



Matching Practices for Trainee Teachers – Germany

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“Matching in Practice” is a research network that brings together the growing community of researchers in Europe working on the various aspects of assignment and matching in education and related labour markets.

These country profiles are part of a collective effort by network members to map matching practices across Europe

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Relevant country background

In Germany, students usually pass two phases of studies in order to become a teacher at a public school. The first phase consists of theoretical education taking place at a university or an educational college. The second phase is a trainee teacher program composed of some practical training courses at a teacher seminar and a teaching position at a school. It requires each student to be assigned to a seminar, which then determines at which school in its district the student will be teaching. Students enter the second phase after completion of the first phase and a successful application to the trainee teacher program.

A teacher in Germany must be educated in at least two subjects. Teacher seminars have a limited subject-specific capacity. The trainee teacher program has the special feature that students are educated at one seminar location. Hence, they must have a seat for both of their subjects at the same seminar in order to be admitted to the program. This leads to complementarities in the allocation procedure.

Two major decisions need to be taken during the application procedure of the trainee teacher program. First, it is decided whether a student is **admitted** to the program or not. Second, it is determined to which seminar an admitted student is **assigned**. The distinction between the two decisions is necessary as the admission criteria differ from the criteria applied in the assignment process.

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Admission is primarily based on grade. In contrast, assignment criteria focus solely on social circumstances (e.g. disability, care of children or other family members).

The legal framework for teacher training in Germany is specified at the state level. Each of the 16 states offers its own trainee teacher program with its own application procedures. Hence, the procedures that are conducted by the respective Ministries of Education vary widely between the states. Students can apply for trainee teacher programs in several states simultaneously. While coordination between states concerning application procedures is rather limited, a decision by the board of state ministers of education (Kultusministerkonferenz) in March 2013 guarantees equal chances of admission in every state's trainee teacher program no matter where in Germany students passed their first phase examinations [1].

In this country profile, the most common assignment mechanisms are presented. Its focus is mainly on difficulties arising for the assignment of trainee teachers to seminars. We distinguish between three different settings regarding the priority ordering of students by the seminars – no priority ordering, global priorities and local priorities.

In the first mechanism, the assignment procedures are trivial. In states such as **Saarland** or **Schleswig-Holstein** with only one seminar location, the assignment to this seminar is automatic once a student is admitted. Mechanisms of this type are therefore not covered in this country profile.

The second mechanism is a *serial dictatorship mechanism* which is used to assign admitted students to seminars in **Hesse**. Its key feature is that all seminars have the same priority ordering of students.

The third mechanism is a *combination of a first-preference-first mechanism and a serial dictatorship mechanism*. It is implemented in **Baden-Württemberg**. The priority ordering of students differs across seminars as students can only claim a higher priority at their first-choice seminar [2]. This is also the case for **North Rhine-Westphalia**. In Baden-Württemberg, a serial-dictatorship mechanism is used to assign all students with social priority and afterwards a first-preference-first mechanism for the remaining students.

Summary Box

What is allocated?	Trainee teacher positions
Who are the participants?	Students and teacher seminars
Stated objectives of matching policy	No admitted student remains unassigned, respecting students' preferences, giving priority to students fulfilling certain social criteria
Who is in charge?	Ministries of Education at the state level
Timing	Varies across states, one or two application periods a year, no coordination between states
Information available to applicants	Personal social score, range of subjects of every seminar location; limited information on assignment mechanism

Restrictions on preference expression	Preference lists limited to three to four teacher seminars
Matching procedure	Varies across states; commonly <i>serial-dictatorship</i> , <i>first-preference-first</i> or combinations of both
Priorities and quotas	States set legal framework and provide priority criteria and quotas
Tie-breaking	Varies. Seminars mostly use subordinate criteria such as subject combination and a lottery as last option
Other special features	Consideration of social scores in priority rankings varies between states

Trainee teacher admission and assignment procedure in Hesse

Background information on Hesse

The trainee teacher program of Hesse lasts 21 months and there are two application periods per year. The Hessian Ministry of Education determines the number of positions for each school type and their distribution according to subjects. Thereby, it considers the seminar capacities as well as the budget dedicated to the trainee teacher program. In addition, the Ministry determines subjects with high demand. All the information is then submitted to the Hessian academy of teachers (“Hessische Lehrkräfteakademie”) [3]. For each school type, it conducts a two-stage procedure: in the first stage, it is decided whether the student is admitted or not; the second stage determines which seminar the student is assigned to.

