

THE ROLE OF ENGLISH IN THE INITIAL COURSES OF GEOFORENSICS

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Abstract: The paper deals with questions relevant to the role of the English language and its use in the possible implementation of geoforensics as a scientific discipline at the Faculty of Mining and Geology, University of Belgrade. The intent is to encourage more meaningful consideration of the significance and role of English and its applicative models in the initial implementation of the abovementioned scientific discipline. Initially, the paper explores the existing definitions of geoforensics, considers its importance, actuality and its relevance regarding the modern needs of society. Following that, processes of acquiring vocational language knowledge are identified through two phases with the help of all existing language-learning tools and facilities within the Faculty. The first phase emphasises the parallel use of the learner's mother language and English whereby they translate select written materials with the aim of acquiring the relevant (untranslated) terminology more profoundly and systematically. After the first receptive phase, the paper deals with the model of the productive phase which seeks to facilitate the development of written and oral skills. The development of oral skills means that the learner acquires communicative competencies when speaking both with professional and non-professional speakers. Further, the paper draws attention to the importance of written skills such as the writing of reports, maps, notes etc. in both technical and colloquial registers. Finally, the paper presents an analysis and discussion of student stances toward the presented model of learning, gained via questionnaire. Conclusions to the paper underscore the importance of using the English language and the legitimacy of the two-phase model as clear and transparent means of implementing and teaching a new scientific discipline in tertiary education.

Keywords: geoforensics, interdisciplinary, two-phase model, English, communication skills.

ON THE CONCEPT OF GEOFORENSICS

Geoforensics, Forensic Geology, and Forensic Geoscience also known as Criminal Geoforensics (sr. *geoforenzika*, *sudska geologija*) deals with trace records in the form of land, minerals and oil. As its name implies, its main application is in the criminal investigations. In other words, a forensic geologist can assist the police in those types of crimes such as murder, terrorism, abduction, serious sexual assaults, rapes, explosive and fire-arms incidents, which are related to rock fragments, micro-fossils, soils and sediments or artificial man-made materials derived from geological raw materials such as bricks, concrete, glass or plaster board. This interconnectedness between the Police and Geology is possible because many of the basic fundamental principles of geology along with geological techniques and methods are applicable to police investigations.

Additionally, geoforensics can be applied in the cases of fraud and theft. Namely, the first recent data on the use of geology in the investigation of a crime is about 150 years old and it is associated with the attempted theft of silver. Silver coins which were loaded in Leipzig, arrived in Berlin in the form of sand, which is a classic case of substitution. At that time a famous microscopist Hans Christian Ehrenberg was asked to analyse the sand which he compared to the sand along the route. He identified one location as comparable, and on questioning the station staff, the confession was obtained and the silver found.

Furthermore, with increasing impact of environmental human activity, the release of contaminants into hydrosphere, lithosphere and atmosphere, there has been an increased need for urgent legal action in this area which, in turn, has led to an increased amount of environmental legislation¹. As a consequence, the application of geological techniques and analyses can be used in identifying and mapping the source and impact of waste materials, pollutants and contaminants in much the same way as it is used traditionally in the murder cases.

The lack of materials, which is more than evident on this subject, is due to the fact that despite the increasing activity in this area, the large scale employment of police staff or outside experts, the works and results were simply not published. This could be interpreted as a multidisciplinary hiatus or oversight among geology, judiciary and police, or simply the lack of willingness to establish the realm of new scientific practice and theory. It is more than evident that the newly-established sophisticated means and methods of analysis of soil, sediments, waters and air need to be supported by rigorous models both in sound science and legislation since several cases of "Expert Witness" evidence have been overturned and challenged as unsafe since the value of Earth Science in forensic investigations is still disregarded².

ON THE IMPORTANCE OF ENGLISH AS LINGUA FRANCA IN GEOLOGY

In agreement with this subtitle, we perform a bibliometric analysis accomplished by Reguant and Casadellà stating that: "(A) English is the language most used in geological sciences; (B) its use by authors and journals from non-speaking English countries is progressively, but slowly, increasing; (C) the citing of non-English scientific literature by most English-speaking authors is scarce or non-existent. This suggests that they lack significant information, as pointed out by Reguant³ in an advanced result of this work"⁴.

