Spot on Challenged Learners

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Abstract. In practice, educational institutions much more focus on teaching than they do on learning. They also have trouble in providing learners with adequate learning circumstances. Parents hope for education to simplify the social ascension of their kids or at least to prevent their descendance. Thus, students flood institutions of higher learning. Many of them cannot be adequately supported in their efforts, due to limited funding and elitist views often met at tertiary institutions. This paper introduces an approach to counter these factors and focuses on challenged learners, i.e. learners that are threatened from expulsion due to insufficient exam performance.

The Problem

As human civilization advances and human society evolves into a hierarchically structured entity that focuses on the production of wealth, the need for formalized learning and examination comes about. Schools of the various kinds appear and institutionalize learning and examination. Clearly, the learning institutions are not neutral about the various groups of a society. They rather tend to follow the elites. In this paper I ignore these things and focuses on the modern individual learner. I, however, mention that the interview [8] hints at the OECD having a political agenda associated with the Pisa studies.

When labor becomes abundant and mobile to the extent that the workforce needed at a place easily can move between continents or countries, investments into the local workforce not necessarily still is the cheapest way to support business. Instead, foreign experts or hands are hired at the labor world market and moved to the proper location. Institutions of learning in consequence potentially suffer from underfunding. Chomsky, in “A Requiem for the American Dream”, even goes as far as considering underfunding as a strategy at hand to the elites of a country or block for restructuring public sector institutions. An obvious goal of that restructuring is privatization, which in the political debates, behind the scenes, may play an important role. Related action in the education sector is a key concern of mine.

Currently, I identify at least four forms of privatization in the education sector: (1) underfunding public educational institutions, (2) creation and operation of private educational institutions; (3) taking self-paid private lessons and (4) conducting for-profit tutoring. About 15% of pupils in Germany take private lessons [5]. Surprisingly, this phenomenon already appears in primary school and not only at the secondary level of education. Clearly, this surmounts to a massive threat to the healthy development of the affected kids. In parallel to these problems a wide spread teacher shortage is diagnosed in Germany [16], [13] and pupil numbers are massively rising [11].

The new conservatism, as employed in the so-called Western countries, in the last 30 years or so, has contributed to mass migration. Surprising the public, large quantities of folks nowadays can advance to some country and start to make their life there, rather than in their native countries. While politics or spontaneous feeling of the folks in the affected countries might not like that phenomenon, the migrants have moved and deserve help to make themselves at home in the new country. Besides, going (or, for that matter, being expatriated) back to their native country, in many cases is not a possible, since war or economic mismanagement together with political structures, that prevent change, are the root-cause of that migration.

As a result, cultural, ethnical and religious differences among the folks in one country may significantly challenge its educational institutions. Moreover, as social security systems begin to malfunction or even disappear entirely, formal education may appear to be the best way to avoid future social disqualification. One can thus currently recognize a run to higher learning. In
Germany, e. g. the number of students at tertiary educational institutions according to the web site of the “Statistisches Bundesamt” has increased from 2.757.799 in 2015/16 to 2.867.586 in 2018/19. This run creates or increases the need for quality educational institutions to flunk huge percentages of their students. It appears, however, to be an outrage that over years certain courses offered by a given alma mater (consider, e. g. the RWTH-Aachen) had exam flunk-rates of 60 percent and over. While that, at the first glance, might not appear worrisome, one needs to know, that one who fails the exam three times and cannot pass the oral examination is discarded at all German universities from studying the subject. While the 2018/19 student number is a preliminary one, the student numbers given above seem to show that the average yearly increase is about 40000 students. Obviously, with this trend continuing, only a major infrastructure initiative can make a decent study experience become reality.

As the narrative goes, those not passing the related exams, are underachievers, who simply must accept their fate. It is, however, not that obvious that the sacked ones would not make decent professionals. As are well-known, social and psychological circumstances may affect academic performance. There is ample evidence that such factors play a significant role at contemporary German institutions [17],[15],[12],[6],[1]. The term used in the press to address these phenomena is “stress”. Online questioning students seems to show [6] that students are more stressed than workers and that they work longer hours per week. Financing their studying for 20% of the students in Germany is that big a problem, that they have a job that turns them into part-time students. According to Press Release No. 284 of the “Statistisches Bundesamt” dated 8.2.18 the number of students getting state funding (BaFöG) is 557.000. This is a little below 20% of students. Consequently, the academic elite in Germany essentially reproduces itself. That data shows, that academic performance is not a real vehicle of social mobility. Roughly, half of those who get funding get the largest monthly amount of about EUR 750. It thus is not surprising that shortness of money and concerns about the future are key causes of stress, as uncovered by [6]. Regarding this it is noteworthy, that the state subsidy must be repaid. According to www.bafoeg-aktuell.de the repayment amount is the minimum of EUR 10000 and half the received funding.

