria for establishing new universities and degree programs. The Commission also promotes student mobility through inter-university transfers. As a result of the populist liberalization of higher education policy to allow private providers of university education[19] mainly at undergraduate level, as of 2016, Tanzania had a total of 59 universities (48 private universities and 11 public universities[20]) enrolling a total of 218, 958 students, 144,157 or 66%

[19] In my opinion, liberalization of the provision of higher education (although well-intentioned, ostensibly aimed at expanding access to higher education), was populist and politically motivated because of its timing closer to the 2000 General Elections. Liberalization of the provision of higher education in Tanzania has led to the proliferation of small for-profit private universities and university colleges mainly offering undergraduate degrees and diplomas and limited graduate programs particularly at masters level. Only one private university offers limited doctorates in few disciplines.

[20] Public universities in the context of Tanzania mean government-owned universities.

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enrolled in public universities and 74,802 (34%) enrolled in private universities.[21] Private universities and university colleges (many of them small in size) despite their large number, enroll a small number of students because of inadequate infrastructure and shortage of academic staff and teaching and learning resources. These inadequacies and shortage have implications on delivering competence/skill-based university education. Due to the inadequate infrastructure and academic staff, the TCU recently (July 2017) banned seventeen (17) private universities and university colleges from admitting new first year students for the academic year 2017/18 for 70 degree programs mainly at undergraduate level with some few programs at graduate levels.[22]

Documentary evidence show that inadequate financial resources[23] (in both public and private universities) resulting into inadequate educational infrastructures and teaching and learning resources remain a critical constraint to offering competence/skill based university education through competence-based teaching and learning. Due to inadequate infrastructure and teaching and learning resources and massification of university education, majority of students in Tanzanian universities learn through lectures and textbooks (at times outdated) and have limited opportunities to acquire practical skills related to the labor market. Another constraint to competence-based university education is that teaching in universities is also mainly teacher-centered, giving little room for competence development. Financial constraint is more critical in tuition-dependent private universities most of them operating in rented premises and buildings in urban and semi-urban areas where they cannot expand because of lack of physical space. Lack of physical space has implication on competence-based teaching and learning and ultimately the quality of education offered in these institutions.

Apart from inadequate financial resources, there is a shortage of academic staff in senior ranks, e.g. senior lecturers, associate and full professors with extensive experience in teaching and research, necessary for

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[21] Tanzania Commission for Universities (TCU), *Statistical Data of Teaching Staff in Higher Education* (Dar es Salaam: TCU, 2016).

[22] *A* total of 22 universities (including 2 foreign-based universities and three public universities) were barred from admitting new students in some programs. (See Tanzania Commission for Universities, List of Universities that Have Been Banned to Admit Students 2017/18, July 24, 2017).

[23] For example, at the University of Dar es Salaam, Government budgetary approval and allocation vs. the University's budgetary requests approved by the University Council ranged between 41% in 2006/07 to 63% in 2010/11. This low budget approval rate creates budget deficit which the University has to struggle to fill out. The deficit has implication on the availability of teaching and learning resources which have impact on quality of teaching and learning and consequently outputs.

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competence-based teaching and learning in both public and private universities. Shortage of senior academic staff has implications on quality of graduates measured by skills and competencies. Empirical evidence shows that shortage of senior academic staff is more pronounced in private universities forcing them to rely on part-time academic staff and retired academic staff from public universities.[24] Table 1 show student enrolments in Tanzania universities and university colleges by discipline from 2006/07 to 2013/14. Although no research data on graduate unemployment by discipline is available, anecdotal evidence shows that they are unemployed graduates in the disciplines mentioned in Table 1 because of skills mismatch and lack of skills for self-employment. Table 2 show the status of academic staff by ranks in public and private universities for 2015. In both public and private universities, the predominant academic rank is *assistant lecturer* (a training position requiring a master degree); while the professorial ranks (associate and full professor) accounts for 9.4 % only in public universities and 5.3% for private universities.[25] Assistant lecturers accounts for 44% of all total academic staff in public and private universities, while tutorial assistants accounted for 23%.

The implication of having the majority of academic staff in junior academic ranks in Tanzania's universities is limited knowledge production and dissemination which impacts on quality of graduates in terms of competencies and skills. Extensive knowledge production and dissemination among academic staff in universities manifests their knowledge levels and depth, and experience, all important for competence-based teaching and learning based on intended learning outcomes. This might partly explain why in the survey cited earlier at the beginning, 61% of the Tanzania universities' graduates lacked competencies and skills. In the context of Tuning philosophy, limited knowledge production and dissemination in Tanzania universities implies that universities are producing less competent or half-baked graduates who are unable to compete in the labor market apparently because they are taught or supervised by inexperienced and perhaps less skilled lecturers without terminal degrees (doctorates) in their areas of specialization.[26] The

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[24] Johnson Ishengoma Muchunguzi, "The Role of African Flagship Universities: The Case of the University of Dar es Salaam," in *Flagship Universities in Africa*, ed. Damtew Teferra (London: Palgrave McMillan, 2017), 373-423.

[25] In private universities, the majority of professors are retired and include part-time professors.

[26] Observation show that the bulk of teaching in Tanzania universities is conducted by assistant lecturers and in extreme cases tutorial assistants who are inexperienced in terms of designing competence-based courses.

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above argument is supported by Heike Mitchelsen and Frank Hartwich's,[27] study. In this study, researchers found out that academic staff (in African universities) with doctorates possessed more advanced scientific skills and expertise in conducting research and publishing (knowledge production and dissemination) than those with master degrees. This finding has further implication on academic staff's (in) ability to design competence based degree programs and develop competencies in students through teaching and research.

Table 1

Students' Enrolments by Discipline in University and University Colleges in Tanzania, 2006/07-2013/14

Discipline	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Agriculture	1024	1536	1677	2026	2222	2200	2632	2867
Engineering Science	1757	2635	3889	2737	3001	9667	11566	12600
Medical Science	4101	6151	8067	5242	5749	7940	9501	10351
Natural Science	1110	1665	2891	1768	1939	1736	2077	2263
Science & ICT	5288	7932	9072	10041	11011	11715	14017	15270
Education Science	2212	3760	4382	9762	10706	10068	12047	13124
Business Mgt. & Admin.	8831	15013	19945	18177	19934	25178	30124	32818
Law & Social Sciences	16795	28852	33773	34632	37980	46607	55765	60752
Education Arts	8846	15038	17526	39050	42825	52869	63257	68914

Source: Adapted from: *Students enrolled in universities and university colleges by program categories, 2006/07-2013/14.*

Table 1 shows an increasing trend in student enrollments in all disciplines in universities and university colleges implying a need for more experienced

[27] Heike Mitchelsen and Frank Hartwich, *University-Based Agricultural Research: A Comparative Study in Sub Saharan Africa* (The Hague: International Service for National Agricultural Research (ISNAR), 2004).

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lectures with terminal degrees in relevant disciplines capable of developing students' competencies and skills through teaching and research.

Table 2 shows academic staff ranks in public and private universities as of 2015.

Table 2

Academic Ranks in Public and Private Universities, 2015

Rank	Public Universities	% Total	Private Universities	% Total
Instructors	67	0.98	34	1.4
Tutors	90	1.3	72	3.0
Tutorial Assistants	1,616	24.0	438	18.3
Assistant Lecturers	*2,757*	*40.6*	*1,218*	*51.0*
Lecturers	957	14.1	366	15.2
Senior Lecturers	652	9.6	138	5.7
Associate Professors	365	5.4	56	2.3
Professors	278	4.0	74	3.0
Grand Total	**6,782**	**100.0**	**2,396**	**100.0**

Source: Adapted from *Statistical data of teaching staff in higher education 2015.* Retrieved on 11/28/2016, www.tcu.gov.tz.

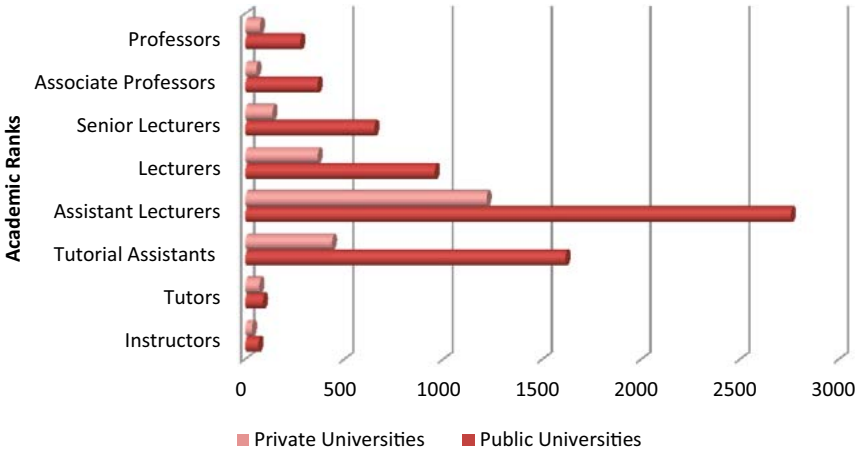

Figure 1

Academic staff ranks in universities and university colleges in Tanzania

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Academic staffing position by ranks at the University of Dar es Salaam (UDSM) for the 2013/14 academic year is summarized in Table 3 below. As is the national scenario of academic staff by ranks in universities in Tanzania, assistant lecturer position dominates all academic positions (38%) at the UDSM. Full professors accounted for 5%, while associate professors accounted for 10%. Senior lecturers and lecturers accounted for 17% each and tutorial assistant for accounted for 13%. It is important to note that as in private universities, professorial ranks at the UDSM also include retired professors employed on contract. Without this cadre of professors the number of professors is likely to be even lower. Due to the shortage of academic staff, assistant lecturers conduct the bulk of lectures (in many cases teaching large classes) and lead seminars at the undergraduate level. As argued earlier academic ranks have implications on the level of knowledge production and dissemination which are very crucial in developing competencies and skills among potential graduates.

Table 3

Academic Staff by Ranks at the UDSM Main Campus, 2013/14

Academic Rank	Number	Percentage Total
Professor	61	5.0
Associate Professor	119	10.0
Senior Lecturers	206	17.0
Lecturers	201	17.0
Assistant Lecturers	452	38.0
Tutorial Assistants	155	13.0
Total	**1,194**	**100.0**

Source: Adapted from *UDSM Annual Report 2013/14,* 59.

In the preceding sub section (III.1) the major argument being made is that the quality of university education in Tanzania is being constrained by two factors: inadequate financial resources which leads to a host of other challenges such as inadequate teaching and learning materials and quality of academic staff (measured by academic ranks and research publications). The two factors are major constraints to delivering competence-based university education to the students. Due to the shortage of senior academic staff in universities (public and private) assistant lecturers and new PhD holders

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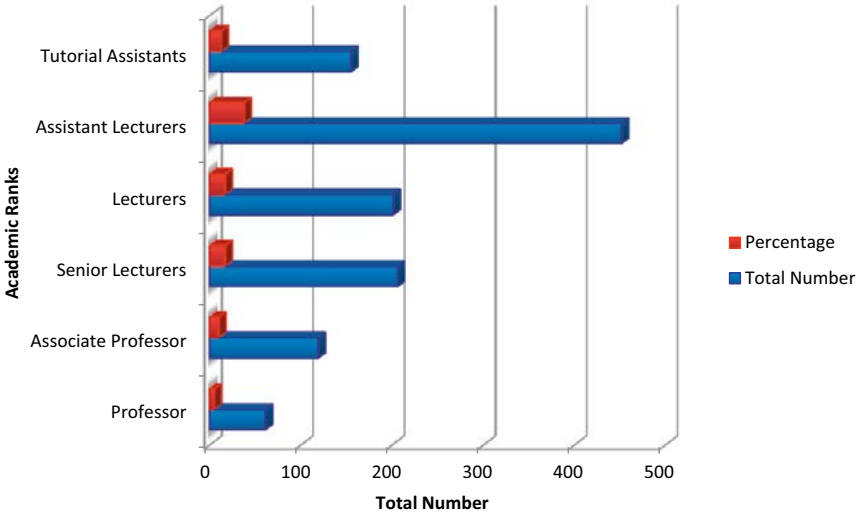

Figure 2

Academic staff by ranks at the
UDSM Mwalimu Julius Nyerere Campus, 2013/14

(majority trained abroad[28]) without adequate experience in university teaching and research conduct a large part of teaching at both undergraduate and postgraduate levels, in many cases teaching large classes where teacher-student interactions are limited. Adequate teacher-student interactions are critical in developing competencies and skills among students. In sub section III.2 below, the framework for curriculum/reform in higher education in Tanzania is discussed in the general context of incorporating Tuning approach in curriculum design in higher education in Tanzania.

IV.2. *Framework for curriculum design/reforms in higher education in Tanzania*

Curriculum design/development in higher education in Tanzania, is theoretically guided by the Tanzania Qualification Framework (TzQF) 2010

[28] Doctoral training in local universities may take between three (3) to seven years (7). Thus many academic staff in both public and private universities avoid registering for doctoral studies in local universities unless they have failed to secure scholarships to study abroad.

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developed by the Tanzania Commission for Universities. The TzQF is aligned to the East African Qualifications Framework for Higher Education (EAQFHE), 2015, a tool developed by the Inter University Council of East Africa on behalf of the East African Community (EAC) "for guiding higher education institutions in the East African region in curriculum development, delivery, assessment and certification in line with the needs of the labor market."[29] Curriculum development/design in higher education in Tanzania should also be guided by *Roadmap to Quality. Handbook for Quality Assurance in Higher Education (2010)* developed by IUCEA, especially Vol. 1 "Guidelines for Assessment at Program Level". The *Roadmap* stipulates 18 aspects to be considered when assessing a degree programme, theoretically, all with implications to graduates' competences and employability because of the emphasis on quality of the input, process, and output. The eighteen (18) aspects form a model for self-assessment of teaching and learning divided into: *process*, *input* and *quality assurance*.

Process is composed of: program specification, content and organization of the program, teaching/learning strategy, and student assessment; while input is made of quality of academic and support staff, profile of students, student advice and support and facilities and infrastructures; quality assurance is composed of student evaluation, curriculum design, staff development activities, and benchmarking.[30] The eighteen (18) aspects for program assessment are summarized below in rank order are to be integrated in higher education curriculum design/development to enhance graduates' employability.

1. Stakeholders' requirements of a program
2. *Expected learning outcomes*
3. Program specification
4. Program content
5. Organization of the program
6. Didactic concept/Teaching/learning strategy
7. Student assessment
8. Quality of academic staff
9. Quality of support staff
10. Students' profile
11. Student advice and support

[29] East African Community (EAC), *East African Qualification Framework for Higher Education (EAQFHE)* (Arusha: EAC, April 2015).

[30] Inter University Council of East Africa (IUCEA), *Roadmap to Quality. Handbook for Quality Assurance in Higher Education* (IUCEA: Kampala, 2010).