Likewise, some years earlier, in a more general sense, Crystal stated: "Many people feel that the only realistic chance of breaking the foreign-language barrier is to use a natural language as a world lingua franca. The history of ideas already provides precedents, with Latin used as a medium of education in Western Europe throughout the middle ages, and French used as the language of international diplomacy from the 17th to the 20th centuries. Today, English is the main contender for the position of world lingua franca"⁵.

1 Nanda V.P., & Pring, G., (2012). *International Environmental Law and Policy for the 21st Century*. Martinus Nijhoff Publishers

2 Pirriell, D., Ruffell, A., & Dawson, L.A., (2016). *Environmental and criminal geoforensics: an introduction*, Available at <http://sp.lyellcollection.org/content/early/2013/09/09/SP384.20>, accessed on 20.03.2017

3 S. Reguant. (1993). What lingua franca? *Nature*, 361, p. 107.

4 Reguant, S. & Casadellà, J., (1994). English as lingua franca in geological scientific publications. A bibliometric analysis. *Scientometrics*. 29 (3), p. 335.

5 Crystal, D., (1987). *The Cambridge Encyclopedia of Language*, Cambridge University Press. Cambridge, 1987, p. 357.

INTRODUCTION TO THE PHASES

Since geoforensics is not currently being studied at FMG in either English or Serbian, this area of study is a didactic blank canvas of sorts. Nevertheless, any potential implementation needs to be considered carefully lest any initial enthusiasm for this science be lost due to an ineffective or uninspired course. Hence, with the situation being as it is, a two-phase system or approach has been proposed to ease students into a completely new scientific discipline more comfortably.

The initial phase, dubbed the receptive phase, would consist primarily of reading and translation exercises. Though there are many arguments both for and against the extensive use of the L1^{6,7}, due to the unique circumstances of any potential study of geoforensics we feel that, in this case, the advantages outweigh the disadvantages given. Most importantly, extensive reading of topical texts is a very effective way of introducing plenty of new vocabulary⁸ as well as translation exercises, with extensive support from both the teacher and a specialized dictionary, facilitating the acquisition of difficult, technical vocabulary⁹.

Following that would be the productive phase in which the focus would shift to areas more in line with modern teaching practice such as speaking and writing. The emphasis here would be on specific vocabulary acquired in the previous phase of study that needs to be activated through meaningful, practical application. There is no use in dutifully memorising lists of words and expressions if the same could not be applied in a real life scenario as described by Donnelly¹⁰ who talks about how geoforensic officers are often called upon to testify in court. When doing so, they often need to communicate complicated scientific procedures or principles in such a way as to be understood by most, if not all, of the members of court. Achieving this would be a daunting task for native speakers of English, let alone students studying geology parallel to English while at the same time practicing their communication skills to be able to deal with delicate situations they may find themselves in professionally.

ON THE RECEPTIVE PHASE

The linguistic necessity that arises from the above mentioned is that if a teacher is to apply a scientific context in a classroom, he/she has to rely on a relevant dictionary as a point of support or departure, and then try to create equivalents in L1. Good English dictionaries are seen as necessary not because the reading activities are viewed as purely word-to-word translation ones or those with overly using dictionary in search for meaning. Quite contrary, dictionaries are tools for bridging the gap between the known and the unknown as well as for linking the L1 with the L2 in the most appropriate way. In order to achieve this, it is essential that the student has previously mastered everything that is taught in the fields of study, such as:

- Geology: stratification, mineralogy, geochemistry, weathering, erosion, soil creep, landslides;
- Geomorphology: elevation, topography, relief, slope, disturbances;
- Geophysics: electrical conductivity, microgravity, seismicity;
- Geotechnics: friction, cohesion, plasticity, diggability, bulking, shrinkage, swelling;

6 Ur, P. (1996). *A Course in Language Teaching*. Cambridge. Cambridge University Press., p. 216

7 Harmer, J., (2012). *Essential Teacher Knowledge*. Edinburgh Gate. Pearson Education Limited, pp. 55-56

8 *ibid.*, p.122

9 *ibid.*, p.170

10 Donnelly, L.J., (2009). The role of geoforensics in policing and law enforcement, Available at <https://www2.le.ac.uk/departments/geology/hosted-sites/esta/downloadable-files/Emergency%20Global%20FINAL.pdf>, Accessed on 25.03.2017

- Hydrogeology: connectivity, porosity, permeability, drainage, runoff, liquefaction, rainfall, flowpaths.