As reported in [18], stress can impair cognitive capabilities of certain kinds of mammals. Loneliness, as reported in [19], is a basic emotion of some kinds of mammals. Obviously, the anonymity of large scale modern educational institutions, can stress students. The experienced stress level of students [7] at German tertiary institutions, among others, depends on gender, subject of study and the chosen tertiary institution or the federal state, it is situated in. Thus, likely structural aspects play a role in the experienced stress level and hence the academic performance of students with German tertiary institutions. A psychologist, however, not necessarily reports such structural causes of student stress [10]. Remarkably, frequently students, who seek psychological help, mention that at school, contrary to university, they used to learn with passion and curiosity [10].

Maybe, the flunked ones were learning under inadequate circumstances or at the wrong time. From a holistic perspective on human society it seems to be worth trying to save at least some of the efforts spent on education. Also, one not necessarily has to agree with the scores used in the tertiary institutions. One might, for example point out, that ascribing performance measures to students, rests on a social construction, i. e., the human characteristics to focus on and the way to quantify or otherwise make them comparable. Therefore, one can challenge any such performance measure on grounds of it essentially resting on a social convention. Clearly, any convention, to some extent, is arbitrary. It thus has alternatives, that, if chosen, might have implied different academic performance outcomes. A recent discussion of performance measuring in German school in in [21]. The OECD in a recent study estimates the annual backlog in education spending in Germany by EUR 30 billion [22].

Another reason for challenging the performance measures as obtained by universities (and schools) is, that the social climate at a given institution might push individuals of a certain learner type while it might block individuals of other types. As changing the learner type, someone has
evolved into, is at least quite difficult, the imposition of a preferred learner type on students equals to an unfair advantage respectively disadvantage. Therefore, the current grouping into high and low achievers is quite questionable. Also, a democratic society from time to time might need to adjust the archetype of researcher or scientific employee, they want their young folks to look for. The 1968 rebellion was an attempt to do this for the Western countries. Since in the West, no big debate on these matters has arisen since, now it might be high time for this.

Finally, nowadays societies are changing quite fast. Therefore, no one really knows under what circumstances current entry level students will have to make their living twenty years after their graduation. It thus seems plausible that teaching and learning should refocus from utility for current business to personal growth, learning to learn and individualized study programs.

Private Lessons in Germany

Some empirical data is available about private lessons, as taken by pupils in Germany. The “Bundeverband Nachhilfe und Nachmittagsschulen” VNN provides such data. They mention recent studies by DIW and Bertelsmann Stiftung https://www.nachhilfeschulen.org. They claim that the annual private lessons business is close to EUR 1 billion, with much of it resulting from private deals. Also, in Germany the percentage of pupils who take private lessons seems to be rising. It currently is about 15% and thus is much smaller than in South Korea and Japan, where 70% of high school students take such classes. The VNN says that in Germany about 4000 institutions are operating, that provide private lessons and employ about 50000 staff for that. The VNN estimates that about 700000 other individuals offer private lessons outside the mentioned institutions. In an article dated 6.13.2018 the Hannoversche Allgemeine Zeitung estimates [14] that a 45-minute private lesson at high school level costs in Germany about EUR 18. It seems that the tutors employed by the larger for-profit private lesson providers, essentially work for the minimum wage. In fact, a stark contrast to the salaries common in the public educational sector. superprof.de mentions further studies on private lessons in Germany. In line with the above, the Spiegel [5] says that each student in average takes about 33 lessons a year.

Several companies exist, that target university students. A related incomplete list is in the appendix to this paper. At uniturm.de in “Vergleich Nachhilfe Für Studenten”, a number of such companies is listed and discussed. They mention Studybees, Easy-Tutor, Tutoria, Studienkreis, Lecturio, Student-Sky and Sofatutor. Some of these offer online-teaching in one form or another. Also, real meetings are common. These may be 1:1 or 1:n meetings. Obviously, the price a student must pay for a teaching unit depends on the chosen alternative. Many of these providers have a matching platform of some kind to simplify the actual finding of a suitable tutor. All of them, however, do not particularly well focus on the actual process of learning. It is up to the tutor in question to organize and ease learning. The above-mentioned companies also do not aid learners to build a community and talk about their problems about learning the subject.

