

RESEARCH & POLICY PAPER

Education Workforce Recruitment and Matching in Sierra Leone

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Executive Summary

This paper is the fourth in a series developed by Fab Inc. (on behalf of the Education Commission), to help the Teaching Service Commission (TSC) strengthen further the education workforce. It is part of the wider [Education Workforce Initiative](#) (EWI) and builds on the [Transforming the Education Workforce](#) report. Sierra Leone has been a key partner in this initiative. This work builds on a phase one scoping study that focused on options to strengthen the workforce. The other papers in this series cover: Education Workforce Management, Education Workforce Spatial Analysis, Education Workforce Supply and Needs and Education Workforce Costed Options.

Sierra Leone faces a multitude of challenges, many of which are a product of successfully expanding access to schooling across the country; combined with the challenges of recovery from conflict, natural disasters, and Ebola. By far the greatest challenge is how to ensure that there is a high-quality education workforce for all schools in the country, a particular challenge for the many remote rural communities.

In this paper we focus on how teachers are recruited into the system in Sierra Leone, and, once hired, how they are then deployed to schools. As with many aspects of the system, there is a stark difference between how this ideally would occur, and how it actually works – with many schools, in the face of shortages and insufficient funding, relying on community contributions to hire locally. Given this difference, once we have the official processes mapped, we look at the possibility of applying this to different types of unrecognised teachers already in schools. The risks and key policy options at each stage in this process are identified.

Moving on from recruitment, we then summarise the deployment protocols for allocating teachers to schools. We highlight the work done here to date in terms of the teacher deployment tool that was used to identify from which schools teachers would be added to the government payroll as part of the 2019 budget, and the Teacher Deployment Policy that adopted a new measure of remoteness and set out associated policy measures to deploy teachers to the most remote categorised schools.

However, we also identify areas that could still be improved and have developed a preference matching model that can help to solve many of these issues. This includes reducing key subject specialism shortfalls, improving the allocation of teachers to remote areas they are more likely to prefer and therefore reduce attrition and relocation, increase the share of female teachers, and reduce the administrative burden on TSC of dealing with complaints and arbitrating disputes around allocations through increased transparency.

The potential of preference matching is further highlighted in the Education Commission's Transforming the Education Workforce Report and is based on a preference matching algorithm that has had significant success in the health sector through solving allocation issues for health workers. This work for the National Residency Matching Program in the US (and Ethiopia) won a Nobel prize in 2012. The algorithm balances the preferences of both health workers and hospitals to ensure that the needs of the hospitals are met, whilst balancing the preferences of the health workers. This has the benefit of both reducing attrition, and the need for incentives. Such preference matching has not been as widely implemented in the education sector yet but does have the potential to bring about similar benefits for teacher deployment.

Using real-world application data received by TSC and incorporating data from the 2019 Annual School Census and the 2015 National Census, we develop an illustrative model that maximises teacher preferences and school (head teacher) preferences whilst matching in order of teacher need.

We find that the model consistently outperforms random allocation based on a number of factors. For example, purposely allocating increases the average qualifications, experience and promotes gender balance in the workforce. The greatest gains are found in secondary schools, where schools can get an improvement in the likelihood of getting the qualifications they need by between 8-10 percentage points. For Junior and Senior Secondary Schools, this means they are more likely to be able to source the specialists they need.

Looking at the teachers, we find they are much more likely to receive the schools they wish than a random allocation – this is driven mostly by location and language preferences, which work much better. For distance we find a strong impact, which illustrates the potential of using this algorithm to ensure teachers can be matched locally.

The algorithm has been developed and will be shared with the Ministry and TSC to run themselves. An important step will be to consult with stakeholders to ensure that the parameters and preferences within the model suit the needs of schools, and the workforce. The teachers' union will be integral to this, and can help survey their members to build on the existing work identifying the most important factors for teachers. Headteachers should also be included, to ascertain both their overall preference for new recruits, but also how they trade these off.

The flexibility of the model also means that it is possible to incorporate a range of other factors that schools or teachers may have preferences for depending upon the results of these consultations. Ultimately, the model can incorporate any quantifiable characteristic that is desired by the teachers, schools and policymakers of Sierra Leone and it can be managed and run by the TSC.

Education Workforce Initiative Overview

This paper is the fourth in a series developed by Fab Inc. (on behalf of the Education Commission), to help the Teaching Service Commission further strengthen the education workforce. It is part of the wider [Education Workforce Initiative](#) (EWI) and builds on the [Transforming the Education Workforce](#) report. Sierra Leone has been a key partner in this initiative. This work builds on a phase one scoping study that focused on options to strengthen the workforce.

The second phase provides succinct evidence products on specific research areas to guide a policy dialogue on aspects of the education workforce in Sierra Leone, to be held in Freetown. Figure 1 summarises the relationship of these papers to each other:

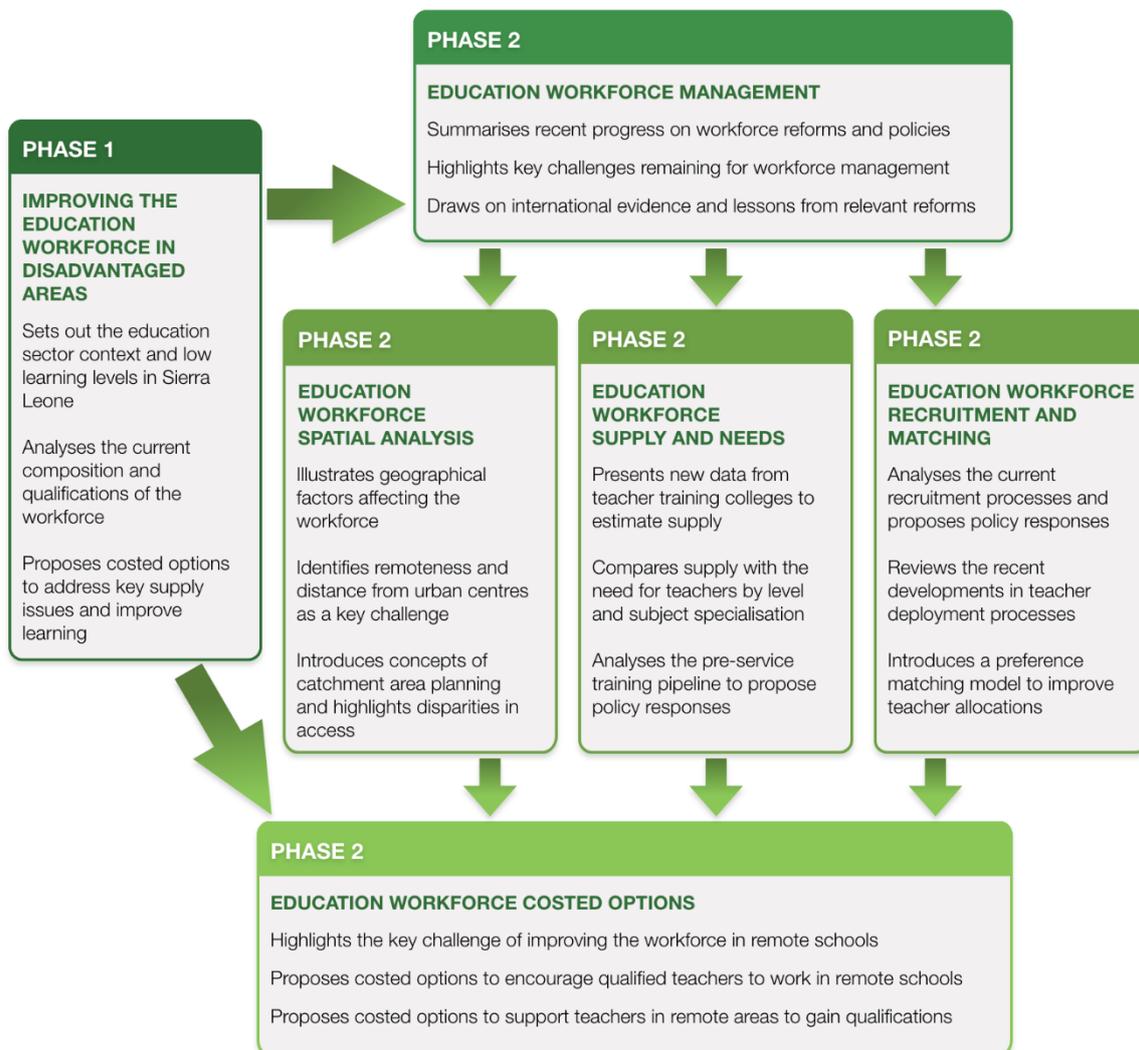


Figure 1: Education Workforce Initiative – Sierra Leone papers

Recruitment and Matching Overview

Sierra Leone faces a multitude of challenges, many of which are a product of successfully expanding access to schooling across the country; combined with the challenges of recovery from conflict, natural disasters, and Ebola. By far the greatest challenge is how to ensure that there is a high-quality education workforce for all schools in the country, a particular challenge for the many remote rural communities.