Only by profiting from the above-mentioned academic studies will the student be likely to establish a basic linguistic context and the order of events in the potential vital role in solving the crimes. The dictionaries relevant to forensic science are the next step and should include a wide array of relevant specialist terms from firearms, toolmarks, trace evidence, crime scene investigation, case history, forensic computing etc. Bearing in mind the advancement of technological equipment and recent scientific development, students are advised to create their own version of a dictionary with all the specificities that the forensic practice may encompass.

Reading activities in a geoforensic course are seen as being able to examine, interpret and reflect on factual texts containing increasing levels of difficulty. Being able to read also means processing and using varied information from footage, film, drawings, graphs, tables, globes and maps. For a student to understand and participate actively, it is also necessary to be able to read and collect information from reference books, newspapers and the internet, and to assess this information critically.

We discern two levels of readers:

- *Fluent reader* – is either a situation model or text model. When reading a text, new elements of meaning are continuously added to a network of ideas from the text. Some elements reappear often, while other are not considered as important and fades away from the reader's immediate attention. Those elements that remain are integrated into a text model of comprehension. This model represents the reader's linguistic comprehension of the text. When engaging with a text, however, the reader also brings a level of interpretation to the information processed, and as a result, builds a situation model of reader interpretation¹¹.

- *Proficient reader* – is also a strategic reader. According to Grabe¹² strategic readers “engage actively in reading, read far more extensively, and have the motivation to read for longer periods of time”¹³. Grabe also adds that strategic readers engage in difficult and challenging texts, using strategies that will help them manage the text. In order for students to develop their reading strategy use, they have to explicitly learn about strategy use, as well as be given the opportunity to implement strategies in their reading. (This will also require teachers to expand their own knowledge of strategies and how they can be taught and to focus more on strategies in their teaching).

ON THE PRODUCTIVE PHASE

Since geologists are often asked to transfer or communicate results, advice and recommendations from their geological exploration to different recipients such as politicians, policy makers, the public, media, judiciary, it is of central importance for them to avoid failure to precisely communicate the message accurately and clearly. According to Donnelly¹⁴: “if the correct message is not conveyed properly, or is misunderstood, or misinterpreted, the consequences can be catastrophic”. It is noted that for geologists the communication of information

11 Grabe, W., & Stroller, F. L. (2002). *Teaching and Researching Reading*. Harlow, England: Pearson Education.

12 Grabe, W. (2009). *Reading in a Second Language. Moving from Theory to Practice*. Cambridge: Cambridge University Press

13 *ibid.*, p. 227

14 Donnelly, L.J. (2007). *Communication in geology: A personal perspective and lessons from volcanic, mining, exploration, geotechnical and police (forensic) investigations*, Available at <http://www.ukgeohazards.info/Documents/Papers/Donnelly%202008%20Communication%20and%20geology.pdf>, Accessed on 21.03.2017

can be more difficult than the investigation itself. This is because many of these investigations apply highly sophisticated scientific techniques, geological terminology and specific technical jargon, which when combined with cultural and language barriers, social, political, religious and economic constraints that often exist, put a geologist in a very difficult position. Namely, conveying the geological data for the recipient to understand means translating it into many “Englishes” or sublanguages that exist within the multilayered social strata.

During the study, geologists have either very modest or no training in communication skills. According to Donnelly¹⁵ “Spoken communication relies on interpersonal skills and the ability to convey information effectively, confidently and consistently.” Thus, for language teachers and geological professors it may sometimes seem very challenging to organize or improvise interviews with media and the public. Supplementing talks and presentations with experts and judiciary are no less demanding. “A good communicator must also be a good listener, using silence, reflecting, paraphrasing and using non-verbal behavior. It is possible, there should be feedback from the targeted audience of individual¹⁶.

Furthermore, the level of successful communication may vary depending on the education of recipients, in cases of experts’ communication, it can be of a technical nature, but with a mixed audience, the appropriate level of non-technical vocabulary is difficult to attain, and should be considered carefully before the engagement takes place.