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12. Facilities and infrastructures
13. Student evaluation
14. Curriculum design
15. Staff development activities
16. Benchmarking
17. Achievement of graduates; and
18. Stakeholders, satisfaction

The TzQF specifies qualification levels and *competence descriptors* for each qualification level. The competence descriptors correspond to the learning outcomes for each qualification level specified in the East African Qualification Framework for Higher Education. The framework indirectly applies some Tuning principles such as outcome/competence-based learning and intended learning objectives (ILOs). The framework generally classifies higher education qualifications as follows: (a) school sector qualifications, (b) vocational and technical sector qualifications, (c) university education qualifications, and (d) professions. Among other objectives, the TZQF seeks to generate qualifications that are *internationally comparable* and promote competence-based assessment practices and qualifications. University sector qualifications are classified into:

- Higher diploma
- Bachelor's degree
- Postgraduate certificate/postgraduate diploma
- Master's degree; and
- Doctorate degree

All of the qualification levels above emphasize outcome-based curriculum design/development expressed through a range of generic knowledge and understanding, competencies, skills and abilities in a specific area. The intended learning outcomes are grouped under three major themes ostensibly with implications to competencies*: knowledge and understanding*, *practical skills and understanding*, and *communication skills*. These themes (which are essentially learning outcomes) have implications on employability of graduates. Tables 4 and 5 show intended learning outcomes for bachelor, master and doctorate degree as stated in the qualifications framework. The TzQF is a useful tool for incorporating Tuning approach in designing competence/skill based degree programs but practically it is not used by many universities because apparently, it is not clearly understood by course designers in universities. This observation is based on experience as a reviewer of new degree courses submitted by different universities (public and private) to the Tanzania

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Table 4

Competencies Related to Intended Learning Outcomes (ILOs) for Bachelor's Degree

Knowledge & Understanding	Practical Skills & Understanding	Communication Skills
• A broad based knowledge with substantial depth in subject areas • A critical understanding of a selection of the principal theories and technologies • Analytical interpretation of a wide range of data • Synthesize and evaluate information and data in the subject area and general practice	The holder of a Bachelor's degree will be able to carry out *work processes* that: • Require a wide range of specialized technical or scholastic skills • Involve a wide choice of standard and non-standard procedures • Are employed in a variety of routine and non-routine contexts The holder of a Bachelor's degree should also: • Practice routine principles of enquiry and or research • Determine appropriate methods and procedures to manage concrete problems with some theoretical elements	• Effective communication of ideas, problems and solutions to both specialists and non-specialists audiences • Communicate with professional level peers, seniors colleagues and specialists • Use a range of IT applications to support and enhance work • Interpret, use and evaluate a wide range of numerical and graphical data to set and achieve goals/ targets

Source: Adopted from: Tanzania Commission for Universities, *Tanzania National Qualifications Framework. Final Draft.*

Commission for Universities for accreditation. For example, designers of most program reviewed failed to clearly define intended learning outcomes and competencies/skills in a particular degree program. In many cases ILOs were confused with program/course objectives. However, one can convincingly argue that competencies related to ILOs for various degree levels stipulated in TZQF are related to graduates employability.

To what extent are the above intended learning outcomes (ILOs) achievable and capable of making a graduate holder of bachelor's degree competent and competitive in the Tanzania labor market and beyond is open to debate given the constraints (financial and human resources) facing

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universities in Tanzania. The major limitation with the above intended learning outcomes for a bachelor's degree in the Tanzanian or East African context is that they are vague and un-measurable. Another limitation is that the ILOs are not directly aligned to what comes out of the major surveys on what most employers want (in terms of skills and competencies) from university graduates with a bachelor's degree. Elsewhere in the world, most surveys report as most important the following competencies/skills required by employers of university graduates which have not been captured in TzQF:

- Team working skills
- Sector-specific skills
- Computer skills
- Leadership
- Flexibility at workplace
- Good reading & writing skills
- Analytical and problem solving skills
- Planning and organizational skills
- Decision making skills
- Numerical/quantitative skills (See Table 5 for descriptor of each skills)
- Foreign language skills; and
- Time management skills.[31]

Some of the above mentioned competencies have also been recommended in *Tuning Educational Structures in Europe*[32] and Tuning's *List of Generic Competencies Agreed upon for Africa*.

Table 5 summarizes competencies described by graduate employers as most important. In a broader context, the competencies described in Table 5 fit into Hanlie's and Ben's[33] four framing categories of graduates attributes from the employers' perspectives in the South African context[34] and Tuning's "List of Generic Competencies Agreed Upon for Africa" (2014).[35] The four broader categories of graduates' attributes used by Hanlie and Ben are:

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[31] See Hanlie, Griesel and Ben Parker, *Graduates Attributes. A Baseline Survey of South African Graduates from the Perspectives of Employers*; *European Commission. Employers' Perception of Graduate Employability. Analytical Report*; and National Association of Colleges and Employers (NACE), *Job Outlook for 2016*.

[32] Tuning Education Structures in Europe (2010) recommends 31 competencies.

[33] Hanlie and Parker, *Graduates Attributes*.

[34] Griesel, Hanlie, and Ben Parker. *Graduates Attributes. A Baseline Survey of South African Graduates from the Perspectives of Employees*. Pretoria, Higher Education South Africa (HESA) and The South African Qualifications Authority (SAQA), 2009.

[35] See Charles Owono Onana et al., eds., *Tuning and Harmonization of Higher Education: The African Experience* (Bilbao: University of Deusto, 2014).

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1. Basic skills and understanding
2. Knowledge and intellectual ability
3. Workplace skills and applied knowledge, and
4. Interactive and personal skills

The competencies/skills described in Table 5 could be critical in facilitating graduates' employability in Tanzania and other African countries, but the major challenge is how to integrate them in curriculum design/ development in a context where junior academic staff with limited experience in the academia (at times also lacking competencies/skills in their subject

Table 5

Most Important Competencies/Skills Expected by Employers from University Graduates

Competence/Skill	Descriptor
Team working skills	Ability to work confidently in a team
Sector-specific skills	Possession of skills relevant to the sector
Computer skills/ Computer literacy	Using computers to generate and manipulate data, using and creating databases, spreadsheets, Internet & e-mails, designing web pages etc.
Leadership	Ability to motivate, influence and direct others
Flexibility	Ability to adapt to and act in new challenging situations
Good reading/ writing skills	Ability to read professional texts in relevant language, ability to write technical/professional reports, including research reports
Analytical and problem solving skills	Ability to critically analyze and solve organizational problems
Planning and organizational skills	Ability to plan, organize and follow up organizational activities
Decision making skills	Ability to make right decisions based on facts and information available
Numerical/ quantitative skills	Ability to manipulate and use numbers to achieve organizational goals
Foreign language skills	Knowledge of foreign languages
Time management	Ability to manage time effectively, prioritizing tasks and able to work with deadlines

Source: Adapted from: European Commission. *Employers' perception of graduate employability. Analytical report*; NACE, *Job outlook for 2016 Survey,* "What are the top ten skills that employers want?" accessed April 28, 2017, https://www.kent.ac.uk/careers/sk/top-ten-skills.htm.

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Table 6

Intended Learning Outcomes for a Master Degree in Tanzania

Knowledge & Understanding	Practical Skills & Understanding	Communication Skills
• A critical understanding of the principal theories, concepts and principles • Extensive, detailed and critical knowledge and understanding in one or more specializations • Critical awareness of the current issues in a discipline and one or more specializations • Knowledge that covers and integrates most of the principal areas, features, boundaries, terminologies, conventions of subject or discipline • Demonstrate mastery of the subject area • Plan and carry out research/ project work to internationally recognized standards demonstrated by the completion of substantiated research paper/dissertation	• Deal with complex issues both systematically and creatively • Make sound judgment in the context of completed data and clearly communicate conclusions to specialists and non-specialists audiences • Continue to advance knowledge and develop new transferrable skills to a high level • Independent learning ability required for continuing professional development	• Effective communicate of ideas, problems and solutions to both specialists and non-specialists audiences; • Communicate with professional level peers, senior colleagues and specialists • Use a range of IT applications to support and enhance work • Interpret, use and evaluate a wide range of numerical and graphical data to set and achieve goals

Source: Adapted from Tanzania Commission for Universities, *Tanzania National Qualifications Framework.*

areas) are largely involved in teaching large classes, and curriculum design and teaching and learning resources are inadequate due to inadequate financial resources? This is a paradox and a challenge of incorporating the Tuning approach in curriculum design in Tanzania. Table 6 below summarizes intended learning outcomes for university level master degree, which do not substantially differ from the ILOs outlined for the Bachelor degree.

The above ILOs for master's degree also lack specificity and cannot be easily translated into a particular measurable competence or skill expected of a graduate master degree holder. The bachelor and master degree ILOs need revision within the framework identified by graduate employers.

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Although the majority of public and very few private universities in Tanzania offer doctorates by theses only;[36] the TzQF has prescribed ILOs for university level doctorate degree summarized in Table 7. Completion of a doctorate by thesis in Tanzania universities may take up to seven years, rendering the ILOs meaningless or obsolete. Some of the ILOs stated for the doctorate degree may not be applicable because the degree is mainly offered through thesis without coursework through which some of the ILOs could be easily measured. Although the PhD ILOs have existed for the past six years, they are not largely implemented in universities. Universities offering taught PhD programs continue to offer doctorates through lectures (some of these taught by recent PhD graduates without experience because of shortage of professors). Consequently, universities continue to produce PhD graduates without requisite competencies and skills required. Unlike ILOs for bachelor and master degrees, ILOs for doctorate degree are derived from four generic competencies. Despite the addition of the fourth generic competence, the PhD ILOs do not significantly differ from bachelor and master degrees.

In principle, a framework for curriculum design in higher education to enhance graduates' competences and enable them compete in the labor market in Tanzania exists as prescribed by the Tanzania Commission for Universities in the Tanzania Qualifications Framework. However, this framework is not effectively applied by curriculum designers due to lack of clear understanding and training in the application of the framework. Most of the ILOs for bachelor and master degrees are vague and poorly formulated and do not address competencies and skills identified by employers as most important. A thorough revision of the TzQF and its prescribed ILOs by Tuning experts is highly needed. Training of the university lecturers in the application of TzQF in curriculum development/course design is required as one the way forward to empower course designers in universities apply Tuning principles in course design. Furthermore, training of Tanzania university lecturers in curriculum development and designing of expected learning outcomes is urgently needed (as way forward) because the majority of university lecturers except those teaching education courses have no background in pedagogy. This training is in order and critical for application of Tuning principles in curriculum design because in the Tanzanian context curricular development in universities begins at the individual level. Individual lecturers in respective departments and academic units design courses using modular system and on the basis of semester system for a particular degree program, e.g. Bachelor of Education in

[36] Very few universities such as the University of Dar es Salaam have recently introduced taught PhD programs in some disciplines, e.g. economics, education, and political science.

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Table 7

Intended Learning Outcomes for Doctoral Degree Prescribed by TCU

Knowledge & Understanding	Practical Skills & Understanding	Communication Skills	Autonomy, Accountability & Teamwork
• A critical understanding of the principles and theories • Extensive, detailed and critical knowledge and understanding in one or more specializations • Critical awareness of the current issues in a subject or and one or more specializations • Knowledge that covers and integrates most of the principles, terminologies and conventions of a discipline. • Demonstrate a mastery of the subject or discipline • Plan and carry out research work to internationally recognized standards demonstrated by the completion of a substantial research paper/dissertation	• Deal with complex issues systematically and creatively • Make sound judgments in the absence of completed data and clearly communicate their conclusions to specialists and non-specialists • Continue to advance knowledge and develop new transferrable skills to a high level • Develop independent learning ability required for continued professional development	• Effectively communicate information, ideas, problems and solutions to both specialists and non-specialists • Use a wide variety of software to support and enhance work • Undertake critical evaluation of a wide range of numerical and graphical data • Use range of established technique to initiate and undertake critical analysis of information and propose solutions to problems arising from analysis	• Ability to initiate, create and take personal responsibility • Exercise autonomy and initiative in professional activities • Take significant managerial or supervisory responsibility in defined areas of work • Work in support of current professional issues in accordance with current professional ethical codes and practices • Demonstrate originality/creativity in the application of knowledge, understanding & practice

Source: Tanzania Commission for Universities, *National Qualifications Framework*.

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Adult and Community Education. Individual courses form a degree program. A new degree program has to be approved by a department in which it is anchored. All new or revised degree program have to be submitted to the University Senate[37] for approval and later submitted to the Tanzania Commission of Universities for review and vetting and approval.

In the following sub section an attempt is made to explain why higher education curricular reforms and new course design have not effectively worked tackle graduate unemployment in Tanzania.

IV.3. *Higher Education curricular reforms and new course design in Tanzania: why they have not effectively worked to mitigate graduate unemployment*

The Tuning approach as explained earlier, is a world-wide accepted approach for reforming higher education and designing outcome-based degree programs. It is an international tool for re-designing and implementing outcome-based degree programs applied by more than 2,000 universities all over the world before it was introduced in Africa in 2010.[38] Public universities in Tanzania have introduced and implemented a number of curricular reforms and designed new courses/programs (commonly known as market-driven courses), whose impact on graduate employability appears largely insignificant. One of the major reasons for the apparently insignificant impact of curricular reforms and new course designs on graduates' unemployment and employability is that the reforms have been largely *market-responsive curricular* reforms undertaken in a larger framework of neo-liberal (market) reforms undertaken by the Government in other social sectors. Market-driven responsive curricular reforms in public universities in Africa are not necessarily focused on developing long-term, relevant competencies and skills among graduates because they are premised on privatization and commercialization of higher education as a private good. As Mamdani convincingly argues, market responsive curricular reforms in public universities inevitably lead to the market determination of curricular priorities[39] which might not necessarily

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[37] In the context of the University of Dar es Salaam, the senate is the main academic body of the institution handling all academic matters of the University including examinations results, award of degrees and promotion of academic staff.

[38] Hahn and Teferra, "Tuning as Instrument of Systematic Higher Education Reform and Quality Enhancement: The African Experience," 127-163.

[39] See Mahamoud Mamdani, *Scholars in the marketplace: The dilemmas of the neo-liberal reforms at Makerere University, 1989-2005* (Dakar: CODESRIA, 2004).

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focus on long-term graduates' competencies and skills. Market-responsive curricular reforms and resulting market-driven academic program addresses short-term labor market needs (short-term employability of graduates) and economy and do not necessarily support mission and vision of higher education institutions or address competences (through LOs) needed for the graduates to be successful on the long term basis in the future labor market. Graduates' employability through market-driven academic program can only be sustainable if designers of these programs take into consideration future labor market demands. The challenge, however, is that market-driven academic programs in African (public) universities are part of long-term economic survival strategy.

