

Exploring the Potential Utilisation of Job Advert Data in Identifying the Teachers We Need for the Education We Want

Lucky Mkhonza

LuckyM@etdpseta.org.za

Education, Training and Development Practices (ETDP SETA),

Johannesburg, South Africa

and

Nomawethu Dumezweni

NomawethuD@etdpseta.org.za

Education, Training and Development Practices (ETDP SETA)

Johannesburg, South Africa

And

Lindiwe Nzuzi

LindiweN@etdpseta.org.za

Education, Training and Development Practices (ETDP SETA)

Johannesburg, South Africa

Abstract

This article presents the research findings of the 2023/24 study on the “Potential of the Utilisation of Job Advert Data in Identifying the Teachers We Need for the Education We Want”. These findings were derived through a desktop analysis of data collected utilizing web scraping software. The article analyzed active job adverts for teachers specialising in Science, Technology, Engineering, Arts, Mathematics (STEAM), and language-related subjects, as these subjects have been identified as priorities by the South African government. The findings of the study indicated that job advert data have the potential to identify the health and nature of the labour market for teachers. The article recommends that the potential of the job advert data needs to be leveraged by education researchers to allow for the wide extraction of skills from job descriptions. This will facilitate an understanding of how demand for certain skills is changing over time.

Keywords: Adverts, Data, Demand, Skills, Teachers

1. INTRODUCTION

The African Union's (AU) Agenda 2063 guides the African continent on the type of education it should aspire to attain. As part of the Agenda 2063, the AU pledged to accelerate the education and skills revolution in the African continent by actively promoting science, technology, research and innovation. This is anticipated to assist in developing knowledge, human capital, capabilities, and skills to drive innovations for the African citizenry (African Union, 2015). Furthermore, the African Union (2015) aims to facilitate effective links with employers and align the education system to labour markets to improve Africa's skills profile and employment outcomes.

At a regional level, South Africa's envisioned education system also aligns with the AU's agenda for 2063 education aspirations. South Africa's education objectives are reflected in its National Development Plan (NDP) Vision 2030 document, which notes that South Africa needs to increase its production of better-qualified teachers (National Planning Commission, 2011). The primary focus for South Africa will be on increasing teachers who specialise in languages, mathematics, science, technology, and the arts (National Planning Commission, 2012). Moreover, the AU Agenda for 2063, as well as the South African NDP, both advocate for the strengthening of linkages between education and training and the world of work.

This paper is of the position that for Africa to achieve the education it wants; it needs to strengthen its labour market information systems to track both the demand and supply of teachers effectively. The Guidelines on Establishing Labour Market Information Systems To Support Effective Labour Market Governance in Africa by the African Union (2021) notes that the current policies and strategies in Africa do not succinctly address the actual labour market realities; African governments struggle to appropriately address the link between economic, labour market and human capital development. Thus, the AU (2021) proposes a granulated approach to labour statistics and labour market information collection, compilation, storage, analysis and dissemination to inform and monitor skills demand and supply.

The status quo in extracting and analysing labour market information for the monitoring of skills supply and demand has been heavily dependent on survey-based data, which is dubbed as static and too reliant on random sampling techniques (Carnevale, Jayasundera & Repnikov, 2014). Correspondingly, a shortfall in the South African labour market economy has been the extensive use of labour market indicators with the ability to improve the accuracy of labour market forecasts for teachers while producing supplemental estimates of both skills and occupational demand.

Therefore, this paper elaborates on the potential role of using job advert data in identifying the teachers we need for the education we want. The number of job vacancies is a crucial indicator of unmet demand for labour in the economy (Edwards and Gustafsson, 2013). Interrogating further the data provided by the job vacancies can tell us more about the relative demand for distinct skills and occupations demanded by employers from various sectors. Job advert data provides comprehensive job descriptions which often provide granular information such as details of the skills, specialised knowledge and qualifications required from the applicant, the job title, the salary, benefits available, and the employer's name (Carnevale, Jayasundera and Repnikov, 2014). Furthermore, the real-time nature of job advert data allows for the early detection of labour demand trends, which gives employers and policymakers a forward-looking analytical tool when recruiting teachers.