At other times however, it is the duty of forensic geologists to write or assist in the writing of reports, information leaflets, guidebooks, technical notes, letters, professional correspondence etc. which is why honing writing skills should definitely be an important area of focus in this course¹⁷. Only through proper guidance, practice and instruction can our students, the majority of whom have poor prior writing experience, learn how to be confident and independent users of the English language¹⁸, and to learn how to deal with the specificities present in geoforensics.

The usefulness of writing practice could even said to be threefold as it facilitates students’ English skills, as well as benefitting them academically and professionally. Taking into account that students are often called upon by their professors to produce writing whether in the form of scientific papers or essays or presentations, this form of writing instruction could have a favourable effect on their writing skills in general¹⁹. Combined with the fact that these writing skills will undoubtedly be used in their future work²⁰, as is the case with future forensic geologists, extensive practice and instruction of writing seem to be more than justified.

This paper in this respect relies heavily on not so ample body of literature and personal reports that it may purport to know the best way to bridge the gap of incomprehension of a professional and a layman (at least as far as geology may be concerned). Rather, it seeks to encourage educators to try to raise awareness of their students regarding this issue and that a more delicate, nuanced approach to communication by both sides is crucial for effective mutual understanding, especially in gravely serious situations that an expert of geoforensics may find themselves in.

15 *ibid.*, p. 1

16 Donnelly, L.J. (2002). Finding the silent witness: how forensic geology helps solve crimes. All-Party Parliamentary Group for Earth Science. The Geological Society of London, *Geoscientist*, 12, 5, p.16

17 Donnelly, L.J. (2007). *Communication in geology: A personal perspective and lessons from volcanic, mining, exploration, geotechnical and police (forensic) investigations*, Available at <http://www.ukgeohazards.info/Documents/Papers/Donnelly%202008%20Communication%20and%20geology.pdf>, Accessed on 21.03.2017. pp. 4-5

18 Edge, J., (1993). *Essentials of English Language Teaching*. London. Longman. pp. 119-120

19 Kellogg, R.T. & Raulerson, B.A., (2007) Improving the Writing Skills of College Students. *Psychonomic Bulletin & Review* 14: 237. doi:10.3758/BF03194058

20 *ibid.*

RESEARCH: METHODOLOGY, RESULTS, DISCUSSION

Taking into account the novelty of geoforensics and the unique role that English has to play in familiarising our students with the key concepts and ideas of this interdisciplinary science, it was deemed crucial to assess their attitudes toward its teaching. We considered a quantitative questionnaire the most useful research tool for this purpose, namely assessing attitudes towards the study of a new discipline directly by means of a foreign language.

The students who responded to the questionnaire are currently attending their first year at the FMG and are well into their second course of English. As far as their English language ability is concerned, it ranges from beginner to intermediate in most cases with several advanced students. In order to ensure that the feedback was as accurate as possible the language used in the questionnaire was Serbian. 93 students in total participated in the survey.

The questionnaire itself is of a Likert-type and is made up from 8 statements assessing student attitudes toward geoforensics, English and their opinions regarding the parallel study thereof. The questions could be divided into four categories according to their statements:

- General attitudes towards geoforensics.
- Students' stance towards the role of English in the study of geoforensics.
- Statements regarding the receptive phase of study.
- Statements regarding the productive phase of study.

In the statements regarding the receptive and productive phases of geoforensics the students had to signify to which degree they agreed with the statements by choosing a number from 1 to 5. 1 denoted complete disagreement whereas the number 5 denoted complete agreement with the statement.

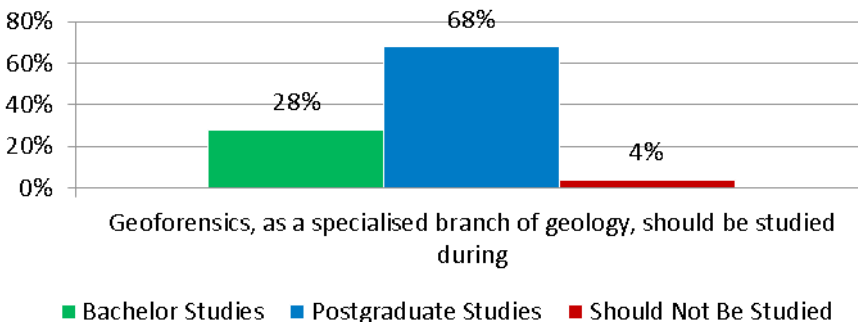


Table 1: General attitudes towards geoforensics

Regarding student attitudes as to when geoforensics should be studied, if at all, the results were overwhelmingly in favour of introducing the subject. Just 4% of students deemed the study of geoforensics unnecessary. What is curious though is that most (68%) would prefer to study geoforensics at a postgraduate course, not during their Bachelor studies.