“Nachhilfe und Unterricht” https://www.nachhilfe-unterricht.com is one of the providers who offer tutorials for pupils as well as for university students. Their 45-minute unit costs between EUR 17,50 und EUR 32,50. For on-site tutorials they charge a starters fee of EUR 29,00 and charge a travel fee of EUR 0,30 per km but at most EUR 6,00 for reach tutorial. Superprof https://www.superprof.de (accessed 12.13.2018) advertises the availability of 1986 private teachers. There appears to occur a remarkable difference in the prices being charged for an hour of teaching. For example, Charlotte from Berlin charges EUR 10 while Niklas from Munich charges EUR 70. He apparently being a mathematics school teacher can even afford to miss out on the business poorer kids represent, who cannot pay his rates. An extremely relevant statement is made by mentorium https://www.superprof.de (accessed 12.13.2018). They say that “… of their pupils and students about 97% pass their mathematics exam and very frequently they perform better than the average.” They do business not only all over Germany, additionally they cover Austria, Luxembourg and Switzerland. Only 5% of the docent applicants pass the application procedure since they aim at only working with the best folks available. They offer a knowledge base that has information about a huge number of issues. They seem not to focus on learning materials, however.
Learning

In case one is honest about it, one notices at once, that in institutions of learning, to some extent, teaching has outranked learning. Those focusing on teaching, may make the surprising observation, that teaching neither is equal to, nor does imply, learning. The teacher, who in the best traditions is understood as a guide of the learner through territories to explore and master, has in many instances turned into a more or less mild dictator who tells the learner what to do, how to and when to do it. No wonder that under these circumstances teaching often is not fun, is not sustainable and thus only to a very small extent triggers learning.

In the amazing 1992 Hollywood film “The Scent of a Woman” Al Pacino, impersonating one of the two main characters of that movie, makes the point quite clear and strong. He, impersonating a blind US veteran, a colonel, instructs his later to be protégé, to never take his arm (to guide him) but rather to wait for him, the colonel, to take the protégé’s arm. Obviously, the first approach is patronizing and deprecating, while the latter approach respects the autonomy of the one, who in a foreign territory aims at looking about. Obviously only the second approach respects the human dignity of the blind or vision impaired, i. e. the learner.

Learning is an adaptation to a situation in which to master a problem that one could not or not master well before. Obviously, complementary to this external view of learning an internal view of learning may exist, that I am, however, going to ignore here. That external view of learning has three important consequences. To enable learning to solve a problem, the learner, first, must be able to experience a sequence of different instances of that problem. Second, the learner must be able to ask a trusted person for help in the learning matter. Third, the learner needs to be able to relate their performance with that of comparable fellow learners. Also, to make sure the failure to learn is not embarrassing, the learner must be able to hide the fact from others.

Obviously, to know who they are, why they learn, what they want to learn and what their learning difficulties are, is key to optimally support learners. Traditionally, one focuses on either university or school students in so far, as they are struggling with the curriculum in general. The learners, I focus on, are special. I call them challenged, since they, due to their insufficient performance in critical exams, are threatened from being expelled from their course of study. While efficiency always plays some role in learning, challenged learners are special, as they need the best possible input-output ratio. Professional experience shows, that quite a number of challenged learners, virtually unprepared, reach out for help three weeks prior to the exam. If nothing else, then this shows the total failure of the German tertiary educational system.

The reasons for being a challenged learner are ample. They may be insufficient study funding, language, cultural or social adaptation difficulties. The number of students enrolled at an institution seems to play a role too [6], with larger numbers seeming to increase the problem. Also, inappropriate secondary level education or ill-chosen educational goals may play a role

The Munitur Solution

Munitur (Munitur.de) is a fresh start-up, the founding of which I have been involved in. My co-founders and I believe that currently the best way to aid challenged learners is by way of a private company providing a learning environment. That environment is supposed to aid the learner to take control of and organize their learning. Such environment, a learning tool, if you will, may help to overcome the learning difficulties mentioned above. Munitur aims at and has designed its business model such that we charge students subscribing to our material and technology EUR 10 per month. Due to space limitations I cannot go into discussing the Munitur business model. We believe that learners on our platform will substantially save on tutor costs. Therefore, we believe that our approach has the potential for a sound business.