Description of current practices

At the start of the application process, students provide information about their grade, their number of waiting periods (in case admission was denied in previous applications) and social circumstances that justify priority. Furthermore, they submit a ranked list of at most three seminar locations which is used for assignment at the second stage.

The first stage is an admission process taking place whenever the number of applicants exceeds the number of available positions which is usually the case. Admission is based on the grade, social priority and waiting periods. Each of the three criteria is relevant for a separate quota where 50% of seats are reserved for admission based on grade, 15% based on social priority, and 35% on waiting periods. That is, for each school type, the total number of positions and the positions per subject are divided up between the three criteria. For example, if there are 1,000 seats in total then 500 places will be filled with grade as the ranking criterion, 150 by social priority and 350 by waiting time. To be admitted, students also need a position for all their subjects. Suppose there are 100 seats for mathematics trainee teachers. Then, 50 are reserved for students who are admitted via grade, 15 for social priority and 35 for

waiting periods. For each criterion, applicants are listed in different rankings. In each ranking, ties are broken by grade first and after that by lottery.

The admission mechanism starts with the first applicant of the “grade” ranking. If there is still a vacant position for each of her subjects and an available overall position, she will be admitted. Should there be no more capacity, the student cannot be admitted in the bracket “grade” and remains in the rankings for the brackets “social score” and “waiting periods”. After admitting the maximum number of students via “grade”, the procedure is repeated for the “social score” and finally “waiting periods”. Remaining vacant seats in the brackets “social score” or “waiting periods” are made available in the bracket “grade”. Afterwards, students with at least one subject of high demand can be admitted. A subject of high demand is a subject for which too few teachers in schools are currently available. Every student that could be successfully admitted proceeds to the second stage, while everyone else is rejected and may apply either in the next period or in another state, as admissions are decentralised across states and students can apply in several states simultaneously.

The second stage is the assignment procedure. In the assignment procedure only social circumstances determine priority in the mechanism. A *serial dictatorship* algorithm is used to match students to their preferences in order of their social priority. To allow for a student to be matched to a seminar, the desired seminar must have vacant seats for both of the applicant’s subject and must not have reached its total capacity limit. If both criteria are satisfied, the applicant is assigned to the seminar. Should there be insufficient capacity, the applicant will be considered for the next preference on her list. If there are no capacities at any of the preferred seminars, the applicant will be assigned a seminar with free seats. If students cannot be assigned, the capacities of seminars are iteratively increased and either the assignment process is repeated from the beginning until all students are assigned or the students are assigned manually.

Performance

In May 2017, 2,456 students of different school types applied for a trainee teacher position in Hesse. 1,399 students were admitted and assigned a position at a seminar afterwards. Admission varies a lot across different school types. Every primary school applicant received an offer (156 in May 2017). In contrast, high-school trainee teacher positions are scarce. Only 583 out of 1.368 students were admitted and assigned to a seminar. Out of those admitted, 1.076 students enrolled in the trainee teacher program.

Hence, 23% of students dropped out of the application process after they had been assigned to a position at a seminar. This quota varies between different school types. While 26% of high-school applicants did not start the trainee teacher program, the ratio was 17% for primary school positions. Students can apply for trainee teacher programs in other states which could explain the withdrawals. In May 2017, 34% of high-school applicants were from other states whereas there were only 17% of applicants for primary school positions coming from another state.

The proportion of admitted trainee teachers who have been assigned to their first-choice seminar is 80-90% in Hesse.

Perceived issues

In general, the serial dictatorship algorithm used in Hesse is strategy-proof and provides a stable and Pareto-efficient allocation. However, particular features of the assignment process are problematic.