1.2. Research Objectives

This study explores the Potential Utilisation of Job Advert Data in Identifying the Teachers We Need for the Education We Want. The following objectives guided the study:

1. Determine the potential role of online job advert data in measuring teacher occupational demand.
2. Explore the capabilities of online job advert data to identify occupations and skills in high demand.
3. Determine the efficacy of online job advert data as an effective triangulation source.

1.3. Key Research Questions

To meet its objectives, the study was guided by the following research questions:

1. What is the potential role of online job advert data in measuring occupational demand for teachers?

2. What are the current limitations of data collection methods in measuring occupational demand?
3. How can the capabilities of online job advert data to identify occupations and skills in high demand for teachers be optimised?
4. How can the job advert data be utilised as a triangulation source?

2. THEORETICAL AND LITERATURE

REVIEW

The acceleration of technologies, the volatility of markets and reconfigured business and training models has had the fundamental impact of producing data at a higher frequency than in normal times and using new sources of information. The use of open-source data can assist researchers in making more accurate models based on real-time data, which, in turn, enhances public policy decision-making. Accordingly, Carnevale, Jayasundera and Repnikov (2014); OECD, (2021) contend that employers, students, researchers, policymakers, higher education institutions, career advisors, and curriculum developers now view online job advert data as a practical source to explore the nature of today's dynamic labour market.

Evans (2021) argues that the application of this methodology is informed by the notion that it provides detailed job descriptions that often provide vast and granular information such as key responsibilities, the job title, the salary and benefits available, and the advertising company, as well as details of the skills, knowledge and qualifications required from the applicant, the scope of potential insights that can be extracted to track the supply and demand of teachers.

Correspondingly, Lukauskas, Šarkauskaitė, Pilinkienė, Stundžienė, Grybauskas & Bruneckienė (2023) note that the extraction of skills and competencies from job descriptions can facilitate an understanding of how demand for specific skills is changing over time. Moreover, data-driven skills at the macro level have the capability to allow policymakers to better understand how occupations and transversal skills are changing over the short, medium, and long-term facilitating the possibility of projections of demand and supply. This is a critical element for skills planning in

terms of education and training resources needed and fundamentally the nature of intervention strategies to be developed to regulate the environment.

At the unit level, Imaizumi, Areias, & Yamauchi (2017), posit that the value of this data is of relevance for employers and training providers to facilitate alignment in supply and demand by minimizing skill mismatches by keeping these role players timeously apprised of evolving demand conditions in the labour market as well as the composition and characteristics of the labour supply.

Despite the above consensus with regards to the useability and value of this type of data, there are also identified limitations that are predominately heuristics and technical in nature. Fernández-Macías & Sostero (2024) succinctly outline the four archetypes of bias that impact on the rigor and accuracy of job advert data, namely, structural representation bias, social desirability bias, systematic bias and processing bias. According to the authors, structural representation bias arises when not all job adverts are published online, resulting in statistics not being representative of the whole labour market and of job openings. Secondly, social desirability bias occurs when certain competencies, skills and jobs enjoy certain privileges due to their perceived appeal and not necessarily based on actual demand and therefore may be overrepresented.

The authors note that in some instances, soft skills, cognitive and technical skills are valued higher in relation to physical and routine skills and therefore enjoy a bigger share of visibility on platforms. The third identified bias is systematic in nature and related to the former wherein more formalised and professionalised jobs are advertised widely in contrast to more manual inclined jobs. Finally, processing bias is effected when attributes that are formalised, well established and more commonly used, even if they are formulaic and uninformative, are easier to classify by the algorithms used for the construction these databases.

Additionally, Romanko & O'Mahony (2022) assert that online job adverts offer insights primarily into demand, gaps, and market failures in terms of current market need but do not capture the

complete spectrum of the job market. At the core of the critique is that whilst the vast coverage of online job postings can provide great insight on what employers want, limited conclusions can be drawn regarding the state of the market for employees. This is based on the perspective that there is no guarantee that all the jobs advertised are filled, or that exactly one employee was hired per one job posting (one job posting could help to fill many positions). Consequently, the authors argue that further sources of information for the job market supply side are needed to assess the timely changes in market conditions.