Ian[40] cited in Ogude et al (undated) cautions against reducing curriculum responsiveness to exclusive focus on responding to the labor market demands (economic responsiveness) and preparing students only for the world of work which mainly requires instrumental competencies. Moll further proposes a multi-faceted (eclectic) model of curricular responsiveness, reflecting long-term competencies, although the model does not cover all types of competencies advocated by Tuning, i.e. instrumental, interpersonal and systemic competencies advocated by Villa Sanchez and Poblete Ruiz.[41] Moll's model is composed of four (ideally) interrelated strata of curriculum responsiveness to be considered in curriculum reform and design in universities to achieve long-term competencies among graduates. Among the four strata proposed in the model, only one stratum focuses on learner-centered teaching/learning and assessments in line with Tuning approach. The components of the model are summarized below:

- Economic/policy responsiveness-response to the labor market demands for professions, careers and vocations (human resource needs of the economy) and government policy demands, at times at the expense of the core functions of universities, e.g. nurturing critical thinking among graduates. Economic responsiveness has been a major push for curricular reforms in many African universities.

- Institutional/cultural responsiveness-an institution responds to its own internal agenda, mission, institutional culture and vision and wants to change its status quo through curriculum reforms. Institutional responsiveness to curriculum reforms also incorporates cultural

[40] Ian Moll, "Curriculum Responsiveness: The Anatomy of a Concept," in *Curriculum Responsiveness: Case Study of Higher Education*, ed. Hanlie Griesel (Pretoria: South African Universities Vice Chancellors' Association (SAUVCA), 1-26. (Undated).

[41] Villa Sanchez and Poblete Ruiz. "Competence-based learning."

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responsiveness of a curriculum by including some relevant cultural elements in the curriculum to take care of cultural diversity of students and society. Institutional responsiveness to curriculum reforms has been rare in African universities but documentary evidence show that the University of Dar es Salaam has attempted to implement institutional responsiveness through its *Institutional Transformation Program*.[42] Cultural diversity as a push for curriculum has not a concern of many African universities because of cultural homogeneity, with the exception of South Africa.

- Disciplinary responsiveness-referring to responsiveness of the curriculum to demands of its knowledge discipline through production of new knowledge through research by university teachers and researchers. "The curriculum is responsive to the nature of the discipline by ensuring a close coupling between the way knowledge is produced and the way in which students are educated and trained in the discipline area";[43] and
- Pedagogical/learning responsiveness (responsiveness of the curriculum to the learner)-in this type of curriculum responsiveness "curricular are designed and delivered in a manner that is pedagogically sensitive to students from diverse educational and cultural backgrounds".[44] Pedagogical and learning responsiveness adopts a learner-centered teaching/learning and assessments which takes care of the needs of the learner in a higher learning institution. Responsiveness to learning "demands that university academic staff concentrate not only on *what* is taught in a course, but also on *how* a course is taught".[45] Although pedagogical responsiveness is an important component of competence-based teaching and learning, documentary and research evidence reveal that in the majority of African universities, because of the paucity of teaching and learning resources, teaching remain largely teacher-centered.[46]

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[42] In 2000, the University of Dar es Salaam launched the Institutional Transformation Program (ITP) designed to bring about overall institutional overhaul under a 15 year corporate strategic plan.

[43] Moll, *Curriculum Responsiveness,* 6.

[44] Nthabiseng Ogude, Heather Nel and Martin Oosthuizen, "The Challenge of Curriculum Responsiveness in South African Higher Education," 13 (undated).

[45] Moll, *Curriculum Responsiveness*, 14.

[46] For example, a recent (2016) report on the teaching and learning processes at the University of Dar es Salaam revealed that the dominant teaching approach was teacher-centered. See UDSM (2016). *Report on the monitoring of teaching and learning processes in semester II 2015/2016*.

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IV.4. *Curricular reforms at the University of Dar es Salaam and the role of the Tuning Methodology: the case of market-driven courses*

In Tanzania, the University of Dar es Salaam has been a champion of economic responsiveness curricular reforms through the introduction of several market-driven degree programs and short courses since the early 1990s---mainly as a survival strategy not necessarily related to enhancing graduates' competencies and skills to enable them compete in the labor market or enhancing their employability. The introduction of market driven courses has taken place in tandem with establishment of new colleges and schools and elevating faculties into schools and colleges. Documentary evidence shows that between 1990 and 2014/15 academic year, the University of Dar es Salaam had introduced more than fifty (50) new programs, all market-driven. The fundamental question is whether these new programs designed without applying Tuning approach focus on a combination of generic competencies (instrumental, interpersonal, and systemic) required for a knowledge worker and meet employers' expectations of a graduate expressed in Table 5 and in other surveys presented in this paper. Some new programs have narrow offering focusing on the newly discovered natural resources in Tanzania, such as oil and gas. The question is what will happen to these programs and to graduates when the natural resources for which these programs address extinct. Although no large scale empirical study has been conducted to establish whether or not these market-driven degree programs produce competent/ skilled graduates required by the labor market conforming to the employers' expectations, observation shows that they are not, given the fact that they have not been designed using the Tuning approach and because of other reasons which will be mentioned shortly. Whether these new courses will produce highly competent graduates with skill match and capable of self-employment remain an open question. However, we can at this point tentatively argue that because competence-based teaching and learning (basic principle of Tuning approach) have not been adopted at the University of Dar es Salaam, these new courses designed as a result of economic responsiveness are unlikely to produce highly competent and skilled graduates as per employers' expectations.

In Tanzania and in other African countries which have embraced neo-liberal economic policies and liberalized the higher education sector to allow private providers, economic responsiveness has been a dominant approach to curricular reforms and design applied by both public and private universities. However, available evidence show that the approach has not enabled universities to produce graduates with requisite competencies and skills required by the labor market, hence graduate unemployment. An eclectic

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approach to curricular reforms i.e. a combination of other approaches mentioned earlier and the injection of the Tuning principles would be useful to enable African universities deliver competence and skill-based education to students. In the following section findings are presented and discussed.

V. **Findings and discussion**

V.1. *Academic staff's general understanding of Tuning Approach and its significance in curricular reforms and course design in universities*

All twenty-one (21) members of the academic staff who volunteered to participate in the study (about 25.4% of the total academic staff in the School of Education) acknowledged to have been engaged in course design (at undergraduate and graduate levels) by indirectly using Tuning approach related criteria such as: competence based learning outcomes, skill-based learning outcomes and knowledge-based learning outcomes. Twelve or 57% of the total respondents were aware of the Tuning approach and its significance in curricular reform and course design in universities to make university education more competence and skill based. Nine members only (43%) claimed being unaware of the Approach, but further observed that they were sure they have been applying Tuning approach in curricular design without knowing it.

Related to the Tuning approach are the concepts of outcome-based education (OBE) through outcome-based teaching and learning (OBTL) and competence-based teaching and learning in higher education. All academic staff respondents in our sample were familiar with the two concepts above and 17 (81%) of the academic staff observed that both OBE and OBTL approaches to curricular design were applied in course design at the University of Dar es Salaam. Only 4 (29%) of the respondents observed that OBE and OBTL principles were inapplicable at the UDSM because of the following factors:

- Both OBE and OBTL principles are unknown or not well understood by many lecturers in public universities in Tanzania
- Inadequate resources and large classes and generally poor teaching and learning conditions make it difficult to apply OBE/OBTL. This factor is related to my earlier observation that inadequate teaching and learning resources were one of the limiting factors in applying Tuning approach and competence-based teaching and learning in our universities and

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- Lecturers and students were not ready to change their mind sets to accept OBE/OBTL. Change of mindsets particularly by lecturers to accept OBE/OBTL as a strategy of making university education more competence –based may perhaps be a result of lack of training in the application of the concepts in curriculum design in universities.

Thirteen members of the academic staff (sixty-two percent) were of the views that if Tuning approach is applied in reforming Tanzania higher education system and in designing new academic programs in universities it can enhance graduates competencies and skills for employability in the labor market. Academic staff's views on the Tuning approach and its capacity to enhance graduates competencies and make university education competence-based are summarized in Box 1 below. Responses can be summarized in five themes/categories related to what Tuning can do and the conditions for effective functioning of Tuning: improvement of students' academic performance, enhancement of students' employability, capacity building in the application of Tuning approach for all academic staff in universities; limited scope of the approach; more investment in teaching and learning resources to support the approach and a call for paradigm shift and re-orientation of Tanzanian universities to accept Tuning approach.

Box 1

Academic staff views on the application of Tuning approach to enhance students' competencies and skills

Enhancement of Students' Competencies & Employability

- ✓ It has great potentiality for enhancing graduates' employability because it focuses on competencies and skills
- ✓ It recognizes both generic and specific competencies necessary for employment

Improvement of Students Academic Performance

- ✓ The approach will improve students' academic performance as it adopts outcome based teaching and learning

Limited Scope of the Approach

"Tuning approach is good, except that it may tend to focus purely on labor market signals rather than on broader development issues required of higher education"

- ✓ It should also focus on self-employment skills
- ✓ Should be carefully applied with consideration to cultural factors

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Capacity Building

"Capacity building through training in Tuning methodology should be provided to all academic staff in all universities in Tanzania."

✓ Capacity building is required to enable the University of Dar es Salaam's academic staff apply it in course design and curricular reforms

Investment of Adequate Financial Resources

✓ Financial and human resources are inadequate to make Tuning approach effectively function in universities

✓ Need to invest more resources in universities to support the approach

"Teaching and learning conditions in our universities are poor, may hinder effective use of the Tuning approach."

Paradigm Shift

✓ Paradigm shift from theory to competence-based curricular is needed

"There is a need to change teacher-centered approach to accommodate Tuning approach in our universities."

✓ Re-orientation of universities to accept Tuning is needed

- Capacity building through training in Tuning methodology is required to enable the University of Dar es Salaam academic staff apply it in course design and curricular reform
- The approach will improve students' academic performance and competencies and will change the current public image that university graduates are unable to compete in the labor market
- It is a good approach for enhancing graduates' competencies in Tanzania, but training on the approach to all academic staff in all universities in the country should be provided

What generally comes outstandingly from the above views is that Tuning approach to curricular reform and course design in higher education has a great potential of enhancing graduates' competencies and consequently employability in Tanzania. But, in the Tanzania context there are two possible limitations to the application of the approach in curriculum implementation: poor teaching and learning conditions and inadequate resources in universities. Inadequate resources and poor teaching and learning conditions, manifested inter alia, by larger classes, shortage of academic staff (in senior academic ranks) and inadequate funding of public universities makes it difficult to effectively apply the Tuning approach in our universities to deliver competence-based university education. Inadequate resources and poor teaching and learning conditions

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have also been cited in literature as limitations to applying outcome-based teaching and learning in universities.

Another limitation to the application of Tuning approach through outcome-based teaching and learning is the entrenched teacher centered approach to university teaching. Seventy-one percent (71%) of the academic staff in our sample acknowledged that teacher-centered approach was currently dominant in university teaching and contributed to the graduates' lack of competencies and skills upon graduation. This view is supported by the earlier report on teaching and learning processes at the University of Dar es Salaam. In this report, authored by the Quality Assurance Bureau of the University of Dar es Salaam, it is observed that the dominant approach to teaching at the UDSM was teacher-centered.[47] In teacher centered approach, lecturers make all decisions concerning course outlines/syllabus, teaching methods, and different forms of assessments through various assignment and tests, and generally the approach does not allow students to influence their own learning in a university setting. This approach, according to Duckworth**,** cited in Ahmed[48] prevents students' educational growth, which has implication on development of competencies and skills. From another perspective, as observed earlier, given the fact the bulk of teaching in universities is conducted by junior members of the academic staff whose competencies and skills needs further enhancement, teacher-centered approach to teaching in universities implies that less competencies, skills and knowledge are passed on to students.

On the other hand, adopting student-centered learning approach in university teaching (deeply rooted in the constructivist approach to teaching and learning[49]) is almost impossible in our universities due the challenges mentioned earlier, i.e. larger classes, poor teaching and learning conditions and inadequate resources (human and financial).

V.2. *Academic staff's views on graduates' unemployment in Tanzania and relationship to competence-based university education*

A questionnaire composed of both closed and open-ended items was distributed to 21 members of the academic staff in the School of Education to

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[47] University of Dar es Salaam (UDSM), *Report on the Monitoring of Teaching and Learning Processes in Semester II, 2015/16* (UDSM, 2016).

[48] Ahmed Khaled Ahmed, "Teacher-Centered Teaching versus Learner-Centered Teaching Style," *The Journal of Global Business Management* 9, no. 1 (2013): 22-34.

[49] Constructivist approach to teaching and learning postulates that learning is an active and contextualized process where learners construct knowledge rather than acquire it.

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solicit their views on whether or not they agreed with the public outcry that university graduates in Tanzania lack employable skills because the current university education is not competence-based and recommend strategies to make university education more competence and skill based. One of the questionnaire items also requested them to express their views on the popular claim among employers that university education in Tanzania is theoretical and un-aligned to the labor market needs (hence graduate unemployment) and suggest ways in which university education can be aligned to the labor market. Findings are summarized below.

V.2.1. Graduate unemployment in Tanzania and strategies of making university education competence and skill-based

Ten members of the academic staff (48%) agreed with the view that Tanzania university graduates lack employable skills because university education is not competence-based; while 52% disagreed. Some of the respondents argued that universities are not polytechnics designed to solely equip students with competencies and skills and that universities are supposed to produce thinkers, not technicians. Although the above argument may reflect an old thinking of a "traditional elite university" designed to produce "thinkers," decision makers and rulers, critical thinking has been mentioned as one of the major graduates' competencies appearing in many major surveys of what employers want from university graduates. However, the traditional "elite university" does no longer exist in contemporary Africa. It has been replaced by the entrepreneurial university long time ago when public universities were compelled to seek alternative means of generating extra income to mitigate inadequate government budgetary allocations.

The entrepreneurial university responds to the labor market and to the society/community and learners' needs. The entrepreneurial university is an "engaged university" interacting with the society and mobilizing human and intellectual resources to directly tackle some of its problems, such as poverty and produces knowledge that has real impact on society and its people."[50] Recommendations of making university education more competence-based are summarized in box 2 below, revolve around the following themes: review of university curricular to emphasize graduates' competencies and skills, capacity building for university lecturers to design competence-based curriculum and use of Tuning approach in curriculum design, change of student assessment and

[50] See David Watson et al., *The Engaged University. International Perspectives on Civic Engagement* (London:: Routledge, 2011).

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evaluation methods, Government to provide adequate resources, and change of teaching and learning methodology. The dominant strategy recommended by almost all academic staff is review of university curricular to emphasize on students' competencies and skills. Issues of capacity building for lecturers to enable them design competence-based degree programs and investment of adequate financial resources in university education expressed earlier by same lecturers regarding the application of Tuning approach to enhance students' competencies were also recommended as strategies of making university education in Tanzania more competence-based. Box 2 below summarizes strategies recommended to make university education more competence-based to enhance graduates employability in the Tanzanian context.