The paper focuses on two related aspects of how teachers come to be in the classroom, working with students.

Section 1 concerns the teacher recruitment process. Like many aspects of teacher management that the TSC has worked on in recent years, the theoretical pathway is now crisp, well-articulated, and logical. However, the operating environment is significantly more complex, as a result of successive emergencies that have made short term fixes a necessity, such as hiring untrained and unqualified teachers locally, or asking educators to work without being put on government payroll.

Therefore, the TSC is faced with a significant set of management challenges if it is to bring teacher recruitment, and the profile of the existing education workforce, into line with the processes and norms it has identified. In this Section, we:

- Reproduce the intended recruitment pathway, discussed further in the companion Workforce Management Paper
- Identify six distinct points in the pathway from secondary school leaver to teacher working in a government or government subsidised school where there is scope for things to go wrong. This could relate to new teachers or to those already serving in the system (more likely, given the history)
- Examine each of these points in turn and suggest a course of action that could help TSC stabilise and turn around each problem within the workforce.

Section 2 focuses on deployment protocols for allocating teachers to schools. This is an area that TSC has worked on more recently, producing a new policy in later 2019. As with work on recruitment, the approach is of good quality, and, if implemented, will do much to improve the efficiency and effectiveness of deployment.

There are two areas where we believe more could be done to refine the new approach, further reducing the number of instances where deployed workers fail to take up their post. The first of these concerns the definition and concept of remoteness, as a factor in identifying hardship posts. This we discuss in our companion Spatial Analysis paper.

The second considers the possibility of introducing some way of factoring teacher preferences into the deployment protocol. This is an approach used in many other systems to minimise the risk of teachers being deployed in places they are not content to work. The Section focuses on this proposed improvement, including introducing an algorithm that matches posts to teachers, based on their preferences.

1. Education Workforce Recruitment

We begin by summarising how entry into the teaching profession¹ officially² works in Sierra Leone, from completion of schooling to being allocated a post within a school.

1.1 Recruitment processes

To become formally eligible to teach, a prospective teacher needs to have both an appropriate qualification and to apply for a licence from the Teaching Service Commission. This involves getting sufficient credits at WASSCE, enrolling in a Teacher Training College and passing the examination for the qualification studied, and making a separate application for a renewable three year professional licence. Once the license is granted, an individual achieves the status of new teacher, as defined by Sierra Leone's 2017 Professional Standards for Teachers and School Leaders. Progressing from being eligible to teach, to beginning to teach requires further steps as shown below. The six-step path visualised in Figure 2 shows in theory how teacher recruitment and deployment takes place in Sierra Leone. The process from leaving school to leaving the TTC has also been discussed and policy recommendations made in the companion EW Supply and Needs paper.

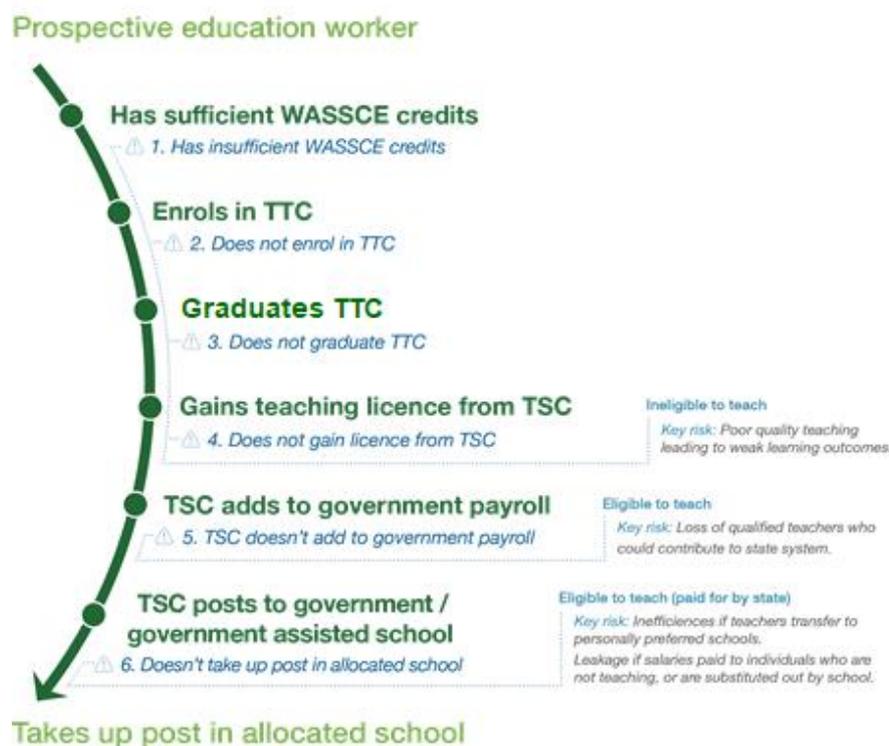


Figure 2: Steps in the formal recruitment process

¹ Other education workers, such as principals and bursars are drawn from the senior ranks of the teaching cadre.

² One key factor to keep in mind is the large numbers of teachers that are currently not on payroll, and the large numbers of teachers who are working through an informal recruitment process, with substantial variation in qualifications. This status quo situation is likely to be a barrier to implementing the official processes, something we discuss in the wider pieces.

While this process seems simple, it requires direct inputs from three distinct actors: (i) the prospective worker (Steps 1-4 and 6); (ii) one of the six Teacher Training Colleges (TTCs) of Sierra Leone (Steps 2 and 3); and (iii) the Teaching Standards Commission (TSC) (Steps 4-6).

It also requires indirect inputs from three further actors: (i) the secondary school attended by the worker (Step 1); (ii) the Ministry of Basic and Senior Secondary Education (MBSSE), or affiliated organisation that operates the school where the teacher is posted; and (iii) the Ministry of Finance (MOF) responsible for paying the teacher. Ensuring all actors are coordinated is key to ensuring clarity around the process and giving potential recruits confidence they can be hired in a fair and transparent manner. The associated Education Workforce Management paper discusses this diagram in terms of some of the challenges around collaboration and potential system-level improvements of these teacher pathways.

In this paper, we examine in more detail the specific challenges of teacher recruitment, with particular focus on the impact and options for those that are already working but are not currently on payroll.

1.2 Applying the official recruitment and deployment process to new or serving teachers who do not meet these criteria

The TSC's 2019 Teacher Management Policy sets out to ensure all teachers are both qualified *and* licensed to operate, on the assumption that achieving a qualification from a TTC equips an individual to teach well. We discuss the limitations to this assumption about the pipeline of teachers in the companion Supply and Needs Paper.

The challenge facing the TSC to regularise this position across the whole of the serving teacher workforce is immense. More than 30% of teachers do not yet hold a legally appropriate qualification, a situation the TSC has committed to eradicating by 2023. As discussed in depth in Phase 1 of the Education Workforce Initiative for Sierra Leone, it will be important to consider ways to ensure unqualified teachers in particular can be supported to develop their skills, gain qualifications and become recognised members of the workforce from the TSC's perspective. Meanwhile, a more immediate management challenge is the rollout of the new licensing system (see below), in a context where many teachers are not on payroll and therefore not easily identifiable in all cases.

We consider here in turn (from Step 1 onwards) each of the groups of workers who may be in the system without being licensed or qualified (or either) to teach, as well as those who are both, but are not on payroll, or have decided not to teach. We describe each situation (derived from the figure above) and suggest possible actions the TSC could take, either alone or working with other parts of the sector. It is important to note we have considered

all points in the qualification and licensing process where there could be a break in the chain. We offer no comment on the relative prevalence of any of these situations.

1.2.1 Those who have not enrolled in a TTC or have not gained enough WAASCE credits to be eligible to apply (Steps 1 and 2) are not qualified, certified, or licensed to teach.