Unstable allocations: One issue arises from the fact that each state has its own trainee teacher program with separate application processes. As students can apply for trainee teacher positions in many different states, it introduces a congestion issue. Students can hold several offers at the same time while they are still waiting for more attractive ones to come in. Once they receive a preferred offer, students reject previous offers (or they keep it and just don't show up at a later stage when students finalize their employment contract). These positions can thus not be offered to other students who might accept less preferred offers or not get a position at all resulting in unstable matchings. The data suggests that congestion is a major concern in the application procedure.

Infeasible allocations: Due to the separation of the admission and assignment procedure and the fact that a trainee teacher must get a position for both of her subjects at the same seminar, the assignment mechanism might create an infeasible allocation. That is, after the assignment mechanism is run the first time, there might be students unassigned due to their combination of subjects. To guarantee a position for all admitted students, capacities of seminars have to be adjusted. In this sense, the algorithm is not able to guarantee an allocation which respects the initial capacities of the seminars. In practice though, this seems not to be a major concern. If such a situation occurs, seminars can increase their capacities and restart the assignment mechanism until every admitted student is assigned to a seminar.

Constrained choice: The limitation of students' preference lists to a number of choices smaller than the number of possible seminar choices introduces well-known issues with strategy-proofness. In particular, students may have an incentive to put a safe seminar choice on their list that is not among their true preferred choices.

Existing data and legal texts

Numbers of applicants and enrolled trainee teachers as well as the distribution according to subjects for the application process in November 2017 provided by the Hessian academy of teachers are available online [4]. Klein and vom Baur have aggregate data on the number of applications and assignments to seminars for the application process in May 2017, but no individual data on student's preferences and priorities.

Legal text concerning the admission and assignment procedure in Hesse can be found in §§ 35 -40a, HLbG (Hessisches Lehrbildungsgesetz) [5] and in §§ 29 -40, HLbGDV (Verordnung zur Durchführung des Hessischen Lehrerbildungsgesetzes) [6]. Detailed information on the assignment procedure is not publicly available. The presented mechanisms were identified based on internet research and numerous conversations with the responsible ministries.

Trainee teacher admission and assignment procedure in Baden-Württemberg

Background information on Baden-Württemberg

The duration of the trainee teacher program in Baden-Württemberg is 18 months. There is one application process per year which is conducted separately for each school type (primary school, high-school, etc.). The number of seminar locations varies depending on school type (nine seminars for high-school trainee teachers, 14 for primary school trainee teachers). While in general the Ministry of Education is responsible for the trainee teacher program, it delegates the task of the application process to an assignment commission (Zuweisungskommission). Before the application process starts, seminars report their overall and their subject-specific capacities to the assignment commission. In contrast to other states, Baden-Württemberg guarantees positions for all trainee teacher applicants who meet the legal requirements for admission [7].

Description of current practices

Students submit a ranked list of seminars which is restricted to exactly four preferences (out of nine possible seminars in the case of high school trainee teachers). Students who are eligible for fewer seminars due to their subject combination must list all these seminars.

The assignment commission uses a point system [8] to define **local** priorities of trainee teachers. It awards points for the following social criteria:

- 20 points: health handicaps that require assignment to a specific region
- 7 points: single parent or applicant's spouse
- 5 points: care of a child (2 points for every following child)
- 5 points: care of family members
- 3 points: underage siblings that would otherwise be untended
- 2 points: public interest (e.g. function in a club)

Students can only claim social points for a seminar if the respective person or facility is located in the district of this seminar. Furthermore, they must list this seminar as their first preference [8]. According to their priority score at their first preference, students are listed in a global priority ranking. Ties are first broken by the number of seminars that students are eligible for due to the subject combination, second by a quota of other applicants with the same subject and at last by lottery. That is, students with the same social priority are ranked using subordinate criteria. First, students who are only eligible for few seminar locations receive a higher rank than those whose subject combination is offered by all seminars. Second, students with a rather frequent subject combination compared to the number of positions in this subject are ranked below students with a rare subject combination.