The problem of someone who is about to go for their third and final try to sit the exam is, that they need to learn very rapidly, effectively and train their capabilities of practically solving problems as posed in the exam. Most of the challenged learners, for that need to find help, help of
qualified individuals who aid them to interact with high quality learning material so that the learner can assume the responsibility for their learning. As challenged learners unsuccessfully have tried the university avenue of learning and the university is not ready to give the kind and amount of aid needed, those challenged learners look out for aid outside their university. To our knowledge, none of the many Germany-wide operating private-lessons-providers has set up a technical infrastructure, that allows the students to take the lead in their own learning and at the same time search for qualified tutors to tutor them in a safe, comfortable and affordable environment.

We at Munitur have designed and are implementing such infrastructure. It consists of three main components: a knowledge base, a knowledgePal and a market place. The market place is an environment in which one can offer and request tutoring and tutoring locations. We are going to set it up such that learners can inspect the credentials of potential tutors online along with learner assessments of tutor performance. Only those individuals may register as potential tutors, who pass our qualification interview. On that market place one will be able to form tutoring groups and make appointments for tutorials. Also, employers interested in graduates of technical disciplines may, in a partner section, represent themselves and offer job opportunities.

The knowledgePal is a software-component, that lets the registered user interact with our knowledge base. The knowledge base consists of chunks of knowledge that are linked together by prerequisite. A user may specify a theme and the knowledgePal then retrieves and delivers it to the learner. Themes are like atoms in the knowledge area the learner is dealing with. Each theme gives basic as well as advanced information. Typically, with our themes we cover the stuff needed to pass the exam.

Each Munitur theme has the sections:
1. Educational aims, i. e. what the successful learner knows after working through the theme;
2. Prerequisites, i. e. what the learner should know prior to working on the theme;
3. Motivation, i. e. the reasons for which the learner should devote some of their time to it;
4. Keywords, i. e. a user adaptable list of words for learner’s associate theme search;
5. Explanation, i. e. key concept definitions and main results;
6. Examples, i. e. worked-out problems involving the key concepts;
7. Problems, i. e. a list of problem schemata, instances of which are common in the exam. These schemata are set-up such that a learner can request new instances of them, supply their solution to the knowledgePal and have them assessed and ranked;
8. Notices, i. e. ad-hoc reminders that a learner might want to read when interacting with a theme. Here the learner also can add their notes and share them with other folks, especially their tutor or any further customers;
9. References;

We consider the themes in our knowledge base as the vertices of a theme graph. The latter is a directed graph and there is an arrow from theme X to theme Y, if and only if theme Y is listed as a prerequisite for theme X. Upon retrieving a certain theme from the knowledge base, the learner, by making use of query execution instructions, can instruct the knowledgePal to retrieve each theme reachable by the transitive closure on the theme graph. Rather than that, the learner may specify to only retrieve the themes, that are at most a specifiable number of links away from their theme of interest.

When interacting with a theme, the learner may mark a part of the theme and have it, along with a comment, mentioned to a trusted individual such as their tutor, for them to be speaking meaningfully about the problem on occasion of their next tutorial or for online interaction. That way, the learner may work through the material prior to the tutorial and notify the tutor in advance of what was difficult. This in a way reverses the roles of teacher and learner. Traditionally the teacher presents the stuff and tries to start a related discussion on issues experienced by the learners. In our case, we offer problem generation and marking on the fly, the learner may very well know what they have mastered and where they are stuck.
Munitur feels related to what in the 1960s was known as “programmed learning”. It was a stream in Pedagogy which was on vogue in Germany in the 1970s [20]. With the technology available at that time the related textbooks allowed pupils to study with their own pace and get solution hints or comments when proper and possible. Pupils even inevitably would create their own path through the schoolbook. A path that implicitly was defined by their learning curve.

The “Notices” section of a theme may serve as an exchange board so that learners may more easily exchange their ideas about the stuff they are learning. A learner may also use that section to store results as provided by the calculator incorporated in our platform. That way, the calculator can be used in discussions as well as when working on examples, problems or fake exams. Our knowledgePal enables a learner to score a shared contribution and we are prepared to reward learners or tutors whose contributions often are ranked highly by many learners.

The theme specification may be achieved by the learner selecting a theme from the theme list or, by way of typing text into an auto completion text field, select one of the keywords mentioned in the theme or specify the most often retrieved theme having certain characteristics such as meeting some of the key words or having the highest or lowest average user score or similar.