We discussed Untrained and Unqualified Teachers (UUTs) extensively in Phase 1 of the Education Workforce Initiative for Sierra Leone. Given that any expertise they have attained has been informally developed, the collective risk they pose to student learning by teaching is likely to be higher than for other groups. However, many UUTs in this category will have gained relevant skills through their practice, in some cases over many years. The TSC has said it wishes to eradicate the use of UUTS in the system by 2023. Doing so by simply terminating serving teachers in this group is not feasible, given the current prevalence of UUTS. The TSC may find a response that differentiates between the situation of certain schools and teachers is the most appropriate, and manageable, way to tackle this problem. For example:

Possible Action

The suggested approach is divided in three ways. One considers districts, chiefdoms and schools which are very **constrained** in terms of teacher supply (for example because of remoteness, as discussed in the companion Spatial Analysis Paper). The second, chiefdoms and schools where there is **oversupply** of teachers (typically major urban centres). The third is an approach for tackling the UUT issue in other locations.

Where supply is **constrained**: Identify UUTS and their locations and make continued employment (whether currently on payroll or funded in some other way, such as through the community) contingent on enrolment in and graduation from a specialised distance learning teacher training course developed with TTCs. This could form a well-defined, clearly pro-poor project for donor financing, taking design inspiration from existing work such as the UK financed, Plan International led GATE Project.

The course would be part time and focus on building teaching practice for core literacy and numeracy skills. The qualification would be distinct from a standard teaching qualification but could potentially form credits towards a TC or HTC for those who go on to invest in further study. Graduates of the course would have a title separate from teacher and would only be permitted to practice in the school in which they are currently working unless they upgraded their qualifications further.

Where there is **oversupply**: Identify chiefdoms and specific schools where there is oversupply of teachers, and some are UUTs. Require these schools to remove UUTs, giving individuals the option of returning to teaching once they have gained the relevant qualifications, or to remaining in teaching if they are open to relocating to an area that falls into the constrained group, and take part in the training course described above.

Ensure the approach communicates very clearly the pathway open to UUTs who wish to remain in the profession and consider providing some level of career counselling as well as exit management for the schools involved.

For **all other** districts, chiefdoms and schools, identify the list of UUTs and serve notice on them and their schools of a fixed term within which they must be able to demonstrate acquisition of or progress towards the relevant qualifications legally required for teaching in Sierra Leone. In the case of those who do not have appropriate WASSCE credits, include an additional year to acquire these and apply for a place in a TTC. Offer the alternative of transfer to a hardship area and enrolment in the special teaching course as an alternative.

This group is least likely to produce good teachers and is also most complex and resource intensive to identify and manage. The TSC has committed publicly to tackling the issue of UUTs by 2023, so this cannot be considered a low priority group. It is important to note the evidence from our companion Supply and Needs paper is that many UUTs are not teaching significantly more poorly than their qualified peers. Within the three sub types of UUT identified here, the priority should be to ensure those in hardship areas are assisted to improve, given the difficulty of arranging alternative teaching, and to ensure those in locations with oversupply do not continue to practice.

1.2.2 Those who have enrolled in a TTC but failed to complete or graduate from their course (Step 3) are not qualified, certified, or licensed to teach

This group are also UUTs but could be expected in general to have more expertise than the group above, by virtue of their partial completion of a course at a TTC. The risk they pose to student learning by teaching is likely to vary based on factors including length of study and level of attainment, professional development received after becoming a teacher, performance while studying, and performance as a UUT. On aggregate, however, this group has more immediate potential than the first one. An appropriate response by the TSC given they need more qualified teachers might be to prioritise the most promising, and then support or fast track their qualification and licensing, working in conjunction with the TTCs.

Possible Action

Isolate this group of serving UUTs by school, chiefdom, and district. Begin by identifying the most promising of these by administering a test, which could be based on the TSC's 2017 Professional Standards that identify competencies for new, proficient, highly experienced and distinguished teachers, to help establish baseline competencies and skills picked up on the job as UUTs. Set a pass mark for the test, based on the minimum level of competencies it is feasible to work with when administering a fast track distance learning qualification.

For those who do not meet this threshold, revert to the actions outlined under 1.2.1, treating UUTs based on their location and the severity of need for additional teachers.

For those that pass the test, offer a one off, time limited opportunity to become a qualified, licensed teacher through a part time, distance learning accelerated TC or HTC developed in conjunction with TTCs. The baseline expectation should be that candidates are self-financing. However, it may be possible to extend some form of scholarship with support from one or more development partners, focusing on the highest performers in the test, or targeting the least able to pay, or a combination of the two. The TSC could also use this to

incentivise particular groups to regularise their position, including female teachers and those interested in working in remote locations where posts are hard to fill.

Add graduation spot checks to the duties of school inspectors and supervisors, taking action against schools and individuals found in breach following the one off test period. Publicise actions taken against schools and individuals in breach of qualifications law, as well as regular data on spot checks and reductions in unqualified teachers in the system.

This group is most likely, after the qualified but uncertified, to return a substantive number of additional teachers to the model pathway within a relatively short period of time. However, developing and administering tests will be costly in terms of financial and human resources. There is also a risk that many candidates will fail proxy tests, leading to a short to medium term lack of teachers in the system.

On the broader issue of UUTs, discussed in 1.2.1 and 1.2.2, the *Transforming the Education Workforce* report highlights that a range of other interim strategies will be needed while the system expands through new entries. This includes using radio technology to broadcast expert lessons in schools without appropriately qualified teachers³, continuing to employ retired teachers on temporary contracts in shortage areas⁴, and using a learning teams approach that utilises the UUTs in a learning assistant capacity to help manage larger classes⁵. Pedagogical support through technology has also been shown to be effective in locations with a large cadre of UUTs, such as in Bangladesh where short videos of simple teaching techniques on mobile phones, along with peer-learning and support, increased students' ability to communicate using a basic level of English⁶ (which rose from 36 to 70 percent).

In both cases, EWI recognises and respects the TSC's commitment to ensuring a fully-qualified education workforce. All these suggestions, existing and new, are offered as ways of helping to deliver this aim.

1.2.3 Those who have graduated from a TTC but have not obtained a licence (Step 4) are technically qualified and certified, but not licensed to teach

Clause 36 of the 2004 Education Act says the following about licensing of teachers:

'No person shall be employed as a permanent full-time teacher in any school unless he holds a professional certificate or a license issued by the Ministry in accordance with this section:

Provided that:

³ A costed proposal for this is contained in the Phase 1 Report, building on evidence from Sierra Leone during the Ebola crisis and the MGCubed project in Ghana

⁴ As demonstrated in Gambia and Malawi; Mulkeen, Aiden. 2010. *Teachers in Anglophone Africa: Issues in Teacher Supply, Training and Management*. Washington, DC: World Bank.

⁵ Discussed in detail in Chapter 5 of the *Transforming the Education Workforce* report

⁶ English in Action. 2015. "English Proficiency Assessments of Primary and Secondary Teachers and Students Participating in English in Action: Third Cohort (2014)." Dhaka: English in Action

the Minister may recognise any certificate issued otherwise than under this section to any person employed as a teacher in any school and such recognition shall have effect as if such certificate had been issued to such person under this section with accreditation from the National Council for Technical, Vocational and other Academic Awards (NCTVA);

b. the Minister may cause a license to be issued to any person who is or may be employed as teacher in any school if in his opinion such person is in all respects suitable so as to warrant his employment as a teacher in a school, and the issue of such license shall have effect as if a certificate had been issued to him under this section.

Every certificate and license issued by the Ministry under this section shall be in such form as may be prescribed by the Minister by rules made under this Act, and shall be signed by the Minister or by an officer of the Ministry authorised by the Minister in that behalf.'

In its 2019 Teacher Management Policy, the TSC, which now has responsibility for licensing, as well as other aspects of teacher management, sets out the approach for a three-year renewable licensing regime. This was also announced publicly by the former Minister⁷ at the time of the Policy's launch. This implies that the group of qualified but unlicensed teachers will technically include anyone whose license precedes the new approach. These teachers don't pose a risk to student learning in the same way as UUTs but do need to be brought into line administratively.

It will also be important to ensure every new teacher is aware of the responsibility they have to apply for a license, and that every serving teacher is aware of the responsibility they have to apply for a renewal every three years. The immediate issue for TSC is one of a relicensing bulge that will be administratively taxing and resource heavy in the short term.

Possible Action

Design and deliver a public communications campaign aimed at teachers in this category outlining the licensing process, a clear amnesty period, and the benefits to workers of being licensed. Deploy additional administrative resource in the TSC for the period of the amnesty (either through fixed term contracts or overtime for substantive posts) to clear backlog of applications efficiently.

In the medium term, add licensing spot checks to the duties of school inspectors and supervisors, taking action against schools and individuals found in breach following the amnesty period. The 2004 Education Law has provision for administering fines in situations where licensing is fraudulent but does not appear to include sanctions for unlicensed teachers. Publicise actions taken against schools and individuals in breach of licensing law, as well as regular data on spot checks and reductions in unlicensed teachers in the system.