This assertion is corroborated by Naughtin, Reeson, Mason, Sanderson, Bratanova, Singh, McLaughlin, Hajkowitz (2017) who note that real-time labour market data in the form of online job adverts is susceptible to volatility by routine fluctuations or spike events. The implication thereof is the limiting of capacity to use real-time data to make reliable, long-term forecasts about the labour market. The authors add that a further limitation of job advert data is with regards to its level of accessibility. This is due to the notion that the majority of online job boards are owned by private companies who may be wary of sharing data as they perceive it as a competitive advantage.

In light of the advantages and disadvantages of this resource and to fully conceptualise and develop the appropriate plan of action by which job advert can be fully utilised in analysing skill supply and occupation demand, a theoretical framework is necessary to organise and inform a logic framework. The Theory of Change (ToC) in this regard will articulate the *Path to Impact*, which illustrates the logical sequence or progression of inputs, activities, outputs, and outcomes that lead to the desired long-term impact of its interventions envisioned through the utilization of job advert data (Taplin, Clark, Collins, & Colby, 2013). The ToC on the [link](#) demonstrates the envisioned actions by which online job advert data can be operationalised to effect the desired change.

3. METHODOLOGY

This study adopted a mixed methods research approach of both qualitative and quantitative methods. Qualitative research, according to Van der Merwe (cited by Garbers, 1996), is a research approach aimed at the development of theories and understanding. Kemper, Springfield and Teddlie (2003) define mixed methods design as including qualitative and quantitative data collection and analysis in parallel form. The combination of both methods will facilitate an

approach of testing theories and determining facts to illustrate the teachers we need for the education we want. This methodological approach allowed the study to collect both quantitative and qualitative data, where the quantitative data fell short, the qualitative data was able to close the gaps and provided further insights.

To meet its objectives, this study was designed as a descriptive study. Thus, no causal hypothesis tests were conducted to answer the research questions. Additionally, the study used pre-determined criteria to select the ‘population’ of advertisements and non-probability sampling techniques to select the potential ‘population’ of advertisements. Hence, the type of non-probability sampling employed by the study was purposive sampling.

To select the sample using purposive sampling techniques, the study explicitly targeted the schooling sector, including private and public schools, in relation to advertised online teacher posts. Public school teacher vacancies, as reported by government websites and independent school association websites reporting on teacher vacancies, were the primary platforms from which the data was extracted. A total population size of 859 schools, representing 5 Provincial Departments of Education (PDE) and 1 Association representing 850 independent schools, were analysed for teacher vacancies. The total sample in relation to the above was 44 schools from PDEs, of which the data was collected in January 2024, and 425 for independent schools, the data of which was collected between January – May of 2023.

The process of extracting online job data was firstly based on the vacancy publication date, the frequency with which the website was updated and the availability of structured data. Secondly, web scraping software in the form of the Microsoft Power Automate tool was utilised to extract unstructured data from websites and transforming that data into structured datasets in the form of Microsoft Excel spreadsheets and stored. Finally, the data was analysed mainly by running a frequency analysis on the Science, Technology, Engineering, Arts, Mathematics (STEAM), and language-related subjects. The analysis was limited to these subjects as the South African government mostly highlights them as being in demand in response to market signals. This consolidated database was then analysed by this paper which provided the results below.

4 FINDINGS AND DISCUSSION

The following section indicates the analysis of the results and the discussion of the main findings.

Table 1: Total active job advert for teachers specialising in Technology.

Occupation	Subject Specialisation	Quantity
Technology Teacher	Technology Grade 8 – 9	59
Civil Technology 10-12	Civil Technology 10-12	12
Information Technology Teacher	Information Technology	5
LOCUM - Senior Phase – Grade 5 Teacher (English & IT)	Information Technology	2
Life Orientation and Technology TEACHER	Life Orientation Information Technology	1
Substitute Educator Post	Natural Sciences Grade 7 Mathematics Grade 4 – 7 Natural Science and Technology Grade 7	1
Temporary Educator Post	Agricultural Sciences Grade 10 – 12 Technology Grade 8 – 9 Life Orientation Grade 8 – 9	1
Permanent Educator Post	Economics Grade 10 – 12 Mathematics Grade 8 – 9 Technology Grade 8 – 9	1
Part-time grade 10-12 computer applications technology and grade 6-8 computer literacy and coding	Information Technology	1

Both public and independent schools recorded technology-related subject specialisations to Teacher vacancy online adverts. As illustrated by the table above, teachers who specialise in this area of expertise are in demand either for a permanent position or in a temporal capacity ranging from Senior to the FET phase of education. A total of 84 teachers through online advert data were noted as being in demand over the course of a year. Moreover, the teacher adverts in technology-related subjects, in some instances, are inclusive of competency in a secondary specialisation, and this illustrates the applicability and relevance of technology-related specialisations to various core functions like Mathematics and Agricultural Science. This indicates that the Teachers we need and want must be able to demonstrate multiple skill sets in various subjects.