While right now there is going to be only the one module “Higher Mathematics I”, in future we are going to import into the knowledge base further modules. A user may subscribe to our knowledge base and will then have access to all our modules of a given knowledge area. We are not going to lock learners into contracts. Everyone will be free to leave with a one-month notice.

We pay attention to two distinct characteristics of challenged learners of “Higher Mathematics I”. These are (1) their attitude towards mathematics and (2) the fact that they did not choose to study mathematics and the latter rather came with their subject. We aim at dealing with the latter characteristic by valuating highly in examples and problems key application aspects of the subject of study.

The attitude of challenged learners towards abstraction and rule-based deduction is not a positive one and their related capabilities are not well trained. At Munitur, we pay tribute to that by focusing less on proofs and more on examples and problems. Also, if we include proofs, then we take care for conclusiveness and completeness. We supply completely worked-through examples and try to put them such, that learners can easily grasp them. In calculation and manipulations of formulae we always are quite complete. We are going to add a switch, that allows a learner to display or hide more detail in any learning material we supply. This shall aid the learner in training their dedicated creativity and abstraction capabilities. Since we make it simple to talk about any problems in understanding the material we provide, we think, that we aid learners well in taking charge of their learning. To this also contributes, that the problems we supply are prepared such that expected errors are included in the solution list from which the learner must choose their answers. Therefore, we can pass meaningful comments to those, who make the related mistake.

We aim at a concrete treatment of our subject. This causes the problem to distinguish the thing we want to illustrate, i.e. the theorem, concept, technique or similar, from the material we encoded it in. To allow the learner to focus on that thing rather than the material we reduce the variety of such materials, like functions, relations, sets or similar. For example, when we introduce Cardano’s formulae for solving equations of degree three, then we use the related polynomial to illustrate Newton’s method and use it to illustrate techniques for curve sketching in the case of quotients of polynomial functions.

To assure the required high competency of the tutors working with the students, subscribing to our knowledge base, we make those tutors to work with our material and contribute to the continued improvement of that learning material. Obviously, if they wish so, tutors can turn this into an advantage, since they can profit from experiences made by fellow tutors. They also may use our material to increase their ability in certain themes and that way increase the list of subjects that they can tutor.

Not only is the knowledgePal able to find out, whether a learner’s answer to a problem is correct. It rather can compare the learner’s performance with the performance of comparable learners.
is supposed to, on demand, give the learner an impression of how they are doing. The anonymized data the Pal is collecting enables also learning strategies such as starting with the seemingly simplest or most popular themes and then working up through to the most difficult ones. Since no other community measure is that easy to come by, a learner might take the average learner performance about a theme as an indicator of its difficulty.

Our attempt, to empower the learner within and by using our learning platform, not only rests on the ability to point out and discuss issues. We rather build into the knowledgePal a calculator that the Pal uses to communicate to the user examples and problems and the graphs of related functions. The learner can then use the transformational as well as the representational power of that calculator to experiment with the related functions or simply to calculate some of their characteristics such as zeros, derivative, integral or evaluate that function at certain locations.

We want to provide the learner with problems on request. That needs a technical solution, as we need in each case to know the correct answer and likely mistakes, so that we on the fly can generate meaningful responses to solutions. Therefore, we classify the problems we deal with. For example, in case of differentiation, we restrict ourselves to supply functions, that are compositions of more elementary functions and in the composition only employ the composition operators for which we have discussed the related derivation rules. We obtain the correct solution by using the rules of the differential calculus.

Concerning other operators, such as the integral operator, we use the same approach. We first classify the various integrands. For each integrand class we cover, we use the established solving transformations. The same goes for other operator classes such as the limit operator applied to a sequence or series.

I classify the problems we use in two different ways. The first of these rests on the operators that a learner might wish to exercise. This is a classification according to the mathematical concepts that the exam suggests that the learner wants to pass. The second classification rests on different ways the learner is to supply their attempted problem solution. To our knowledge currently no AI-approach exists, that is able to take a solution in free-form and verify its correctness. My preliminary list of solution solution types is:

1. **Multiple choice**, we pass a selection-list to the learner. That list, along with false solutions has correct ones in it. The learner’s task then is to point out the correct solutions. We credit them for each correct solution they point out.