⁷ <https://www.politicosl.com/articles/sierra-leone-license-teachers>

In the longer term, review the licensing process and pricing, and simplify as far as possible. Work with TTCs to automate as far as possible the application for a teaching license on graduation from a course of pre-service training, including encouraging institutions to publicise importance of this to students.

This group is already qualified to teach, so taking steps to regularise these teachers would be less expensive and time consuming than other courses of action.

1.2.4 Those who have fulfilled Steps 1-4 are qualified, certified, and licensed to teach. However, many are not included on the government payroll, some for long periods (Step 5)

Those who are not on payroll are not easily accessible to take part in system wide efforts to support the strengthening of teaching in government and government assisted schools, and do not have a direct relationship with the TSC.

While many take posts in other types of school, this is often a temporary arrangement while waiting either to be included in the government payroll, or to find alternative employment. The major risk with this group is that the Sierra Leone education system loses fully qualified teachers. This is a significant concern in a situation where there are not enough qualified teachers in the system, and supply of pre-service training depends on only six TTCs.

Ideally, the TSC should aim to replace many UUTs in the government and government assisted subsector with this group of teachers, while legislating to require other parts of the sector to follow suit. Achieving this would require two types of investment: additional fiscal space to add teachers to the payroll, and the temporary human resources at the TSC required to clear the backlog of applications to go onto the government payroll.

1.2.4 Those who have fulfilled Steps 1-5 are qualified, certified, licensed to teach and are legally obligated to do so, as salaried employees of the Government of Sierra Leone.

Teachers who are salaried employees but fail to take up their posts typically do so for a variety of reasons.

Some teachers do not wish to occupy the post allocated, for reasons of distance, unfamiliarity with the location and its people, or other reasons such as the wish to live in a city. This issue is common to most developing world education systems and is difficult to eliminate completely, given the universality of humans using contacts to game public sector systems. One common approach is to incentivise hardship posts, which can be effective but often only in the short term and at a cost, as highlighted in the *Transforming the Education Workforce* report. Additional methods have included pairing students who have trained together to be posted to remote schools together as in Ghana and provision of housing.

Other teachers may take a post, but then transfer elsewhere including completely out of the teaching profession, frequently into the NGO sector in Sierra Leone which sees qualified teachers as a cost-effective source of educated labour. Legally, such transfers and exits should be reported to the government to remove the individual from the payroll, allowing for any end of service liabilities. In practice, this does not always happen. Sometimes

school chains may transfer a teacher on government payroll to another position, substituting the post with an UUT or a qualified teacher outside the government system. This practice, like influencing of posting outcomes, results in considerable inefficiencies in teacher allocation at system level. From a value for money perspective, this is problematic, particularly in a resource constrained operating environment like Sierra Leone. From a learning perspective, this means children in hard to reach areas, who are often disadvantaged in other ways as well, are less likely to benefit from good quality teaching.

A third group may leave a government paid post and arrange to split the salary with an unqualified substitute. This practice results in weaker teaching and learning outcomes for pupils, but also constitutes fraud against the Government of Sierra Leone and its people. In the case of unauthorised substitutions and desertion of post, the TSC should consider taking as close to a zero-tolerance approach as possible on the grounds of safeguarding public money as well as children's learning.

In all three cases, the TSC should consider taking as close to a zero-tolerance approach as possible on the grounds of safeguarding public money as well as children's learning.

Specific actions might include:

- A public communications campaign on the consequences of these actions on children and the government's ability to provide public services. This could include a confidential hotline for whistle-blowers, and a published commitment on follow up actions.
- A well-publicised fixed term amnesty for those who have transferred or left posts to declare their new status and be removed from the payroll.
- Commissioning a payroll audit.
- Spot checks during school inspections to match teachers on roll with teachers in post, with show cause notices issued to schools and teachers found to be in breach of legal obligations.
- Spot checks during regulation of NGO registration and compliance with operating guidelines to ensure no teachers on roll are employed, with consequences for NGOs and teachers in breach of legal obligations.
- A few high-profile legal cases against schools, NGOs, and individuals found to be in breach of legal obligations.

1.3 Suggested action plan

Understanding the scale of irregularities in the existing workforce in relation to official recruitment processes, and taking action, is a complex management issue for the TSC. It will take some time, and a combination of approaches, to bring actual practice into line with the commendably clear theoretical processes. Based on the full set of actions explored in Section 1.2, we suggest a plan of action based on the following:

In the short term (i.e. 2020-21):

UUTS (1.2.1-1.2.2):

- Identify districts, chiefdoms and schools that are constrained or oversupplied with teachers. Use this as the starting point for taking action on UUTs.
- Require schools in areas where there is oversupply of teachers to remove UUTs, replacing them where necessary with teachers from the undeployed group (subject to fiscal space).
- Serve notice on UUTs in all other areas of a time limit to regularise their qualifications and licensing.
- Identify partially trained UUTs and serve notice to all of the need to sit a test, including the consequences of passing or failing the test. Design and administer a test based on the 2017 teacher competencies.
- Develop a proposal for partnership support for (i) a specialised distance learning course for UUTs in constrained locations; and (ii) scholarships for part trained UUTs who show promise or fulfil priority criteria on location or other profiles. Work to identify a financing partner for this (for example ECW, given its emphasis on helping systems bridge the gap between emergencies, which have led to this situation, and development work).

Licensing (1.2.3):

- Design and deliver a public communications campaign outlining the licensing process and an amnesty. Deploy additional administrative resource in the TSC for the period of the amnesty to clear backlog.

Undeployed Teachers (1.2.4):

- Advocate for additional fiscal space to take on more of the pool of existing qualified and licensed teachers to replace UUTs who cannot or will not gain sufficient qualifications to meet the minimum standards.

Absentee Teachers (1.2.5):

- Develop and run a communications campaign on the impact of absenteeism on public services and children. Establish a whistleblowing hotline and launch a commitment to follow up and prosecute.
- Develop and run an amnesty for those who are on payroll but not in post to regularise their position, either by returning to service, or resigning. Clarify the consequences of continuing to claim public sector wages without working as directed after the amnesty.
- Commission a payroll audit to take place immediately following the amnesty period.

In the medium term (i.e. 2021-23):

UUTS (1.2.1-1.2.2):

- Design and administer a part time distance learning course with TTCs, and external finance, considering the GATE project and other models. Start to develop a group of

partly trained educators, with a focus on basic literacy and numeracy, to support learning in highly constrained locations.

- Announce and administer external funded scholarship program, if feasible, to support the strongest, or most needed, candidates from the partially trained UUT group identified through testing.

Licensing (1.2.3):

- Add licensing spot checks to the duties of school inspectors and supervisors, taking action against schools and individuals found in breach following the amnesty period. Publicise actions taken as well as regular data on spot checks and reductions in unlicensed teachers in the system.

Undeployed Teachers (1.2.4):

- Continue to advocate for additional fiscal space to take on more of the pool of existing qualified and licensed teachers to replace UUTs who do not meet the minimum standards.

Absentee Teachers (1.2.5):

- Use school inspections for spot checks on absenteeism per payroll audit, issuing show cause notices where teachers are not in post.
- Use NGO registration processes to ensure no serving teachers per payroll audit are employed, taking legal action where necessary.

In the long term (i.e. 2023 onwards):

UUTs (1.2.1-1.2.2):

- Use school inspections for spot checks on teacher qualifications, taking action against schools and individuals found in breach.
- Publish regular data on spot checks and reductions in unqualified teachers in the system.

Licensing (1.2.3):

- Review the licensing process and pricing and simplify as far as possible.
- Work with TTCs to automate as far as possible the application process, and encourage them to support graduating students to make their first application.

Undeployed Teachers (1.2.4):

- Continue to advocate for additional fiscal space to take on more of the pool of existing qualified and licensed teachers to replace UUTs who do not meet the minimum standards.

Absentee Teachers (1.2.5):

- Pursue some legal cases against schools, NGOs, and individuals found to be in breach of legal obligations and publicise these as a deterrent.

- The challenges on recruitment and the job of regularising the position of many teachers after a period of multiple emergencies frequently interact with aspects referred to in the associated EW Supply and Needs, Workforce Management, and particularly the Spatial Analysis paper. Many are exacerbated in remote areas, particularly those that are more than 5km away from urban centres. Teachers typically have less desire to live and work in these areas, particularly female teachers and those with in-demand key subject specialisms. These issues of deployment are discussed in more detail in the next section, whilst introducing a solution with the potential to tie many of these threads together.