Box 2

Academic staff views on strategies to make university education competence-based

Review university curricular to emphasize on competencies and practical skills more than theories

Ensure that courses as well as the teaching and learning processes incorporates Bloom's Taxonomy of Educational Objectives

✓ Develop courses considering student needs

Capacity building for university lecturers

✓ Train university lecturers to design competence-based and practical degree programs

"Many university professors are not well versed in competence-based curriculum although they use some terms such as 'intended learning outcomes' and 'competencies in their course outlines"

✓ Provide regular professional development courses for lecturers

Change assessment method

✓ Introduce practical examinations

Investment of adequate resources in university education

✓ Government should provide adequate resources to facilitate provision of quality higher education

Change teaching and learning methodology, adopt competence-based teaching and learning

✓ Use different pedagogies that emphasize different skills and competencies

✓ Adopt small classes, large classes affect teaching, as a result we rely on teacher-centered method which does not impart skills

V.2.2. University education alignment to the labor market needs and graduate unemployment

Sixty-seven percent of the faculty supported the argument that university education in Tanzania was theoretical and un-aligned with the labor market needs, and hence graduate unemployment; thirty-three percent disagreed. Major recommendations made to align university education to the labor market needs in the Tanzanian context are:

a) Involve potential employers of university graduates and labor market experts in university curriculum design through comprehensive needs assessment of competencies and skills (dominant recommendation). The logic in this recommendation is that potential employers will provide inputs on competencies and skills required by the labor market.

b) Design relevant, competence-based curriculum (also dominant recommendation)

c) Regularly assess the labor market needs and reform university curricular through Tuning approach

d) Adopt competence based teaching and learning

e) Conduct regular tracer studies to get feedback from employers and graduate students

All of the above recommendations are feasible in the Tanzanian context, provided public universities take the initiative. Anecdotal evidence also show that employers, on their part, are willing to work with universities in matters related to designing competence based curricular aligned with the labor market,[51] but apparently universities still function in the 'ivory tower mode'. In this mode, universities do not adequately interface with potential employers and communities. The last recommendation, that is, conduct of regular comprehensive tracer studies also known as graduate surveys, has been one the key strategies used by higher education institutions world-wide to obtain direct feedback from graduate students and employers on the relevance to the job and

[51] For example, on February 23rd, 2017, the Tanzania Private Sector Foundation (TPSF) organized a workshop on internship training program and urged universities to establish links with businesses to produce graduates needed in the labor market. The TPSF also urged universities to equip students with practical skills and competencies rather than theories. See http://www.thecitizen.co.tz/News/Business/Graduates...skills-wanting...accessed on August 10, 2017. TPSF is an apex organization of all private sector companies and organizations.

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marketability of higher education programs.[52] Furthermore, according to Schomburg, graduates tracer studies further provide an important feedback for curriculum review and development in terms of competencies and skills required by the labor market and other aspects related to study conditions in higher education institutions.[53] Unfortunately, tracer studies (despite their importance for the introduction of new programs and review of old ones) have been abandoned by many Tanzanian universities because of inadequate financial resources. At the University of Dar es Salaam, the last official tracer study was conducted in 2001, and was limited to the Bachelor of Commerce graduates in the then Faculty of Commerce and Management.[54]

V.3. *Academic staff views on the market-driven degree programs at the University of Dar es Salaam*

Through an open-ended item twenty-one faculty were asked to give their general views on market-driven academic programs introduced at the University of Dar es Salaam in the late 1980s in terms of being competence-based, their relevance to the national development and their potentiality to enhance graduates' employability in the competitive labor market.

V.3.1. Competencies and skills

All but two respondents (90%) observed that the market-driven courses introduced in different academic units at the University of Dar es Salaam and generally in other public universities in Tanzania were not competent and skill-based, although some are designed to meets specific labor market needs of the targeted clients for a short term. The major reasons given for the above respondents' observation are:

- They are introduced without conducting a comprehensive needs assessment of the labor in terms of skills and competencies required;

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[52] The National Commission for Higher Education (NCHE) reports that regular graduate surveys of Makerere University graduates has helped the University improve its curricular through reviews. See NCHE report of 2015, among others,

[53] See Harald Schomburg, *Carrying Out Tracer Studies. Guide to Anticipating and Matching Skills and Jobs* (Luxembourg: European Union, 2016).

[54] Erasmus. S. Kaijage "Knowledge and skills of the Bachelor of Commerce Graduates of the Faculty of Commerce and Management of theUniversity of Dar es Salaam in the job market," 2001 http:rc.aau.org/files/kaijage.pdf, accessed August 10, 2017

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they are therefore out of touch with the labor market requirements for skills,

- The lecturers who designs these courses are not trained in competence-based curriculum design and application of competence-based teaching and learning,
- The courses are designed with profit motives for academic units offering them, not for making graduates competent and skilled on the long-term basis,
- The courses are offered in poor infrastructure (poor teaching and learning conditions), which cannot support competence-based teaching and learning,
- Courses do not incorporate entrepreneurial and self-employment skills in their curricular.
- Resources and teaching and learning conditions in universities make it difficult to apply competence-based teaching and learning to make these courses competence-based.

The introduction of market-driven academic programs in African public universities is a part of market-responsiveness of curriculum and one of the strategies for the marketization of universities, which unfortunately does not address key issues of long-term competencies and skills through expected learning outcomes. Despite massive marketization of African universities, graduate unemployment is still a challenge.

V.3.2. Relevance to national development

The question of relevance sought to relate market-driven courses developed in universities and their contribution and relationship to the long-term national development agenda and goals. Only five faculty members (24%) thought the courses were relevant to the national development but with caution that they should be regularly reviewed to meet current development priorities and strategic development plans; while seventeen respondents (76%) thought market-driven courses are irrelevant to the broader national development agenda because:

1. Majority of courses do not focus on the broader national development needs, but focus on short-term labor market needs which saturate with time (dominant factor)

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2. Courses tend to be motivated by an urge to generate extra income for the cash-starved universities rather than imparting critical competencies necessary for national development,
3. They address sectoral labor market demands which saturate with time,
4. The contents, teaching and learning methodologies in market-driven courses are not designed to contribute to national development needs; and
5. The courses are not aligned to nation' strategic needs and plans.

The issue of relevance of market-driven courses introduced in public universities in Africa as a strategy of marketization of universities has been also raised by Munene.[55] Munene citing Dill[56] argues that reforms that have taken place in African public universities have challenged the notion of a public university as a public good and key instrument of national development. He argues that public universities in Africa are now agents of the markets or they are themselves markets. This is a sound argument given the entrepreneurial nature of African universities.

IV.3.3. Enhancement of graduates' employability

Eleven respondents (52.4%) of the respondents reported that market-driven courses introduced in public and private universities in Tanzania cannot or do very little to add to the enhancement graduates' employability; while ten (47.6%) another had a view that these courses enhances graduates' employability.

Members of the academic staff who thought market-driven courses do very little to enhance graduates' employability cited the following hindering factors:

- Most of the courses have been introduced without comprehensive labor market needs assessment (this was a popular view)
- They are not competence and skill based

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[55] See Ishmael Munene, *Profits and pragmatism. The commercial lives of market universities in Kenya and Uganda*. (SAGE Open, October-December 2015): 1-14, doi: 10.1177/2158244015612519.

[56] David Dill," Allowing markets to rule: The case of the United States of America," *Higher Education Quarterly* 57 (2003), 136-157.

- They are designed on ad hoc basis
- Teaching and learning in these courses is teacher-centered
- The courses are not focused on enhancing ability for self-employment and
- They are irrelevant

Faculty who thought that market-driven courses enhance graduates employability observed (with caveat)[57] that the courses:

- Target certain skills wanted by employers (most popular view)
- Target current labor market needs, and
- Incorporate a "skilling element" for necessary employment or self-employment

V.3.3.1. *Generic competencies related to employability most wanted by employers from graduates: faculty and graduate student views*

Related to graduates' employability is the skills or generic competencies (in the context of Tuning approach) most wanted by employers. Using competencies adopted from the European Commission, 2010. *Employers perception of graduate employability*, NACE's'2016 *Job outlook survey* and Graduates Attributes. *A Survey of South African Graduates from the Perspectives of Employers*, this study also sought to find out how faculty members and graduate students ranked fourteen competencies used in the two reports cited above. Faculty (21) and students (89) were asked to rank in order of priority the following competencies:[58]

1. Ability to work in team structure (group) (C1)
2. Ability to make decisions (C2)
3. Ability to solve (organizational) problems (C3)

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[57] The caveat expressed by respondents in the above group is that although market-driven courses can enhance graduates' employability they focus on short-term labor market needs which saturates with time, and therefore, they do not focus on sustainable labor market skills.

[58] The choice of these competencies has been influenced by the fact they appear to be universal cited in many major surveys of what employers want from university graduates. They are also comparable with List of Generic Competencies Identified in Tuning Africa Project.

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4. Ability to communicate verbally (C4)
5. Technical knowledge related to the job (Technical skills) (C5)
6. Ability to plan, organize and prioritize work (C6)
7. Ability to obtain and process information/data (C7)
8. Quantitative skills (ability to analyze quantitative data) (C8)
9. Proficiency with computers' software programs (C9)
10. Ability to write technical/professional reports (C10)
11. Adaptability (Flexibility) (C11)
12. Leadership skills (12)
13. Time management (C13)
14. Critical thinking and analysis (C14)

3.3.1.1. Faculty ranking of important competencies related to graduates' employability

Analysis of faculty rank order of the above competencies (calculated from average rankings) is summarized in Table 8 below. Faculty ranked critical analysis and thinking as the most important graduate competence which should be valued by employers, followed by technical knowledge related to the job or technical skills. Surprisingly, proficiency with computer software programs was ranked as of least importance by faculty, although computer skills are necessary for faculty' to effectively function in this era of globalization and knowledge economy.

Table 8

Faculty Rank Ordering of Competencies
Most Wanted from Graduates by Employers

Competence	Average Ranking	Rank Order
Critical thinking & analysis	3.33	1
Technical knowledge related to the job (Technical skills)	4.47	2
Ability to plan, organize & prioritize work	5.38	3
Ability to solve (organizational) problems	5.47	4
Ability to make decisions (Decision making)	6.19	5
Ability to communicate verbally	7.14	6

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Competence	Average Ranking	Rank Order
Ability to work in a team structure	7.76	7
Quantitative skills (ability to analyze quantitative data)	7.80	8
Ability to obtain & process information	7.85	9
Time management	8.19	10
Ability to write technical reports	9.28	11
Leadership skills	9.76	12
Adaptability (Flexibility)	9.80	13
Proficiency with computer software programs	10.0	14

3.3.1.2. Graduates' students ranking of important competencies related to graduates' employability

Students' ranking of important competencies summarized in Table 9 also shows that critical thinking and analysis was ranked as most important competence/skill, followed by technical knowledge (technical skills) related to the job and ability to analyze quantitative data was ranked as least important. This is not surprising given the fact the majority of students in social sciences, education and humanities in African universities, because of their poor background in Mathematics in secondary schools, dislike quantitative related courses. However, possessing quantitative skills is generally an important competence required by employers of graduate students.

Table 9

Students Rank Ordering of Competencies
Most Wanted from Graduates by Employers

Competence	Weighted Average Ranking	Rank
Critical thinking & analysis	5.0	1
Technical knowledge related to the job	5.34	2
Ability to make decisions	5.87	3

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Competence	Weighted Average Ranking	Rank
Ability to work in a team structure	6.40	4
Ability to solve organizational problems	6.67	5
Ability to communicate verbally	6.79	6
Time management	7.09	7
Ability to plan, organize & prioritize work	7.19	8
Leadership skills	8.14	9
Ability to obtain & process information	8.56	10
Ability to write technical reports	8.73	11
Proficiency with computer software programs	8.97	12
Adaptability (Flexibility)	9.35	13
Quantitative skills (ability to analyze quantitative data)	9.66	14

Tables 9 and 10 show that both faculty and students have similarly ranked the following competencies:

- Critical thinking and analysis (ranked 1)
- Technical knowledge related to the job (ranked 2)
- Ability to communicate (ranked 6)
- Ability to write technical reports (11)
- Adaptability (13)

It is interesting to note that both groups ranked 'Critical thinking and analysis' as the most important competence for university graduates, followed by 'technical knowledge/skills related to the job. However, due to dominance of teacher-centered teaching approach in our universities and other challenges facing universities, particularly overcrowded lecture rooms, it is almost impossible to nurture critical thinking and analysis among students. It is also a challenge for students to acquire technical knowledge/ skills in overcrowded classrooms and through lectures. Table 10 compares and summarizes faculty and students' average and actual rankings of fourteen competencies most wanted by employers from graduates presented in Tables 8 and 9.

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Table 10

Comparison of Faculty and Students' Weighted Average Rankings of Most Important Graduates' Competencies Wanted by Employers

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Weighted Average Ranking														
Faculty	7.76	6.19	5.47	7.14	4.47	5.38	7.85	7.80	10.0	9.28	9.80	9.76	8.19	3.33
Students	6.40	5.87	6.67	6.79	5.34	7.19	8.56	9.66	8.97	8.73	9.35	8.14	7.09	5.0
Ranking														
Faculty	7	5	4	6	2	3	9	8	14	11	13	12	10	1
Students	4	3	5	6	2	8	10	14	12	11	13	9	7	1

Key: C = Competence (See p. 26).

V.4. *Students' views on graduate unemployment, application of tuning approach and competence-based teaching and learning to enhance graduates' employability in Tanzania*

V.4.1. Causes of graduates' unemployment and under-employment and what universities should do

All 89 graduate students (100%) in our sample admitted that graduate unemployment and underemployment are serious problems in Tanzania. The major causes of the above problems (from students' perspectives) are summarized in Table 11. In order of priority major causes of graduate unemployment are:

- lack of competencies and skills required by the labor market,
- irrelevant curricular,
- expansion of higher education without concomitant infrastructure and resources,
- teaching and learning approaches which are not competence-based,
- courses and programs offered by universities are not competence-based, and

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- lecturers' lack of knowledge in designing competence/outcome-based academic programs.

About six percent of the respondents thought that all the above factors were responsible for graduates' unemployment in Tanzania.

Some of the reasons for graduate unemployment identified by students have also been mentioned by faculty, e.g. lack of competencies and skills required by the labor market, irrelevant curricular and lecturers' lack of knowledge in designing competence based and outcome-based courses. It is interesting to note that students brought out the issue of expansion of higher education and its attendant low quality university education as one of the factors of graduate unemployment in Tanzania, although they are major beneficiaries of university education expansion. It is a fact that higher education in Tanzania has dramatically expanded in terms of student enrollment and number of universities without expansion of educational infrastructure and increase of financial and human resources.