The assignment procedure in Baden-Württemberg is a process composed of four steps. In the first step, applicants with special features (e.g. foreigners) are assigned manually. The second step considers students who are only eligible for one specific seminar because of their subject combination.

Only in the third and fourth step, in which the vast majority of students is assigned, assignment is based on priority scores and student's preferences. In the third step, only students who can claim social points are assigned using a **serial dictatorship** algorithm. If a student cannot be assigned a seat at her first preference, then her following preferences will be considered immediately whenever the following

preferences are neighboring seminars [10] of her first preference. That is, the procedure allows the student to transfer her social priority score to this neighboring seminar. If the following preferences are not neighboring seminars or there are no listed preferences left, the student drops out of step three and is assigned in step four.

In the fourth step, students without any (remaining) social points are assigned using a centralized **Boston Mechanism**. In the first round all students are considered for their first preferences. In all following rounds applicants compete only for seats that remained vacant in the previous round. In case students remain unassigned after the four rounds, a fifth round is conducted. There, they are considered for their geographically closest seminar with vacant seats. However, the possibility of being unmatched remains. Any unassigned applicant will therefore either be manually assigned or the assignment process is repeated from the beginning after the capacities of the seminars have been increased.

Performance

In 2018, 6,486 students of different school types applied for a trainee teacher position in Baden-Württemberg. By construction, all students meeting the legal requirements who were still present in the application process at the time of the execution of the assignment procedure were assigned a position (5,703 in 2018). Overall, 4,780 students enrolled in the trainee teacher program.

Hence, 16% of students dropped out of the application process after they had been assigned to a position at a seminar. This quota varies between different school types. While 20% of high-school applicants did not start the trainee teacher program, the ratio was only 9% for primary school positions.

The quota of trainee teachers who have been assigned to their first-choice seminar is around 80%. In 2018, 83.25% of high-school trainee teachers and 77.3% of primary school trainee teachers were assigned their first choice.

Perceived issues

Besides issues concerning constrained preference lists and problems arising from 16 trainee teacher programs with different admission and assignment procedures in Germany, the special treatment of seminar-specific priorities introduces additional incentive issues.

Strategy-proofness: The consideration of a social score which applies only for the most preferred seminar introduces an essential problem to the assignment mechanism. Even though the *serial-dictatorship-mechanism* is generally strategy-proof, this is not the case in this setting where the student's priority at a seminar depends on her preference list. Applicants are encouraged to state untruthful preferences, if for example they can claim social points for a seminar that is not their truly most preferred one. In this case, they might try to ensure an assignment of a seat at this seminar by ranking it first, instead of ranking their most preferred seminar first and taking the risk of not getting assigned a seat there. A similar reasoning applies in the context of neighboring seminars [11].

The second stage of the assignment procedure faces a well-known incentive issue resulting from the *Boston mechanism*. Consider a student who cannot claim social priority and therefore takes part only in the second stage of the assignment mechanism. If her first-choice seminar is very popular, and she perceives assignment chances to be slim, she will have an incentive to state a less popular, but less preferred seminar first.

Stability: The assignment procedure in Baden-Württemberg suffers from another well-known problem of the Boston mechanism, namely the possibility that the outcome may not be stable. However, this does not seem to be a major concern as stability can only be violated for subordinate criteria such as subject combination [12].

Pareto-Efficiency: The allocation procedure delivers a Pareto-optimal allocation under the assumption that every applicant truthfully announces her preferences. The actual outcome might not be Pareto-optimal though, due to the lack of strategy-proofness.

Existing data and legal texts

Numbers of currently enrolled trainee teachers in each school type and distributions according to subjects are published every year by the Statistical Office of Baden-Württemberg [13]. For each school type, Klein and vom Baur have aggregated data on the number of applications and assignments at the seminar level as well as the quota of first-choice assignments, but no individual data on student's preferences and priorities.

Requirements for admission are stated in the legal text concerning the respective school type, see §2, GymPO II for the high-school trainee teacher program. [7] Information about the social point system used in the assignment procedure can be found in [8]. There is no publicly available information about the assignment mechanism. The presented mechanisms were identified based on internet research and numerous conversations with the responsible ministries.