2. Teacher Deployment

2.1 Background on Teacher Deployment Systems

Building on the research and the recommendations within the *Transforming the Education Workforce* report, the team looked to understand how teacher deployment is organised in different systems, and particularly in Sierra Leone, to ensure that any policy response is grounded in best practice and reality. In practice, two main systems of teacher deployment exist, either deployment by a “market system,” or deployment by a central authority. In reality Sierra Leone is a hybrid, with the intention of deploying by a central authority, but where this has not been sufficient, schools have substituted government recruitment with local hires.

Most African countries use a system of centralised teacher deployment, where it is fairly common for a secondary teacher’s contract to require deployment to anywhere in the country.

Deployment by a single, central authority has the advantage of being relatively free from local pressures and can more easily be made transparent and fair. However, centralised deployment systems have several weaknesses that undermine the rational operation of the posting system:

1. The system is dependent on the quality of information coming from the schools and, without adequate data, it may easily become bureaucratic and unresponsive.
2. The posting system often allows experienced teachers to transfer, thus resulting in greater numbers of inexperienced teachers in the areas with weak infrastructure and teaching resources.
3. Teacher deployment at the secondary level is further complicated by the need for teacher specialisation.
4. Teachers may not always take up the postings given, or work for a short period and move once eligible⁸.

Given the Teaching Service Commission’s work towards centralising, and professionalising teacher deployment, we have focussed on optimising the system, rather than revolutionising – but it is important to note that over the last 10 years, many countries

⁸ For example, in Ghana, significant numbers of trained teachers fail to take up their postings in rural areas. In a recent survey of 262 newly trained teachers posted to four districts in the Upper West Region of Ghana, 115 (44 percent) failed to arrive at their teaching posts

have given new attention to the benefits⁹ of decentralising the teacher-hiring process to a local level, and that there is scope within the new Local Government Act to do so – care must be taken to align policies across Ministries, to ensure consistency of planning and structures.

The literature on how teachers are specifically assigned to schools is not broad, but some examples stand out. In Tanzania, teachers are allocated to regions, based on teacher preferences (teachers propose three districts) and regional need; in Mexico, teachers are assigned to schools based on their performance in tests, with high scoring candidates getting priority. Here, higher-scoring teachers are likely to choose schools with more favourable working conditions and schools that are closer to urban centres, leaving marginalised children with lower-scoring teachers.

In Karnataka (India), the system of teacher recruitment, assignment, and transfers is centralised. The results of an examination, along with the teacher's education records, are used to generate a ranked list of teachers. Schools with open positions are categorised into three zones—A, B, and C—based on their proximity to city centres. Placement in zone A is preferred by most candidates due to greater urban conveniences, but it is not easy to obtain. New recruits are explicitly asked to choose an open position located in zone C, a practice that can contribute to inequitable teacher distribution. Within a specific zone, teachers with the highest rank are more likely to be matched with their top locations again tending to mean that marginalised children have lower-ranked teachers.

In developed countries, France is one of the few highly centralised hiring and deployment systems - since 1999, teachers' assignment procedures takes place in two successive phases. Teachers can first ask for a transfer to another region. This is managed centrally by the government which runs an algorithm that determines teachers' regional assignment. In a second step, teachers newly assigned to a region and teachers wishing to change schools within their regions submit a list of ordered schools. The central administration defines priorities over teachers using a points system. It considers three legal priorities: spousal reunification, disability, and having a position in a disadvantaged or violent school. Several individual characteristics also enter the computed score: total seniority in teaching, seniority in the current school, previous demands of mobility (repetition of first wishes), and time away from the spouse and/or children.

The criteria considered to compute teachers' scores are numerous but, in the end, most criteria are used by only a small number of teachers. For instance, only the teachers who are married and live in a region different from their spouse are eligible for the spousal reunification criteria. As a result, seniority is the main criterion (even though it is not the one that gives the most points).

⁹ In terms of teacher deployment, decentralisation brings both benefits and risks. The more local the system, the more likely it is to be in touch with the needs of the schools and respond quickly and flexibly to these needs. However, a local system may also be susceptible to undue influence by individuals in positions of power, especially in countries with weak administrative capacity at district and local levels. Improved systems of checks and balances are needed to ensure countrywide equity, justice, and efficiency in teacher deployment.

In many examples, the emphasis on teacher choice particularly when linked to performance in tests or seniority, can lead to inequitable workforce distribution. This can disadvantage further some of the most vulnerable students and communities. *The Transforming the Education Workforce* report highlights examples targeting this issue using technology. For example, Malawi has used GPS data to help target incentives to specific unpopular and remote areas, rather than on a blanket basis to rural districts¹⁰. In Ghana, a smartphone school mapping platform allows users to collect and display information on resources, teachers, infrastructure, and school performance, enabling both policymakers and citizens to monitor investments and outcomes at relatively low cost¹¹. In Zimbabwe, a Teacher Training and Development Information System has been established to improve needs-based deployment of qualified teachers and targeting of teacher professional development¹².

2.2 Deployment in Sierra Leone

After a government hiring freeze on teachers for some years, the 2019 budget contained provisions for the recruitment of 5,000 teachers across the pre-primary, primary, junior secondary and senior secondary schools. In response, the TSC has undertaken work to improve their systems and action the recruitment of teachers. This resulted in the addition of 4,225 teachers to the government payroll in late 2019.

We focus on the two initiatives to improve their deployment processes. These were:

- (1) a teacher deployment tool utilised in the addition of 4,225¹³ teachers to the government payroll in late 2019;
- (2) the development of a measure of remoteness and the subsequent official adoption of this measure within the new Teacher Deployment Policy in December 2019.

We aim to build on this and have developed a matching model which allocates teachers to schools according to their preferences, and the preferences of the schools.

2.2.1 Teacher Deployment Tool

The initial work on teacher deployment was hampered by the substantial numbers of teachers not currently on payroll. Following the announcement of the hiring process, the TSC received 14,000 applications from teachers that were already qualified, and already teaching within public schools, but that were not yet on the government payroll.

¹⁰ World Bank. 2016. "Teacher management 2.0: improving teacher deployment in Malawi." Washington, DC.

¹¹ Pathways for Prosperity Commission on Technology and Inclusive Development. 2019. Positive disruption: Health and education in a digital age. Oxford: Blavatnik School of Government, University of Oxford.

¹² Global Partnership for Education. 2017. "How GPE supports teaching and learning." Policy Brief September 2017. Washington, DC: Global Partnership for Education (GPE).

¹³ The reason that 4,225 teachers were added to the payroll instead of the initially announced 5,000 was due to this budget increase also being used for promotions and wider wage rises, with a 30% wage increase, in line with previous increases for health workers, announced effective April 2020.

Therefore, it is important to recognise that, in the short term, any teacher recruitment is likely to be additional to the payroll, not additional to the education system. In practise, this meant that the deployment tool *was in effect a school selection tool for permission to hire their existing teachers, rather than a tool to deploy a central pool to schools.*

The deployment tool was structured around school need, with the following criteria agreed: Firstly, it was decided by TSC and the World Bank that 70% of the teachers added to the government payroll would be from newly approved schools and 30% from existing approved schools. Secondly, the tool had a strong PTR focus, in order to add teachers to the payroll in schools with the greatest shortage of teachers. Finally, there was also consideration of school facilities, such as classroom space and sufficient infrastructure.

While the tool identified schools that were to have staff added to the government payroll, the school did not select the specific teachers by itself. Selection of teachers was decided by the school leader (principal), School Management Committee (SMC) and TSC District Deputy Director, using factors such as experience and workload. As this process is quite opaque, we cannot rule out the possibility of personal/political factors also affecting the decision of which teacher was chosen.

This teacher deployment tool was an important step by the TSC in setting out a protocol to improve the transparency of recruitment into the education workforce in disadvantaged areas. However, it still has room for improvement and two further challenges were identified in discussions with TSC.

The first challenge was that the use of facilities in the allocation tool may have inadvertently biased allocations towards better resourced schools, and away from poorer rural schools. A second challenge was that once teachers were added to the payroll, the teachers didn't always stay in their contracted schools and disciplinary and monitoring actions were required. In particular, it was noted that whilst teachers at schools in headquarter towns of each district tended to stay at their contracted schools, those in more remote areas did not always stay¹⁴.

Following this initial work, and the subsequent challenges in keeping teachers at the schools they were allocated, the TSC commissioned a report on 'Teacher Deployment & Incentives in Sierra Leone' into this issue, to ascertain what incentives teachers would require to work in the most remote schools.