Table 11

Major Causes of Graduate Unemployment in Tanzania:
Graduate Students' Perspectives
N=89

Cause	Number of Respondents	%
Students are not equipped with competencies & skills required by the job market	28	31.46
Irrelevant curricular to the job market	25	28.08
Expansion of higher education which lowers the quality of university education	14	15.73
Teaching & learning approaches are not competence-based/outcome-based	7	7.86
Courses/programs offered by university are not competence-based	6	6.74
Lecturers lack knowledge of designing competence/ outcome based programs	5	5.61
All of the above	4	4.49
Total	**89**	**100.0**

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V.4.2. What universities should do to mitigate graduate unemployment and best solution to graduate unemployment implementable by universities in Tanzania

In the context of the above identified major causes of graduates' unemployment, students recommended the following measures (apparently logically interrelated) as strategies for reducing graduate unemployment in Tanzania:

- design of competence-based university curriculum,
- design of relevant curricular to the labor market,
- inclusion of entrepreneurial/self-employment skills in curriculum,
- change of mode of student evaluation to focus on competencies, instead of examinations
- use of innovative teaching approaches (particularly adoption of competence-based teaching and learning approaches, and
- training of university lecturers in designing competence-based courses, See Table 12.

In the students' opinion, the best solution to graduate unemployment was equipping students with more practical skills and competencies through university curriculum, this means changing the current university curricular to make it more competence-based.

Table 12

Measures to be Implemented by Universities to Reduce Graduate Unemployment
N=89

Measure	Frequency	%
Design of competence/skill-based curriculum	30	34.0
Design relevant curricular to the labor market in consultation with employers	21	23.5
Include self-employment/entrepreneurial skills in all university courses	18	20.2
Change mode of student assessment/evaluation currently focused on examinations to include competencies	8	9.0

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Measure	Frequency	%
Use innovative teaching and learning approaches/Adopt competence-based teaching and learning	7	7.6
Lecturers should be taught or learn how to design competence-based degree programs	5	5.6
Total	**89**	**100.0**

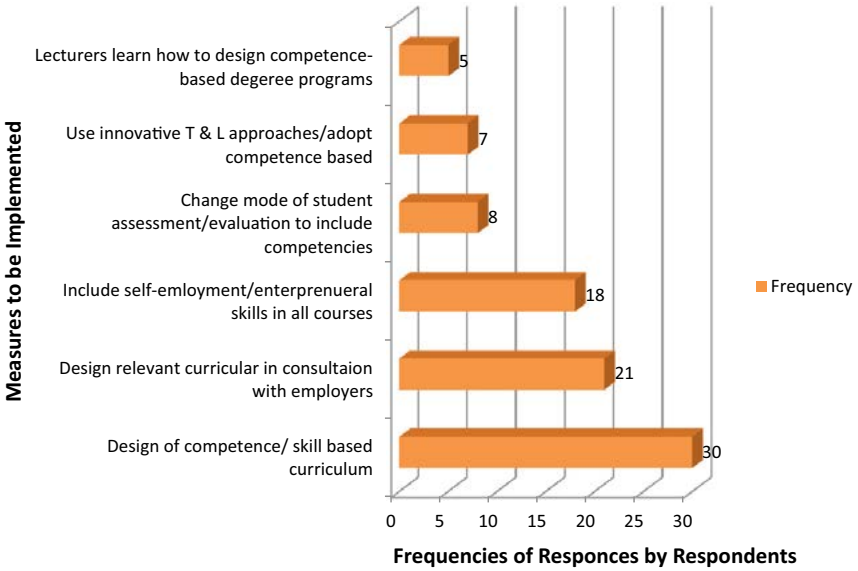

Figure 3

Measures to be Implemented by Universities to Reduce Graduate Unemployment N=89

Seventy graduate students (78.6%) supported a popular view that university education in Tanzania is theoretical. Furthermore, students supported another view from university graduates employers that graduates were not innovative, lacked necessary skills and competencies required by employers forcing some employers to employ foreign professionals from neighboring countries. Students recommended that universities should adopt competence-based curriculum and competence based teaching and learning to enhance graduates employability. All (100%) graduate students in our

sample had a view that the application of Tuning approach and competence-based teaching and learning in Tanzania universities can enhance university graduates competencies and skills and boost their employability.[59]

Findings generally show that:

- Members of the academic staff were aware of the Tuning approach and its significance in curricular reforms and course design in universities to make university education more competence/skill based to enhance graduates' employability. Faculty were also familiar with the two key concepts related to Tuning approach, i.e. outcome-based education (OBE) and outcome-based teaching and learning (OBTL) in universities, but further observed that lecturers and students (at the UDSM) were resistant to the application of OBE and OBTL. Apart from resistance to the application of OBE and OBTL, members of the academic staff observed that teacher-centered approach to teaching dominant in almost all universities in Tanzania was a constraint to adopting both OBE and OBTL in the Tuning context.

- All student respondents were also aware and positive of the Tuning approach and competence-based teaching and had view that if Tuning approach is applied in curriculum design and implementation can enhance university graduates employability.

- Forty-eight percent of the faculty in our sample also agreed that university graduates in Tanzania lack employable skills because current university education is not competence-based and is un-aligned to the labor market needs. They recommended adoption of competence based curriculum and training of lecturers in designing and implementing competence-based curriculum.

Almost all faculty respondents agreed that the majority of market-driven courses introduced at the University of Dar es Salaam and other universities were not competence-based because they are introduced without conducting comprehensive labor market needs assessment and also the lecturers who design market-driven courses are not trained in designing competence-based curriculum. On relevance to national development and contribution to enhancement of graduates' employability; the majority of the faculty

[59] As explained earlier, the concept of Tuning and its importance in designing competence-based academic programs was earlier explained to students when they participated in the students' workload study. The concept of competence-based curricular was introduced/described in the students' questionnaire.

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observed that most of the market-driven courses are irrelevant because they are designed with a profit motive behind and mostly designed on ad hoc basis to address short-term, sectoral labor market needs which saturates with time, but some can enhance graduates' employability because they target specific skills.

Both faculty and students similarly ranked five generic competencies as most important competencies preferred by employers from university graduates: critical thinking and analysis, technical knowledge/skills related to the job, ability to communicate verbally, ability to write technical reports, and adaptability (flexibility). These competencies have appeared in all major international surveys on what employers want from university graduates.

All respondents (faculty and students) acknowledged of the existence of graduate unemployment and underemployment in Tanzania. Both groups attributed the two problems to different factors, but they all pointed out common causes as: (1) lack of competencies and skills required by the labor market, (2) irrelevant curricular and (3) lecturers' lack of knowledge and skills in competence/outcome based degree courses and programs. Faculty and students, among other recommendations, strongly recommended review of university curricular to make it competence-based, design of competence/skill-based university curricular and application of Tuning approach in curricular design as strategies of mitigating graduates' unemployment. Students further recommended inclusion of self-employment or *entrepreneurial skills* in the university curriculum to further enhance graduates' competencies. Some student respondents suggested that undergraduate students should be psychologically prepared from the first year for self-employment through inclusion of entrepreneurship skills in university curriculum and should be made to understand that a university degree is not a guarantee for employment in the public or private sector. The recommendation to include entrepreneurship in university curriculum is plausible. Currently, entrepreneurship courses are offered by the University of Dar es Salaam Business School (UDBS) on short-term basis as a part of income-generating activities. Entrepreneurship could be made a general common course for all undergraduates as is the case with Development Perspectives course (formerly known as Development Studies)[60] and

[60] Development Perspectives is a multi-disciplinary course focusing on Third World development issues and problems and issues offered by the Institute of Development Studies of the University of Dar es Salaam.

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Communication Skills which are university-wide compulsory courses for all first year students in all disciplines.

VI. **Conclusions and recommendations (the way forward)**

This paper generally explored faculty and graduate students' views on the possibility of applying Tuning approach and competence-based teaching and learning at the University of Dar es Salaam to enhance graduates competencies and skills for employability. Findings from both faculty and students involved in this study (although the sample is limited) generally points out to the fact that Tuning approach in course/curriculum design and implementation to produce competence-based curriculum and application of competence based teaching and learning in university teaching might be a panacea for increasing graduates' employability in Tanzania. However, the major challenge to the application of both Tuning approach and competence based teaching and learning (particularly at undergraduate level) is poor teaching and learning conditions (manifested by large classes, overcrowded classrooms, inadequate teaching and learning, and shortage of senior members of the academic staff). This challenge, among other consequences, compels most lecturers to resort to teacher-centered approach (lecture method) to teaching and examination based student evaluation. The above consequences are counterproductive to the application of competence-based teaching and learning and consequently the production of competent graduates capable of competing in the labor market. Students in this study have also expressed their concern about the current student assessment method largely based on examinations. This assessment method encourages cramming of materials and rote learning in order to pass examinations and secure a good grade. But as pointed out at the beginning, employers have shifted from using certificates (grades) for recruitment of graduates, they are currently "looking for capabilities beyond a list of subjects defined in certificates". The observation above underscores the importance of applying Tuning approach in higher education reforms and curriculum/course design in Tanzania.

In the context of the study findings and the discussion arising, I am recommending the following as a way forward:

- Capacity building of all academic staff in public and private universities in the application of Tuning approach in course design and general curriculum development, i.e. training of university lecturers to design competence/skill-based degree programs. This

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recommendation has also been made by respondents (academic staff and graduate students) and is viewed as one of the solutions to graduate unemployment in Tanzania. The International Tuning Academy can facilitate this training through on-line courses if approached by a respective university. Training in the application of Tuning approach should be compulsory to all newly-recruited and experienced university lecturers. Emphasis of training should be on formulation of expected learning outcomes, curriculum design and program specification. Training is important given the fact that the majority of university lecturers have no background in educational theories. In the past, the University of Dar es Salaam had in place University Teaching and Learning Improvement Program (UTLIP) which meant to expose lecturers to the best methods of teaching which was discontinued due to inadequate financial resources to support the program. This program could be revived to become an integral part of training in the application of Tuning approach.

- Comprehensive review of university curricular to emphasize competencies and practical skills by using Tanzania Qualifications Framework as guideline. The implementation of this recommendation might require massive investment in teaching and learning resources, which might be a challenge. Despite the challenge of massive investment in teaching and learning resources, comprehensive review of university curricular to emphasize competencies and skills remain a viable solution to graduate unemployment in Tanzania.

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Algebraic competences and emotional intelligence of first year Bachelor of Science in Mathematics and Science Education students at the Copperbelt University in Zambia

Allan Musonda*

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Abstract: This study examined the relationship between algebraic competences and emotional intelligence of first year Bachelor of Science in mathematics and science education students at Copperbelt University in Zambia. All (143) first year Bachelor of Science in mathematics and science education students, in 2016, were purposively selected for the study. The study was motivated by evidence that students generally do not perform well in their first year university mathematics examinations despite the students having very good university entry grades in secondary school mathematics. This poor academic performance may be due to many factors. However, this study identified and focused on emotional intelligence as one such factor. Emotional intelligence is defined as the ability to identify, assess and manage the emotions of one's self, of others and of groups. It is argued that emotional intelligence represents an ability to reason with emotions and to use emotions to facilitate thought. On the other hand, Algebra was chosen as the focus of the study because of its centrality to the whole of first year university mathematics content. Algebra is found in all branches of mathematics directly or indirectly. Therefore, the study explored the algebraic competences of the first year students and examined possible relationships with their emotional intelligence. Emotional intelligence was measured using the Schutte Self-Report Emotional Intelligence Test (SSEIT), and algebraic competences were measured through a Grade 12 level algebra achievement test and a university level algebra achievement test constructed by the researcher. Data were analysed using non-parametric statistical techniques: Spearman's Rank Order Correlation (rho) and the Mann-Whitney U Test. Results showed that there is a significant positive correlation between Grade 12 level and first year university level algebraic competences. Results also showed that there is no significant relationship between students' algebraic competences and their emotional intelligence. Furthermore, the study reviewed that female students have higher levels of emotional intelligence than their male counterparts.

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Keywords: algebraic competences; emotional intelligence; emotions; facilitate thought; mathematics and science education students; algebra.

I. **Introduction**

Every institution of learning whether at primary, secondary or tertiary level, is concerned with the academic achievement of its learners.[1] It is the concern of institutions of learning that their learners progress from one level to another and are able to complete whatever programme they are in within the specified time period. Thus learners are expected to express levels of competence in what they are learning in order to move to a higher level. In many situations, however, this is not the case as learners do not progress from one level to another due to poor academic achievement.[2] Poor academic achievement of learners is due to many factors, among which is emotional intelligence. Scholars have pointed out that learners' emotional intelligence is one of the factors that determine the achievement of learners.[3]

A number of studies on emotional intelligence and academic achievement have been conducted in tertiary institutions of learning both in Africa and outside. For instance, a study[4]conducted in Malaysia examined the effect of emotional intelligence on academic performance of first and final year medical students. A total of 163 (84 year one and 79 year five) medical students participated in this study and the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) was used to measure emotional intelligence of the participants. The researchers found that emotional intelligence was a significant predictor of academic performance in overall continuous assessments and final examination amongst the first- and final-year medical students.[5]

A study[6] was conducted in Dubai, in 2014, to determine the impact of emotional intelligence on academic achievements of expatriate college students in that country. In this study, the researcher observed that expatriate

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students with positive emotional intelligence traits succeeded in academic achievement, whereas expatiate students with negative emotional intelligence traits failed in gaining academic achievements. The tool used for data collection, in this study, was a structured questionnaire, which covered the demographic profile of students, their academic achievement and their perception on emotional intelligence. This tool was in the researcher's view not adequate to measure emotional intelligence since it only provided for students' perception on their emotional intelligence.

Another study investigating the relationship between emotional intelligence and academic achievement among undergraduate university students is that conducted at the University of the West Indies (UWI), Barbados.[7]The study investigated the relationships between emotional intelligence and academic achievement among 151 undergraduate psychology students. The instruments used in this study are Barchard's Emotional Intelligence Scale and an Academic Achievement Scale. The researcher found significant positive correlations between academic achievement and six of the emotional intelligence components. In this study since the Academic Achievement Scale was a 50-item multiple choice test, it is possible that some students might have resorted to guessing answers to questions which were not known. A test in which students showed their thinking by writing out explanations as solutions could have been ideal.

In 2011 a study to examined the role of emotional intelligence in college students' success was conducted in Florida.[8]The participants in this study were studentsenrolled in an Introduction to Business course at a large state college in Florida. The Bar-On 2004 (Emotional Quotient Inventory) EQ-i with 133-items was used to assess students' emotional intelligence. Results revealed that there was a slight positive correlation between traditional measures of academic success (GPA, attempted-to-completed credit hour ratio, grade in the course) and emotional intelligence.