Table 2: Total active job advert for teachers specialising in Mathematics

Occupation	Subject Specialisation	Quantity
Mathematics Teacher	Mathematics	658

Occupation	Subject Specialisation	Quantity
Intermediate and Senior Phase Substitute Educator Mathematics Grade 4 – 7	Mathematics Grade 4 – 7	1
Intermediate Phase (Grade 6 Maths) Teacher	Mathematics	1
Mathematics and Mathematical Literacy Teacher	Literacy and Numeracy Mathematics	1
Mathematics and NST Teacher	Mathematics	1
Permanent Educator Post	Economics Grade 10 – 12 Mathematics Grade 8 – 9 Technology Grade 8 – 9	1
Permanent Foundation Phase Educator	IsiNdebele Home Language Grade R Mathematics Grade R Life Skills Grade R	1
Substantive Educator Post	Mathematics Grade 10 – 12 Physical Sciences Grade 10 – 12 Life Sciences Grade 10 – 12	1
Substantive Educator Post Mathematics Grade 10 – 12	Mathematics Grade 10 – 12	1
Substitute Educator Mathematics Grade 8 – 12	Mathematics	1
Substitute Educator Post	Natural Sciences Grade 7 Mathematics Grade 4 – 7 Natural Science and Technology Grade 7	1
Substitute Educator Post	Mathematics Grade 10 – 12 Physical Sciences Grade 10 – 12	1
Temporary Educator Post	Social Sciences Grade 8 – 9 English and Setswana Grade 8 – 9 Mathematics Grade 8 – 9	1
Temporary Educator Post	Post 2: Mathematics and Physical Sciences Grade 10 – 12	1
Temporary Foundation Phase Educator Mathematics	Mathematics Grade 1	1

Table 3 below indicates the total active job ads where mathematics was indicated as one of the subjects. For the sampled organisations, mathematics was advertised 672 times during data collection. This indicates both the demand for mathematics teachers in South Africa and the high turnover rates of mathematics teachers. The table above shows that the demand for mathematics teachers is across all phases, from the intermediate phase to the FET phase. The total active job adverts for mathematics teachers are indicative of the aggregate view of employer skills demand for mathematics teachers in South Africa.

Table 3: Total active job advert for teachers specialising in English

Occupation	Subject Specialisation	Quantity
English First Additional Language Teacher	English First Additional Language	87
ENGLISH Home Language Teacher	ENGLISH Home Language	72
Temporary Foundation Phase Educator English HL Grade 1	English Home Language Grade 1	1
Intermediate and Senior Phase Substitute Educator English FAL Grade 4 – 7	English First Additional Language Grade 4 – 7	1
SGB Educator Post English and Afrikaans 10 – 12	Language of learning and teaching: English and Afrikaans History Grade 10 – 12	1
Substitute Educator English HL Grade 7	English Home Language Grade 7	1
Temporary Substitute Educator English FAL Grade 8 – 10	English First Additional Language Grade 8 – 10	1
Temporary Educator English FAL Grade 8 – 12	English First Additional Language Grade 8 – 12	1
Substantive Educator Post English FAL Grade 10 – 12	English First Additional Language Grade 10 – 12	1
Temporary Educator Post	Social Sciences Grade 8 – 9 English and Setswana Grade 8 – 9 Mathematics Grade 8 – 9	1
Vacant SGB Educator Post	English Grade 4 Life Skills Grade 4	1
Temporary Educator Post	Post 3: Geography and English Grade 10 – 12	1
Temporary Educator Post	Sepedi Home Language Grade 10 – 12 English First Additional Language Grade 10 – 12 Life Orientation Grade 8 – 9	1

Due to the diversity and complexity of the South African schooling systems, whereby schools can be at minimum dual medium in their instruction, with English being the main medium of instruction, the teachers required must be able to communicate in more than one language to fully translate knowledge in a substantive manner to students. Accordingly, the online job advert data illustrates this flexibility in that the teacher required must be able to demonstrate competencies in not only English but also other languages and other subject specialisations. This trend can be found in all phases of education, with the overall demand for English Teachers as per the online job advert data being at 171, the nature of the employment contracts primarily being for permanent appointment, thereby underscoring it as an identified priority.