This acknowledges the challenge of ensuring that members of the education workforce contracted to schools in remote areas remain and work at those schools instead of being able to receive payment whilst working at a school of their own choice (or not at all). While this is primarily a monitoring and enforcement issue (discussed in Section 1 above), the report also signals the more difficult challenge of finding ways to incentivise teachers and other education workers to stay in remote schools, or in locations that are otherwise inconvenient.

¹⁴ For example, in Bonthe District, 24 teachers out of an initial 124 (approximately 19%) added to the payroll were later reported as no longer turning up to their contracted school - requiring disciplinary actions and replacement.

The 'Teacher Deployment & Incentives in Sierra Leone' report looked at this, in terms of non-salary incentives, and found consistent messaging from teachers on the unattractiveness of remote schools and proposed a method of categorising remoteness. We cover this issue in detail in the associated Education Workforce Spatial Analysis paper. It also highlighted some key preferences for teachers, which we draw upon in our preference matching model discussed here.

2.2.2 Teacher Deployment Policy – December 2019

The TSC incorporated many of the principles highlighted in the report mentioned above into its new Teacher Deployment Policy, published in December 2019. This includes formal definitions of remoteness, as follows:

- **A Not Remote:** Within the district HQ town. Has at least three of electricity, water, toilet facility, adequate furniture, and library. Easily accessible, including during rainy seasons.
- **B Moderately Remote:** Outside district HQ town but has at least three of the amenities on the list. Inside district HQ town but lacks basic amenities from the list. Easily accessible except in rainy season.
- **C Most Remote:** Outside district HQ town. Lacks basic amenities from the list. Not easily accessible.

The Teacher Deployment Policy also introduces a number of new and important measures relevant to the spatial analysis of the education workforce and deployment of teachers to remote locations:

1. 'It will be the policy of the TSC that new teachers will be deployed to remote locations as the default position [referring to the most remote category C]
2. It will be the policy of the TSC that existing teachers will be encouraged to apply for positions in remote locations [referring to the most remote category C]
3. It will be the policy of the TSC that new and serving teachers, after having served a period of 5 years will be considered for promotion although actual promotion will depend on the criteria and system in place.
4. It will be the policy of the TSC that teachers, after having served a period of 5 years will be entitled to be considered for positions in less remote locations when a vacancy arises.'

This marks a significant shift. Careful implementation will be required to ensure the policy achieves the desired improvement in remote schools, without negatively impacting upon the quality of new entrants into the workforce as well as the motivation of existing members of the workforce that had been anticipating previous promotion structures.

We propose two measures to support implementation of this policy. First, we recommend adding travel time to schools from population centres into the remoteness categorisation to refine this categorisation further. This issue is discussed in the companion Spatial Analysis paper.

Second, we propose adapting the deployment process to make it more transparent and inclusive of teachers' preferences by using a matching model. We discuss this in the remainder of this paper.

2.2.3 Potential improvements

Several important considerations are not covered in the current recruitment and deployment processes. We can try to solve these using a preference matching method.

- As highlighted in the EW Supply and Needs, and the EW Spatial Analysis papers, there are significant shortfalls in key subject specialisms across secondary schools in Sierra Leone.
- As highlighted in the EW Spatial Analysis paper, there is a significant shortfall in qualified teachers in remote areas and particularly in schools that are more than 5km (an hour's walking distance) away from urban centres.
- Sierra Leone has the 6th lowest ratio of female teachers in the world. There are several means through which female teachers can be promoted, explicitly or more subtly. For example, it is possible for the preferences of female teachers to be matched first ahead of male teachers, or more subtly, it could simply be that in the case of identical matches, the gender of teachers could be used as a 'kicker' so that female teachers are selected in the event of a tie.
- TSC spends a considerable amount of time dealing with complaints and arbitrating disputes, from teachers, head teachers and local officials, with distributions and allocations a key cause of these disputes. The transparent nature of the preference matching model allows TSC to clearly publish the parameters of the model, and direct questions towards this.

2.2.4 Using lessons learned from the health sector in improving deployment

The Transforming the Education Workforce report highlights several methods through which education systems can meet some of the challenges being faced by countries such as Sierra Leone. One of the key recommendations of the 'Strengthening the education workforce' chapter states that: 'Deployment systems should use robust data to better match supply and demand, take into account workforce preferences, and ensure equitable resource distribution.' This refers to the use of preference matching models, such as has been extensively used in health.

The National Residency Matching Program in the US (and Ethiopia) won a Nobel prize in 2012 for its algorithm, in solving health worker allocation issues. This algorithm balances the preferences of both health workers and hospitals to ensure that the needs of the hospitals are met, whilst balancing the preferences of the health workers. This has the benefit of both reducing attrition and the need for incentives. Such preference matching has not yet been as widely implemented in the education sector but does have the potential to bring about similar benefits for teacher deployment.

2.3 The Preference Matching Model

Premise

The premise of matching models is simple, and best illustrated using the notion of marriage – here two people express their preferences for what they are looking for in their partners – and, once they find it, make a stable match. This is a common challenge in computer science/mathematics, and has been applied to many real world examples. The most famous of these, to assign medical graduates to hospital jobs, is the Gale-Shapley Algorithm (GSA). We adapt this algorithm to the similar challenge of allocating teachers to schools.

Data

The preference matching model that we have developed is coded to draw upon the existing data system – we use data from the 2019 Annual School Census, the 2015 National Census and the 13,000 applications received by TSC from current teachers from the 2019 Teacher Deployment Protocol exercise.

Teacher Data

This data allows us to show the characteristics of the existing workforce who are applying for roles. This can help answer three key questions: can we a) identify whether there is a school they are better matched for, b) identify the priority of adding those teachers to payroll¹⁵ and/or c) use this to simulate deploying new additional teachers to positions that they are best matched for (by assuming they are new teachers looking for roles).

This data was compiled at the district level and includes¹⁶:

- The level of schooling the teacher applied for
- The district the teacher applied for
- Their gender
- The number of years teaching experience

The data was not collected in a consistent fashion across all districts, and unfortunately, data on the qualifications and subject specialisms was too inconsistent to be used. To aid the simulation, additional data was incorporated from the 2019 Annual School Census. This was again randomly simulated for each teacher application using the percentages from non-private school, non-government payroll teachers for:

- Qualifications (and removing the possibility for unqualified teachers)
- For JSS and SSS teachers, their shares of subject specialisms for English (Language Arts), maths and science

¹⁵ This prioritisation for adding to payroll can be flexibly based on characteristics such as school need and remoteness, and teacher experience and specialisms for example.

¹⁶ Where the variables here were not available (particularly in the case of gender and experience), this was randomly simulated to make the shares in the overall dataset equal to those who reported these characteristics.

To take into account the importance of distance to schools highlighted within the Spatial Analysis paper, we randomly simulate a longitude and latitude GPS location for where the teacher currently lives within the district. In future, we recommend the existing teacher application form be amended to include location, and location preferences for deployment.

Finally, we also incorporate the 2015 National Census data which asked the main language of each respondent (household) in the country. Using the shares of these languages across each district, we randomly simulated the teacher's main language at the district level (e.g. so that teachers in Kenema were more likely to speak Mende, and teachers in Tonkolili were more likely to speak Temne).

The algorithm is flexible, and can be adapted to include more, or less, categories of preferences as required.

School Data

The school data was based on the 2019 Annual School Census data for primary, junior secondary and senior secondary schools. We strictly differentiate between each of these levels so that teachers who apply for primary are only matched with schools at primary, teachers who apply for junior secondary are only matched with schools at junior secondary and so on for senior secondary.

For each school, we calculate a teacher need, based on the work in the associated Supply and Need paper. We add to this by simulating an additional specialism – being an early grade teacher. We do this by grouping primary grades 1-3 (lower primary), and primary grades 4-6 (upper primary), and then estimating the need as the number of teachers required to bring pupil-teacher ratios below 40.

This split is justified by the fact that more than three times as many teachers are needed at the earlier grades than later¹⁷, and the different pedagogical skills required to teach foundational literacy.

At the secondary level, we estimate teacher need for each subject specialism, as detailed in the companion Supply and Needs paper. This is more complex as it requires information on timetabling, and the size of the school. To facilitate this analysis, we developed a simple model of subject specialisms, timetables and school size based around a maximum class size, whereby targeting a maximum class size of 30 is equivalent to requiring an additional subject specialist for every 180 students.

The latitude and longitude of each school is also taken from the annual school census.