The sample of research studies show the positive relationship between emotional intelligence and academic achievement in a number of first year university courses. A lot of the studies examined were outside Africa, and therefore cultural context cannot be ruled out in the relationship between emotional intelligence and academic achievement. It is important to ascertain if similarfindings would be found in a different cultural setting. This paper

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examines the relationship between emotional intelligence and algebraic competences of first year Bachelor of Science in mathematics and science education students at Copperbelt University in Zambia, Africa.

II. **Statement of the problem and research purpose**

Mathematics is one of the key subjects in the study of natural sciences including engineering, technology, and business related studies. At Copperbelt University in Zambia, every student admitted into first year, regardless of the programme they wish to pursue, is required to do first year mathematics. Thus mathematics, at first year level is compulsory to all schools of the university at undergraduate level. Even though first year mathematics is emphasised so much in the university, the performance of the students in the mathematics course at first year is not good. According to the university records, and my observation as a lecturer teaching first year mathematics over a period of four (4) years, it has been observed that more than 30% of education students fail first year mathematics (MA 120) every year with some students repeating it twice and in some cases thrice. In particular, the Examiners' Reports for the past four consecutive years (2012, 2013, 2014 and 2015) have indicated that 43%, 47%, 39% and 34% respectively of first year Bachelor of Science in mathematics and science education students failed MA 120. This is not positive as students who fail end up being delayed in their academic programmes. The delay results in students not being able to graduate on time and serve the nation in various capacities of their careers. Furthermore, other students do not even graduate as they are excluded from the university along the way due to their poor performance in the course.

This situation raises a number of questions, more especially that these students are admitted to the University because they passed their Ordinary level mathematics (secondary school mathematics) with good grades (a merit or better). That being the case, students then have the cognitive intelligence to make it in first year university mathematics in general and algebra in particular. However, there seem to be factors influencing the achievement of students while at university. It is argued that these factors "go beyond academic intelligence capabilities and cover a wide range of issues such as loneliness, loss of the peer support group from high-school, relationship break-ups, and financial difficulties."[9] The researcher's argument is that these factors have

[9] James D. A. Parker, Donald H. Saklofske, and Con Stough,ed., *Assessing Emotional Intelligence - Theory, Research, and Applications* (New York: Springer, 2009).

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something to do with students' emotions. As such the students' emotional intelligence might be one of the factors influencing academic achievement in mathematics. Thus,this research was aimed at establishing the relationship between algebraic competences and emotional intelligence of first year Bachelor of Science in mathematics and science education students' at Copperbelt University in Zambia. Algebra was chosen because it spreads throughout all other branches of first year university mathematics and it is taught in the first term of the academic year at the university.

Research questions

The following questions guided the study:

1. Is there any correlation between the Grade 12 level Algebraic competences and the First year university level Algebraic competences of first year Bachelor of Science in mathematics and science education students as measured by the Grade 12 level Algebra test and the First year university level Algebra test?
2. Is there a significant relationship between Grade 12 level algebra test scores and emotional intelligence scores of first year Bachelor of Science in mathematics and science education students?
3. Is there a significant relationship between first year Bachelor of Science in mathematics and science education students' university algebra test scores and their emotional intelligence scores as measured by the SSEIT?
4. Is there a significant difference between male and female first year Bachelor of Science in mathematics and science education students in their emotional intelligence as measured by the SSEIT?

III. **Competences and emotional intelligence**

III.1. *Competences*

Competences refer to skills, knowledge, understanding and abilities we possess.[10] Competences can generally be divided into two: generic competences

[10] Aurelio Villa Sánchez and Manuel Poblete Ruiz, eds., *Competence –based learning: A proposal for the assessment of generic competences* (Bilbao: University of Deusto, 2008).

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and subject specific competences. Generic competences are those competences which every student, regardless of their chosen field should possess.

Generally every university graduate is expected to be able to translate knowledge into practice and to apply knowledge to new situations.[11] University graduates should be able to work independently or with minimum supervision, and should at the same time be able to work with other people in intra and intercultural and/or international environments.[12] In this 21st century, university graduates should have practical cost effective problem solving techniqueswhile possessingthe capacity to use innovative and appropriate technologies, for example; the use of a computer by demonstrating ability to use basic computer packages such as Microsoft Word, Excel and use of Email.

Apart from generic competences which apply to all university graduates, there are subject specific competences. Subject specific competences are those competences that are unique to a particular programme. For instance, all Bachelor of Science in mathematics and science education students at Copperbelt University in Zambia, are on a programme – the teacher education programme. There are specific skills and abilities expected from every student on this programme upon completion. The abilities and skills of teacher education graduates include: ability to prepare schemes of work, ability to prepare lesson plans, ability to identify suitable methods of teaching for different topics and different contexts, ability to teach secondary school students using different methods of teaching, ability to assess students using different ways of assessment, ability to manage their classes, ability to monitor students` progress and ability to record work done during the teaching and learning sessions.[13] Teacher education graduates are expected to be able to create a learning environment conducive to promoting learning. Furthermore, graduates on a teacher education programme are expected to have interpersonal competences which help them to be sensitive to the feelings of others and to collaborate and network with other people: their peers, head teachers, parents, professional groups and any other stake holders in the field of education.[14]

In teacher education programmes, two sets of subject-specific competences need to be developed; those that permit graduates to work as teachers and those that permit them to become specialists in a chosen area of

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[11] Karola Hahn and Damtew Teferra, "Tuning as Instrument of Systematic Higher Education Reform and Quality Enhancement: The African Experience," *Tuning Journal of Higher Education* 1, no. 1(2013): 127-158.

[12] Ibid.

[13] Julia González and Robert Wagenaar, eds., *Tuning Educational Structures in Europe II. Universities' Contribution to the Bologna Process* (Bilbao: Universidad de Deusto, 2005).

[14] Hahn and Teferra, "Tuning as Instrument of Systematic Higher Education," 127-158.

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teaching, for example mathematics. At Copperbelt University, in Zambia, for instance, Bachelor of Science in mathematics and science education students have to choose one specific subject specialization from four areas namely: Biology, Chemistry, Mathematics and Physics. The subject specialization under consideration in this research is Mathematics. Within the mathematics area of specialization, there are competences which every student of Mathematics is expected to demonstrate both before and after graduation.

III.2. *Algebraic competences*

Algebra, as a branch of mathematics, has its own competences, and those competences are related to the rest of mathematics. Some of the Algebraic competences at both Grade 12 and university levels expected of students, in Zambia,[15] include:

1. Ability to solve quadratic equations using different types of methods e.g. Factorization, completing the square etc.
2. Ability to factorise higher order polynomials by first factoring out a common power of the variable. For example the question: Solve the equation $x^4 - 29x^2 + 100 = 0$.
3. Capacity to manipulate algebraic rational expressions by decomposing them into partial fractions. For example the question: Decompose $\frac{2x + 3}{x^2 - 7x + 6}$ into partial fractions.
4. Ability to translate word problems involving one or several variables into equations (or inequalities) and solve them.For instance the question: Tickets are being sold for a film show. Tickets for adults cost K50 each while tickets for children are sold at half the cost of an adult ticket each. How many tickets of each kind were sold if a total of 200 tickets were sold and a total of K6, 000 was collected (let x be the number of tickets for adults and y the number of tickets for children)
5. Ability to simplify algebraic rational expressions. For example the question, simplify $\frac{2x^2 - 9x + 10}{5x^2 - 20}$.

[15] Ministry of Education (MoE),*"O" Level Mathematics Syllabus (Grades 10 – 12)* (Lusaka: Curriculum Development Centre, 2012).

6. Capacity to work with different functions and be able to manipulate them. For example the question: If the function $f(x) = 5 + \frac{x}{2}$ and $g(x) = 3x + 2$, find the value of x for which $f^{-1}(x) = g(x)$.

The above mentioned algebraic competences are not just unique to Zambia. Algebra is universal. Students from different countries around the world learn the same algebraic concepts, principles and skills.[16]

Apart from algebra mathematics has other branches, which include: arithmetic, geometry, trigonometry, calculus etc. We find that algebraic competences are needed in other branches of mathematics. For instance, here is a question and solution on trigonometric identities at first year university.

Question:

Find all the possible values of θ in the equation $cos^2\theta - 3sin\theta + 3 = 0$, given that $0^0 \leq \theta \leq 360^0$.

Solution:

We proceed to find the values by first ensuring that $cos^2\theta$ and $sin\theta$ in $3sin\theta$ are expressed in similar terms. Taking the identity $cos^2\theta + sin^2\theta = 1$, we make $cos^2\theta$ the subject of the formula so that we obtain $cos^2\theta = 1 - sin^2\theta$. We take the trigonometric equation $cos^2\theta - 3sin\theta + 3 = 0$ and replace $cos^2\theta$ in this equation with $1 - sin^2\theta$ so that we have $1 - sin^2\theta - 3sin\theta + 3 = 0$. At this point we notice that we have expressed the terms in terms of $sin\theta$, we now need to simplify the equation to obtain $-sin^2\theta - 3sin\theta + 4 = 0$ which is the same as $sin^2\theta + 3sin\theta - 4 = 0$ obtained by multiplying the equation throughout by negative 1. We remember that multiplying or dividing the terms of an equation throughout by the same number does not change the equation. It remains the same equation. Having obtained $sin^2\theta + 3sin\theta - 4 = 0$ we may notice that this resembles a kind of equations called quadratic equations so we let a letter say $x = sin\theta$ so that $x^2 = (sin\theta)^2 = sin^2\theta$. We then make replacements in the equation $sin^2\theta + 3sin\theta - 4 = 0$, that is $x^2 + 3x - 4 = 0$. The equation is then solved by factorization as outlined below:

$$x^2 + 3x - 4 = 0$$
$$x^2 + 4x - x - 4 = 0$$
$$x(x + 4) - 1(x + 4) = 0$$
$$(x + 4)(x - 1) = 0$$

[16] Frederick K.S. Leung et al., *Algebra Teaching around the World* (Rotterdam: Sense Publishers, 2014).

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$$(x + 4) = 0 \text{ or } (x - 1) = 0$$
$$x = -4 \text{ or } x = 1$$

But $x = sin\theta$ then $sin\theta = -4$ or $sin\theta = 1$.
We discard $sin\theta = -4$ since $-1 \leq sin\theta \leq 1$ and we remain with $sin\theta = 1$
Then $sin\theta = 1$

$$\theta = \sin^{-1}(1)$$
$$\theta = 90^0$$

In this trigonometry problem, algebraic competences are needed. Competences needed include the following:

1. Ability to express terms in an expression or equation in similar terms.
2. Ability to express one term as the subject of the formulae of the other.
3. Ability to make substitutions
4. Ability to simplify mathematical expressions
5. Ability to solve quadratic equations

Possession of these competences is affected by many factors. In this study the researcher isolated emotional intelligence as one such factor that may affect the acquisition of algebraic competences by students. This decision was arrived at by the researcher based on studies done earlier by other researchers who assert that emotional intelligence is a factor that predicts academic achievement.[17],[18],[19]

III.3. *Emotional intelligence*

Emotional Intelligence is defined as the ability to identify, assess and manage the emotions of one's self, of others and of groups.[20] It is argued that emotional intelligence represents an ability to reason with emotions and to

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[17] Joseph C. Adigwe," Emotional Intelligence and Problem- Solving Achievement of Chemistry Students,"*Journal of Science, Technology & Education* 3, no. 1 (2015):80.

[18] Yoke Theing Chen and Chooi Seong Lai, "Personality Traits, Emotional Intelligence and Academic Achievements of University Students," *American Journal of Applied Psychology* 4, no. 3 (2015): 39-44.

[19] Rosalind M. Prabha, "Emotional intelligence as a correlate of academic achievement among first year degree students in Puducherry," *International Journal of Research in Social Sciences* 3, no. 6 (2015): 259-263.

[20] Susan Chirayath and Nancy G. Elizabeth, "Influence of Emotional Intelligence on Learning Styles-An Exploratory Study on Management Students,"*Journal of Business Management & Social Sciences Research* 2, no. 3 (2013): 2319-5614.

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use emotions to facilitate thought. A number of scholars and researchers are associated with development of the concept of emotional intelligence. These include: Howard Gardner, Wayne Payne, John Mayer, Peter Salovey and David Goleman.

IV. **Theoretical framework of emotional intelligence**

The concept of emotional intelligence has roots in past research and practice of early scholars who believed that emotional intelligence should be understood in the context of all that makes up human intelligence and not in isolation. Scholars indicate that as early as the 1920s a psychologist named Thorndike theorized that there were three types of intelligence: social, mechanical and abstract. It is argued that Thorndike used the term "social intelligence" to describe the skill of understanding and managing other people.[21],[22]Social intelligence is said to be "the ability to understand other people, what motivates them, how they work, how to work with them and the ability to act wisely in the relationship between human beings."[23]Furthermore, it is argued that self-awareness, empathy, and dealing with interpersonal relationships, which are at the centre of emotional intelligence, are the basic elements of social intelligence.[24]In 1940 David Wechsler added to the concept of non – cognitive intelligence by arguing that "no full definition of intelligence could exist until we were able to fully define those aspects that were not related to traditionally measured cognitive skills."[25]In 1983, Howard Gardner advanced the theory of Multiple Intelligences in his book entitled "Frames of Mind; The Theory of Multiple Intelligences."He argued that people have more than one type of intelligence, and these types of intelligence were also cognitive in nature but could not fully be defined by a model such as the standard intelligent quotient (IQ) tests.Gardner's model for multiple intelligences focused mainly on two aspects:

i) Intrapersonal intelligence, which is the ability to understand one's own feelings, motivations and fears and

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[21] Mc Pheat, *Emotional Intelligence*.

[22] Olivier Serrat, *Understanding and Developing Emotional Intelligence* (Washington, DC: Asian Development Bank, 2010).

[23] Azizi Yahaya et al., "The Impact of Emotional Intelligence Element on Academic Achievement," *Journal of Archives Des Sciences* 65, no.4 (2012): 3

[24] Yahaya et al., "Impact of Emotional Intelligence Element on Academic Achievement."

[25] Mc Pheat, *Emotional Intelligence*, 9.

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ii) Interpersonal intelligence, which is the ability to understand others and their desires, motivations and intentions.

The term emotional intelligence was first used in 1985 by a doctoral student Wayne Payne in his thesis, "A Study of Emotion: Developing Emotional Intelligence." In 1990, two psychologists Peter Salovey and John Mayer for the first time defined emotional intelligence as the ability of a person to cope with his/her emotions and later in 1995, Goleman attracted so much public attention through his book entitled "Emotional Intelligence: Why It Can Matter More Than IQ." He summarized the concept of emotional intelligence into five domains. The five domains are:

i) Knowing one's emotions
ii) Managing one's emotions
iii) Motivating oneself
iv) Recognizing and understanding others' emotions
v) Managing others' emotions[26]

The five domains are sometimes referred to as the components or elements of emotional intelligence. A person is said to be emotionally intelligent if he is able to utilize all the five elements or components of emotional intelligence. That is an individual needs to know his/her emotions, control those emotions as a way of motivating oneself. Apart from that it is important that an individual understands other people's emotions and use that understanding or knowledge to manage those other people so as to develop relationship which encourage learning from others. In a learning setting at university level, students should be aware that they are responsible not only for their own learning, but also for the learning of other students.[27] Thus, the emotional intelligence of students is important so that they identify, assess and make use of not only their emotions but also of their classmates so that the classroom becomes a place for conducive maximum learning.