Table 4: Total active job advert for teachers specialising in isiZulu

Occupation	Subject Specialisation	Quantity
isiZulu Home Language teacher	isiZulu Home Language	56
isiZulu First Additional Language	isiZulu	2
Substantive Educator Post	isiZulu Home Language Grade 8 – 12	1
Substitute Educator Post	isiZulu Home Language Grade 7 Social Sciences Grade 6	1

Likewise, isiZulu is a major language in the country with many citizens considering it their mother tongue. Therefore, instruction in schools requires Teachers who can teach it as a Home Language, and this demand is primarily located at the Senior to FET phases of schooling. Sixty (60) Teachers with competency in isiZulu were identified for vacant posts.

Table 5: Total active job advert for teachers specialising in Sepedi

Occupation	Subject Specialisation	Quantity
Senior and FET Phase teacher Sepedi HL Grade 10 – 12	Sepedi Home Language Grade 10 – 12	48
Temporary Senior and FET Phase teacher Sepedi HL Grade 10 – 12	Sepedi Home Language Grade 10 – 12	1
Temporary Educator Post	Sepedi Home Language Grade 10 – 12 English First Additional Language Grade 10 – 12 Life Orientation Grade 8 – 9	1

The Sepedi language, though not as widely spoken in the country, is still an official language of the country and must be represented in the medium of instruction in some schools, primarily in the regional provinces of Limpopo and Gauteng. Due to its scarcity and localisation, its demand is reflected in online job adverts, with 50 vacant posts being advertised for teachers with this specialisation primarily for the FET phase of schooling.

Table 6: Total active job advert for teachers specialising in Arts

Occupation	Subject Specialisation	Quantity
Teacher Creative Arts	Creative Arts 8-9	62
Substitute Educator Creative Arts Grade 7	Creative Arts Grade 7	1

Occupation	Subject Specialisation	Quantity
Substitute Educator Post Creative Arts Grade 8 – 9	Creative Arts Grade 8 – 9	1
Foundation Phase Afrikaans - Art and Culture Teacher	Afrikaans Arts and Culture	1
Visual Arts, Arts and Culture Teacher	Visual Arts	1

The creative arts subject specialisation and its demand for teachers with this competency has also been identified by the job advert data primarily for the intermediate phase of schooling. Sixty-six (66) vacant posts for teachers with this competency have been identified with some posts requiring competency in a further subject specialisation most notably an accompanying medium of instruction.

5. CONCLUSION AND RECOMMENDATIONS.

The above data for the identified subject specialisations were recorded as being in demand by most PDEs and member schools of associations. This is reflected by the number of times the teacher demand for a particular specialisation made it onto the online job advert. The results above also demonstrate that job online data as a source can provide a myriad of information which was not easily accessible before. This data, used with other databases such as the Personal and Salary System (PERSAL) data for teachers, can contextualise the labour market data and assist policymakers and curriculum planners to utilise accurate labour market information data as the bedrock to inform policy and government programmes.

When all the variables from the job advert data are analysed, the scope of potential insights that can be extracted is vast. The data above indicates the subject specialisation of teachers, specifically in which subject areas the demand for teachers is. The data can further be sifted according to the sector where the demand is and compare the demand for the private sector against the public sector. In terms of skills/competencies required, the teachers' job adverts mostly indicate the minimum Relative Equivalent Qualification Value (REQV) required and the South African Council for

Educators certification, which provided a limitation in the analysis of technical and soft skills required from the teachers. The recommendations of this study are as follows:

1. Deconstructing the data and the variables from job advert data, the data gives the nature and health of the labour market for teachers which can be used with other data sources for triangulation.
2. The job advert data allows for the wide extraction of skills from job descriptions, enabling employers and policy-makers. The collection of this data over time will give us an indication of whether the demand is increasing or decreasing over time.
3. The job advert data for teachers assists in better understanding the relationship between various subject specialisations and other variables (such as salary, location, length and nature of contract) characterising occupational demand for teachers.

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