Building on the focus group research within the Teacher Deployment and Incentives in Sierra Leone report, we also include a number of other factors that are important to teachers about the schools they teach in. These are:

- Whether the school is approved or not (pending approval is treated as not approved)

¹⁷ Teacher need at lower primary using this formula equates to 5,221 teachers compared to 1,591 at upper primary

- Whether the school has a water source or not (the possible sources of borehole, piped, river, well and other treated as having water)
- Whether the school has an electricity source or not (the possible sources of generator, grid, solar and other treated as having electricity)
- Whether the school has teacher houses or not (one or more houses counts as having teacher houses)

Finally, this was combined with the language data in the 2015 National Census. At the chiefdom level, we used the modal (most common) main language of each person in the chiefdom and assigned this as the main language for each school in that chiefdom.

Preferences Criteria

Matching preferences are encoded in two [Teachers x Schools] matrices, one matrix for teacher preferences and one for school preferences. **Note, all of these matrices are amendable, and the overall scores can be adjusted to give differing weights for policy priorities as seen fit.**

Teacher preference matrix:

Each teacher is given a preference score for each school, as a sum of the following scores:

- District score: **A score of 1** if the school district matches their preferred district
- Language score: **A score of 1** if the main language of the chiefdom the school is in is the same as their main language
- Housing score: **A score of 1** if either the school has teacher accommodation or the school is less than 5km from the teacher's home
- Approval score: **A score of 1** if the school is approved
- Distance score: **A score calculated by $1 - D/500$** , where D is the distance in kilometres between the teacher's home and the school
- Electricity score: **A score of 1** if school has grid electricity, **a score of 0.5** if another form of electricity
- Water score: **A score of 1** if school has piped water, **a score of 0.5** if another form of water.

School preference matrix:

Each school is given a preference score for each teacher as a sum of the following scores:

- Qualifications score:
 - **A score of 1** if the teacher has post-graduate education qualification,
 - **A score of 0.8** if the teacher has any bachelor's education qualification,
 - **A score of 0.6** if the teacher has HTC matching the school level (so HTC (S) for secondary),
 - **A score of 0.4** if the teacher has HTC but not matching school level
 - **A score of 0.2** if the teacher has TC
- Experience score from 0 to 1; calculated by dividing the teacher's experience by 30 – so zero score is no experience, and 1 score is 30 years or above.

- Gender score: **A score of 0.1** if the teacher is female – meaning schools, in the event of a tie, prefer female teachers.

Matching Process

Matching is performed by a generalisation of the Gale Shapley matching algorithm for the stable marriage problem. The algorithm finds a stable match between a set of “proposers” and a set of “acceptors”, where a matching is stable if, of all the possible acceptors that any given proposer prefers to their current match, none can be matched that prefer this proposer to their own current match. While the basic algorithm allows only a single match for each proposer and acceptor, our generalisation allows both proposers and acceptors a (finite) capacity for matches, meaning that a stable matching is now one where, of all the possible acceptors that a given proposer prefers to their current least preferred match, none can be matched that prefer this proposer to their current least preferred match.

Where more than one stable match exists, the algorithm will return the one which is best overall for the proposers, therefore the choice of which side acts as proposer and which as acceptor can be important - *in our implementation the schools act as proposers and the teachers as acceptors, but this can be reversed to favour teachers if required.*

When there are ties in preferences, multiple stable matches may exist which are equally good overall for the proposers, and can only be separated by some tie-breaking rule.

In our implementation we always award ties to the school with the greatest remaining capacity (and therefore remaining need) out of the tied proposers. In other words, all else being exactly equal, a teacher will always be allocated to the school with the greatest need.

Simulating the model

We find that the model consistently outperforms random allocation¹⁸ based on a number of factors – here, we simply look at the average of the outcomes of allocating 5,000 teachers from the 13,000 applicants compared to if we distributed this number of teachers randomly - for most criteria¹⁹, this is simply the number of teachers, or number of schools, that got their desired outcome (so teacher got a school within their district). By looking at the shares that get this, we can see if the average quality increases using the algorithm. This average improvement in matching is shown by school preferences in Figure 3 and teacher preferences in Figure 4, whilst the raw scores of each method are shown in Figure 5.

¹⁸ Due to data issues, it is not possible to compare this to the previous deployment tool allocation or the remoteness categorisation of the teacher deployment policy.

¹⁹ The exception is for distance, which needs to be calculated as $(1 - \text{Score}) * 500\text{km}$.

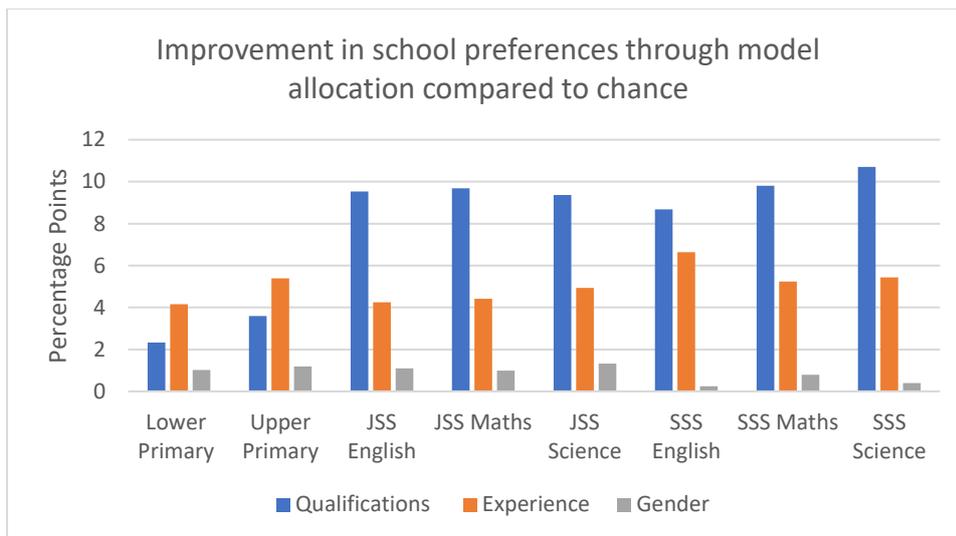


Figure 3: Percentage improvement of model allocation over random allocation by school preferences

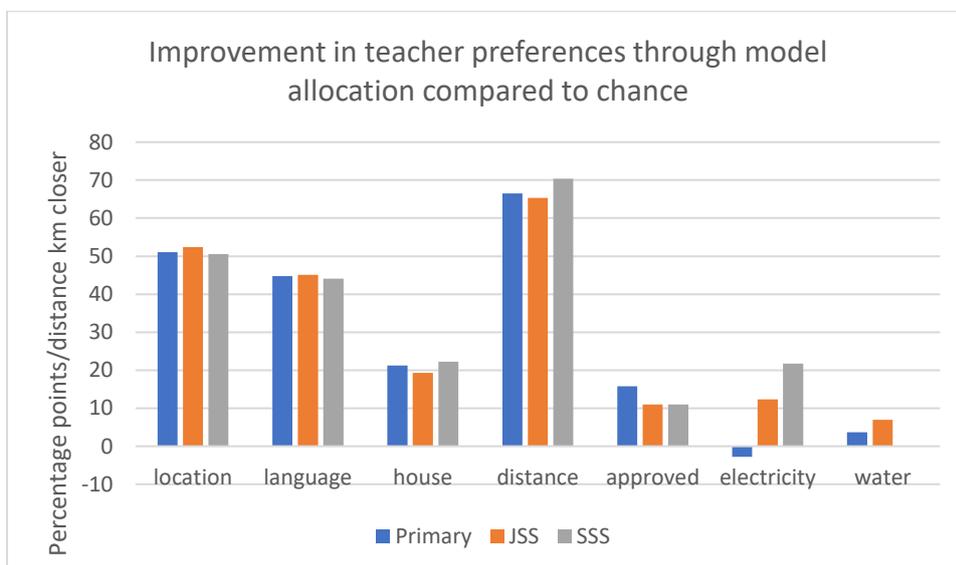


Figure 4: Percentage improvement of model allocation over random allocation by teacher preferences

We find in Figure 3 that the model allocation increases the average qualifications, experience and promotes gender balance in the workforce. The greatest gains are found in secondary schools, where schools can get an improvement in the likelihood of getting the qualifications they need by between 8-10 percentage points. For junior and senior secondary schools, this means they are more likely to be able to source the specialists they need – an issue highlighted in the associated Supply and Needs and Spatial Analysis papers.

As we simulated the data based on the existing shares of qualifications among the teacher population, we find that it is much easier for JSS and SSS schools to get higher qualified teachers matched to them than for primary schools – this reiterates the need to focus on upskilling the lower grades. For gender, again, while schools have a preference for female teachers on the margin, and we can marginally improve the allocations, this is much harder

with the workforce as it is – given the low proportion of female teachers – underlying the need for supply side improvements as described in the associated Supply and Needs paper.