V. **Students' intelligence and academic achievement**

Academic achievement refers to the goals which teachers or lecturers hope their students are able to reach. In a university setting such goals may

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[26] Daniel Goleman, *Emotional Intelligence: Why it can matter more than IQ* (New York: Bantam Books, 1995).

[27] Joyce Bruce, *Models of Learning-Tools for Teaching* (Buckingham: Open University Press, 2002).

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include matters such as obtaining a passing grade in a particular subject area, for example algebra; to graduate with a certain degree classification. In accomplishing such goals students need to be in the right frame of mind. As such emotions should be identified and utilised accordingly. The students' ability to utilise emotions is important in academic achievement. Many scholars[28] support this, and furthermore, assert that the skills to identify and manage emotions appear to be major contributors to students' success and avoiding dropping out of university. Thus, it seems awareness and controls of emotions are important for the students' academic success in Algebra or any other area of study.

VI. **Algebra teaching and achievement**

Algebra teaching and learning among the first year students at university level is key to teaching and learning of mathematics in its entirety. At many universities algebra is taught in the first term, leaving other branches of mathematics for term two and three. This is so because algebra provides a sound background for the learning of other branches of mathematics.[29] In fact this is the more reason why algebra is taught earlier than other branches of mathematics because algebra has its roots in both arithmetic and geometry.[30] It is further acknowledged that algebra has a system of symbols to explain relationships. The symbols used in algebra will have different meanings and interpretations depending on the situation. Therefore, students should take time and effort to familiarize themselves with these symbols and their meanings. From this background, it is clear that the learning of algebra and mastering of the symbols provides a useful foundation for the students to learn the other aspects of mathematics for instance arithmetic, geometry, trigonometry and calculus.

There is need for students to develop positive emotional intelligence towards algebra so that they are able to confidently solve new problems in different situations. Students should believe in themselves and learn to cooperate with other students in order to solve such new problems in new situations. Learning of any concept brings change in the learner. Such learning affects the emotions of the learner either positively or negatively. In

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[28] Parker et al., "*Assessing Emotional Intelligence.*"

[29] Kulbir Singh Sidhu, *The Teaching of Mathematics* (New Delhi: Sterling Publishers Private Limited, 1995).

[30] Doug French, *Teaching and Learning Algebra* (New York: Continuum, 2002).

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a university setting, students should know why they feel the way they do towards a learning situation. They need to manage their emotions and appreciate the emotions of those around them. There is need for students to work on assignments in a way that promotes cooperation with and from others. Students need to understand themselves, their friends and their lecturers in order to appreciate each other as important in any given learning situation. Scholars[31]give us a view of how students and lecturers should relate to each other when they describe education as a social system devoted to developing better human relations, whereby students' needs are met. In this way students are better able to cope with their world of learning. Better human relations help students build a cooperative social environment within the classroom and teach students the skills of negotiation and conflict resolution necessary for democratic problem solving.[32]

VII. **Methodology and data collection**

Research design

This study adopted a correlational descriptive survey research design. In correlational research design, the researcher seeks to establish the degree of relationship between two or more variables.[33] The variables whose relationship was explored are emotional intelligence and algebraic competences of first year Bachelor of Science in mathematics and science education students who were enrolled in a mathematics and science teacher education programme at the Copperbelt University in Zambia.

Participants

A total of 143 first years in the academic year 2016/2017 were targeted in the study. The students were enrolled for the Bachelor of Science in mathematics and science education in the School of Mathematics and Natural Sciences in the Department of Mathematics and Science Education. The BSc programme they were pursuing trains science and mathematics secondary school teachers.

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[31] Jean Dresden Grambs, John C. Carr, and Robert M. Fitch, *Modern Methods in Secondary Education*, 3rd ed. (New York: Holt, Rinehart and Winston Inc., 1970).

[32] Bruce, Models of Learning.

[33] Louis Cohen, Lawrence Manion, and Keith Morrison, *Research Methods in Education*, 5thed. (New York: Routledge Falmer, 2004).

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All students were taking the compulsory course MA 120 (First year university mathematics). However, only 107 (25 females and 82 males) students fully participated in the study by completing the research instruments designed for the study. Three data collection instruments were employed in this study: the Schutte Self-Report Intelligence Test (SSEIT), Algebra Achievement Test (Grade 12 Level), and the Algebra Achievement Test (University Level).

Measuring emotional intelligence

In this study emotional intelligence was measured using the 33-item Schutte Self-Report Intelligence Test. This is a self-report test developed by Schutte and her colleagues.[34] The test measures four factors: expression of self's emotions, understanding of others emotions, regulation of emotions, and utilization of emotions. The items are scored on a 5 point Likert scale (1-Strongly disagree; 2-Disagree; 3-Neither disagree nor agree; 4-Agree; 5-Strongly Agree).

Measuring algebraic competences

The researcher developed two tests to measure algebraic competences. The first test was an Algebra Achievement Test (Grade 12 Level) developed to assess students' level of competence in Algebra of Grade 12 level. The second test was an Algebra Achievement Test (University Level) developed to assess students' levels of competence in Algebra of first year university level. Both tests included Algebraic topics such as solving of quadratic equations, simplifying expressions, changing subject of the formula, and simultaneous equations among others.

Reliability of instruments

SSEIT's reliability was calculated using Cronbach's reliability test and Cronbach's alpha was found to be 0.793 (or 0.79) which showed good reliability of the SSEIT.

To calculate the Algebra tests reliability the researcher used the Parallel forms of reliability. This is the reliability test in which two similar tests are

[34] Schutte et al., "Development and validation of a measure of emotional intelligence," *Personality and Individual Differences* 25 (1998): 167-177.

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given to the same group of participants at different times and the scores obtained in the two tests are correlated. The coefficient of correlation r was 0.889 (or 0.9) for the Grade 12 level Algebra and r=0.859 (or 0.9) for the first year university level Algebra.

Piloting the research instruments

All three instruments were piloted before being administered to the target group. The researcher selected 20 students (10 females and 10 males) from the population of the main study. Both stratified and systematic random sampling techniques were employed to select the pilot sample. Stratified sampling[35] involves dividing the population into smaller groups, each containing participants with similar characteristics, for example, group A might contain males and group B, females. Systematic sampling[36] involves selecting subjects from a population list in a systematic way. For example if from a population of 100 a sample of 20 is required, then every fifth person can be selected, that is $\frac{100}{20} = 5$. Piloting of the instruments helped the researcher to know, on average, how long it would take respondents to complete each instrument; and also helped the researcher to check on the clarity of instructions and questions in the instrument. Prior to the pilot test, face validity of the achievement tests was achieved by asking three Algebra experts to critically review and give suggestions to improve the tests. The suggestions from the experts were taken care of by making the necessary changes to the tests. Validity of the SSEIT was assumed as its validity had already been established by the designers.[37]

Data analysis

Before using any statistical technique to test the hypotheses and answer the research questions, the researcher tested for normality of the three sets of data (Emotional Intelligence, Grade 12 level Algebraic competences and First year university level Algebraic competences) using the Shapiro – Wilk test of normality. For any of the three data sets to be said to be normally distributed the Shapiro – Wilk test p – value should be above 0.05. The p –

[35] Cohen et al., *Research Methods in Education*.

[36] Ibid.

[37] Schutte et al., "Development and validation of a measure of emotional intelligence."

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values for all the data sets are less than 0.05 (as shown in Table 1 below), indicating that the data sets are not normally distributed.

Table 1

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
SSEIT	.131	107	.000	.951	107	.001
Grade12levelalgebratest	.143	107	.000	.919	107	.000
Firstyearuniversityleveltest	.087	107	.046	.971	107	.020

a. Lilliefors Significance Correction.

Therefore, the researcher used non-parametric statistical techniques to answer the research questions. The techniques used were: Spearman's Rank Order Correlation (rho) and the Mann-Whitney U Test. The Statistical Package for Social Sciences (SPSS) was used to carry out the different analyses.

Ethical considerations

Informed consent was obtained from each participant and the purpose of the study was explained to the participants. Confidentiality was assured by using codes instead of names throughout the research.

VIII. **Findings**

Data for the SSEIT and the two achievement tests were punched into Statistical Package for Social Sciences (SPSS) version 23 for analysis. This section presents the results and findings of the analysis with respect to the research questions.

Descriptives

Table 2 shows the descriptive statistics of the participants. The age of the participants ranged from 18 years to 26 years with a mean age of about 21

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years old. The participants mean score on emotional intelligence for the participants was 77.72 which was the highest compared to the means of the scores in the two algebra tests.

Table 2

Descriptive Statistics

	N	Minimum	Maximum	Mean
Age	107	18	26	20.53
Grade12levelalgebratest	107	20	100	74.50
Firstyearuniversityleveltest	107	0	96	41.52
SSEIT	107	44	95	77.72
Valid N (listwise)	107			

First research question

The first research question sought to establish whether there was any correlation between the Grade 12 level Algebraic competences and the First year university level Algebraic competences as measured by the two Algebra tests. Spearman's Rank Order Correlation (rho) was used to establish whether there was correlation. The results showed that there was a strong positive correlation between the Grade 12 level Algebraic competences and the First year university level Algebraic competences ($rho = 0.689, p< 0.01$).

Second research question

The second research question aimed at determining whether there was a significant relationship between first year Bachelor of Science in mathematics and science education students' Grade 12 level algebra test scores and their emotional intelligence scores as measured by the SSEIT. Spearman's Rank Order Correlation (rho) was used to find out whether there was correlation. The co-efficient of correlation was found to be (rho = -0.226). Since rho is small and negative, it was established that there is no positive significant correlation between emotional intelligence and Grade 12 level Algebraic competences. Table 3 below shows the correlations obtained:

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Table 3

Correlation between Grade 12 Algebra test and Emotional Intelligence

			SSEIT	Grade12levelal-gebratest
Spearman's rho	SSEIT	Correlation Coefficient	1.000	-.226
		Sig. (2-tailed)	.	.019
		N	107	107
	Grade12levelalgebratest	Correlation Coefficient	-.226	1.000
		Sig. (2-tailed)	.019	.
		N	107	107

Third research question

The third research question sought to establish whether there was any significant correlation between first year Bachelor of Science in mathematics and science education students' university algebra test scores and their emotional intelligence scoresas measured by the SSEIT. The researcher used Spearman's Rank Order Correlation (rho) to find out whether there was any correlation. The co-efficient of correlation was found to be (rho= -0.123). Since rho is small and negative it was established that there is no positive significant correlation between emotional intelligence and academic achievement in first year university Algebra. Table 4 below shows the correlations obtained:

Table 4

Correlation between University Algebra test and Emotional Intelligence

			Firstyearuniversi-tyleveltest	SSEIT
Spearman's rho	Firstyearuniversityleveltest	Correlation Coefficient	1.000	-.123
		Sig. (2-tailed)	.	.206
		N	107	107

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			Firstyearuniversi-tyleveltest	SSEIT
Spearman's rho	SSEIT	Correlation Coefficient	-.123	1.000
		Sig. (2-tailed)	.206	.
		N	107	107

Fourth research question

The fourth research question: "Is there significant difference between male and female first year Bachelor of Science in mathematics and science education students in their emotional intelligence as measured by the SSEIT?" To answer this research question, the researcher considered the fact that the data was not normally distributed and that there was need to explore differences between males and females on the measure of emotional intelligence. Therefore a non-parametric statistical technique was to be used. The Mann-Whitney U Test (the non-parametric alternative to the t-test for independent samples) was used to analyse the data. As shown in Table 5, the test was set with the null hypothesis (Ho) that the distribution of Emotional Intelligence is the same across categories of Gender while the alternative hypothesis (H_A) was that the distribution of emotional intelligence was not the same across categories of Gender. The Mann-Whitney U Test indicates that the Null Hypothesis: the distribution of Emotional Intelligence is the same across categories of Gender should be rejected since p =0.004 which is less than the set significance level of 0.05. Therefore the hypothesis (H_A) that

Table 5

Emotional Intelligence and gender

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of SEIT is the same across categories of Gender.	Independent-Samples Mann-Whitney U Test	.004	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

the distribution of Emotional Intelligence was not the same across categories of Gender is accepted. Results indicate further that female students have higher emotional intelligence levels (Mean rank = 69.70) compared to their male counterparts (Mean rank = 49.21).

IX. **Discussion**

The study was set out to address four research questions: to examine if there is any correlation between Grade 12 level Algebraic competences and First year university level Algebraic competences, to find out if there is a significant relationship between first year Bachelor of Science in mathematics and science education students' Grade 12 level algebra test scores and their emotional intelligence scores as measured by the SSEIT, to find out if there is a significant relationship between first year Bachelor of Science in mathematics and science education students' university algebra test scores and their emotional intelligence scores as measured by the SSEIT, and to establish if there a significant difference between male and female first year Bachelor of Science in mathematics and science education students in their emotional intelligence as measured by the SSEIT.

From the research findings it is clear that the students Grade 12 Algebraic competences correlate with First year university level Algebraic competences. This indicates that building on prior knowledge is an important principle for educators. The topics which were in the two algebra tests were based on the same topic areas; they only differed in terms of their levels of difficulty. There were questions on linear equations, simultaneous equations, inequalities, word problems in both tests. The correlation may be explained in the context of students having competences in first university algebra because of their experiences in Grade 12 level Algebra.

In considering the second and third research questions, the study has established that there is no positive significant correlation between algebraic competences and emotional intelligence. These findings are consistent with findings of some earlier researchers. For instance Nor et al.[38] conducted a study on the relationship between emotional intelligence and mathematical competence among secondary school students. It was found that there was no relationship between students' emotional intelligence and their mathematical

[38] Nurul Adibah Khairiyah Mohd Nor, Zaleha Ismail, and Yudariah Mohammad Yusof, "The Relationship Between Emotional Intelligence and Mathematical Competency Among Secondary School Students," *Journal on Mathematics Education* 7, no. 2 (2016): 91-100.

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competence. Although the study focused on secondary school students, the variables considered were emotional intelligence and mathematical competence of which algebraic competence was part.

A study conducted at an Engineering institution explored the relationship between different factors of emotional intelligence and academic performance of engineering students.[39] The Schutte Emotional Intelligence Test was used to measure emotional intelligence while students' academic performance was taken from academic records. A total of 177 students participated in the study and the study revealed that academic performance of engineering students in that institution was independent of factors of emotional intelligence and also of total emotional intelligence.