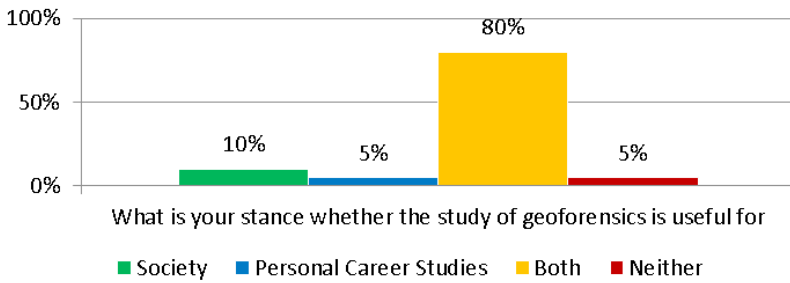


Table 2: Usefulness of geoforensics study

In terms of usefulness and its benefit to society, once again most (79%) felt that geoforensics was dually beneficent, benefitting society on one hand by providing another method of gathering evidence and so serving justice, as well as offering a unique career opportunity that many had never thought to consider before – a career in law enforcement.

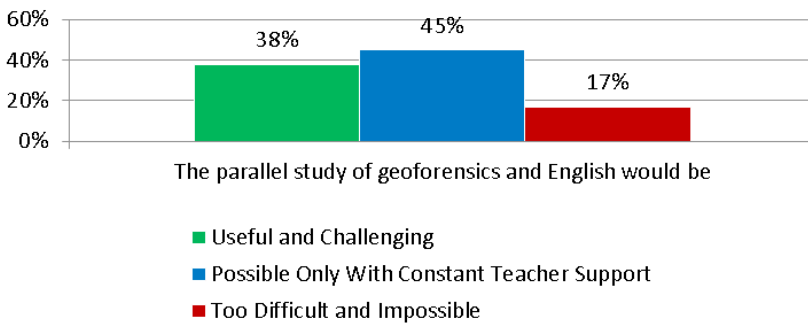


Table 3: Students’ stance towards the role of English in the study of geoforensics

When it comes to the parallel study of English and geoforensics i.e. learning geoforensics primarily through English, a not insignificant portion of students (17%) had misgivings about the idea. This may be attributed to the generally weak level of English exhibited by most students, combined with the radical notion, from their point of view of course, of learning a new subject wholly via English. That being said, it bears repeating that despite these odds, the willingness to learn and challenge oneself prevails, with the remaining 83% of students opting for a positive answer.

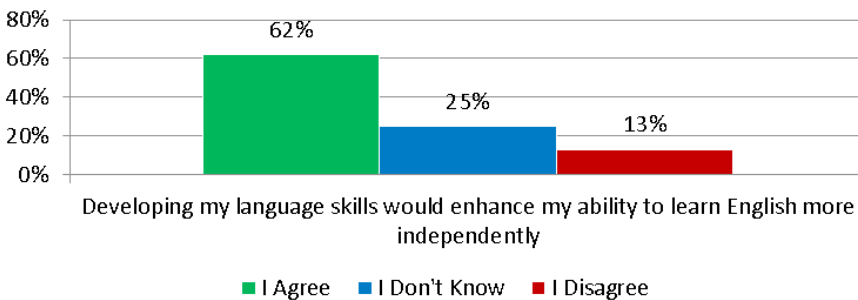


Table 4: Students’ stance towards language skill enhancement

The majority of students do feel that developing their English skills would make them more independent learners. Given the situation that we are currently in, with a new scientific discipline untranslated into Serbian, making our students more independent learners would better prepare them to deal with these situations in the future. Therefore, we must make every effort to promote student independence language-wise.