Looking at the teachers in Figure 4, we find they are much more likely to receive the schools they wish than a random allocation – this is driven mostly by location and language preferences, which work much better. For distance we find a strong impact, which illustrates the potential of using this algorithm to ensure teachers can be matched locally.

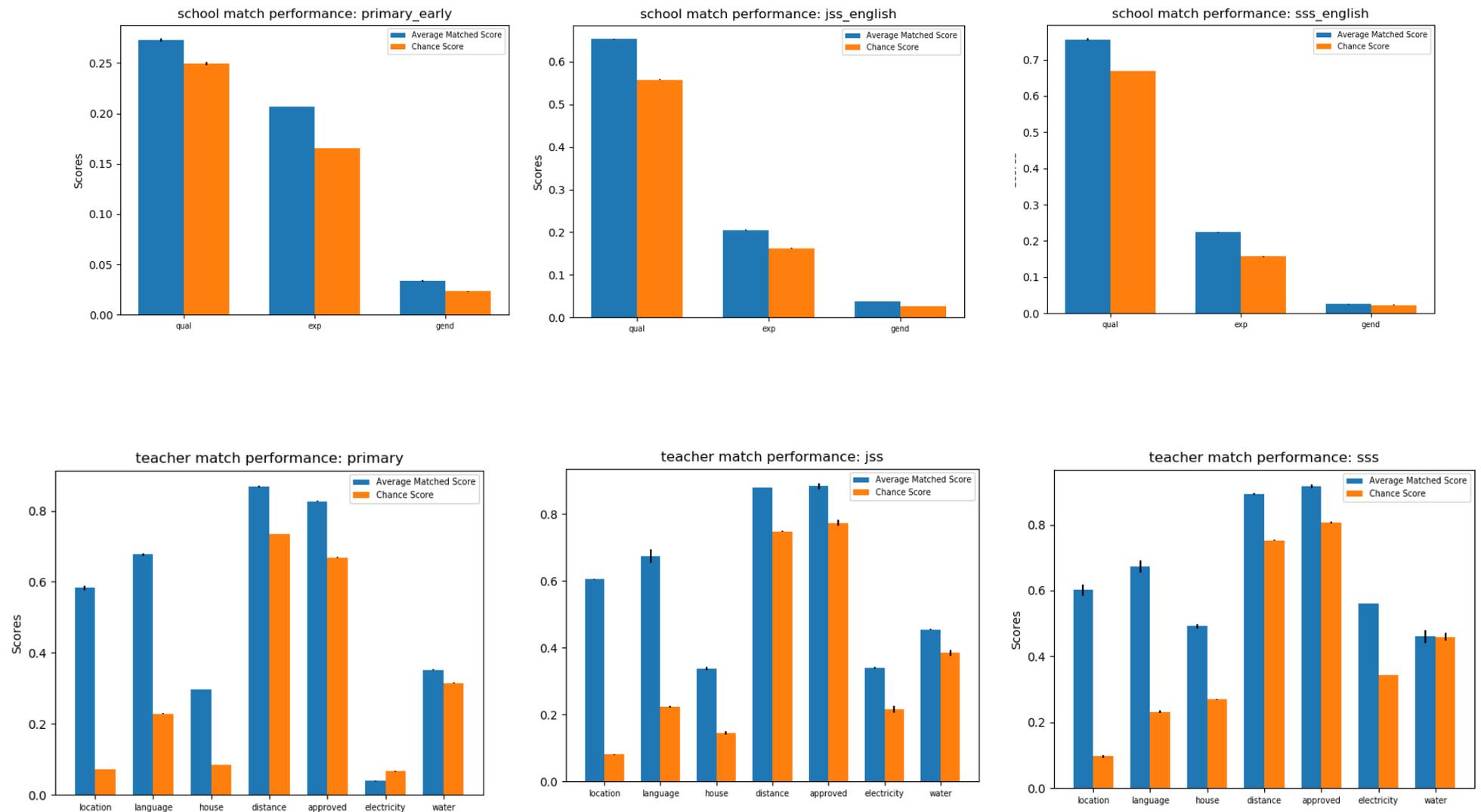


Figure 5: Raw scores (where success equals average percentage chance of meeting needs) of model allocation over random allocation for school and teacher preferences by education levels

Potential for future development

Once a basic matching model is in use, and teacher and school preferences become a key part of the approach to workforce deployment, additional refinements can be considered. Pursuing as close a match as possible between preferences and the administrative and legal rules is likely to lead to more successful deployments, with significant benefits for student learning, as well as for teachers, schools and the administration.

Ultimately, this model could incorporate any quantifiable characteristic that teachers, schools and policymakers consider desirable. Surveying teachers (through the teachers' union), head teachers, and administrators would be a good way to understand more about those preferences and incorporate them over time in the model. For example:

- A teacher with an aptitude for languages or who has already lived in different places across the country may be less concerned about moving to an area that speaks a different main language to them and may reduce the weighting of this preference.
- A school with a particularly young workforce may have a stronger preference for a teacher with a lot of experience to help guide and train their other teachers and so may increase the weighting of the experience preference.

A consultation would be important initially to test the basic model before launch. The Ministry could follow this up with periodic surveys to improve the approach on a regular basis. This may lead to introducing new factors into the model over time. For example:

- Gender: A teacher may have a strong preference not to be the only female in a school. Equally, a school might be seeking a better gender balance in its workforce.
- Specific Requests: Some matching systems allow teachers to express preferences for a finite number of specific schools or districts.

2.4 Suggested action plan

We recommend the following next steps to the TSC and the Ministry:

Short Term:

- The team shares the algorithm with the Ministry and the TSC, presenting it as an option to further refine the new teacher deployment policy, which can be run easily in house.

Assuming the idea is accepted in principle:

- The Ministry should commission or design in house a consultation with teachers and headteachers, administrators, and particularly the teachers' union, to test and refine the parameters of the model. This will be important for ensuring both teachers' and schools' most pressing issues are included.

- The TSC works to identify and alter all administrative tools that will require adaptation to ensure the relevant data is captured to feed the algorithm. For example, this will include developing the application form to ask for prospective teacher location and preferences for working locations.
- The TSC tests, or commissions tests on, the adapted tools to ensure that teachers are likely to fill out information consistently, a basic requirement for this approach. Preference surveys to each teacher and each school can help to bring out these differences, integrated into the application portal²⁰ (for teachers) and the Annual School Census (for schools).

Medium Term:

One advantage of the initial consultation will be that the Ministry and TSC will gain more knowledge about how teachers decide where they want to work, and how schools approach picking the best candidates. In the medium term, this information could be used to refine the approach in the future once basic matching is up and running. Further surveys could be commissioned over time to make continuous improvements to the model.

The flexibility and adaptability of the Preference Matching Model enables it to continually ensure that it is meeting the changing needs of schools, teachers and policymakers, highlighting its potential for full development into the recruitment and matching processes of Sierra Leone.

²⁰ This can be done using an application portal with fixed entry portals (e.g. drop-down selections of limited choices for each criteria). This is crucial to avoid the pitfalls of open text entry that result in too many varied responses to be incorporated.

Annex A – French system diagram

What is allocated?	Teaching positions in public schools.
Who are the participants?	All newly tenured teachers who have never been assigned a position. Participation is optional for any other tenured teacher wishing to change schools or regions.
Stated objectives of matching policy	Ensure that all vacant seats in schools are filled and that no teachers remain unallocated, ensure transparency and equality in teachers' demands treatment.
Who's in charge?	The central administration for the inter-regional phase. Regions for the intra-regional phase.
In place since	1999 for the bi-phase procedure.
Timing	Phase 1 – inter-regional mobility: November to March. Phase 2 – intra-regional mobility: March to July.
Information available to applicants	Teachers know all the elements that make up their priority scores, previous years' thresholds of teachers' scores required to enter each region[4], department or school in each discipline[5]. Limited information provided on schools: address, belongs to 'Priority Education', vacant position or not.
Restrictions on preference expression	Inter-region mobility: no restrictions. Intra-region mobility: at most 20 schools (or cities, department...) ranked
Matching procedure	The assignment uses a variant of the school-proposing deferred acceptance algorithm, followed by cycles.
Priorities and quotas	There are no quotas. A point system, based on legal criteria and individual characteristics, is used to rank teachers.
Tie-breaking	Inter-region mobility: date of birth (rarely used given the numerous criteria entering priorities over teachers). Intra-region mobility: teachers have the possibility to rank large geographic areas. Tie-breaking might be used to select a school within this area.