2. **Puzzle**, we pass several arguments or solution steps to the learner. The task of the learner is to put the arguments or steps into such order as needed to achieve a specified goal. The goal could, for example, be to obtain a proof or complete a multi-step calculation. I distinguish (1) **Incomplete puzzle** from (2) **disturbed puzzle**. The former is a puzzle from which a few parts are missing, and the learner must figure these out prior to completing the puzzle. A disturbed puzzle is one, that has a number of its components altered, such that no solution exists anymore. The learner then first must correct the mangled with components and then solve the puzzle.

It should be possible to combine these two solution types. For example, by means of a multiple-choice selection list we are going to supply the puzzle components to the learner and have them choose the right ones prior to solving the puzzle.

As we supply to a learner only problems or fake exams the solutions of which we know and have the learners give their answers in a way that enables us to automatically tell right from wrong, we can grade and rank the learners. Grading the learner means to point out to them the percentage of correct answers. Ranking, however, means, to point out to them the percentage of learners who were graded lower, roughly equal or higher than them. Both these measures can a learner use to better their understanding of their performance.

**Perspectives**

Currently Munitur focuses on learning that takes place outside educational institutions. However, in case our approach proves to be effective, we are prepared to cooperate with educational institutions, so that more learners can improve their learning and their academic performance.
activities focus on “Higher Mathematics I” for mechanical engineering students. We are going to include other Mathematics subjects and then go beyond mathematics. Future targets may be second language learners and law related subjects. However, also self-helping-guides, enterprise training courses and such are on our map. Finally, we have started to design and are going to implement a virtual class room. It shall offer an alternative to physical meetings and also limit to the minimum, the need for such meetings.

Appendix: German nation-wide student private lesson providers

- [http://aachen.studentenring.de/?gclid=CjwKCAiAjNjgBRAgEiwAGLlf2iJYm1wIBiTZaNqB9PtpKaNtaE1Tfqr96eAGU-P4Y0SH-8LnpQJhoCndwQAvD_BwE](http://aachen.studentenring.de/?gclid=CjwKCAiAjNjgBRAgEiwAGLlf2iJYm1wIBiTZaNqB9PtpKaNtaE1Tfqr96eAGU-P4Y0SH-8LnpQJhoCndwQAvD_BwE)
- [https://www.statisticz.de/](https://www.statisticz.de/)
- [https://www.online-nachhilfe.de/uebersicht/?c=IN2503&keyword=nachhilfe%20f%C3%BCr%20studenten&matchtype=e&device=t&campaign=198034579&adgroup=13586495059&gclid=CjwKCAiAjNjgBRAgEiwAGLlf2kq12RX6PcA3v31UTotxS5QS2iCNH-QWcH4AI-mYKJH_J6vFotdpxOTboQAvD_BwE](https://www.online-nachhilfe.de/uebersicht/?c=IN2503&keyword=nachhilfe%20f%C3%BCr%20studenten&matchtype=e&device=t&campaign=198034579&adgroup=13586495059&gclid=CjwKCAiAjNjgBRAgEiwAGLlf2kq12RX6PcA3v31UTotxS5QS2iCNH-QWcH4AI-mYKJH_J6vFotdpxOTboQAvD_BwE)
- [https://www.superprof.de/unterrichtsangebot/mathematik/deutschland/bachelor/](https://www.superprof.de/unterrichtsangebot/mathematik/deutschland/bachelor/)
- [https://www.mentorium.de/mathematik-nachhilfe-unterricht-studenten/](https://www.mentorium.de/mathematik-nachhilfe-unterricht-studenten/)
- [https://www.nachhilfe-team.net/studenten-nachhilfe.php](https://www.nachhilfe-team.net/studenten-nachhilfe.php)
- [https://www.alpha-academica.de/kursangebot/nachhilfe-fuer-studenten/](https://www.alpha-academica.de/kursangebot/nachhilfe-fuer-studenten/)
- [https://optimalnachhilfe.de/nachhilfe-gesucht/studenten/mathematik](https://optimalnachhilfe.de/nachhilfe-gesucht/studenten/mathematik)
- [https://www.student-sky.de/](https://www.student-sky.de/)
- [http://www.bildungsdoc.de/infos/studium/nachhilfe-privatlehrer](http://www.bildungsdoc.de/infos/studium/nachhilfe-privatlehrer)
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- [http://studium.lerntipp.at/student-sein/nachhilfe.shtml](http://studium.lerntipp.at/student-sein/nachhilfe.shtml)
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