Another study[40]that revealed no statistically significant link between academic achievement and emotional intelligence is the study that investigated the effect of emotional intelligence and academic procrastination on academic achievement of students in two Nigerian Universities.One hundred respondents participated in the study. Two instruments were adapted for the study: the Emotional Intelligence Scale and Academic Procrastination Scale. Data obtained was analyzed using Pearson Product Moment Correlation (PPMC) and t-tests. Findings revealed that there was no significant relationship between emotional intelligence and academic achievement of students and there was no significant relationship between academic procrastination and academic achievement.

From studies cited above it is clear that while emotional intelligence may be one of the factors affecting students' academic achievement, it should be noted that other factors are equally at play. Another matter of consideration is that of the sample size in this study (107); in many of the studies cited where emotional intelligence seemed to impact on academic achievement positively, the sample sizes were greater than this (150 or higher).

An additional issue of consideration is that in nearly all the studies that the researcher revealed where emotional intelligence was found to significantly affect academic achievement positively, academic achievement was measured by the use of multiple choice tests (in the case of one test) or Grade Point Average (GPA) in the case of many subjects. In the case of multiple choice questions, all the questions have a fixed list of answer

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[39] Rama V. Devi and Lakshmi P. Narayanamma, "Academic Achievement in Engineering: Does Emotional Intelligence Matter?," *International Business Management Journal* 8, no. 2 (2014): 85-92.

[40] Eni-Olorunda Tolu and Adesokan Adedayo, "Emotional Intelligence, Academic Procrastination and Academic Achievement in Two Tertiary Institutions in South-Western Nigeria," *Gender and Behaviour Journal* 13, no. 1 (2015).

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options and the data the researchergets back is limited to the choices the researcher provides. The multiple choice questions in many instances is more or less like the Likert type questions which also have fixed answer options. In this study academic achievement was measured by an algebra test in which participants were required to show their working instead of just the final solutions. There were marks given for the method as opposed to the multiple choice case where only the final answer mattered. In the case of the GPA, performance from several subjects or courses is averaged to come up with one grade. The advantage of this grading being that for a student sitting for tests in say six courses (as is the case at Copperbelt University) poor performance in one or two courses may be offset by very good performance in the remaining four courses, hence a good overall GPA. In this study the participants' mean achievement in Algebra was (41.52%) and this was below thepass mark of 50% for Copperbelt University. This poor performance could be compensated by good performance in other courses for some students in the case of a GPA.

In considering the fourth objective the study has established that among the first year Bachelor of Science in mathematics and science education students, females have higher emotional intelligence compared to males. This means female students in this study are better able to identify their emotions, those of others and are better able to manage relationships. Other researchers have found similar results to this study in the area of emotional intelligence and gender.[41],[42]

X. **Conclusion and recommendations**

This study has revealed that there is a significant positive correlation (0.689) between students' Grade 12 algebraic competences and their first year university algebraic competences. This means that participants who failed the Grade 12 level based Algebra test also failed the university level based Algebra test. Similarly, those with good Grade 12 level Algebra competences generally exhibited good first year university level Algebra competences.

There is no significant relationship between students algebraic competences and their emotional intelligence levels. Therefore, low achievement levels in

[41] Sangita, Biswas and Surekha Invalli, "A Study on the Relationship between Gender and Emotional Intelligence,"*Journal of Exclusive Management Science* 5, no. 5 (2016).

[42] Maryam, Meshkat and Reza Nejati, "Does Emotional Intelligence Depend on Gender? A Study on Undergraduate English Majors of Three Iranian Universities," *SAGE journal* (2017): 1-8.

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first year university Algebra (and mathematics in general) at Copperbelt University cannot be traced back to students' lack of emotional intelligence. Students have higher levels of emotional intelligence as already indicated, however, there is no positive correlation with their algebraic competences. Possesion of high levels of emotional intelligence did not necessarily translate into acqusition of algebraic competences and success in first year mathematics.

It has been established that there is a significant difference between male and female first year Bachelor of Science in mathematics and science education students in their emotional intelligence as measured by the SSEIT. The females exhibited higher levels of emotional intelligence than their male counterparts. A number of studies attest to the fact that females are generally more emotionally intelligent than males.[43,44,45,46]

Future research may consider the relationship between achievement in first year mathematics and other factors, such as, learning resources, class sizes, lecturers' attitude, student's attitude, parental background among others. This is in order to establish factors influencing the low academic achievement levels of first year students in mathematics.

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Editors' Acknowledgments

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Anna Serbati
November 20th, 2017.

In memory of Arlene Gilpin

In memory of Arlene Gilpin (April 30th, 1942 – Sept 8th, 2017)

My mother, Arlene Gilpin, nee Moscrop, was born in Allendale on April 30, 1942, daughter of Bobby and Dot and sister to Wally, Frank, Anne, Wendy, Elsie, Richard, and David. She grew up in Croglin, Cumbria, and attended the White House school before teacher training college in Sheffield. She went on to influence generations of teachers throughout the world through her international career specialising in teacher education, learning and assessment. After teaching English in Spain and Africa, she worked at the British Council in Singapore before gaining her MA in Linguistics at the University of Lancaster. She then joined Bristol University's School of Education where, among other things, she designed and set up the MA in TEFL (Teaching English as a Foreign Language) at the Graduate School of Education where she was a senior lecturer and then, after she retired, a Research Fellow.

Arlene's daughter, Emma Gilpin

* * *

Arlene is in the roots of Tuning. She was there from the very start animating the initial Education group; a group which was fresh, innovative and wonderfully critical. Her moral authority was felt when she was not the coordinator and when she was fulfilling this task. She was always there; creative, full of resources and initiative. Nothing was indifferent for her; all had an educational angle. She was always there; cooperative, helpful, and committed. Her passion for education was visible and undeniable: looking at her, one got the impression that she was constantly creating things, living them for the first time. Some of us had the privilege of sharing with her for all those years. Until the last trip, illness could not destroy the truth of her commitment and her passion for those who follow behind and her dedication to the human being. Thank you Arlene, you left us a clear mark and Tuning owes you important signs of identity.

Julia Maria González, President of Education for an Interdependent World, General Secretary of the Teresian Association and Tuning Senior Expert

* * *

There are many reasons for the Tuning Family and the global higher education sector to be grateful to Arlene for her exceptional commitment and contribution towards our shared mission to offer the best possible higher education to a new generation of students.

Robert Wagenaar, International Director of the Tuning Academy in Groningen

* * *

Arlene's exceptional commitment and contribution towards Tuning-shared mission has been an essential part of many projects in Europe, Latin America, Africa, Middle East, Russia, India, and China. She was also known in her professional life for her pragmatic approach and her ability to bring together theory and practice, generate ideas and inspire changes in higher education.

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FINAL VERSION (MARCH 2015)

Tuning Journal for Higher Education (TJHE), Tuning Journal in short, is an international journal publishing in English original research studies and reviews in all aspects of competence-based, student-centred, and outcome-oriented education reforms at university level across the globe. It is published by the University of Deusto's Publications department on behalf of the International Tuning Academy (Tuning Academy in short), a jointly managed project of the Universities of Deusto (Spain) and Groningen (The Netherlands). The Journal, essentially an open access, online and peer-reviewed publication, is committed to maintain the highest ethical standards. Hence, the involvement of any stakeholder in any function connected with TJHE, including acting as an editor, the reviewing of manuscripts, the management and production of the Journal and the authorship and submission of manuscripts implies acceptance of and adherence to **TJHE Ethical Guidelines for Publication**.

* The term *Editor(s)* as used below refers to Editors, Advisory Editors, Guest Editors, and Editorial Board members when delegated to serve in an editorial capacity.

1. Publishers, Managing Board, Editorial Board

1.1. The Editorial Board is appointed by the Tuning Academy in consultation with the Universities of Deusto and Groningen.

1.2. The Editorial Board is responsible for setting policy, appointing the Editor and Advisory Editors of the Journal.

1.3. The Editor is responsible for ensuring that publication policies set by the Editorial Board are carried out.

1.4. The Management Board is appointed by the Tuning Academy in consultation with the Universities of Deusto and Groningen.

1.5. The Managing Board is responsible for the commercial management of the Journal and appointing a Managing Editor.

1.6. The Managing Editor is responsible for ensuring that the commercial policies set by the Management Board are carried out.

1.7. Members of the Editorial or Management Boards or employees and, or members of the Tuning Academy should not intervene in or comment on editorial decisions on individual manuscripts.

2. Editors, Advisory Editors, and Guest Editors

2.1. *Editors* of the Journal and Specialist Volumes are expected to carry out editorial duties in a manner consonant with policies set by the Editorial Board.

2.2. The Editor has full responsibility, which he/she may delegate to an Advisory Editor, for editorial and technical decisions on Journal and specialist volume content.

2.3. *Editors* will give manuscripts unbiased consideration.

2.4. *Editors* should process manuscripts expeditiously.

2.5. The Editor has sole responsibility for acceptance or rejection of a manuscript. Manuscripts should have peer review, but the Editor may reject any manuscript for other causes (inappropriate for journal, clearly of poor quality, contents previously published elsewhere, etc.)

2.6. The Editor should not disclose information about submitted manuscripts except to reviewers, Advisory Editors, Editorial Board members, and staff at the University of Deusto's Publications department. Information about a manuscript may be shared after electronic publication (e.g., news releases or inclusion in a list of contents, etc.).

2.7. Manuscripts submitted by an *Editor* should be delegated to another Advisory Editor or Editorial Board member.

2.8. An *Editor* should not handle manuscripts for which there is a real or perceived conflict of interest. Examples include, but are not restricted to, past (within the last 5 years) or current collaboration, employer or employee, close friend, family relationship, institutional relationship, past or present graduate advisor or advisee, someone with whom the reviewer has had a past or on-going academic controversy, or situations where the *Editor* could stand to gain or lose economically or in any other way by publication or rejection of the manuscript. Editorial responsibility should be delegated to another Editor, Advisory Editor, or Editorial Board member.

2.9. An *Editor* must not use information, data, theories, or interpretations of submitted manuscript in her/his own work unless that manuscript is in press, published or the author has given permission to do so.

2.10. If an *Editor* is presented with convincing evidence that the main substance or conclusions of a publication is/are erroneous, he/she should facilitate publication of a report (e.g., correction, follow-up manuscript, or other appropriate means) pointing out the error and, if possible, correcting it. The report may be written by the person who discovered the error or by the original author. The original publication does not disappear from the published record.

3. Authors and Co-authors

3.1. Manuscripts should contain original, new results, data, ideas and/or interpretations not previously published or under consideration for publication elsewhere (including electronic media and databases).

3.2. Authors should be encouraged to avoid fragmentation of their work where practical, so that the submitted manuscript is as comprehensive and authoritative as possible.

3.3. Authors should inform the Editor of related manuscripts under consideration elsewhere and provide copies if requested.

3.4. Fabrication of data, results, selective reporting of data, theft of intellectual property of others, and plagiarism are unethical practices and unacceptable.

3.5. Information obtained privately (e.g., in conversation, correspondence, or discussion with third parties) should be avoided as it is not in the public domain and is thus unverifiable. If considered necessary, it should not be used or reported in a manuscript without explicit permission from the party with whom the information originated. Information obtained in the course of confidential services (e.g., refereeing manuscripts or grant applications) should be treated similarly.

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3.6. Manuscripts will contain proper citation of works by others, especially publications of the original hypotheses, ideas, and/or data upon which manuscript is based or addresses.

3.7. Authorship

a) Authorship should be limited to those who have made significant contributions to the concept, design, execution or interpretation of the work reported in a manuscript; others who have contributed should be acknowledged;

b) Author order should be agreed on by all authors as should any changes in authors and order that occur while the manuscript is under review or revision. Changes in authorship must be submitted to the Editor in writing and must be signed by all authors involved.

c) Authors and co-authors should review and ensure the accuracy and validity of results prior to submission; co-authors should have opportunity to review manuscript before submission.

3.8. Authors should reveal to the Editor any potential conflict of interest (e.g., a consulting or financial interest in a company) that might be affected by publication of the results contained in a manuscript. The authors should ensure that no contractual relations or proprietary considerations exist that would affect the publication of information in a submitted manuscript.

3.9. Authors are encouraged to disclose major funding sources (e.g., government agencies, private foundations, private industry, and universities) for reported research.

4. Reviewers

4.1. A reviewer should disclose real or perceived conflict of interests to the Editor before agreeing to write a review. Examples include, but are not restricted to, past (within the last 5 years) or current collaboration, close friend, employer or employee, family relationship, institutional relationship, past or present graduate advisor or advisee, someone with whom the reviewer has had a past or on-going scientific controversy, or situations where the reviewer could stand to gain or lose economically or in any other way by publication or rejection of the manuscript. The Editor will decide if the conflict is severe enough to prevent the reviewer from writing a fair, objective review.

4.2. A reviewer should decline to review a manuscript if she/he feels technically unqualified, if a timely review cannot be done, or if the manuscript is from a competitor with whom the reviewer has had an acrimonious professional relationship or a conflict of interest as defined above (section 4.1).

4.3. Reviewers should be encouraged, but not required, to sign reviews. The Editor will preserve anonymity of reviewers should a reviewer elect to remain anonymous.

4.4. Reviewers must treat the manuscript as confidential.

4.5. Reviewers must ask the Editor for permission to discuss the paper with others for specific advice, giving names and reasons for such consultation.

4.6. Reviewers must not pass the manuscript to another to carry out the review without permission from the Editor.

4.7. Reviewers must not use information, data, theories, or interpretations of the manuscript in their own work unless that manuscript is in press, published or the author has given permission to do so.

4.8. Reviewers should clearly support and justify the basis for their review analysis.

4.9. Reviewers should alert the Editor to similar manuscripts published or under consideration for publication elsewhere in the event they are aware of such. However, it is the responsibility of the Editor, not the reviewer, to decide on the proper course of action once so informed.

5. Citation Manipulation

5.1. Citation manipulation is considered unethical. Manipulation may include adding citations not contributing to a manuscript's content or solely aiming at increasing an author's or a journal's citations.

6. Sanctions

6.1. Suspected breaches of this policy may be handled by the Editor or may be forwarded to the Editorial Board for review and recommendation.

6.2. If an *Editor* is determined to have violated the **TJHE Ethical Guidelines for Publication**, the matter will be referred to the Editorial Board.

6.3. If an author is determined to have violated the **TJHE Ethical Guidelines for Publication**, TJHE reserves the right to impose sanctions, which may include restriction from further consideration of accepting the author's work, retraction of a published paper, or withdrawal of a submitted paper.

Date: 16 March 2015

Approved by the TJHE Editorial Board and signed on behalf of the Tuning Academy by:

Pablo Beneitone
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