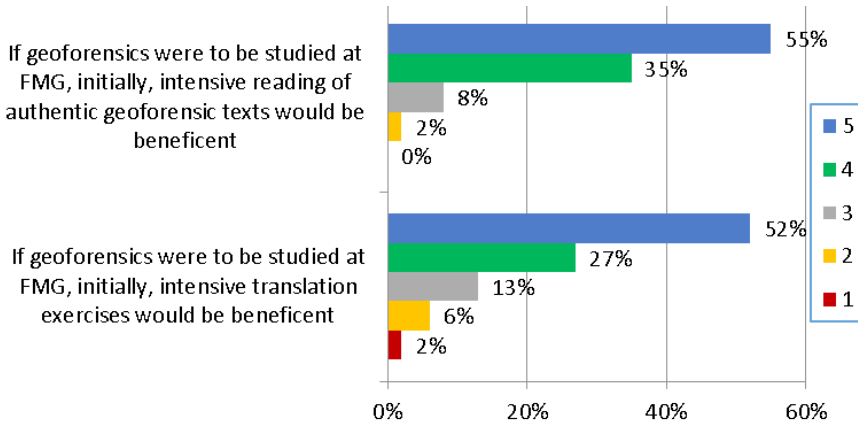


Table 5: Questions concerning the receptive phase

When it comes to the receptive phase, the majority of students seem to recognise the importance of building up a passive vocabulary from scratch, both through reading and translation. It does seem that translation is a slightly less popular method though the difference in preference is not marked.

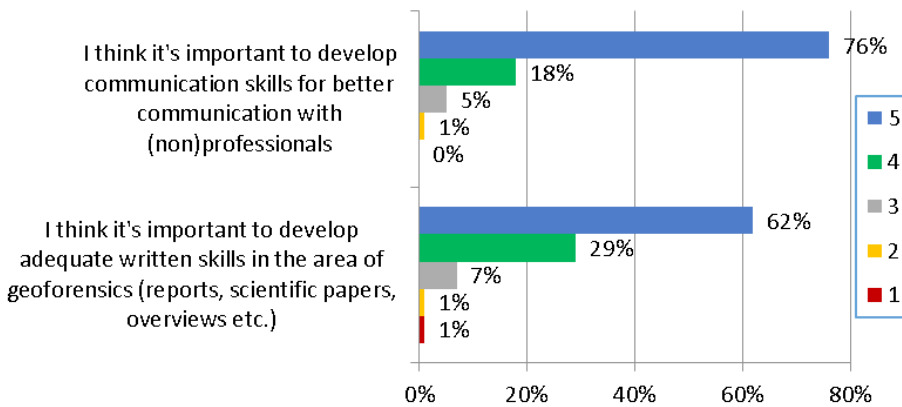


Table 6: Questions concerning the productive phase

Student responses in the productive phase are even more positive than in the receptive phase with writing skills being considered slightly less useful than communication skills. This small dichotomy might stem from the fact that students might be able to more easily see the practical and direct applications of their communication skills as opposed to producing writing. That is why it is important to reinforce the idea of the importance of writing in regards to their future academic success, professional career and the development of English skills.

CONCLUSION

This paper has discussed the concept of geoforensics and its relevance to modern day society. Geoforensics is an emerging, interdisciplinary scientific field that offers a whole new perspective to young geological engineers, offering unique employment opportunities previously unthought of.

Since geoforensics is not a subject currently taught at the Faculty of Mining and Geology in Belgrade, we have proposed a way in which English and ELT might be used to successfully implement the study of geoforensics at FMG.

To that end, a two-phase system of study has been devised consisting of an initial receptive phase focusing on extensive reading and translation and a later phase which puts more emphasis on more meaningful and practical language production through speaking and writing dubbed the productive phase. We felt that in this way students would be given enough time to acclimate to the new vocabulary, especially that from the area of forensic science.

As our survey has shown, we may tentatively conclude that interest for the study of geoforensics does exist although it will still take some time to see how it could be best integrated into the existing curriculum. More specifically, the greatest point of contention could be whether or not the subject should be studied during the initial four years of Bachelor studies or potentially become part of a postgraduate course.

Nevertheless, given student interest, especially regarding future career opportunities, the possible study of geoforensics at FMG could be a great boon to the students at the Faculty, the Faculty itself and Serbian geology. Whether or not English, and the study thereof, has a place in that process remains to be seen, however, it is our hope that we have shown how an interdisciplinary approach such as this one, integrating language, geology and forensics, may serve to everybody's benefit.

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