References

[1] Decision about the mobility of applicants by the Kultusministerkonferenz in March 2013
https://www.kmk.org/fileadmin/Dateien/veroeffentlichungen_beschluesse/2013/2013_03_07-Lehrermobilitaet.pdf

[2] In Baden-Württemberg, the higher priority score will also be considered for some seminars other than the first-choice seminar, if it is a neighboring seminar to this first-choice seminar and the student lists the neighboring seminar as his second preference.

[3] §34 HLbGDV ("Verordnung zur Durchführung des Hessischen Lehrerbildungsgesetzes")
http://www.rv.hessenrecht.hessen.de/lexsoft/default/hessenrecht_rv.html?pid=Dokumentanzeige&showdoccase=1&js_peid=Trefferliste&documentnumber=1&numberofresults=2&fromdoctodoc=yes&doc.id=ilr-LehrBiGDVHErahmen&doc.part=R&doc.price=0.0&doc.hl=1#docid:4577568,35,20130101

[4] Data provided by the Hessian academy of teachers about the application procedure in November 2017
<http://www.uni-giessen.de/studium/dateien/lehramt/bewerbvorbereitungdienst>

[5] HLbG („Hessisches Lehrerbildungsgesetz“)

https://www.rv.hessenrecht.hessen.de/lexsoft/default/hessenrecht_rv.html?pid=Dokumentanzeige&showdoccase=1&js_peid=Trefferliste&documentnumber=1&numberofresults=2&fromdoctodoc=yes&doc.id=jlr-LehrBiGDVHErahmen&doc.part=R&doc.price=0.0&doc.hl=1#docid:448423,1,20160217

[6] HLbGDV (“Verordnung zur Durchführung des Hessischen Lehrerbildungsgesetzes“)

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[7] The admission criteria are defined in the legal texts concerning the trainee teacher program of a specific school type. For high-school trainee teachers, they can be found online in §2, GymPO II:

<http://www.landesrecht->

[bw.de/jportal/portal/t/zgm/page/bsbawueprod.psml;jsessionid=E4BEBAA3EA24A1513BF6014EC5733F1B.jp80?doc.hl=1&doc.id=jlr-](http://www.landesrecht-bw.de/jportal/portal/t/zgm/page/bsbawueprod.psml;jsessionid=E4BEBAA3EA24A1513BF6014EC5733F1B.jp80?doc.hl=1&doc.id=jlr-)

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[8] The point system for social criteria is stated in the “Erlass des Kultusministeriums an die Oberschulämter vom 4. Dezember 1987, Nr. III/5-6701.7/22”

https://www.hoc.kit.edu/zlb/downloads/2018-06-33_Infoveranstaltung_Refererndariat_FINAL_Neu.pdf

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[9] Consider a student who must take care of her sick mother (5 points). The mother lives in the district of the seminar “Weingarten”. Hence, the student can only claim social points if she lists “Weingarten” as her first preference. She does not receive social points if she lists any other seminar as her first preference.

[10] Neighboring seminar is defined as a seminar whose geographical area is located next to the first-choice seminar district.

[11] Consider a student who can claim social points for her most preferred seminar. Her true second preference is not a neighboring seminar of her first choice. If she is neither assigned a seat at her most preferred seminar nor her second choice, she might have the incentive to list a neighboring seminar as her second choice.

[12] Remember that only students who cannot claim any social points (for their remaining preferences) take part in the Boston mechanism. Therefore, the priority of these students depends only on their subject combination with less frequent subjects getting higher priorities. A situation in which a student with common subjects is assigned a position at a seminar in a round before a student with less common subjects is considered, describes a blocking pair.

[13] Data provided by the Statistical Office of Baden-Württemberg about the trainee teacher program

<https://www.statistik-bw.de/BildungKultur/SchulenAllgem/lehrerAusbildg.jsp>

MiP Country Profiles downloadable from matching-in-practice.eu

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MiP Country Profile 2. Kübler, Dorothea (2011), [University admission practices – Germany](#).

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